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Memoirs

Of The New York Botanical Garden

Volume 35, part 1

THE AMERICAN CASSIINAE

**A Synoptical Revision of Leguminosae
Tribe Cassieae subtribe Cassiinae
in the New World**

Howard S. Irwin and Rupert C. Barneby

Issued 17 December 1982

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FOREWORD

In looking back over the nearly three decades of work that have led to this treatment, I believe its genesis lay with my fascination for the *Cassiinae* found on the roadside banks and in the dooryards of Georgetown, Guyana. In 1952, while a Fulbright teacher at Queen's College, I began making herbarium collections of local plants, partly for classroom use but mostly for my own edification, and in that way encountered some of the several species of *Cassia*, *Senna* and *Chamaecrista* indigenous and introduced along the alluvial coastal plain.

After moving the next year to Timehri Airport (then Atkinson Field), some 25 miles southward, I found that the lofty riverine forest along the Demerara River and the nearby depauperate muri bush and scrubby dakama forest, both on white sand upland, displayed distinctive floras, each with its own complement of *Cassiinae*. In time, airplane and jeep trips were made further afield to such places as Orealla, Kaieteur Falls and Mount Roraima, and to several localities in the Rupununi savannas and the Pakaraima range. Many of these forays were made solo or with students but on some I enjoyed the company of the late Dennis Fanshawe, then conservator of forests, whose help and encouragement meant much to me, particularly in defining a significant taxonomic project for my postgraduate pursuit.

In 1954, after many discussions with Fanshawe and a visit to see Dr. B. L. Turner at the University of Texas, I undertook intensive field study and collecting of *Cassia* sens. lat., as we then regarded it, and not long afterward decided to concentrate especially on the well defined subsection *Xerocalyx*. After acquiring a copy of Bentham's 1871 revision of *Cassia* from Sir Edward Salisbury, director of the Royal Botanic Gardens at Kew, I made an exploratory trip to the rural university at Viçosa, in the Brazilian state of Minas Gerais, where, thanks to the generous prior assistance of Dr. Lyman Smith of the Smithsonian, contact was made with botanists Chotaro Shimoya and Moacyr Maestri. With university and state collaboration, Maestri and I made a memorable preliminary three-week jeep trip through central and western Minas, southern Goiás and the new Federal District. I returned elated, not only over having seen and collected so much *Xerocalyx* but at having confirmed Bentham's description of the rocky ridges of central Brazil as a veritable garden of *Cassia*. In addition to making extensive field notes, hundreds of herbarium specimens and numerous seed sets, special collections of flower buds and root tips were preserved for prompt chromosome number determination (many by Turner in Texas). A few years later, while at the University of Texas for doctoral work, I made numerous *Cassia*-collecting trips in the American Southwest and Mexico and a seven-month return expedition to central Brazil to continue work on *Xerocalyx*, which culminated in a dissertation.

In 1960, at Dr. Bassett Maguire's invitation, I began work at The New York Botanical Garden, initially as the leader of the series of the Garden's NSF-supported botanical expeditions to Amazonian Brazil and the Guianas and later as The New York Botanical Garden principal in a collaborative exploration program focused on the Planalto do Brasil and headquartered at the co-sponsoring institution, the Universidade de Brasília. During this very productive period, from 1964 to 1972, which included a year's residence in Brasília and benefitted greatly from the early assistance of Dr. João Murça Pires, numerous months-long mo-

torized forays were made to diverse localities in this vast savanna region, from central Goiás to southern Minas and from central Bahia to eastern Mato Grosso. While making many thousands of survey collections, I arranged itineraries and schedules according to what was known of the distribution and behavior of local *Cassiinae*. In collaboration with Dr. David Rogers, a taximetric study of section *Apoucouita* was completed in 1967—one of the first computer assisted taxonomic studies to be published.

After I was appointed the Garden's executive director in 1971, it became difficult to carry out regular field work and to advance the derivative research. Not only was the next planalto expedition turned over to Dr. William Anderson but I was dismayed to find so little time to continue work on sections *Absus* and *Chamaecrista*.

In 1973, Rupert Barneby came to the rescue as collaborator, not only in the present work but in several related projects as well. Without his enthusiastic participation, superb taxonomic judgment and single-minded drive to see projects through to completion, most would have foundered or lain uncompleted. Although the taxonomic decisions made throughout this collaboration reflect much discussion and eventual concensus between us, the keys, descriptions and notes are mostly in his words, reflecting his mastery of the genera, his elucidation of much new information and, in large part, his synthesis of relevant data. In addition to his devoting untold hours to the detailed study of thousands of specimens, many of them borrowed, Dr. Barneby spent several weeks in the field in the Planalto and undertook numerous study visits to American and European herbaria.

The fifty-four figures that embellish these volumes are the work of Mrs. Annetta Duveen (fig. 18), Mr. William S. Moyer III (figs. 47, 50–53) and Ms. Barbara Angell. The five contributed by Mr. Moyer were drawn from life and are reproduced here from an earlier paper (Irwin & Barneby, 1976a). Ms. Angell's forty-eight figures bear witness to her mastery of technique, her appreciation of fine morphological detail, and her gift for restoring life to herbarium specimens.

We both thank the Garden, the National Science Foundation, all participating institutions in the countries visited and the scores of taxonomists and other collaborators who have assisted us in pursuing this extended project, whether in the field, the herbarium, the laboratory, the office, at meetings, aboard airplanes, around campfires, over coffee—the catalog is too extensive to detail. I do want to single out three people, however, without whose intelligent, willing, and faithful field service year after year in Amazonia and later in the Planalto the raw material for this research would never have been so intensive. Sidney Geraldo Fonseca, Raimundo Reis dos Santos and the late Raimundo Sousa are our unsung Brazilian heroes who, in ways not evident to the reader, deserve as much credit as those who helped us in their varied professional capacities.

Research in field and herbarium culminating in this volume was supported by National Science Foundation grants GB 2293, GB 6458, BMS 74-19289, BMS 76-24079 and DEB 78-18365 to The New York Botanical Garden.

H. S. Irwin

THE AMERICAN CASSIINAE
A Synoptical Revision
of Leguminosae tribe Cassieae subtribe Cassiinae in the New World

HOWARD S. IRWIN¹ AND RUPERT C. BARNEBY²

INTRODUCTION

The subtribe Cassiinae is the largest of five which form the tribe Cassieae of the Leguminosae Caesalpinioideae or of the family Caesalpinaceae. A definition of the tribe and its component subtribes has been published elsewhere (Irwin & Barneby in Polhill & Raven, 1981, pp. 97-106), but for purposes of orientation it is appropriate to reproduce here a short description of the Cassieae and a key to its subtribes. Immediately following these will be found a diagnostic description of the subtribe that is the subject of this monograph and a key to its three genera.

LEGUMINOSAE tribus CASSIEAE Bronn emend. Irwin & Barneby

Leguminosae tribus Cassieae Bronn, De formis pl. legum. 130. 1822, ex parte, quoad genus typicum *Cassiam* L.

Leguminosae tribus Cassieae subtribus Irregulares Bronn, 1822, l.c., ex parte, quoad genus *Cassiam* L., caeteris exclusis.

Trees, shrubs, bush-ropes and herbs; leaves paripinnate, imparipinnate (exceptionally bipinnate), 1-foliolate, phyllodal or 0, sometimes bearing nectariferous glands on leafstalks or axes of inflorescence, the lfts either opposite or alternate; stipules lateral, rarely 0; inflorescence racemose or paniculate, the fls regular, zygomorphic, or without axis of symmetry, either hermaphrodite, polygamous or dioecious; bracteoles 0-2; hypanthium cupular, solid, or 0; sepals (3-)4-5(-6), free beyond hypanthium rim, imbricate or rarely subvalvate; intrastaminal disc sometimes (Ceratiinae, some Dialiinae) present; petals 0-5; stamens variable in number, some often reduced to staminodes; anthers either basi- or dorsifixed, dehiscent by lateral or more often by (sub)terminal slits or pores; pollen 3- or rarely 4-colporate, exceptionally 2-porate; pods highly diverse in form, texture, dehiscence and dispersal; seedlings commonly epigeous; $x = 6, 7, 8, 10, 11, 12, 13, 14$.

Key to the Subtribes of tribe Cassieae

1. Inflorescence cymose-paniculate; pod (with rare exceptions) either drupaceous or samaroid-disciform, when thin-textured commonly winged along one or both sutures, in any case

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1-few-seeded, only exceptionally and tardily dehiscent; lvs imparipinnate or reduced to a terminal lft. subtrib. Dialiinae.

1. Inflorescence spirally racemose or, if paniculate, composed of racemose elements, occasionally reduced to 1-2 fls but these in no sense cymose, in Australian Labicheinae sometimes distichously racemose; fruit commonly a conventional pod, but this either dehiscent or not, usually several-seeded and always so if winged along the sutures, never drupaceous; lvs either paripinnate (in some Cassiinae 2-foliolate) or imparipinnate (in some Labicheinae reduced to a terminal lft).
2. Fls hermaphrodite, petaliferous, lacking hypogynous disc; anthers mostly basifixed, usually dehiscent (by pore or slit) at apex only, but some in subtribe Cassiinae at once dorsifixed and basally dehiscent.
3. Pedicels jointed above the bracteoles; 2 exterior sepals larger than other perianth parts and aligned on the vertical axis of the fl, the 2 interior sepals petaloid, 1 or both 2-lobate; petals gland-fimbriate, the abaxial pair minute; androecium of 4-5 stamens united by their margins into a forwardly incurved synandrium. subtrib. Duparquetiinae.
3. Pedicels not jointed; perianth and androecium otherwise.
4. Lvs paripinnate (2-foliolate); phyllotaxy mostly spiral, distichous only in some *Chamaecrista* (sects. *Chamaecrista* and *Apoucouita*), but the androecium then 5-10-merous; funicle of seed either filiform or deltately dilated, but aril 0. subtrib. Cassiinae.
4. Lvs imparipinnate or 1-foliolate (the 1 lft then terminal); phyllotaxy distichous; androecium functionally 2-3-merous; seed-funicle dilated into a cup-shaped aril. subtrib. Labicheinae.
2. Fls polygamo-dioecious, apetalous, with a fleshy hypogynous disc wider than the calyx; lvs paripinnate (bipinnate), the lfts prevailingly opposite; anthers dorsifixed subversatile, dehiscent their whole length; pod compressed, indehiscent. subtrib. Ceratoniinae.

CASSIEAE subtrib. CASSIINAE Irwin & Barneby

Cassieae subtrib. **Cassiinae** Irwin & Barneby in Polhill & Raven, *Advances in Legume Systematics* 1: 104. 1981.—Genus typicum: *Cassia* L. emend. Gaertn.

Lvs paripinnate (2-foliolate) or (in Australia) sometimes phyllodal or (in S. America) 0; lfts opposite; inflorescence basically racemose, the anthotaxy spiral, the racemes sometimes paniculate or corymbosely clustered, rarely cauliflorous, or reduced to 1-2 fls; pedicels articulate only with the hypanthium, not below it; bracteoles 0-2; fls hermaphrodite; receptacle flat or shallowly concave, if deeper in-filled with solid tissue; sepals 5 imbricate; petals 5, the vexillar one almost always interior in bud; hypogynous disc 0; stamens (2-)4-10, when 10 either all fertile or 3 adaxial commonly staminodal, the anthers most commonly basifixed and dehiscent by (sub)terminal pores or short slits, in genus *Cassia* subversatile and some basally dehiscent; pod terete, variably angulate, or laterally compressed, (1-)2-many-seeded, the valves variable in texture, sometimes winged either along or between the sutures, either dehiscent or indehiscent, when dehiscent separating along the ventral or along both sutures, sometimes then elastically coiling; funicle either filiform or dilated, but not arilliform.

Key to the Genera of subtrib. Cassiinae

1. Filaments of 3 abaxial antesepalous stamens sigmoidally curved (below middle outward from the fl's vertical axis, thence inward) and many times longer than their anther, this dorsifixed subversatile and introrsely dehiscent by slits, the filaments of 2 abaxial antepetalous and of the remaining 5 adaxial stamens straight and shorter, their anthers dehiscent mostly by basal pores; pedicels 2-bracteolate at or shortly above base; pod elongate, cylindric or variously compressed, indehiscent, pulpy or pithy within; seeds 1- or 2-seriate, their funicle filiform; seed-coat smooth, exareolate; no extrafloral nectaries; trees or early arborescent shrubs; all continents, obligately tropical. *Cassia* (p. 4).

1. Filaments of all stamens straight or simply incurved and either shorter than or not over twice as long as their anther, if 3 abaxial ones longer than the rest these 2 antepetalous with 1 antesepalous between them, and the anthers in any case terminally dehiscent by slit or pore; pedicels either bracteolate or ebracteolate, but if bracteoles present these (with extremely rare exceptions) inserted above or near middle of pedicel and the pod then elastically dehiscent; pod various, but if resembling that of *Cassia* the pedicels ebracteolate; funicle and seed variable; extrafloral nectaries common but not universal.
2. Bracteoles 0; pod either indehiscent or inertly dehiscent through 1 or both sutures, if through one only then follicular, if through both then the valves tardily separating but not coiling, or (infrequently) the valves breaking up into 1-seeded joints; androecium commonly zygomorphic, the stamens tending to dwindle from abaxial to adaxial side of the fl, the 3 adaxial members commonly staminodal, but sometimes all 10 subequal fertile; anther-thecae naked along the sutures; extrafloral nectaries (when present) mounded, claviform or phalloid, secreting nectar from a convex surface; funicle filiform; seed-coat either smooth or minutely rugulose but not pitted, often charged on each face (or on margin) with a closed areole; trees, woody vines, shrubs, herbs; all continents and Oceania, a few extratropical. *Senna* (p. 64).
2. Bracteoles 2; pod elastically dehiscent, the valves coiling; androecium (suberratically) actinomorphic, the 2 cycles of stamens bearing anthers of different lengths but never zygomorphically dwindling from abaxial to adaxial side of fl; anther-thecae ciliolate along the sutures; extrafloral nectaries, when present, dish- or cup-shaped, rarely flat, secreting nectar from a concave (flat) surface; funicle deltately dilated; seed-coat either smooth or pitted, but exareolate; all continents and Oceania, but primarily American, one section (*Chamaecrista*) highly differentiated also in Africa, less so in Asia, Australia and the Pacific, a few extratropical in both Old and New World. *Chamaecrista* (p. 636).

CASSIA [Tournefort] Linnaeus

Cassia [Tournefort] Linnaeus, Sp. Pl. 376. 1753 & Gen. Pl. ed. 5, 178. 1754, minore ex parte, androecio descripto et syn. *Senna* Tournef. exclusis.—Sp. lectotypica (Gaertner, Fruct. sem. pl. 2: 313, t. 147, fig. 1. 1791, by implication; Britton & Brown, Ill. Fl. N. U.S. and Brit. Poss. ed. 2, 2: 335. 1913; accepted in Index Nom. Genericorum): *C. fistula* Linnaeus, a choice inappropriate because the androecium described in the protologue (Gen. Pl. ed. 5, l.c.) is that of *Senna*, not that of *Cassia* sens. restr., but a happy one insofar as it preserves the name *Cassia* in its historical pre-Linnaean sense.—*Cassiana* Rafinesque, "Amer. Mon. Mag. Crit. Rev. 2: 266. 1818" fide Merrill, Index Rafin. 143. 1949, a superfluous substitute for *Cassia* Linnaeus.

Cathartocarpus Persoon, Syn. Pl. 1: 459. 1805.—Lectogeneritypus: *C. fistula* (Linnaeus) Persoon = **Cassia fistula** Linnaeus.

Bactrylobium Willdenow, Enum. hort. berol. 439. 1809.—Generitypus: *B. fistula* (Linnaeus) Willdenow = **Cassia fistula** Linnaeus.

Cassia sect. *Fistula* DeCandolle ex Colladon, Hist. Cass. 83. 1816, nom. superfluum.—Sp. typica: **C. fistula** Linnaeus.—*Cassia* subgen. *Fistula* (DeCandolle) Benth in Martius, Fl. Bras. 15 (2): 83, in Conspectu definitum, 92. 1870, nom. superfluum.

Cassia sensu Link, Handbuch 2: 138. 1831; Roxburgh, Fl. Ind. ed. Carey 2: 332. 1832; Britton & Rose, 1930, p. 229; Britton & Killip, 1936, p. 169.

Cassia subgen. vel sect. *Fistula* sensu Benth, 1871, pp. 513–518. *Cassia* subgen. *Cassia* sensu De Wit, 1955, pp. 202–228.

Cassia sensu Irwin & Barneby in Polhill & Raven, 1981, p. 105.

Hypanthium solid, turbinate or slenderly vase-shaped, sometimes obscure externally, that of unfertilized fls disjoining from pedicel; calyx 5-merous, the sepals little graduated obtuse, reflexed at anthesis, deciduous; corolla zygomorphic, the petals commonly yellow or pink, less often red, white or heterochrome, the vexillum then of different color from the rest; petals obovate or elliptic-oblong, clawed or subsessile, subhomomorphic or the vexillum differentiated by crenulate margin, or by callosities at base of blade, or by laterally appendaged claw. Androecium (Fig. 1) zygomorphic 10-merous, the stamens irregularly accrescent toward abaxial side of fl, 2-cyclic: antesepalous (lower) cycle consisting of a) 3 long abaxial members, their filament sigmoidally bent proximally and incurved distally, often dilated (ribbonlike) or abruptly nodulose in the outer curve, their anther dorsifixed ascending, dehiscent ventrally above middle by vertical slits (absent in *C. roxburghii*, gaping in *C. grandis*) and by basal pores, and b) 2 adaxial much shorter, erect but apically recurved or coiled and the anther small, sterile or nearly so; antepetalous cycle consisting of a) 2 unequal pairs of stamens arising between and on either side of the 3 long sigmoid ones, their filament straight erect or gently bent forward, sometimes carnosulous-incrassate, their dorsifixed anther either ascending, or horizontal, or resupinate, the thecae dehiscent by basal pore; and b) 1 antevexillar stamen, much smaller and sterile. Ovary stipitate, linear incurved, 1-locular multiovulate, the poorly differentiated style terminating in a minute ciliolate stigmatic cavity looking in- and upward. Pod (Fig. 2) pendulous, shortly stipitate, linear in profile, terete or laterally subcompressed, the sutural ribs either slender immersed or thickened and externally raised as simple or double keels; valves woody, stiffly chartaceous or crustaceous, consisting of a thin epidermal layer transversely fissured when dry and a \pm woody endocarp, this (except in *C. hintoni*) produced internally between ovules to form adventitious septa traversing usually the whole cavity, but in few spp. across only \pm half the cavity, which is then divided into 2 shallowly interdigitating files of locules; seed-locules packed with either a) a sweet or bitter,

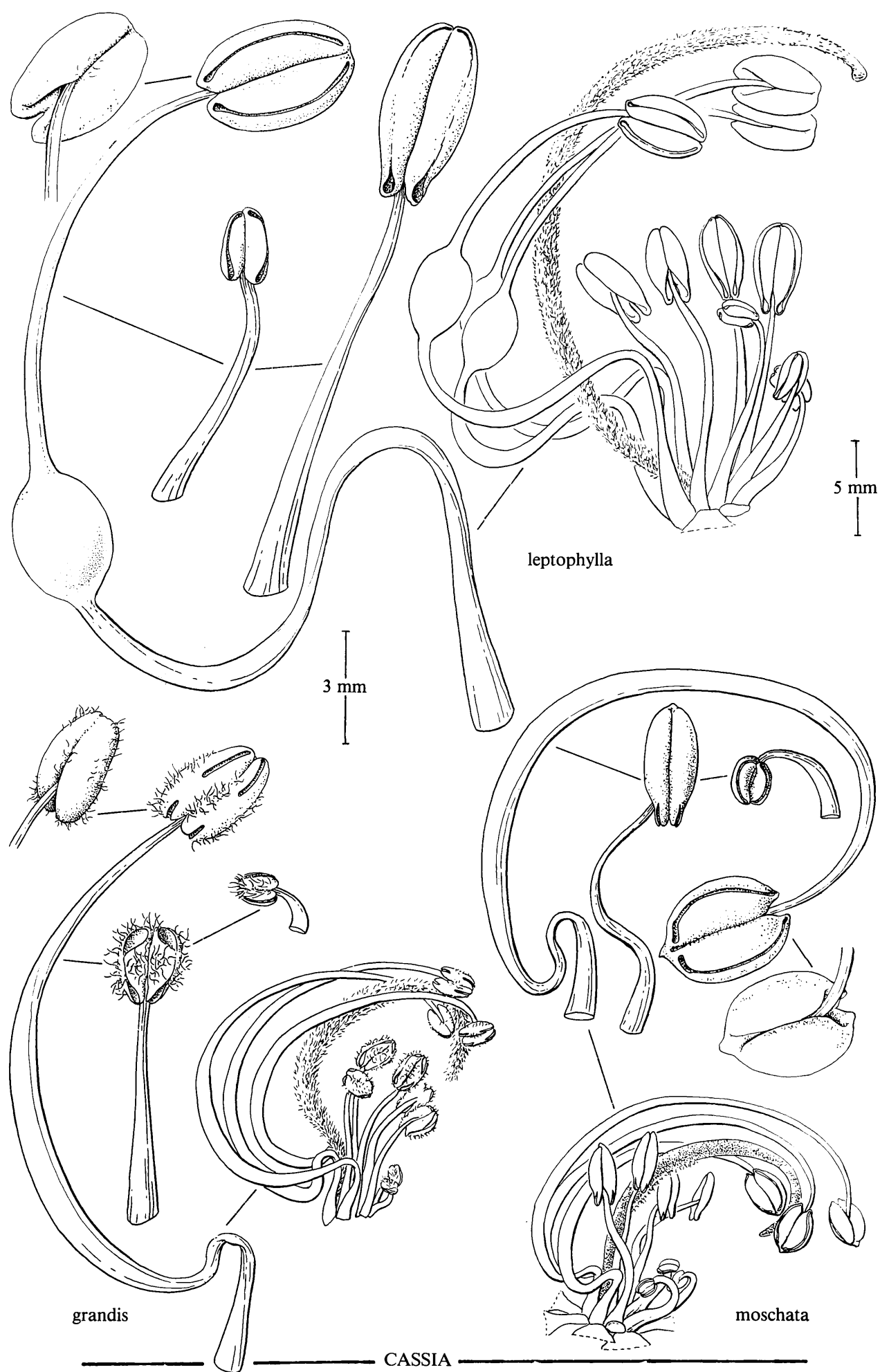
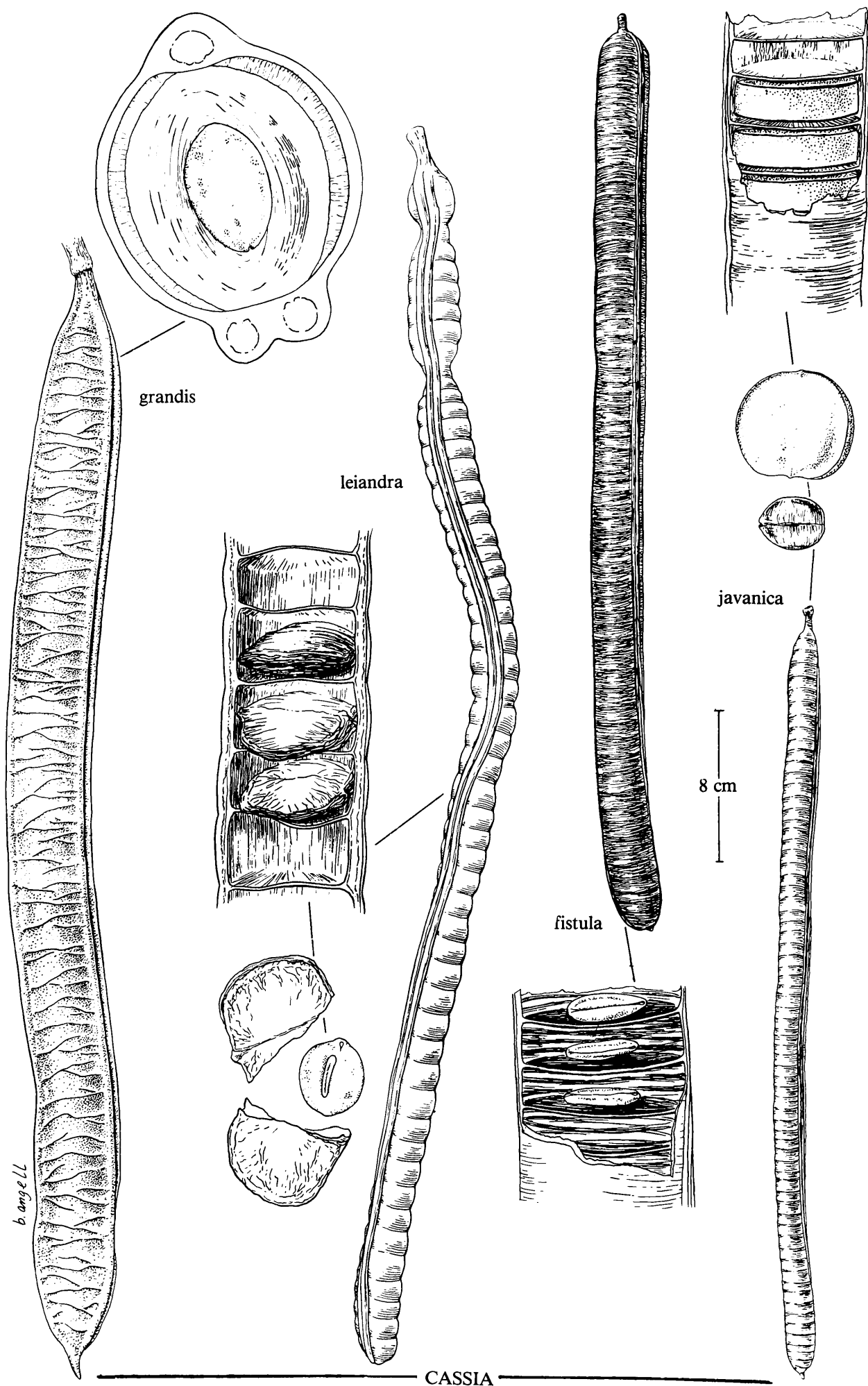


Fig. 1. Androecia of genus *Cassia* (to scale, as shown): *C. leptophylla* Vog. (Hatschbach 25921); *C. grandis* Linn. f. (Irwin 5034); *C. moschata* H.B.K. (Pittier 11477).



commonly malodorous, gelatinous pulp drying to a brittle blackish pitch free from the seed, or b) a fibrous-suberous coin-shaped envelope ultimately detached from the valves but enveloping the seed; seed-funcle filiform; aril 0; seeds obovoid-ellipsoid biconvex, in all but *C. hintoni* lying transverse, broadside to the septa, obcompressed, the punctiform hilum near base on one broad face, in *C. hintoni* basipetal, broadside to the valves, laterally compressed, the hilum sub-basal on one rim, the testa in all smooth lustrous exareolate; endosperm copious; cotyledons irregularly corrugated, epigeal in germination.—Trees, some precociously flowering as shrubs, some reaching large size. Phyllotaxy either spiral or distichous. Pubescence of simple and sometimes partly of minute thickened discolored trichomes. Stipules either simple or 2-lobed, usually caducous. Lvs paripinnate, the pulvinate lfts either small and numerous (± 10 –25 pairs) or few and larger. Inflorescence racemose, basically determinate, terminal to either hornotinous leafy branchlets or to greatly shortened leafless branchlets arising (singly or geminate) from annotinous branches below current foliage, the latter appearing to be simple cauliflorous racemes. Pedicels laterally compressed, subtended by a bract and furnished at or shortly above base on either side by a similar but smaller bractlet, these all either caducous or persistent into anthesis. $x = 12, 14$.

We here formally adopt the restricted definition of genus *Cassia* that we proposed at the Legume Conference at Kew in 1978 (Irwin & Barneby, 1981, p. 105). The true cassias differ from the sennas, which formed the major element of the Linnaean genus *Cassia* and subsequently came to dominate botanists' concept of that genus, in the basically determinate (not lateral axillary) inflorescence, bibracteolate pedicels and characteristic androecium. The androecia of *Cassia* and *Senna* are superficially similar in their bilateral symmetry and in the inequality of their members, which dwindle from front to back of the flower, but the organization of the stamens is different. In *Cassia* sens. str. the three long abaxial stamens are antesepalous, members of the lower whorl of five; in *Senna* the two longest are antepetalous, members of the upper whorl. In *Cassia* the four stamens of medium length belong to the antepetalous whorl, two of them standing erect from between the long sigmoid ones, whereas in *Senna* the four median ones stand together in pairs, one of each pair antepetalous and one antesepalous. The dorsally attached, versatile anthers of *Cassia*, which dehisce both ventrally by distal slit and basally by a pore, are grossly different from the basifixed anthers of *Senna*, which dehisce only terminally. These differences between *Cassia* and *Senna* are definitive and constant, forming a morphological discontinuity uniformly encountered on all continents. As a syndrome they equal or surpass any generic criterion widely accepted in the taxonomy of Leguminosae.

Cassia differs from *Senna* in the fruit also, but here and in the seeds the difference is not absolute. The pod of *Cassia* is indehiscent and with one exception (*C. hintoni*) multicellular by stiff adventitious septa between the seeds, which lie horizontal to the long axis of the pod and are obcompressed, with hilum at foot of one broad face. The pod of *Senna* commonly dehisces along one or both sutures, but the orientation and compression of the seeds is variable. In *Cassia hintoni* the interseminal septa are poorly developed and the seed is at once obliquely basipetal and laterally compressed, with hilum near base of one rim like

←

Fig. 2. Pods of genus *Cassia* (all $\times \frac{1}{2}$): *C. grandis* Linn. f. (W. D. Stevens 6157); *C. leiandra* Benth. (M. Silva 757); *C. fistula* Linn. (S. Stein 1); *C. javanica* var. *indochinensis* Gagnep. (S. Stein 8).

that of some sennas; and in several members of *Senna* ser. *Coluteoideae* the pod is at once indehiscent and multilocular like that of *Cassia*. The long woody pipe-like pod of *Senna spectabilis* superficially resembles that of some true cassias, but when ripe it splits open along the ventral suture and it arises from a flower wholly unlike that of any *Cassia* in its androecium and asymmetric corolla, features that remain in close harmony with related sennas characterized by plano-compressed pods. *Cassia* lacks petiolar glands, but while the gland characteristic of the majority of sennas is absent in some series of the genus it is infallibly present wherever the pod approaches that of *Cassia* in form or other attributes. An internally pulpy pod, common but not ubiquitous in *Cassia*, occurs also in some sennas (e.g. *S. pendula*, *S. bacillaris*); it is a specialization doubtless related to seed dispersal which we suppose to have developed independently in the two genera, as it has in some neotropical acacias. By itself, therefore, the pod does not provide a sure means of separating *Cassia* from *Senna*, although the few exceptions are not genuine obstacles but merely distractions due to convergent evolution. The fallibility of the pod deserves emphasis, nonetheless, because of its influence on the historical taxonomy of Cassiinae.

Cassia and *Senna* became first known to European botanists through the pods of *C. fistula* and of *S. italica* and *S. alexandrina*, articles of herbal medicine imported from the Orient by way of Egypt and Asia Minor. The fistular woody multilocular pulp-laden pod of *Cassia* appeared (and really is) fundamentally distinct from the bifacial papery unilocular dry pod of *Senna*, and it was in these terms that Tournefort (Inst. Rei Herb. 618, t. 390, 392. 1700) defined the genera. And it was to Tournefort's durably influential work that the origin of confusion between *Cassia* and *Senna* can be traced. While Tournefort illustrated *Cassia* by pods of *C. fistula* and *C. grandis* and by a flower probably of the latter, he also listed as species of *Cassia* seven American sennas, mostly known to him only from antecedent accounts by Piso and Plumier. All of these were deliberately absorbed by Linnaeus (1753, 1754, ll. cc.), along with several sennas discovered after 1700 and the five then-known species of *Chamaecrista*, into the heterogeneous genus that survived into modern times. In this historically momentous decision Linnaeus adapted, in the high-handed manner that shocked many contemporary botanists, a familiar name to an unfamiliar usage. For the genus *Cassia* described in the fifth edition of *Genera Plantarum* is no longer *Cassia* of the ancients but explicitly *Senna*. The carefully described androecium, which is profoundly at odds with that of the genuine cassias or of the chamaecristas attributed to *Cassia* in *Species Plantarum*, is that of *Senna* as observed alive in the conservatories at Hartekamp and Upsala; for the androecium of *Cassia* sens. str., a genus of tropical trees that had not yet been brought to flower in cultivation, was evidently unknown to him. The world monographs of *Cassia* by DeCandolle in Colladon (1816), Vogel (1837, incorporating a wealth of Brazilian sennas discovered by Sellow) and Bentham (1871), while attaining progressively sophisticated understanding of relationships between natural groups of Cassiinae, reaffirmed the generic concept of Linnaeus, and stifled the voices of protest.

In fact the intratribal generic limits, as we understand them today, had been worked out intuitively as early as 1739 by Jacob Breynia (Prod. fasc. rar. pl. secund. 50), who first described the genera *Chamaecrista* and *Chamaecassia*, the latter equivalent to *Senna* P. Mill. Later on, piecemeal partitions of Linnaean *Cassia* were attempted by Persoon and Willdenow, who abstracted from it the true cassias as *Cathartocarpus* (1805) and *Bactrylobium* (1809) respectively, and also by Link (1831) and Roxburgh (1832), who contradictorily expelled the sennas and chamaecristas and reserved a purified *Cassia* for the immediate kindred of

C. fistula. When Britton and colleagues, in 1930–1936, revived *Cassia* sensu Link and Roxburgh, its just claim to generic status was devaluated by association with the false claims of a horde of ill-considered segregates from *Senna*. Nevertheless, Bentham's often quoted remark (1871, p. 503) to the effect that "no tolerably fair botanist" had ever mistaken a cassia for anything else is true only provided that the concept of a subtribe Cassiinae be substituted for a comprehensive genus *Cassia*.

In his work on Caesalpiniaceae and Mimosaceae the generic criteria emphasized by Britton were primarily carpological and his taxonomy became as a consequence highly formalized, like that of Rydberg in the papilionate legumes. While the elastically dehiscent pod of *Chamaecrista* effectively and consistently, even by itself, separates that great genus from *Cassia* and *Senna* collectively, there is no one single feature of the pods of these two genera that will consistently separate one from the other. The terete indehiscent pulpy pod of *Senna bicapsularis* is morphologically very close to that of some genuine *Cassiae*, even in its biseriate seeds, and the chain of character states that has been found to lead from an idealized plano-compressed dehiscent pod in *Senna* to a terete indehiscent one in *Cassia* sens. restr. has made the case for the latter fatally vulnerable and given decisive support to Bentham's inclusive concept. Our definition of *Cassia* is, however, no longer based on particulars of the fruit, but on an infallible syndrome of characters expressed in form of inflorescence, bracteoles and floral morphology that rigorously defines a genus much further removed from any one set of *Sennae* than any one group of these is from another.

In his masterly discussion of *Cassia* sect. *Fistula*, Bentham (1871, p. 507) found insuperable difficulty in arranging the species into subsidiary groups, owing to lack of correlation between spatial dispersal and phenetic characters, particularly size and number of leaflets, persistence of floral bracts, details of staminal and carpological structure, and substance (pithy or pulpy) enveloping the seeds. With the advantages of more complete materials and knowledge of several species discovered since 1871, we find on the contrary that it is possible to distinguish between the capricious effects of parallel or convergent evolution and clues to presumed genetic relationships that are confirmed by patterns of distribution on a continental scale. We have accordingly arranged the American cassias and those exotic ones of which we have detailed knowledge into named series, our purpose being to bring out relative degrees of relationship between groups and stress the isolation within the genus of several unique species. Following a key to these series, which encapsulates our basic classification of *Cassia*, will be found (p. 10) a practical key to species native and commonly cultivated in the Americas which is adapted for use both with flowering and fruiting specimens.

Key to Series of genus *Cassia*

1. Cavity of pod divided by transverse septa into one rank, or into 2 parallel ranks, of 1-seeded locules; seeds transverse and broadside to the septa, obcompressed, their hilum situated near base of one broad face.
2. Seeds stacked in one vertical column within the pod, the intervening septa traversing the whole cavity.
3. Both sutures of the pod thickened and externally prominent and each consisting of 2 ribs, the pod consequently bluntly compressed-quadrangular. Bracts persistent into anthesis; anthers of 4 fertile antepetalous stamens erect; spp. 3 of S. America (Amazon Basin and the Guianas to s.-e. Brazil). Petals yellow. ser. *Tetrapleurae* (p. 36).
3. Sutures of pod either thickened or not, if prominent the semiferous one 2-ribbed and the opposed one 1-ribbed.
4. Pod massively woody 3.5–5 cm diam, coarsely 3-ribbed by the sutures and the valves coarsely transverse-venose; anthers of 3 long abaxial stamens pilose and

- widely gaping in dehiscence; anthers of 4 fertile antepetalous stamens resupinate; 1 sp. of tropical N. and S. America. Petals white-pink, the vexillum with callous yellow eye-spot; bracts early caducous. ser. *Grandes* (p. 28).
4. Pod less than 3 cm diam, less woody, neither ribbed nor veiny as the preceding; anthers of long abaxial stamens either glabrous or dorsally pilosulous but their distal slits (absent in *C. roxburghii*) scarcely or not gaping in dehiscence.
 5. Each seed enveloped in a disc of dry suberous tissue that becomes detached from inner walls of the locule; bracts persistent into anthesis; spp. 4+ (in need of revision) of India, Indochina, Malesia and tropical Australia, some planted throughout the tropics. Petals pink-carmine, concolorous. ser. *Obolospermae* (p. 46).
 5. Each seed enveloped in gelatinous pulp drying to an amorphous usually black brittle pitch, not coherent into a distinct disc; bracts early caducous.
 6. Anthers of 4 fertile antepetalous stamens perched subhorizontally on tip of their filament. spp. 8, primarily of Africa, 1 of Madagascar, 1 (*C. fistula*) native of tropical Asia but widespread elsewhere in cultivation and sub-spontaneous. Petals yellow, rarely white. ser. *Cassia* (p. 13).
 6. Anthers of 4 fertile antepetalous stamens (in rare Amazonian *C. rubriflora* only one pair of them) resupinate, the structurally proximal tails turned upward and their filaments usually carnosulous; Neotropical, unless cultivated.
 7. Anthers of 3 long abaxial stamens obtuse and nearly always pilosulous dorsally; corolla widely gaping, the petals at full anthesis plane or shallowly convex (except the sometimes modified vexillum) and radially spreading; spp. 4, of Amazon Basin and the Guianas. Petals yellow, red, rarely white or pink; axis of racemes stiffly up-curved. ser. *Amazonicae* (p. 16).
 7. Anthers of 3 long abaxial stamens minutely umbonate-acute and glabrous; corolla subglobose, the petals at full anthesis concavely connivent; sp. 1 of n. S. America to s.-e. Mexico and West Indies. Petals dark yellow, bronze-yellow or yellow red-veined or -suffused; axis of racemes pliantly pendulous. ser. *Moschatae* (p. 32).
 2. Seeds stacked in 2 vertical ranks, the individual seed-locule occupying about half the cavity's diameter, the cavity itself becoming both transversely and longitudinally septate; spp. 4 of tropical Africa. Petals either pink or yellow; bracts persistent into anthesis. ser. *Bifariae*.³
 1. Cavity of pod continuous, the interseminal septa obsolete or almost so; seeds basipetal in one vertical rank and broadside to the valves, laterally compressed, their hilum situated near base of one rim; sp. 1, of s. Mexico. Petals yellow; bracts caducous long before anthesis. ser. *Heterospermae* (p. 35).

Key to the Species of *Cassia* Native or Spontaneous in the Americas

1. Specimen in flower:
 2. Bracts and bracteoles very early caducous, shed as the pedicel of young fl-bud begins to elongate.
 3. Vexillar petal scarcely different from the rest in shape except for sometimes slightly longer claw, in native *C. grandis* 2-callose at base but the margin then entire. Petals commonly yellow or bronze-yellow or orange, but pink turning salmon or white in *C. grandis* and sometimes pink turning yellow in native *C. spruceana*.
 4. Hypanthium clearly differentiated externally from the pedicel and 2–5.5 mm; anthers of 4 fertile antepetalous stamens erect or subhorizontal (not resupinate); racemes pliantly pendulous.
 5. Lfts 3–7 pairs and the blade of larger pairs 9–21 cm long; petiole terete or almost so; widely planted, occasionally subspontaneous. 1. *C. fistula* (p. 14).
 5. Lfts 10–18(–20) pairs, the blade of largest pairs not over 5.5 cm; petiole

³ *Cassia* ser. *Bifariae* Irwin & Barneby, ser. nov., seminibus secus legumen quasi longitrorsus simul ac transverse septatum 2-seriatim dispositis praestantes.—Sp. typica: *C. mannii* Oliver.

- sulcate ventrally; native from s. Mexico to n. S. America, sometimes planted elsewhere.
6. Pedicels 3–4 cm; hypanthium 4.5–5 mm; petals light golden-yellow, radially explanate at full anthesis and (1.8)2–2.5 cm; s.-w. Mexico. 9. *C. hintoni* (p. 35).
6. Pedicels 0.5–1.4 cm; hypanthium 2–3.5 mm; petals deep golden- or bronze-yellow, at full anthesis concave and connivent into a bowl-shaped perianth, 1.1–1.6 cm; s.-e. Mexico to n. S. America. 8. *C. moschata* (p. 33).
4. Hypanthium weakly differentiated externally or obscure, not over 1.5 mm; anthers of 4 antepetalous stamens resupinate (the acute tails upward); racemes either ascending from the parent axis or, if geotropic, their axis stiffly curved.
7. Lfts 8–20 pairs, oblong, their long sides parallel or almost so, the blade of the longest pairs 3.5–6.5 cm; if lfts less than 11 pairs then the anthers of fertile stamens woolly pilosulous and the thecae of 3 long sigmoid ones explanate in dehiscence and confluent.
8. Petals opening white or pink, aging salmon, the blade of vexillum 2-callose at base and yellow-eyed; fertile anthers woolly pilosulous, the thecae of 3 long sigmoid stamens explanate and confluent in dehiscence; stipe of ovary 7–11 mm. 7. *C. grandis* (p. 30).
8. Petals yellow or brick-red, the eye of vexillum neither callose nor heterochrome; anthers of fertile stamens glabrous or thinly pilosulous dorsally, the thecae of 3 long sigmoid stamens dehiscent by narrow distal slit and proximal pore. 5. *C. cowanii* (p. 24).
7. Lfts 3–11 pairs, ovate or ovate-elliptic, their lateral margins convex, the blade of the longest pairs 3.5–12 cm; anthers glabrous or thinly pilosulous dorsally, dehiscent by distal slit and proximal pore but not explanate.
9. Lfts 6–11 pairs, the distal pair 3.5–6.5 cm; várzea forest of centr. Amazon Basin. 2. *C. leiandra* (p. 17).
9. Lfts 3–5 pairs, the distal pair 9–12 cm; widespread on terra firme from French Guiana to Pará and w. to Ecuador. 3. *C. spruceana* (p. 19).
3. Vexillar petal heteromorphic, either its blade carnosulous and marginally crenulate below middle, or panduriform, the claw then flabellately dilated on each side into a crenate appendage; centr. and w. Amazonian Hylaea. Petals yellow, red, white, or heterochrome.
10. Claw of vexillum not dilated, but the blade carnosulous and crenulate marginally from near middle downward; anthers of the longer abaxial antepetalous pair of stamens (those arising from between the 3 long sigmoid ones) obliquely ascending, those of the shorter antepetalous pair resupinate; lfts 10–14 pairs oblong, to 2.5–3 cm, weakly penniveined but not reticulate-venulose. Petals red, the vexillum sometimes heterochrome; fls foetid. 6. *C. rubriflora* (p. 26).
10. Claw of vexillum dilated on each side into a flabellate, marginally crenulate appendage, the whole petal in outline panduriform; anthers of both pairs of antepetalous stamens resupinate; lfts (3–)4–7 pairs, the blade of larger pairs 8–14 cm, reticulate-venulose. Petals yellow, red, or white and pink; fls sweetly perfumed. 4. *C. swartzoides* (p. 20).
2. Bracts and bracteoles persistent at least till full anthesis of associated fl. Anthers of 4 fertile antepetalous stamens erect.
11. Phyllotaxy spiral; fls yellow, both alive and dry; native in S. America, from the Guianas and Brazilian Amazonia s.-ward, w. just into n.-e. Bolivia.
12. Racemes loose and open, the axis almost fully developed prior to anthesis and many fls tending to open simultaneously to form an inflorescence much longer than wide; pedicels at full anthesis 2.5–5.5(–6) cm; petals variable in length and amplitude, but in s.-e. Brazil, within or near range of the next, very much shorter, narrower, and sessile; 3 long filaments dilated in their distal inward curve but plano-compressed, ribbonlike; ovules 108–234.
13. Stipules relatively ample, at point of attachment 2.5–5 mm wide, the ascending lobe mostly 7–15 mm long; petals ample and long-clawed, including claw mostly 25–37 × 13–26 mm, the claw itself 2.5–6 mm; anthers of 4 fertile antepetalous stamens (4–)4.4–6 mm; ovules 162–234; Hylaeon Brazil (Pará and Amapá to Acre and Rondônia) n. to French Guiana and Surinam, w. just into Bolivia (Beni). 11. *C. fastuosa* (p. 40).
13. Stipules narrower and smaller, at point of attachment not over 1 mm wide,

- the ascending lobe mostly 2–7 mm long; petals variable in size but mostly narrower or shorter or both at once, and either sessile or subsessile, the claw not over 1 mm; anthers of 4 fertile antepetalous stamens 2.4–3.5 mm; ovules 108–156; extra-Hylaeae Brazil (centr. Goiás and s. Ceará to Paraná). 10. *C. ferruginea* (p. 38).
12. Racemes dense and short, subcorymbose, the expanded fls raised to level of succeeding buds, and anthesis progressing upward over several days; pedicels at full anthesis 6.5–9 cm; petals 30+ mm, their claw 3–5 mm; 3 long filaments abruptly dilated in their distal inward curve into a plumply ellipsoid nodule $\pm 1.5\text{--}3 \times 1.5$ mm; ovules $\pm 80\text{--}114$; s.-e. extratropical Brazil (lat. $\pm 23\text{--}31^\circ\text{S}$). 12. *C. leptophylla* (p. 43).
11. Phyllotaxy distichous; fls pink or red when fresh, but drying yellowish-tan; introduced from Asia, occasionally planted but weakly or perhaps never spontaneous in the Americas.
14. Filaments of 3 long sigmoid stamens abruptly dilated in their distal curve into a globose or ellipsoid nodule and their anther pilosulous or puberulent dorsally; petals mostly 18–35 mm; pedicels (2.5–)3–6 cm. 13. *C. javanica* (p. 46).
14. Filaments of 3 long sigmoid stamens not dilated, their anther glabrous; petals 10–14 mm; pedicels 10–19 mm. 14. *C. roxburghii* (p. 51).
1. Specimen in fruit, but lvs required:
15. Cavity of pod continuous, the septa vestigial; seeds obliquely basipetal, turned broadside to the valves and bearing the hilum on the rim; valves of pod velvety-puberulent. Lfts 14–18 pairs, the blade of longest pair 2–3.5 cm; s.-w. Mexico. 9. *C. hintoni* (p. 35).
15. Cavity of pod divided horizontally by complete septa into 1-seeded locules; seeds transverse, turned broadside to the septa and bearing the hilum near base of one broad face; valves of mature pod usually glabrous or remotely puberulent, velvety only in *C. fastuosa* var. *fastuosa* of the Guianas and e. and centr. Amazonian Hylaea; allopatric, unless obviously cultivated.
16. Petiole terete or almost so; lfts 3–7 pairs, the blade of larger ones 9–21 cm and the secondary veins arising on each side of midrib 30–60; widely planted, rarely spontaneous. 1. *C. fistula* (p. 14).
16. Petiole commonly grooved ventrally, emphatically so if lfts less than 8 pairs, the secondary veins then 8–22 pairs; native and introduced spp., but those with only 3–7 pairs of lfts known only in the wild state, in Amazonia and the Guianas.
17. Pod bluntly 2-carinate both ventrally and dorsally by parallel contiguous pairs of thickened emergent sutural ribs. Native spp., from the Guianas and Amazonia to n.-e. Bolivia and s.-e. Brazil.
18. Secondary, tertiary and reticular venulation of lfts all sharply prominulous on both faces; pedicels 6.5–9 cm; pod heavily woody 2–2.5 cm diam, $\pm 80\text{--}114$ -ovulate; extratropical s.-e. Brazil. 12. *C. leptophylla* (p. 43).
18. Weak secondary and faint tertiary venulation of lfts prominulous on one or both faces, but neither face sharply reticulate; pod thinly woody 1.1–1.7 cm diam, 108–234-ovulate; pedicels 2.5–6 cm, not over 4 cm in range of the last.
19. Eastern Brazil, s. and e. from s. Ceará and centr. Goiás; pod 108–156-ovulate, its seed-locules $\pm 6\text{--}7$ mm long. Valves of pod consistently glabrate. 10. *C. ferruginea* (p. 38).
19. Amazon Basin from n.-e. Bolivia to n.-e. Brazil, thence n. to Surinam; pod 162–234-ovulate, its seed-locules $\pm 3\text{--}3.5$ mm long. Valves of pod either velvety (var. *fastuosa*) or glabrate (var. *calva*). 11. *C. fastuosa* (p. 40).
17. Pod either terete, its sutures not or scarcely thickened and fully immersed, or dorso-ventrally carinate, but the ribs then 3, 2 (parallel-contiguous) ventral, 1 dorsal.
20. Pod extremely massive, 3.5–5 cm diam, the valves coarsely bluntly venose and the sutural ribs coarse, at least 6 mm wide. Lfts 8–20 pairs, the longer ones up to 3.5–6.5 cm. *C. grandis* (p. 30).
20. Pod narrower and less woody, sausage- or rod-shaped, less than 3 cm diam, either terete or shallowly corrugated by constriction at the septa, the valves veinless, the sutural ribs either immersed or, if prominulous, much less than 5 mm wide.
21. Seeds embedded in viscous or gelatinous pulp, this drying to a flaky

black pitch, amorphous and not coherent into a detached dry coinlike envelope; native spp.

22. Pod perfectly terete, its sutures fully immersed, the body 1.3–1.7 cm diam; sp. of savanna habitats, n. Brazil n.-ward.
8. *C. moschata* (p. 33).
22. Pod bluntly 3-carinate by externally emergent sutural ribs, the body 2–2.5 cm diam; spp. of Hylaeon habitats, widespread over the Amazon Basin and through the Guianas just into s.-e. Venezuela.
23. Lfts of larger lvs either at least 8 pairs or the largest lfts not over 7.5 cm, usually both, the pulvinules in any case 1–2.5 mm.
24. Lfts of larger lvs 6–11 pairs and the longest lfts ovate (4.5–)5–7(–7.5) cm; camptodrome secondary veins of larger lfts 14–21 pairs, prominulous together with the tertiary venulation on both faces; seasonally flooded forest of centr. Brazilian Amazonia.
2. *C. leiandra* (p. 17).
24. Lfts of larger lvs 10–20 pairs and the longest lfts oblong 2.5–5 cm; camptodrome secondary veins of larger lfts 10–15 pairs; widespread but, where sympatric with the last, found only on terra firme.
25. Both secondary veins and subsequent venules prominulous on the ± lustrous upper face of lfts; widespread from s.-e. Venezuela and the Guianas to n.-e. Peru.
5. *C. cowanii* (p. 24).
25. Only secondary veins prominulous and these only so beneath, the upper face of lfts dull; rare in centr. Amazonia.
6. *C. rubriflora* (p. 26).
23. Lfts of larger lvs 3–7 pairs, the largest 8–14 cm, the pulvinules 3.5–5.5 mm; 2 spp. very distinct in form and coloring of fl but essentially alike in fruit.
26. Known range extending from middle Brazilian Amazonia to French Guiana, s.-e. Colombia and e.-centr. Ecuador, 51–78°W, 3°S–6°N.
3. *C. spruceana* (p. 19).
26. Known range limited to s.-w. Amazon Basin in Brazil and extreme n.-e. Bolivia, 55–67°W, 3–11°S.
4. *C. swartzoides* (p. 20).
21. Seeds embedded in a dry pithy coin-shaped disc which becomes detached from the interior walls of the seed-locule; Asiatic spp., planted in the New World but only exceptionally subsponaneous.
27. Pedicels not over 2 cm long in fruit; rarely cultivated.
14. *C. roxburghii* (p. 51).
27. Pedicels (2.5–)3–6 cm long in fruit; widely cultivated for ornament in parks, streets and gardens.
13. *C. javanica* (p. 46).

i. ser. CASSIA

Cassia Linnaeus ser. **Cassia**. *Cassia* sensu Linnaeus, 1753, l.c., sens. str.—Sp. typica: *C. fistula* Linnaeus.

Petioles terete or almost so; inflorescence pliantly pendulous from annotinous branchlets, simply racemose or branched; anthers of 4 fertile antepetalous stamens subhorizontally versatile; pod terete, without thickened sutures, the 1-seriate seeds embedded in pulp.—As here provisionally defined, monotypic, native to tropical Asia but now circumtropical in horticulture and locally naturalized.

We provisionally define ser. *Cassia* as a monotypic group, our knowledge of the African cassias (*Cc. abbreviata* Oliv., *afrofistula* Brenan, *angolensis* Welw. ex Hiern, *arereh* Del., *burtii* Baker fil., *hippophallus* Capuron, *thyrsoidea* Brenan) other than members of ser. *Bifariae* being insufficiently detailed to permit evaluation of degrees of kinship to the generitype, *C. fistula*. In the Asian flora

C. fistula is isolated, all native sympatric species being referable to ser. *Obolosperrmae*, which have persistent bracts, internally dry pods and seeds embedded in a corky disc. It is equally alone as an immigrant among American cassias which, if similar in pod or deciduous bracts or both, have grooved petioles and resupinate antepetalous anthers. The few large leaflets induced Bentham to associate *C. fistula* with American *C. spruceana* (and synonymous *C. sagotiana*) in an informal group; but examples of mutual size-number adjustments in leaflets of *Cassieae* are so frequent that we have learned to look elsewhere for sure indications of consanguinity.

1. *Cassia fistula* Linnaeus, Sp. Pl. 377. 1753.—“*Habitat in India, Ægypto.*”—Described first by Linnaeus in 1737 (Hort. Cliffort. 158, *Cassia* No. 2) and again in 1747 (Fl. Zeylan. 63) from a spm in Hermann’s herbarium, but the concept enriched from the first by earlier descriptions of Bauhin (whence the epithet), J. Commelijn (Hort. Med. Amstel. 1: 215, t. 110. 1697) and Rheede tot Draakestein (Hort. Ind. Malabar. 1: t. 22. 1686).—Lectoholotypus (Fawcett & Rendel, 1920, p. 102, confirmed by DeWit, 1955, p. 209), *Hermann s.n.*, BM (hb. Hermann.).—A lf from Cliffort’s garden survives in Herb. Cliff., *Cassia* No. 1, BM! and another, source unknown, in *LINN 528/12* (as ‘*C. falcata*’)!—*Cathartocarpus fistula* (Linnaeus) Persoon, Syn. Pl. 1: 459. 1805. *Bactyrilobium fistula* (Linnaeus) Willdenow, Enum. hort. berol. 440. 1809.

Cassia excelsa Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6 (fol): 267. 1824.—“... prope Porto-Cabello et in convallibus Araguensium [n. Venezuela] . . .”—Holotypus, P-HBK!—*Cassia bonplandiana* DeCandolle, Prod. 2: 490. 1825, a legitimate substitute (non *C. excelsa* Schrader, 1821). *Cathartocarpus excelsus* (Humboldt, Bonpland & Kunth) G. Don, Gen. Hist. Dichl. Pl. 2: 453. 1832.—Equated with *C. fistula* by Bentham, 1870, p. 92.

Cassia fistuloides Colladon, Hist. Cass. 87, t. 1. 1816.—“Hab. in calidis Mexici.”—Described from plate and manuscript of Sessé & Mociño, Fl. Nov. Hisp., the plate, long lost, copied at G.—Lectotypotypus, *Hb. Sess. & Moc. 1141 & 1146*, MA!—*Cathartocarpus fistuloides* (Colladon) G. Don, Gen. Hist. Dichl. Pl. 2: 454. 1832.—Equated with *C. fistula* by Bentham, 1870, p. 92.

Cassia fistula sensu Bentham, 1871, p. 514; Sessé & Mociño, Pl. Nov. Hisp. 59. 1893; Schery, 1951, p. 44, fig. 117; DeWit, 1955, p. 207–212, q.v. for exhaustive citation of literature, synonymy based on Old World types, and discussion of ecology and dispersal in Asia; Isely, 1975, p. 96, map 39 (cult. in Florida).

Slender deciduous or semideciduous trees potentially attaining 20 m and trunk diam up to 6 dm but often flowering as treelets, with smooth gray bark and narrowly ascending, then out- or downwardly arching branches, the livid annotinous branchlets ridged and lenticellate, the hornotinous ones together with lvs (except the sometimes glabrous upper face of lflets) and axes of inflorescence all finely minutely puberulent or thinly pilosulous with appressed or less often spreading-incurved hairs up to 0.05–0.2(–0.25) mm, the incipient lvs and fl-buds transiently silky-canescant, the amply chartaceous lflets bicolored, rich green and (dry) dull or sublustrous above, pallid or subglaucescent beneath, the openly many-fl’d, pliantly pendulous racemes of large yellow fragrant fls arising, singly, geminate or paniculately few-branched, directly from annotinous branchlets and ± coeval with fall of old and flush of new foliage.

Stipules erect appressed, broadly or narrowly subulate 1–2 mm, caducous before expansion of associated lf.

Lvs, disregarding the often depauperate first lf of annual growth, (1.5–)2–5.5(–6.2) dm; petiole including wrinkled pulvinus 4–7.5(–9) cm, at middle

1.3–2.8(–3.2) mm diam, subterete, the ventral sulcus obscure or very shallow and narrow, only upward along rachis becoming a little excavated below each pair of pulvinules; rachis (7–)10–33(–40) cm, its longer interfoliolar segments 4–7(–8.5) cm; pulvinules pallid or livid wrinkled, sulcate ventrally (2.8–)3–8(–9) mm; lfts (2–)3–7 pairs, accrescent upward but either the terminal or the penultimate pair largest, these subsymmetrically ovate from broadly or narrowly cuneate base, (7–)9.5–21 × (4.5–)5–8.5(–9) cm, (1.6–)1.8–2.8(–3) times as long as wide, at apex obscurely to emphatically acuminate, the acumen itself obtuse or retuse mucronulate, the plane margin delicately nerve-marginate, the tapering midrib immersed or shallowly depressed above, cariniform beneath, giving rise on each side to ±30–60 camptodrome and almost equally strong intercalary secondary veins, these all with the tertiary and reticular venulation finely sharply prominulous on both faces.

Racemes laxly (7–)15–75-fl'd, the tapering primary axis 1.5–6.5 dm, that of some lateral axes shorter, all elongating prior to anthesis, then several fls simultaneously expanded and often retaining their ± reflexed petals after both sepals and androecium have fallen; bracts subulate or linear-caudate 2–5 mm, caducous with the similar but shorter bracteoles as the pedicel begins to elongate; pedicels (of fully expanded fls, including the hypanthium) 3–6(–7.5) cm, widely spreading or from geotropic axes refracted and twisted to restore the (actually resupinate) fl to vertical; hypanthium slenderly vase-shaped 2–5.5 mm; sepals early reflexed, thinly herbaceous membranous-margined, greenish, brownish or pink-tinged, puberulent on both faces, scarcely or moderately graduated, the inner ones obovate or oblong-elliptic (6–)6.5–9.5(–11.5) mm; petals clear golden-yellow drying pale yellow delicately brown-veined, subequilong or the vexillum shortest and the abaxial petals longest, the elliptic-oblongate or obovate blade cuneately narrowed to a claw 1–2.5 mm, the longest petal (18–)21–32 × (8–)11–24 mm; androecium glabrous except for dorsally pilosulous fertile anthers, the sigmoid filaments of 3 long stamens (26–)31–43 mm, of 4 fertile antepetalous ones erect linear-attenuate, varying (in 2 pairs) from 5–7 to 11–13 mm, of 3 adaxial stamens 4–13 mm, that of the 2 antesepalous ones curved or coiled at apex, that of the ante vexillar one straight; anthers of 3 long stamens elliptic or ovate-elliptic obtuse (3.5–)3.6–4.6 × 2.1–2.5 mm, of 4 fertile antepetalous ones pitched forward, in lateral view gently sigmoid-curved, in dorsal view broadly oblanceolate 4–5.2 × 1.8–2.4 mm, the anthers of 3 adaxial stamens much smaller ±1.2–2.4 mm, sterile or almost so; ovary strigulose, sometimes subglabrous, rarely pilosulous, its stipe 5.5–9 mm, the style 3–4.5(–5) × (0.6–)0.65–0.9(–1) mm, its obliquely antrorse stigmatic cavity 0.15–0.3 mm; ovules (80–)92–122(–151).

Pod pendulous, slowly maturing and long persisting on the tree, narrowly rod-shaped terete (strangled only where ovules abort), when fully fertile 3–6 dm × 1.5–2.3(–2.5) cm, abruptly rounded at both ends, the sutures externally visible but not thickened and fully immersed, the thin fibrous epidermis early atrolivid or black, smooth glabrous and transversely fissured when dry, the woody endocarp 0.5–1 mm thick, the interseminal septa stiffly chartaceous 0.15–0.2 mm thick, the fertile locules ±5 mm long; seeds transverse, turned broadside to the septa embedded in sweet glutinous blackish pulp, this lining the locule when dry with a pitchlike layer and also enveloping the seed with a thin loose envelope, the seed itself biconvexly obovoid-ellipsoid 7.5–10 × 6–7 × 2.5–3 mm, the castaneous testa smooth and glossy; $x = 14$.—Collections: 56.—Fig. 2 (pod).

Native of s.-e. Asia, probably (De Wit, 1955, l.c.) originally in open forest subject to dry monsoon conditions, prized for the beauty of its flowers sometimes

used for ritual adornment and for its medicinal pods, long since dispersed throughout the Indian subcontinent, Malesia, Indochina and some islands of Micronesia, thence to tropical and n.-e. subtropical Africa, prior to 1800 established in the West Indies and Mexico; in the Neotropics widely planted in streets, parks and gardens, whence sparingly spontaneous but nowhere extensively naturalized or appearing native, known by spms from s.-e. Mexico through Central America to Colombia, n. Venezuela, Trinidad and the Guianas, in Brazil from cities and botanical gardens only, common in the Greater and many of the Lesser Antilles, cultivated in warm temperate Florida and California, and in Hawaii.—Fl. most abundantly in the dry or cool season, but sporadically throughout the year, the foliage annually renewed and the pods long persisting through slow maturation on the tree, the seeds released only by rotting of the pod on the ground.—*Golden Shower Tree*, *Indian Laburnum*, *Pudding Pipe Tree*, *Purging Cassia*; *Canéficier* (French Antilles); *cañafistula* (Spanish Amer.); *canafistula* (Brazil).

Cassia × **nealiae** Irwin & Barneby, nom. nov. *C. fistula* × *javanica* Neal, In Honolulu Gardens 145. 1929.—“. . . [Hawaii, Oahu: Honolulu]. . . . with pinkish-orange flowers at 1060 Lunalilo Street . . . with cream-colored flowers at Kamanele Park, others at 1543 and 1555 Pensacola Street.”—No typus known to exist, but *Degener* 7267 (NY) from Kamanele Park, the Rainbow Shower mentioned by him under *C. javanica* in Fl. Hawaiiensis, is considered authentic.

Cassia fistula × *javanica* sensu Neal, In Gardens of Hawaii 372. 1948.

Intermediate between the supposed parents in size of lfts; bracts more persistent than those of *C. fistula*, and the raceme-axis stiffer; petals persistent after fall of androecium and calyx, as often in *C. fistula*, but ± suffused with pink coloration of *C. javanica*; filaments of 3 long stamens not nodular; pod not seen, said by Degener to take full form but to bear only barren seeds.

A highly decorative ornamental tree, said by Degener (in annotation of specimens, NY) to have been raised by David Haughs, and now existing in several color-forms. The parentage is known only from tradition, but seems altogether plausible morphologically, the *javanica* forebear being presumably var. *indochinensis*, commonly cultivated in Hawaii.

ii. ser. AMAZONICAE Irwin & Barneby

Cassia ser. **Amazonicae** Irwin & Barneby, ser. nov., a ser. *Cassia* quoad legumen vix diversa imprimis petiolo ventre sulcato (nec tereti) staminumque fertilium ante petala sitorum antheris resupinatis separandae.—Sp. typica: *C. leiandra* Benth.

Bracts and bracteoles caducous long before anthesis; inflorescence from an-
notinous branchlets, incurved-ascending from parent axis (not pliantly pendulous); flowers yellow, orange, blood-red, or rarely partly white or pink, the petals either subhomomorphic or the vexillum variably modified (but its blade not 2-callose ventrally at base as in ser. *Grandes*); anthers of 4 (in rare *C. rubriflora* only of 1 pair of) antepetalous fertile stamens resupinate; pod almost that of ser. *Cassia*, its valves sometimes shallowly corrugate, the seeds embedded in bitter-sweet pulp.—Spp. 5, primarily of the Amazon Basin, 2 extending into the Guianas and 1 of these into extreme s.-e. Venezuela.

The series *Amazonicae* is a closely knit group, despite a number of unusual

modifications peculiar to one or two of its members and a marked divergence in number and size of leaflets. The sulcate leaf stalk, the stiff inflorescence axis and the resupinate anthers of antepetalous fertile stamens separate the series from paleotropic ser. *Cassia*, which has essentially the same pod and similarly caducous bracts and bracteoles. The core of the series consists of *C. spruceana*, *C. leiandra* and *C. cowanii*, alike in their sweet-scented yellow (exceptionally reddish) and subhomomorphic petals, but different from one another in number and inversely in amplitude of leaflets. The vexillum of *C. rubriflora* and *C. swartzoides* is unlike the other four petals, in the first hooded and marginally crenulate, in the second flabellately appendaged at either side of the claw so as to become pandurate in total outline. The flower of *C. swartzoides*, which has the few large leaflets of *C. spruceana*, is fragrant and heterochrome, most commonly orange with paler vexillum but in one variety, where the yellow pigment is suppressed, white with pinkish vexillum. The flower of *C. rubriflora*, which has the relatively numerous and small leaflets of *C. cowanii*, is malodorous and blood-red with paler or yellowish vexillum pitched forward to form a roof over the antepetalous stamens, of which the pair further from the vexillum bears ascending, that nearer to the vexillum resupinate anthers. These modifications in color and attitude of anthers are presumably imposed by the mechanics of pollination, a study of which should be undertaken in the field.

2. *Cassia leiandra* Benth in Martius, Fl. Bras. 15(2): 94, t. 30 (optima, nisi staminum breviorum antherae erectae delineantur). 1870.—“Habitat in provincia do Alto Amazonas secus flumen Rio Negro: Schomburgk n. 894.; ad ostium ejusdem fluminis: Spruce n. 1557.; secus flumen Amazonum ad Punta Paricatuba: Spruce n. 439.; in sylvis Manaqueri prov. Para [? Amazonas]: Martius; prope Borba ejusdem prov. [on lower Madeira in Amazonas]: Riedel; in ripa fluvii S. Francisci prope Malhada, prov. Bahiensis: Martius.”—Lectoholotypus, *Schomburgk 894*, mislabelled ‘British Guiana,’ collected probably (fide Sandwith) near Manaus, K (hb. Benth.)! = NY Neg. 1435; isotypus K (hb. Hook.)! paratypi, *Spruce 439, 1557, K!*—*Martius s.n.* from Bahia, not found at BR or M, is presumed either misidentified or mislabelled.

Trees with simple or branched trunk and rounded crown, commonly encountered at 5–10 m, attaining 20 m, and rarely seen as a (presumably immature) shrub 3 m tall, the older stems fuscous, eventually lenticellate, obtusangulate by dark smooth ribs descending from each lf-scar, the young stems and foliage densely pilosulous or puberulent with spreading-incurved, often lutescent hairs up to (0.1–)0.2–0.5 mm, the foliage red at flush, when adult 2-colored, when dry brownish-olivaceous dull beneath, above darker lustrous and except along the midrib glabrous or almost so, the erect racemes arising singly or paired from axils of annatinous branchlets, usually below the current lvs but sometimes accompanied by persistent old ones of the previous season.

Stipules caducous before expansion of the associated lf, consequently little known, subulate or triangular-subulate 1–2.5 mm.

Adult lvs 14–30 cm, the shallowly openly sulcate petiole proper \pm as long as the interfoliolar segments of rachis, these up to 13–25 mm; pulvinules (1–)1.5–2.5 mm; lfts (5–)6–11 pairs, either gently accrescent distally or except for 1–2 proximal (and exceptionally the distal) decrescent pairs all of subequal length, the larger distal pairs in outline ovate- or oblong-, rarely lance-elliptic, obtuse (4.5–)5–7(–7.5) \times 1.4–2.5 cm, \pm 2.2–3.4 times as long as wide, at obtuse or broad-

ly cuneate base \pm inequilateral, broader on distal side, the margin subrevolute, the midrib depressed above, cariniform beneath, the 14–21 pairs of major camp-todrome and subequally strong intercalary secondary veins prominulous on both faces, an irregular tertiary venulation always sharply raised on the ventral face, sometimes also dorsally.

Racemes 15–65-fl'd, the several expanded fls standing well below the narrow cone of developing fl-buds, the axis including short or obscure peduncle becoming 1–3(–3.5) dm; bracts firm, broadly ovate-triangular, densely gray-puberulent on both faces, before anthesis of fl deciduous together with 2 similar but smaller bracteoles; pedicels ascending or curved outward, at full anthesis 8–18 mm, the few fertile ones greatly thickened and lignified at maturity; buds ovoid obtuse, densely gray-puberulent; hypanthium not over 1 mm, often obscurely differentiated externally; sepals firm ovate- or oblong-elliptic obtuse, subhomomorphic except the 2 outermost a trifle shorter and wider, the 3 inner (6.5–)7–11 mm, all early reflexed; petals yellow, widely spreading (12.5–)13–20 mm, the blades beyond a short claw all oblanceolate or oblong-elliptic entire or those of the vexillar petal and sometimes of its two neighbors minutely auriculate at base; androecium glabrous, its members 4-morphic; the anthers of 3 long stamens erect, those of the rest resupinate; 3 abaxial antesepalous, sigmoidally curved filaments 20–24 mm, 2 abaxial antepetalous ones erect 6.5–9.5 mm, 3 adaxial antepetalous ones greatly dilated $3.5\text{--}6 \times 1\text{--}1.7$ mm, and 2 interposed between the last ± 2 mm; anthers, in the same ab- to adaxially descending sequence, ovate $2\text{--}2.6 \times 1.6\text{--}2.2$ mm, $2.5\text{--}3 \times 1.4\text{--}1.7$ mm, 1.8–2.3 mm, and (shortest) sterile 0.6–0.9 mm diam; ovary densely pilosulous; style very short, the stigmatic cavity minute, looking obliquely upward and inward; ovules 70–98.

Pod pendulous cylindric or a trifle laterally compressed, when fully fertile up to 60 cm long, 2–2.5 cm diam, shallowly corrugated by constriction at the inter-seminal septa, the sutures scarcely elevated, the valves firm, at maturity dull blackish-brown or livid glabrate, the endocarp 0.5–1 mm thick, the stiff but thin septa ± 0.2 mm in section, the seed-locules 6–10 mm long; seeds unknown.—Collections: 24.—Fig. 2 (pod).

Annually flooded riverbanks and várzea forest below 200 m, widespread in the centr. Amazon Basin in Amazonas and w. Pará, Brazil, both on the great river and its affluents Negro, Juruá, Purús and Madeira, between $\pm 54\text{--}68^\circ\text{W}$ and $1\text{--}8^\circ\text{S}$.—Fl. III, V, VIII–XI, perhaps irregularly through the year, the pods maturing slowly and sometimes coeval with fls of another season.

A small crooked tree, described by Ducke (1939, p. 79) as common on backwaters and quiet lateral channels of the Amazon river system, one of several true cassias and sennas known locally as *marimarí*. The flowers are bright yellow, fragrant, and the gelatinous pulp of the fruit is said to be bittersweet but edible.

Cassia sp.

Closely akin to, perhaps only an aberrant form of *C. leiandra*, notable for these features: a tree to 27 m; lfts 6–8 pairs, ovate acuminate, the longest $\pm 5.5 \times 2.4$ cm, highly lustrous above, dull pale beneath; inflorescence of *C. leiandra*, but the bracts subpersistent (into anthesis, then falling), the fls smaller, the anthers puberulent; longest sepal 6.5 mm and longest petal ± 11.5 mm; long filaments 17.5 mm, their anther 1.6×1.2 mm.

BRAZIL. Amazonas, basin of Rio Madeira: near Tres Casas, mun. Humaitá, IX–X.1934, Krukoff 6466 (NY).

The cited specimen was tentatively identified by Killip & Smith as *C. leiandra*

and is obviously allied to it. The great stature, the persistence of the bracts almost or quite into anthesis, the small size of the flower and of its puberulent anthers fall outside the range of variation recorded elsewhere in *C. leiandra*. The latter is found only in varzea forest, whereas this tree was recorded by Krukoff from terra firme. Typical *C. leiandra* is also known from the flood-plain of the Madeira river near Humaitá (Ducke 221, NY) and in this station alone has, suggestively, thinly puberulent anthers.

3. *Cassia spruceana* Benth in Martius, Fl. Bras. 15(2): 92. 1870.—“Habitat in Brasilia boreali, in sylvis ‘Gapo’ ad Rio Uaupés: Spruce n. 2558.”—Holotypus, collected IX.1852 (fl, fr) near Panuré, K (hb. Benth.) (2 sheets)! = NY Neg. 1432; isotypi, GH, NY!

Cassia sagotiana Benth in Martius, Fl. Bras. 15(2): 93. 1870.—“... a cl. Sagotio in Guiana gallica ad flumen Acarouany lecta et sub numero 802 distributa”—Holotypus, K (hb. Benth.)! = NY Neg. 1434; isotypi, G, GH, NY, P, W!—Equated with *C. spruceana* by Ducke, Arch. Jard. Bot. Rio de Jan. 3: 112. 1922.

Cassia spruceana sensu Benth, 1871, p. 514, t. 60 (optima, nisi antheris medianis haud resupinatis); Ducke, 1939, p. 80.

Cassia sagotiana sensu Benth, 1871, p. 515.

Amplly leafy trees 10–30 m, with trunk 1.5–2.5(?) dm diam, the glabrate an-
notinous branchlets prominently angulate by smooth livid or castaneous ribs de-
scending from each lf-scar, the hornotinous branchlets, lower face of lflets, all axes
of inflorescence and sepals finely minutely pilosulous with incurved or sinuous
(along costa of midrib beneath sometimes straighter erect) hairs up to 0.1–
0.2(–0.3) mm, the vesture of the inflorescence lutescent, the relatively few large
subcoriaceous lflets strikingly bicolored, lustrous dark green (when dry brownish)
above, pale dull beneath, the racemes (strictly speaking inhibited leafless branch-
lets) stiffly incurved-ascending, singly or paired, from axils of fallen or soon-to-
fall lvs on annotinous branchlets and \pm coeval with flush of new foliage.

Stipules caducous before expansion of associated lf, submembranous, minutely
2-lobed, the subulate ascending lobe \pm 1 mm, the descending one half as long.

Lvs (13–)20–36 cm; petiole including livid rugulose pulvinus 17–32(–45) mm,
at middle 1.2–2.1 mm diam, widely shallowly sulcate ventrally; rachis (4–)5.5–19
cm, the ventral groove interrupted at each pair of lflets, the longer interfoliolar
segments (2–)2.5–5.2 cm; pulvinules (3–)3.5–5.5 mm; lflets 3–5 pairs, accrescent
distally, the terminal pair broadly ovate or ovate-elliptic, commonly shortly,
sometimes obscurely acuminate (the acumen obtuse or emarginate), \pm 9–12 \times 4–5.5
cm, 1.9–2.4(–2.8) times as long as wide, at obscurely inequilateral base either
broadly or narrowly cuneate, the (adult) margin subrevolute, the midrib immersed
or shallowly depressed above, cariniform beneath, the 14–22 pairs of campto-
drome with random intercalary secondary nerves sharply prominulous on both
faces, the open irregular tertiary and reticular venulation prominulous likewise
on both faces or more sharply so above than beneath.

Racemes loosely 15–30-fld, the fls serially expanding below unopened buds,
the stiffly incurved-ascending axis (measured from parent branchlet) becoming
7–19 cm; bracts enfolding the young buds, cast off as pedicel begins to elongate,
concavely ovate obtuse or subacute 2–3.5 mm, the 2 bracteoles similar but small-
er, equally caducous; pedicels ascending, at and after anthesis 10–20(–28) mm;
hypanthium scarcely differentiated externally, narrowly turbinate 1–2 mm; sepals
reflexed at anthesis, subequilong, ovate-obovate mostly 6–9.5 (rarely 10–12) mm,
densely puberulent on both faces, falling with the petals and androecium; petals
subhomomorphic, yellow red-veined, widely spreading and almost plane, oblong-

elliptic or -oblanceolate mostly 13–15 (rarely 17–19) \times 5–8.5 (–9.5) mm, the blade minutely (of abaxial petals sometimes obscurely) auriculate at base, the claw (1–)1.5–2 mm; androecium glabrous except for dorsally pilosulous fertile anthers, the sigmoid filaments of 3 long stamens 15–19 mm, of 2 interposed slenderly tapering erect 4.5–6 mm, of 3 adaxial antepetalous ones greatly dilated fleshy 3.5–4.5 \times 1.2–1.5 mm, of 2 adaxial antesepalous ones less than 2 mm, the anthers of 3 long stamens ovate in dorsal view 1.1–1.7 \times 1.1–1.4 mm, those of 4 fertile antepetalous stamens and 1 much diminished anteveaxillar one all resupinate, the 4 subequal or in 2 pairs (the adaxial smaller) 1.6–3 \times 0.9–1.2 mm, those of the 2 antesepalous minute sterile; ovary strigulose-pilosulous, sometimes thinly so laterally, its stipe 3–5.5 mm; style 1.6–2 mm, at apex 0.5–0.65 mm diam, the stigmatic cavity looking inward \pm 0.1 mm diam; ovules 60–76.

Pod pendulous, rodlike, terete or a trifle laterally compressed, when fully fertile said to be 3–6 dm, in diam \pm 2–2.5 cm, the double ventral and single dorsal sutural ribs immersed or almost so, the thin, transversely cracking exocarp early glabrate, brown, livid-castaneous or blackish, the crustaceous endocarp 0.3–0.4 mm thick, the interseminal septa stiffly papery \pm 0.1 mm thick, the fertile locules 6–9 mm long occupying the whole width of the cavity; seeds (little known) turned broadside to the septa enveloped in a thin pulpy, when dry papery envelope separating from the valve walls, biconvexly ellipsoid \pm 12 \times 7.5 \times 6 mm, the smooth atropurpureous testa moderately lustrous.—Collections: 13.

Forest margins and high land along rivers, in Ecuador reaching 500 but mostly below 250 m, on terra firme, surviving in capoeira and along fences, sometimes encountered in abandoned fields as though formerly cultivated, middle and lower Amazonian Brazil downstream from lower Rio Branco and on the lower reaches of rios Trombetas and Tapajóz, n.-w. in Amapá to the valley of R. Araguari and to the coastal lowlands of French Guiana; apparently isolated on the upper Vaupés near the Brazil-Colombia border, and on the upper Río Morona near 77°30'W in e.-centr. Ecuador.—Fl. VIII–XI, \pm coincident with lf-fall and flush of new foliage, and with maturity of preceding year's pods.

Close to *C. leiandra* except for the few large leaflets and habitat in non-flooded forest. According to Ducke (1939, p. 80) the pulp enveloping the seeds is inedible, unlike that of *C. leiandra*. In spite of a notably discontinuous dispersal *C. spruceana* appears very uniform morphologically, and we readily follow Ducke's reduction of *C. sagotiana*, originally supposed to differ in more obtuse leaflets and smaller flowers, characters that have not been borne out by subsequent collections.

4. *Cassia swartzioides* Ducke, Archiv. Jard. Bot. Rio de Jan. 5: 129. 1930, sensu ampliato.—Typus infra sub var. *swartzioide* indicatur.

Trees 8–20 m with trunk attaining 4 dm diam, the annotinous and older branchlets fuscous, obtusely angulate by livid or blackish ribs descending from each lf-scar, the young branchlets and lower face of the ample chartaceous lflets with axes of inflorescence and calyx at first densely, later more thinly puberulous with fine sinuous or straightish subappressed hairs 0.1–0.25 mm, the foliage bicolored, the lflets when dry brownish-olivaceous and lustrous above, paler dull beneath, sharply reticulate-venulose on both faces, the solitary, paired or rarely paniculate racemes stiffly ascending from nodular spurs on old wood below the current foliage or from temporarily leafless annotinous branchlets.

Stipules linear-subulate 0.8–1.4 mm, caducous from the incipiently expanding lf, absent from mature foliage.

Adult lvs 1.5–3.3 dm; petiole including livid pulvinus (2–)2.5–4.5(–6) cm, openly shallowly sulcate ventrally; rachis (6–)7–19 cm, its longer interfoliolar segments (1.5–)2.5–4(–5) cm; pulvinules 3.5–4.5 mm; lfts (3–)4–7 pairs, accrescent distally, the ultimate pair broadly elliptic or ovate-elliptic obtuse or shortly bluntly acuminate $8\text{--}14 \times 2.5\text{--}6(–7)$ cm, (1.9–)2–2.8 times as long as wide, at subequilateral base rounded or broadly cuneate, the margin strongly or obscurely revolute, the midrib depressed on upper and cariniform on lower face, the 10–21 major campodrome and usually many intercalary secondary veins prominulous on both faces, a close tertiary and subsequent venulation sharply raised on upper face and equally or sometimes more faintly so beneath.

Racemes sessile or almost so, 15–45-fl'd, the young fl-buds crowded into a narrow cone above the expanded fls, the axis elongating, becoming 8–18 cm; bracts and bracteoles firm, broadly ovate 2.5–4 mm, densely gray-puberulent on both faces, caducous as the pedicel begins to elongate; pedicels at full anthesis 1–3 cm; sepals greenish or fuscous obovate subequal, densely puberulent both within and without, 7.5–10.5 mm, all early reflexed; fls fragrant, the petals either homochromous or the pandurate vexillary one heterochromous, the shape and coloring described under the vars.; the longest petal 15–21 mm; androecium glabrous except for dorsally puberulent anthers, the 3 sigmoid, distally dilated long filaments 20–30 mm, the 2 between them erect 7–9 mm, the 3 adaxial antepetalous ones dilated $5\text{--}7 \times 1\text{--}1.4$ mm, the 2 between these 1.5–3.5 mm; anthers of 3 long abaxial stamens $2\text{--}3.8 \times 1.7\text{--}2$ mm, those of the 5 antepetalous ones diminishing toward the vexillum all resupinate 2.2–2.9 mm, those of 2 adaxial antesepalous ones substerile 0.65–1.1 mm diam; ovary densely gray-strigulose; style very short, the minute stigmatic orifice introrsely terminal; ovules 70–110.

Pod (of var. *scarlatina*, even this little known) pendulous cylindric a trifle laterally compressed $40\text{--}70 \times 2.5$ cm, bluntly carinate by sutures ± 5 mm wide, the ultimately woody valves fuscous rough, transversely fissured and ± 1 mm thick at maturity, the cavity divided by stiffly chartaceous septa $\pm 6\text{--}7$ mm apart; seeds (not seen ripe) turned broadside to the septa, suspended in pulp.

In habit, foliage, inflorescence, fragrance, and what is known of its ecology, *C. swartzoides* closely resembles *C. spruceana*, from which it differs chiefly in the heteromorphic vexillary petal and the color of the rest. The vexillum takes the form of a pandurately oblanceolate blade constricted toward the base and, between this constriction and the short claw, dilated on each side into a flabellate lobe irregularly crenulate around the margin. The lateral and abaxial petals are not different from those of *C. spruceana*; they vary from oblanceolate to oblong-obovate, sometimes (especially the 1–3 adaxial) minutely angulate-appendaged at the claw. There are two color patterns in the flower of *C. swartzoides* for which Ducke proposed specific status. In the commoner var. *scarlatina* all petals open vivid brick-red, blood-red, or pinkish-orange, or the banner may open yellowish and fade to red in age. In var. *swartzoides* the yellow element in the pigment is suppressed but some red persists, the vexillum remaining rose-tinted in contrast with white lateral and abaxial petals. Despite Ducke's insistence on the importance of flower-color in this group, we are at a loss for characters of substance to support the differences in pigmentation, obviously capable in this group of canafistulas of somewhat capricious changes (see note under *C. cowanii*). The relatively rare pink and white var. *swartzoides* replaces var. *scarlatina*, so far as known, only in a restricted enclave on the Peruvian Amazon near Iquitos, within the range of var. *scarlatina* which is found along the great river both up- and downstream. The petals of both varieties turn brownish-yellow or livid when dried, and are then indistinguishable unless the coloration has been recorded in

vivo. Imperfect small flowers that open but fail to expand either corolla or androecium are known in both color-forms of *C. swartzoides*. A tree of var. *scarlatina* from near the type-locality (Krukoff 9107, NY) had nothing but these depauperate flowers, whereas a collection of var. *swartzoides* (Schunke 30, NY) has a few such mixed in the same panicle of racemes with amply expanded flowers.

Key to the Varieties of *C. swartzoides*

1. Petals all orange or blood-red, or the vexillum sometimes yellow when first expanded, reddening in age; secondary camptodrome veins of distal lfts mostly 14–21 pairs; upper Amazonian Hylaea in Brazil, Peru, and extreme n.-e. Bolivia. 4a. var. *scarlatina* (p. 22).
1. Petals white except for the rose- or red-tinged vexillum; secondary veins of distal lfts mostly 10–15 pairs; Loreto, Peru. 4b. var. *swartzoides* (p. 22).

4a. *Cassia swartzoides* Ducke var. *scarlatina* (Ducke) Irwin & Barneby, stat. nov. *C. scarlatina* Ducke, Bull. Mus. Paris II, 4: 730. 1832 (oct) & Archiv. Jard. Bot. Rio de Jan. 6: 25, 1933 (jan).—"Habitat prope São Paulo de Olivença (Rio Solimões, civitate Amazonas) silva non inundabili, leg. A. Ducke 20-8-1929 (H[erb.] J[ard.] B[ot.] R[i]o de Janeiro) n. 23.307) . . ."—Holotypus, RB; isotypi, K = IPA Neg. 1173, MO, NY, P!

Cassia scarlatina sensu Ducke, 1939, p. 80; Macbride, 1943, p. 181, ex parte, exclus. Schunke 30.

Fls colored as given in key.—Collections: 9.—Fig. 3.

Forest margins and riverbanks above flood-line, 120–600 m, scattered along the upper Amazon and its right tributaries between 55–77°W and 3–11°S, from Loreto (Alto Amazonas), Peru and w. Amazonas, Brazil, s. to the Madeira-Mamoré basin in Rondônia, Brazil and adjacent Pando, Bolivia.—Fl. VII–XI(–I).

Readily distinguished at anthesis from all Amazonian cassias except *C. rubriflora* by the vermilion flowers, and from the latter by the few large leaflets, agreeable perfume, and pandurate vexillum.

4b. *Cassia swartzoides* Ducke var. *swartzoides*. *C. swartzoides* Ducke, 1030, l.c., sens. str.—"Habitat silva non inundabili prope Iquitos Peruviae orientalis, 27-10-1928, legit A. Ducke, H[erb.] J[ard.] B[ot.] R[i]o de Janeiro] n. 20.330."—Holotypus, RB; isotypi, K = IPA Neg. 1176, P!

Cassia swartzoides sensu Macbride, 1943, p. 183.

Flowers colored as given in key.—Collections: 5.

Habitats of var. *scarlatina*, below 250 m, known only from the upper Amazon near and above the mouth of Río Napo (Iquitos, ríos Momón, Mazán) in Loreto (Maynas), Peru.—Fl. X–II.—*Machetebaina*.

Perhaps referable to *C. swartzoides* sens. lat. is *C. rhonhofiana* Harms (Notizbl. Bot. Gart. Berlin 15(1): 46. 1940), described from a specimen (apparently not duplicated) from Amazonian Ecuador (*Schultze-Rhonhof* 3008, †B). The protologue agrees with *C. swartzoides*, from which it was supposed to differ only in longer (6, not 2–3 mm) bracts, in most respects, but no mention was made of any appendage to the claw of the vexillum, and the flowers were noted in the field as light pink fading pale yellow. New material from the Pastaza valley near Mera is required.

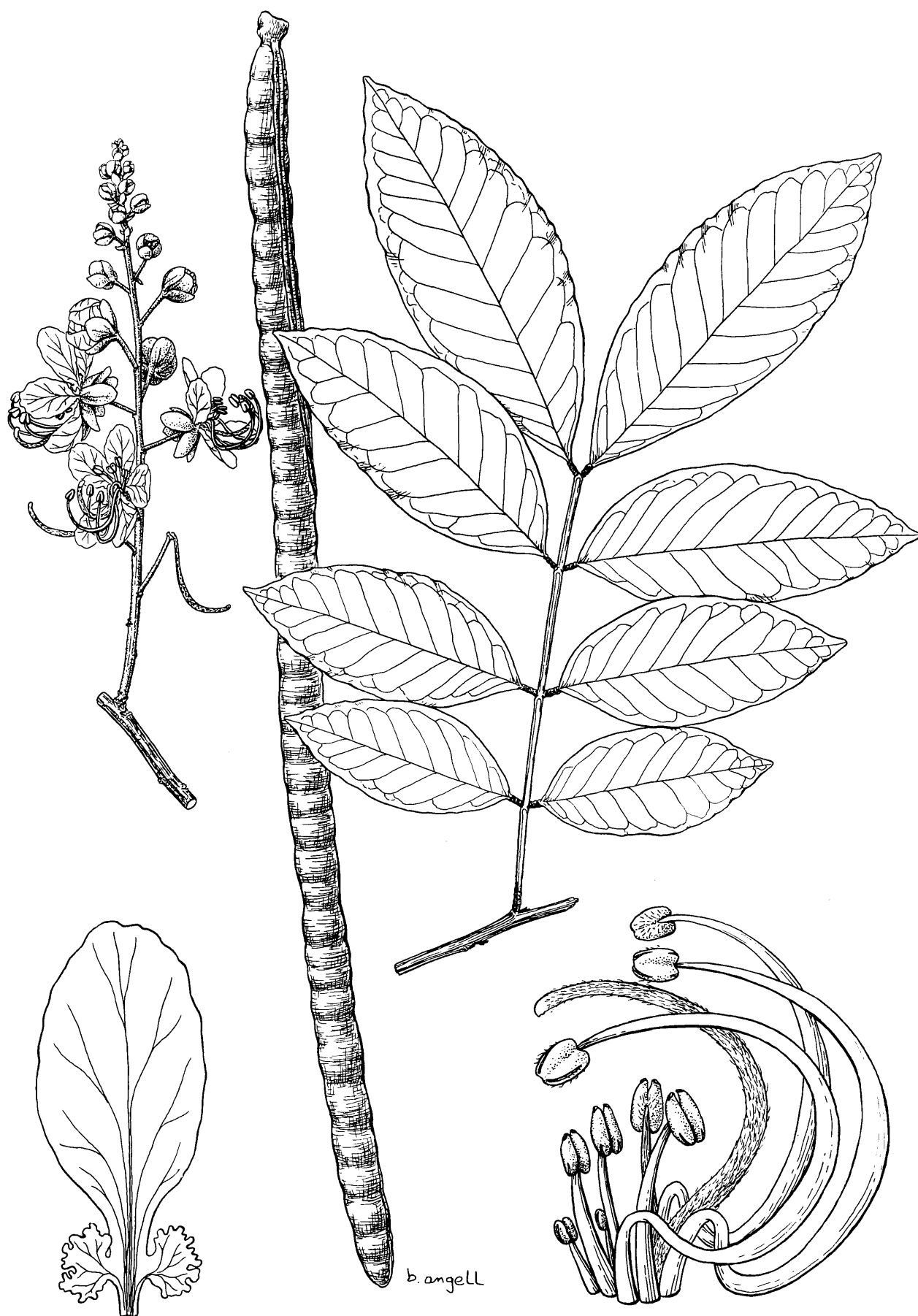


Fig. 3. *Cassia swartzioides* Ducke var. *scarlatina* (Ducke) Irwin & Barneby.—Raceme + leaf $\times \frac{1}{2}$; vexillum, androecium $\times 2\frac{1}{2}$; pod $\times \frac{1}{4}$ (Maguire 56616).

5. *Cassia cowanii* Irwin & Barneby, sp. nov., hucusque perperam pro aliqua *C. leiandrae* varietate habita sed ab ea foliolis simul magis numerosis (foliorum majorum 12–20, nec 6–11-jugis) oblongis (nec ovato-ellipticis) et minoribus (majoribus plerumque $2.7\text{--}4.5 \times 0.9\text{--}1.3$, nec $5\text{--}7 \times 1.4\text{--}2.5$ cm), legumine tereti (nec corrugato) necnon ecologia (nostra silvis non-inundabilibus incola) certe specificè separanda.— Holotypus infra sub var. *cowanii* indicatur.

Potentially tall forest trees attaining 40 m with basally dilated trunk up to 3 dm diam at breast-height, flowering first when smaller, the annotinous branchlets glabrate livid or fuscous, bluntly angulate by blackish ribs descending from each lf-scar, the hornotinous branchlets together with lf-stalks, dorsal face of lfts and all axes of inflorescence densely pilosulous with either crisply incurved or straighter ascending, commonly lutescent hairs up to 0.1–0.3(–0.5) mm, the expanding lvs at first yellow-tomentulose, red in flush, at maturity bicolored, the blades (dry) above brownish-olivaceous dull or moderately lustrous, finely thinly puberulent, beneath paler dull, the racemes ascending singly or paired from nodular spurs on annotinous or older branches, always well below current foliage.

Stipules caducous from the expanding lf (consequently little known), subulate or triangular-subulate 0.5–2 mm, absent from adult foliage.

Adult lvs (11–)14–27(–35) cm; petiole including livid pulvinus 10–27(–32) mm; rachis (9–)10–22(–29) cm, openly sulcate ventrally, the sulcus interrupted at each pair of lfts, the longer interfoliolar segments 9–14(–16) mm; pulvinules 1–1.7 mm; lfts 12–20 pairs, strongly decrescent at base of rachis, less so or not at all so distally, the lft-blades in outline oblong obtuse or emarginate, at inequilateral base broadly rounded to truncate or subcordate, the larger ones $2.7\text{--}4.5(5.4) \times 0.9\text{--}1.3(1.4)$ cm, the margin revolute, the midrib depressed on upper and cariniform on lower face, the 11–15 pairs of rather crowded and widely divergent camptodrome secondary veins becoming prominulous on both faces, a fine tertiary and irregular but close reticular venulation becoming sharply raised at least on the ventral face, sometimes on both.

Racemes subsessile 20–50-fl'd, the subglobose fl-buds densely racemose above the several simultaneously expanded fls, the axis including short or obscure peduncle becoming 8–16(–20) cm; bracts deltate-ovate or broadly lanceolate 2–4 mm, densely pilosulous both within and without, together with the similar but slightly smaller bracteoles deciduous either as the pedicel begins to lengthen or not later than full anthesis of the subtended fl; pedicels (8–)10–16 mm, greatly thickened and woody in fruit; hypanthium ± 1 mm, narrowly turbinate; sepals firm, densely pilosulous on both faces, obovate, obovate-suborbicular or broadly oblance-obovate, the inner ones 5.5–10 mm, all early reflexed; petals usually golden-yellow, rarely (in Guyana) orange-red, subhomomorphic, all obovate or elliptic-obovate beyond the short claw, entire or minutely angulate-toothed at base of blade; filaments of 3 long abaxial stamens 10–22 mm, of 2 abaxial antepetalous ones erect 2.5–9 mm, of 3 other antepetalous ones fleshy-dilated $2\text{--}6 \times 0.7\text{--}1.2(1.8)$ mm, of 2 sterile alternate with the last 1.3–2 mm; anthers glabrous or thinly pilosulous on back, of 3 long stamens erect $1.1\text{--}2.1 \times 1\text{--}1.6$ mm, of the rest resupinate, those of 2 abaxial antepetalous ones 1.8–3 mm, of 3 similar adaxial ones 1.4–2.3 mm, of 2 sterile adaxial 0.4–0.7 mm diam; ovary densely short-pilosulous; style very short, the minute stigmatic cavity looking up and inward; ovules 56–80.

Pod pendulous subcylindric a trifle laterally compressed, bluntly bicarinate by thickened sutures 0.6–0.7 cm wide, when fully fertile reaching $70(80) \times \pm 2.5$

cm, the shining green valves becoming blackish-brown and woody, externally roughened but not corrugated, when fully ripe 0.6–1 mm thick, the cavity divided by horizontal, stiffly papery septa 7–11 mm apart; seeds plumply ellipsoid, turned broadside to the septa suspended in pulp, ± 13 –14 mm, not seen fully ripe.

Cassia cowanii, of which two geographic races have already been described as varieties of *C. leiandra*, is closely related to that species and to *C. spruceana*. The inflorescences and component flowers of these three cassias are alike in fine detail and if principal emphasis is laid on floral morphology all might reasonably be interpreted as forms of one multiracial species. However differences in number and size of leaflets, considered specifically diagnostic for *C. leiandra* and *C. spruceana*, are equally pronounced in *C. cowanii*, the foliage of which, because of the oblong outline of the leaflets, is really more like that of *C. moschata* or *C. grandis*. In number of leaflets (6–11 pairs) *C. leiandra* stands between *C. spruceana* (3–5 pairs) and *C. cowanii* (12–20 pairs), but it is ecologically different from both, being confined to seasonally inundated riverine forest whereas its two kindred are consistently reported from terra firme or upland habitats. The surprising bicentric dispersal of *C. cowanii* follows a pattern already known to Benth in the case of *C. spruceana*. The pods of this group of cassias are poorly known as yet, but our few mature samples of *C. spruceana* and *C. leiandra* are corrugated by shallow strangulations at each interseminal septum, well illustrated by Benth (1870, t. 30; 1871, t. 60), whereas those of *C. cowanii* are terete.

While our circumscription of *C. cowanii* includes the type of two previously named varieties of *C. leiandra* we have deliberately passed over their provincial epithets *guianensis* and *peruviana*, misleading in the present context. It is a pleasure instead to associate this handsome cañafistula with the name of our friend Richard S. Cowan, eminent botanical bibliographer and paramount student in this century of Neotropical Caesalpinioideae and Rutaceae.

Key to Varieties of *C. cowanii*

1. Fls relatively large, the long sepals 7.5–10 mm, the petals when fully expanded 13.5–18 mm, the filaments of 3 long abaxial stamens 17–22 mm and of the 2 interposed antepetalous ones 6–9 mm; s.-e. Venezuela, Guyana and Surinam. Anthers usually glabrous, rarely minutely pilosulous (in Venezuela); ovules ± 70 –80. 5a. var. *guianensis* (p. 25).
1. Fls small, the long sepals 5–6 mm, the petals 9–10 mm, the filaments of 3 long abaxial stamens 10–18 mm and of the 2 interposed antepetalous ones 2.5–5 mm; either in French Guiana and adjoining Amapá, Brazil, or in w. Peruvian and Ecuadorian Amazonia.
 2. Three long filaments 10–11 mm, their anther 1.1–1.3 mm, glabrous; ovules 56–60; basins of Oiapoque and Araguari rivers in French Guiana and Amapá. 5b. var. *cowanii* (p. 26).
 2. Three long filaments 13–16 mm, their anther 1.5–1.8 mm, thinly pilosulous dorsally; ovules of var. *guianensis*; Ecuador and n.-e. Peru. 5c. var. *peruviana* (p. 26).

5a. *Cassia cowanii* Irwin & Barneby var. *guianensis* (Sandwith) Irwin & Barneby, comb. nov. *C. leiandra* var. *guianensis* Sandwith, Bull. Misc. Inform. 1931: 361. 1931.—“BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 25th, 1929, Sandwith 521 . . .”—Holotypus (2 sheets), K! = NY Negs. 1436 (fl), 1437 (lvs).—Two paratypes cited (*Hohenkerk* in FD 790, 790A) are conspecific (K!).

Characters as given in key; petals usually deep yellow, rarely orange-vermilion.—Collections: 9.

Margins and openings of mixed forest, rain-forest, or on river banks above flood-water, 100–250 m, local along the lower Essequibo, the Demerara, Berbice and lower Corantijn rivers in Guyana and adjoining Surinam, and on Serranía de

Imataca in far e. Venezuela (Delta-Amacuro and adjoining Bolívar).—Fl. III, V, X, sometimes when partly defoliate, the optimum season of bloom unknown.—*Cañafistola montañera* (Ven.); *warua* (Arawak).

Several collectors comment on the fragrance of the flowers. The sapwood is said by Hohenkerk to be yellowish, the heartwood dark red-brown.

5b. *Cassia cowanii* Irwin & Barneby var. *cowanii*. *C. cowanii* Irwin & Barneby, ut supra descripta, sens. str.—BRAZIL. Amapá: in forest near Pedra Preta, Rio Amapari [Mapary], Sa. do Navio, 22.XI.1954 (fl), *Richard S. Cowan* 38503.—Holotypus, NY; isotypi, GH, US.

Characters as given in key; petals golden-yellow.—Collections: 4.—Fig. 4.

Upland forested hill-country, 70–120 m, known only from the basins of the Araguari and Oiapoque rivers in n.-e. Amapá, Brazil and adjoining French Guiana.—Fl. IX–XII.

Notably different from var. *guianensis* in the small flower and included long stamens.

5c. *Cassia cowanii* Irwin & Barneby var. *peruviana* (Macbride) Irwin & Barneby, comb. nov. *C. leiandra* var. *peruviana* Macbride, Field Mus. Bot. 13, part 3 (1): 171. 1943.—“[PERU.] Loreto: Upper Marañón, *Tessmann* 4240 . . . Middle Ucayali, *Tessmann* 5455 . . . Florida, *Klug* 2321 (var.). Río Mazán, *José Schunke* 336 (var.) . . .”—Lectoholotypus, *Schunke* 336, collected at Gamitanacocha, prov. Maynas, 3.III.1935 (fl), F! isotypi, NY (2 sheets)!—The cited paratypes except *Tessmann* 5455, which = *C. grandis*, are conspecific.

Characters as given in key; petals golden-yellow.—Collections: 4.

Forest margins, along rivers or in sunny openings, 120–250 m, apparently local on the upper tributaries of the Amazon in Napo-Pastaza, Ecuador, and in Loreto (Alto Amazonas, Maynas), Peru.—Fl. III, IX, the high season of bloom unknown.—*Jacarandá*.

The var. *peruviana* has the small perianth of var. *cowanii* but more strongly exerted long stamens and anthers pilosulous on the back. Its range lies about 2500 km distant from that of either var. *cowanii* or var. *guianensis*, but apart from the small floral modifications described above we have found no differences of note. Oldeman reports that the pods are sought by green parrots in Ecuador.

6. *Cassia rubriflora* Ducke, Archiv. Jard. Bot. Rio de Jan. 3: 110. 1922.—“Hab. ad fluminis Tapajoz cataractas inferiores [Pará, Brazil], l[egit] A. Ducke 27-8-1916, [RB] n. 16.399.”—Holotypus, RB; isotypi, G, P!

Trees of small or moderate stature, in habit (so far as known), foliage, pubescence and inflorescence closely resembling *C. cowanii*, differing in dull surface and simple venation of lfts, in form, color and odor of the fls, and in minor features of the androecium.

Lvs up to 15 cm, the lf-stalk narrowly sulcate ventrally, its intrafoliolar segments ± 7 –10 mm; pulvinules 1–1.5 mm; lfts 10–14 pairs oblong obtuse or subemarginate, at inequilateral base broadly rounded or subtruncate, the longer ones 2.5 – 3×0.9 – 1.1 cm, the revolute margins subparallel, the midrib depressed above, prominulous beneath, the ± 10 –13 pairs of delicate camptodrome secondary veins faintly raised beneath only, tertiary venulation immersed, the bicolored blade when dry brownish-olivaceous dull above, paler dull beneath.

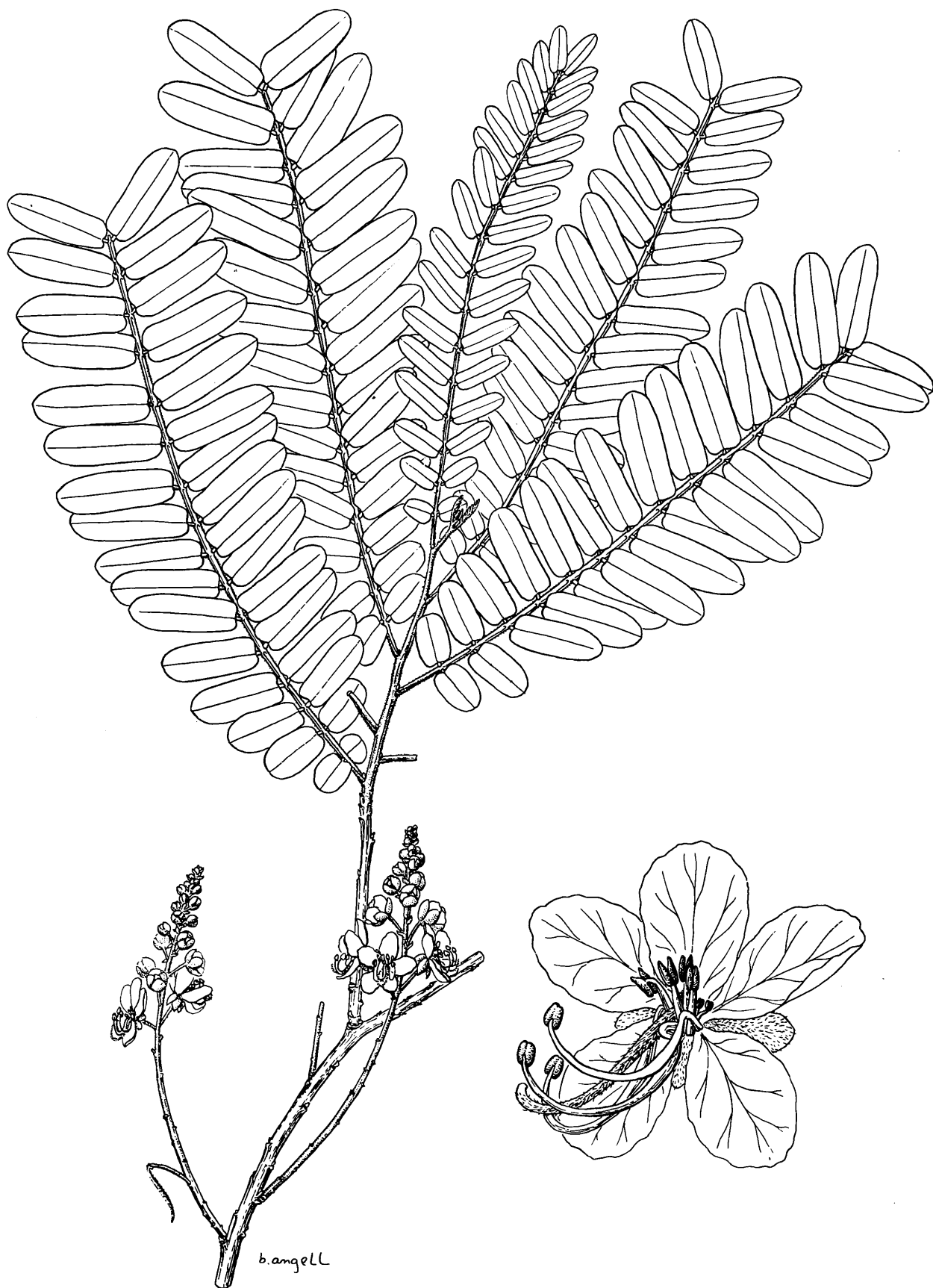


Fig. 4. *Cassia cowanii* Irwin & Barneby var. *cowanii*.—Flowering branchlet $\times\frac{1}{2}$; flower $\times 2\frac{1}{2}$ (Pires 51255).

Axis of inflorescence ± 4 –9 cm; bracts and bracteoles firm ovate ± 1.5 –2.5 mm, densely puberulent on both faces, caducous; pedicels at full anthesis 12–14 mm; hypanthium 1–1.5 mm, obscure externally; sepals firm greenish, densely puberulent on both faces, the longest 7.5 – 8×6 mm; petals heteromorphic, the lateral and abaxial pairs blood-red, beyond the short claw elliptic-obovate entire ± 14 – 15×9 mm, the vexillary one either yellow or red with yellow eye, of thicker texture and a trifle longer than its neighbors (up to 16–17 mm), its ovate blade pitched forward from the claw, its margin conspicuously crenulate from base to beyond middle, entire distally; androecium glabrous except for scattered short hairs on dorsal face of anthers, the 3 long sigmoid filaments \pm dilated distally and ± 20 mm, their ovate anther 2×1.5 mm, the 2 abaxial antepetalous filaments ± 8 mm, their anther obliquely ascending and ± 2.8 mm, the remaining 5 filaments decrescent toward the vexillum, 2 dilated and $\pm 5.5 \times 1$ –1.3 mm, one ± 3.5 mm, two ± 2 mm, the anthers of these 5 all resupinate, of the 2 shortest sterile and ± 0.6 mm diam; ovary densely gray-strigulose; ovules ± 70 .

Pod, acc. to Ducke, like that of *C. spruceana*, not seen by us.—Collections: 4.—Fig. 5.

Riverbanks above flood-water and lowland forest on terra firme, apparently rare, known only from the lower middle Amazon basin in e. Amazonas (Manaus and vicinity) and w. Pará (Juriti Velho; lower Rio Tapajóz), Brazil.—Fl. VIII–X.

Cassia rubriflora resembles *C. cowanii* in its relatively numerous and small oblong leaflets and *C. swartzioides* var. *scarlatina*, which has only 4–7 pairs of much larger ovate leaflets, in color of the flower and in its heteromorphic vexillary petal. This petal, however, is differentiated from its neighbors only in thicker texture, crenulate margin and yellow or partly yellow coloring; it lacks the flabellate appendages characteristic of *C. swartzioides*. Among the Hylaeae marimarís *C. rubriflora* is unique in three features: the simple pinnate venation and dull upper surface of the leaflets; the disagreeable odor of the flowers emphasized by Ducke; and the porrect (not resupinate) anther of the two antepetalous stamens that rise erect in the shelter of the hooded vexillum. The small known range of *C. rubriflora* lies within that of *C. leiandra*, but it appears that the two species are ecologically separated, the former being reported only from above the annual flood line, the latter only from varzea forest. *Cassia leiandra* is in any case easily distinguished by its golden-yellow, agreeably perfumed flowers, its almost or quite homomorphic entire petals, and its fewer (6–11) pairs of larger elliptic-ovate leaflets lustrous and reticulately venulose on the upper face.

iii. ser. GRANDES Irwin & Barneby

Cassia ser. **Grandes** Irwin & Barneby, ser. nov., ser. *Amazonicis* proxime affines, ab illis vexilli lamina ventraliter basi 2-callosa luteo-ocellata, antheris (patule villosulis) staminum fertilium ante petala sitorum maturis late hiantibus thecis saepe confluentibus, necnon legumine maximo lignoso costis crassis ventrali 2 dorsali 1 longitrorsus carinato dissimiles—Sp. unica: *C. grandis* Linnaeus fil.

Bracts and bracteoles caducous long before anthesis; petals whitish or pink, the blade of vexillum heteromorphic, at base on inner face 2-callose and yellow-eyed; anthers densely villous-pilosulous, those of 4 fertile antepetalous stamens resupinate and widely gaping in dehiscence, the thecae commonly confluent; pod heavily ligneous (endocarp 1+ mm thick), bluntly bicarinate by prominent ventral suture and unicarinate by the dorsal one, the valves coarsely venose, the seed-



Fig. 5. *Cassia rubriflora* Ducke.—Flowering branchlet $\times \frac{1}{2}$; vexillum, androecium $\times 2\frac{1}{2}$ (Ducke 1991).

locules pulpy.—Sp. 1, neotropical, from the Caribbean to s.-e. Brazil and Colombia.

Cassia grandis is related to ser. *Amazonicae*, with which it shares a common pattern of inflorescence and resupinate antepetalous anthers, but it differs in the heteromorphic, basally appendaged vexillum, in the gaping, densely villosulous thecae of the resupinate anthers and in the massively ligneous tricarinate, coarsely venose pod, unlike any other in the genus. In favorable sites, when free of competition, *C. grandis* attains a stature and massive trunk hardly equalled elsewhere in the genus, and it is the only native cassia with blush-white or pink, yellow-eyed flowers which, however, sometimes acquire a tinge of yellow when old.

7. *Cassia grandis* Linnaeus fil., Suppl. 230. 1781.—“Habitat in Surinamo. C. G. Dahlberg.”—Based in part on specimens from Surinam, not seen, in part on *Cassia fistula brasiliana flore incarnato* Breynius, Exot. pl. cent. 58, t. 21 (optima!). 1678.—*Cassia brasiliana* Lamarck, Encycl. Méth. 1: 649. 1785, nom. illegit. *Cathartocarpus grandis* (Linnaeus fil.) Persoon, Syn. Pl. 1: 459. 1805. *C. brasilianus* (Lamarck) Jacquin, Fragm. 58, t. 85, fig. 3 (legumen). 1809. *Bactrylobium grande* (Linnaeus fil.) Hornemann, Suppl. Hort. Bot. Havn. 135. 1819.

Cassia brasiliensis Buc'hoz, Hist. Univ. Règne Vég., Planches 10, decas 4: t. 2. 1775.—Without text, but provided with analytical detail, this appears to be the earliest binomial for *C. grandis*, here passed over on the pretext that binomial nomenclature is not uniformly employed throughout the volume. Buc'hoz described the plant in detail in op. cit. Discours 5: 1777, but inexplicably there equated it with *Cassia fistula*.

Cassia mollis Vahl, Symb. bot. 3: 57. 1794.—“Habitat in America meridionali. Dn. v. ROHR.”—Holotypus, labelled (verso) ‘*Cassia mollis*. Ex America meridionali mis[it] Dr. von Rohr,’ C (hb. Vahl.)!—*Bactrylobium molle* (Vahl) Schrader, Götting. Gelehrt. Anz. 1: 713. 1821.

Cassia brasiliana var. *tomentosa* Miquel, Linnaea 18: 578. 1844.—“Colitur in hortis Paramariboae [Surinam].”—No typus seen, but said to differ from *C. brasiliana* (= *C. grandis*) only in relatively dense vesture.

Carthartocarpus erubescens W. Hamilton, “Pharm. J. 5: 119. 1825.”—Protologue not seen; cf. Mabberley, Taxon 30(1): 10. 1981.

Cassia pachycarpa De Wit, Webbia 11: 259, fig. 3. 1955.—“. . . Carr 11958 in L (SE. New Guinea, Koitaki).”—Holotypus, L, not seen; isotypus, K!—Equated with *C. grandis* by Verdcourt, Kew Bull. 32(1): 221. 1977.—Based on a plant naturalized in New Guinea, the internal structure of the immature pod misinterpreted.

Cassia brasiliana sensu Colladon, 1816, p. 83; Humboldt, Bonpland & Kunth, 1824, p. 337; DeCandolle, 1825, p. 489; Vogel, 1837, p. 11, exclus. var.; Saldanha da Gama Filho, Config. e descr. org. fundam. das princip. mad. Rio de Jan. 1: 43. 1865.

Cassia grandis sensu Benthams, 1870, p. 93; 1871, p. 515; Perkins, Contrib. U.S. Nat. Herb. 10: 157. 1907; Fawcett & Rendle, 1920, p. 101; Standley, 1922, p. 405; Colthurst, Familiar Fl. Trees India 64. 1924; Pittier, Pl. Usuales Ven. 163. 1926; Pittier, 1928, p. 117; Britton & Rose, 1930, p. 229; Britton & Killip, 1936, p. 169; Ducke, 1939, p. 79; Amshoff, 1939, p. 57; Standley & Steyermark, 1946, p. 116; Schery, 1951, p. 45, fig. 118, exclus. syn. *C. regia*; De Wit, 1955, p. 213; Neal, In Gardens of Hawaii 424, fig. 175b. 1965; Little, Trees Pto. Rico, second vol. t. 371. 1974; Isely, 1975, p. 98; Graf, Tropica 551. 1978. *Cathartocarpus grandis* sensu G. Don, 1832, p. 452.

Semideciduous trees of potentially great stature, in age attaining 30 m with trunk up to 7 dm diam breast-high, but flowering when (4–)6 m, the adult crown of foliage broad and rounded, the woody parts foetid when cut or bruised, the livid annotinous branchlets angulate by spurs descending from each lf-scar, the hornotinous branchlets contemporary with the cauliflorous inflorescence as well as all lvs and raceme-axes densely pilosulous with sinuous or straightish spreading-incurved hairs up to 0.2–0.45(–0.6) mm, the newly expanding lvs rusty-tomentulose, the copious distichous adult foliage bicolored, the lflets (dry) brownish-olivaceous and dull or sublustrous above, paler dull beneath, the racemes ascending solitary or paired from nodular spurs on branchlets of second or third year, the fl-buds and sepals pallidly mealy-tomentulose.

Stipules livid triangular-subulate 0.4–1 mm, commonly concealed by vesture and promptly deciduous from their expanding lf, absent from mature foliage.

Adult lvs mostly (12–)15–30(–35) cm, exceptionally some (?shade) lvs 40–53 cm; petiole including livid pulvinus (1.5–)2–4.5 cm, a little longer than the first interfoliolar segment of rachis, this 10–25 (rarely 30–45) cm, shallowly openly grooved ventrally, the groove interrupted at each pair of pulvinules, these 10–20(–26) mm apart; pulvinules 1.4–2.1(–2.6) mm; lflets (7–)8–17(–21) pairs decrescent proximally and also sometimes a trifle so distally, in outline most often

exactly oblong and at apex obtuse, depressed-deltate or emarginate but shorter ones sometimes ovate-oblong and some distal ones oblong-oblongate or -elliptic, all at inequilateral base broadly rounded, truncate or subcordate, the longest of a lf $3.5-6.5(-8.3) \times 1.2-2.4(-3)$ cm, 2.5-4(-4.2) times as long as wide, the margins revolute, the midrib canaliculate on upper and cariniform on lower face, the 14-23 rather crowded and widely ascending pairs of camptodrome secondary veins with tertiary and irregular reticular venules all becoming prominulous on both faces, rarely immersed on the upper.

Racemes ascending from the branchlets, but these often drooping and the racemes consequently obliquely geotropic, their early elongating (15-)20-45(-50)-fld axis finally (8-)10-23(-27) cm, the obtusely obovoid or globose fl-buds early separated and raised well above the several simultaneously expanded fls; bracts and bracteoles firm, pilosulous on both faces, the former ovate, deltate-ovate or lance-acuminate (2-)2.5-5 mm, the latter similar except a little smaller, all caducous as the pedicel beings to elongate; pedicels at full anthesis (8-)10-20 mm; hypanthium turbinate, not over 1 mm deep, often obscurely differentiated; sepals firm, pallid greenish or pinkish, minutely densely tomentulose on both faces, obovate or oblong-obovate obtuse, early reflexed, the longest (5.5-)6-8.5(-9) mm; petals heteromorphic and of variable color, the vexillary one oblong-elliptic, bent forward, ventrally 2-callose at thickened base of blade and differing from its neighbors in a yellow flare or eye-spot, the rest alike obovate or obovate-flabellate beyond the short claw, the longest petal (8.5-)9-11 mm, all opening pink and fading peach-color, orange-pink or pale yellow, or opening whitish fading creamy, or all opening white except for pink vexillum, in any case drying dull yellowish-tan; filaments glabrous, the 3 sigmoid antesepalous ones 14-22 mm, \pm dilated in the long distal curve, the 5 antepetalous erect, slenderly tapering and slightly diminished toward the vexillum (4.5-)5-9 mm, the 2 next the vexillum 1-3 mm, bent backward, the anthers all densely loosely white-pilosulous, those of 3 sigmoid stamens (1.5-)1.7-2.9(-3) \times (1.1-)1.4-1.9 mm, of 5 antepetalous ones resupinate (0.8-)1.2-2 mm, of 2 short ones 0.6-1.5 mm, the 5 antepetalous dehiscent by widely gaping, sometimes confluent slits; ovary conspicuously stipitate, the stipe 7-11 mm pilose with subhorizontal hairs, the body falcately incurved white-pilosulous with ascending hairs, the style very short, the minute stigmatic cavity looking up- and inward; ovules 74-98.

Pod pendulous, slow to mature and sometimes persistent into anthesis of the following year, massively linear-oblong, when fully fertile $40-60 \times 3.6-5$ cm, a little laterally compressed but strongly turgid, keeled dorsally by 1 and ventrally by 2 parallel blunt ribs, the former 7-14, the latter together 13-25 mm wide, the valves at first shining green becoming rough blackish transversely cracked and coarsely prominently venulose, consisting of a coriaceous exocarp 0.7-1.3 and a woody endocarp 1.2-2.5 mm thick, the cavity divided by stiffly chartaceous septa into one row of locules 7-8 mm long, these filled with sweetish (edible, cathartic) pulp that dries to laminated flakes adherent to the locule-walls; seeds turned broadside to the septa, obovoid-ellipsoid biconvex $\pm 14-16 \times 9-10$ mm, the testa smooth lustrous castaneous; pod indehiscent, the seeds released only by weathering on the ground.—Collections: 110.—Fig. 1 (androecium), 2 (pod).

An element of lowland and riparian, semideciduous forest adapted to a more or less pronounced dry season, persisting in thickets and as a fence or shade tree, planted, apparently from remote times, about dwellings and thence sparingly naturalized, the aboriginal dispersal consequently ambiguous or controversial, but apparently truly native, mostly between 3 and 300 m but ascending in Nica-

ragua to 600 and in Colombia to 1000 m, in Central and South America and parts of the Greater Antilles: s.-e. Mexico (Tabasco) and s.e., predominantly on the drier Pacific slope, to the Magdalena and Cauca valleys in Colombia; middle Orinoco basin in Venezuela; e. and e.-centr. Cuba, Jamaica, Hispaniola and s.-w. Puerto Rico; along rivers and estuaries in the Guianas and lower Amazon (Pará, reported by Ducke from Amazonas); disjunct in gallery forest of the Pantanal in Mato Grosso, Brazil; questionably native in s.-centr. Mexico (Guerrero, s.-w. México), in trans-Andine Peru (middle Ucayali valley in Loreto) and at scattered points around the e. shoulder of Brazil; cultivated in Brazil s.-ward from Bahia, in tropical and subtropical gardens around the world, in some Lesser Antilles, and sometimes as an ornamental within its native range.—Fl. mostly (XI–)II–IV(–V), in the Guianas, the Amazon delta region and the Pantanal mostly VIII–X, the fls usually contemporary with the flush of new foliage, when the tree is partly defoliate.—*Horse cassia*, *pink shower*, *liquorice tree*; *stinking-toe* (B. W. I.); *cañafistula de Castilla* (Mexico); *carao*, *caragua* (Centr. Amer.); *bucut*, *mucut* (Maya); *carámano* (Nicaragua); *sandal* (Costa Rica); *cañandong*, *capote* (Colombia); *cañaflote*, *canafistolo buerrero* (Venezuela); *cañafistula cimarrona* (Pto. Rico); *geneúna*; *marimarí grande*, *m. preto* (Brazil).

Cassia × **regia** Standley, stat. nov. (= *C. grandis* × *moschata*). *C. regia* Standley, Contrib. U.S. Nat. Herb. 18: 103. 1916.—“Type [US] no. 677196, collected around El Paraíso, Canal Zone, Panama, altitude 30 to 100 meters, January 24, 1911, by H. Pittier (no. 2532).”—Holotypus, US! isotypus, US! clastotypus, NY!

Cassia regia sensu Britton & Rose, 1930, p. 230; Schery, 1951, p. 47, in nota sub *C. grandis*.

The hybrid origin of *C. regia* as the offspring of *C. grandis* × *C. moschata* was plausibly suggested by Schery (1951, l.c.). The type-collection has the pliantly pendulous raceme, the long hypanthium, the red sepals and the unmodified vexillum of *C. moschata* but the open corolla and small pilosulous obtuse anthers of *C. grandis*. Standley described the petals, from dried specimens then five years old, as pale yellow with conspicuous purple veins, but fresh color is indecipherable from dried specimens in this group, pink and yellow petals often turning nearly the same shade of buff-orange when dried. A similar plant with petals noted in the field as salmon-pink was collected by Britton (no. 12889) in a pasture at Cristo near Santiago in eastern Cuba, close to normal *C. grandis* (no. 12901). The two supposed parents are native in similar habitats in Panama and *C. moschata* was cultivated in the vicinity of Santiago not far from Cristo (El Caney, Britton 1856, NY), so the possibility of contact is established. Controlled hybridization should be attempted to settle the question.

iv. ser. MOSCHATAE Irwin & Barneby

Cassia ser. **Moschatae** Irwin & Barneby, ser. nov., bracteis diu ante anthesin deciduis, racemo pendulo necnon legumine tereti pulpa gelatinosa farcto ser. *Cassiae* simillimae, sed ab omnibus generis seriebus flore maturo petalis concavis conniventibus subgloboso staminumque 3 longorum antheris apiculato-umbonulatis diversae.—Sp. unica: *C. moschata* H.B.K.

Bracts and bracteoles caducous long before anthesis; racemes pliantly pendulous from annotinous branchlets; petals (yellow or bronze-yellow, often red-veined) permanently concave and connivent at full anthesis to form a subglobose

bowl-shaped perianth; anthers glabrous, of 3 long stamens apiculate at apex, of 4 antepetalous fertile ones erect; pod and seeds of ser. *Cassia*.—1 sp. of tropical America n. of the Equator.

Cassia moschata is unlike any other in the bowl-shaped inner perianth and differs from vegetatively similar American cassias in the glabrous apiculate anthers. The pod and seeds of *C. moschata* are structurally like those of *C. fistula*, and the pods, which have the same medicinal properties, were formerly exported to Europe as substitutes for the genuine Asiatic senna. The abundant flowers, of rich golden or bronze-yellow sometimes veined or suffused with red, hang down from actively leaf-shedding or already leafless branchlets of the preceding year on a slenderly tapering axis, but each flower is borne on a refracted and twisted pedicel by which its orientation in relation to the pollinator is restored to vertical. According to Neal (In Gardens of Hawaii 425. 1965) *C. moschata* is sterile where planted in the Hawaiian Islands, presumably for lack of the appropriate pollinator, a point which may have a bearing on the peculiar form of the corolla.

8. *Cassia moschata* Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6 (qu): 338. 1824.—“Crescit in sylvis, ad fluvium Magdalenae, prope Mompox [=Mompós, Bolívar, Colombia].”—Holotypus, labelled ‘n. 1479, Río Magdalena prope Mompox,’ P-HBK (lvs only), char. ampliat. Hanbury, Trans. Linn. Soc. 24: 162, t. 26. 1864.—*Cathartocarpus moschatus* (Humboldt, Bonpland & Kunth) G. Don, Gen. Hist. Dichl. Pl. 2: 453. 1832.

Cassia moschata sensu Vogel, 1837, p. 11; Bentham, 1870, p. 94; 1871, p. 156; Hanbury, Trans. Linn. Soc. London 24: 162, t. 26. 1863 (OPTIMA!); Pittier, 1928, p. 118; Britton & Rose, 1930, p. 230; Britton & Killip, 1936, p. 169; Schery, 1951, p. 47, fig. 119.

Semideciduous, amply leafy trees with rounded crown and trunk when adult 1.5–9 dm diam, commonly seen 7–20 m tall but potentially flowering when smaller and attaining 28 m, the older branchlets livid lenticellate, the hornotinous ones and their distichous lvs pilosulous with spreading or incurved hairs up to 0.2–0.4 mm, the flush foliage yellowish- or whitish-tomentulose, the mature foliage bi-colored, the lfts above lustrous brownish-olivaceous and either thinly pilosulous marginally or overall or glabrate, beneath paler dull and more densely pilosulous, the elongate racemes produced from axils of lvs newly fallen or soon to fall, pliantly pendulous from annotinous branchlets and subcontemporaneous with new lvs.

Stipules thinly herbaceous, semisagittately 2-lobed, the longer lobe erect lanceolate or subulate 1.5–4.5 mm, the shorter one descending triangular-subulate 0.5–1.5 mm, the whole blade caducous from newly expanded lf.

Adult lvs, excluding the often shorter and simpler first lf of each branchlet (not further mentioned), 11–26 cm; petiole including firm, moderately dilated pulvinus 9–22 mm, shallowly sulcate ventrally; rachis 9–22 cm, its ventral groove continuous past the pulvinules, the longer interfoliolar segments on either side (9–)10–16(–18) mm; pulvinules dorsoventrally compressed 1–1.8(–2.4) mm; lfts either opposite or alternate along rachis (sometimes both on different lvs of one branchlet), decrescent proximally and thence either subequilong or again decrescent distally, those of larger lvs 10–16(–17, exceptionally –20) pairs, in outline oblong, lance-oblong, rarely ovate-oblong, obtuse, emarginate or broadly delatately subacute, the largest (26–)28–53 × (8–)9–17(–20) mm, (2.7–)2.8–4.1 times as long as wide, at inequilateral (distally broader) base broadly rounded or subcordate, the margin revolute, the oblique but straight midrib shallowly depressed

above, cariniform beneath, the (12-)14-19 pairs of widely ascending camptodrome secondary veins with connecting tertiary and reticular venulation all becoming finely sharply prominulous on both faces.

Racemes loosely 25-70-fl'd, the axis elongating much before anthesis and becoming (6-)9-32 cm, the several simultaneously expanded fls far surpassed by unopened buds, or all fls subcontemporaneous, the pedicels refracted and so twisted as to restore the vexillum to vertical, though the fl in reality resupinate relative to its parent axis; bracts slenderly lance-subulate up to 3 mm, very early caducous with the similar bracteoles, all thrown off before the pedicel begins to elongate, absent at anthesis; pedicels at anthesis (5-)6-12(-14) mm measured up to base of the slenderly vase-shaped hypanthium, this 2-3.5 mm; fl-buds globose when very young, puberulent or subglabrate; sepals ovate-suborbicular obtuse, little graduated, the outer firm, bronze-red, dark wine-red or livid, the inner a trifle thinner-textured, often submembranous- and pallid-margined, the longest (5.5-)6-8(-8.5) mm; petals golden or bronze-yellow commonly red-veined, sometimes red-suffused, all convex and connivent to form a subglobose perianth, the vexillum differentiated by its longer claw (3-4.5 mm), forwardly inclined over the backwardly arched long stamens, its blade a little thickened along midrib but not appendaged, the blades of all petals elliptic-obovate, the longest petal (10-)11-15.5 mm; androecium glabrous, the sigmoid filaments of 3 abaxial stamens (15-)17-26 mm, those of 4 median stamens either straight erect or obscurely sigmoid, slightly decrescent toward the vexillum, 4-8 mm, those of 3 adaxial ones thickened (the central one more so) 2-3.5 mm and distally recurved, the anthers of 3 long stamens firm brownish lustrous, in dorsoventral view broadly ovate apiculate (2.6-)2.8-3.5 \times 2.1-2.5 mm, those of 4 median ones erect, slenderly ovate-elliptic 2.2-3.3 \times 1-1.2 mm, the anthers of 3 adaxial ones sterile not over 1 mm, of the one opposed to vexillum often lacking; ovary stipitate, the glabrous or rarely pilosulous stipe 3-5.5(-6) mm, the incurved body either glabrous or thinly pilosulous along the sutures, at anthesis glabrous laterally but following fertilization becoming densely velvety-puberulent, the very short style abruptly narrowed into an introrsely ascending stigmatic cavity 0.1-0.15 mm diam; ovules 76-109.

Pod pendulous, when fully fertile and undamaged by insects smoothly rod-shaped terete 35-50 \times (1.2-)1.3-1.7(-1.9) cm, straight or almost so, the slender sutures immersed, the fuscous or livid-brown valves minutely puberulent overall, consisting of a pithy-fibrous, transversely fissured exocarp \pm 0.1 mm thick and woody endocarp 0.25-0.6 mm thick, the cavity divided by complete woody septa nearly as thick as the valve-wall, the fertile locules 3.5-4.5 mm long, as wide as the cavity; seeds (poorly known, much predated by bruchids) slowly maturing, laid broadside to the cavity in thin malodorous pulp, \pm 7-8 \times 5-6 mm, the castaneous testa smooth, highly lustrous.—Collections: 72.—Fig. 1 (androecium).

Open semideciduous woodlands, savanna thickets, savanna-forest ecotone, and along streams in wet forest, 1-300 m, common and locally abundant, wild, cultivated and preserved for shade and beauty in pastures and along fences over much of the Orinoco basin and n.-e. Colombia (Boyacá, Meta, Vichada) and Venezuela (Amazonas and Apure to Delta Amacuro), n. in Venezuela to interior valleys of Cordillera Costanera and to the Maracaibo Basin in Zulia, feebly n.-e. in Colombia to lower Magdalena valley and thence to centr. Panama, skirting the flanks of Guayana Highland to the w. and reappearing abundantly on savannas of upper Rio Branco in Terr. do Roraima, Brazil and adjacent Guyana; apparently native but disjunct in e. Guatemala, adjoining Belize and the Gulf lowlands of

s.-e. Veracruz and Tabasco, thence just reaching the Pacific slope near Tehuantepec in Oaxaca; collected once (perhaps cultivated) in Guayas, Ecuador, long cultivated and locally naturalized on Cuba, and a prized ornamental tree of Old and New World tropical botanic gardens.—Fl. I–IV, sometimes earlier in Brazil and s. Venezuela, usually when annotinous foliage is falling or mostly fallen and new leaves begin to unfold.—*Cañafistola sabanera*.

v. ser. **HETEROSPERMAE** Irwin & Barneby

Cassia ser. **Heterospermae** Irwin & Barneby, ser. nov., leguminis cavitate septis fere obsoletis continuo necnon seminibus oblique basipetis de latere (valvulis parallele) compressis inter congeneres unicae, caeterius bracteis bracteolisque caducis, racemis pendulis necnon antheris staminum ante petalos sitorum erectis ser. *Moschatis* similes sed ab eis petalis radiatim apertis fere planis antherisque staminum 3 longorum obtusissimis (nec apiculatis) diversae.—Sp. unica: **C. hintoni** Sandwith.

Bracts and bracteoles caducous long before anthesis; petals (yellow) rotately expanded at full anthesis, plane or nearly so, shed before the sepals; anthers pilosulous, those of 4 fertile antepetalous stamens erect, those of 3 long sigmoid ones obtuse; septa of pod incomplete or almost lacking, the seeds obliquely basipetal and laterally compressed parallel to the valves, their hilum near base of one rim.—1 sp. of s. Mexico.

Cassia hintoni has almost the foliage of *C. moschata* and similarly pliant racemes pendulous from annotinous branchlets, but the corolla is rotately expanded like that of *C. fistula* and the subunilocular, internally thinly pulpy pod with its basipetal, laterally compressed seeds are without peer in the genus. The pod's plush-like indumentum recurs in South American *C.* (ser. *Tetrapleurae*) *fastuosa* var. *fastuosa* and in African *C. abbreviata* Oliv.; this striking phenetic character seems to lie deep in the genetic potential of the genus and is only randomly realized, in species not closely related to each other.

9. Cassia hintoni Sandwith, Kew Bull. Misc. Inf. 1936: 5. 1936.—“Mexico. State of Mexico: District of Temascaltepec; Nanchititla . . . Feb. 23rd, 1933, *Hinton* 3440 (typus); Limones, 960 m . . . Jan 30th, 1934, *Hinton* 5570; Ixtapan . . . May 3rd, 1935, *Hinton* 7727.”—Holotypus, K! = NY Neg. 1424; isotypi, G, MEXU! paratypi, *Hinton* 5570, 7727, K, NY, US!

Shrubs and slender trees at anthesis 2–17(–20) m with grayish-brown, in age lenticellate, vertically fissuring bark, the hornotinous branchlets, foliage and axes of inflorescence finely pilosulous with erect or forwardly incumbent hairs up to 0.2–0.5 mm, the loose racemes of large fls pendulous from leafless annotinous branchlets, the foliage deciduous during the dry season.

Stipules subulate 0.7–1.7 mm caducous.

Lvs up to 15–23 cm (some on immature spurs coeval with fls shorter, not further described); petiole including little-dilated pulvinus 25–35 mm, at middle 0.7–1.1 mm diam, obscurely sulcate ventrally; rachis \pm 12–20 cm, the interfoliolar segments 9–14 mm; pulvinules \pm 0.7–1 mm; lfts (9–)14–18 pairs subisomorphic, oblong or ovate-oblong obtuse apiculate \pm 20–35 \times 7.5–12 mm, at inequilateral base broader on distal side, the blades submembranous, the pallid midrib with 5–8 pairs of slender secondary veins prominulous only beneath, tertiary venulation immersed.

Racemes loosely 15–25-fl'd, the peduncle proper no longer than interfloral segments of the slender tapering rachis, this becoming 12–24 cm; bracts firm lanceolate or lance-acuminate 2.5–4 mm, like the 2 basal ovate bracteoles deciduous; pedicels obliquely ascending to vertical (appearing refracted from geotropic parent axis) including hypanthium ± 3 –4 cm, the fertile ones early thickened, lignified in fruit; fl-buds obovoid-ellipsoid obtuse, densely subvelutinous-puberulent; hypanthium slenderly vase-shaped 4.5–5 mm; sepals greenish or fuscous with pallid yellowish margins, obovate of nearly equal length (10.5–)11–14.5 mm, early reflexed, persistent after fall of petals; petals subequal yellow, delicately brown-veined when dried, externally puberulent along venules, the claw (± 4 mm) and ovate-oblong obtuse or emarginate blade together (18–)20–25 mm; filaments glabrous, those of 3 abaxial antepetalous sigmoid stamens 32–40 mm, compressed but dilated near middle of distal inward curve, those of their 4 antepetalous neighbors and of 3 adaxial ones gently porrect and 7.5–12 mm, the anthers of the 3 long stamens ovate, bluntly lobed at base $4\text{--}4.3 \times 2.5$ mm, those of 4 median stamens ovoid acutely sagittate at base and a trifle sigmoidally arcuate $3.8\text{--}4.8 \times 2\text{--}2.4$ mm, those of 3 adaxial ones ovoid obtuse $1.3\text{--}1.8 \times 0.8\text{--}1$ mm, all anthers thinly pilosulous but those of the 3 longest and 3 abaxial stamens only so on dorsal face; dehiscence of 3 far-exserted anthers through the sutures, of 4 median ones by basal slits, of 3 abaxial ones by small basal pores; ovary densely white-pilosulous; style (scarcely differentiated externally) 4–5 mm, pilosulous except at gently incurved apex, the stigmatic aperture looking upward, minute.

Pod pendulous, shortly stout-stipitate, the body cylindric, acuminate tapering at both ends, straight or slightly decurved, $35\text{--}75 \times 1\text{--}1.3$ cm, the sutures scarcely differentiated externally, the valves densely gray-velvety-pilosulous, when ripe consisting of a stiffly papery, transversely fissured exocarp exfoliating from a cylindric coriaceous endocarp, the pulpy cavity not divided by septa; seeds enveloped in thin, when dry pitchlike pulp, obliquely descending in the cavity, turned broadside to the valves, plumply biconvex, in outline obovate or oblong-obovate $7\text{--}9 \times 5\text{--}6$ mm, the castaneous testa smooth, highly lustrous, the hilum situated on the rim; pod essentially indehiscent, seeds tardily released following decay of pod on the ground.—Collections: 14.—Fig. 6.

Drought-deciduous brush-woodland and open places in the oak-belt, $\pm 100\text{--}1100$ m, apparently local and scattered in the Balsas Depression and on the Pacific foothills of s.-w. Mexico, in coastal Jalisco (near Chamela and Barra de Navidad), coastal s.-w. Michoacán (mun. Arteaga and Aquila) and s.w. México (mun. Tejupilco).—Fl. III–VI.

vi. ser. **TETRAPLEURAE** Irwin & Barneby

Cassia ser. **Tetrapleurae** Irwin & Barneby, ser. nov., imprimis legumine intus pulposo sutura utraque bicostato, bracteis bracteolisque per anthesin persistentibus insignes.—Sp. typica: **C. fastuosa** Willdenow ex Benth.

Bracts and bractlets persistent into anthesis; anthers of 4 fertile antepetalous stamens erect; pod carinate both ventrally and dorsally by a contiguously parallel pair of thickened ribs; seeds transverse 1-seriate, enveloped in thin gelatinous (when dry fragile, flaky) pulp.—Spp. 3, of tropical and subtropical S. America.

The *Tetrapleurae* are the only native American cassias in which the bract and bracteoles persist into anthesis of the flower, and their pod, doubly costate along both sutures, occurs nowhere else in the genus. The Asiatic *Obolospermae* have

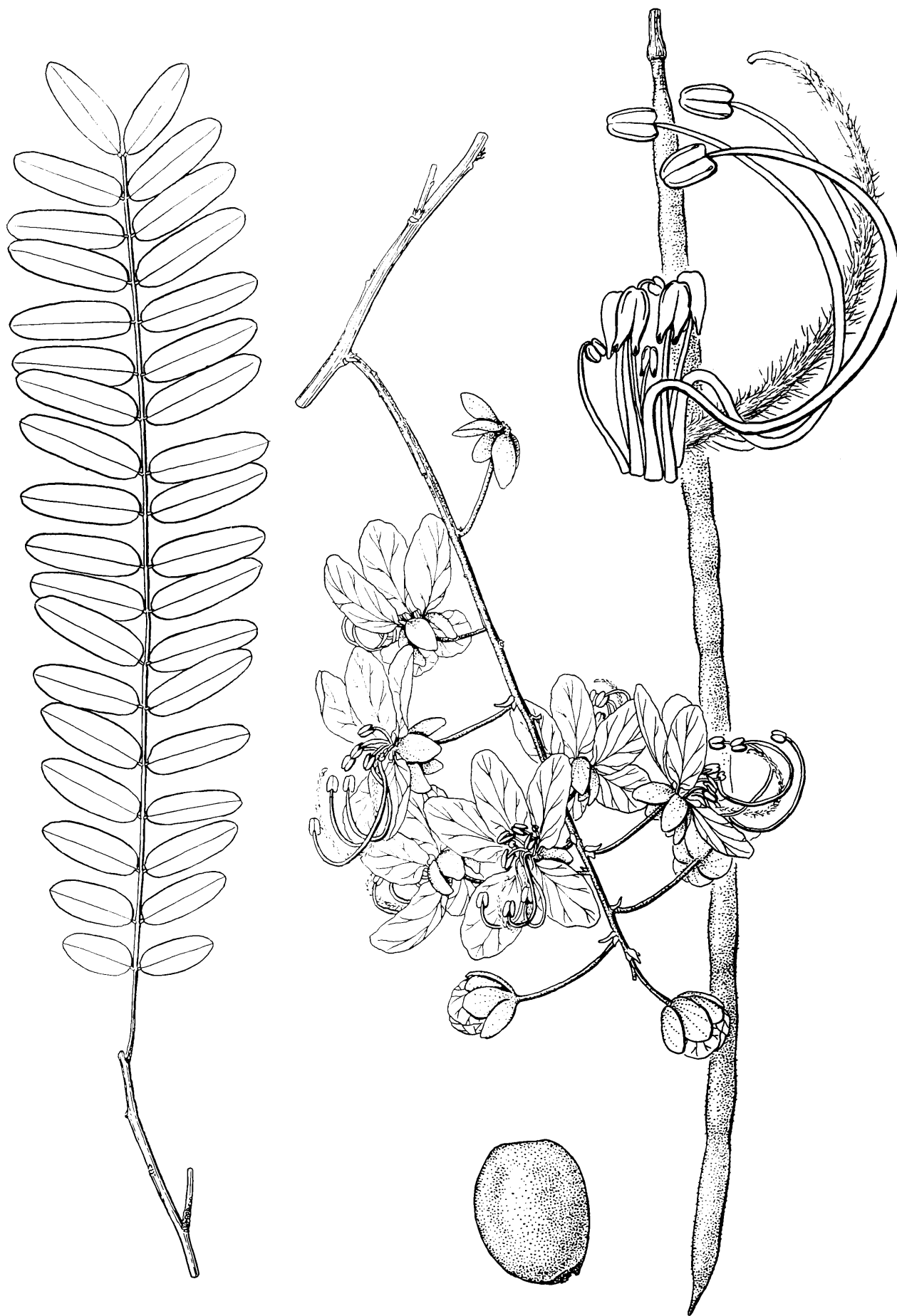


Fig. 6. *Cassia hintoni* Sandw.—Leaf + raceme $\times \frac{1}{2}$; androecium $\times 1\frac{1}{2}$; pod $\times \frac{1}{4}$; seed $\times 2$ (Hinton 15876).

similar bracts but their pods lack the double sutures and their seeds are enveloped not in pulp but in a dry suberous disc. The nodular swelling on the outer curve of the long stamens in yellow-flowered south-Brazilian *C. (Tetrapleurae) leptophylla* is precisely repeated in pink-flowered Asiatic *C. (Obolospermae) javanica*, but we interpret this as an instance of parallelism, not as an indicator of close kinship.

10. *Cassia ferruginea* (Schrader) Schrader ex DeCandolle, Prod. 2: 489. 1825.
Bactyriolobium ferrugineum Schrader, Götting. Gelehrt. Anz. 1(72): 713. 1821.—Typus infra sub var. *ferruginea* indicatur.

Trees 6–20 m, potentially flowering as juvenile shrubs, when adult with rounded crown and trunk up to 6 dm diam, the glabrescent gray-brown, atro-castaneous or livid annotinous branchlets angulately ribbed, the hornotinous ones together with lf-stalks, lfts (except rarely the upper face) and axes of inflorescence varying from densely pilosulous to minutely puberulent with spreading, incumbent or rarely subappressed, commonly rufescent hairs up to 0.1–0.35 mm, the phyllotaxy spiral, the lvs bicolored, when dry dull brownish-olivaceous above, paler beneath, the long loose racemes of fragrant yellow fls terminal to current year's, obliquely geotropic leafy branchlets or to leafless branchlets emergent laterally from annotinous branchlets \pm coinciding with the new flush of foliage.

Stipules thinly herbaceous 2-lobed, the ascending lobe narrowly lanceolate or lance-attenuate (1.5–)2–7 \times 0.4–1 mm, the descending one similar but only 1–2.5(–3.5) mm, the whole blade deciduous before the associated lf, sometimes prior to its full expansion.

Lvs (10–)12–28 cm, becoming longer and more complex upward along each branchlet; petiole including firm pulvinus 14–26 mm, at middle 0.9–2 mm diam, openly shallowly grooved ventrally; rachis (5–)8–22.5 cm, its longer interfoliolar segments (6–)8–14 mm; pulvinules (1–)1.2–2 mm; lfts (7–)10–21(–23) pairs, opposite or less often scattered, a little decrescent toward each end of rachis, the largest adult ones narrowly oblong or oblong obtuse mucronulate or apiculate 22–45(–48) \times 6.5–12(–15) mm, (2.6–)2.9–4.1(–4.3) times as long as wide, at base inequilaterally cuneate, rounded, subtruncate or proximally subcordate, the broader distal side commonly abruptly obtusangulate, the mature margin revolute, the midrib depressed above, cariniform beneath, the 6–9(–10) pairs of campodrome with few random intercalary secondary veins finely prominulous on both faces, a weak open tertiary venulation scarcely raised or immersed.

Racemes sessile or almost so, loosely 20–65-fl'd, the tapering, geotropically arcuate (but not pliantly pendulous) axis elongating prior to anthesis and many (or all) fls usually expanding subsimultaneously, the mature axis (6–)12–30(–36) cm; bracts firm, lance-ovate or lance-acuminate to -caudate 3–10 \times 1.6–2.2 mm, persistent with the pair of similar but shorter, proportionately broader bracteoles into or shortly past anthesis, then deciduous; pedicels widely divaricate or from pendent axis refracted and twisted so as to restore its fl to vertical, including the slenderly vase-shaped hypanthium (21–)25–45 mm, the hypanthium itself (1.5–)2–4 mm; fl-buds ellipsoid obtuse, densely finely puberulent, the firm ovate-obovate sepals only a little graduated, the longest inner one 6.5–11(–12) mm, all reflexed at full anthesis and deciduous promptly thereafter; petals yellow sometimes brick-red in age, often puberulent dorsally along veins, widely expanding and almost plane at full anthesis, elliptic or obovate subhomomorphic (9–)11–28 \times 5–15 mm, at base either abruptly cuneate or when broad contracted into a claw up to 1 mm long; androecium glabrous except for dorsally pilosulous anthers of 3 long stamens, the sigmoid filaments of these dilated distally (ribbon-

like) and (measured along curvature) 18–46 mm, the other 7 filaments straight erect \pm dilated proximally and tapering distally, variably diminished backward toward the vexillum, the 4 median antepetalous 6–17 mm, the 3 adaxial 3.5–13 mm, the 2 antesepalous hamately recurved at apex, the anthers of 3 long stamens ovate obtuse $2.3\text{--}3.5 \times 1.5\text{--}1.9(-2)$ mm, of 4 median more narrowly obovate-hastate $2.4\text{--}3.5 \times 1.1\text{--}1.8$ mm, of 3 adaxial minute, sterile or nearly so, (0.5–)0.7–1.3 mm diam; ovary pilosulous, its stipe 3–5.5 mm, its style (externally scarcely differentiated) $1.5\text{--}2.7(-3) \times 0.6\text{--}0.8$ mm, incurved at apex and abruptly contracted into the intro-antrorse ciliolate stigmatic cavity 0.1–0.2 mm diam; ovules 108–156.

Pod (little known) pendulous, slenderly rodlike 4.5–7 (acc. Mexia –8.8) dm \times 1.7 cm \times 1.4 cm, straight, a little laterally compressed, coarsely bluntly 2-carinate both ventrally and dorsally by greatly thickened double sutures, gently convex and obscurely corrugated laterally, the cross section oblately elliptic, the thin, early glabrate exocarp becoming skinlike, transversely cracked, livid-castaneous and lustrous, the woody endocarp ± 0.8 mm thick and the interseminal septa only a trifle thinner, the locules $\pm 6\text{--}7$ mm long; seeds 1-seriate, turned broadside to the septa, each clothed in a pulpy envelope which contracts around it in drying as a loose coat separated from the locule-wall, in form (immature) like that of kindred spp., not seen ripe.

Like all genuine cassias *C. ferruginea* is a handsome, potentially long-lived tree, notable for its abundant drooping racemes of sweet-scented flowers and for its extremely long and narrow pod double keeled along both sutures. It differs from related and partly sympatric *C. leptophylla*, which has a similar but more massive 4-keeled pod, in the more numerous oblong and smaller, more simply penniveined rather than reticulate leaflets, and in the narrow and loose, not congested corymbiform racemes of smaller flowers borne on pedicels about 2.5–4.5 (not 6.5–8) cm long. The nodular swelling on the outer curve of the three long stamens which characterizes *C. leptophylla* alone among native American cassias is represented in *C. ferruginea* by a gradual ribbonlike dilation, and their anthers are substantially smaller, 2.3–3.5 (not 3.6–4.5) mm long. The pod of neither species is well known, but that of *C. ferruginea* appears on present evidence to be at once longer and narrower, its length correlated no doubt with a generally higher number ($\pm 108\text{--}156$, not 80–114) of ovules. The largest-flowered forms of *C. ferruginea* resemble allopatric *C. fastuosa* in the elongating raceme of persistently bractate flowers, but can be separated infallibly at anthesis by the narrow stipules and sessile or subsessile petals and in fruit by the more coarsely 4-costate pod.

From early times the leaflets and flowers of *C. ferruginea* (or *C. staminea*) have been noticed as variable in size and its pubescence as variable in length and density, but the modes of variation were known by Bentham (1870, l.c.) to be poorly correlated, a fact confirmed by modern collections. On the other hand the accumulated material of *C. ferruginea* shows an emphatic clinal curve of variation in amplitude of petals and length of sigmoid stamens that corresponds with north–south dispersal. Although the curve seems continuous and there are a few equivocal collections from central Minas Gerais, the extreme forms are so strikingly different that we feel justified in recognizing two taxonomic units.

Key to the Varieties of *C. ferruginea*

1. Petals obovate or oblong-obovate $15\text{--}28 \times 10\text{--}15$ mm; sigmoid filaments (measured along their curvature) 30–46 mm; centr. Minas Gerais, n.-ward from $\pm 20^\circ\text{S}$, to e.-centr. Goiás, s. Ceará and s.-e. Bahia.
 - 10a. var. *ferruginea* (p. 40).

1. Petals oblong-elliptic (9–)10–20 × 5–9(–10) mm; sigmoid filaments 18–30 mm; s.-e. Minas Gerais, s.-ward from ±21°S, and Rio de Janeiro to Paraná. 10b. var. *velloziana* (p. 40).

10a. *Cassia ferruginea* (Schrader) DeCandolle var. *ferruginea*. *Bactyrilobium ferrugineum* Schrader, 1821, l.c., sens. str.—“. . . [der Prinz Maximilian von Neuwied . . . in Brasilien gesammelten Gewächse . . .] n. 27.”—Holotypus not seen; isotypus, fragm. + drawing, sent to DeCandolle by Schrader as *Cassia ferruginea*, G-DC!—A spm labelled “*C. staminea*, leg. Maximilian zu Wied-Neuwied,” s. loc., M (hb. Mart.)! is possibly isotypic.—*Cathartocarpus ferrugineus* (Schrader) G. Don, Gen. Hist. Dichl. Pl. 2: 453. 1825. *Cassia brasiliensis* var. β [?*C.*] *ferruginea* (Schrader) Vogel, Syn. Gen. Cass. 11. 1837.

Cassia staminea Vogel, Syn. Gen. Cass. 14 & Linnaea 11: 536, descr. ampliata. 1837.—“In Brasilia: Sellow leg. pr. Pitangui et Fac[enda] de Caxoeira [=w.-n.-w. of Belo Horizonte, Minas Gerais].”—Evidently described from at least 2 collections at †B, one differentiated as an unnamed forma β ; Sellow s.n., K! = NY Neg. 1438, may duplicate one of these but lacks data of locality.—Equated with *C. ferruginea* by Bentham, 1870, p. 95.

Cassia ferruginea sensu Bentham, 1870, p. 95 & 1871, p. 516, maj. ex parte, exclus. syn. Velloz, & Saldanh. nonnullisque speciminibus e Brasilia austro-orientali, quae var. *vellozianae* referimus.

Characters as given in key.—Collections: 23.

Wooded valley slopes, gallery-margins, cerradão, and surviving in capoeira or as a fence-tree, mostly 200–950 m, scattered around and within the basin of Rio São Francisco from centr. Minas Gerais n. to Sa. de Araripe in s. Ceará (lat. ±7–20°S), w. to the upper Tocantins in centr. Goiás and reappearing locally on the Atlantic slope in s.-e. Bahia at 5–300 m, both in coastal wet forest and in mata de cipó of the Paraguaçu and Contas valleys; here and there cultivated for shade and ornament and locally spontaneous (as in Parque do Guará, D.F.).—Fl. X–II.—*Canafistula preta*.

10b. *Cassia ferruginea* (Schrader) DeCandolle var. *velloziana* Irwin & Barneby, var. nov., a var. *ferruginea* petalis saepius brevioribus 1–2 (nec 1.5–2.8) cm longis semper angustioribus (minus quam 1 cm latis), staminum 3 longiorum filamento breviori 18–30 (nec 30–46) mm longo patriaque meridionali diversa.—BRAZIL. Guanabara: Floresta da Tijuca, s.d., flor., Glaziou 10696.—Holotypus, NY; isotypus, P.

Cassia javanica sensu Vellozo, Fl. Flum. 168. 1825 & Ic. 4: t. 73. 1835.—“*Habitat silvis maritimis, ac mediterraneis*.”—Only provisionally equated by Vellozo with *C. javanica* Linnaeus and recognized by Bentham (1870, p. 95) as synonymous with *C. ferruginea* sens. lat.—Non *C. javanica* Linnaeus, 1753.

Cassia ferruginea sensu Bentham, 1870, p. 95 & 1871, p. 516, amb. ex parte, quoad syn. supra cit.

Characters as given in key.—Collections: 15.

Wet woodlands, gallery-forest, sometimes abundant in disturbed or regenerating forest, ±300–750 m, discontinuously dispersed from the headwaters of rios Doce and Grande in s. Minas Gerais and coastal mountains of Rio de Janeiro s.-e. to e.-centr. and n.-e. Paraná, lat. ±22–25°S, in its native range preserved for ornament and shade and sometimes planted about dwellings.—Fl. XI–I.—*Canafistula*, c. *preta*; *banana de macaco*.

11. *Cassia fastuosa* Willdenow ex Bentham in Martius, Fl. Bras. 15(2): 95. 1870.—Typus infra sub var. *fastuosa* indicatur.

Potentially massive trees with broadly rounded crown, reaching 40 m with trunk 1 m diam but commonly seen 8–18 m with trunk 1.5–6(–8) dm diam and

sometimes as a precociously flowering treelet no more than 4 m, the older branchlets livid glabrate, prominently obtusangulate, the hornotinous ones with lvs (except for sometimes glabrate upper face of lfts) and axes of inflorescence all minutely pilosulous with fine incurved or curly hairs up to 0.1–0.25 mm, the emergent foliage sordid-tomentulose but early greening and when adult bicolored, the lfts then lustrous green above and paler beneath, the phyllotaxy spiral, the long loose racemes of large fragrant fls borne on a stiff tapering, geotropically arcuate axis either terminal to few-lvd branchlets or to leafless branchlets arising from annotinous wood, anthesis coinciding with or closely following leaf-fall and flush of new foliage.

Stipules thinly herbaceous green 2-lobed, appearing lunately semi-elliptic and laterally attached below middle, there 2.5–5 mm wide, the obliquely lance-acuminate or -caudate lobes unequal, the ascending one (5–)7–14(–15) mm, the descending one 3.5–7(–10) mm, the whole blade in age delicately reticulate-venulose, deciduous long before the associated lf.

Lvs 1–4, mostly ± 1.5 –3 dm, progressively longer and more complex upward along each branchlet; petiole including firm pulvinus 14–26(–32) mm, at middle 0.8–2 mm diam, openly shallowly grooved ventrally; rachis mostly ± 1 –2.5 (rarely –3.4) dm, the lfts inserted alternately up to 9–19 mm apart on each side, the ventral groove continuous; pulvinules 0.8–2 mm; lfts on each side of rachis 9–12 in early lvs, in later ones 12–25(–29), slightly decrescent toward base and often also toward apex of lf-stalk, the larger lfts narrowly lance-oblong, oblong-elliptic or seldom narrowly oblong-ovate, obtuse apiculate or acute to acuminate $3\text{--}6 \times 1\text{--}1.5$ (–1.7) cm, 3–4.4(–5) times as long as wide, at inequilateral base cuneate or rounded proximally, rounded to truncate and obtusangulate distally, the (adult) margin revolute, the midrib impressed above, cariniform beneath, the 8–13(–15) camptodrome with random intercalary secondary veins becoming finely prominulous on both faces, a faint open tertiary venulation either prominulous on both faces or dorsally only, or sometimes fully immersed.

Racemes subsessile, openly (15–)20–35-fld, the axis with short or obsolete peduncle 15–35 cm, fully grown before the subsimultaneous anthesis of all its fls, these borne on stout, widely divaricate or recurved pedicels (2.5–)3–5.5(–6) cm, the pedicels when recurved also twisted to restore the fl to vertical; bracts herbaceous lance- or narrowly ovate-acuminate or -caudate $6\text{--}12 \times 2\text{--}4$ mm, persistent at least into early anthesis, then deciduous; bracteoles (basal or exceptionally shortly displaced upward along pedicel) similar to bracts but shorter and somewhat more persistent; fl-buds obovoid-ellipsoid, densely minutely velvety-puberulent; hypanthium narrowly vase-shaped (2.5–)3–5 mm; sepals firm, greenish or fuscous, convexly ovate-obovate, scarcely graduated in length, the longest 9.5–14(–15) mm, all promptly deciduous; petals golden yellow, widely expanded and almost plane, persistent beyond fall of sepals and androecium, subhomomorphic, broadly obovate beyond the conspicuous claw, the longest petal (23–)25–37(–39) $\times 13\text{--}26$ mm, the claws 2.5–6; androecium glabrous except for sometimes puberulent fertile anthers, the sigmoid filaments of 3 long stamens strongly dilated ribbonlike (33.5–)35–62 mm, of the rest porrectly erect, diminishing backward toward the vexillum, of 4 fertile ones 7–18 mm, of 3 adaxial sterile ones 5.5–14 mm, the antesepalous pair of the latter hamately recurved at apex; anthers of 3 long stamens ovate obtuse $2.5\text{--}4.5 \times 1.8\text{--}2.2$ mm, of 4 fertile median ones (4–)4.4–6 $\times 1.6\text{--}2.5$ mm, of 3 adaxial sterile ones 0.5–1.7 mm, that of the antevexillar one larger than that of its neighbors; ovary densely loosely pilosulous, the stipe 4–6(–8) mm, the style (little differentiated externally) $2.5\text{--}3.5 \times (0.55\text{--})0.6\text{--}0.75$ mm, the minute intro-antrorse stigmatic cavity ± 0.2 mm diam; ovules 162–234.

Pod pendulous, narrowly rod-shaped, when fully fertile $40-70 \times 1.1-1.35(-1.65)$ cm, bluntly bicarinate both dorsally and ventrally by parallel contiguous, low-prominulous stout ribs 1–2 mm diam, convex laterally, the cross section oblatelly elliptic, the thin pithy exocarp either early glabrate or densely persistently velvety-puberulent, transversely cracked when dry, the thinly woody but rigid endocarp 0.3–0.4 mm thick, the wall of the septa slightly thinner, the locules 3–3.5 mm long, occupying the whole width of the cavity; seeds turned broadside to the septa enveloped in gelatinous, when dry flaky pulp, in broad outline obovate $5.5-8 \times 4-5.5$ mm, the testa smooth castaneous lustrous.

The sumptuously large-flowered *C. fastuosa*, during its short flowering season the handsomest of the Amazonian true cassias, is closely related to *C. ferruginea*; together they are a sibling couple that conforms to a familiar pattern of differential radiation and vicariant dispersal within and to the southeast of the Amazonian Hylaea. The relatively ample stipules, long-clawed petals and large median anthers reliably distinguish *C. fastuosa* at anthesis or in young leaf, and later on the narrower, less prominently 4-costate pod, in which the more numerous seeds are packed into locules only half as long, is distinctive. Although the flower of *C. fastuosa* is prevailing larger than that of *C. ferruginea*, there is some overlap in overall length of petals, especially in the more northern populations of the latter (var. *ferruginea*) and those disjunct in the wet coastal forest of southern Bahia, exactly where one might expect to find evidence of a common origin. Until lately *C. fastuosa* has appeared to differ from *C. ferruginea* in the velvety-puberulent, not early glabrate pod, but this difference fails in *C. fastuosa* var. *calva* described below.

Our material of *C. fastuosa* from French Guiana and lower Amazonia in Pará and Amapá appears identical at anthesis with that obtained in the Madeira-Purus basins in the southwestern Hylaea. In both the ovary is pilosulous, but its subsequent history is different in the two regions. In lower Amazonia the expanding epidermis of the fertilized ovary acquires, in addition to its original vesture, a plushlike indumentum of minute silvery gray or at first yellowish hairs which persists into full maturity of the fruit. In Acre, Rondônia and adjoining Mato Grosso and Beni no secondary indumentum develops and the pilosulous hairs of the ovary are quickly dispersed over the expanding valves and ultimately lost altogether, the half-grown pod becoming smooth and lustrous. Except for one collection from Humaytá on the Madeira (*Krukoff* 6989, NY), of which the mature pod appears to have been velvety when young, the two forms are widely and effectively separated in dispersal and consequently deserve taxonomic status.

Several collectors have recorded the strong agreeable perfume of the flowers of *C. fastuosa*, likened by George Black to the aroma of passionfruit.

Key to Varieties of *C. fastuosa*

1. Fertilized ovary acquiring a dense plushlike indumentum of minute whitish or yellowish hairs, this persisting throughout the life of the developing fruit, the fully formed pod velvety-puberulent; French Guiana, n.-e. Brazil (Amapá, Pará), rarely w. to Manaus and the middle Maderia R. in Amazonas. 11a. var. *fastuosa* (p. 42).
1. Fertilized ovary lacking a secondary indumentum, its pilosity quickly dispersed over the expanding valves of the pod and ultimately deciduous, the developing and mature pod glabrate lustrous; s.-w. Brazil (Acre, Rondônia, n. Mato Grosso) and adjoining Bolivia (Beni). 11b. var. *calva* (p. 43).

11a. *Cassia fastuosa* Willdenow ex Benth. var. *fastuosa*. *C. fastuosa* Benth., 1870, l.c., sens. str.—“Habitat in provincia Paraënsi prope Para in

sylvis: Martius, Burchell n. 9649.; ad Parana-miri dos Ramos et Caripí ejusdem prov.: Spruce n. 234. (specimina florida); et ad flumen Amazonum prope ostium Rio das Trombetas: Martius (specimen fructiferum).”—Lectoholotypus, *Spruce* 234, K! all paratypi (K, M) are conspecific!—*C. fastuosa* Willdenow ex Vogel, *Linnaea* 11: 654, in nota sub *C. staminea*. 1837, nom. provis.—Described briefly from *Sieber s.n.* (dedit Hoffmannsegg) in *herb. Willdenoviano* 7978, B! = F Neg. 1687, but not unequivocally accepted as a distinct species.

Cassia fastuosa sensu Bentham, 1871, p. 516; Amshoff in Pulle, 1939, p. 57.

Characters as given in key; fertile anthers glabrous.—Collections: 27.—Fig. 7.

Virgin and disturbed forest on terra firme (one record from varzea), surviving in capoeira and as a shade tree in pastures, originally native on riverbanks and in natural openings, ± 10 –200 m, local and sometimes solitary, in scattered stations along the lower Amazon and its tributaries, mostly downstream from mouth of Rio Trombetas, in Pará, extending n. through Amapá to s.-centr. French Guiana and e.-centr. Surinam; thence rarely w. to Manaus and the middle Madeira river in Amazonas, where closely approaching var. *calva*.—Fl. VIII–XII, the fruit long and slowly maturing, the seeds released only by rotting of the fallen pod.—*Marimarí* (applied also to *Senna multijuga*), *maripixuma*, *parica*, *cordão de S. Francisco*.

- 11b. *Cassia fastuosa* Willdenow ex Bentham var. *calva* Irwin & Barneby, var. nov., a var. *fastuosa* ovario fecundato mox glabrescenti, legumine glabrato atropurpureo nitidulo nec ut in var. *fastuosa* molliter velutino-puberula diversa.—BRAZIL. Rondônia: Madeira-Mamoré RR, km 90–93, near Jaciparaná, 30.VI.1968 (fr), *Prance et al.* 5412.—Holotypus, NY.

Characters as given in key; fertile anthers glabrous or puberulent.—Collections: 12.

Habitats of var. *fastuosa*, but allopatric on the upper forks of rios Purús, Madeira and Mamoré in Acre, Rondônia and n. Mato Grosso, Brazil and closely adjoining Beni, Bolivia.—Fl. VIII–IX.

12. *Cassia leptophylla* Vogel, *Syn. Gen. Cass.* 13 & *Linnaea* 11: 652, descr. ampli., exclus. syn. Velloziano. 1837.—“In Brasilia: Sellow leg. pr. Ypanema [São Paulo].”—Holotypus, †B = F Neg. 1702! neoholotypus, former isotypus, K! = NY Neg. 1439.

Cassia leptophylla sensu Bentham, 1870, p. 96; 1871, p. 516; Isely, 1975, p. 107.

Trees with amply leafy rounded crown of gracefully bending branches, potentially attaining 15–18 m and trunk up to 5 dm diam but sometimes precociously flowering as a bushy treelet, the annotinous branchlets pilosulous with erect or forwardly incurved hairs up to 0.2–0.4 mm often mixed with small orange glandiform trichomes, the lfts on both faces and the axes of inflorescence more thinly or shortly puberulent, the phyllotaxy spiral, the mature lvs bicolored, lustrous green above, dull beneath, the subcorymbiform racemes of large long-pedicellate fls terminal to leafy annotinous branchlets, scarcely or shortly exerted from foliage.

Stipules unknown, caducous before anthesis of associated fls, presumably as the lf itself begins to expand.

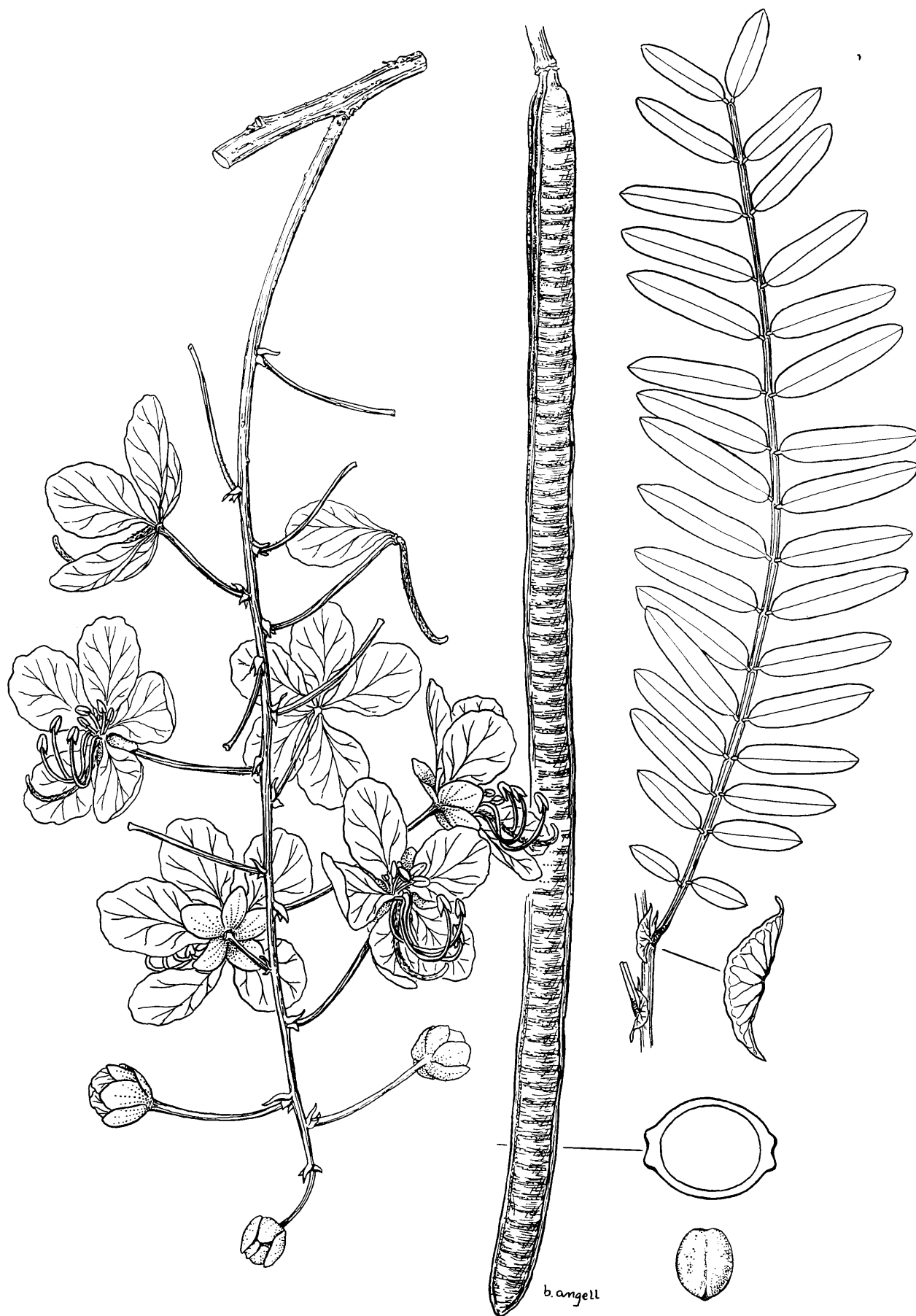


Fig. 7. *Cassia fastuosa* Willd. ex Benth. var. *fastuosa*.—Leaf + raceme $\times \frac{1}{2}$ (N. T. Silva 1301); pod $\times \frac{1}{4}$ (Krukoff 6989).

Lvs 13–28 cm; petiole including firm pulvinus 22–36 mm, at middle 1.1–1.6 mm diam, shallowly grooved ventrally; rachis (9.5–)11–22 cm, its longer interfoliolar segments (11–)12–21 mm, the ventral groove interrupted at the pulvinules, these opposite or subopposite 2.3–3 mm; lfts (8–)9–13(–14) pairs, gently accrescent the length of rachis or a few distal pairs slightly decrescent upward, the longer lfts obliquely lance- or elliptic-ovate, acuminate or apiculate (3.2–)3.5–6.5(–7) × (1.1–)1.2–2.4(–2.6) cm, 2.5–3.1(–3.3) times as long as wide, at base inequilaterally cuneate or on broader distal side rounded-subcordate, the margin plane or subrevolute, the midrib immersed or shallowly depressed above, cariniform beneath, the 11–16 pairs of major camptodrome and often some intercalary secondary veins with tertiary and reticular venulation all subequally sharply prominulous on both faces.

Racemes densely ±30–50-fl'd, the expanded fls ascending at wide angles and raised almost to level of succeeding buds, the stout tapering axis including very short or obsolete peduncle becoming ±1–2 dm; bracts deflexed, persistent through anthesis, the firm blade narrowly lance-acuminate 7–16 × 1.5–2 mm, puberulent on both faces, the bracteoles similar but shorter and proportionately broader; pedicels at full anthesis widely spreading-ascending 6.5–9 cm; fl-buds subglobose, densely minutely velvety-puberulent; hypanthium narrowly vase-shaped 2–3.5(–4) mm; sepals firm, usually reddish-brown or livid except for a narrow pallid margin, rarely greenish, subequally obovate-suborbicular 8.5–10.5(–11) mm, faintly few-nerved from base; petals yellow, thinly puberulent dorsally along midrib, subhomomorphic 3–3.6 cm, all strongly clawed, the claw 3–5 mm, the ovate-suborbicular or oblong-obovate, shallowly convex blade 1.8–2.5 cm wide; androecium glabrous, the 3 long sigmoid abaxial filaments 29–46.5 mm, near middle of distal curve abruptly dilated into an ellipsoid nodule ±2.6–4 × 1.2–1.8 mm, the other 7 filaments all linear erect, slightly diminished toward the vexillum, the shortest not less than 7 mm and the longest not more than 14 mm, the anthers 3-morphic, those of 3 long stamens obovoid obtuse, in dorsoventral view 3.6–4.5 × 2.1–2.6 mm, thinly puberulent dorsally, those of 4 stamens alternating with the 3 long ones erect oblanceolate in profile 4–5 × 1.3–1.7 mm, those of 3 adaxial stamens sterile or almost so 1.5–1.9 × 0.7–0.9 mm; ovary densely minutely gray-pilosulous stipitate, the straight stipe 7–12 mm, the body hamately incurved, the style poorly differentiated externally, 3–3.5 mm, glabrate distally, abruptly incurved to the ciliate stigmatic cavity, this looking in- and upward ±0.2 mm diam; ovules (78–)86–114.

Pod (little known) pendulous, linear in outline, reaching 7 dm when fully fertile and ±2–2.5 cm greatest diam, bluntly quadrangular, keeled both ventrally and dorsally by 2 parallel ribs and ±1.2–1.5 cm thick, the thin livid or blackish exocarp splitting both lengthwise and transversally when dry, the woody endocarp up to 0.7 mm thick, the interseminal septa up to 0.5 mm thick, the almost pulpless locules 4.5–5 mm long; seeds turned broadside to the septa, in broad view obovate 8–10 × 6.5–8.5 mm, biconvex, the castaneous testa moderately lustrous.—Collections: 13.—Fig. 1 (androecium), 8.

Low woods, moist thickets and woodland-margins, sometimes in araucaria forest, surviving as a shade tree in pastures, 10–1000 m, discontinuously dispersed on e. affluents of Paraná river in s.-e. extratropical Brazil, from the upper Tieté in s.-e. São Paulo s.-w. through w.-centr. Paraná and Santa Catarina to s.-w. Rio Grande do Sul, in Santa Catarina passing the crest of Sa. do Mar to the valley of Rio Itajaí on the Atlantic slope.—Fl. XI–II.

Perhaps the handsomest of the American cassias, *C. leptophylla* is readily recognized by the large fragrant golden-yellow flowers corymbosely arranged at the end of leafy branchlets, by the greatly elongate pedicels, the nodular sigmoid filaments (reminiscent of pink-flowered *C. javanica*) and the massive four-angled pod. The extratropical dispersal suggests that wider use of *C. leptophylla* might be made in warm temperate gardens.

vii. ser. OBOLOSPERMAE Irwin & Barneby

Cassia ser. Obolosperrmae Irwin & Barneby, ser. nov., leguminis loculis 1-seriatis disco suberoso semen nidulanti farctis praestantes.—Sp. typica: *C. javanica* Linnaeus.

Bracts and bractlets persistent into anthesis; anthers of 4 fertile antepetalous stamens subhorizontally versatile; seeds transverse 1-seriate, each enveloped in a dry suberous disc detached when ripe from the walls of the locule.—Tropical Asia, Indonesia, Australia.

13. Cassia javanica Linnaeus, Sp. Pl. 379, 1753.—Typus infra sub var. *javanica* indicatur.

Semideciduous trees of rapid growth, attaining 25, rarely 40 m, some flowering precociously, where not crowded amply round-crowned with downswept branchlets, these and the trunk either smooth or armed with persistent spiniform branchlets, the young parts varying from minutely puberulous to densely pilosulous, the phyllotaxy distichous, the simply or paniculately racemose inflorescence terminal to lateral branchlets, these either leafless from annotinous or even older branchlets or basally leafy from hornotinous growth.

Stipules 2-lobed, highly variable in development, either thinly foliaceous and reniform or crescentic, laterally attached, each lobe obtuse mucronulate or apiculate-acuminulate, the blade attaining 25×1 cm measured between tips of lobes, or both lobes subulate-linear and less than 1 mm wide, the lower lobe then often divaricate-ascending, in any case early caducous and absent from mature specimens.

Lvs heteromorphic, progressively longer and more complex upward along each annual increment of stem, those of flowering branchlets always relatively short and simple, the longest lvs attaining $\pm 2-3.5(-4.3)$ dm, the shortest rarely less than 1 dm; lfts (4-)8-17(-20) pairs, subequilong or the lowest and sometimes the terminal pairs a little smaller than the rest, all quite variable in outline, either ovate-obtuse, or ovate-acuminulate, or broadly oblong obtuse or deltately acute, or obovate obtuse or emarginate, the longer ones (3-)3.5-8(-9) \times 1.5-3.2 cm, when adult sublustrous and intricately reticulate.

Racemes subsessile, densely 10-many-fl'd, subcorymbose at anthesis, the several simultaneously expanded fls raised to level of nodding buds, the axis becoming 3-12(-18) cm; bracts thinly herbaceous, persistent with the similar but shorter bracteoles into anthesis, broadly to narrowly ovate-acuminate from broadly cuneate or subcordate, rarely auriculate base, less often lance-attenuate, 5-12(-17) mm long; pedicels widely ascending, including the hypanthium (2.5-)3-6 cm; hypanthium slenderly vase-shaped 2.5-6 mm; sepals firm, green or purplish, subequilong, ovate, oblong-obovate or lanceolate obtuse or rarely subacute, the longest 4-10 mm, all reflexed at anthesis and puberulent on both faces; petals widely spreading subhomomorphic, pale pink or carmine at full anthesis fading whitish, buff-pink or (dry) orange-buff, puberulent dorsally, including the short claw



Fig. 8. *Cassia leptophylla* Vog.—Flowering branchlet $\times \frac{1}{2}$; bract and bracteoles $\times 1$; androecium $\times 2$ (Reitz & Klein 17380).

(15–)18–35 mm long, in outline varying from broadly obovate to oblong-elliptic or oblanceolate and at apex from broadly rounded to subacute, 8–16 mm wide; androecium yellow, like that of *C. fistula* except for long filaments abruptly or gradually dilated in their distal curve into a plump ellipsoid or subglobose nodule $3.5\text{--}5 \times (1.1\text{--})1.7\text{--}2.5$ mm, the anthers thinly puberulent dorsally, those of 3 long stamens 2.4–4.3 mm, of 4 fertile antesepalous ones 3–5.5 mm; ovary strigulose, pilosulous or glabrescent; ovules 68–94.

Pod pendulous short-stipitate, the body elongately pipelike terete or a trifle obcompressed 4–6 dm \times 1.4–1.8(–2) cm, straight or almost so, the sutures neither thickened nor prominent, the valves atropurpureous, dark brown or almost black

and glabrate at maturity, obscurely constricted at the septa, the firm endocarp only 0.2–0.3 mm thick in section, the interseminal septa almost papery 0.1–0.2 mm thick, each locule filled with a finally detached suberous disc 4–5 mm thick enveloping a seed; seeds horizontal, broadside to the septa within their suberous envelope, plumply biconvex-obovoid, $\pm 6.5\text{--}8 \times 6\text{--}7 \times 4\text{--}5.5$ mm, the hilum sub-basal on one broad face, the testa pale or chestnut brown, smooth and glossy; $x = 12, 14$.—Fig. 2 (pod).

As described herein, *C. javanica* consists of a complex series of forms thought to be native from the Bay of Bengal southeast through Malaya, Sumatra and Indonesia to Timor and New Guinea and through Indochina to southern China (Yunnan) and the Philippines, but for so long and so widely planted for ornament both within and beyond its supposed homeland that aboriginal patterns of dispersal are now difficult or impossible to reconstruct. The plants vary between themselves in a) pubescence b) amplitude of stipules, c) shape of leaflets, d) position of racemes on new or old wood, accompanied or not by coeval foliage, e) size of calyx, f) amplitude and length (not necessarily correlated) of petals, g) size of fertile anthers, and h) chromosome number; furthermore some trees are said to have, particularly when immature, trunks and annottinous branchlets armed with persistent spinescent branchlets, but the significance of this feature, seldom noted by collectors and not seen on herbarium specimens, cannot be estimated. In the past, various syndromes of the characters just listed have been evoked in support of segregate species *C. nodosa* Buch.-Ham. ex Roxb., *C. megalantha* Dcne., *C. agnes* (De Wit) Brenan, and the varieties *indochinensis* Gagnep. and *pubifolia* Merr., but the identification of specimens is still difficult and the literature is contradictory. The species most persistently segregated from *C. javanica*, latterly with explicit misgivings, is *C. nodosa*, originally described from trees grown by Roxburgh at the Calcutta Botanic Garden, to which it was introduced from the region of the Ganges Delta (Chittagong, East Pakistan). Recent and contemporary authors who maintain *C. nodosa* either as a distinct species or as a subspecies of *C. javanica* (De Wit, 1955, p. 204; Isely, 1975, p. 101; Ali, 1973, p. 10; K. & S. Larsen, 1974, p. 205) attribute to it relatively small (but still dilated) stipules, short petals and acute leaflets; but this formula cannot be applied usefully to the whole complex, for stipules proper in *C. nodosa* may be found on plants with obtuse-retuse leaflets or large flowers (or both). When Brenan (1958, l.c.) raised *C. javanica* var. *agnes* De Wit to specific rank he introduced as a taxonomically meaningful criterion a difference between leafless cauliflorous simple racemes and leafy terminal, simple or branched ones, the branched type being supposedly characteristic of *C. agnes*. This same mode of variation was noticed in Philippine *C. javanica* by Merrill (Philip. J. Sci., Bot. 6: 48. 1910) who, somewhat paradoxically but perhaps following King (Mat. Fl. Malay Pen. 9: 155. 1902), associated cauliflory with *C. nodosa*, not with *C. javanica* as most others have done. Backer & Backhuizen van den Brink (Fl. Java 1: 537. 1963) state that in Java *C. javanica* and *C. nodosa* both flower from defoliate branches, but they maintain the species as different in the intensity of sepal and flower color, in average shape of leaflets and in size of calyx (*nodosa* 5–7.5 mm, *javanica* 7.5–10 mm). No consensus as to the differential characters, the taxonomic status, or the exact dispersal of *C. nodosa* has been reached.

In our search for acceptable names for the cassias of the *C. javanica* complex cultivated and weakly naturalized in the Americas, we have sorted all available Asiatic material in several ways, using each of the variable features listed in the preceding paragraph as the primary division. Partition by characters a, c, d and

f produced assortments which were either flagrantly improbable from the geographic viewpoint or were internally heterogeneous in parallel ways, or both at once. A dense pilosulous vesture of foliage and inflorescence was encountered only in the Philippines, but was found associated there either with broad foliaceous or minute subulate stipules and with inflorescences arising either from new or from old branches; moreover a pilosulous inflorescence combined with merely puberulent foliage occurs at random points in the range of the complex. We regard such pubescence variants as beneath taxonomic notice, although they can be visually striking and may have horticultural value. Merrill and De Wit (ll. cc.) have noticed the variation in leaflet outline and we think rightly regard this as superficial, for it is not consistently linked with any other single character-state or combination of such. Position of the inflorescence in relation to annotinous foliage would be significant if it could be shown that two fundamentally different types of raceme were present, as suggested by Brenan's emphasis on a branched panicle terminating leafy branchlets supposed to characterize *C. agnes*. In reality all inflorescences of *C. javanica* sens. lat., whether simple or branched, terminate branchlets lateral to a primary indeterminate (seldom collected) leafy axis; they are generally leafless when arising from older wood and vary from leafless to several-leaved when arising from annotinous growth, a phenomenon that occurs also in Brazilian *C. ferruginea*. Transition from leafless cauline and leafy subterminal racemes (branched or not) is not to be denied, and once again we agree with De Wit and Merrill in devaluating the taxonomic import of this character. It is noteworthy in this connection that Roxburgh's portrait of the original *C. nodosa* cultivated at Calcutta that was published in Wight's *Icones* (l.c.) shows a leafy branchlet bearing one major and one lateral minor raceme, an arrangement not fundamentally different from the inflorescence attributed to *C. agnes*. The two chromosome numbers reported in *C. javanica* sens. lat. suggest genetically distinct species, and this line of investigation should be followed up by Asiatic botanists who have ready access to fresh material of morphologically different populations. The senior author's count (Irwin & Turner, 1960, p. 310) of $2x = 28$ relates to var. *indochinensis* of this revision; that of $x = 12$ lacks a voucher and cannot be tied in with any particular form of the species.

Characters that we have found promising for the purposes of classification are development of the stipules, the size (but not the color) of the sepals, and the size of the fertile anthers, for these in varying combinations, sometimes reinforced by petal-length, appear to be related to the dispersal of plants certainly or probably wild. The fleeting nature of stipules, which are never found associated with mature leaves or with pods, is a practical handicap, and we have found the identification to variety of fruiting *C. javanica* possible only by inferential matching with more or less sympatric flowering specimens similar in foliage. In spite of difficulties and uncertainties which are unavoidable in our present state of ignorance we can dimly recognize four main classes of specimens which may provisionally be referred to four varieties of *C. javanica*. The recognition of more than one independent species in the complex is no longer possible.

Key to Varieties of *C. javanica*

1. Stipules dilated, amply foliaceous reniform or moderately dilated crescentic, the lobes diametrically opposed and the blade at point of attachment (1.5–)2–10 mm wide. Anthers of 4 fertile antepetalous stamens 4–5.5 mm; petals (23–)25–42 mm.
2. Blade of stipules amply foliaceous venulose, at least 1 cm long from tip to tip of lobes and at least $\frac{1}{3}$ as wide; sepals (6.5–)7–10 mm; native in Indonesia e.-ward from Java, n. to Luzon in Philippine Is.
 - 13a. var. *javanica* (p. 50).

2. Blade of stipules crescentic up to 18 mm long but not over 5 mm wide; sepals 5.5–7 mm; n.-e. India through Indochina to s. China, widely diffused in cultivation.
13b. var. *indochinensis* (p. 50).
1. Stipules not dilated, the lobes subulate-linear less than 1 mm wide, the lobes often divergent at $\pm 90^\circ$.
3. Calyx relatively large, the sepals 6–9 mm; anthers of 3 long stamens 3.5–4.3 mm, of 4 fertile antepetalous ones 4–5.5 mm; petals 20–32 mm (note: in spite of epithet only sometimes densely pubescent).
13c. var. *pubifolia* (p. 51).
3. Sepals 4–4.5 mm; anthers of 3 long stamens 2.2–2.9 mm, of 4 fertile antepetalous ones 3–4 mm; petals mostly 15–20, rarely –25 mm.
13d. var. *microcalyx* (p. 51).

13a. *Cassia javanica* Linnaeus var. *javanica*. *C. javanica* Linnaeus, 1753, l.c., sens. str.—“*Habitat in India*.”—Based entirely on *Cassia fistula javanica*, *flore carneo* J. Commelijn, Hort. Med. Amstel. 1: 217, fig. 111. 1897.—“*Nobilissimi D. Cleyeri adjumento, siliquae hujus Cassia Fistulae . . . ad me [ex insula Java] pervenerunt, Anno MDCVIII, nomine Tang-goeliwangwang*.”—Holotypus (De Wit, 1955, p. 215): Commelijn, op. cit., fig. 111! which shows a pod of ser. *Obolospermae* + a cultivated leafy shoot awkwardly lacking the enlarged stipules of var. *javanica*, this perhaps due to artistic license.—The alternative neotypus (I.L. 2b, cult. in hort. BO) proposed by De Wit, op. cit. p. 220, is superfluous.—*Cathartocarpus javanicus* (Linnaeus) Persoon, Syn. Pl. 1: 459. 1805.

(?)*Cassia bacillus* Gaertner, Fruct, sem. pl. 2: 313. 1791.—Described from a pod of unknown provenance acquired from William Hudson, but equated with *Cassia fistula indica*, *flore carneo*, Jaegeri Breynius, Prod. rar. pl. sec. 51. 1689, this described from an Indian pod, certainly of ser. *Obolospermae* but otherwise uncertain.—Equated with *C. javanica* by DeCandolle, 1825, p. 490, the synonymy not since questioned.—*Cathartocarpus bacillus* Lindley, Bot. Reg. 11: 881. 1825, nom. illegit. = *Senna bacillaris* (Linnaeus fil.) Irwin & Barneby.

Cassia megalantha Decaisne, “Nouv. Ann. Mus. Hist. Nat. Paris III, 3: 469. 1834, reprinted in Descr. herb. Timor. 136. 1835.”—Not seen, but referred here by De Wit (1955, p. 214).—A spm in herb. Torrey. (NY ex P) from Timor may be authentic, or isotypic.

The var. *javanica*, characterized by enlarged foliaceous stipules, long sepals, large petals and long fertile anthers, has not been recognized among the strains of *C. javanica* cultivated in the Americas.

13b. *Cassia javanica* Linnaeus var. *indochinensis* Gagnepain, Fl. Gén. Indochine 2(2): 158, exclus. syn. dub. *C. bakeriana*. 1913.—Gagnepain cited 13 collections from Annam, Laos, Cambodia, Siam and Cochinchina, from among which a lectotypus should be selected, presumably at P.—Equated by Brenan, l.c., infra, with *C. agnes* and represented at NY by *Pierre 417* from Cambodia, a presumed paratypus.

Cassia nodosa Buchanan-Hamilton ex Roxburgh, Fl. Ind. ed. Carey 2: 336. 1832.—“A native of Chittagong. At the Botanic garden at Calcutta.”—Authentic specimens from Hort. Bot. Calcut. were distributed as Wallich, *Herb. Ind.* 5331, K, NY (hb. Torr. ex hb. Benth.)! and Roxburgh’s illustration was published by Wallich, l.c. pl. Ind. or. 2: t. 410. 1840–43.—*Cathartocarpus nodosus* (Roxburgh) Steudel, Nom. ed. 2, 1: 311. 1840 (by error attributed to G. Don). *Cassia javanica* subsp. *nodosa* K. & S. Larsen, Nat. Hist. Bull. Siam Soc. 25(3–4): 205. 1974.

Cassia javanica var. *agnes* De Wit, Webbia 11: 220, fig. 1. 1955.—“Type specimen—A. Cuadra 3049 . . .”—Holotypus, L (not seen); isotypus, K!—*C. agnes* (De Wit) Brenan, Kew Bull. 1958(1): 180. 1958.

We refer to var. *indochinensis*, which differs consistently from var. *javanica* only in the smaller stipules and shorter sepals and not in leaflet-shape or in size or color of the petals, almost all *C. javanica* cultivated in the Americas. The

garden stock, occasionally subsontaneous in the vicinity of botanical gardens or about dwellings, is probably derived from more than one introduction, and has very likely been selected for size of flowers which tend to be larger than the average in Indochina. The variety is grown commonly in the West Indies from Cuba to Barbados (from where Brenan cited *C. agnes*) and we have seen specimens from Belize, Guatemala and Honduras in Central America, from Venezuela (urban), from Trinidad and Tobago, Guyana, and from several Brazilian cities. It is well established in gardens of subtropical Florida, where known as the *Pink Shower* (Isely, 1975, map 71) and is a favorite garden and street tree in Hawaii (Degener, New Ill. Fl. Hawaiian Is., sine pag., 30.VI.1932), where the delicately fragrant flowers are woven into leis and the shiny seeds threaded into necklaces.

- 13c. *Cassia javanica* Linnaeus var. *pubifolia* Merrill, Philipp. J. Sci., Bot. 5: 48. 1910.—“Luzon, Province of Ilocos Sur, *For. Bur.* 5239 Klemme; Province of Rizal, Merrill 1313, 2639, *For. Bur.* 1173 Ahern's collector, *Decades Philip Forest Fl. no. 37 Ahern's collector.*”—Lectoholotypus, collected at Antipolo, prov. Rizal, Luzon, III. 1904, *Dec. Philippine Forest Flora* 37, NY!

This variety was described in terms of densely pubescent foliage but is maintained here because of its subulate stipules; in other respects it is not different from var. *indochinensis*. It appears to be endemic to the Philippine archipelago and has not been introduced to our knowledge in America. Taxonomically and geographically it stands intermediate between var. *indochinensis* and var. *microcalyx*, combining the ample calyx and large fertile anthers of the former with the minute stipules of the latter. Merrill (Enum. Phil. Pl. 7: 263. 1923) cites no less than eighteen dialect names for var. *pubifolia* current in the Philippines.

- 13d. *Cassia javanica* Linnaeus var. *microcalyx* Irwin & Barneby, var. nov., inter alias speciei formas omnes stipulis parvis subulatis latitudinem vix 1 mm attingentibus, calycis parvi sepalis 4–4.5 mm tantum longis, staminum 4 fertilium ante petala sitorum antheris parvis 3–4 mm tantum, triumque longorum sigmoideorum 2.2–2.9 mm tantum longis insignis.—SUMATRA, TAPIANOELI. Division Padang Si Dimpoean, Subdivision Padang Lawas: Hatiran, 3–14.VII.1933 (fl), *Rahmat Si Toroes* 4898.—Holotypus, NY.

The var. *microcalyx* appears to replace other forms of *C. javanica* in Sumatra and Borneo, except insofar as var. *indochinensis* is planted for ornament. Its tiny calyx, narrow stipules and small fertile anthers are distinctive. One introduction at Río Pedras, Puerto Rico (*Little* 16346) appears to belong here and may be the model for the figure in Wadsworth, Common Trees Pto. Rico 172, fig. 73, 1964; but as var. *indochinensis* is also on the island we cannot be certain of this identification.

14. *Cassia roxburghii* DeCandolle, Prod. 2: 489. 1825, a legitimate substitute for *C. marginata* Roxburgh, Fl. Ind. ed. Carey 2: 338. 1832.—“A native of Ceylon introduced into the Botanic garden at Calcutta by General MacDowall in 1802.”—Holotypus (De Wit, 1955, p. 227): Wallich 5308, K!—Non *C. marginata* Willdenow (1809).—*Cathartocarpus marginatus* (Roxburgh) G. Don, Gen. Hist. Dichl. Pl. 2: 453. 1832. *Cathartocarpus roxburghii* (DeCandolle) Loudon, Hort. Brit. 167. 1832.

Cassia roxburghii sensu Britton & Rose, 1930, p. 230; Adams, 1972, p. 322 (in clave); Isely, 1975, p. 124.

Closely akin to *C. javanica*, but different in: leaflets averaging smaller, the larger ones 2–4 cm, either obtuse or retuse; all racemes (leafless determinate branchlets) shortly supra-axillary to coeval lvs of current year, their axis mostly simple, exceptionally 1–2-branched; pedicels only 10–19 mm; petals (pink or orange) \pm 10–14 mm; anthers glabrous; style slightly dilated and abruptly hooked at apex, the stigma retrorse; $x = 14$.

Native to south peninsular India and Sri Lanka, established in Florida parks and gardens, said to have been naturalized (Britton & Rose, 1930; Adams, 1972, ll. cc.) formerly in Jamaica.

Numbered Exsiccatae of Neotropical *Cassia*

- Acuña, J. 20164 (8)
 Aguilar, M. 25 (7), 336 (8)
 Allen, P. H. 910 (8), 1697 (8), 6809 (7)
 Anderson, W. R. 12103 (11b)
 André, E. 2562 (7)
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 Aristeguieta, L. 1555 (8)
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 Baker, C. F. 113 (7)
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 Benítez de Rojas, C. E. 537 (7)
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 Berg, C. C. 633 (11a), 720 (11a)
 Bernardi, L. 3344 (8), 7391 (8)
 Berti, L. M. 264 (5a)
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 Bovill, T. R. 468 (7), 498 (7)
 Braga, P. I. J. 1406 (10b)
 Breteler, F. J. 3649 (8)
 Britton, N. L. 1856 (8), 3799 (7), 12899 (7 \times 9), 12901 (7)
 Britton, N. L. & E. G. 4345 (7), 9756 (7), 10016 (7)
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 Croat, T. 5889 (13b), 9178 (8), 12983 (8), 19969 (4b)
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 Cuatrecasas, J. 27523 (7)
 Davidse, G. 12956 (8), 14355 (8), 14742 (8), 14843 (8), 15551 (8)
 Duarte, A. P. 7218 (11b), 7475 (10a)
 Ducke, A. 221 (2), 890 (4a), 1351 (8), 1679 (2), 1732 (3), 1813 (4b), 1991 (6)
 Duke, J. A. 15192 (8)
 Dwyer, J. D. 4342 (7)
 Ekman, E. L. 3817 (7)
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 García Arizpe, C. H. 22 (8)
 García-Barriga, H. 18801 (8), 20319 (1)
 Gardner, G. 1936 (10a), 5439 (10b)
 Gentle, P. H. 1204 (7), 3504 (8)
 Gentry, A. 24245 (7)
 Gevieski, A. 44 (12)
 Glaziou, A. 10696 (10b)
 Gómez-Pompa, A. 1671 (8)
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 Haught, O. 2638 (8)
 Heringer, E. P. 14858 (10a), 14863 (7)
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 Holdridge, L. R. 1068 (7)
 Holton, I. F. 981 (7)
 Hostmann, F. W. & A. Kappler 843 (7)
 Humboldt, F. W. H. A. & A. Bonpland 1479 (8)
 Ijjasz, E. 577 (8)
 INPA 12985 (11b)
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 Luna, A. 649 (7)
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 Martius, K. F. P. von 244 (10b)
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 Montaldo, P. 3125 (8)
 Mori, S. 9058 (2)
 Nee, M. 9498 (8)
 Neill, D. 1561 (7)
 Norris, D. O. 408 (7)
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 Oliveira, E. 4761 (11a)
 Pabst, G. F. J. 25165 (10a)
 Palmer, E. 352 (7)
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 Pennell, F. W. 4082 (8), 4127 (7)
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 Pittier, H. 2532 (7 × 8), 10148 (7), 11477 (8), 11683 (8), 12597 (7)
 Plowman, T. et al. 9517 (11a)
 Pohl, J. E. 3544 (10b)
 Prance, G. T. 2452 (11b), 4080 (8), 4331 (8), 5194 (11b), 5412 (11b), 6098 (4a), 6766 (4a), 7640 (11b), 9140 (8), 9559 (8), 14761 (2), 16270 (2), 18253 (11b), 19717 (2), 19764 (2), 23414A (2), 26322 (2)
 Prance, G. T. & T. D. Pennington 1801 (11a)
 Prance, G. T. & N. T. Silva 58709 (11a)
 Pursell, R. A. 8256 (8), 8489 (8)
 Ramia, M. 2864 (8)
 RB 16399 (6), 16978 (6), 20330 (4b), 23307 (4a), 44810 (10b), 59639 (6), 202124 (10a)
 Regnell, A. F. II/77 (10a)
 Reitz, R. & R. M. Klein 7615 (12), 8084 (12), 17380 (12), 17578 (12)
 Renson, C. 117 (7)
 Revilla, J. 1876 (4b)
 Ricksecker, A. E. 371 (7)
 Rodrigues, W. 3597 (2), 6721 (3)
 Rodríguez C., H. A. 538 (7)
 Rodríguez E., L. 6 (7)
 Rosa, N. A. & M. R. Cordeiro 1435 (8)
 Rose, J. N. 4088 (7), 4345 (7)
 Rovirosa, J. N. 413 (8)
 Saer d'Heguaert, J. 851 (8)
 Sagot, P. 802 (3)
 Sandwith, N. Y. 521 (5a)
 Santos, T. S. dos 3079 (10a), 3083 (7)
 Sastre, C. 755 (8)
 Schaller, G. 61 (7)
 Schimpff, H. L. F. 1073 (8)
 Schnee, P. 1332 (8)
 Schomburgk, Richard 894 (2)
 Schott, A. 5656 (10b)
 Schulz, J. P. 377 (8)
 Schunke, J. M. 30 (4b), 336 (5c)
 Service Forestier (Guiane Fr.) 7590 (3), 7735 (3)
 Sessé & Mociño Hb. 1169 (7)
 Shafer, J. A. 511 (7), 1381 (7)
 Silva, A. S. 91 (11a)
 Silva, M. 757 (2)
 Silva, M. & R. Sousa 2304 (11a), 2323 (11a)
 Silva, N. T. 137 (7), 1270 (11a), 1301 (11a)
 Sintenis, P. 3633 (7), 4733 (7)
 Smith, A. C. 3139 (8)
 Smith, F. D. 278 (8)
 Smith, H. H. 2061 (7)
 Solís Magallanes, J. A. 1027 (9), 1036 (9), 1577 (9)
 Soto Núñez, J. C. 103 (9)
 Sousa, M. 697 (8), 7311 (8), 9200 (8), 11709 (8)
 Spruce, R. 277 (11a), 439 (2), 1557 (2), 2300 (8), 2558 (3)
 Stahel, 53 (11a)
 Standley, P. C. 20695 (7)
 Stehlé, H. 114 (7)
 Stein, S. 9 (7)
 Stevens, W. D. 3838 (7), 6157 (7), 6253 (7), 7372 (7)
 Steyermark, J. A. 86440 (8), 101999 (7)
 Taylor, N. 403 (7)
 Téllez, O. 2270 (1), 2373 (1)
 Tessmann, G. 3193 (7), 4240 (5c), 5455 (7)
 Toro, R. A. 252 (7)
 Trinta, Z. A. 1220 (12)
 Trujillo, B. 1169 (8)
 Tyson, E. L. 3552 (8), 3655 (8), 3886 (13b)
 Ule, E. 5820 (4a)
 Valeur, E. J. 834 (7)
 Velasco, R. 276 (7)
 Versteeg, 409 (11a)
 Vieira, G. 363 (11b), 413 (11b)
 Vincelli, P. C. 104 (7)
 White, S. 473 (7)
 Williams, L. I. 10083 (8)
 Williams, R. S. 643 (7)
 Wilson, P. 514 (7)
 Wurdack, J. J. & J. Monachino 39728 (5a)
 Zarucchi, J. L. 2620 (11b)

CASSIAE DUBIAE

Cassia acisperma Schrank ex Colla, *Illustr. Ic. strip. hort. Ripul. Append.* 2: 343. 1826.—“Enata a seminibus missis a cl: SCHRANKIO.”

Described from a cultivated plant which had not flowered; lfts 3 pairs; gland conic-clavate, between proximal pair; seeds resembling grape pits. This was pronounced unrecognizable by Bentham (1871, p. 582). The gland indicates the genus *Senna*.

Cassia acunae Borhidi, *Acta bot. Acad. Sci. Hung.* 22: 298. 1977.—“Cuba; Prov. Pinar del Rio. La Cajalbana, junto al arroyo La Palma. Leg. J. Acuña, 27. jun. 1961. (flor.) 22698.”—Holotypus, SV.

Not seen. Described as akin to *Senna gundlachii*, but leaflets more numerous, up to 14–20 pairs.

Cassia arborescens Sessé & Mociño, *Fl. Mex.* 101. 1893.—“Habitat in montibus Cordobae [Veracruz].”

Described as a tree 6–7 m tall, with eglandular leafstalk and 15 pairs of leaflets, characters compatible with *C. grandis* Linn. f., which is represented in Sessé & Mociño’s herbarium, but not associated with the epithet *arborescens*. Because the name is a posterior homonym of *C. arborescens* Vahl its application is academic.

Cassia aurita Colladon, *Hist. Casses* 131. 1816.—“Hab. in Brasilia.”

Based directly on *Cassia foliis 2-jugis . . . glandula ovata inter infima* Vandelli in Roemer, *Script.* 104. 1796. We agree with Bentham (1871, p. 582) that this is indecipherable.

Cassia bonplandia Rojas Acosta, *Cat. Hist. Nat. Corrientes* 61, 160. 1897, nom. nud.

Known as *taperiva pilá*, and perhaps identifiable through vernacular usage.

Cassia cafesiana Rojas Acosta, *Cat. Hist. Nat. Corrientes* 160. 1897, nom. nud.

Known in Corrientes as *Casia café*, presumably therefore either *S. occidentalis* or *S. scabriuscula*, the seeds of which yield a surrogate coffee.

Cassia chrysoloma DeNotaris, *Index sem. hort. bot. archigymnasii Genuensis an.* 1840, p. 16. 1840.—“Colitur in horto multo abhinc tempore.”

Described as very close to *C. coluteoides* Collad. but different in diffusely scandent habit, globose petiolar gland, yellow-margined leaflets, and details of pubescence. Presumably either *S. bicapsularis*, with which it was equated by Bentham (1871, p. 525), or some form of *S. pendula*.

Cassia cinerea Colla, *Herb. Pedem.* 2: 281. 1834.—“In Brasilia . . . habui e cl: Martio . . . (Brasil: cap: Frio).”

Described from a cultivated plant, possibly of *Chamaecrista ramosa* (Vog.) Irwin & Barneby, but the description not sufficiently detailed to permit certain identification. The name is a later homonym of *C. cinerea* Schlechtd. & Cham. (1830) and is therefore of no consequence.

Cassia confusa Philippi, Anal. Univ. Chile **84**: 438. 1893.—“[Chile] Ad Pihuanco [lat. 30°, on Río Claro near 1000 m] in prov. Coquimbo legit orn. doctor Felix Peralta.”

Not seen. No typus reported at SGO by Muñoz Pizarro (1960, p. 73).

Cassia cubensis Hoffmansegg, Verzeichn. Pflanzenkult. 209. 1824.—“H. in Cuba.”

Fully described from plants flowering and fruiting in Germany, thought to be of Cuban origin. Bentham guessed that it might be some horticultural form of either *C. corymbosa* (our *Senna corymbosa*) or *C. laevigata* (our *S. septemtrionalis*), a plausible interpretation of the foliage and subterete pod specified in the protologue. The pod, however, was said to be up to 15 cm long and only about 2.5 mm diam, moreover rufous-pubescent, suggesting that of *S. pilifera*. A vexatious enigma, not easily reconciled with any known Cuban *Senna*.

Cassia decipiens Desvaux, J. Bot. **3**(2): 72. 1814.—“Habitat in America.”

We did not find, but perhaps overlooked, a typus at P. Described as having leaves of *Senna alexandrina* (about 8 pairs, linear-lanceolate, glabrous) and fruits of *S. italica*, and equated by Bentham (1871, p. 553, sub *C. angustifolia*) with the former.

Cassia elegans Voigt, Sylloge Ratisbon. **2**: 55. 1828.—*C. pinnata* hort. ex Voigt, l.c.

Described from a sterile plant grown in the Belvedere Garden at Munich, wholly obscure.

Cassia fagifolia Bertoloni, Nov. Comment. Bonon. **4**: 414. 1840.—“Habitat in Mar del Sur Guatimalae [*Velásquez*].”—No typus found at BOLO in 1977.—*Chamaefistula fagifolia* Britton & Rose, N. Amer. Fl. **23**: 235. 1930.

A senna of sect. *Bacillares*, unfortunately unidentifiable from the description.

Cassia foliosa G. Don, Gen. Hist. Dichl. Pl. **2**: 446. 1832.—“Native of Peru (v.s. in herb. Lamb[ert.])”—No typus found either at OXF or BM.

This was tentatively identified by Bentham (1871, p. 571) with *C. tenella*, our *Chamaecrista serpens* var. *grandiflora*. Supposing that Lambert had received the plant from Pavón, it could have come either from Peru or from Mexico, which widens the possibilities of interpretation. Leaflets 3–4 pairs coinciding with acute sepals point strongly to *Ch. serpens* or *Ch. pilosa*, but the description is inadequate for exact identification.

Cassia foliosa Philippi, “Anal. Univ. Chile **1862**, **2**: 379” and Linnaea **33**: 61. 1864.—“Chile. Prov. Ñuble: In valle de Chillan dicto c. 3—4000 m. s. m.”

Not seen. Muñoz Pizarro (1960, p. 73) cites two specimens so named at SGO. The name is a posterior homonym.

Cassia fruticosa Rojas Acosta, Cat. Hist. Nat. Corrientes 160. 1897, nom. nud.

Called *cañuto* in Corrientes, which may provide a clue to its identity.

Cassia galegifolia Linnaeus, Syst. Nat. ed 10: 1017. 1759.—Based on Plumier, ed. J. Burmann, Pl. Amer. t. 78, fig. 1.

Bentham (1871, p. 543) identified *C. galegifolia* with his *C. biflora* (our *Senna pallida*) and cited Patrick Browne's plant in the Linnaean herbarium (LINN 528/21!) as authentic. We believe that the holotype is the Plumier drawing cited above, but are unable to identify this with any confidence. The flowers are shown as borne in pairs on peduncles nearly as long as the pedicels, and coincide with elliptic subacuminate leaflets suggestive of *S. sophora*. No petiolar glands are depicted.

Cassia glaucescens Hoffmannsegg, Verzeichn. Pflanzenkult. 209. 1824.—Based on a plant cultivated in Germany; no specimen extant.

Likened to *S. occidentalis*, and very likely a synonym.

Cassia graveolens Colla, Illustr. Ic. stirp. hort. Ripul. Append. 2: 343. 1826.—“E seminibus . . . missis a cl. BERTERO anno 1818 e Guadalupa . . . In silvis et fruticetis insulae Guadalupae . . . BERTERO.”

Described from a potted seedling that had not flowered and from the pod sent by Bertero from Guadeloupe. The leaflets were 2–4 pairs, 2–4 × 1–2 inches and there was no petiolar gland. Following these clues Bentham listed (1871, p. 548) *C. graveolens* in the synonymy of *C. atomaria* (our *Senna mollissima*) but the locality of origin suggests the true *Senna atomaria* (Bentham's *C. emarginata*) as more likely.

Cassia hirta Willdenow, Enum. pl. hort. Berol., suppl. 23. 1813.—No locality given.

Described from a sterile plant cultivated at Berlin, said to have five pairs of oblong leaflets and a gland between the first. Not found in hb. Willdenov. (B), where the only cassia bearing the (unpublished) epithet *hirta* is an isotypus of multijugate *Chamaecrista glandulosa* var. *tristicula*.

Cassia homophylla Hoffmansegg, Verzeichn. Pflanzenkult. 209. 1824.—Based on a plant cultivated in Germany; no specimen extant.

The description suggests *S. × floribunda* but is inconclusive.

Cassia hornemanni DeCandolle: vide *C. venosa* Nocca ex Hornemann, infra.

Cassia latifolia Desfontaines, Tabl. école bot. 182. 1804, nom. nud., listed by Colladon, Hist. Casses 135. 1816 among *Cassiae Dubiae*, where accompanied by a phrase of five words quoted from a letter of Desfontaines.

The quoted phrase describes the shape and pubescence (but not the number) of leaflets, and might be considered a validating description. We think, however, that neither Desfontaines nor Colladon intended to describe as new this wholly obscure plant, grown at Paris and apparently seen only in leafy condition. Consequently we do not consider the name to be a legitimate prior homonym of the well-known *C. latifolia* G. F. W. Mey. (1818), our *Senna latifolia*.

Cassia huidobriana Philippi, Anal. Univ. Chile 84: 440. 1893.—“[Chile.] In Provincia Aconcagua legi, in praedio Catemu et in monte Cuesta de los Loros.”

Not seen. Muñoz Pizarro (1960, p. 73) cites two specimens so named at SGO.

Cassia mornicola Urban, Notizbl. Bot. Gart. Berlin 7(70): 496. 1921.—“Haiti in Morne Megi . . . 1000 m alt., m. Aug. flor.: Buch 1423.”—Holotypus, †B; no isotypus or photograph is known to survive.

Described as intermediate between *C. tuerckheimii* (= *Chamaecrista portoricensis*) and *C. pygamaea* (= *Ch. pygmaea*). A stipitate gland and 8–12 pairs of leaflets up to $10 \times 1\text{--}1.5$ mm with strongly displaced midrib suggest *Ch. pedicellaris*, but firm identification will be impossible unless an isotypus can be found.

Cassia multiflora Scheele, Linnaea 17: 337. 1843.—“In provincia Minarum generalium [Minas Gerais, Brazil] leg. Hartleben.”—Typus, †B; no isotypus known to survive.

Bentham (1871, p. 528) referred *C. multiflora* to the synonymy of *C. excelsa*, with the remark that the protologue agreed in everything but the presence of petiolar glands. Scheele's description is detailed and specifies 20–25 pairs of leaflets, a stipitate gland between each of them, a terminal panicle of racemes, unequal stamens (2 inferior elongate), and a heteromorphic incurved petal. We have seen no specimen of *Senna spectabilis* var. *excelsa* with more than 20 pairs of leaflets, glands are never seen on its leaf-stalks, and the stamens are notably subisomorphic and of nearly equal length. The description agrees excellently with some form of *Senna multijuga*, however. The precise variety cannot be told, but from the locality var. *lindleyana* is most likely. The exact application is academic, *C. multiflora* being a posterior homonym. The collector Hartleben is not noticed by Urban in *Flora Brasiliensis* and we have found no mention of him elsewhere.

Cassia multisiliqua J. F. Gmelin, Syst. Nat. 2(2): 1521. 1792.

This name, listed in *Index Kewensis*, appeared only in the index to *Systema Naturae* and has no nomenclatural status.

Cassia ovalifolia Martius ex Colla, Herb. Pedemont. 2: 280. 1834. —“ . . . in Brasilia . . . habui e cl: Martio . . . ”

Well described from cultivated plants, said to have two pairs of leaflets, the larger 1.5×1 inch, glands between proximal pair and also at base of petiole, and pentandrous flowers. We have not interpreted this proposal, which carries nomenclatural consequences in being a prior homonym of *C. ovalifolia* Mart. & Gal. The only pentandrous Brazilian cassia known to us is *Chamaecrista rotundifolia*, but this has only one pair of leaflets and lacks petiolar glands. The name was overlooked by Bentham (1871).

Cassia oxyadena DeCandolle, Prod. Syst. Veg. 2: 495. 1825. “In Jamaica.”—Holotypus, labelled “Jamaïque, M. de Sussac, 1801.,” G-DC! Fragm. + tracing, misit Hochreutiner anno 1929, NY!—*Peiranisia oxyadena* Britton & Rose, N. Amer. Fl. 23: 263. 1930.

The type is in young bud and ambiguous between *Senna angustisiliqua* var. *fulgens*, with which it was associated by Britton & Rose, and *S. pallida* var.

Cassia paposana Philippi, Florula Atacam. 17. 1860.—“[Chile. Antofagasta:] pr. Paposo [near 25° S.]”

Not seen. Perhaps a form of *Senna cumingii*.

Cassia papulosa Hoffmansegg, Zweiter Nachtrag Verzeichn. Pflanzenkult. 81. 1826.—“Hab. in Bras[ilia].”

Said to resemble *C. cubensis*, which see, but different in the pod twice as wide, glabrous, striate, and in seeds more oblong and twice as long. Leaflets three pairs, obovate obtuse subciliolate 1 inch long, borne on petioles that are roughened with minute diaphanous papilli (doubtless the thickened hairs common in *Senna*) intermixed with sparse decumbent hairs. Odor of *S. occidentalis*, but gland between the proximal pair of leaflets. Not recognizable to Bentham (1871) or to us.

Cassia parviflora Sessé & Mociño, Fl. Mex. 99. 1893.—“Habitat in Tospa [Veracruz, Mexico].

A member of *Chamaecrista* sect. *Chamaecrista*, possibly *Ch. nictitans* var. *glabrata*, but not safely identifiable with any of several species of this group represented in Hb. Sesse. (MA).

Cassia parvifolia Wenderoth, Syll. fl. Ratisbon. 65. 1824.—No typus cited.

An urceolate petiolar gland, suprapetiolar pedicels and 10–15 pairs of leaflets suggest *Ch. fasciculata*.

Cassia pencana Philippi, Anal. Univ. Chile 97: 298. 1897; Reiche, Fl. de Chile 2: 36. 1898.—“En las provincias centrales [de Chile] hasta Concepción.”

According to Reiche's description (sub nom. *C. frondosa* Ait.) this is probably a variety of *S. stipulacea*. Not mentioned by Muñoz Pizarro (1960).

Cassia planisiliqua Lamarck, Encycl. Méth. 1: 645. 1785.

Although listed by *Index Kewensis* as an independent name, this is technically a synonym of *C. planisiliqua* Linn. The plant described by Lamarck was, however, *Senna atomaria*, q.v.

Cassia pulcherrima Dehnhardt, “Revista Napolit. 1. III. 174” ex Ind. Kew.—Protologue not seen.

Cassia punctata Scheele, Linnaea 17: 336. 1843.—“In provincia Minarum generalium [Minas Gerais, Brazil], leg. Hartleben. 1832.”—Holotypus, presumably †B; no isotypus found.

The description points decisively to *Chamaecrista* sect. *Absus* but lacks detail necessary for specific identification. The chief characters are 8–12 pairs of leaflets glandular-punctate beneath, glandular-pilose peduncles and petioles, and externally rough-glandular sepals. Bentham (1871, p. 549) guessed that it might be a form of *Senna silvestris*, but the protologue does not support this interpretation. The name is of itself of no consequence, being a posterior homonym of *C. punctata* Vog.

Cassia ramosissima Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(qu): 367. 1823.—“Crescit in monte ignovomo Jorullo [Michoacán], alt. 500 hex. (Regno Mexicano).”—Holotypus, ticketed “44. Jorullo.” P-HBK!

A member of *Chamaecrista* sect. *Chamaecrista* that we were unable to identify with certainty from the type specimen, which lacks flowers for critical analysis.

Cassia simplicifolia Desvaux, J. Bot. 3(2): 72. 1814.—“Habitat in Brasilia.”—No typus found at P.

This was said to have simple elliptic leaves, unlike those of any known *Cassia*.

Cassia tetrafoliolata Desvaux, Ann. Sci. Nat. 9: 428. 1826.—“Hab. in America calidiori.”—No typus found at P.

This name was overlooked by Bentham (1871) and by Irwin (1964), but was plausibly equated by *Index Kewensis* with *C. langsdorfii*, for which it would be, if truly synonymous, the earliest specific name. The description clearly indicates a member of *Chamaecrista* sect. *Xerocalyx*, and the two pairs of elongately oblique-obovate leaflets pilose on both faces and ciliate are such as might be found in our *Ch. desvauxii* var. *mollissima*. In this critical group only specimens, which we may possibly have overlooked at Paris, can settle the exact identity.

Cassia tuberculata Colladon, Hist. Casses 133. 1816.—“Hab. in Brasilia.” Based entirely on *Cassia foliis 7–8-jugis . . . caule angulato tuberculato* Vandelli in Roemer, Script. 104. 1796.

Like *C. aurita*, incomprehensible to Bentham and to us.

Cassia uniflora C. Sprengel, Neue Entdeck. 1: 291. 1820.—“Hab. in Brasilia.”—No typus known.

The short protologue is indecisive but the species was redescribed in greater detail by Vogel (Linnaea 9: 701), who dissented from Sprengel’s reduction (Syst. Veg. 2: 341. 1825) of his own species to *C. gracilis* Kunth. Bentham (1870, p. 157, tab. 43, fig. I: 1871, p. 568) revived the name for a variety of small-leaved plants intermediate between our *Chamaecrista ramosa* (which he considered varietally distinct) and *Ch. desvauxii*. The measurements taken by Vogel, apparently from an authentic specimen (now lost) in the Berlin herbarium, suggest either small leaved *Ch. desvauxii* var. *langsdorfii* or *Ch. ramosa* var. *erythrocalyx*. Vogel distinguished his own *Cassia langsdorfii* from *C. uniflora* Spreng. primarily by its ciliate leaflets and simple erect, not branched stems, a contrast which would be apt if he had var. *erythrocalyx* in view. In absence of a specimen the identity of *C. uniflora* is an inscrutable puzzle, but as the name is a posterior homonym of *C. uniflora* P. Mill. it has no importance.

Cassia venosa Nocca ex Hornemann, Hort. Havn. suppl. 46. 1819 (non Desvaux, 1814).—*C. hornemanni* DeCandolle, Prod. 2: 507. 1825.

Briefly described from a cultivated plant and evidently a *Chamaecrista*, probably *Ch. fasciculata* which was cultivated in Italy in early XIX century, but not identifiable with any degree of certainty.

CASSIAE EXCLUSAE

Cassia riedelii Bentham in Martius, Fl. Bras. 15(2): 122. 1870.—“Habitat in Serra da Chapada, prov. Minas Geraës: Riedel.”—Holotypus, *Riedel 651*, originally ticketed “S. Chapada” but this scored out in contemporary ink, LE! = NY Neg. 9232.

Cassia riedelii sensu Bentham, 1871, p. 545.

We confidently refer *C. riedelii* to the synonymy of *C. odorata* Rich. Morris

(Fl. Conspicua t. 57. 1826), a species of *Senna* sect. *Psilorhegma* native to New South Wales (cf. Symon, 1966, p. 102, map 6) which was introduced to European horticulture in 1825 and quickly acquired independent names in England, Italy and Germany. The holotypus, apparently a unicate specimen, was studied by Bentham several years before he undertook a detailed monograph of the Cassieae and was not revised by him in connection with *Flora Brasiliensis* or the revision of *Cassia*, where it was referred to ser. *Rostratae* (our *Interglandulosae*). Superficially *C. odorata* does resemble some American *Interglandulosae*, especially in form of inflorescence and in the asymmetric perianth, but the flower is functionally decandrous like that of other members of sect. *Psilorhegma*, a detail that Bentham must either have overlooked or more likely failed to record. In the circumstances it was altogether plausible that the typus represented a native Brazilian species allied to "*Cassia biflora*" (a mixture of our *S. pallida*, *S. rostrata* and *S. aversiflora*). Incidentally Riedel's Serra da Chapada was not in Minas Gerais, as Bentham supposed, but in Mato Grosso, the Chapada dos Guimarães of modern maps. This error in the label-data combined with an erasure that dates back many years (we cannot say whether before or after Bentham saw it) further weakens the link between the plant and its supposed origin in Brazil. We conjecture that the plant was cultivated at Leningrad and inadvertently incorporated into the Riedel collection. There is no evidence that *C. odorata* was ever cultivated the Americas.

ADDENDUM TO GENUS CASSIA

While this account of neotropical *Cassia* was in proof, we unexpectedly received, through the agency of Projeto Flora Amazônica, material of an undescribed species of ser. *Tetrapleurae*.

11bis. *Cassia* (ser. *Tetrapleurae*) *midas* Irwin & Barneby, sp. nov., racemis ramulo hornotino terminalibus, bracteis bracteolisque peracta anthesi persistentibus, staminumque ante petala sitorum antheris erectis cum ser. *Tetrapleuris*, ulterius floribus parvulis (petalis 10–14 mm longis) totoque inflorescentiae adspectu cum *C. ferruginea* (Schrad.) Schrad. ex DC. omnino congrua, ab hac stipulis foliaceis late sagittatis, foliolis 3–8 (nec 10–23)-jugis magnis ovato-acuminatis 3.5–11.5 (nec oblongis obtusis 2–4.5) cm longis, petalis ex albo aureo-flavescentibus, ovulisque minus numerosis 62–84 (nec 108–156) diversissima.—BRAZIL. Estado do Acre: along road to Brasiléia 12 km (s.-w.) from Rio Branco, 2.X.1980 (fl), S. R. Lowrie, B. Lowy & V. M. de Souza 320.—Holotypus (2 sheets), NY; isotypi, A-GH, ILL, K, MICH, MO, PH, US.

Trees 10 m tall, the branchlets, leafstalks and axes of inflorescence densely minutely puberulent with incurved yellowish hairs \pm 0.1–0.2 mm, the ample lvs glossy and glabrous above, olivaceous dull beneath, the showy racemes pendulous from the tip of leafy hornotinous branchlets or rarely emergent from leafless twigs of second year.

Stipules foliaceous persistent into full expansion of lf, then deciduous, in outline semi-ovate acuminate, sagittately produced backward against the stem, the blades 1–2 cm measured between tips of longer ascending and shorter descending lobe, at point of attachment up to 1 cm wide, flabellately many-nerved and sharply reticulate-venulose.

Lvs 1.5–3.5 dm, the lf-stalk rounded dorsally, shallowly openly sulcate ventrally, its interfoliolar segments \pm 2–3.5 cm; pulvinules 2.5–4 mm; lflets 3–8 pairs

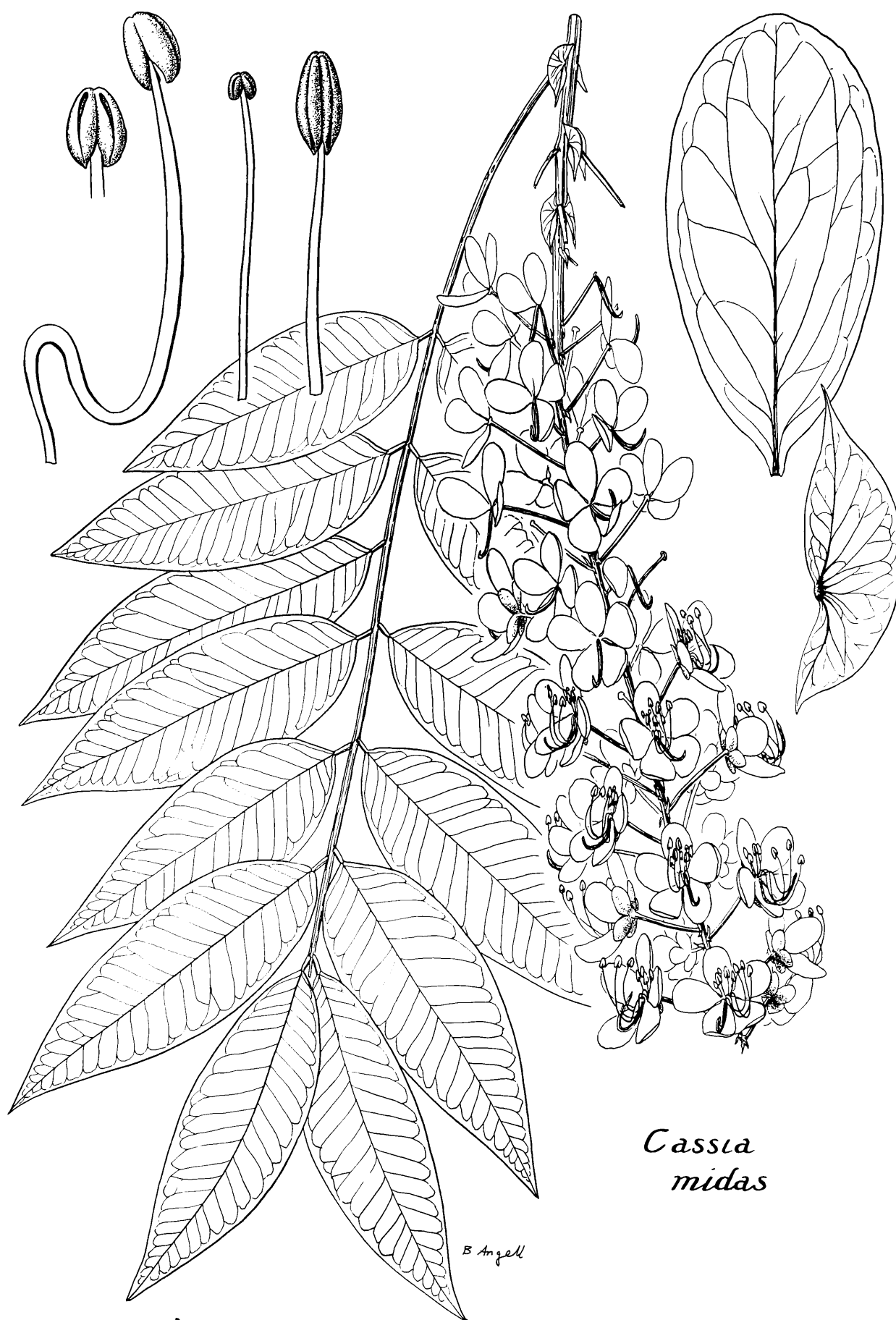
opposite or commonly alternate along rachis, accrescent distally, ovate- or very broadly lance-acuminate $3.5\text{--}11.5 \times 2\text{--}4$ cm, at base subsymmetrically rounded or broadly cuneate, the straight costa canaliculate on upper face, cariniform beneath, giving rise on both sides, at intervals of $\pm 3\text{--}6$ mm, to slender, widely incurved-ascending secondary nerves, these and subsequent reticulate venules prominulous on both faces but more sharply defined above than beneath.

Racemes mostly terminal to annotinous branchlets subsessile, the pendulous axis 1–2 dm, the $\pm 50\text{--}80$ fls expanding in rapid succession, the distal ones opening when the proximal ones have shed their androecium but not their perianth, the fls together forming a loose cylindric cluster ± 7 cm diam; bracts and bracteoles persistent into full anthesis, deciduous thereafter, all narrowly lance-acuminate, the former 3–6 mm, the latter shorter; pedicels refracted at wide angles and so twisted as to bring the vexillar petal of the resupinate corolla uppermost, at anthesis $\pm 2\text{--}2.5$ cm; hypanthium slenderly vase-shaped ± 3 mm solid; sepals firm brownish-olivaceous obovate concave $7\text{--}8 \times 4.5\text{--}6$ mm, subequilong but the outermost a trifle shorter than the inner; petals opening white, turning golden-yellow at full anthesis and, following fall of androecium, orange-brown marcescent, widely equably spreading-incurved to form a shallow bowl, all elliptic widest slightly beyond middle, cuneate (not clawed) at base, obtuse at apex, $10\text{--}14 \times 5.5\text{--}7$ mm, the vexillar one slightly shorter and the 2 abaxial ones slightly wider than the rest; 3 antesepalous sigmoid filaments 16–18 mm, slightly dilated but not nodular distally, their obcordate anther glabrous muticous $2\text{--}2.2 \times 1.6$ mm dehiscent by introrse slits, 2 (dorsal) antesepalous filaments subfiliform 6–9 mm, their sterile anther 0.7–1 mm diam, 5 antepetalous filaments all erect and parallel 5–8 mm, their broadly elliptic, basally porose anther $2.6\text{--}3 \times 1.7$ mm; ovary densely puberulent, grooved lengthwise along each suture and along middle of each valve; ovules 62–84.

Pod unknown.—Collection: 1.

Disturbed lowland forest, known only from the headwaters of Rio Purús in s.-e. Acre, Brazil, to be sought in neighboring Peru and Bolivia.—Fl. IX–X.—Fig. 8bis.

The discovery in the neotropics of undescribed species of *Senna* or *Chamaecrista* is commonplace and expectable, but that of a new true *Cassia* is a rare and surprising event. While the pod of *C. midas* is still unknown, the general morphology of the inflorescence and that of the individual flower are so fully consonant with the small ser. *Tetrapleurae* as to leave no room for doubt about affinities. Within this group *C. midas* is instantly distinguished by the relatively few large ovate-acuminate leaflets which in outline, texture, venation and coloring resemble those of *C. fistula* on a small scale. In its simplified but reciprocally amplified leaves *C. midas* occupies in ser. *Tetrapleurae* the place filled in partly sympatric ser. *Amazonicae* by *C. spruceana* and *C. swartzoides*. In its relatively small and shortly pedicelled flowers *C. midas* resembles allopatric *C. ferruginea* much more closely than *C. fastuosa* var. *calva*, which Lowrie and his associates collected in the same place and on the same day. *Cassia* (ser. *Amazonicae*) *swartzoides* var. *scarlatina*, known to occur in the Mamoré-Beni basin both in Bolivia bordering on Acre and in adjoining Rondônia, is comparable to *C. midas* in foliage, but differs fundamentally in the stiffly ascending raceme-axis, clawed and appendaged vexillum, and resupinate antepetalous anthers. The possibility that *C. midas* is a hybrid between *C. fastuosa* and *C. swartzoides* var. *scarlatina* has been considered but rejected on the grounds that its inflorescence and floral architecture show no influence whatever of ser. *Amazonicae* and that a hybrid hypothesis is superfluous to account for one more instance in *Cassia* of this type



*Cassia
midas*

Fig. 8bis. *Cassia midas* Irwin & Barneby. Leaf + Raceme $\times \frac{1}{2}$; stipule $\times 3$; petal $\times 5$; stamens $\times 5$.

of leaf modification. Pods, however, are needed to settle the question beyond dispute.

The petals of *C. midas* are golden-yellow in flowers dried at full anthesis and fade after the stamens are shed to bright orange-brown, but they are said by the collectors to open white and change to yellow, a pattern unknown elsewhere in *Cassia*. The sequence of color-change suggested the epithet.

Efforts should be made to introduce this handsome floriferous cassia into tropical gardens, where it would surely be a welcome addition to the small but distinguished company of Pink and Golden Showers already in cultivation.

SENNA [K. Bauhin] P. Miller

Senna [K. Bauhin] P. Miller, Gard. Dict., Abr. ed. 4, vol. 3. 1754, sensu mag-nopere ampliatis. Irwin & Barneby in Polhill & Raven, 1981, p. 105.—Generitypus: “*Senna alexandrina sive foliis acutis* C[aspar] B[auhin] P[inax 397]” \equiv **Senna alexandrina** P. Miller, 1768.—*Cassia* sect. *Senna* [Tournefort] DeCandolle ex Colladon, Hist. Casses 92. 1816. *Cassia* subgen. *Senna* Benth in Martius, Fl. Bras. 15(2): 96. 1870; Trans. Linn. Soc. London 27: 513, 518. 1871.

Senna sensu Gaertner, Fruct. sem. pl. 2: 312, t. 146, fig. 4. 1791; Link, Handbuch 2: 139. 1831; Roxburgh, Fl. Ind. ed. Carey, 2: 339. 1832.

Cassia sect. *Senna* sensu Benth in Benth & Hooker, Gen. Pl. 1(2): 139. 1865.

General characters of subtribe Cassiinae, with these particular ones: pedicels ebracteolate (except *S. peralteana* and *S. paradictyon*); androecium (Fig. 10, 11) zygomorphic, functionally 4–10-merous, the stamens \pm graduated in length from ad- to abaxial side of fl, the 3 adaxial stamens (except in Palaeotropic sect. *Psilorhegma*) staminodal, the (6–)7 fertile anthers basifixed, usually modified into heteromorphic sets of 4 median and (2–)3 abaxial (these lacking in *S. hayesiana*), all beakless or variably beaked or appendaged at apex, where dehiscent by 2 separate or confluent pores or short slits, the thecae either glabrous or pubescent but not ciliolate along the lateral (closed) sutures; pod either dehiscent or indehiscent, if the former inertly so through both sutures, the valves not elastically coiling, when indehiscent either breaking up into 1-seeded achenelike segments or the seeds released only by rotting of the valves; seed-funcle filiform; seed-coat commonly but not always areolate, never serially pitted.—Trees, shrubs, herbs, some monocarpic, the roots often blackish, lacking bacterial nodules; extrafloral nectaries (Fig. 9), when present, ovoid, globose, claviform or phalloid, excreting nectar from convex surface (plane in petiolar gland of *S. kuhlmannii*); foliage often foetid; lfts 1–many pairs or lvs rarely (except for transient eophylls) absent or (in Australia) phyllodal; inflorescence of 1–many-fl'd racemes, these axillary from hornotinous stems or sometimes cauliflorous, then either solitary or paniculate; hypanthium solid, shallowly bowl-shaped or slenderly vase-shaped, often not externally differentiated from pedicel; calyx-lobes either equal or strongly graduated, the inner then longer, mostly obtuse; petals (in America always) yellow, rarely white, drying either yellow (brown) or whitish dark-veined, the corolla either zygomorphic or irregular, one abaxial petal then highly modified either as a flag or as an androecial shield, the vexillar petal almost always interior in praefloration; pistil either centric or enantiostylous; ovules 5–266; stigma punctiform or dilated and cupular, usually ciliolate; pod (Fig. 12–14) highly variable in length, texture and compression, primitively plano-compressed, becoming turgid, angulate, terete, or rarely either its valves or its sutures winged lengthwise, the valves sometimes crested or otherwise elevated over seeds, the dry or pulp-filled cavity continuous or commonly transversely septate, the valves commonly continuous, sometimes breaking up into panels or into indehiscent achenelike segments; seeds free or (Madagascan *Senna perrieri* Ghesqu.) adherent to the endocarp, mostly 1-, less often 2-, exceptionally 4-seriate, either transverse or basipetal in orientation, lying broadside either to the valves or to the interseminal septa, their testa naked or wax-coated (crackled when ripe), smooth or irregularly pitted, areolate or not; $2n = 22, 23, 26, 28$.—Spp. ± 260 , about $\frac{4}{5}$'s American, these referred below to 35 series in 6 sections, the whole genus circumtropical but extending into warm temperate, temperate desert-grassland and exceptionally

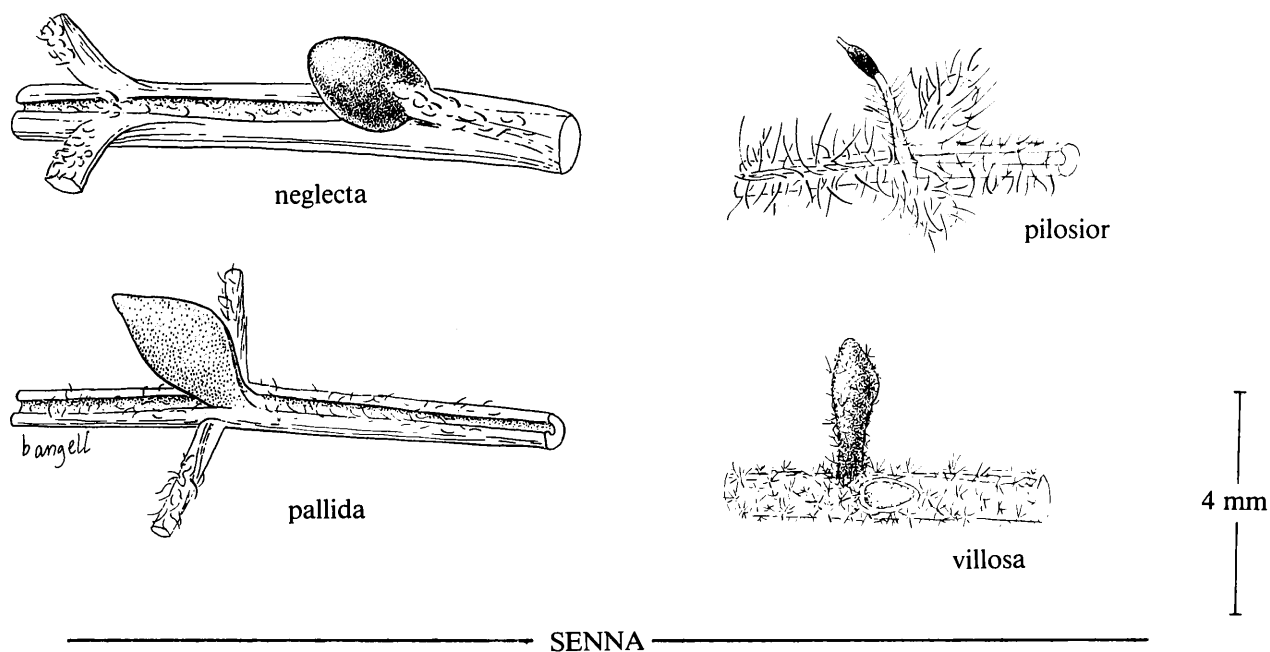


Fig. 9. Petiolar nectaries (glands) of genus *Senna*: *S. (Basiglandulosae) neglecta* (Vog.) I. & B.; *S. (Brachycarpae) pilosior* (Macbr.) I. & B.; *S. (Interglandulosae) pallida* (Vahl) I. & B.; *S. (Astroites) villosa* (P. Mill.) I. & B.

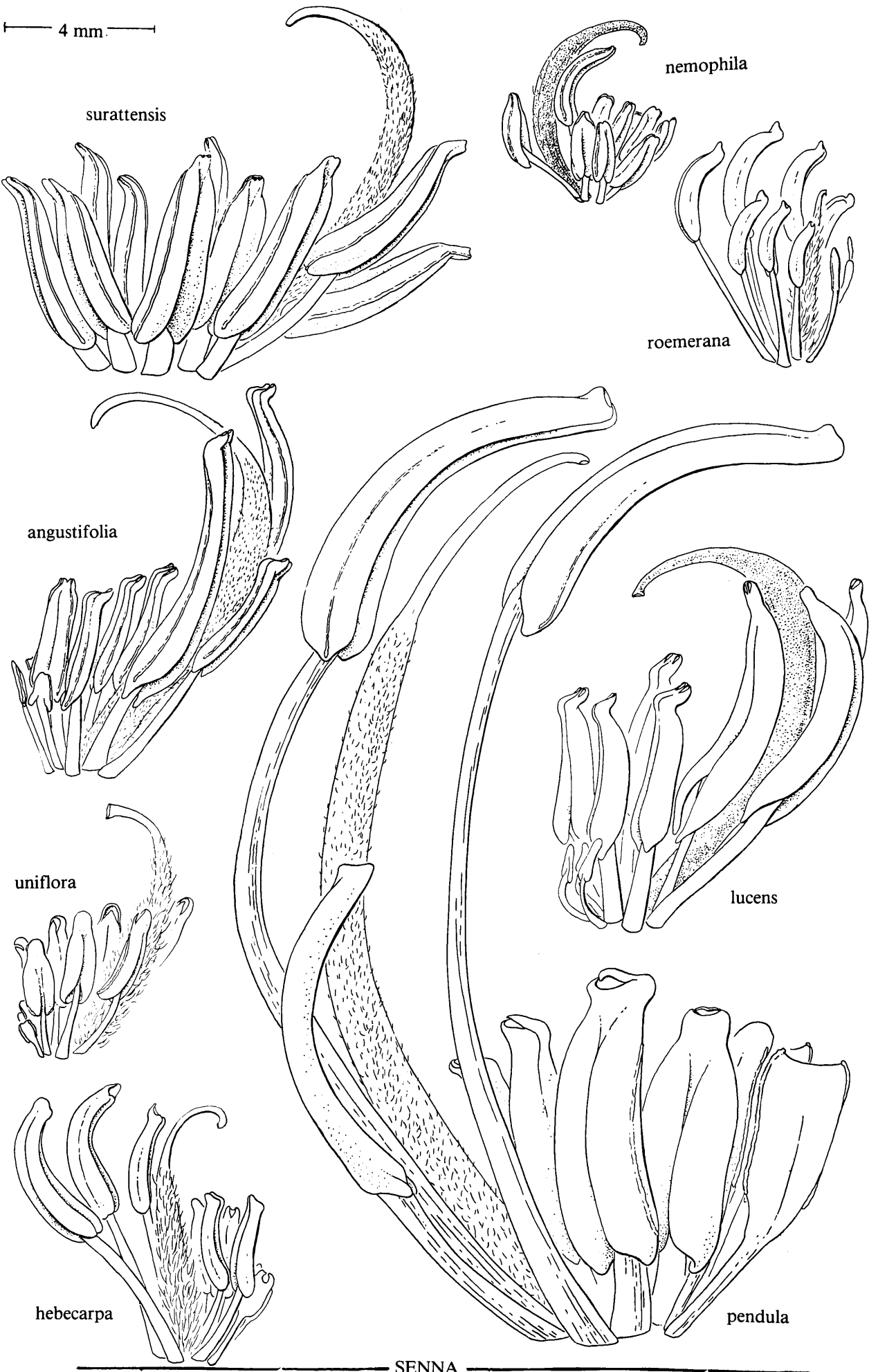
into cool-temperate zones of both hemispheres, almost ubiquitous throughout the Neotropics and as widespread (but less numerous in kinds) in tropical Africa, Madagascar, and Australia, fewer in s.-e. Asia and Pacifica. Many cultivated for ornament.

The syndrome of characters that separates *Senna* from *Cassia* sens. restr., and incidentally from *Chamaecrista* also, has been discussed under the title of genus *Cassia*. In this place we propose to scrutinize some aspects of its complex internal structure and concurrently to justify, or at least explain, the principles that underlie the taxonomy that follows.

Over its global range *Senna* displays a rich diversity of detail in habitat and habit, in foliage, inflorescence, flower and fruit. The principal variable features are here analyzed from the viewpoint of relative specialization in the belief that such analysis, set against a broad geographical background, yields insights into the recent evolutionary history of the genus.

LIFE-FORM: Dwarf tufted herbs, rank annual ones, buried shrubs that take the form of herbs arising from a xylopodium, ephedroid bushes, sarmentose bush-ropes, free-standing shrubs and umbrageous trees are numbered among the sennas. We suppose, a priori, that the common ancestors of subtribe Cassiinae, and presumably of *Senna*, were primitively woody, mesophytic, macrophyllous, macrothermic and heliophilous. From this base arose the more specialized life-forms: the liana adapted to closed forest, the monocarpic herb to disturbed successional environment, the microphyllous and leafless shrubs to seasonally dry savanna and desert, the herbaceous cryptophytes to winter frost or to fire. Almost all contemporary sennas, by this criterion, are specialized in growth-form, many highly so. We assume that an inherent adaptability has enabled *Senna* to proliferate into increasingly arid and otherwise hostile environments. This general trend has occurred independently in North America, South America, Africa and Australia, sometimes on parallel lines.

4 mm.



surattensis

nemophila

roemerana

angustifolia

uniflora

lucens

hebecarpa

pendula

SENNA

PUBESCENCE: Seven main types of trichome are encountered in *Senna*: i) simple short, incurved or straight unicellular, whitish or often lutescent, almost universal throughout the genus even if only vestigial along margins of leaf-stalk or sepal; ii) minute dilated-glandiform but not secretory, often colored (red, brown, orange), frequent in groups of species otherwise heterogeneous; iii) fine setiform unicellular, much longer than type i, of curiously erratic occurrence both within groups of related species and within the individual species; iv) 2-several-cellular setiform, excretory at apex, a type rare in this genus (ser. *Interglandulosae*) that is highly developed in *Chamaecrista* sect. *Absus*; v) spiculiform, non-secretory though often discolored, found mostly around the pulvinus and pulvinules of leaves, and within or around the floral hypanthium; vi) capitate-glandular, known only in monotypic ser. *Aculeatae*; and vii) stellate, unique to monotypic ser. *Astroites*. While hairs of type iv, vi and vii are obviously specialized the remainder are widespread, without mutual correlation, throughout the genus and may be absent or present in pairs of closely related species, sometimes in individuals of one species. Epidermal prickles, as well as glandular hairs of type vi, are unique to *S. aculeata*.

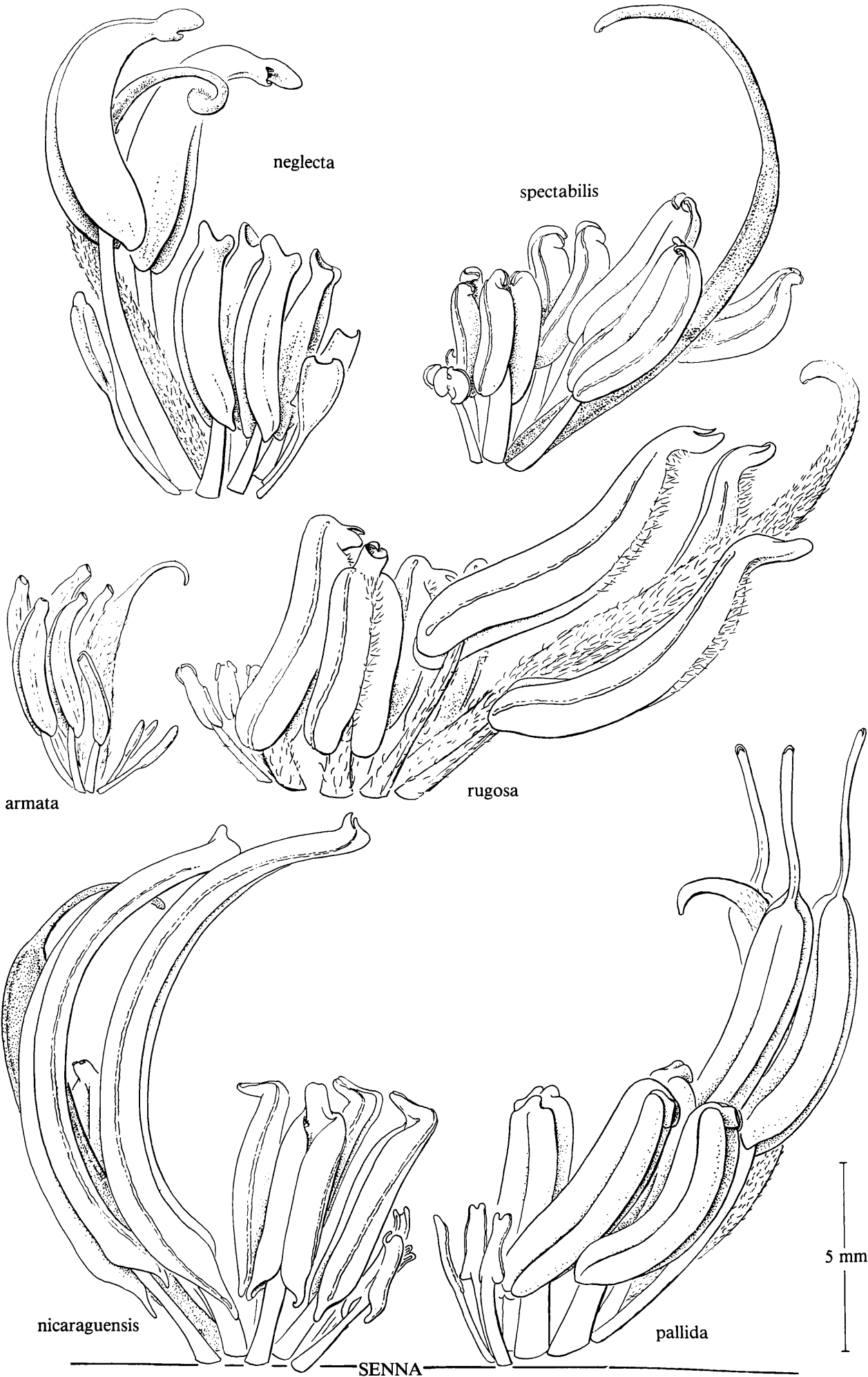
STIPULES: The stipules of Cassiinae in general have no obvious function. They do not protect the leaf-bud and are ordinarily small, or caducous, or both. Those of *Senna* range from minute dry subulate structures through oblanceolate (often falcate) herbaceous blades to the broad foliaceous ones of e.g. *S. (Bacillares) herzogii* and *latifolia* (in part), *S. (Stipulaceae) stipulacea*, *S. (Coriaceae) corifolia*, *S. (Coluteoideae) subulata* and the Paleotropic *Cassia auriculata* L. Within a given group, often within a given species, development of foliaceous stipules is often capricious and labile, and has clearly arisen in several mutually remote evolutionary lines. They appear to have been lost entirely in ser. *Aphyllae*.

LEAVES: A leaf composed of perhaps 5–10 pairs of moderately ample leaflets is the model from which it is most easy to derive all leaves of contemporary *Senna*. Specialization has proceeded primarily in two directions: toward fewer and larger and toward more numerous and smaller leaflets, the reciprocal adjustment between size and number furnishing a more or less constant photosynthetic apparatus. The range of variation in number within species rises and falls with the average number, becoming exactly stabilized only at one, two or rarely three pairs. Where *Senna* has become adapted to desert or near-desert conditions the photosynthetic function has been transferred, partly or entirely, from the leaflets to green stems (ser. *Aphyllae*, *Armatae*, of South and North America respectively) or to phyllodes (in Australian members of sect. *Psilorhegma*). In some cases (e.g. *S. acuruensis*, *S. pallida* sens. lat.) a change of leaflet number is the principal morphological expression of recent geographical divergence. In other groups, especially in the bijugous ser. *Bacillares*, leaflet number must have been stabilized at an early date, antecedent to the proliferation of the species.

PETIOLAR GLANDS: We suppose the nectariferous gland to be an archaic feature of *Senna* which has been suppressed independently in a few advanced evolu-

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Fig. 10. Androecia of genus *Senna* (1). Sect. *Psilorrhegma*: *S. surattensis* (Burm. f.) I. & B.; *Cassia nemophila* A. Cunn. Sect. *Chamaefistula*: *S. (Sapindifoliae) lucens*, properly *S. silvestris* (Vog.) I. & B.; *S. (Brachycarpae) roemerana* (Scheele) I. & B.; *S. (Confertae) uniflora* (P. Mill.) I. & B.; *S. (Temperatae) hebecarpa* (Fern.) I. & B.; *S. (Coluteoideae) pendula* (Willd.) var. *glabrata* (Vog.) I. & B. Sect. *Senna*: *S. angustifolia*, properly *S. alexandrina* P. Mill.



tionary lines, not closely allied to one another: sect. *Senna*; some series of sect. *Chamaefistula* and several of sect. *Peiranisia*. Alternative hypotheses, that a similar gland has developed independently in different branches of the genus, each from glandless predecessors, or that the glanduliferous and glandless species form mutually exclusive natural groups, are not supported by other data. In some species of sect. *Peiranisia* ser. *Inter glandulosae* and of sect. *Chamaefistula* ser. *Brachycarpae* and *Confertae*, as in all species of sect. *Chamaefistula* ser. *Coriaceae* and *Laxiflorae*, a nectariferous gland similar to that of the leafstalk occurs at base of or attached to one edge of the pedicels. All of these clavate or phalloid nectaries like the cup- or shield-shaped ones of *Chamaecrista*, are attractive to ants, which have been supposed to deter predators. The extent to which this symbiotic relationship is of real benefit to the *Senna* partner is unknown.

INFLORESCENCE: The basic unit of the *Senna* inflorescence is a raceme axillary to a developed leaf, and an indeterminate sequence of lateral several-flowered racemes is the inflorescence that either prevails or survives in all major groups of species. Reduction and subsequent elimination of distal leaves subtending individual racemes, sometimes accompanied by shortening of the primary axis, produces a terminal exserted thyse or panicle which, when the elementary racemes are reduced to one or two flowers apiece, may simulate a terminal raceme. The cauliflorous panicle of some *Bacillares* is structurally identical to that terminating an annotinous branchlet except that it is wholly leafless. Apparently simple cauliflorous racemes in the same series, like those arising from year-old wood of some drought-deciduous members of sect. *Peiranisia*, are panicles reduced to one elementary racemose axis. These specializations of the inflorescence no doubt correspond to particular biological advantages that may be gained by compression of flowering time and energy into a showy but transient display or by appeal to a particular pollinator. However that may be, a particular inflorescence type has rarely been stabilized within a group of species otherwise defined, and its organization may even be modified in the course of its own maturation. Flower-number, like leaflet-number, approaches stability only when very low. The scapiform one-flowered raceme of *S. pumilio* is almost invariable, but those of the prevailing biflorous *Inter glandulosae* (*S. pallida* and kindred) are in fact one- to three- or rarely four-flowered.

CALYX: The sepals of *Senna* are prevailing graduated from short to longer in an upward spiral and are obtuse at apex. Subequal sepals of ser. *Brachycarpae* and *Tharpia* are certainly derived, as are the lanceolate acute one of *S. (Bacillares) acutisepala*. Venation of the sepals is palmate except in monotypic sect. *Paradictyon*, which see for discussion, and varies only in strength, prominence and number of primary veins. When proportionately small the sepals may separate long before true anthesis, exposing the immature petals and androecium. Conversely, proportionately ample sepals (as in *S. latifolia* or *S. trolliiflora*) permanently nidulate all the inner floral parts. The extremes both occur in the one series *Bacillares*.

COROLLA: *Senna* displays two basically different types of corolla, one vertically

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Fig. 11. Androecia of genus *Senna* (2). Sect. *Chamaefistula*: *S. (Bacillares) rugosa* (G. Don) I. & B.; *S. (Armatae) armata* (S. Wats.) I. & B.; *S. (Basiglandulosae) neglecta* (Vog.) I. & B. Sect. *Senna*: *S. (Pictae) nicaraguensis* (Benth.) I. & B. Sect. *Peiranisia*: *S. (Inter glandulosae) pallida* (Vahl) I. & B. var. *pallida*; *S. (Excelsae) spectabilis* (DC.) I. & B.

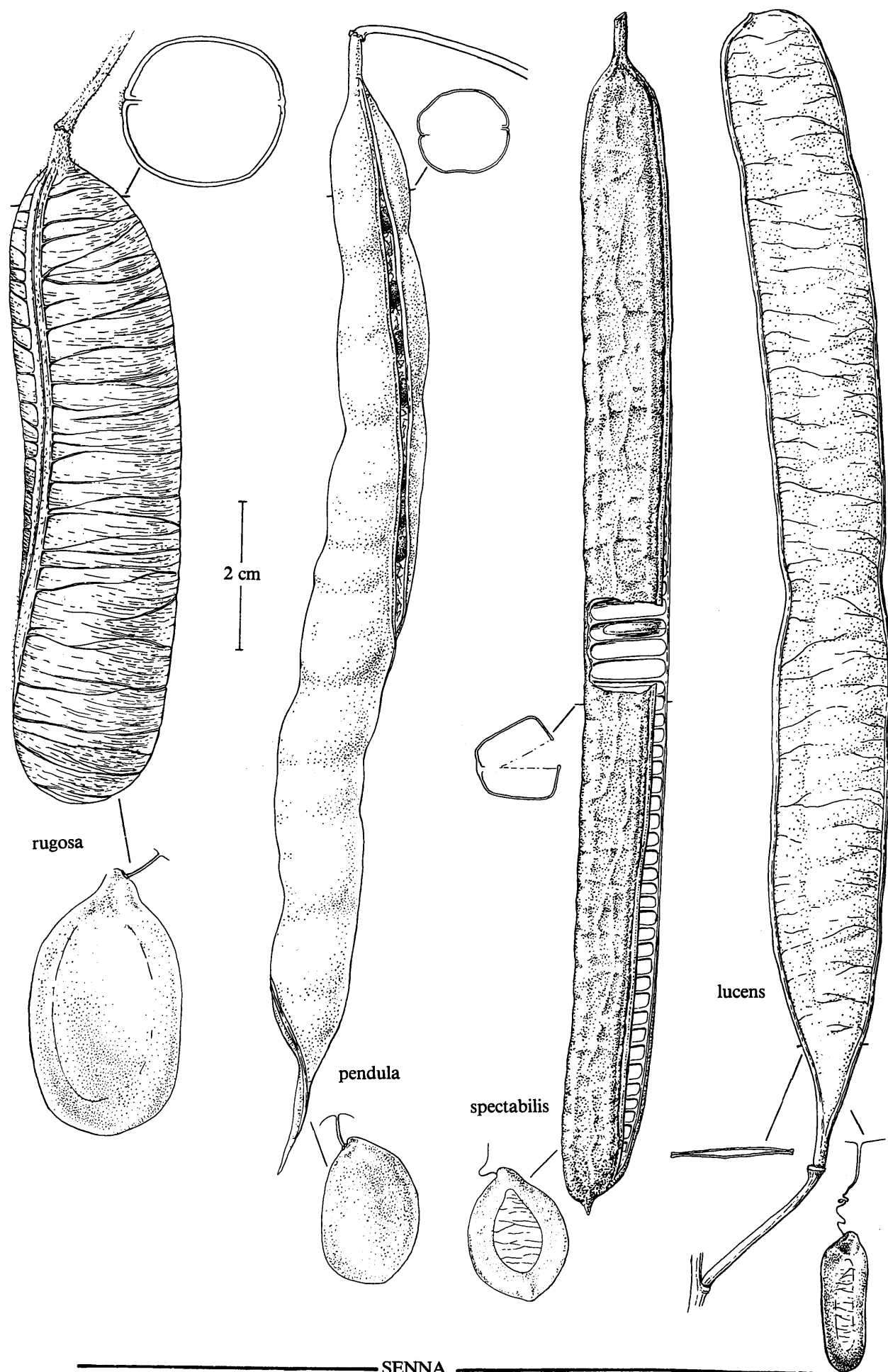


Fig. 12. Pods and seeds of genus *Senna* (1). Sect. *Chamaefistula*: *S. (Bacillares) rugosa* (G. Don) I. & B.; *S. (Coluteoideae) pendula* (Willd.) var. *glabrata* (Vog.) I. & B.; *S. (Sapindifoliae) lucens*, properly *S. silvestris* (Vog.) I. & B. Sect. *Peiranisia*: *S. (Excelsae) spectabilis* (DC.) I. & B.

zygomorphic, like that of *Cassia*, which we consider relatively primitive, the other highly irregular, like that of *Chamaecrista*, following differentiation of one of the two abaxial petals in opposition to an asymmetrically displaced pistil. In the first case an axis of symmetry runs vertically through each flower, in the second case vertically between two contiguous flowers of a raceme, which mirror each other in the mode called enantiostylous. A third type of corolla, encountered in some *Bacillares* and elsewhere, is randomly asymmetrical, all petals except the vexillar one being of odd and irregular shapes and sizes. Because this third sort is combined with a centrically (or subcentrically) oriented pistil we regard it as a variation of simple zygomorphy. It seems certain that the asymmetric perianth and pistil which composes the *Peiranisia* flower is designed to promote outcrossing and evolved in relation to insect pollination, no doubt in more than one evolutionary line. The Malesian *Cassia divaricata* (cf. De Wit, 1955, p. 242, fig. 2) and the Australian *C. odorata*, both of which retain the decandrous androecium of sect. *Psilorhagma*, have the perianth of the American *Interglandulosae*. The simulation is so exact that De Wit suspected an American origin for *C. divaricata* and Bentham was deceived by a mislabelled specimen of *C. odorata* into describing a supposedly Brazilian *C. riedelii*. Consequently we have no assurance that all the American sennas herein referred to sect. *Peiranisia* belong to a monophyletic group.

In terms of floral specialization the genera of *Cassiinae* stand at three levels: at the bottom *Cassia*, with invariably zygomorphic flower; at the top *Chamaecrista*, in which an asymmetric perianth and displaced pistil, common to all members, must have been stabilized prior to differentiation into section and species; and between them *Senna*, in which intermediate stages of distortion coexist with exactly zygomorphic and highly asymmetric flowers.

ANDROECIUM: It appears probable, a priori, that the functionally decandrous androecium of sect. *Psilorhagma* (e.g., *Cassia nemophila*—Fig. 10; see also pod, Fig. 13) is more primitive than and antecedent to that of all other groups of *Senna*, in which the three adaxial stamens, that opposed to the vexillum and its two immediate antesealous neighbors, are sterile rudiments, or lacking, or assume a secondary function of flag or eyespot. In the American sennas one can trace progressive differentiation of the seven fertile stamens into two sets of four shorter median and three longer abaxial members, the first set providing food-pollen, which visitor bees extract by vibratory milking, while the second is so oriented as to deposit pollen on the bee's underside (sect. *Chamaefistula*) or flanks (sect. *Senna*) for transport to the stigma of another flower. Developments of this theme are i) degeneration and ultimate loss of the centric abaxial stamen; ii) aggrandizement of the centric abaxial stamen at the expense of its immediate neighbors; iii) loss of all three abaxial stamens (*S. hayesiana*); and iv) displacement of the two long abaxial antepetalous stamens from a plane parallel to their opposed petal to a plane horizontal to the flower's vertical axis, the signature of sect. *Senna*. A converse trend toward uniformity is seen in sect. *Chamaefistula* ser. *Brachycarpae* and sect. *Peiranisia* ser. *Isandrae* in which the seven fertile stamens, while retaining evident traces of differentiation into two sets and still perceptibly graduated in size from back to front of the flower, resemble each other in orientation of the filament, in size and curvature of the anther and in orientation of its terminal pore or slits.

In part concurrently with and in part independently of differentiation into morphologically and functionally unequal sets, the stamens of *Senna* have developed specialized orifices for egress of pollen which may be interpreted as promoting its efficient transport. At the simplest each theca of the anther opens by a discrete

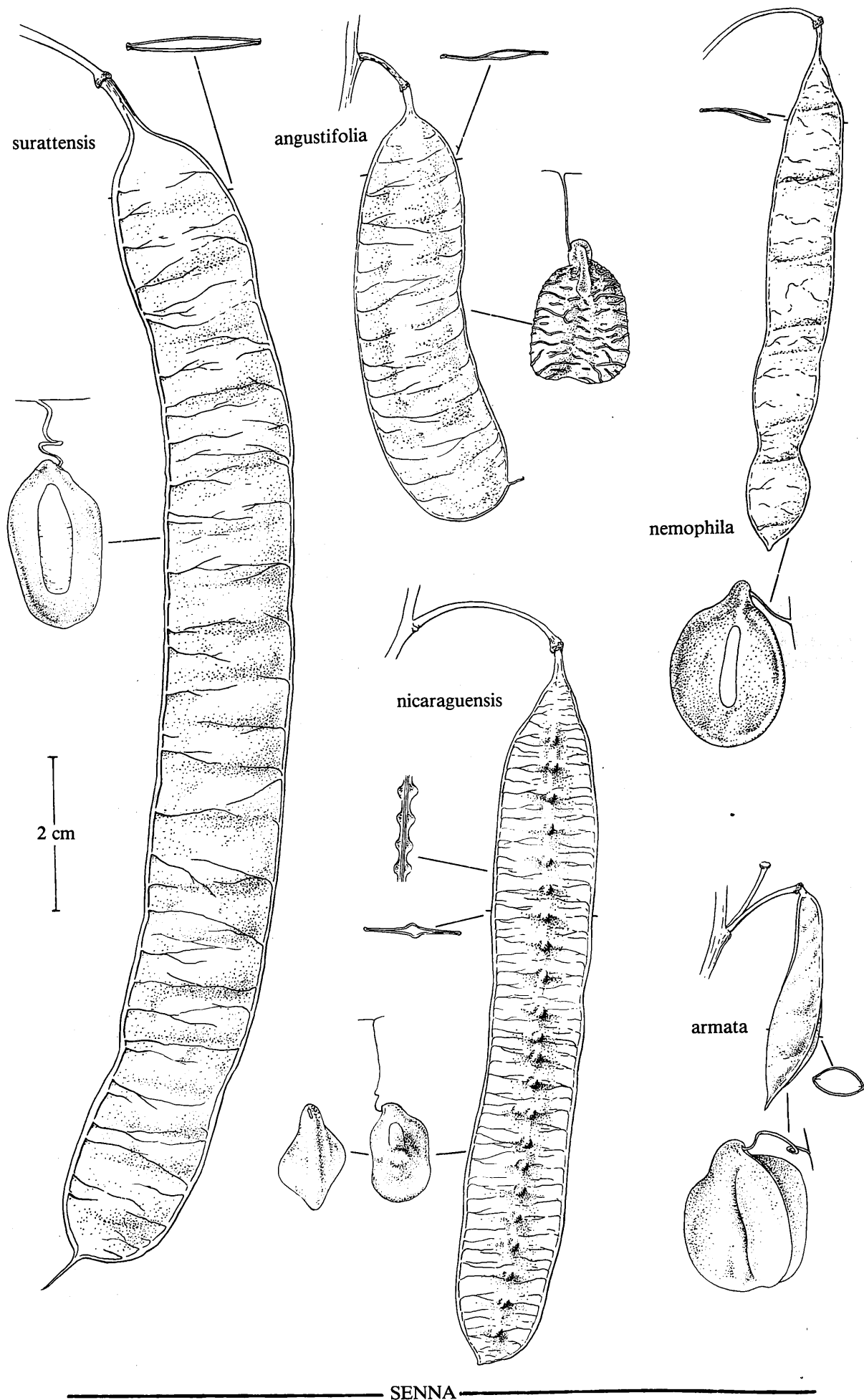


Fig. 13. Pods and seeds of genus *Senna* (2). Sect. *Psilorrhagma*: *S. surattensis* (Burm. f.) I. & B.; *Cassia nemophila* A. Cunn. Sect. *Chamaefistula*: *S. (Armatae) armata* (S. Wats.) I. & B. Sect.

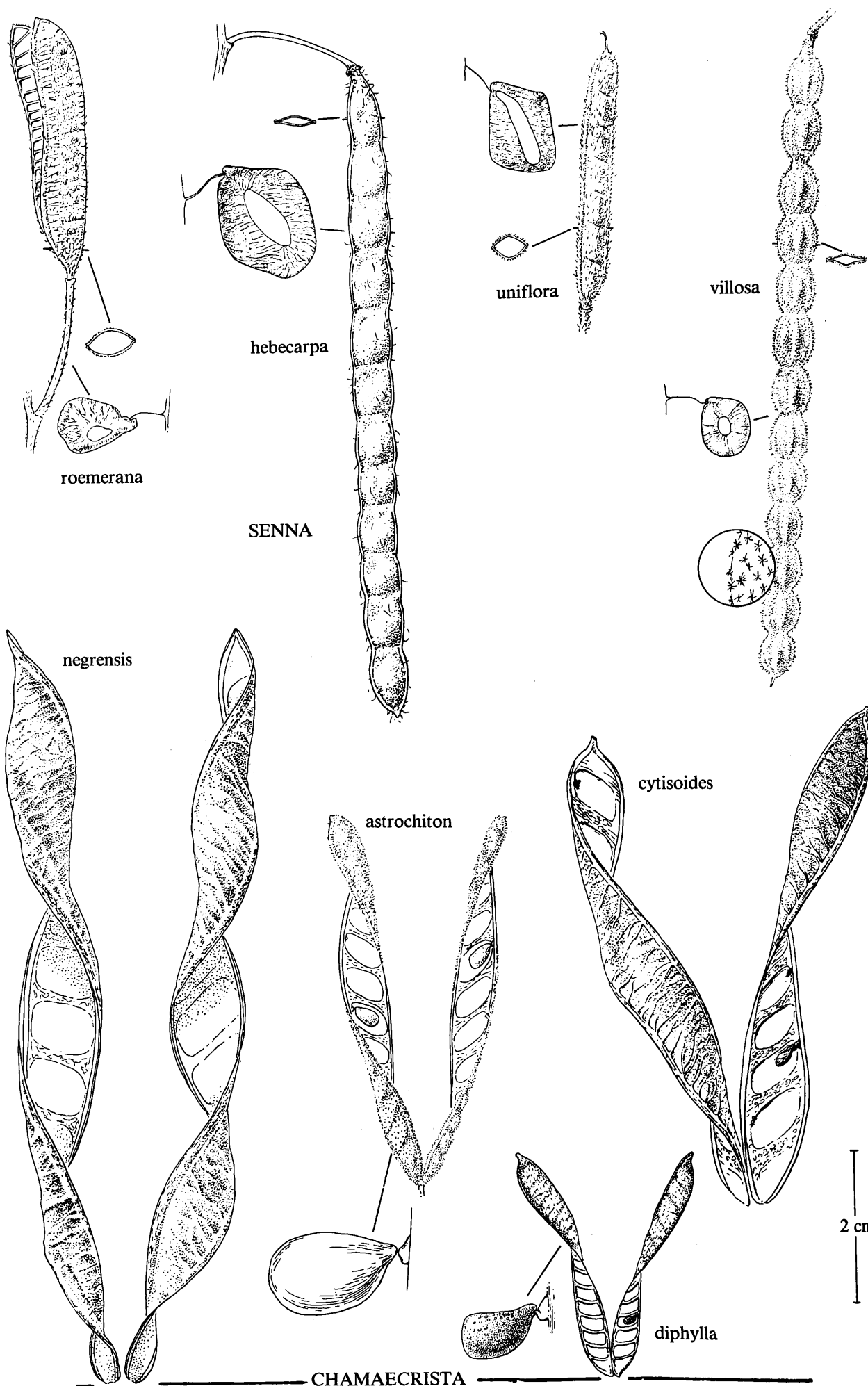
apical slit looking upward and outward. Later the two slits fuse into one round or U-shaped pore, divided or not by an exiguous septum. The slits of the four median stamens, whether separate or confluent, are shifted by imperceptibly small steps from terminal to a position at first obliquely terminal and finally lateral infraterminal. Perfectly or partly coalescent beaks, especially in the long abaxial anthers, develop by more or less abrupt strangulation of the thecae, and these beaks become variously modified into a truncate tubule, an oblique pollen-cup, or develop a tonguelike appendage produced beyond the true orifice. Anthers evenly tapering to a bluntly rounded or abruptly truncate, biporose apex represent the simplest type in *Senna* and are presumed to represent that from which the rest arose.

PISTIL: The pistil of *Senna*, whether aligned along the vertical axis of floral symmetry or turned alternately left and right in opposition to a modified abaxial petal, varies little in form except for length of style and size and orientation of the stigma. The number of ovules, on the other hand, varies enormously, with consequences to the pod discussed under the next heading. Curiously there is only partial correlation between ovule number and capacity of the stigmatic orifice. The massive hollow stigma of *S. (Bacillares) quinquangulata*, accommodates enough pollen grains to fertilize more than 200 ovules, but the stigmatic orifice of *S. (Coluteoideae) pendula*, which may have as many as 150 ovules, remains minute and punctiform like that of most pauciovulate species. We suppose that a simple linear style of moderate length, with punctiform stigma looking upward, preserves the archetypal form. A distally incurved style, dilated or not below the stigma, promotes self-fertilization of the flower, whereas the whole architecture of the longistylous flower, especially that of sect. *Peiranisia* when the long anthers are shielded by one abaxial petal from contact with the laterally displaced pistil, seems designed for out-crossing. A trend away from entomophily to autogamy which is expressed by simultaneous inward curvature, shortening and dilation of the style has reached a climax in the advanced monocarpic *S. uniflora*. In this species the enlarged stigma is poised in the bud to receive precociously released pollen from anthers directly facing it; and most flowers are, in fact, self-fecundated before the small ephemeral corolla expands. Changes in spatial relationships between pistil and androecium, upon which successful pollination is contingent, probably have occurred many times in the evolutionary history of *Senna*, but once made are conservative and consequently become significant in interpretation of affinities.

POD: The simplest form of *Senna* pod is a plano-compressed bean inertly dehiscent along both sutures and enclosing some 10–20 seeds which are laid across a dry cavity and turned broadside to the valves. From such a pod all other types seem to be derived, either by multiplication (less often by loss) of ovules, by elaboration of a pulpy endocarp enveloping the seeds, by pressures brought to bear on the valves by the swelling seeds, by epidermal excrescences of wings or crests arising from either valve or suture or, in a few highly specialized groups, by development of lomentiform constrictions and lines of fracture between seeds. Seeds of American sennas are highly vulnerable to attack from larvae of Bruchidae, the effects of which, in absence of chemical defenses, are mitigated by

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Senna: *S. (Senna) angustifolia*, properly *S. alexandrina* (P. Mill.) I. & B.; *S. (Pictae) nicaraguensis* (Benth.) I. & B.



alternate strategies: production over a long season of many few-seeded pods, some of which are likely to evade the predator; and production of few massive multiovulate pods which, even when infested, are likely to produce at least a small viable harvest. Reduplication of ovules, by far the commoner (or more successful) of the two strategies, has had profound effects on the ultimate outline and compression of the pod and often also on orientation and shape of the mature seeds, each of which is obliged to adapt itself to a limited space in its chamber of the pod, as the body of a mollusc adapts itself to its shell. A great number of ovules can be accommodated in different ways, either stacked in one row along an elongate and, for economy's sake, narrow pod; or displaced laterally into two rows along a pod at once half as long but twice as wide; or turned broadside to the interseminal septa which, by closing up the rank of seeds, permits a sacrifice of length to a plump capacious cavity; or exceptionally, as in *S. ruiziana*, doubly doubled up into four interdigitating ranks, an unexpected compromise between length of pod and a high number of propagules requiring space for growth.

Disregarding epidermal excrescences and lines of fracture between seeds, the diversity of the senna pod can be viewed as the outcome of reciprocal adjustments between ovule-number and potential expansion of valvular tissue. These adjustments, however, have not followed a single unidirectional sequence but appear rather to have occurred at random, independently, and as often as not at the level of specific differentiation. For example, the cavity of the crenately winged pod of *S. alata* is rhombic in cross section and the seeds become rhomboidally distorted at maturity, compressed vertically to the internally crumpled cotyledons and consequently bearing the areole on the narrower faces of the testa. But in closely related *S. reticulata*, which has a conventional plano-compressed pod, the seed accommodates itself to the cavity, not vice versa, and the areole is on the broader faces. The gamut of variation in pods of ser. *Bacillares*, assuming for argument that this otherwise morphologically uniform group is indeed monophyletic, is extraordinarily wide, involving ovule-number and deployment of seeds, mode of dehiscence, development of pulpy endocarp, intrusion of a woody false septum from one suture and other minor features. The small ser. *Isandrae*, defined within sect. *Peiranisia* by a strikingly individual androecium, exhibits a comparable diversity in ovule-number and in texture and dehiscence of the pod. As an index of affinity the pod has been much overvalued by past students of Cassiinae.

SEED: The graphic display of senna seeds assembled by Lasseigne (1979, figs. 6–90 incl.) well illustrates their diversity in size and outline, much of which, as discussed above, we attribute to constraints from the walls of the individual locule. The most notable external feature of the seed is the areole, present in all extra-American members of the genus and in the majority of New World species. Because the areole is common to all sections of *Senna*, and to all its most disparate monotypic series, we regard it as an archaic feature, wholly suppressed only in ser. *Stipulaceae*, *Corymbosae*, monotypic *Harleyanae* and most species of ser. *Bacillares*, but surviving in a few species of the latter series. The alter-

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Fig. 14. Pods and seeds of genus *Senna* (3) and genus *Chamaecrista*. *Senna* sect. *Chamaefistula*: *S. (Brachycarpae) roemerana* (Scheele) I. & B.; *S. (Basiglandulosae) hebecarpa* (Fern.) I. & B.; *S. (Confertae) uniflora* (P. Mill.) I. & B. Sect. *Astroites*: *S. villosa* (P. Mill.) I. & B. *Chamaecrista* sect. *Apoucouita*: *Ch. negrensis* (Irwin) I. & B. Sect. *Absus*: *Ch. astrochiton* (I. & B.) I. & B. *Ch. cytisoides* (DC.) I. & B. Sect. *Xerocalyx*: *Ch. diphylla* (Linn.) Greene.

native hypothesis, that an unmarked seed survives in a few evolutionarily active American groups and that an areole has appeared independently in remotely related ones scattered around the globe, appears less likely.

In the foregoing section we have summarized our thoughts, developed in greater detail in the taxonomic text that follows, on the gross morphological diversity of *Senna* and what we can more or less safely infer from it concerning the evolutionary significance of particular character states. A probable sequence of modification of a particular feature is not hard to perceive within the context of a section or series otherwise defined; but synthesis of all these sequences into an orderly model of progressive specialization is not possible. The species of *Senna* existing in our times present a mosaic of relatively primitive and relatively advanced characters which must have developed at different periods and at different rates of change, in the manner called by Takhtajan (1980, p. 232) heterobathmic. Selection seems to have operated asynchronously on the plant body, the floral mechanism and the fruit, and the data are often contradictory. No sennas primitive at all levels exist today. Difficulties of interpretation arise in distinguishing homology from analogy, and the possibility of evolutionary reversal is troubling. It is hard to reconcile, for example, the ostensibly primitive decandrous androecium of sect. *Psilorhegma* with the contemporary range of the section in Australia, Pacifica and Indonesia. If the decandrous androecium were in fact a reversal toward symmetry it would be easier to explain the perplexing overall similarity between the Malesian *Cassia* (*Psilorhegma*) *divaricata* and the American *Senna* (*Peiranisia*) *pallida*, particularly noted by Bentham (1871, p. 554) and De Wit (1955, p. 242).

Most of the rare, narrowly endemic or ecologically insulated American sennas are obviously recent derivatives of more widely dispersed progenitors and most of the relatively few broken-up areas of dispersal in the New World are as easily explained by aggressive discontinuous colonization as by relictual persistence in favorable corners of a formerly continuous range. It is otherwise, however, with the world distribution of sect. *Senna*, and especially of ser. *Pictae*, which contains apparently close kindred endemic to Brazil (*S. martiana*), Africa (*S. didymobotrya*) and Australia (*Cassia venusta* F. Muell.). The characters by which these spatially dissevered species are perceived as kindred are not found in the fruit but in the peculiar androecium of sect. *Senna* coincident with a common facies; the pods, isolated from the plant, are of a generalized type common to diverse groups within the genus. The androecium of sect. *Senna*, which is specialized and idiosyncratic in high degree, must have evolved prior to differentiation of its species and to establishment of a circumtropical dispersal. It must also be a conservative and stable organ which has survived the genetic upheavals incident to speciation. Differentiation of the androecium is implicated in the primary generic differentiation of subtribe Cassiinae and apparently has subsequently continued an orderly though not necessarily unidirectional progress of specialization. By contrast the pod and seeds have undergone profound changes unaccompanied by perceptible alteration in the flower (cf. *S. alata* and *S. reticulata*), a situation that students of Leguminosae will recognize as familiar.

The sectional synopsis of *Cassia* subgen. *Senna* presented in Bentham's monograph (1871, p. 513) is based primarily on carpology. On close acquaintance, however, the reader finds that the pod was not in reality of paramount concern in Bentham's system which is based rather on intuitive sorting of multiple similarities. Where inconvenient (e.g. ser. *Confertae*), the pod was ignored. Although we have shifted primary emphasis from the fruit to the organization of the flower,

our classification is based foursquare on that of Bentham's subgenus *Senna*. Except for minor details, relating to species incompletely known a century ago, our infrageneric groups are, unless enriched by taxa described since 1871, those formulated by Bentham or adapted by him from Colladon and Vogel. The nomenclature, following transfer from *Cassia* to *Senna*, is of course different, and reevaluation of the so-called basal petiolar gland of sect. *Oncolobium* (=ser. *Basiglandulosae*) of the basipetal seeds of sect. *Prososperma* (=ser. *Trigonelloideae*) has induced us to demote these sections of subgen. *Senna* to serial status in sect. *Chamaefistula*. The sections are presented in an order that reflects our views on evolutionary specialization of the perianth and androecium and, we believe, a rational recapitulation of the phylogeny.

Key to Sections of genus *Senna* Represented in the Americas

1. Stems and lvs pubescent with simple hairs or setae, or glabrous.
 2. Fertile stamens 10; 2 spp. cultivated and weakly naturalized from Old World.

A. sect. *Psilorhegma* (p. 77).
 2. Fertile stamens usually 7, the 3 adaxial ones reduced to staminodes (or absent), the fertile ones more rarely reduced to 6, 5, or 4.
 3. Venation of sepals palmate from insertion, rarely conspicuous, often immersed or almost so; bracteoles 0 except in one woody N. American sp. with asymmetrical corolla and thornlike stipules; range of the genus.
 4. Flower exactly zygomorphic or, if the petals randomly asymmetrical, then the pistil centric.
 5. Two long (antepetalous) abaxial stamens incurved together in a plane opposed to the vexillar petal, divergent from one another at a narrow angle or contiguously subparallel.

B. sect. *Chamaefistula* (p. 82).
 5. Two long, structurally antepetalous abaxial stamens raised sideways into the plane horizontal to the floral axis of symmetry, the incurved anthers opposed to one another like the arms of tongs.

D. sect. *Senna* (p. 455).
 4. Flower strongly asymmetrical, one abaxial petal (alternately right and left following the raceme axis) strongly modified in shape, texture or both and opposed to the laterally displaced pistil.

F. sect. *Peiranisia* (p. 486).
 3. Venation of the subequal, glumaceous sepals parallel, the veins at once prominulous and closely crowded; pedicels bracteolate at base; herbs from xylopodium, of s.-e. Paraguay and adjacent Brazil (1 sp.).

E. sect. *Paradictyon* (p. 484).
1. Stems and lvs densely pubescent with stellate hairs; shrubs of Mexico and Bahamas (1 sp.).

C. sect. *Astroites* (p. 452).

A. Sectio PSILORHEGMA (Vogel) Irwin & Barneby

Senna sect. **Psilorhegma** (Vogel) Irwin & Barneby, comb. nov. *Cassia* sect. *Psilorhegma* Vogel, Syn. Gen. Cass. 8, 47–48, exclus. B. spp. brasiliens. 1837, emend. Bentham, Fl. Austral. 2: 284. 1864 & Trans. Linn. Soc. London 27: 554. 1871.—Sp. typica (Symon, 1966, p. 77): *Cassia glauca* Lamarck = **Senna sulfurea** (Colladon) Irwin & Barneby.—*Cassia* subgen. *Psilorhegma* (Vogel) Baker in Hooker f., Fl. Brit. Ind. 2(5): 265. 1878. *Psilorhegma* (Vogel) Britton & Rose, N. Amer. Fl. 23(4): 255, pro gen. 1930.

Everything of sect. *Chamaefistula* except the androecium, this functionally 10-merous, the anthers all similar in form but a trifle accrescent toward abaxial side of fl, the thecae dehiscent at apex through the glabrous lateral sutures, these sometimes more deeply separating in age.—Spp. ±32, most numerous and morphologically diverse in Australia (cf. Symon, 1966, spp. 22–48), few extending n. into India, Indonesia and s. China and e. through Micronesia to Hawaii; ours locally naturalized arborescent shrubs with ample, dorsally glaucescent foliage,

stipitate petiolar glands, zygomorphic corollas, plano-compressed papery pods and transverse lustrous seeds compressed parallel to the pod-valves, an areole on each face.

Key to Species of sect. *Psilorhegma*

Naturalized in the Americas

1. Lvs 14–30 cm, the longer interfoliolar segments of rachis 13–33 mm; lfts 4–6(–7) pairs, the longest (distal or penultimate) lfts mostly 4.5–8.5 cm; innermost sepal 8–11.5 mm and longest petal (20–)23–30 mm; style 4–6.5 mm; stipe of pod 10–20 mm, the body 12–17(–20) × 1.3–1.8 cm; seeds ±6–7 mm. 1. *S. sulfurea* (p. 78).
1. Lvs 8–18 cm, the longer interfoliolar segments of rachis 9–15(–17) mm; lfts 6–10 pairs, the longest lfts (2–)2.5–4.5(–5) cm; innermost sepal 5.5–7.5(–8) mm and longest petal (16–)18–24 mm; style 2–3 mm; stipe of pod 5–7 mm, the body 7–10 × 1.1–1.5 cm; seeds ±5–6 mm. 2. *S. surattensis* (p. 81).

1. ***Senna sulfurea*** (Colladon) Irwin & Barneby, comb nov. *Cassia sulfurea* DeCandolle ex Colladon, Hist. Casses 84. 1816.—“Hanc Prof. de Candolle descripsit florentem mense novembri anni 1803 in horto Parisino.”—No typus found at G, MPU, or P, but the plant in G-DC labelled ‘*Cassia sulfurea* Ile de France ou de Bourbon, Muséum de Paris, 1821’ is considered authentic.—Recognized by DeCandolle himself, 1825, p. 495, as conspecific with *Wellia tagera* Rheede.

Cassia glauca Lamarck, Encycl. Méth. 1: 647. 1785.—“... dans les environs de Pondichéry [s.-e. peninsular India]. M. Sonnerat nous en a communiqué des morceaux chargés de fleurs & de jeunes fruits.”—Holotypus, P-LAMK!—Equated by Lamarck with *Wellia tagera* Rheede, 1686, l.c. infra.—Non *Senna glauca* Roxburgh, 1832, quae = *Cassia timorensis* DC.

Cassia arborescens Vahl, Symb. bot. 3: 56. 1794.—“Habitat in India orientali. KÖNIG.”—Holotypus, labelled (verso) “*Cassia arborescens*. Ind. Orient. *Wellia tagera* Hort. Malab.,” C (hb. Vahl.)!—Equated by Bentham, 1871, p. 555, with *C. glauca*, and by Vahl himself with *Wellia tagera* Rheede, 1686, q.v. infra.—*Senna arborescens* (Vahl) Roxburgh, Fl. Indica 2: 345. 1832, nom. illegit.—Non *Cassia arborescens* P. Miller, 1768, quae = *Senna atomaria* nob.

Cassia enneaphylla König ex Wight & Arnott, Prod. Fl. Pen. Ind. 1: 289. 1834, pro syn.

Cassia petropolitana Glaziov, 1905, p. 161, nom. nud.—“Petropolis . . . au Alto Serra, Rio [de] Jan[eiro, Brazil], no. 10684.”—Spm. authent., Glaziov 10684, K = IPA Neg. 1167, P!—Equated with *C. glauca* by Harms in Fedde, Repert. Sp. Nov. 20: 124. 1924.

Wellia tagera Rheede, Hort. Ind. Malabar. 6: 17, t. 9 (fl), 10 (fr, ambae optima!). 1686.—Equated with *Cassia glauca* by Hasskarl, Hort. Malabar. clav. locupletiss. 47. 1867, and all other commentators.

Flos flavus Rumphius, Herb. Amboin. 4: 63, t. 23 (mediocris). 1743.—Identified by Merrill, Herb. Amboin. 258. 1917.

Cassia planisiliqua sensu N. L. Burman, Fl. Ind. 96. 1768, quoad descr., exclus. basionym. *C. planisiliqua* Linnaeus quae = *Senna occidentalis* (Linnaeus) Link.—Spm. authent.: *Cassia planisiliqua*. Juxta Malayenses *Cambang cuning* . . . a Rumphio vocata *Flos flavus*, G (hb. Burman.)!—Strangely equated by *Index Kewensis* with *Albizzia lebbek*.—*Psilorhegma planisiliqua* sensu Britton & Rose, 1930, p. 255; Little, Woodbury & Wadsworth, Trees Pto. Rico, Second Vol., fig. 372. 1974.

Cassia surattensis sensu De Wit, 1955, p. 269; Isely, 1975, p. 129 (var. *surattensis*), map 58 (cult. in Florida), p. 209; K. & S. Larsen, J. Nat. Hist. Siam. Soc. 25(3–4): 205. 1974; Saldanha & Nicolson, Fl. Hassan distr. Karnataka 221, 1976; Srivastava, Fl. Gorakhpur. 120. 1976; V. Singh, Bull. Bot. Surv. India 18(1–4): 90. (“1976”) 1979.

Cassia glauca sensu Colladon, 1816, p. 102; DeCandolle, 1825, p. 495; Wight & Arnott, Prod. Fl. Pen. Ind. Or. 1: 289. 1834; Vogel, 1837, p. 26; Gagnepain in Lecomte, Fl. Gén. de l’Indochine 2(2): 159. 1913; Fawcett & Rendle, 1920, p. 110; Ridley, Fl. Malay Pen. 1: 616. 1922.

Amplly leafy arborescent shrubs at anthesis 2–6 m, appearing glabrous, but the young stems, lf-stalks and axes of inflorescence strigulose with fine straight ap-

pressed hairs up to 0.15–0.3 mm, the thin-textured lfts notably bicolored, above dull dark green brunnescenscent when dry and glabrous, beneath pallid or glaucous and glabrous or nearly so except for puberulent midrib, sometimes sparsely ciliate, the corymbiform racemes of large handsome fls at first axillary and lateral but commonly paniculate distally, immersed in or shortly exerted from foliage.

Stipules firmly herbaceous, falcately ascending, linear attenuate at both ends (3–)6–15 × 0.6–1.3 mm, dorsally 1-nerved, deciduous before the lf.

Lvs 14–30 cm; petiole 3–5.5(–6.5) cm, at middle 1–2.5 mm diam, subterete except for the broad shallow ventral sulcus; rachis (4–)5–15 cm, its longer interfoliolar segments 1.3–3.3 cm; glands between (1–)2–4 proximal (never between distal) pairs, stoutly stipitate, in profile 1.5–2.6 mm tall, the ovoid or ovoid-ellipsoid acute or obtuse body 0.6–1 mm diam; pulvinules 2.5–5 mm, densely pubescent; lfts 4–6(–7) pairs, accrescent distally, in outline subsymmetrically broadly elliptic, ovate- or obovate-elliptic obtuse mucronulate or minutely emarginate, the longest (distal or penultimate) pair (4–)4.5–8.5 × 2–3.8 cm, 2–2.7 times as long as wide, the tapering midrib cariniform beneath, the 7–11 pairs of fine campitodrome with intercalary secondary nerves and delicate reticulum discolored and sometimes subprominulous beneath, essentially immersed above.

Peduncles stout ascending 3–9(–13) cm; racemes 3–45 (commonly 7–15)-fld, the several simultaneously expanded fls raised beyond succeeding buds, the scarcely elongating axis becoming 1–6 cm; bracts early reflexed, thinly herbaceous ovate-triangular or broadly lanceolate (2–)2.5–8 × 1.5–3 mm, persistent into anthesis, then dry deciduous, the proximal ones (sometimes all) subtended on one side by a stipitate gland resembling those of lf-stalk; pedicels at and after anthesis 2.2–4.2 cm; fl-buds nodding when young, subglobose glabrous or basally puberulent; sepals thinly herbaceous, pale green or commonly reddish-brown with pale submembranous replicate margins, strongly graduated, the outermost one broadly ovate 3–5.5 mm, the innermost suborbicular (elliptic-obovate) obtuse 8–11.5 mm; corolla zygomorphic, the bright yellow petals drying orange- or pinkish-brown, dorsally puberulent along veins, nearly isomorphic, beyond the slender claw broadly ovate or oblong-obovate (2–)2.3–3 cm; androecium functionally 10-merous, the stamens alike except slightly accrescent toward abaxial side of fl, the filaments of 7 adaxial ones 0–1.5 mm, of 2 latero-abaxial (0–)1–2.5 mm, of the centric abaxial one 2–5 mm, the anthers all slenderly lanceolate in outline, straight except for slightly porrect conical tip, firm brown glabrous, dorsoventrally sulcate, ridged laterally by the prominulous sutures, (1.5–)1.6–2 mm wide, the centric abaxial anther 6–7.7 mm, the rest 4.8–6.8 mm, all alike dehiscent apically by short lateral slits; ovary strigulose, the pistil early glabrate; style filiform, erect except at gently incurved conic tip, 4–6.5 mm, just below the minute terminal stigmatic cavity 0.2–0.35 mm diam; ovules 23–32.

Pod obliquely pendulous, the stipe 1–2 cm, the broadly linear plano-compressed body when fully fertile 12–17 × 1.3–1.8 cm, straight or slightly decurved, 2-carinate by the slender, shallowly undulate sutures, the papery valves fuscous-brown often paler along the edges, obscurely elevated over ripe seeds, narrowly septiferous between them, the 1-seriate locules 4.5–6 mm long extending the width of the cavity; seeds transverse, compressed parallel to the valves, oblong-elliptic in profile ±6.3–7 × 3.5–4 mm, the smooth testa lustrous castaneous, the narrowly oblong-elliptic areole ±4.5–5 × 1.2–1.5 mm.—Collections: 34.

Native to tropical India and Burma, from remote times cultivated for shade and ornament and thereby widely dispersed through Indomalaysia, becoming naturalized in disturbed forest, in hedges and waste places, long established on Mauritius (prior to 1835) and in the West Indies (Bahamas, Cuba, Jamaica prior

to 1814, Martinique, Montserrat, Barbados), and locally in s.-e. Brazil (Sa. dos Orgãos, Rio de Janeiro). The genuine native range in continental Asia is obscure to us and its secondary dispersal is clouded in the literature by taxonomic confusion with closely related *S. surattensis*; reports from Fiji and New Hebrides are based on *S. gaudichaudii* (H. & A.) Irwin & Barneby.⁴

We here follow Britton & Rose (1930) and agree with V. Singh (1979, l.c.) in maintaining two specific taxa segregated from the heterogeneous concept of *Cassia glauca* defined in Bentham's revision (1871). In *Flora Australiensis* (1864) Bentham had accepted a *C. suffruticosa* (our *Senna surattensis*) distinct from *C. glauca* sens. str. (our *S. sulfurea*), but later found it impossible to sort his Indian material even into two varieties. Primary or exclusive emphasis on size of leaflets and glaucescence of their dorsal face would lead anyone to the same conclusion, for in these respects both species are variable and appear fully confluent. On the other hand we have found that the relatively small and slightly more numerous leaflets traditionally attributed to *S. surattensis* (*C. suffruticosa*) are consistently associated with a small brachystylous flower that gives rise to a shorter, narrower, more shortly stipitate pod. Like us, Isely (1975, l.c.) has seen two taxa in the complex, which he evaluates as varieties of *Cassia surattensis*, mentioning in support of them chromosome counts by Pantulu (1960) which suggest that *S. surattensis* ($n = 28$) is a tetraploid derivative of diploid *S. sulfurea* ($n = 14$), perhaps not known in a genuinely wild state. We have not seen vouchers for these counts, however, which will require careful checking because of the taxonomic and nomenclatural confusion that has followed Bentham's comprehensive definition of *C. glauca*, a confusion which has contaminated the literature of the past century and has left the exact native range of each segregate species still to be defined. This problem is, however, peripheral to our present purpose.

Senna surattensis and *S. sulfurea* are the only two genuine sennas with ten fertile stamens encountered outside gardens in the New World, and are thus readily identified to section when in flower. In fruit they become somewhat generalized sennas without striking individuality except for the glaucescent foliage and the stipitate gland, unfortunately not reliably present in all plants, that subtends the proximal floral bracts of the raceme. In the West Indies, where the question is most likely to arise, they will be recognized in fruit by the combination of ample obtuse leaflets and relatively broad plano-compressed pod shallowly undulate along the sutures.

Roots, bark and leaves of *Cassia glauca* auct., probably meaning our *Senna sulfurea*, enter into folk medicines of India and Indomalaya prescribed for treatment of gonorrhea, gout, diabetes and arthritis, and the flower-buds are eaten in salad. Both *S. surattensis* and *S. sulfurea* are cultivated primarily for shade and ornament, being prized for rapid growth and prolific flowering over long successive periods but furnishing at best a soft and perishable wood.

Particular attention must be drawn to our changed interpretation of *Cassia surattensis*, which runs contrary to modern practice. De Wit (1955, p. 269) applied the epithet *surattensis* erroneously to the species with larger flower and fewer ample leaflets, our *S. sulfurea*, a mistake that might have been avoided by closer analysis of the protologue, which describes the leaflets as eight pairs. Burman simultaneously described *C. surattensis* sensu De Wit, recognized as the *Flos flavus* of Rumphius, under the name *Cassia planisilqua*, a Linnaean binomial

⁴ *Senna gaudichaudii* (Hooker & Arnott) Irwin & Barneby, comb. nov. *Cassia gaudichaudii* Hooker & Arnott, Bot. Beechey Voy. pt. 2: 81. 1832.

technically synonymous with *S. occidentalis* (Linnaeus) Link. While the epithet *surattensis* must be adopted for the species known latterly as *Cassia suffruticosa*, the earliest epithet available and legitimate in *Senna* for the related, large-flowered species is apparently *sulfurea*. *Cassia discolor* Desvaux, which has a short priority over *C. sulfurea*, has been considered a synonym (Bentham, 1871), but is based on a mixture of foliage of *S. pallida* and mismatched fruit of *S. sulfurea*, and herein is typified by the “discolorous” foliar element of the typus. The true identity of *C. surattensis* was first appreciated, according to annotation of the holotypus at Geneva, by Drs. K. and S. Larsen in 1978.

2. *Senna surattensis* (N. L. Burman) Irwin & Barneby, comb. nov. *Cassia surattensis* N. L. Burman, Fl. Indica 97. 1768—“*Senna surattensis* Garzin [=Laurent Garcin] herb.”—Holotypus, originally labelled ‘*Cassia sumatrensis*’ but the epithet corrected in an old hand to ‘*surattensis*,’ G (hb. Burman. annotated as typus by K. Larsen, 1978)!—Wrongly equated by Colladon, 1816, p. 105, with *Cassia auriculata*, and by DeCandolle, 1825, p. 495, with *C. glauca* and illegitimately reduced to it; restored by Merrill, Philip. J. Sci. 19: 353. 1921 but wrongly applied by De Wit, 1955, p. 269 and consequently by several modern writers, to our *S. sulfurea*.

Cassia fastigiata Vahl, Symb. Bot. 3: 57. 1794.—“Habitat in India orientali. KÖNIG.”—Caret in hb. Vahl., C!, but the protologue decisive and referred by Vahl himself (ms., C) to *Cassia glauca*.—Listed by Bentham among many synonyms of *Cassia glauca*, this name was overlooked by De Wit, 1955.

Cassia suffruticosa Roth, Nov. sp. pl. 213. 1821.—“. . . communicavit celeberrimus HEYNE ex India Orientali.”—Collected presumably by König, no typus found, but the protologue decisive. Referred by Bentham, 1871, p. 555, to synonymy of *C. glauca*.—*C. glauca* var. *koenigii* Kurz, J. Asiatic Soc. Bengal 45(2): 284. 1876. *C. glauca* var. *suffruticosa* (Roth) Baker in Hooker f., Fl. Brit. Ind. 2: 265. 1878. *Psilorhegma suffruticosa* [sic] (Roth) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 255. 1930. *Cassia surattensis* subsp. *suffruticosa* (Roth) K. & S. Larsen, J. Nat. Hist. Siam. Soc. 25(3-4): 205. 1974. *Cassia surattensis* var. *suffruticosa* J. R. Sealey ex Isely, Mem. N.Y. Bot. Gard. 25(2): 129, 209. 1975, illegitimate because the varietal epithet *koenigii* prior.

Senna speciosa Roxburgh, Fl. Ind. 2: 347. 1832.—“. . . only found in gardens . . .”—Lectotypus, cult. in India, K. (hb. Benth.)!—Equated with *C. suffruticosa* by Wight & Arnott, Prod. Fl. Pen. Ind. 1: 289. 1834.

Cassia surattensis sensu Bentham, 1871, p. 55, ex parte; Symon, 1966, p. 100, quoad descr.; Chun & Chang, Fl. Hainanica 2: fig. 421. 1965; Walker, Fl. Okinawa and s. Ryuku Is. 546, fig. 74. 1976.

Cassia suffruticosa sensu Wight & Arnott, 1834, l.c. supra; Bentham, Fl. Austral. 2: 285. 1864; Iconogr. Cormophyt. Sinic. 2: fig. 2413. 1972. *C. glauca* var. *suffruticosa* sensu Gagnepain in Lecomte, Fl. Gén. de l’Indochine 2(2): 160. 1913; Gamble, Fl. Presidency Madras 1(3): 403. 1919; V. Singh, Bull. Bot. Surv. India 18(1-4): 91. (“1976”) 1979.

Like closely related *S. sulfurea* except for more numerous, smaller lfts, smaller brachystylous fls and shorter, short-stipitate pod, the young growth and almost always the dorsal face of lfts pilosulous with ascending or subappressed, often lutescent hairs to 0.2–0.45 mm, the lfts strongly bicolored, glaucous beneath, the mature inflorescence commonly corymbose-paniculate toward the end of densely leafy annotinous branchlets.

Stipules (of *S. sulfurea*) 4.5–13 × 0.5–1.4 mm.

Lvs 8–18 cm; petiole 2–3.5(–4) cm; rachis (4–)4.5–10.5 cm, its longer interfoliolar segments 9–15(–17) mm; glands between 1–3 proximal, commonly only between first or first and second pairs of lfts, stipitate, slenderly or stoutly claviform, in profile 1–2.4 × 0.3–0.7 mm; lfts 6–10 pairs, strongly accrescent and proportionately narrower distally, obovate, elliptic-obovate or broadly oblanceo-

late obtuse, the longest (distal or penultimate) pair $(2-2.5-4.5(-5) \times (0.8-)1-1.8(-2)$ cm, 2.2–3 times as long as wide, veined like those of *S. sulfurea*, but the major camptodrome secondary veins only 6–8(–9) pairs.

Peduncles $(2.5-)3-8$ cm; racemes shortly densely 5–17(–21)-fld, the axis becoming 4–25 mm; bracts thinly herbaceous ovate- or broadly lance-acuminate $(2-)2.5-7 \times (1-)1.2-2.6$ mm, persistent into anthesis, then deciduous, the lowest occasionally subtended on one side by a claviform gland; pedicels at and after anthesis 16–25 mm; outermost sepal 3–4(–4.4) mm, innermost one 5.5–7.5(–8) mm; corolla of *S. sulfurea* but on average smaller, the longest petal $(16-)18-24$ mm; androecium of *S. sulfurea*, 9 filaments 0.7–2 mm, that of the centric abaxial stamen 1.5–3.5 mm, anthers of 9 stamens $4-5.2 \times 1.1-1.5$ mm, that of the centric abaxial one $(4.5-)5-6.5 \times 1.1-1.6$ mm; style 1.5–3 mm; ovules $(18-)22-30$.

Stipe of pod 5–7 mm, the body $7-10 \times 1.1-1.5$ cm, in other respects not different from that of *S. sulfurea*; seeds essentially similar but a trifle smaller, $4.9-5.9 \times 2.5-3.4$ mm, the areole $2.7-3.6 \times 1.2-1.8$ mm.—Collections: 27.—Fig. 10 (androecium), 13 (pod, seed).

Of obscure origin, thought by Bentham (1864) to be native to coastal n. Australia (N. Terr. and offshore islands) but characterized by Symon (1966) as probably an old introduction there, in India, Burma, Indochina, Philippine Is. and Malaysia planted in parks, gardens and temple yards, whence locally adventive, of uncertain status on the Caroline and Society Is., a common locally weedy ornamental on Oahu in Hawaii; cultivated in subtropical United States and locally established in s. peninsular Florida (Dade Co.); in West Indies cultivated before 1826 on St. Vincent, Windward Is., and latterly in Puerto Rico.

For comment see above under *S. sulfurea*. We gratefully acknowledge the help of Mrs. A. Fox Maule, curator of type specimens at the Botanical Museum in Copenhagen, for help in interpretation of *C. arborescens* and *C. fastigiata* and for supplying us with copies of Vahl's notes on these species, no longer represented by specimens in his herbarium.

B. Sectio CHAMAEFISTULA (Colladon) Irwin & Barneby

Senna sect. **Chamaefistula** (Colladon) Irwin & Barneby, comb. nov. *Cassia* sect. *Chamaefistula* DeCandolle ex Colladon, Hist. Casses 21, 87. 1816.—Sp. lectotypica (hoc loco designata): *Cassia corymbosa* Lamarck \equiv **Senna corymbosa** (Lamarck) Irwin & Barneby.—For further synonymy see under ser. *Coluteoideae*.

Corolla and pistil zygomorphic or the lateral and abaxial petals sometimes randomly asymmetric, but one of the abaxial petals not obviously different from the rest and the fls not enantiostylous; androecium consisting of 3 abaxial staminodes (exceptionally suppressed) and 7 or rarely fewer fertile stamens, these either subisomorphic except for graduated lengths or differentiated into heteromorphic sets of 4 median and 3 abaxial, one of the latter set often substerile (rarely the whole set suppressed), the antepetalous abaxial pair directed in a plane opposed to the vexillary petal (not horizontal to the corolla's vertical axis).—Petiolar glands present or 0; pod plano-compressed, turgid, angulate or terete, the valves papery, coriaceous or lignescant when mature, the cavity dry or pulp-filled; dehiscence by inert separation of both sutures, or through the ventral suture only, less often through apex and thence downward through both sutures, or 0, the seeds then released either by rotting of the valves or dispersed in 1-seeded achenelike segments; seeds either transverse or obliquely basipetal, compressed

parallel either to valves or to interseminal septa, exceptionally angulate or rhomboid, the testa areolate or not.—The section is represented in the Americas by 143 (described) species here referred to 21 series, mostly confined to the tropics, few extending north and south into warm (exceptionally cold or high montane) temperate zones.

Our comprehensive concept of sect. *Chamaefistula* as defined in the foregoing description embraces all of Bentham's section of the same name except his ser. *Excelsae*, all of his sect. *Prososperma* except *S. villosa* (our sect. *Astroites*), sect. *Oncolobium* in its entirety, and those elements of his sect. *Chamaesenna* characterized by a zygomorphic corolla and forwardly directed long abaxial stamens, namely the ser. *Pachycarpae*, *Auriculatae* and miscellaneous species of ser. *Floridae*. Our devaluation of characters derived from petiolar glands and orientation of seeds upon which the sections *Prososperma* and *Oncolobium* were based by Vogel or maintained by Bentham is discussed under ser. *Basiglandulosae* and ser. *Laxiflorae*. Arguments in support of a sect. *Peiranisia*, composed of ser. *Excelsae* excised from sect. *Chamaefistula* and the greater part (but of course not the typical element) of sect. *Chamaesenna*, are advanced in discussion following the generic description of *Senna*. The section *Chamaefistula*, which was designed in the first place to accommodate the sennas with terete, internally pulpy pods, that is for such *Bacillares* and *Coluteoideae* as were known to DeCandolle by 1816, long ago lost by accretion of new taxa its exclusive carpological character. Bentham was fully aware that a distinction between turgid and laterally flattened pods did not correspond with a natural classification and recognized his sections *Chamaefistula* and *Chamaesenna* for categories of convenience. In this revision the concept of a section *Chamaesenna* is abandoned, and that of *Chamaefistula* reorganized in terms of the flower.

The 21 series of sect. *Chamaefistula* appear to fall into eight clusters corresponding with nos. i–ii, iii–v, vi–vii, viii–ix, x–xi, xii–xv, xvi–xviii and xix–xxi, but the phyletic kinship between these groups is unknown. A linear sequence of presentation is therefore inescapably arbitrary. Some weak speculation on the subject of interserial relationships is reserved for the commentary following the description of particular series.

Key to Series of sect. *Chamaefistula*

1. Junciform shrubs of Mohave and Colorado deserts (California and Baja California, w. Arizona and s. Nevada) with small, early deciduous exstipulate lvs and retrorsely pubescent stems. xv. ser. *Armatae* (p. 291).
1. Normally leafy (but sometimes microphyllous) herbs, shrubs and trees, if sympatric with the last the lflets ample and the lvs stipulate.
 2. Dwarf subcaulescent herbs with 2-foliolate lvs and 1–2-fl racemes, the lflets pallidly corneous-margined.
 3. Texano-Mexican; lflets narrowly lanceolate or oblanceolate; anthers of fertile stamens subhomomorphic except slightly accrescent toward abaxial side of fl. xiii. ser. *Tharpia* (p. 288).
 3. Argentino-Uruguayan; lflets obovate; anthers of fertile stamens differentiated into 2 sets. xiv. ser. *Nanae* (p. 290).
 2. Caulescent herbs, shrubs and trees; if lvs 2-foliolate or stems short (or both) the lflets not corneous-margined.
 4. Petiolar gland present, either between or below the proximal pair of lflets.
 5. Gland(s) inserted between pairs of pulvinules or slightly above them.
 6. Seven fertile stamens homomorphic except slightly accrescent toward abaxial side of fl, the anthers obliquely or horizontally truncate at orifice, sometimes attenuate toward apex but not beaked; pod mostly erect or erect-ascending; herbs (some weakly suffrutescent) of centr. and n. Mexico

- and s.-w. United States, and 1 widely dispersed to Antilles, Ecuador and Brazil.
7. Perennial; valves of pod plane or shallowly corrugated, not deeply sulcate between seeds; ovules 14–44; Mexico and United States.
xii. ser. *Brachycarpae* (p. 260).
 7. Monocarpic; valves of pod deeply corrugated between seeds; ovules 6–12; 1 widespread weedy sp.
xi. ser. *Confertae* (p. 257).
 6. Seven fertile stamens modified into sets of 4 shorter straighter (median) and 3 more strongly incurved (abaxial) members, the central one of the latter set often sterile and exceptionally (16. *S. hayesiana*, p. 133) the whole set lacking; pod commonly but not always widely spreading to pendulous.
 8. Anthers of 2–3 fertile abaxial stamens distinctly beaked, the beak \pm correctly incurved and its orifice oblique.
 9. Lfts exactly 1 or exactly 2 pairs in all lvs.
 10. Trees, vines and erect or leaning shrubs over 1 m at maturity; lfts always 2 pairs; widespread.
 11. Pod turgid, quadrangular or terete, less often compressed-quadrangular, often but not always pulpy within, at least 50-ovulate except 1 sp. endemic to Jamaica; spp. very numerous and widespread throughout the American tropics.
iv. ser. *Bacillares* (p. 102).
 11. Pod plano-compressed papery, dry within, 30–42-ovulate; 1 sp. of Bahia, Brazil.
v. ser. *Harleyanae* (p. 209).
 10. Herbs, occasionally weakly suffrutescent but seldom over 1 m; lfts either 1 or 2 pairs.
x. ser. *Trigonelloideae* (p. 237).
 9. Lfts of some or all lvs more than 2 pairs.
 12. Pedicels charged, either at base on one side or near (above) the middle with a fusiform or claviform gland.
 13. Petiolar gland (between proximal pair of lfts) like that of the pedicels, fusiform or claviform.
 14. Pedicellar gland inserted near or beyond middle of pedicel; valves of pod plane, not ribbed lengthwise.
viii. ser. *Coriaceae* (p. 220).
 14. Pedicellar gland subtending base of pedicel; valves of pod charged with an accessory nerve running parallel and sometimes contiguously to the ventral suture.
ix. ser. *Laxiflorae* (p. 225).
 13. Petiolar gland patelliform; pedicellar gland of ser. *Laxiflorae* combined with plane pod of ser. *Coriaceae*.
58. *S. kuhlmannii* (p. 224).
 12. Pedicels glandless.
 15. Lfts of larger lvs more than 2 but not more than 5 pairs; coarse herbs (if led hither by an arborescent shrub cf. 55. *S. skinneri*, p. 218).
x. ser. *Trigonelloideae* (p. 237).
 15. Lfts of some larger lvs more than 5 pairs.
 16. Sepals ample, at anthesis connivent over the petals and androecium; ovules ± 200 ; valves of pod continuous; rare cauliflorous tree of sub-Andean e. Ecuador and Peru.
iii. ser. *Trolliflorae* (p. 100).
 16. Sepals much shorter than the widely expanded corolla; ovules less than 70; not cauliflorous; ripe pod breaking up into 1-seeded segments.
 17. Riparian bush-ropes and scandent shrubs armed with indurated conical, thornlike stipule-bases; lfts broadest at or below middle; ovules 30–66.
vi. ser. *Spinescentes* (p. 210).
 17. Xerophytic arborescent shrubs, unarmed, lfts broadest above middle; ovules 16–24.
vii. ser. *Skinneranae* (p. 217).
 8. Anthers of 2–3 abaxial stamens not beaked (if exceptionally attenuate into a short-tubular beak, this symmetrically truncate); 3 series effectively differentiated only by characters of pod and seed.

18. Pod either plano-compressed or (less often) turgid, but if turgid the seeds areolate; seeds mostly lying broadside to the valves (in s. Andean 99. *S. arnottiana*, p. 316, broadside to interseminal septa, but then not over 14 in number); ovules nearly always less than 28.
 19. Seeds areolate; Andean and Pacific S. America; montane and desert Mexico and Central America.
 xvi. ser. *Pachycarpae* (p. 293).
19. Seeds exareolate; Andes from Ecuador to Chile and n.-w. Argentina; Atlantic s. Brazil.
 xvii. ser. *Stipulaceae* (p. 324).
18. Pod cylindric or strongly turgid, the seeds lying broadside to the interseminal septa, exareolate, and relatively numerous, the ovules 28–152 (in rare Peruvian *S. lasseigniana* only 22–26).
 xviii. ser. *Coluteoideae* (p. 345).
5. Gland inserted on petiole at variable distance below the proximal pair of lflets, often contiguous to the lf-pulvinus (lflets commonly several pairs, if only 1 pair cf. rare Peruvian 51. *S. acuparata*, p. 202).
20. Anthers of 2 long antepetalous abaxial stamens prolonged beyond the orifice into a thickened linguiform appendage; style usually both recurved and distally dilated, or the stigmatic orifice elongate and introrse; tropical and warm-temperate, from s. and s.-w. United States to Argentina, where sympatric with the next represented by an adventive monocarpic weed.
 xix. ser. *Basiglandulosae* (p. 405).
20. Anthers of 2 long antesepalous abaxial stamens truncate or obscurely 2-labiolate at apex; style not dilated, only slightly incurved, its orifice poriform; range cool-temperate, in centr. and e. United States and s.-e. Canada, and duration perennial.
 xx. ser. *Temperatae* (p. 443).
4. Petiolar gland 0.
21. Mesophytic shrubs and trees of wide tropical dispersal in West Indies and South America (1 exotic cultivated in Central America); sutures of pod not winged and its valves continuous.
22. Hypanthium of fl infundibuliform, attenuate downward to joint with pedicel; sepals thin-textured, early reflexed; staminodes linear; seeds narrowly oblong-oblancheolate in outline; native and widespread.
 i. ser. *Sapindifoliae* (p. 85).
22. Hypanthium of fl shallowly broadly obconic; sepals carnosulous (wrinkled when dry) not reflexed at anthesis; staminodes hippocrepiform; seeds subdiscoid; cult. only.
 ii. ser. *Floridae* (p. 97).
21. Xerophytic shrubs and treelets of centr. and w. Mexico; sutures of pod winged and its valves separating when ripe into individual panels over each seed.
 xxi. ser. *Galeottianae* (p. 448).

Bi. ser. SAPINDIFOLIAE Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Sapindifoliae** Irwin & Barneby, ser. nov. inter affines Americanas petiolo eglanduloso, foliis plurifoliolatis, hypanthio infundibuliformi, a ser. *Floridis* sens. restr. (gerontogeis, una per Americam calidiorem culta) sepalis membranaceis mox reflexis necnon seminibus oblongis (nec discoideis) diversae.—Sp. typica: *Cassia sapindifolia* Vogel = **Senna silvestris** var. **sapindifolia** (Vogel) Irwin & Barneby.

Cassia sect. *Chamaesenna* ser. *Floridae* *** Paniculatae Americanae Benth. Proc. Linn. Soc. London 27: 549. 1871.

Cowellocassia Britton ex Britton & Rose, N. Amer. Fl. 23(4): 251. 1930, pro gen.—Generitypus: *C. scleroxyla* Britton = **Senna domingensis** (Sprengel) Irwin & Barneby.

Corolla zygomorphic but the early reflexed sepals strongly graduated, the hypanthium infundibuliform, narrowed downward to a joint with pedicel (this most evident in sterile fls); androecium functionally 7-merous, the 3 adaxial members linear staminodal, the fertile anthers moderately firm-textured, those of 4 median

stamens shorter straight, the 3 abaxial longer (the straightish centric one a trifle shorter and narrower than its incurved neighbors), all acutely sagittate at base, at apex gradually or abruptly narrowed into a porrect beak intro-antrorsely dehiscent by 2 pores; style subangulate, scarcely or distinctly thickened distally, incurved at apex, the stigmatic cavity infraterminal introrse; ovules 10–60; pod linear or linear-oblong plano-compressed (3–)7–27 cm; seeds transverse, either 1- or 2-seriate, narrowly oblong-oblongate in outline, compressed parallel to the valves, the areole sharply defined or sometimes obscure.—Amply leafy, potentially arborescent shrubs and trees; stipules narrow fugacious; petiolar glands 0; lfts (3–)4–13 pairs; inflorescence an exserted panicle or thyrs of subcorymbose racemes.—Spp. 3, one pluriracial and widespread over lowland tropical S. America e. of the Andes, 2 narrowly endemic to e. Cuba and Hispaniola.

At least in an American context, ser. *Sapindifoliae* is a somewhat isolated group. The slenderly funnel-shaped hypanthium and asymmetrically sagittate long anthers are reminiscent of sect. *Senna* ser. *Pictae*; but the two long stamens project, at narrow angle from each other, in a plane opposed to the vexillum, and are not lifted sideways, as in ser. *Pictae*, so as to face each other in pincer fashion. In its interior organization the flower of ser. *Sapindifoliae* is almost that of ser. *Basiglandulosae*, but the pollen-cup of the long anthers is unappendaged and the characteristic petiolar gland is lacking. The small ser. *Galeottianae* is similar in the infundibuliform hypanthium and loss of petiolar gland, but these are microphyllous Mexican shrubs with obscurely beaked anthers and peculiarly dehiscent winged pods reminiscent of some Mimoseae. The paleotropical ser. *Floridae* are habitally similar to ser. *Sapindifoliae*, especially in their thyriform-paniculate inflorescence, but the hypanthium is shortly turbinate, the sepals are incrassate and not deflexed at anthesis, the three staminodes remain recognizably depauperate sterile stamens and have not dwindled as here to linear rudiments, the fertile anthers dehisce by one confluent pore, and the seeds are much broader and flatter, paddle-shaped or discoid. The resemblance to ser. *Floridae* is perhaps more superficial than real.

The series *Sapindifoliae* was perceived as such by Bentham who, however, treated it as a subgroup ("Paniculatae Americanae," without nomenclatural intent) of a heterogeneous sect. *Chamaesenna* ser. *Floridae*, dispersed in these pages between sects. *Chamaefistula* redefined and *Peiranisia*. The two rare Antillean *Sapindifoliae* were segregated by Britton & Rose as a genus *Cowellocassia*, which reflected an apparent isolation among North American sennas; but no overt acknowledgment of their relationship to the common South American *S. silvestris* was made until Pittier transferred *Cassia racemosa* sensu Bentham (non P. Mill) to the same genus.

Key to the Species of ser. *Sapindifoliae*

1. Plants of continental South America (Orinoco valley s.-ward); ovules 26–60.
 3. *S. silvestris* (p. 87).
1. Plants of e. Cuba and Hispaniola; ovules (7–)10–18.
 2. Lfts ovate-acuminate, the larger ones $\pm 1-2$ cm wide and 2.5–4 times as long; fls relatively large, the longest sepals 6.5–8 mm, longest petals 12–17 mm; pod ± 13 cm; ovules 16–18; mountainous n. slope of Oriente province, Cuba.
 4. *S. gundlachii* (p. 95).
 2. Lfts lance-acuminate, the larger ones 7–12 mm wide and 4–7 times as long; fls very small, the longest sepal 4–4.5 mm, longest petal 5–6 mm; pod 3–7 cm; ovules (7–)10–15; coastal s.-e. Cuba (Oriente) and Hispaniola.
 5. *S. domingensis* (p. 96).

3. *Senna silvestris* (Vellozo) Irwin & Barneby, comb. nov. *Cassia silvestris* Vellozo, Fl. Flum. 169, 1825.—Typus infra sub var. *silvestri* indicatur.

Subshrubs, shrubs and trees, polymorphic in mature habit and stature, often precociously flowering when not or scarcely woody but potentially arborescent, at anthesis (0.5–)2–20(–30) m tall, varying from almost glabrous to densely strigulose, pilosulous or villous-tomentulose with commonly golden or rufescent hairs up to 0.1–0.6 mm, the membrano-chartaceous, moderately bicolored dull or lustrous foliage either glabrous or pubescent on either face, the inflorescence a corymbiform panicle or elongate thyrses of densely-flowered corymbiform racemes.

Stipules caducous, erect or incurved to erect, linear-setiform or subulate 4–8 × 0.5–1 mm, absent from most mature flowering and all fruiting specimens.

Lvs (below the inflorescence) mostly 1.5–6 dm; petiole including wrinkled pulvinus 2.5–8 cm, at middle 1–2.3(–2.5) mm diam, subterete except for the very shallow open ventral sulcus; rachis (5–)8–30(–34) cm; petiolar glands 0; pulvinules 1.5–4.5(–6) mm; lfts (3–)4–11(–13) pairs, accrescent upward but usually only to a point beyond middle of rachis, thence often a little diminished, in outline symmetrically obovate-, oblong-, ovate- or lance-acuminate, obtuse mucronulate or acute, at base rounded or cordate, marginally revolute, the larger of fully developed lvs 4–13(–15.5) × 1.4–6(–6.5) cm, 1.8–4.5(–5.3) times as long as wide, the straight centric midrib depressed-sulcate above, cariniform beneath, the (8–)9–17(–18) pairs of camptodrome with random or alternating intercalary veins and subsequent venulation varying on upper face from subimmersed to finely prominulous, on the lower face from sharply delicately subprominulous to very strongly raised, then circumscribing sunken areoles.

Racemes densely (7–)10–80(–105)-flowered, the open fls elevated to or beyond level of succeeding buds, the axis scarcely elongating, together with stout spreading-incurved peduncle becoming (2–)2.5–16(–23) cm; bracts caducous from below very young fl-buds, ovate acute or lanceolate 1.2–2.5 mm; pedicels (excluding hypanthium) at and after anthesis (14–)18–36(–40) mm; fl-buds obovoid or subglobose, puberulent proximally or rarely puberulent up to periphery of inner sepals, these however ciliolate; hypanthium 2–3.5(–4) mm; sepals submembranous yellowish, brownish or livid with paler edges, concavely obovate-suborbicular or oblong-obovate, strongly graduated, the 2 outer 3.5–5.5 mm, the innermost (6.5–)7–12(–13) mm, all early deflexed; petals glabrous yellow with darker yellow-orange veins or yellow with red flare at base, strongly clawed, subhomomorphic, their blades symmetrically broadly obovate or flabellate obtuse or widely emarginate, the longest (claw included) 13–23 (exceptionally 9–13) mm; androecium functionally 7-merous glabrous (the anthers rarely remotely pilosulous), the 3 staminodes linear, the filaments of 4 median stamens 2–3.5(–4.3) mm, of 3 abaxial ones (3.5–)4.5–7(–8) mm, those of the 2 long stamens dilated distally, the anthers all sagittate basally, those of 4 median stamens nearly straight 3–6 mm, their correct biporose beak 0.6–1.2 mm, that of the centric abaxial stamen linear-lanceolate straight (3.5–)4–7.5 × 0.8–1.3(–1.5) mm, those of 2 latero-abaxial ones lunately lanceolate in outline (5–)6–10.5(–11) mm, at insertion of filament 1.3–2.2 mm diam, the often obscurely differentiated erect beak (0.5–)0.7–1.7 mm, its orifice divided by a slender septum; ovary either glabrous, pilose-ciliate along sutures, or pilosulous overall; style 2–4 mm, at apex incurved, slightly thickened (0.3–)0.35–0.7 mm diam, the stigmatic cavity introrsely lateral, minutely barbelate; ovules 26–60.

Pod obliquely declined or pendulous, the stipe 5–12 mm, cuneately expanded

into the body, this linear or linear-oblong plano-compressed straight or slightly decurved $(8-10-27 \times 1-3.3 \text{ cm})$, bicarinate by the scarcely thickened sutures, the glabrous or early glabrate, reddish or purplish-castaneous, often paler-margined valves becoming chartaceous or subcoriaceous \pm lustrous, either finely or very coarsely venulose, low-corrugate over seeds, the transverse seed-locules either 1-seriate homomorphic oblong-elliptic in outline or 2-seriate and alternately oblong and bottle-shaped, the scarcely elevated septa $3-5.5 \text{ mm}$ apart; seeds narrowly oblong or oblong-ob lanceolate $5.3-8 \times 2.3-3 \text{ mm}$, the brown, castaneous or atropurpureous testa smooth and lustrous, the shadowy and obscure or precisely differentiated areole linear or linear-elliptic $3-5 \times 0.5-1.3 \text{ mm}$.

Study of the extensive material that has accumulated in herbaria under the names *Cassia sylvestris*, *C. lucens* (or *racemosa*, misapplied) and *C. sapindifolia* demonstrates that the differential characters of number and outline of leaflets upon which Benthams principally relied to distinguish these species are no longer decisive, failing to coincide with morphological discontinuities or with patterns of dispersal. A search for more reliable criteria in the androecium or corolla merely confirms the fact, already perceived by Benthams, that granted some variation in size these are essentially uniform throughout ser. *Sapindifoliae*. The pod, of which Benthams had few samples, is now known to vary significantly in width, in texture and venulation of the valves and in alignment of the seeds; and the venulation of the leaves, more or less closely correlated with vesture, is closely linked to distribution. While Benthams's three species have dwindled to fairly well-marked varieties, emphasis on some new criteria and the much more complete picture of dispersal built up in a century of collecting in South America enable us to define within a multiracial *S. sylvestris* six infraspecific taxa. These cluster readily into two groups characterized by reticulation of the leaflet blades, one, the presumably more specialized subsp. *bifaria*, endemic to campo cerrado and related savanna communities in Brazil and adjacent Bolivia and Paraguay, the other, subsp. *silvestris*, primarily Hylaeans but with disjunct representatives in coastal southeastern Brazil and the Paraguai valley.

Review of the nomenclature in the light of our taxonomic decisions has brought to light a vexatious misapplication of the epithet *silvestris*, stemming probably from Vogel (1837, p. 36), but become traditional since Benthams's monographs (1870, 1871). At this point we need only note that the genuine *Cassia sylvestris* of Vellozo belongs properly to and, being older, must replace *C. lucens* Vog., the plant that Benthams, in another error (already corrected by Amshoff), called *C. racemosa* Mill. The taxon treated by Benthams as *Cassia sylvestris* is technically undescribed; it appears here as *S. sylvestris* var. *bifaria*. The points are discussed further below in the synonymy and commentary on vars. *silvestris* and *bifaria*. The emended spelling *sylvestris* of Vellozo's epithet, first published by Vogel and later maintained by Benthams, has neither philological nor historical justification and should not be perpetuated.

We are unable to refer to any particular variety of *S. sylvestris* the fine portrait published in *Flora Brasiliensis* 15(2): t. 38, the model for it being unknown. As a generalized likeness of the species, sensu lato, it could hardly be improved, the details of corolla and androecium being especially lifelike. The leaves suggest our subsp. *bifaria*, the narrow pod containing about 30 seeds aligned in one row either var. *unifaria* or var. *velutina*.

Key to the Subspecies and Varieties of *S. sylvestris*

1. Lfts glabrous above, either pubescent beneath (along major veins only or also between them) with straight appressed or loosely ascending hairs, rarely glabrous on both faces;

tertiary and subsequent venulation of dorsal face of lflets not so strongly raised as to form sunken areoles; Hylaeal forest from Venezuela s. of the Orinoco and s.-e. Colombia to w.-centr. Bolivia, e.-centr. Paraguay and Mato Grosso, Brazil, thence interruptedly s. on the Atlantic slope in Brazil from e. Bahia to Sta. Catarina; subsp. *silvestris*:

2. Lflets pubescent beneath, at least along secondary veins and midrib, and the larger ones mostly 7–13 cm, at base varying from cuneate to shallowly cordate, but if cordate the pulvinules 2.5–6 mm; ovules 36–60; Hylaeal n.-ward from 17°S and disjunct along the Atlantic slope and coast between 13° and 27°S.
3. Lflets of larger lvs (4–)6–11(–13) pairs, the largest 2–4 cm wide; range as above except for coastal Brazil in lat. 13–20°S. 3a. var. *silvestris* (p. 89).
3. Lflets of larger lvs (3–)4–5 pairs, the largest 3–6 cm wide; coastal forest of Bahia and Espírito Santo in lat. 13–20°S. 3b. var. *sapindifolia* (p. 91).
2. Lflets at once glabrous beneath and deeply cordate at base, the longest 4–7 cm, and their pulvinules only 1.5–2.2(–2.5) mm; s. Mato Grosso and e. Paraguay. 3c. var. *guaranitica* (p. 91).
1. Lflets finely (sometimes inconspicuously) puberulent above, densely pilosulous beneath with spreading, incumbent or curly hairs; tertiary and subsequent venulation of lower face of lflets sharply raised, circumscribing deeply recessed areoles; range entirely s. of, or in enclaves within the s. margin of, the Hylaeal forest; subsp. *bifaria*:
4. Large inner sepals golden-strigulose dorsally at the middle; pod 26–30-ovulate, the valves (\pm 10–12 mm wide) chartaceous and finely venulose (like those of var. *silvestris*); middle Xingú, Tocantins and upper Parnaíba valleys in s.-e. Pará, n. Goiás and s. Maranhão in lat. \pm 7–9°S, s. in w. Bahia to \pm 13°S. 3d. var. *velutina* (p. 93).
4. Large inner sepals glabrous dorsally; pod 30–58-ovulate, the valves stiffly coriaceous, coarsely venulose; Brazilian Planalto and upper Paraguai valley in lat. 12–24°S.
5. Pod 11–14 mm wide, 30–38-ovulate, the seed-locules 1-seriate, all alike oblong-elliptic; s. Mato Grosso and adjoining s.-e. Bolivia and Paraguay. 3e. var. *unifaria* (p. 93).
5. Pod 18–30 mm wide, 40–58-ovulate, the seed-locules biseriate, alternately shorter elliptic-oblong and longer bottle-shaped (the bottleneck accommodating the funicle); n.-e. Mato Grosso through highland Goiás to n.-centr. Minas Gerais, thence s. to e. São Paulo. 3f. var. *bifaria* (p. 94).

3/I. *Senna silvestris* (Vellozo) Irwin & Barneby subsp. *silvestris*.

Venulation of lflets variable in strength and prominence but the dorsal face not alveolate-reticulate, even the smallest areoles plane and shallow; pubescence of foliage usually sparse (–0), the hairs straight or almost so, the lflets glabrous above; valves of pod always chartaceous and delicately transverse-venulose.

Our subsp. *silvestris* embraces *Cassia racemosa* of Benth (C. *lucens* of recent authors), *C. sapindifolia* and *C. guaranitica*, collectively different from subsp. *bifaria* in venulation and vesture of the leaflets and from subsp. *bifaria* except its var. *velutina* in the thinner-textured pod.

3a. *Senna silvestris* (Vellozo) Irwin & Barneby subsp. *silvestris* var. *silvestris*. *Cassia silvestris* Vellozo, 1825, l.c. & Icones 4: t. 78. 1835.—“Habitat silvis maritimis Reg. Praedii S. Crucis [s.-w. Rio de Janeiro].”—Holotypus, the cited plate!

Cassia lucens Vogel, Syn. Gen. Cass. 46 & Linnaea 11: 687, descr. ampliata. 1837.—“In Brasilia: Sellow leg.”—Holotypus, presumably \dagger B; neoholotypus, former isotypus, K! = NY Neg. 1469.

Cassia racemosa var. *tenuifolia* Huber, Bol. Mus. Goeldi 4: 564. 1906.—“([J. Huber] 1470) . . . PERU. Loreto: Ucayali: ‘Quebrada Grande’ de Canchahuaya, 13.XI.1938.”—Holotypus, presumably MG, not seen.

Cassia racemosa sensu Benth, 1870, p. 126; 1871, p. 549; auct. plur. recentior., non P. Miller, 1768.

Cassia lucens sensu Amshoff, On South American Papilionaceae 23. 1939.

Arborescent on riverbanks and in forest, then 5–20(–30) m tall, sometimes arborescent and distally sarmentose, in capoeira, cerrado and savanna flowering precociously as coarse suffrutices or soft-woody shrubs (2–)3–6 m, the lflets gla-

brous above, pubescent beneath either overall or only along principal veins with straight appressed or ascending hairs up to (0.15–)0.2–0.6 mm, the reticulation of upper face of lfts either sharply prominulous or immersed, that of lower face prominulous, but the areoles plane and shallow; lvs mostly (2.5–)3–6 dm, shorter only at or near base of panicle; lfts (6–)7–11(–13) pairs, the larger ovate- or lance-acuminate from rounded base, (6.5–)7–13(–15.5) \times 2–4(–4.3) cm; flowers variable in size, the long inner sepals mostly 7.5–11(–13), in Peruvian and adjacent Brazilian Amazonia only 6.5–7.5 mm, the pure yellow petals (9–)13–21(–23) mm; long anthers (5–)6–9(–11) mm; ovary either glabrous, or ciliolate along sutures or pilosulous overall; ovules 36–60; body of pod (12–)15–24(–27) \times 1.6–2.8(–3.3) cm, the locules 1-seriate or, in very wide pods, a few of them laterally displaced and randomly 2-seriate.—Collections: 192.—Fig. 10 (androecium), 13 (pod + seed), both under synonym *lucens*.

Forest margins, especially along riverbanks and shores and in gallery-savanna ecotone, both in varzea and terra firme, in disturbed woodlands, and savanna thickets, becoming a vigorous pioneer in capoeira, mostly between 15 and 500 m but ascending to 1200 m on Guayana Highland (Sa. Tepequem), to 750 m along inter-Andean valleys in Peru, to 900 m in the Bolivian Yungas, and to 1500 m in s. Sa. do Espinhaço in Minas Gerais, bicentric in dispersal: widespread and locally common over the Guayana Highland and whole Amazonian Hylaea from middle Orinoco valley s. to lat. 17°S in Bolivia and 14°S in Mato Grosso, w. in Peru to the middle Marañón, upper Huallaga and Middle Ucayali valleys, e. to the interior of the Guianas and in Brazil to the middle Tocantins valley and n. Maranhão, n. in Venezuela to Maracaibo Basin; disjunct on the Atlantic slope and coastal forest of s.-e. Brazil: s. Bahia (very local near Vitória da Conquista), highland s.-e. Minas Gerais (Sa. da Caraça, Caieté and vicinity), and along the foothills of the Coast Range from s.-w. Rio de Janeiro to Santa Catarina.—Fl. in the Hylaea year around, most prolifically VIII–IV, in s.-e. Brazil XII–III.—*Brujillo* (Venezuela); *katawerewere* (Guyana); *paricá*, *mucurão* (Pará); *yacucaspi*, *quillu-sisa*, *tampush*, *shanshan* (Peru); *mamuri* (Bolivia). Wood hard, used for gunstocks in Maranhão.

The most widespread variety of its species, var. *silvestris* is predominantly a senna of forest margins in the Hylaea, from which it has radiated west into the Andean foothills and south into the cooler wet forest of Atlantic Brazil, becoming a composite of minutely different genetic races. Our attempts to extricate these in the form of useful and meaningful taxonomic units have not succeeded, the variable characters of vesture, flower-size and number of leaflets being poorly correlated and subject to individual as well as racial variation. The most noteworthy examples of the latter are 1) a small-flowered type dominant on the upper forks of the Amazon in Peru and adjacent Brazil, the flower at its smallest (long sepals 6.5–7.5 mm, long petals 9–12.5 mm, with proportionately diminished androecium) resembling that of Cuban *S. gundlachii* (=var. *tenuifolia* Huber, cited in the synonymy) and 2) sympatric with normal Hylaeian var. *silvestris* on the upper Madeira and its tributaries in Rondônia and adjoining states a plant different in having relatively few (5–8) and ample pairs of leaflets combined often but inconsistently with a narrow pod (\pm 10–15 mm wide). This narrower pod resembles that of subsp. *bifaria* var. *velutina*, also found near the belt of transition between the Planalto and the Amazon forest, but its foliage is that of subsp. *silvestris*, sometimes approaching with uncomfortable closeness that of var. *sap-indifolia*. An exceptionally wide pod (27–33 mm) occurs at random points in the Amazon Basin and on the Guayana Highland. In it some seeds are commonly displaced from vertical alignment down the middle of the pod, but the seeds are

never sorted into two regularly alternating rows as in subsp. *bifaria* var. *bifaria*. Contrary to expectations, the populations native to mountainous Minas Gerais and to the coast ranges of south-eastern Brazil, far distant from the variety's main range, seem to have acquired no distinctive qualities. Probably it was in this region that Sello collected the typus of *Cassia lucens*, which much resembles some modern collections from Sa. de Caraça and Caieté.

Identification of *Cassia silvestris* Vell., in which we differ from all antecedents, depends on interpretation of the protologue, for no specimen survives. Two elements of the protologue are, in our opinion, crucial and decisive: the type-locality at the imperial fazenda of Sta. Cruz on the coastal plain to the west of Rio de Janeiro city; and the figure of the pod, so drawn as to show the inner face of the valves with a single row of locules. Bentham, placing greater emphasis than seems justified in our present state of knowledge on shape of the leaflets, which are shown distinctly even though very shallowly cordate at base in Vellozo's plate, identified *C. silvestris* with what is here called var. *bifaria*, the common planaltine plant which is not known to cross Sa. da Mantiqueira and differs from the coastal one in its broad, thick-textured, coarsely veiny pod enclosing a double row of seeds. From the plate alone, *C. silvestris* might be our var. *unifaria*, or the *C. lucens* of Vogel and modern authors. But only the last of these is found today on the Atlantic coastal plain. Bentham's use for *C. lucens* of the name *C. racemosa* Mill. has rightly been challenged by Amshoff (1939, l.c.), who examined the typus of the latter at the British Museum but was unable to identify it other than negatively. The name *C. racemosa* is taken up in this revision for the Mexican and Cuban *C. ekmaniana* Urban.

3b. *Senna silvestris* (Vellozo) subsp. *silvestris* var. *sapindifolia* (Vogel) Irwin & Barneby, stat. nov. *Cassia sapindifolia* Vogel, Syn. Gen. Cass. 34 & Linnaea 11: 677, descr. ampliata. 1837.—“In Brasilia: Sellow leg.”—Holotypus, †B = F Neg. 1742! neoholotypus, former isotypus, K! = NY Neg. 1468.

Cassia sapindifolia sensu Bentham, 1870, p. 124; 1871, p. 549.

Subarborescent shrubs 2–8 m becoming sarmentose in forest, rufescent-strigulose with ascending or appressed hairs to 0.2–0.4(–0.5) mm, the lfts glabrous on both faces or remotely strigulose along principal veins beneath, the reticulation of both faces prominulous; lvs (1.6–)2–3.2 dm; lfts (3–)4–5 pairs, the larger (distal or penultimate) ones symmetrically ovate or oblong-ovate shortly acuminate 7–12.5 × 3–6(–6.5) cm, 1.8–2.5 times as long as wide; fls relatively large, the long inner sepals 10–12 mm, the pure yellow petals 17–23 mm; long anthers 7.5–8.5 mm; ovary glabrous; ovules 44–60; body of pod 20–24 × 1.7–2.2 cm, the locules 1-seriate or a very few laterally displaced.—Collections: 16.

Coastal rain forest below 50 m, scattered along a strip within ±15 km of the Atlantic between 13° and 30°S in Bahia and Espírito Santo.—Fl. XI–III.

The var. *Sapindifolia* is visually striking because of its relatively few and ample leaflets, but in the inflorescence, in vesture, and in fine detail of the flower, pod and seed it is not different from var. *silvestris*. A parallel but not quite so extreme modification of the foliage is described above as a minor variant of var. *silvestris*, sympatric with the typical form in the upper Madeira Basin.

3c. *Senna silvestris* (Vellozo) subsp. *silvestris* var. *guaranitica* (Chodat & Hassler) Irwin & Barneby, stat. nov. *Cassia guaranitica* Chodat & Hassler, Bull. Herb. Boissier II, 4: 824. 1904.—“... in campis Ipe Hu, Sierra

de Maracayu, Nov. n. 5338; in altoplanitie pr. flumen Corrientes, Dec., n. 5889.—Lectoholotypus, *Hassler* 5338, G! isotypus, NY! paratypi, *Hassler* 5889, G, NY!

Cassia guaranitica fma. *latifolia* Chodat & Hassler, l.c. 1904.—“... in valle fluminis Y-aca, Dec., n. 6683.”—Holotypus, *Hassler* 6683, G! isotypus, NY!

Shrub or subshrub at anthesis 1–3 m, either glabrous except for puberulent pulvinules or (rarely) the stems and lower face of lfts pilosulous with straight ascending hairs; lvs 13–28 cm; lfts (7–)8–11(–12) pairs, the largest (near or beyond middle of lf) ovate 4–7 × 1.4–2.8 cm, 2.3–3.3 times as long as wide, at base deeply cordate, the sinus often as deep as the short pulvinule (1.5–2.5 mm), the firmly chartaceous lustrous blades reticulate on both faces; longer sepals 8–10.5 mm; petals 12–20 mm; ovary glabrous; ovules 26–32; body of pod 8–14 × (1–)1.2–1.7 cm, the locules 1-seriate.—Collections: 12.

Cerrado, and becoming weedy in roadside thickets, 200–550 m, locally abundant in the triangle formed by the parallel 19°S, Rio Paraguai and Rio Paraná in s. Mato Grosso and s.-e. Paraguay.

The distinct facies of *Cassia guaranitica* is due entirely to the relatively small size of the stiffly chartaceous lustrous leaflets which, because of their cordate base and short pulvinule, appear to stand sessile against the leafstalk. Hassler's Paraguayan specimens are almost wholly glabrous, but similar plants from southern Mato Grosso (e.g. *Hatschbach* 33094, NY) have dorsally pilosulous leaflets. The flower and pod are exactly those of var. *silvestris*. On upper Rio Apa that marks the Brazil-Paraguay frontier var. *guaranitica* is sympatric or almost so with subsp. *bifaria* var. *unifaria*, instantly distinguished by its densely yellowish-pubescent, alveolate-reticulate leaflets and coarsely veiny pod.

3/II. *Senna silvestris* (Vellozo) subsp. *bifaria* Irwin & Barneby, subsp. nov., a subsp. *silvestri* imprimis foliolis dorso alte subalveolatim reticulato-venulosis, pube magis copiosa laxiori patula etiam per foliolorum faciem ventralem sparsa abstans.—Typus infra sub var. *bifaria* indicatur.

Cassia silvestris sensu Bentham, 1870, p. 125; 1871, p. 549; non *C. silvestris* Vellozo, sens. str.

The subsp. *bifaria*, as defined in our key above, is equivalent to Bentham's *Cassia silvestris*, differing from genuine *S. silvestris* in the close subalveolate reticulation of the leaflets' dorsal face and in the more copious pubescence of incumbent or curly hairs that extends, even though sometimes inconspicuously, over the leaflets' ventral face. The leaflets of subsp. *bifaria* tend to be slightly fewer and more broadly rounded at base than those of subsp. *silvestris*, but are far from consistently so. The petals of subsp. *bifaria* are often streaked at base with red, not uniformly yellow as those of subsp. *silvestris*, but the red pigment is easily lost in drying, and we have no systematic information on this point. The thick texture and coarse venation of the pods of var. *bifaria* and var. *unifaria* might furnish specific criteria supporting Bentham's separation of two independent species in this group, but subsp. *bifaria* var. *velutina*, described below, combines the characteristic foliage of its subspecies with the pod of subsp. *silvestris*. The present subspecies consists of three varieties, differing principally in width and texture of the pod and in alignment of the seeds within it. Each variety is neatly vicariant in range.

- 3d. *Senna silvestris* (Vellozo) subsp. *bifaria* var. *velutina* Irwin & Barneby, var. nov., a var. *bifaria* leguminis angustioris 10–12 (nec 18–30) mm lati loculis minus numerosis ± 26 –30 (nec 40–58) uniseriatis, a var. *unifaria* leguminis caeterius similis valvulis chartaceis tenuivenulosis, ab ambabus sepalis interioribus ad medium dorsum dense aureo-strigulosis (nec glabris) diversa.**—BRAZIL. Maranhão: município de Loreto, n. of Fazenda 'Morros,' ± 35 km s. of Loreto, 350 m, 2.V.62 (fl, fr), G. & L. Eiten 4490.—Holotypus, NY (2 sheets).

Shrubby or subarborescent, at anthesis (1.5–)2–6 m, with pubescence, venation of lfts and general aspect of the subsp., the annotinous stems densely velvety-pilosulous; lvs (10–)12–25 cm; lfts (5–)6–8 pairs, ovate-oblong obtuse-mucronulate from rounded or shallowly cordate base, the longest 5 – 9.5×2 –4 cm, 1.6–3 times as long as wide; sepals densely golden-strigulose dorsally, the short outer ones overall, the inner with broad glabrous border, these up to 9–13 mm; petals yellow, the 3 adaxial ones sometimes orange at base, the longest 1.55–2 cm; body of long anthers puberulent in the grooves, 8 – 11×1.4 –2 mm, the beak 1–1.4 mm; ovary densely golden-pilose overall; ovules 26–30; body of pod 10–13 \times 1–1.2 cm, the chartaceous valves finely venulose (as in var. *silvestris*), the locules 1-seriate.—Collections: 12.

Cerrado, 150–550 m, locally plentiful in the middle Xingú, middle Tocantins and Parnaíba valleys between 6° and 9°S in s.-e. Pará, n. Goiás and s. Maranhão and s. along crest of Espigão Mestre in w. Bahia to $\pm 13^\circ$ S.—Fl. III–VIII.

The range of var. *velutina* coincides with the floristically critical zone where the shrub-savannas (cerrado, taboleiro) of the Planalto interfinger and intergrade with the Hylaeian forest. Three varieties of *S. silvestris* are known to occur in the Tocantins valley between 5° and 9°S latitude: typical var. *silvestris* extending south to 8°S; var. *bifaria* at one detached northernmost outpost at 9°; and var. *velutina* between them. The var. *velutina* is morphologically intermediate to the degree that it combines the dense vesture and dorsally alveolate leaflets of var. *bifaria* with the chartaceous, delicately veined pod of var. *silvestris*, but it can hardly be passed off as a set of intergradient populations, for the narrow pod, the densely golden-strigulose sepals and pilosulous anthers are found in neither of the possible parent stocks. The variety differs clearly and abruptly from vegetatively similar var. *bifaria* in the narrow, relatively few-seeded pod and its uniseriate seeds. The remotely allopatric var. *unifaria* has similarly proportioned pod and ovule-number, but the coriaceous, coarsely veined pod-valves of var. *bifaria*.

- 3e. *Senna silvestris* (Vellozo) subsp. *bifaria* var. *unifaria* Irwin & Barneby, var. nov., omnibus fere cum var. *bifaria* congruens sed legumine angusto 10–14 (nec 18–30) mm lato seminibusque minus numerosis ± 30 –38 (nec 50–58) 1-seriatis diversa.**—BOLIVIA: prov. Velasco, VII.1892 (fr), O. Kuntze s.n.—Holotypus, NY.

Cassia silvestris fma. *ferruginea* Chodat & Hassler, Bull. Herb. Boiss. II, 4: 693. 1904.—“Paraguay: . . . pr. Bellavista (Apa), Nov., [Hassler] n. 8017a.”—Holotypus, G! isotypus, NY!
Cassia silvestris fma. *olivacea* Chodat & Hassler, Bull. Herb. Boiss. II, 4: 693. 1904.—“Paraguay: . . . pr. Bellavista, Nov., [Hassler] n. 8017.”—Holotypus, G! isotypus, NY!

Shrubs up to 6 m, in habit, pubescence, venation of lfts and in flower not different from var. *bifaria*; lfts 7–8 pairs, the longest ± 6 – 7.5×2 –3 cm; ovules

30–38; body of pod $10\text{--}12.5 \times 1.1\text{--}1.4$ cm, the valves stiffly chartaceous and coarsely venulose, the seminal locules uniseriate, as wide as the cavity and 3–4 mm long.—Collections: 8.

Cerrado, becoming weedy on roadsides, $\pm 300\text{--}500$ m, locally plentiful in scattered stations, s. and s.-centr. Mato Grosso, Brazil, adjoining s.-e. Bolivia, and extreme e.-centr. Paraguay.—Fl. I–III.

The var. *unifaria*, which occupies a small peripheral segment of the whole range of *S. silvestris* contiguous to, but distinct from, those of vars. *bifaria*, *guaranitica* and *silvestris*, is readily distinguished by the combination of dorsally alveolate-reticulate, densely pilosulous leaflets and a relatively narrow but coarsely veined and few-ovulate pod. The foliage is that of var. *bifaria*, but the pod, except for coarser venulation of its valves, is that of var. *guaranitica*, perhaps marginally sympatric on Sa. de Amambay along the Brazil-Paraguay border. Dorsally glabrate sepals and coarsely venulose pod combine to distinguish it from the otherwise similar but remotely allopatric var. *velutina*.

3f. *Senna silvestris* (Vellozo) subsp. *bifaria* var. *bifaria* Irwin & Barneby, var. nov., intra speciem homonymam ut supra descriptam legumine lato (18–30 mm) 40–58-ovulato, seminumque loculis fere omnibus biserialis praestans.—BRAZIL. Goiás: Sa. Geral do Paranã 3 km s. of São João da Aliança, 23.III.1973 (fl, fr), W. R. Anderson et al. 7840.—Holotypus, UB; isotypi, F. K, NY, RB, US.

Cassia silvestris sensu Benth., 1870, p. 125 ("sylvestris"), max. ex parte, exclus. t. 38; 1871, p. 549, max. ex parte., & auct. recentior., non Vellozo, 1825, sens. str.

Potentially arborescent, at anthesis (0.5–)1.8–6 m, the trunk rarely attaining a girth of 15 cm, except for glabrate sepals villosulous throughout with spreading, incumbent or curly, commonly yellowish or rufous hairs up to 0.1–0.35 mm, the lfts at least thinly villosulous-puberulent above, densely so beneath, there subalveolately reticulate, the areoles sharply depressed below level of venules; lvs 1.5–3.5(–4) dm; lfts (4–)5–9(–10) pairs, the larger usually broadly lance- or ovate-oblong obtuse or bluntly acuminate (5.5–)6–11(–12) \times (2.2–)2.4–5.7 cm, at base shallowly cordate to broadly rounded; outer sepals 4–5(–5.5) mm, inner ones up to (7–)7.5–11 mm; petals commonly, perhaps always, red at and just above the claw, thence bright yellow, the longest (15–)16–21 mm; long anthers 6–8 mm; ovary densely pilosulous along the sutures, glabrous laterally; ovules 40–58; body of pod $10\text{--}15.5 \times 1.8\text{--}3$ cm, the coriaceous valves glabrous lustrous, coarsely venulose, the locules aligned in 2 parallel interdigitating rows, alternately in outline simply elliptic-oblong (toward the seminiferous suture) and bottle-shaped (toward the dorsal suture), the septa (2.5–)3–5 mm apart.—Collections: 65.

Cerrado and gallery margins, becoming locally plentiful in disturbed brush-woodland and in hedges, mostly between 400 and 1000 m but ascending to 1200 m on Chapada dos Veadeiros in e.-centr. Goiás, widespread and common over the Brazilian Planalto between $\pm 13^\circ\text{S}$ and Tropic of Capricorn, from Sa. do Roncador in n.-e. Mato Grosso s.-e. across Goiás to n.-centr. Minas Gerais, s. to headwaters of Rio Tieté in s.-e. São Paulo; one remote record from 9°S in n. Goiás (Guará, within the range of otherwise fully allopatric var. *velutina*) may perhaps have been introduced along the Belém-Brasília highway.—Fl. (XI–)XII–IV(V).—*Amendoim do campo*; *avelão*.

The var. *bifaria*, which represents *S. silvestris* on the Brazilian highlands drained northward by the Araguaia-Tocantins and São Francisco rivers and southwestward by the Paraná, is most readily distinguished by its coarsely veiny

broad many-ovulate pod enclosing two interfingering rows of seed-locules. In Serra do Roncador in northeastern Mato Grosso it is sympatric with var. *silvestris* but readily distinguished by the pronounced venulation of the leaflets' lower face. The two varieties again occur close together in south-central Minas Gerais, var. *bifaria* below 1000 m on the headwaters of Rio das Velhas and var. *silvestris* at mostly greater elevations on the Atlantic slope. Elsewhere their ranges are mutually exclusive. The var. *unifaria*, which replaces var. *bifaria* in central and southwestern Mato Grosso, is entirely similar to var. *bifaria* at anthesis, but obviously different in the narrower pod and few uniseriate seeds. A similarly narrow but more papery and delicately venulose pod characterizes var. *velutina*, already distinguishable in flower by the golden-strigulose inner sepals and the puberulent anthers.

The variety varies somewhat in density of pubescence and outline of leaflets, and its pod varies in length and breadth to about the same degree as that of var. *silvestris*. A curious dwarf form, small-leaved and flowering when only 5 dm tall, was collected (Irwin 23921) with normal var. *bifaria* (Irwin 23915) between Agua Boa and Jequetaí in northern Minas Gerais; its genetic structure would make an interesting study.

4. *Senna gundlachii* (Urban) Irwin & Barneby, comb. nov. *Cassia gundlachii* Urban, Feddes Repert. Sp. Nov. 15: 309. 1918.—“Hab. in Cuba orient.: Wright no. 150.”—Holotypus, presumably †B; neoholotypus, GH! isotypi, BR, G, MO, NY!

Cassia esmeraldensis Alain, Contrib. Ocas. Mus. Hist. Nat. Colegio ‘De La Salle’ 9: 10, fig. 3. 1950.—“Tipo en [LS, nunc HAC], Alain, Clemente y Crisógono 1035, de La Esmeralda, sur de Cananova, Oriente [Cuba], Julio de 1949.”—Holotypus not seen; isotypus, numbered Alain 1025, NY!

Shrubs or small trees at anthesis 2–? m, resembling small-lvd forms of *S. silvestris*, except for the glossy upper face of lfts and dorsally glabrous sepals, petals and gynoecium puberulent throughout with fine subappressed hairs 0.1–0.2 mm, the inflorescence a leafless or basally leafy-bracteate thyrses or panicle of racemes.

Stipules caducous (little known) linear-subulate 2–3 mm.

Lvs (12–)15–23 cm; petiole including wrinkled pulvinus 2–4.5 cm, at middle 0.6–1.1 mm diam, terete except for shallow open ventral sulcus; rachis (5.5–)8–14 cm, the interfoliolar segments 8–22 mm; pulvinules 1.5–2.5 mm; lfts 7–12 or of some upper lvs only 5–7 pairs, a little accrescent upward to beyond middle of rachis, thence slightly smaller, all ovate or broadly lanceolate acuminate, the longest 3.5–6.5(–7.5) × 1–1.8(–2.5) cm, 2.5–3.7 times as long as wide, symmetrically rounded or cuneate at base, the margins revolute, the midrib impressed-sulcate above, cariniform beneath, the ±7–10 pairs of camptodrome secondary veins with connecting tertiary and subsequent reticular venules all sharply finely prominulous on both faces, a trifle more so above than beneath.

Racemes densely subcorymbosely 10–60-fl'd, the axis including peduncle becoming 2–6 cm; bracts caducous ovate or subulate 1–1.5 mm; pedicels at full anthesis 1.5–2.7 cm; hypanthium ±2 mm long; sepals reflexed at anthesis, submembranous dark purplish-brown glabrous ciliolate, all obovate but strongly graduated, the outer 3–4 mm, the longest inner one 6.5–8 mm; petals yellow orange-veined subhomomorphic, beyond the conspicuous claw broadly flabellate truncate-emarginate, the longest 12–17 mm; androecium glabrous, the filaments of 4 median stamens 1.5–2 mm, of 3 abaxial ones 3–4 mm, the anthers of 4 median stamens 3–3.5 mm, their beak ±0.4–0.6 mm, those of 2 latero-abaxial ones lu-

nately incurved 5–6 mm, at insertion of filament 1–1.4 mm wide in dorsoventral view, that of the centric abaxial stamen nearly straight $3\text{--}3.8 \times 0.6\text{--}0.9$ mm; ovary glabrous; style $\pm 1.5 \times 0.4\text{--}0.6$ mm, incurved as that of *S. silvestris*; ovules 16–18.

Pod broadly linear $10\text{--}13 \times 1.2\text{--}1.4$ cm, apparently not essentially different from that of *S. silvestris*.—Collections: 4.

Habitat little known, but apparently an element of xeromorphic montane scrub woodland, endemic to the northern ranges of Oriente province (Sa. de Nipe, Sa. del Cristal, Cuchillas del Pinal), Cuba.—Fl. VI–X.—*Camarón*.

Senna gundlachii is very closely related to *S. silvestris*, resembling small-flowered, small-leaved forms of var. *silvestris* in texture and pubescence of the foliage and different from all of these principally in the few-ovulate pod. The seeds, described by Alain for *C. esmeraldensis*, must also be shorter and relatively broader ($\pm 4 \times 3$ mm). In its fruit *S. gundlachii* approaches *S. domingensis*, of which the flower is again smaller and accompanied by narrowly lance-acuminate leaflets. As often seen in *S. silvestris* sens. lat., the leaves of *S. gundlachii* immediately below the flowering panicle tend to be shorter and simpler than those of vigorous leafy branchlets. The type-collection of *S. gundlachii* shows only these shorter leaves in contrast to that of *C. esmeraldensis* which bears leaves wholly of the longer type.

This species was named in honor of Johannes Gundlach (1810–1896), German zoologist and sometime companion of Charles Wright in Cuba.

5. *Senna domingensis* (Sprengel) Irwin & Barneby, comb. nov. *Cassia domingensis* Sprengel, Neue Entdeckungen 3: 55. 1822.—“Hab. in Hispaniola.”—No holotypus known to survive; neotypus, doubtless originally isotypic, labelled ‘*Cassia domingensis* Spreng. lit.’, collected by Bertero in Sto. Domingo, FI (hb. Webb.)! isotypi, G-DC, M, MO!—*Cowellocassia domingensis* (Sprengel) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 252. 1930.

Cassia scleroxyla Britton, Bull. Torr. Club 43: 458. 1916.—“... Berraco, near Daiquiri, Oriente [Cuba, 14–16.III.1912, (N. L.) Britton & [J. F.] Cowell 12664].”—Holotypus, NY!—*Cowellocassia scleroxyla* (Britton) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 251. 1923.—Reduced to *C. domingensis* by Urban, Symb. Antill. 9: 443. 1928.

Cassia domingensis sensu Vogel, 1837, p. 34; Bentham, 1871, p. 549, exclus. *pl. wrightiana*.

Slender trees of unknown potential height or girth, with terete lenticellate branches, appearing glabrous but the young stems, lf-stalks and axes of inflorescence at least thinly strigulose or pilosulous with fine straight appressed or spreading-ascending, in inflorescence mostly golden hairs up to 0.1–0.3 mm, the foliage bicolored, the lflets dull dark olivaceous above, pale olivaceous beneath, except for sometimes dorsally ciliolate midrib glabrous on both faces, the inflorescence a leafless thyse or panicle of short dense racemes of small fls either terminal or lateral to hornotinous branchlets, either moderately or far exserted from foliage.

Stipules caducous, subulate-setiform 2–4 mm (absent from fruiting specimens).

Lvs 11–22 cm; petiole including discolored wrinkled pulvinus 1.7–3.5 cm, at middle 0.6–0.9 mm diam, terete except for the very shallow ventral sulcus; rachis (4–)6–14 cm, the interfoliolar segments 6–17 mm; pulvinules 1.6–2.5 mm; lflets 7–11(–13) pairs, accrescent from base to beyond middle of rachis, thence slightly decrescent, all in outline symmetrically lanceolate or lance-acuminate obtuse mucronulate or acute, the larger ones $(2.5\text{--})3\text{--}5.5 \times (0.6\text{--})0.7\text{--}1.2$ cm, (4–)4.3–7 times as long as wide, all at base equilaterally cuneate, the margins revolute, the midrib impressed above, cariniform beneath, the $\pm 9\text{--}14$ pairs of camptodrome

with random intercalary secondary veins, connecting venules and fine reticulation sometimes almost immersed, sometimes finely prominulous on both faces.

Racemes densely (7–)10–35-fl'd, the axis including peduncle 1.5–3.5 cm; bracts ovate 0.7–1 mm caducous; pedicels slender 4–12 mm; fl-buds subglobose, puberulent at base, thence glabrous except for ciliolate margins of sepals; hypanthium 1.5–2 mm; sepals submembranous brownish, deflexed at anthesis, strongly graduated, the outer 1.5–2.5 mm, the longest inner ones 4–4.5 mm; petals yellow glabrous, like those of *S. gundlachii* but smaller, the longest ± 5 –6 mm; androecium glabrous, the filaments of 4 median stamens 0.8–2.2 mm, those of 3 abaxial ones ± 2.5 mm, the body of median anthers 1.8–3.2 mm, of 2 latero-abaxial ones lunately incurved 3.5 – 5×0.8 –1 mm, of the centric abaxial one straight 2 – 3×0.3 –0.6 mm, the beaks and sagittate bases as in *S. gundlachii*; ovary sparsely ciliolate along ventral suture, sometimes only at base; style $\pm 1.5 \times 0.3$ –0.4 mm; ovules (7–)10–16.

Pod obliquely deflected, the stipe ± 3 mm, the linear-oblong, plano-compressed body 3 – 7×0.75 –1.6 cm, the stiffly papery, purplish-castaneous, highly lustrous valves only slightly raised over the seeds, the transversely oblong locules 3.5–5 mm long occupying the whole width of the valves; seeds (few seen) oblong-obovoid compressed parallel to valves $\pm 4.5 \times 2.5$ mm, the testa castaneous scarcely lustrous, the sharply defined linear areole 2.6×0.5 mm.—Collections: 6.

Rocky hills and shores, 3–650 m, at least sometimes calciphile, local in scattered stations in s.-e. Cuba (s. coast of Oriente) and Hispaniola (n. coastal Haiti; n.-e. and s.-w. Dominican Republic in El Seibo and in Independencia and Barahona).—Fl. IX–V(–VII).

Senna domingensis represents the last of a series of reductions stemming from the stock of *S. silvestris* sens. lat.; it has the narrowest leaflets, the smallest flowers, the shortest pods and the fewest seeds of all the *Sapindifoliae*. It is obviously related closely to *S. gundlachii*, vicariant, probably at greater elevations, in eastern Cuba. Benthams, in fact, referred the type-collection of *S. gundlachii* to *C. domingensis*, but we now know that *S. gundlachii* differs in several correlated features and consequently experience no difficulty in following Urban (1928, l.c. sub *C. scleroxyla*) in his evaluation of the two species. We also confidently adopt Urban's view of Cuban *C. scleroxyla* as an inconsequential form of *S. domingensis*. The pod of the type collection is indeed atypically narrow for the species, but the second gathering from Daiquirí (*Ekman 8402*, identified by Britton himself as *Cowellocassia domingensis*) has precisely the same foliage and flowers but the wider pod prevalent in Hispaniola. The differences in leaflet reticulation and length of petals supposed by Britton & Rose (1930, l.c., in key) to separate the two species of *Cowellocassia* are not borne out by the material seen.

Bii. ser. FLORIDAE (Benthams) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Floridae** (Benthams) Irwin & Barneby, comb. nov.

Cassia sect. *Chamaesenna* ser. *Floridae* Benthams in Martius, Fl. Bras. 15(2): 124. 1870 & Trans. Linn. Soc. London 27: 547. 1871, ex parte, quoad “***Paniculatae Gerontogae,” caeteris exclusis.—Sp. lectotypica: *C. florida* Vahl = **Senna siamea** (Lamarck) Irwin & Barneby.

Sciacassia Britton ex Britton & Rose, N. Amer. Fl. 23(4): 252. 1930.—Generitypus: *S. siamea* (Lamarck) Britton & Rose = **Senna siamea** (Lamarck) Irwin & Barneby.

In habit and technical characters resembling ser. *Sapindifoliae*; hypanthium

shallowly broadly obconic; sepals firm or fleshy, not or scarcely deflexed at anthesis; staminodes hippocrepiform; pores of scarcely beaked fertile anthers either confluent or separate; pod linear or oblong, plano-compressed; seeds transverse 1-seriate, in broad profile paddle-shaped or discoid, strongly compressed parallel to the valves.—Trees; stipules either minute fugacious or foliaceous and then sometimes lobed; petiolar glands 0; lfts 5–20 pairs, of ample or moderate size; inflorescence thyrsiform-paniculate.—Spp. 3, of s.-e. Asia (India, Sri Lanka, Burma, Malaya, Indochina), Malesia, n. Australia, 1 circumtropical in cultivation and naturalized.

The scope of Benthams heterogeneous ser. *Floridæ* is here restricted to the so-called *Paniculatae Gerontogæe*, the old-world analogues of Neotropical *Sapindifoliae*, collectively different in the rather weak set of characters listed above. Of its three species, *S. siamea* alone is firmly established in the Americas. ***Senna timoriensis*** (DeCandolle) Irwin & Barneby [comb. nov. *Cassia timoriensis* DeCandolle, Prod. 2: 499. 1825.—For full synonymy and commentary cf. De Wit, 1955, p. 273] has been transiently cultivated in Florida and may be expected to turn up elsewhere in tropical horticulture. We have no record outside its native range for the relatively rare Indochinese *S. garrettiana* (Craib) Irwin & Barneby [comb. nov. *Cassia garrettiana* Craib, Kew Bull. 1912: 151. 1912], which departs from the others in its fewer (3–7) pairs of ample ovate-acuminate leaflets and an exceptionally broad flat chartaceous pod, and therefore omit it from the following.

Key to Species of ser. *Floridæ* Cultivated or Adventive in the Americas

1. Stipules minute subulate; lfts 5–14 pairs; inner sepals glabrous and (dry) conspicuously wrinkled; locules of fertile anthers confluent, 1-porose; valves of pod stiffly coriaceous, corrugated lengthwise, the sutures thickened cordlike; seeds in broad view suborbicular.
6. *S. siamea* (p. 98).
1. Stipules foliaceous, often lobulate; lfts 10–20 pairs; inner sepals commonly densely minutely gray-puberulent (rarely glabrous), smooth when dry; locules of anthers separate at very apex, the apertures discrete; valves of pod chartaceous pliant, almost plane, the sutures scarcely thickened; seeds in broad view pyriform; sparingly cultivated, not further described herein.
S. timoriensis

6. ***Senna siamea*** (Lamarck) Irwin & Barneby, comb. nov. *Cassia siamea* Lamarck, Encycl. Méth. Bot. 1(2): 648. 1785.—“Commerson dit que c’est un arbre cultivé à l’Ile de Bourbon . . . Cette belle espèce croît aux environs de Siam.”—Holotypus, labelled *C. siamea* but without further data of origin, P (hb. Lamk.)!—*Sciacassia siamea* (Lamarck) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 252. 1930.

Cassia florida Vahl, Symb. Bot. 3: 57. 1794.—“*Habitat in India orientali.*”—Typus not seen, but the traditional interpretation, accepted by Benthams (1871, p. 549), fully in accord with the protologue.

Cassia gigantea Bertero ex DeCandolle, Prod. 2: 492. 1825.—“. . . in Jamaica cultam sub nomine *C. arborescentis* reperit cl. Bertero.”—Holotypus, G-DC!—*Chamaefistula gigantea* (DeCandolle) G. Don, Gen. Hist. Dichl. Pl. 2: 452. 1832.—Equated with *C. siamea* by Benthams, 1871, p. 549.

Cassia arborea Macfadyen, Fl. Jamaica 1: 343. 1837, probably only by mistake for *C. arborescens*, in any case nom. illegit., two prior synonyms being listed.—Equated with *C. siamea* by Benthams, 1871, p. 550.

Cassia siamea var. *puberula* Kurz, J. Asiatic Soc. Bengal 45(2): 284. 1876.—“[Burma:] . . . forests of Ava and Prome.”—No typus seen; described as a pubescent forma.

Cassia siamea sensu Benthams, 1871, p. 549, which see for further synonymy based on Paletropic types; Brandis, Indian Trees 254. 1906; Rock, Orn. Trees Hawaii 99, pl. 42, 1917; Rock, Legum. Pl. Hawaii 81, pl. 30. 1920; Koorders, Excursionsfl. Java 4(7): 901, fig. 1189. 1926; Irvine, Pl. Gold Coast 89, fig. 32. 1930; Schery, 1951, p. 48; Corner, Wayside Trees Malaya

ed. 2, 1: 390. 1951 & 2: pl. 89, 90. 1952; De Wit, 1955, p. 263; Liu, Ill. lign. Pl. Taiwan 1: 511, t. 443. 1960; Irvine, Woody Pl. Ghana 288. 1961; Little & Wadsworth, Common Trees Pto. Rico 174, t. 74. 1964; Talbot, Forest Fl. Bombay Pres. & Sind 1: 454, fig. 257. 1976; Fl. Taiwan 3: 201, pl. 537. 1977; Graf, Tropica 552. 1978; Malick & Krishna, 1978, fig. 5 (seed).

Amplly leafy, precociously flowering trees of rapid growth, regenerating by suckers when felled, with almost smooth gray bark and dense rounded (when old misshapen) crown of foliage, at anthesis (3–)6–20(–30) m but in the Neotropics seldom exceeding 15 m, the hornotinous branchlets subterete lenticellate, these with lf-stalks and axes of inflorescence \pm densely strigulose-pilosulous with fine appressed, ascending or erect hairs up to 0.05–0.2 mm, the foliage bicolored, the stiffly chartaceous lfsts above lustrously dark olivaceous, always glabrous, beneath paler dull and minutely strigulose either along veins only or overall, the inflorescence an exserted or basally leafy-bracteate, either narrowly thyrsiform or pyramidal panicle of densely many-fld racemes, its main axis \pm 1–4 dm.

Stipules very early caducous subulate \pm 1 mm, absent from most spms.

Lvs 1–3(–3.5) dm, those of vigorous leafy shoots often longer and more complex than those near or at base of panicle; petiole including discolored but not much swollen pulvinus (1.5–)2–3.5 cm, at middle 1–1.8 mm diam, terete except for shallow open ventral groove; rachis (4.5–)6–21(–25) cm, the longer inter-foliar segments 1.3–2.7(–3) cm; petiolar glands 0; pulvinules 2–3.5 mm; lfsts 5–12(–14) pairs, of subequal length or commonly longest near or beyond middle of rachis and diminished toward base or toward both ends, in outline symmetrically lance-, oblong- or ovate-elliptic obtuse mucronulate or (when relatively broad) ovate or obovate emarginate, the largest 4–8 \times (1.1–)1.4–2.7(–3) cm, (1.8–)2–3.5(–4) times as long as wide, at base symmetrically rounded or broadly cuneate, the margin plane, the straight centric midrib immersed or shallowly depressed above, stoutly cariniform beneath, the 8–14 major camptodrome with many intercalary secondary veins, connecting tertiary and fine reticular venules all subequally prominulous on both faces.

Racemes \pm (10–)20–60-fld, at anthesis corymbiform, the open fls elevated beyond the succeeding buds, the axis including short stout peduncle becoming (3–)4–9 cm; bracts spreading-incurved, linear-elliptic 3–6 mm, near middle abruptly dilated or sublobulate, closely conduplicate, deciduous by full anthesis; pedicels at full anthesis and afterward (2–)2.2–3.5 cm; sepals successively explanate during anthesis, finally subreflexed, all orbicular or almost so, carnosulous and hence wrinkled when dried, either yellow or more commonly fuscous, the 2 outer ones 4–6(–7) mm, the inner 6.5–9 mm; petals yellow glabrous, oblong-obovate beyond the short claw, subhomomorphic except the vexillar one often a little smaller and the 2 abaxial ones a little longer than the rest, the longest (10–)12–17 mm; androecium glabrous, functionally 7-merous but the staminodes relatively large, their thecae 2.2–3 \times 1.3–1.8 mm; filaments of 4 median stamens 2.5–4 mm, of the central abaxial one 4.5–5.5, of 2 latero-abaxial ones 7–12 mm, the anthers of 4 median and central abaxial one 5–6 mm, of 2 latero-abaxial ones 5.5–8 mm, the anthers all lanceolate in outline, scarcely beaked, bluntly sagittate at base, dehiscent by a wide U-shaped slit sometimes divided by a tongue-like septum; ovary densely velutinous; style glabrous, 4.5–5.5 mm, circinnately incurved at apex, the stigmatic cavity latero-intorse; ovules 25–38.

Pod ascending or commonly bent at base and so appearing pendulous, the linear plano-compressed body (1.5–)2–3 dm long, 1.2–1.5(–1.6) cm wide, cuneately contracted at base into a stout stipe 5–9 mm, coarsely bicarinate by the thick riblike sutures, the brown, stiffly coriaceous or subligneous, venulose valves alternately expressed and depressed over the seeds, the interseminal septa not

elevated, the locules broadly elliptic 7–10 mm long; seeds very strongly compressed parallel to the valves, discoid, $6.5-8 \times \pm 5.5-6$ mm, the testa castaneous lustrous, the narrowly oblong-elliptic areole $3.2-4.5 \times 0.9-1.2$ mm.—Collections: 57.

A tree of forest or forest margins at low elevations, native probably to Burma and Thailand, widely planted throughout the Tropics and locally naturalized, a common tree of parks and avenues, in the Old World employed as windbreak or coffee-shade, in the New mostly as an ornamental: s. peninsular Florida; Bermuda and Greater Antilles, where introduced in early XIX century; s. Mexico (Tabasco, Chiapas) s. through Central America to n. Colombia, n. Venezuela and s. Brazil (cities of Amazonia, Brasília and environs, coastal Bahia, Guanabara, São Paulo); Hawaiian Is.—*Kassod Tree*; *jahor* or *johor* (Malaya).

Fresh seeds of the Kassod Tree germinate readily, the tree itself grows rapidly and flowers both precociously and prodigally, and it is these virtues rather than any particular aesthetic merit which have favored its spread and propagation in the Neotropics. For unless carefully pruned the tree ages ungracefully, the flowers are not especially showy (notably less so than those of *S. multijuga* or *S. macranthera*, which have the same general habit and uses), and the dead inflorescences with their abundant pods that persist long on the branches give it after flowering an untidy or moribund appearance. In the Old World *S. siamea* is grown less for ornament than as a windbreak or shade-tree in orchards and door-yards, and its wood used both for fuel and for turnery, for which the hard heartwood is preferred. De Wit (1955, p. 265) mentions minor medicinal and magic uses in Malaysia. The living wood is said to resist termites in Africa, but when dry becomes highly susceptible in the New World. The foliage, pods and seeds are fatally toxic to swine.

Biii. ser. TROLLIIFLORAE Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Trolliiflorae** Irwin & Barneby, ser. nov., a ser. *Bacillaribus*, cum quibus perianthio, androecio necnon legumine (immature autem tantum noto) congruunt, imprimis foliis 8–12 (nec exacte 2)-jugis diversae, ulterius in sect. *Senna* tota inflorescentia confertim paniculata cauliflora, sepalis magnis inter se subaequalibus crassis petala subincludentibus necnon antheris staminum 3 abaxialium substerilibus quam ea medianorum brevioribus notabiles.—Sp. unica: ***S. trolliiflora*** Irwin & Barneby.

Sepals ample firm subequal, prominently nerved and distally reticulate, at full anthesis laterally inbricate and concavely incurved over the zygomorphic corolla; 4 median anthers largest, stoutly oblong, their short beak divaricate at 90° from body and 2-pored, the 3 abaxial anthers substerile, flask-shaped, their erect beak 1-pored; style short stout, incurved at apex, the stigmatic cavity inversely deltate, infraterminal introrse; ovules 200+, early 2-seriate; pod elongately linear, apparently subterete, the dehiscence and seeds unknown.—Trees; lfts 8–12 pairs; petiolar glands between all pairs of lfts; inflorescence cauliflorous, compactly paniculate.—Sp. 1, of Amazonian Ecuador and n. Peru.

Senna trolliiflora might be visualized as combining the plurifoliolate leaves of *S.* (ser. *Excelsae*) *spectabilis* with flowers of ser. *Bacillares*, a group in which amply quadrifoliolate leaves are invariable. The flower would be notable among *Bacillares* for the firm texture, strong venation and subequal length of the large concave sepals which even at full anthesis enclose the corolla; and for the re-

duction of all three abaxial anthers to sterile flasks narrower and shorter than the four median ones. Strongly nerved sepals (*S. macrophylla*) and cauliflory (*S. ruiziana*, *S. sandwithiana*), however, both occur infrequently in ser. *Bacillares*, and in one member of that group (*S. hayesiana*) the three abaxial stamens are completely suppressed. The forming pod suggests close affinity in the same direction; we suppose when ripe it becomes a linear subterete bean such as alone could accommodate the very numerous, early biseriate ovules. Thus everything agrees with ser. *Bacillares* except the incongruous foliage.

7. ***Senna trolliiflora*** Irwin & Barneby, sp. nov., signis jam supra sub serie monotypica *Trolliifloris* expositis ab omnibus distinctissima.—ECUADOR. Napo: secondary forest, Napo road, Limoncocha, III. 1970 (fl, fr jun), Robert N. Mowbray 70366.—Holotypus, TENN = NY Neg. 9452; isotypi, MO, NY.

Amplly leafy trees ± 3.5 m with terete striate glabrous older stems and strongly angulate livid-pustulate subglabrous annotinous branchlets, the elongate plurifoliate lvs bicolored, the thinly chartaceous lfts dull olivaceous above, pallidly olivaceous beneath, densely minutely strigulose on both faces with appressed hairs 0.05–0.15 mm, the inflorescence a condensed leafless cauliflorous panicle of few-fl'd racemes subappressed-pilosulous with incumbent hairs to 0.2–0.3 mm, the fls themselves little expanding, subglobose.

Stipules caducous from minutely raised (but not spurlike) scars, those of developed lvs not seen, some subtending reduced lf-stalks subulate 2–3 m.

Larger lvs 2–3.8 dm; petiole 4–5 cm, including the deeply wrinkled pulvinus 4–5 cm, at middle 1.8–2.3 mm diam, like each segment of rachis rounded dorsally, 2-ridged and openly shallow-sulcate ventrally; rachis 1.6–3.3 dm, the segments between lfts 1.5–3 cm, shorter upward; glands between all pairs of lfts ascending short-stipitate, in profile 1.5–1.8 mm tall, the body slenderly oblong- or clavate-cylindroid or compressed-linguiform 0.4–0.9 mm diam; pulvinules ± 2.5 mm; lfts (of major lvs) 8–12 pairs, slightly accrescent upward, symmetrically oblong-elliptic or (distally) -oblanceolate, deltately acute mucronulate, at scarcely oblique base either broadly or narrowly cuneate-decurrent on pulvinule, the margin revolute, the straight centric midrib on upper face immersed, on lower cariniform, the 6–9 major (with some intercalary) secondary veins and the irregular tertiary venulation weakly prominulous on both faces.

Racemes 3–7-fl'd, the axis including short peduncle 1–4 cm; bracts ovate-elliptic concave, densely strigulose dorsally, caducous as the pedicel begins to elongate; fertile pedicels becoming 3.5–5.2 cm; fl-buds globose densely strigulose-pilosulous; sepals firm brownish with pallid submembranous ciliolate margins, coarsely 7–9-nerved from base and reticulate distally, little graduated in length, broadly obovate-oblong to -suborbicular $15\text{--}17 \times 10\text{--}16$ mm, permanently imbricate by lateral margins, almost or fully enclosing the corolla; petals yellow, coarsely venulose, puberulent on both faces, short-clawed, obovate-cuneate 13–17 mm, the banner a little longer and wider than the rest; androecium functionally 7-merous, the 3 spatulate staminodes ± 2.5 mm, the filaments of the fertile members strigulose, those of 4 median stamens greatly thickened 3 mm, of 3 abaxial ones stoutly linear 3.5 mm, the 4 median anthers stoutly oblong, slightly incurved, 9–10.2 mm, with divaricate 2-porose beak ± 0.6 mm, the 3 abaxial anthers much smaller, flask-shaped, the body 4–4.5 mm, the erect 1-porose beak 2–2.4 mm; ovary densely strigulose, the style clavately dilated and 1.5 mm diam just below the introrse stigma; ovules ± 210 .

Pod pendulous, the stipe ± 7 mm, the body narrowly linear up to ± 2 dm, not seen fully formed, when immature 5 mm diam, the expanding ovules 2-seriate but the compression of the ripe fruit unknown; seeds not seen.—Collections: 2.

Disturbed forest and forest margins, below 1000 m, known only from the type-locality in the e. foothills of the Ecuadorian Andes near 1°S and from the lower Marañón basin (Pongo de Manseriche) near $4^{\circ}30'\text{S}$ in n. Peru.—Fl. III–IV.

Biv. ser. BACILLARES (Bentham) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Bacillares** (Bentham) Irwin & Barneby, comb. nov.
Cassia subgen. *Senna* sect. *Chamaefistula* ser. *Bacillares* Bentham in Martius, Fl. Bras. 15(2): 96. 1870 & sensu ampliato in Trans. Linn. Soc. London 27: 519. 1871.—Sp. lectotypica: *C. bacillaris* Linnaeus f. \equiv **Senna bacillaris** (Linnaeus f.) Irwin & Barneby.

Cassia sect. *Chamaesenna* ser. *Coluteoideae* § I. *Jugiglandulosae* DeCandolle ex Colladon, Hist. Casses 98. 1816, ex parte (spp. 26–28).

Chamaefistula G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832, ex parte, quoad spp. foliolis bijugis, exclus. basionymi *Chamaefistulae* typo qui = *Cassia corymbosa* Lamarck \equiv **Senna corymbosa** (Lamarck) Irwin & Barneby. *Cassia* sect. *Chamaefistula* DeCandolle emend. Vogel, Syn. Gen. Cass. 7, 14, sequ. quoad “*Xylobium*,” majore ex parte & “*Chamaefistula genuina* § 1.” 1837, nec sect. *Chamaefistula* sens. str. quae = **Senna** ser. **Corymbosae** (Bentham) Irwin & Barneby.

Scolodia Rafinesque, Sylva Tellur. 128. 1838, pro gen.—Generitypus: *S. viminea* (Linnaeus) Rafinesque \equiv **Senna viminea** (Linnaeus) Irwin & Barneby.

Cassia sect. *Chamaefistula* ser. *Speciosae* Bentham in Martius, Fl. Bras. 15(2): 101. 1870.—Sp. lectotypica: *C. speciosa* Schrader = **Senna macranthera** var. **micans** (Nees) Irwin & Barneby.—Reduced by Bentham, 1871, p. 524, to a subserial group of ser. *Bacillares*.

Chamaefistula sensu Britton & Rose, N. Amer. Fl. 23(4): 231–239. 1930, erroneously typified by *Cassia bacillaris* Linnaeus f., a species not included in the original concept of basionymic *Cassia* sect. *Chamaefistula* DeCandolle ex Colladon, 1816; Britton & Killip, 1936, pp. 170–176; Pittier, Cat. Fl. Venezuel. 1: 370–372. 1945.

Corolla zygomorphic, or with 1 abaxial petal asymmetrically distorted, this opposed to the pistil and \pm nidulating some abaxial stamens; sepals either graduated or subequilong (but the inner broader), obtuse (except in *S. acutisepala*); androecium functionally (4-, 5-) 6–7-merous, of 3 adaxial staminodes and always 4 median fertile stamens, the abaxial set perfect or variably degraded, rarely (*S. hayesiana*) absent, either shorter or longer than the median set; anthers firm (ordinarily neither crushed nor crumpled by pressure), all beaked, the beaks of the 4 median ones short, divaricate or shortly infraterminal, those of the abaxial set usually longer and more porrect, the orifice of either set either 1- or 2-porose; style stout, often poorly differentiated externally from ovary, a little incurved and often thickened distally, the ciliolate stigmatic orifice introrse-ascending; ovules (38–)50–266, in all but *S. viminea*, *S. rizzinii* and (sometimes) *S. rugosa* more than 60; pod usually subcylindroid or angulately cylindroid, in few spp. compressed laterally, the firm, often juicy valves becoming papery, coriaceous or subligneous, often differentiated marginally in color or texture, rarely (*S. lourteigiana*) winged lengthwise, the endocarp usually separating in age, the internally \pm pulpy cavity transversely septate between seeds and rarely also divided by a pithy longitudinal septum arising from the ventral suture; dehiscence commonly follicular, through the ventral suture, in some spp. 0, the seeds then tardily released by decay of valves or (*S. georgica*) by transverse fracture along lines of interseminal septa; seeds mostly 2-seriate, in *S. georgica* and (sometimes) *S. dariensis* 1-seriate, or (*S. ruiziana*) alternate seeds of each vertical rank horizontally displaced into a parallel or interdigitating files, the seeds in any case turned

broadside to the septa, their testa exareolate or in few spp. faintly areolate.—Trees, sarmentose or free-standing and bushy shrubs, and scrambling bush-ropes; stipules either setiform, or herbaceous falcate, or foliaceous and dilated, caducous or subpersistent; lfts exactly 2 pairs (in *S. subtrijuga* randomly 3-jugate; in *S. acuparata* the proximal pair lacking); a gland always between proximal and often one between or behind the distal pair; racemes axillary to contemporary lvs, or paniculate, or in few spp. cauliflorous, in *S. cuatrecasasii* paniculate in lf-axils.—Spp. ± 50 , widespread throughout the American tropics except Pacific Peru, 44 herein described in *Senna*, the rest of uncertain status.

The series *Bacillares* is the largest and taxonomically the most complex group of Neotropical sennas. The signature of the series is a quadrifoliate leaf combined with firm, beaked anthers, a multiovulate, internally pulpy pod, and transversely oriented seeds turned broadside to the septa. Some *Coluteoideae* such as *S. pendula* or *S. bicapsularis* have essentially the same fruit, but their leaves have more than four leaflets and their anthers are thin-textured and apically truncate. Only *S.* (ser. *Harleyanae*) *harleyi* resembles the *Bacillares* at once in leaf and flower, but this differs in relatively few ovules and a dry, plano-compressed pod with seeds turned broadside to the valves.

Knowledge of the *Bacillares*, and consequently the taxonomy, leaves much to be desired. Still unknown are the pods of ten and the ripe seeds of seventeen species, and the dehiscence of the pod (if any) of several more remains uncertain. The corolla, often difficult to observe in pressed specimens, varies much in size and asymmetry, tending when small to be nearly or quite zygomorphic, and when larger to develop one asymmetric abaxial petal cupped to shield or mask one or two of the abaxial anthers opposed to the laterally displaced pistil. It seems likely that there are both autogamous and exogamous species of *Bacillares*, but the attitude of the petals and the architecture of the flower in relation to its insect visitors requires attentive observation and interpretation in the field. It seems certain that the general pollination strategy of the group is directed toward a massive seed-crop from relatively few, successfully fecundated flowers. Multi-ovulate fruits, however vulnerable to bruchids, still contrive to mature at least some seeds, and we suppose that the multiplication of ovules, of which the pods' conformation and the seeds' orientation are mere epiphenomena, has been promoted by this evolutionary advantage. A feature seemingly related to increase in ovule-number is an unprecedented enlargement of the stigmatic cavity and its ciliate orifice, especially notable in *S. quinquangulata* and *S. latifolia*. The malodorous pulp derived from septal tissue in which each seed is enveloped is apparently related to dispersal by beetles.

This series is a climactic and currently successful group of species adapted primarily to forest ecotone habitats, thus well equipped to colonize the ever-increasing unstable brush-woodlands that follow man's progress into the wilderness. It is unique in the cassioid genera for the stabilization of the foliage pattern while evolution has continued to modify the flower and fruit. We have developed no unified hypothesis about an evolutionary sequence in ser. *Bacillares*. It is equally possible that the smaller zygomorphic corollas represent genuinely primitive states, or reversal to them. The reduction in several species and the loss in *S. hayesiana* of the three abaxial stamens appear progressively specialized, and we imagine that the slenderly drawn-out pod of *S. georgica*, which may accommodate as many as 170 seeds in a single row, like the short, compressed, falcate pod *S. ruiziana*, in which a like number of seeds are laterally displaced into four rows, are specialized features. But the pod of *S. georgica* is preceded by an especially large and irregular flower, that of *S. ruiziana* by a small zygomorphic

one, showing that specializations of flower and fruit are not necessarily linked or synchronized. *Senna rugosa*, *S. rizzinii* and *S. insularis* have similar short, plumply sausage-shaped pods from which the seeds are normally released only by rotting of the valves and not by the more usual follicular dehiscence; but the androecium of the first-mentioned has three greatly elongated abaxial stamens as in closely related *S. macranthera*, whereas the rest have the more isomorphic stamens of *S. bacillaris*. As with flower and pod, modification of pod and androecium have taken independent paths.

Until missing data about pod, seeds and fine detail of the living corolla can be obtained and correlated, it will be impossible to interpret evolutionary relationships within ser. *Bacillares*. The following arrangement of species preserves Bentham's useful, but perhaps phylogenetically unnatural, distinction between those with subequilong and those with strongly heteromorphic sets of fertile stamens. Within these two groups, which are now much more heterogeneous than Bentham could foresee, we have attempted to cluster species obviously similar. But the clusters themselves are arbitrarily arranged. Three newly described species at the end of the series are distinguished by transformation of the leaf-seta into a spine or climbing-hook. Other individual peculiarities are: a winged pod in *S. lourteigiana*; a pod internally pithy-septate from the ventral suture in *S. caudata*; strongly reticulate-veiny sepals and petals fading whitish brown-veined in *S. macrophylla*; a compound panicle of racemes arising from contemporary leaf-axil in *S. cuatrecasasii*; and narrowly lanceolate sepals in *S. acutisepala*. An indistinct areole, which we take to be a primitive feature of the senna seed-testa, survives in *S. oxyphylla*, *S. bacillaris* and *S. fruticosa*, which seem genuinely related; in the small group of *S. chrysocarpa*, *S. insularis* and *S. viminea*; in *S. rugosa*; and in *S. quinquangulata* (but surprisingly not in kindred *S. undulata*). An areolate seed does not by itself furnish a useful taxonomic character in ser. *Bacillares*.

In the form perpetuated herein the series *Bacillares* was first defined by Bentham in 1871 (l.c.) when he united subisandrous ser. *Bacillares* sens. strictior. with conspicuously heterandrous ser. *Speciosae*, groups treated in *Flora Brasiliensis* (1870) as coordinate series of sect. *Chamaefistula*. Bentham's predecessors had mistaken *Senna bacillaris* for a true *Cassia*, and had divided such other *Bacillares* as had then been described between *Chamaefistula*, if the pod were known, and *Chamaesenna*, if it were not. It must be emphasized that *Cassia* sect. *Chamaefistula* as originally formulated by DeCandolle and Colladon consisted of our ser. *Corymbosae* and *Basiglandulosae* combined, but included not a single element of the present *Bacillares*. When George Don raised *Chamaefistula* to generic rank he altered its circumscription to admit, side by side with the Candollean nucleus and miscellaneous additions thought or suspected to have terete pulpy pods, the eleven genuine 4-foliolate *Bacillares* discovered up to that time. Britton & Rose (1930) unaccountably mistook these for the typical element of genus *Chamaefistula* and mistypified the genus by *C. bacillaris*, a species explicitly excluded from the original (basionymic) sect. *Chamaefistula* by DeCandolle.

Key to the Species of ser. *Bacillares*

1. Seta terminating the lf-stalk erect, slender, pliant, early dry and deciduous.
2. Functional stamens 4 (all 3 abaxial ones suppressed); s. Mexico to n. Colombia and n.-w. Venezuela. 16. *S. hayesiana* (p. 133).
2. Functional stamens 6-7, at least 2 of the abaxial ones fully developed and fertile.
3. Two sets of fertile stamens anisomorphic at once in length and in form, both the filament and the anther of 3 (or 2 of the 3) abaxial ones markedly longer than those of 4 median stamens, the whole becoming longer by $\frac{1}{3}$ or more.

4. Blade of distal pair of lflets equilateral or almost so, symmetrical at base.
5. Distal lflets of larger lvs $2-10.5 \times 1.5-3.5$ cm, in outline obovate, elliptic, lance-elliptic or linear-elliptic obtuse; secondary veins widely ascending from midrib at angles of 45° or more; pod cylindric, the seeds usually 2-seriate; e. and s. Brazil, extra-Hylaeae.
6. Distal lflets of larger lvs $5-10.5 \times 1.5-3.5$ cm, 2-6.5 times as long as wide, in outline ovate or lance-elliptic; secondary nerves from midrib not anastomosing with a strong marginal one; ovules 160-240.
44. *S. splendida* (p. 190).
6. Distal lflets of larger lvs $\pm 2-4 \times 1.5-2$ cm, 1.2-2 times as long as wide, in outline broadly obovate; secondary nerves from midrib anastomosing with a raised thickened marginal one; ovules 80-90.
45. *S. gardneri* (p. 192).
5. Distal lflets of larger lvs $8-22 \times 4-11$ cm, in outline ovate- or obovate-acuminate; secondary veins more narrowly ascending from midrib; Amazonian and e. Brazil to Bolivia, Colombia and Costa Rica, sympatric with the last in e. Brazil but the lflets there decisively larger, the pod compressed and the seeds 1-seriate.
7. Petiolar glands between each pair of lflets; Costa Rica.
48b. *S. caudata* var. *diadema* (p. 198).
7. Petiolar gland between proximal pair of lflets only.
8. Widespread species of Amazonian and s.-e. Brazil to Bolivia; large inner sepals mostly 12-16 mm; pod compressed, ribbon-like, 5-6.5 mm diam; seeds 1-seriate.
46. *S. georgica* (p. 193).
8. Local species of centr. Andean Colombia and of e. Panama; large inner sepals 8-12 mm; pod (so far as known) cylindric and $\pm 10-12$ mm diam; seeds 2-seriate.
9. Reticulation of lflets fine, sharp and close, the ultimate areoles of mature blades much less than 0.5 mm diam; Colombia.
S. huilana (p. 196).
9. Reticulation of lflets weak and open, most ultimate areoles 0.5+ mm diam; local in e. Panama.
48a. *S. caudata* var. *caudata* (p. 198).
4. Blade of distal pair of lflets inequilateral, strongly asymmetric at base, the proximal side broader.
10. Bracts subtending the pedicels petaloid, yellowish (brunnescent), persistent into (and often past) anthesis, 8.5-15 mm long, in profile 2-3.5 mm wide; s.-e. Brazil (s.-centr. Minas Gerais to s. Bahía and Paraná); hornotinous branchlets strongly angulate-ribbed.
39. *S. angulata* (p. 177).
10. Bracts 1-4 mm, commonly caducous before anthesis; widespread over tropical S. America and extending n. to Costa Rica, where sympatric with the last the branchlets subterete.
11. Plants of Panama and Costa Rica with fully glabrous foliage; lflets caudate-acuminate; cf. *S. caudata* (p. 197).
11. Plants of continental S. America; either lflets pubescent (puberulent) beneath or (in Colombian *S. huilana*) not caudate-acuminate.
12. Glands between each pair of lflets, the distal gland inserted in front of the pulvinules in the same position (ventral to lf-stalk) as the proximal one.
13. Petiole proper mostly 2.5-12 mm long and shorter than the rachis, the proximal pair of lflets therefore below middle of lf-stalk; pedicels (2-)2.5-4.5 cm; lflets alveolately reticulate beneath; Brazilian Planalto and periphery.
43. *S. rugosa* (p. 188).
13. Petiole 20-35 mm, much longer than rachis; pedicels < 2 cm; lflets reticulately venulose above but only faintly so beneath; coastal e. Brazil.
41. *S. pinheiroi* (p. 180).
12. Gland between proximal pair of lflets only or, if one also at tip of rachis, this inserted behind the pulvinules, between them and the seta; petiole proper as long or commonly longer than rachis, always longer when distal gland present.
14. Inner sepals subpetaloid broadly obovate-suborbicular 12-17 mm; hornotinous branchlets strongly angulate-ribbed; widespread in the Amazonian Hylaea of Brazil (Amazonas to Pará and n. Mato Grosso).
38. *S. tapajozensis* (p. 175).

14. Inner sepals shorter or, if as above, the branchlets terete; allopatric, around the extreme periphery of the Amazonian Hylaea in s.-e. (Atlantic and Planaltine) Brazil, s. Bolivia, n. Peru, Colombia and Venezuela.
15. Rare small-fl'd species of Atlantic s.-e. Brazil (Rio de Janeiro and e. Minas Gerais), the longest petal 18–23 mm.
40. *S. tenuifolia* (p. 179).
15. Widespread multiracial species represented over much of tropical S. America outside the Hylaea, always large-fl'd, the longest petal in the range of the last 28–50 mm.
42. *S. macranthera* (p. 181).
3. Two sets of fertile stamens \pm anisomorphic in form of anthers but not or little different in overall length, the anther of 2–3 abaxial stamens often raised on a slightly longer filament but then shorter than that of the 4 median stamens or at least no longer than them, the tips of the beaks of all 7 anthers elevated approximately to same height or the 3 abaxial rarely shortest of all.
16. A gland present at tip of lf-stalk as well as between the proximal pair of lf's.
17. Distal gland formed by a modified seta, therefore inserted behind the pulvinules; upper Amazon basin in Brazil and Peru.
18. Inflorescences mostly leafless and cauliflorous; calyx small, the longer sepals 3.5–6 mm; ovules over 125; seeds 4-seriate (displaced into 2 double rows).
25. *S. ruiziana* (p. 150).
18. Inflorescences terminal to leafy hornotinous branchlets; calyx larger, the longer sepals 10–13 mm; ovules less than 100; seeds 2-seriate.
22. *S. loretensis* (p. 146).
17. Distal gland arising between the pulvinules, in the same position (ventral to lf-stalk) as that between the proximal pair of lf's.
19. Bracts subtending pedicels enlarged, subsepaloid, persistent through (or past) anthesis, (6–)7–15 \times (2–)2.5–7 mm; Amazonia to West Indies (Windward Is.) and s. Mexico.
27. *S. undulata* (p. 157).
19. Bracts inconspicuous and usually early deciduous, often long before anthesis, only rarely persistent, in any case much smaller, lanceolate, ovate or subulate, 1.5–8 \times 1–2 mm.
20. Functional stamens 7 (i.e. 4 median and 3 abaxial); continental N. and S. America and Jamaica.
21. Sepals all large, little graduated, obovate-suborbicular, the outer 9.5–20 mm; Amazon and Orinoco basins and the Guianas (if brought hither by a plant of coastal Bahia, cf. *S. subtrijuga*, p. 141).
22. Distal lf's obliquely ovate or obovate, shortly bluntly acuminate, up to 10–17 \times 5–10 cm, their margin plane when adult; cf. the uncommon form (p. 143) of *S. latifolia* with glandular lf-stalk.
22. Distal lf's elliptic-acuminate, either at base symmetrically cuneate, or much smaller (4.5–11.5 cm), or both, the margin revolute; local in Guyana and French Guiana.
23. Stipules linear-attenuate 0.4–0.5 mm wide; distal lf's narrowly elliptic or ovate-elliptic from asymmetric base, 1.3–3.2 cm wide, glossy and venulose above, dull and almost smooth beneath; pedicels 16–28 mm; axes of inflorescence and dorsal face of petals densely puberulent; pod terete; Guyana.
33. *S. rupununiensis* (p. 166).
23. Stipules commonly \pm expanded, 0.8–3.5 mm wide; distal lf's symmetrically cuneate at base, the blade in outline broadly elliptic-acuminate 2.5–5 cm wide, glabrous and equally venulose on both faces; pedicels 30–36 mm; axes of inflorescence and dorsal face of petals glabrous; pod narrowly 4-angulate lengthwise; French Guiana.
35. *S. lourteigiana* (p. 170).
21. Sepals either all less than 10 mm or strongly graduated and the outer ones less than 9.5 mm.
24. Inflorescence composed of leafless panicles of densely

- many-fl'd racemes arising from axil of living lvs and much shorter than them, the individual racemes 30–100-fl'd and the individual fl small, the petals 12–14 mm; lfts extremely large, the distal pair ± 28 –35 cm; local in Pacific Colombia near 4°N lat. 32. *S. cuatrecasasii* (p. 164).
24. Inflorescence of racemes axillary each to a lf, if distally paniculate then exerted from foliage, the individual raceme fewer-fl'd and the individual fl larger, the lfts never more than 25 cm, commonly all less than 20 cm; widespread.
25. Distal pair of lfts subsymmetrically elliptic, long-acuminate, 15 – 25×5.5 – 10 cm; plant glabrous to the inflorescence; local in Colombia, Panama and Costa Rica. 48. *S. caudata* (p. 197).
25. Distal pair of lfts variable in outline but only 5–16 cm long, nearly always pubescent dorsally; widespread.
26. Lfts symmetrically elliptic-obovate, glabrous on both faces; very local in coastal forest of Bahía, Brazil. 19. *S. subtrijuga* (p. 141).
26. Lfts obliquely lance-, oblance- or ovate-elliptic, nearly always pubescent dorsally; widespread.
27. Blade of lfts bicolored, obviously paler beneath, the margin usually revolute.
28. Style much dilated immediately below the stigmatic orifice, there (0.9–)1–2.8 mm diam; w. and s. Mexico to Amazonian Peru and centr. and s.-e. Brazil, common and widespread. 26. *S. quinquangulata* (p. 153).
28. Style little dilated, 0.35–0.9 mm diam below the stigmatic orifice; local in Peru, n. Venezuela, or Jamaica.
29. Jamaican; ovules not more than 60; pod 3–10 cm long. 29. *S. viminea* (p. 160).
29. Peruvian or Venezuelan; ovules at least 90 and pod, so far as known, well over 10 cm.
30. Fl small, the sepals 3.5–7 mm, the longest petal 6–16 mm; lft-margin revolute; cf. the uncommon Venezuelan form of *S. oxyphylla* (p. 117) with 2-glandular lf-stalk.
30. Fl larger, the sepals 7–8.5 mm, the petals 20–25 mm; lft-margin plane; Andean Peru; cf. in Species Incertae Sedis (p. 205) *Chamaefistula elegans*.
27. Blade of lfts concolorous, plane-margined; middle Magdalena valley in Colombia. 31. *S. trianae* (p. 163).
20. Functional stamens 6 or 5 (i.e. 4 median and 2 or 1 abaxial); West Indies (Puerto Rico to Leeward Is, Hispaniola (?), but not Jamaica) and middle Orinoco valley along Venezuela-Colombia boundary.
31. Distal lfts narrowly ovate- to subsymmetrically lance-elliptic 6 – 9.5×2 – 3.2 cm; sepals 8.5–11 mm; middle Orinoco valley. 34. *S. wurdackii* (p. 167).
31. Distal lfts obliquely ovate-acuminate, mostly 6 – 11×2.8 – 5 cm; sepals 3.2–5.5 mm; West Indies. 28. *S. nitida* (p. 159).
16. Gland between proximal pair of lfts only.—Spp. often difficult to distinguish without fruit or data of provenance, here keyed first by geographic range:

32. Plants of West Indies.
33. Lfts relatively small, the distal pair of larger lvs $1-8 \times 0.6-3.6$ cm, their margin revolute; longer sepals 3.5–8 mm; pod 3–8.5 cm; ovules $\pm 40-80$; weak sarmentose or trailing shrubs of Cuba or Jamaica.
34. Largest lfts $1-4 \times 0.6-2$ cm; long inner sepals 5.5–7.5(–8) mm; petals up to 10–12 mm; Cuba. 30. *S. insularis* (p. 162).
34. Largest lfts $4-8 \times 2-3.6$ cm; long inner sepals 3.5–5.5 mm; petals up to 13–17.5 mm; Jamaica. 29. *S. viminea* (p. 160).
33. Lfts relatively large, the distal pair (7–)8–19 $\times 3.5-9.5$ cm, the margin plane; longer sepals 8–12.5 mm; widespread through the Antilles, often cultivated, arborescent when adult. 8. *S. bacillaris* (p. 111).
32. Plants of continental N. and S. America.
35. Dispersed from w. and s. Mexico through Centr. America to Panama Canal.
36. Margin of lfts revolute; terminal orifice of beak of abaxial anthers divided by a septum; pod compressed or compressed-quadrangular, indehiscent, the seeds (exareolate) 1- or irregularly 2-seriate. N.-e. Costa Rica, centr. Panama e.-ward (if specimen from n.-w. of n. Costa Rica cf. *S. papillosa*, p. 125). 14. *S. dariensis* (p. 128).
36. Margin of lfts plane; beak of abaxial anthers 1-pored; pod cylindrical or almost so, dehiscent through the ventral suture, the seeds regularly 2-seriate.
37. Small-fl'd, the longest petal 8.5–14 mm, and lfts loosely pilosulous beneath; ovules $\pm 80-100$; Mexico (s. from Sinaloa and Veracruz) to Honduras; distal lfts often only obscurely or bluntly short-acuminate. Valves of pod neither thickened parallel to the externally visible sutures nor coarsely granular-papillose; seeds faintly areolate. 11. *S. fruticosa* (p. 121).
37. Either larger-fl'd (the longest petal 18+ mm) or the lfts appressed-strigulose, or both; ovules $\pm 120-260$; if sympatric with the last and equally small-fl'd then the lfts sharply acuminate and strigulose beneath. Pod either with thickened margins or granular-papillose valves.
38. Sp. common and widespread from Veracruz and Oaxaca to s.-e. and centr. Panama; lfts at base asymmetrically cuneate or on proximal side quite shallowly rounded; sutures of pod not differentiated externally and its valves densely granular-papillate; seeds exareolate. 13. *S. papillosa* (p. 125).
38. Sp. common in Panama, rare n.-ward to Honduras, sometimes cultivated elsewhere; lfts at base rounded to deeply cordate proximally; sutures of pod evident externally and bordered with a differentiated margin, its valves otherwise smooth; seeds faintly areolate. 8. *S. bacillaris* (p. 111).
35. Dispersed through tropical S. America s. and e. from Panama Canal.
39. Range confined to Atlantic and Planaltine Brazil s.-ward from Ceará, beyond the s.-e. limits of the Amazonian Hylaea.
40. Distal lfts symmetrically elliptic, acuminate at both ends; sepals lanceolate acute, glabrous dorsally; Bahia and Espírito Santo. 18. *S. acutisepala* (p. 140).
40. Distal lfts strongly asymmetric at base; sepals obtuse.
41. Larger distal lfts $10-20 \times 4-9$ cm; pod 14–24 cm; ovules $\pm 180-210$; Bahia, s. Minas Gerais, Rio de Janeiro (with Guanabara). 12. *S. affinis* (p. 123).
41. Larger distal lfts $\pm 2-4.5 \times 1-1.5$ cm; pod 3.5–8.5 cm; ovules $\pm 40-60$; centr. Bahia n.-ward. 37. *S. rizzinii* (p. 174).
39. Range extending through the Amazon Basin and whole Brazilian Hylaea n. and w. to the Guianas, Venezuela, Panama Canal, Pacific Ecuador, and subandine Peru and Bolivia.
42. Of Amazonia proper, the Guayana Highland and the Guianas.
43. Sepals reticulately venulose when mature, the primary veins branched distally and there anastomosing with their

- neighbors. Petals very commonly drying whitish-stramineous brown-veined, rarely (and only temporarily) retaining their fresh yellow color; lvs extremely large, the distal lfts 18–37 cm. 17a. *S. macrophylla* var. *gigantifolia* (p. 139).
43. Sepals palmately veined from base, sometimes obscurely so. Petals usually yellow when dried; lfts rarely over 20 cm.
44. Stipules amply foliaceous, ovate-deltate 2.5–5 cm wide.
45. Lfts subcoriaceous glossy, plane-margined; sepals 10–17 mm; long petals 24–32 mm; ovules ± 120 –240; widespread over Amazonia but unknown as yet from Bolivia. 20. *S. latifolia* (p. 143).
45. Lfts submembranaceous, not highly glossy, the margin revolute; sepals 5–7 mm; long petals 14–21 mm; ovules ± 70 –90; Bolivia and s.-e. Peru. 21. *S. herzogii* (p. 145).
44. Stipules setaceous or only moderately dilated, then falcately oblanceolate and less than 2 cm wide.
46. Inflorescence partly or wholly a cauliflorous panicle (if any doubt, follow either choice).
47. Longer sepals 7–9.5 mm; ovules ± 180 –210, the resulting seeds 2-seriate in a greatly elongated pod 2.5–3 dm; lowland and interior upland Guyana. 9. *S. sandwithiana* (p. 116).
47. Longer sepals 3.5–6 mm; ovules either less than 150 or, if as numerous as in the preceding, the resulting seeds crowded into 4 rows, the pod in any case only 3–12 cm; w. Brazilian Amazonia and interandine Colombia, Ecuador and Peru.
48. Anthers smooth; long petals 7–14 mm; ovules ± 130 –200; seeds displaced into 2 double files. 25. *S. ruiziana* (p. 150).
48. Anthers densely papillate; long petals 16–25 mm; ovules ± 70 –140; seeds simply 2-seriate. 23. *S. obliqua* (p. 148).
46. Inflorescence (actually or apparently) consisting entirely of racemes axillary to contemporary lvs.
49. Distal lfts of larger lvs ± 2.5 –6 cm; lower Brazilian Amazonia and the Guianas. 36. *S. chrysocarpa* (p. 171).
49. Distal lfts of larger lvs (7–)8–24 cm.
50. Calyx small, the long sepals ± 5 –6 mm; anthers densely papillate; foliage minutely puberulent, appearing glabrous; pod less than 1 dm; Ecuador and Peru. 23. *S. obliqua* (p. 148).
50. Calyx larger, the long sepals 8–21 mm; pod larger except in *S. lorentensis*, this with lfts pilosulous beneath.
51. Style greatly dilated distally, 1.2–2 mm diam just below the stigmatic orifice; foliage subcoriaceous glossy, the lfts beneath minutely puberulent, the proximal pair subequilateral at base. Pod over 2 dm long, the valves coarsely venulose but not thickened to form a differentiated border parallel to each suture. 20. *S. latifolia* (p. 143).
51. Style not or little dilated distally,

- 0.6–1.2 mm diam near apex; foliage subchartaceous, not highly glossy; lfts either pilosulous beneath or the proximal pair markedly inequilateral at base (their proximal basal angle broadly rounded to deeply cordate), or both.
52. Proximal pair of lfts subequilateral; pod 3–9 cm; ovules +75–100. 22. *S. loretensis* (p. 146).
52. Proximal pair of lfts strongly inequilateral at base; pod ± 1.5 –3.5 dm; ovules ± 120 –260.
- 8b. *S. bacillaris* var. *benthamiana* (p. 114).
42. Of extra-Amazonian Colombia and Ecuador, Venezuela exclusive of Guayana Highland, and e. Panama.
53. Sepals prominently reticulate-venulose when mature, the primary veins branched distally and there anastomosing with their neighbors. 17. *S. macrophylla* (p. 137).
53. Sepals palmately veined from base, sometimes obscurely so, the veins sometimes prominulous in age but not distally anastomosing.
54. Margin of lfts plane; pod (so far as known) cylindric and dehiscent.
55. Anthers of 7 functional stamens nearly homomorphic, the beak of 3 abaxial ones less than 1 mm and only a trifle more porrect than that of 4 median ones; local in w.-centr. Ecuador (Los Ríos, Guayas). 24. *S. scandens* (p. 149).
55. Anthers of (2–)3 abaxial stamens obviously different from those of 4 median ones, their beak well over 1 mm long and porrect; allopatric.
56. Blade of proximal pair of lfts very strongly oblique at base, the proximal angle there broadly rounded to deeply cordate; functional stamens 7; widespread.
8. *S. bacillaris* (p. 111).
56. Blade of proximal pair of lfts only slightly oblique at base, the proximal basal angle shallowly rounded to cuneate; one abaxial stamen commonly (but not quite always) lacking; local in n. Colombia (Sta. Marta).
15. *S. smithiana* (p. 132).
54. Margin of lfts revolute; species very distinct in fruit but often ambiguously similar at anthesis.
57. Dispersed through wet lowland forest of e. Panama and adjoining Colombia s. along the Pacific slope to n.-w. Ecuador.
58. Distal pair of lfts 8–27 cm; pod ribbonlike, compressed or compressed-quadrangular indehiscent, 4.5–12 mm diam; seeds 1- or irregularly 2-seriate, ± 4 –6 mm.
14. *S. dariensis* (p. 128).
58. Distal pair of lfts 6–9 cm; pod subcylindric 18–20 mm diam; seeds fully 2-seriate, 8–10 mm.
- 26b. *S. quinquangulata* var. *meizonoloba* (p. 156).
57. Dispersed across n. Venezuela (w. from Anzoátegui and Sucre) to n. Magdalena valley in Colombia, s. along e. Andes to Meta, Colombia; disjunct in Pacific s.-w. Ecuador (Golfo de Guayaquil and vicinity); pod cylindric, dehiscent

through the ventral suture; seeds regularly 2-seriate.

59. Valves of pod smooth (or remotely gland-verruculose) and thickened parallel to the externally differentiated sutures as a raised border; n. and w. Venezuela and n. Colombia, in Venezuela s. to Cord. de Mérida; in s.-w. Ecuador var. *hartwegii*; if brought hither by plants of central Colombia, cf. in Species Incertae Sedis (p. 207) *Chamaefistula toroana*. 10. *S. oxyphylla* (p. 117).

59. Valves of pod densely granular-papillose overall, not differentiated along the sutures and these not or scarcely externally differentiated from the valves; Maracaibo Basin to Aragua in Venezuela, s. along the e. Andes of Venezuela and Colombia to the edge of Orinoco Basin in Barinas and Meta.

13. *S. papillosa* (p. 125).

1. Seta terminating the lf-stalk modified into a prickle- or hooklike, persistent spine.

60. Lfts of all lvs 2 pairs, ovate obtuse or very obtusely short-acuminate, the margins either revolute or entire or both; pod (of *S. uncata* not known) probably always greatly elongate, much over 1 dm, the ovules ± 120 –160; either arborescent and, if Peruvian, sub-Andean, or a vigorous woody liana of n.-e. Brazil.

61. Seta hooked backward from tip of lf-stalk; distal lfts of lvs in and close below the inflorescence 4.5–9.5 cm, their margin plane but undulate; Amazonian Peru (Amazonas). 50. *S. uncata* (p. 200).

61. Seta divaricate at 90° from tip of lf-stalk and slightly porrect distally; distal lfts of lvs in and close below inflorescence 10–14 cm, their margin revolute; n.-e. Brazil (Pará–Amapá). 49. *S. cornigera* (p. 199).

60. Lfts (so far as known) only 1 pair, the site of the suppressed proximal pair marked by a stipitate petiolar gland, the blades ovate-acuminate, their acumen slender and acute, the margins undulate-denticulate; pod less than 1 dm; ovules ± 50 ; weak subherbaceous vines of lowland e. Peru (near Iquitos, Maynas). Seta of lf-stalk hooked backward.

51. *S. acuparata* (p. 202).

8. *Senna bacillaris* (Linnaeus f.) Irwin & Barneby, comb. nov. *Cassia bacillaris* Linnaeus f., Suppl. Pl. 231. 1781.—Typus infra sub var. *bacillari* indicatur.

Shrubs and trees with ultimately gray or whitish trunks up to 6 cm diam, in closed woodland communities becoming sarmentose, at anthesis (2–)2.5–8.5 m, the young branchlets terete striate, pliant and commonly plagiotropic or pendulous under the weight of fls and pods, all like the foliage and axis of inflorescence finely strigulose with subappressed or appressed whitish or gray hairs up to 0.05–0.25(–0.3) mm or (in Colombia and w. Amazonia) the lfts on both faces or only on lower one pilosulous with spreading-incurved lutescent hairs up to 0.3–0.6 mm, the thinly chartaceous lfts in any case bicolored, dull or sublustrously olivaceous above, paler and sometimes subglaucescent beneath, the paniculate inflorescence terminal to branchlets, leafless or at base \pm leafy-bracteate, sometimes when young appearing leafy-bracteate throughout but at maturity at least partly exserted and the primary axis then becoming abruptly flexuous or zigzag.

Stipules nearly always caducous (absent from many specimens, even at young anthesis), linear straight or falcately linear-ob lanceolate acute, prominently 1–few-nerved, 4.5–8(–20) \times 0.4–1.3(–3) mm, rarely foliaceous falcately oblanceolate up to 7–13 \times 1–4.5 mm.

Lvs below inflorescence 12–28(–30) cm; petiole including wrinkled, usually

livid pulvinus 2–5.2(–6.7) cm, at middle 1–2.4 mm diam, bluntly carinate dorsally, openly shallow-sulcate ventrally, the sulcus widened upward to the proximal pair of lfts; rachis 1.3–4.7 cm, usually a little shorter than or equalling, rarely a little surpassing the petiole; gland 1 between proximal pair, sessile or very shortly stoutly stipitate, in profile ovate-elliptic to broadly ovate obtuse (1.5–)1.8–4.5 × 0.8–2 mm, the body (often eaten) red or livid glabrous; pulvinules (2–)2.5–6 mm; distal pair of lfts obliquely elliptic, ovate- or (rarely) obovate-elliptic, acutely short-acuminate to broadly deltate-acuminate and obtuse, 7–19 × 3.5–9.5 cm, 1.7–2.7 times as long as wide, at base on proximal side rounded to cordate, on distal side more shallowly rounded to cuneate, the margin (of mature blades) plane, the incurved midrib slightly raised above, cariniform beneath, the (6–)7–12(–14) pairs of major camptodrome with intercalary secondary veins and all tertiary venules subequally prominulous on both faces, the subsequent reticulation variable, but \pm equally prominent on both faces; proximal pair of lfts $\pm \frac{1}{2}$ – $\frac{2}{3}$ as long as the distal, proportionately broader, very obliquely ovate, the midrib strongly displaced and the proximal basal angle broadly cordate-rounded.

Racemes solitary, 5–35-fl'd, the expanded fls subcorymbose, the axis including short stout peduncle (1.5–)2–7(–8.5) cm; bracts caducous from below young fl-buds, usually before elongation of pedicel, ovate or lanceolate 0.8–2.5(–3) mm; pedicels at and after full anthesis (2–)2.5–5(–5.5) cm; young buds subglobose, densely gray- or yellowish-strigulose or pilosulous, opening long before true anthesis; sepals thinly herbaceous often membranous-margined, greenish, yellowish, or red-flecked, little graduated, all obovate or broadly elliptic-oblong obtuse, the longest inner ones 8–11.5(–12.5) mm; petals pale or golden-yellow, puberulent both dorsally and (at least thinly) ventrally, the 3 adaxial subhomomorphic except the sometimes broader vexillar one, beyond the claw obovate, oblong-obovate, of flabellate, the longest (16–)18–30(–32) mm; the 2 abaxial commonly narrower and shorter, one \pm oblique; androecium functionally 6–7-merous, the filaments puberulent or sometimes glabrous, those of 4 median anthers clavate- or bulbous-dilated distally (or almost throughout) 1.2–2.5 mm, those of 2–3 abaxial ones filiform 2.5–5 mm; anthers usually puberulent in the grooves, sometimes thinly so overall, those of 4 median stamens slightly incurved, up to 5.5–10 mm, with very short divaricate 2-porose beak 0.4–0.7 mm, those of 2–3 abaxial ones much more strongly lunate-incurved, the body shorter than that of the longest of the median ones, 4–8.5 mm, with porrect 1-porose beak 1.4–2 mm; ovary densely strigulose; style scarcely dilated, 0.6–1.2 mm diam at the bend just below the stigma, this 0.3–0.45 mm diam; ovules 122–266.

Pod pendulous, stipitate, the stout stipe 3–8(–10) mm, the straight or slightly decurved cylindric or (fully ripe) obtusely 4-angular body (10–)14–36 × 0.9–1.4 cm, the sutures 1.2–2.6 mm wide, the valves stramineous or brown when ripe, smooth or coarsely low-venulose, glabrescent, the thickened margin along the sutures 0.5–3 mm wide; dehiscence follicular, before falling, the valves gaping to expose the seeds embedded in foetid pulp; seeds biseriate, turned broadside to the septa, compressed-ovoid, 3.2–5.6 × 2.2–3.5 mm, the atrocastaneous, usually lustrous (rarely dull) testa either smooth or finely pitted around the long diam, a faint but definite areole on each face 2.6–4.4 × 1.7–2.4 mm.

The syndrome of characters that defines *S. bacillaris* sens. lat. consists of a) reticulately venulose plane-margined leaflets, the proximal pair half-cordate at the strongly oblique base; b) a paniculate inflorescence with abruptly flexuous primary axis; c) relatively large sepals and petals; d) 1-pored abaxial anthers; e)

a multiovulate pod broadly margined along the sutures; and f) biseriate, faintly areolate seeds. The several closely related species which have been and often still are confused with *S. bacillaris* differ from it in one or more of these features, as brought out in greater detail under each.

The native range of *S. bacillaris* is primarily northern South American, and we believe that it is only planted northward from southern Nicaragua and the southern Windward Islands, though common in cultivation and locally naturalized throughout most of Antillia. The common species which have passed as *Cassia bacillaris* in Mexico and Central America are *S. fruticosa*, *S. papillosa* and *S. hayesiana*. All have more or less distinctly revolute leaflets; in addition *S. hayesiana* is instantly distinguished by its 4-merous androecium, *S. fruticosa* by its smaller flowers, fewer ovules and smooth glossy pod not marginally differentiated parallel to the sutures, and *S. papillosa* primarily by the distinctive pod, unmargined as in *S. fruticosa* but densely papillate overall. Of these three, only *S. fruticosa* has similarly areolate seeds.

We here recognize two varieties of *S. bacillaris*, distinguished by a small difference in the androecia supported by almost fully vicariant ranges.

Key to the Varieties of *S. bacillaris*

1. Androecium functionally 7-merous, the anther of the centric (antesepalous) abaxial stamen not or scarcely smaller than that of its immediate (antepetalous) neighbors, fertile; n. Colombia, n. Brazil (Terr. do Roraima) and the Guianas n.-ward; widely cultivated.
8a. var. *bacillaris* (p. 113).
1. Androecium functionally 6-merous, the anther of the centric abaxial stamen much shorter or more slender (or both) than that of its immediate neighbors, sterile; Brazilian and Peruvian Amazonia, upper Orinoco basin, and n.-w. through Colombia to Ecuador and the middle Magdalena valley.
8b. var. *benthamiana* (p. 114).

8a. *Senna bacillaris* (Linnaeus f.) Irwin & Barneby var. *bacillaris*. *Cassia bacillaris* Linnaeus f., 1781, l.c., sens. str.—“Habitat in Surinamo. C. G. Dalberg.”—Holotypus, LINN 528.2 & 3!—*Cathartocarpus bacillus* Persoon, Syn. Pl. 1: 459. 1805, nom. illegit. *Bactyrilobium bacillare* (Linnaeus fil.) Hornemann, Hort. Havn. 1: 392. 1813. *Chamaefistula bacillaris* (Linnaeus fil.) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.

Mimosa nodosa Linnaeus, Sp. Pl. 516 (“*uodosa*”). 1753—“*Habitat in Zeylona*.” Lectoholotypus, *Phaseolus arboreus tetraphyllus Zeylanicus* Plukenet, Phytographia 3 (=Opera omnia bot. 2): t. 211, fig. 5, 1692, drawn from a plant cultivated at Hampton Court, England, further described by Plukenet, Almagest. Bot. (=Opera omnia bot. 4): 294. 1696.—Grown also at Hartekamp by Clifford, but no specimen survives in LINN; a leaf at BM accompanied by the phrase-name from Hort. Cliff. was received from Jacquin, probably after 1753.—Equated by Bentham with *C. bacillaris* (1871, p. 521).—Non *Cassia nodosa* Buch.-Hamilt., 1832.

Cassia puberula Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(qu): 341. 1824.—“*Crescit cum praecedente*.” i.e. “. . . ad ostia fluvii Sinu, prope Carthagenam (Regno Novo-Granatensi [=Sincelejo, Edo. Córdoba, Colombia]).”—Holotypus, labelled “n. 1389, Rio Sinu prope Carthagenam” P (HBK)! isotypus, labelled by Bonpland ‘5801. *Cassia viminea?* Rio Sinu, Carthagène.’ P. (hb. Bonpland.)!—*Chamaefistula puberula* (Humboldt, Bonpland & Kunth) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832. *Cassia carthaginensis* Willdenow ex Steudel, Nom. Bot. Ed. 2, 1: 304, 307. 1841, pro syn. *C. puberulae* (=Willd. Herb. 7932).

Cassia inaequilatera Balbis ex DeCandolle, Prod. 2: 490. 1825.—“. . . ad Sanctam-Martham (Bertero).”—Holotypus, labelled by DeCandolle, ‘S. Martha ex H[erb.] Bert[eroano] m[isit] Balbis 1822,’ G-DC! clastotypus (fragm) + print of holotypus, NY (misit Hochreutiner, 1924)! isotypi †B = F Neg. 1694 + fragm, F, Fl.—*Chamaefistula inaequilatera* (DeCandolle) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.

Cassia fockeana Miquel, Linnaea 18: 579. 1844.—“*Crescit spontanea in hortis ad Paramaribo*, m. Oct. fl.”—Holotypus presumably at U, not seen; isotypus, ticketed ‘Surinam, Miquel

1850,' K (hb. Benth.)!—Equated by Bentham, 1871, p. 521, with *C. fruticosa* sensu Benth. (= *C. bacillaris* vera).

Cassia insignis N. E. Brown, Trans. Linn. Soc. II, Bot. 6: 24. 1901.—“On the upper slopes of Mount Roraima, [British Guiana], McConnell & Quelch, 23.”—Holotypus, collected by J. J. Quelch & F. McConnell in autumn 1894 (fl), K! = NY Neg. 1549.

Cassia bacillaris sensu Bentham, 1870, p. 98, t. 31, magna pro parte, exclus. pl. brasil. et syn. *C. puberula*; 1871, t. 62, max. pro parte.

Chamaefistula fruticosa sensu Britton & Rose, 1923. p. 235, exclus. typ.

Vesture of lvs and inflorescence appressed or rarely incumbent white or grayish; lfts intricately reticulate on both faces, the smaller defined areoles 1 mm diam; functional stamens 7, the 3 abaxial long-beaked ones of \pm equal size; ovules 122–204.—Collections: 243.

Margins of woods, thickets, often along streams, becoming weedy in disturbed forest, along hedges, and in abandoned fields or orchards, mostly below 300 m but ascending in Venezuela to 1000–1400 m on the Gran Sabana (Bolívar) and Cordillera Costanera (Distrito Federal and Miranda) and on upper Rio Branco in Brazil to 1525 m, widely dispersed around the s. circumference of the Caribbean and in n.-e. South America, from s. Nicaragua (Chontales) through Costa Rica (rare), Panama (common, in almost all provinces), n. Colombia (n. from lat. 6°N) and n. Venezuela (uncommon, in Cordillera Costanera, Isla Margarita and Paria Peninsula) to Trinidad, Tobago and Windward Islands (St. Vincent, Martinique), thence s. in Venezuela to the Gran Sabana (Bolívar), upper Rio Branco in Brazil (n. Terr. do Roraima), interior upland and coastal lowland Guyana, and lowland n. Surinam. Reported from Puerto Rico and Virgin Islands (St. Thomas). Long cultivated in tropical gardens of Old and New Worlds (Jamaica, Puerto Rico, Florida, Hawaii, Java, East Africa (Brenan, 1967, p. 70, sub. *C. fruticosa*), and formerly in European conservatories.—Fl. in Central and n. South America most abundantly VIII–II, but also, both wild and cultivated, at intervals through the year.

Except that we emphatically exclude *Cassia fruticosa*, with consequences to the dispersal of the species, our concept of *S. bacillaris* and its synonymy differ but little from that of Bentham (1871). We reinterpret *C. inaequilatera* Balb. as a synonym of *S. bacillaris*, now known to be common in the foothills of Sa. Nevada de Santa Marta, and not equivalent to *S. papillosa*, the species to which Bentham tentatively applied the name. *Cassia insignis* represents a form of *S. bacillaris* in which the stipules are dilated into falcately oblanceolate blades that tend to persist long into the adult life of the associated leaf. In the protologue N. E. Brown compared *C. insignis* with *C. latifolia*, which has stipules of the same type, rather than with *C. bacillaris*, of which it has all other attributes. We now have collections of *S. bacillaris* from all sides of the Roraima Plateau, some closely resembling the typus of *C. insignis*, but others with narrower or early deciduous stipules, some with strigulose annotinous stems and foliage, and some with finely pilosulous stems; but these variations appear independent of one another.

8b. *Senna bacillaris* (Linnaeus f.) var. *benthamiana* (Macbride) Irwin & Barneby, comb. nov. *C. fruticosa* var. *benthamiana* Macbride, Field Mus., Bot. 13(3, part 1): 165. 1943.—“Type, Williams 566.” Holotypus, collected on Río Nanay, prov. Maynas, dpto. Loreto, Peru, 3.V.1929, F!

Cassia hoffmannseggii Bentham, 1870, p. 104. pro parte, quoad pl. amazon. Spruceanas, exclus. typ.

Vesture of lvs and inflorescence variable, either appressed and short as in var. *bacillaris* or longer (hairs sometimes to 0.6 mm) and spreading- or incurved-villosulous, in either case often lutescent; lfts variably reticulate, and defined areoles in upper Amazonia often >1 mm, in Colombia and sometimes elsewhere as in var. *bacillaris*; functional stamens 6, the anther of the middle abaxial one much smaller than those of its neighbors, sterile; ovules 160–266.—Collections: 129.

Forest margins, bush-islands in savanna and gallery woodland, commonly on seasonally flooded land (varzea and creek-banks), widely dispersed over middle and upper Amazonian Hylaea, in Brazil from w. Pará (Obidos) w. and s.-w. to middle Rio Purús and into the Andean foothills of Peru (Loreto and San Martín), Ecuador (Santiago-Zamora and Napo-Pastaza), and Colombia (n. to e. Boyacá where attaining 900 m and reaching the headwaters of Río Meta), from Brazil extending n. through the Negro-Vaupés valley into the upper Orinoco basin in Amazonas and Apure, Venezuela, and in Colombia across the e. Cordillera to middle Magdalena valley (Antioquia and Santander).—Fl. w. and n.-ward mostly XI–III, in middle Amazonia mostly III–VII, but throughout the range of dispersal irregularly through the year.—*Justo sin razón* (Nariño, Colombia).

Apart from more numerous ovules, perhaps correlated with a longer pod, the var. *benthamiana* is consistently distinguished from var. *bacillaris* only by the modified androecium, the middle one of the three abaxial, long-beaked anthers being greatly reduced in size and sterile; this character, however, is neatly correlated with dispersal. In a very general and unreliable way the variety may be said to have shorter, proportionately wider and less strongly acuminate leaflets and a yellowish- rather than gray-pubescent inflorescence which tends to be thyrsoid and leafy-bracteate rather than paniculate and exserted from foliage. Limited field-data suggest that the Amazonian plant attains when adult a more treelike stature than is common in Caribbean var. *bacillaris*, and the pod, still poorly known, is perhaps on the average longer and more slender, with narrower thickened borders parallel to the sutures. Pubescence in the variety, as here defined, is variable, the denser looser pilosity which Macbride emphasized as diagnostic for *C. fruticosa* var. *benthamiana* no longer seeming taxonomically significant. Within the range of var. *benthamiana* as defined by the androecium we find short appressed pubescence constant in Amazonia and the Rio Negro-Orinoco basins; loose vesture replaces this on the upper Solimões in Brazil and follows the rivers upstream into Peru, only to reappear in the Andean foothills of Colombia from Río Putumayo northward. These areas of pilosity are divided, however, by an enclave of appressed pubescence in Ecuador and the two types of vesture occur together in Magdalena valley in Colombia. We cannot divide the material seen on any feature correlated with pubescence and believe that this sort of variation can well be accommodated in one taxon.

The epithet *benthamiana* (which would be a later homonym in specific rank) was suggested by a misunderstanding. Macbride intended to describe formally a cassia which Bentham (1871, p. 522) had referred to as “perhaps . . . a broad-leaved pubescent variety of *C. bacillaris*,” represented in his herbarium by *Mathews 1591* from Chachapoyas, Peru, and by a miscellany of pilosulous *Bacillares* from Yucatán and Nicaragua which are irrelevant to our present purpose. The Mathews collection, which was Macbride’s particular concern in context of *Flora of Peru*, in reality represents the endemic Peruvian *S. loretensis*, greatly different from the holotypus of var. *benthamiana* in outline of the leaflets and in particular in the short pod. The earliest collections of the present var. *benthamiana*, all

middle-Amazonian (*Martius s.n.* at M and *Spruce 1110, 1558* in hb. Benth.) were referred by Bentham (1870, p. 104) to a mixed and imperfectly realized *Cassia hoffmannseggii*, a name which, by lectotypification in this paper, has become a synonym of *Senna latifolia*.

9. *Senna sandwithiana* Irwin & Barneby, sp. nov., corollae androeciique forma ut videtur *S. bacillari* proxime affinis, sed racemis simul e truncorum ramulorumque vetustiorum nodulis ac e foliorum maturorum axillis erumpentibus (nec corymboso-paniculatis) diversa, foliis maximis nec non cauliflorescentia *S. ruizianam* (procul allopatricam) referens sed ab hac corolla majori leguminisque elongati recti seminibus 2 (nec 4)-seriatis remotior.—GUYANA, upper Mazaruni basin: n.-e. side of Mt. Ayanganna, 914 m, 1.VIII.1960 (fl), *S. S. & C. L. Tillett* with *R. Boyan 44957*.—Holotypus, NY; isotypi, K, US; w. bank of Kamarang River above Utschi mouth, 550 m, 23.X.1960 (fr), *S. S. & C. L. Tillett 45778*.—paratypi fruct., K, NY.

Trees 5–9 m with trunk up to 8 cm diam and terete, smooth, obscurely striate young branches, appearing glabrous up to the minutely pilosulous inflorescence but the branchlets, ventral face of lf-stalk and margin of lfcs often obscurely puberulous with fine incurved hairs up to 0.1–0.2 mm, the ample, thinly chartaceous reticulate lfcs olivaceous subconcolorous, sublustrous above and dull beneath, the corymbose-paniculate inflorescences both cauliflorous from knobs on the trunk or old branches and axillary to annotinous (older) lvs, but then much shorter than them.

Stipules not seen, caducous from small pustuliform scars.

Lvs (2–)2.5–4 dm; petiole including longitudinally wrinkled pulvinus 2.5–7 cm, at middle 1.8–3.4 mm diam, the ventral sulcus shallow, defined by low thickened ridges; rachis 3.7–7.5 cm, almost always longer than petiole; gland 1 sessile between proximal pair, plumply linguiform or ovoid-pyramidal obtuse, 1.5–4 mm tall; pulvinules wrinkled 5.5–9 mm; distal pair of lfcs very obliquely ovate- or obovate-elliptic, shortly acuminate, (12.5–)15–32 × (6–)7–16 cm, ± 2 –2.4 times as long as wide, at very base cuneately decurrent into the pulvinule but above this rounded to subcordate on proximal side, the forwardly incurved midrib with ± 8 –14 pairs of major camptodrome (and often some intercalary) secondary veins finely prominulous on ventral and sharply carinate on dorsal face, the fine tertiary and reticular venulation about equally prominulous on both faces, the ultimate defined areoles of the mesh <1 mm diam; proximal pair of lfcs similar but only ± 0.5 –0.75 times as long, proportionately broader.

Axis of panicle gently flexuous (not zigzag) 1–8 cm or, when cauliflorous, sometimes reduced to a knotty pediment, leafless except for some bladeless petioles; racemes loosely, sometimes subcorymbosely 5–40-fl'd, the axis with short or subobsolete peduncle 2–18 cm; bracts submembranous elliptic-oblongate or obovate 2–3.5 mm concave, early caducous; pedicels at full anthesis and subsequently (20–)25–45 mm, much thickened in fruit; young fl-buds globose, glabrous except for ciliolate sepals or minutely puberulent overall; sepals thin-textured greenish or yellowish, oblong-obovate obtuse or suborbicular, little graduated, the largest of the inner 2.7–9.5 mm, all delicately 5–7-nerved, the nerves not raised externally; petals pale (when dry often orange-) yellow, puberulent both within and without, subhomomorphic, oblong-obovate beyond the claw, the adaxial one 16–17 mm; filaments puberulent, of nearly equal length, those of 4 median stamens 3–4 mm, of 3 abaxial ones 4–4.5 mm; anthers glabrous, strongly incurved,

those of 4 median stamens 6–7 mm truncate, with divaricate beak ± 0.6 –0.8 mm, those of 3 abaxial ones 6–7.5 mm, contracted into a porrectly sigmoid beak 1.6–2 mm; ovary strigulose, the short style obliquely dilated into a cupshaped stigma 0.7–1.2 mm diam, the orifice 0.6–0.8 mm diam; ovules 186–208.

Pod pendulous, short-stipitate, the stipe 5–6 mm, the body when fully formed (but unripe) straight subterete but obtusely 4-angulate $25\text{--}30 \times \pm 0.8$ cm, cuneately contracted at both ends, the firm brown valves rough and dull, evenulose, faintly constricted between the 2-seriate seeds; dehiscence and ripe seed unknown.—Collections: 11.—Fig. 15.

Rocky river-banks, sandstone cliffs, sometimes in Mora forest, 90–915 m, apparently local, foothills and middle slopes of Pakaraima Mts. about the sources of the Potaro, Mazaruni and Cuyuni rivers in Guyana and immediately adjoining Bolívar, Venezuela; and in n. Guyana also on the coastal plain, in unknown habitats along Waini and Barima rivers (Assakatta; Morawhanna), to be expected therefore in the Orinoco delta immediately n.-ward.

Senna sandwithiana was first collected by the brothers Schomburgk in the region of Mt. Roraima in 1841. Their collection (*Robert 881* = *Richard 1523*) was identified by Benthams (1971, p. 587) as related to *Cassia bacillaris* but left undescribed. The relationship in this direction is certainly a very close one, but the wholly or almost wholly cauliflorous inflorescences emergent from nodular swellings on the trunk and branches below the leafy canopy of the tree and their gently flexuous rather than abruptly zigzag prime axes seem significantly different. In general habit *S. sandwithiana* is comparable to the distantly allopatric *S. ruiziana*, but this has much smaller flowers and a short pod in which the seeds are doubled up into four rows. The fully ripe pod and seeds of *S. sandwithiana* may provide further differential characters.

The epithet commemorates the eminent Kew botanist Noel Yuri Sandwith, who collected the species in the Kaieteur gorge in November, 1937 (no. 1497, K, NY).

10. *Senna oxyphylla* (Kunth) Irwin & Barneby, comb. nov. *Cassia oxyphylla* Kunth, *Mimoses* pl. 39. 1822 & p. 129. 1823.—Typus infra sub var. *oxyphylla* indicatur.

Shrubs and treelets 1–7.5 m, the slender subterete branchlets as often also the lf-stalks, the dorsal face of lf-stalks and the pod at least remotely and often densely resinous-punctate or -verruculose, the foliage and inflorescence varying from thinly strigulose with appressed hairs up to 0.2–0.4 mm to thinly or densely pilosulous with erect or loosely incurved hairs up to 0.3–0.65 mm, the lf-stalks bicolored, dull or sublustrous olivaceous above, paler dull beneath, the inflorescence subcorymbose, paniculately corymbose or thyrsoid, either leafy at base, or leafy nearly throughout, or quite leafless, hence either exerted or not from foliage, its primary axis at maturity becoming abruptly flexuous.

Stipules falcately oblanceolate-acuminate or linear, acute, $4.5\text{--}14 \times 0.4\text{--}2$ mm, when expanded arborescently venulose, usually caducous long before the lf, always deciduous before it.

Lvs 7–17(–19) cm; petiole including scarcely swollen pulvinus (0.7–)1–5.5 cm, at middle 0.7–1.8(–2) mm diam, often a little dilated upward, openly shallow-sulcate ventrally; rachis (6–)9–37(–40) mm, either a little longer or shorter than petiole; gland between the proximal pair sessile or shortly stipitate, plumply ovate-linguiform obtuse or narrowly lanceiform acute 1.5–4 mm tall glabrous, a



Fig. 15. *Senna sandwithiana* I. & B. Leaves, flowers and pods $\times \frac{1}{2}$; stamens $\times 4$ (Tillet 44957, 45778).

similar gland rarely between the distal pair, the seta caducous; pulvinules scarcely or moderately swollen, becoming finely wrinkled 2–4(–5) mm; distal pair of lfts varying independently in outline and asymmetry, commonly obliquely lance- or oblance-elliptic acute or acuminate (caudate), when relatively broad becoming

obliquely ovate or obovate acute to shortly deltate-acuminate, those of larger lvs (4.5–)5–16 × 2–7 cm, 1.7–3.2(–3.6) times as long as wide, at base asymmetrally cuneate on both sides or (when broad) rounded to subcordate on proximal one, the margin revolute, the slender, usually incurved midrib with (6–)7–13(–14) pairs of major camptodrome with or without intercalary secondary veins finely prominulous above, sharply cariniform beneath, the tertiary and reticular venulation prominulous on both faces or sometimes only beneath, the ultimate areoles variable in size, becoming smaller and more sharply defined with diminishing size of blade; proximal pair of lfts similar but often proportionately wider, $\pm \frac{1}{2}$ – $\frac{2}{3}$ as long as the distal.

Peduncles with raceme-axis together (1.5–)2.5–11 cm; racemes densely (rarely loosely) 7–45-fld, at first subcorymbose; bracts either oblanceolate acute or lance-acuminate, (1.5–)2–6(–7) mm, usually caducous from below young buds, sometimes persistent into anthesis; pedicels at anthesis variable in length (sometimes on one raceme), (10–)14–32 mm, but the fertile ones at least 20 mm and becoming in fruit thickened 22–36 mm; young fl-buds globose, puberulent at base or pilosulous throughout; sepals submembranous yellowish often red-flecked and hyaline-margined, delicately immersed-venulose, oblong-obovate, ovate or suborbicular, always very obtuse, little graduated, the innermost (4–)4.5–7 mm; petals yellow, puberulent externally along veins, variable in length and amplitude and sometimes moderately heteromorphic, up to 6–16 mm, the blades beyond the short claw obovate-suborbicular or oblong-oblanceolate, the 2 abaxial either a little shorter or a little longer but often a trifle narrower than the rest; androecium functionally 7-merous, the filaments either glabrous or puberulent, of 4 median stamens 1–2.5 mm, of 3 abaxial ones 2.5–3.5 mm, the anthers glabrous or puberulent along the dorsoventral grooves, those of 4 median stamens gently incurved 3.5–7 mm with divaricate blunt 2-porose beak 0.4–0.8 mm, those of 3 abaxial ones at once a little shorter, more strongly incurved and longer-beaked, the body 2.5–5.1 mm, the porrect beak (0.8–)1–1.7 mm; ovary strigulose-pilosulous, the very short incurved style scarcely swollen, 0.6–0.9 mm diam just below oblique stigmatic orifice, this 0.3–0.4 mm diam; ovules (82–)90–146.

Pod pendulous, the stipe 4–10 mm, the body subcompressed-terete, gradually narrowed at both ends, 11–27 × 1–1.2 cm, the valves green but brunnescent and glabrate, often resinously black-dotted, the sutures proper 1–2.5 mm wide, bordered on either hand by a thickened, smooth or papillose ridge 1–3 mm wide; dehiscence follicular, through the ventral suture, the valves finally explanate, the mesocarp tardily separating from the exocarp; seeds 2-seriate, turned broadside to the septa, embedded in thin pulp, obliquely ovoid-compressed 4.7–6.5 mm, the testa lustrous mahogany- or chestnut-brown, the areole 0 or represented by a faintly paler but not otherwise differentiated patch on either face of seed.

This species, which we believe to be endemic to northern South America and not found, as Bentham thought, in Mexico or Central America, has always been difficult to define neatly or to separate from nearly allied ones; and so it remains, due partly to great internal variability and partly to the fact that its essential phenetic character, in context of ser. *Bacillares*, seems made up of negative qualities unredeemed by any feature peculiar to itself. In practice *S. oxyphylla* can be distinguished at anthesis from *S. bacillaris* by the smaller flower and revolute margin of the usually less asymmetric (and commonly smaller) leaflets; from *S. viminea* only insecurely by the zigzag primary axis of the mature inflorescence; from *S. quinquangulata* either by lack of a distal petiolar gland or by this combined with a slender style; and from sympatric races of *S. papillosa* or *S. dariensis* by the smaller abaxial anthers (the body excluding beak 2.5–4 not

4+ mm). The two last are handily distinguished in fruit, the first by its narrow, densely papillose pod and the second by its narrow, laterally compressed one, both of them lacking thickened borders parallel to the suture. Pods of *S. oxyphylla* and *S. bacillaris* are similar in external form, but here the seeds differ materially, those of *S. bacillaris* having a marked areole, lacking in the other. Both pod (lacking borders) and seed (with areole) distinguish allopatric *S. fruticosa* which we have not been able to distinguish by any one reliable feature of the flowering plant.

In Venezuela *S. oxyphylla* is highly variable in pubescence, and the synonymy reflects an exaggerated emphasis in the past on this feature. The ranges of appressed-pubescent or glabrate and of pilosulous or densely villous-pilosulous states are approximately the same, but we lack field data about possible correlation of these states with local edaphic conditions. Flowers produced early in the season are mostly axillary and immersed in foliage, but give way to a depauperately leafy or naked panicle later in the year. Although first described as a tree 50 feet tall, *S. oxyphylla* has been encountered since only as a shrub, treelet or sarmentose bushrope flowering at heights of two to five, exceptionally seven meters.

The range of typical *S. oxyphylla* is more or less continuous along the crest and north slope of Venezuela's coastal mountains from Sucre west to Maracaibo Basin, extending thence feebly south along Cordillera de Mérida to Portuguesa and along the eastern Andes in Colombia to Norte de Santander. Remotely disjunct populations confined to the Pacific lowlands around Guayaquil Bay in Ecuador, one of which furnished the type of *Cassia hartwegii* Benth., seem certainly conspecific in the wide sense but differ in enough small details to deserve some taxonomic notice. Part of the gap in the whole dispersal of *S. oxyphylla* is occupied by the still obscure entity described herein among imperfectly known species as *Chamaefistula toroana*; it very possibly may eventually rank as a third geographic expression of the species.

Key to the Varieties of *S. oxyphylla*

1. Stipules mostly expanded and 0.6–2 mm wide; anthers of 3 abaxial stamens small, the body (below beak) 2.5–4 mm; borders parallel to the pod's sutures smooth; n. Venezuela and n.-e. Colombia. 10a. var. *oxyphylla* (p. 120).
1. Stipules linear-setiform 0.3–0.5 mm wide; anthers of 3 abaxial stamens longer, the body 4.3–5 mm; thickened borders parallel to the pod's sutures densely papillose. 10b. var. *hartwegii* (p. 121).

10a. *Senna oxyphylla* (Kunth) Irwin & Barneby var. *oxyphylla*. *Cassia oxyphylla* Kunth, 1822–3, l.c., sens. str.—“Crescit in monte Cocollar, alt. 400 hex. (Nova Andalusia [hodie Estado Sucre, Venezuela]).”—Holotypus, labelled ‘n. 253. Cocollar,’ collected by Humboldt & Bonpland IX.1799, P-HBK! isotypus, B (hb. Willd. 7931)! = F Neg. 1722.—*Chamaefistula oxyphylla* (Kunth) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.

Chamaefistula axillaris Pittier, Arb. y Arbust. Nuev. Venezuela, Decad. 6–8: 89. 1927.—“Miranda: Alrededores de Petare . . . flores Septiembre 11, 1921 (Pittier 9801, tipo).”—Holotypus, VEN! = NY Neg. 6329; isotypus, NY! = NY Neg. 4963.—*Cassia axillaris* Pittier, Cat. Pl. Venez., 3rd Conf. Interamer. Agric. Caracas 371. 1945, pro syn.; non *C. axillaris* Sessé & Mocino, 1894.

Chamaefistula foliosa Pittier, Arb. y Arbust. Nuev. Venezuela, Decad. 6–8: 90. 1927.—“Distrito Federal: El Limón, valle de Puerto La Cruz (Jahn 1301, tipo).”—Holotypus, VEN! = NY Neg. 6321; isotypi, K, NY, US!—*Cassia foliosa* (Pittier) Pittier, Cat. Pl. Venez., 3rd Conf. Interamer. Agric. Caracas 371. 1945, pro syn.

Chamaefistula hemicardia Pittier, Arb. y Arbust. Nuev. Venezuela, Decad. 6–8: 91. 1927.—“Miranda: Alrededores de la estación Las Mostazas [entre Los Teques y Tejerías], en el Gran Ferro-Carril de Venezuela, 963 m; fl. Nov. 1924 (A. Allart 199, tipo).”—Holotypus, VEN! = NY Neg. 6322; isotypi (fr jun), A! & (fl), NY, US!—*Cassia hemicardia* (Pittier) Pittier, Cat. Pl. Venez., 3rd Conf. Interamer. Agric. Caracas 371. 1945, pro syn.—*Ch. hemicardia* sensu Pittier, 1928, p. 124.

Chamaefistula pumila Britton & Rose ex Pittier, Bol. Ministerio de Relac. Exter. 1–3: 122. 1928.—“... alrededores de Curucutí y Tacagua, D[istrito] F[ederal, Venezuela], de 50–900 m. de altitud.”—Lectoholotypus, labelled “Foot of Curucutí valley, 150 m, . . . 30.VIII.1927 (fl), Pittier 12452” and annotated “*pumila*” by Britton, NY! isolectotypi, A, US!

Chamaefistula tortiramis Pittier, Cat. Pl. Venez., 3rd Conf. Interamer. Agric. Caracas 372, 1945, sine descr.—“[Venezuela, Distrito Federal:] Entre Catia y Blandín [20.XI.1926 (fr)] (Pittier 12247).”—Specimina authent., VEN! = NY Neg. 6325, NY, US!

Cassia oxyphylla sensu Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(qu): 342. 1824; Benth., 1871, p. 521, t. 61, ex parte, exclus. syn. *C. fagifolia*, *C. hartwegii*. *Chamaefistula oxyphylla* sensu Pittier, 1928, p. 124.

Variable in pubescence, the foliage and young branchlets thinly strigulose with appressed hairs to 0.2–0.4 mm or thinly to densely pilosulous with erect or loosely incurved ones to 0.3–0.65 mm; petioles mostly 1–3 cm; long petals (6–)7–12(–14) mm; otherwise as given in key to varieties.—Collections: 98.

Thickets on sunny hillsides, stream-banks, shady ravines, sometimes in humid forest, 15–1300 m, widespread along the n. slope and near crest on s. slope of Cordillera Costanera in Venezuela, from Sucre and adjoining Anzoátegui w. to Maracaibo Basin in Zulia, s.-w. along the e. cordillera of the Andes to Trujillo and Portuguesa, extending feebly into Norte de Santander in Colombia.—Fl. (III–)V–XII.—*Candelilla*; *Cigarrón*; *Brusca*.

10b. *Senna oxyphylla* (Kunth) var. *hartwegii* (Benth.) Irwin & Barneby, stat. nov. *C. hartwegii* Benth., Pl. Hartw. 117. 1843 (“*Hartwegi*”).—“[Hartweg] 652 . . . Prope Guayaquil.”—Holotypus, collected in fl in IV, K (hb. Benth.)! = NY Neg. 1559.—*Chamaefistula hartwegii* (Benth.) Killip ex Little, Caribbean Forester 9(3): 243. 1948.

Hornotinous branchlets densely and foliage more thinly pilosulous with spreading hairs 0.2–0.4 mm; petioles 2.5–5.5 cm; long petals 10–16 mm; otherwise as given in key to varieties.—Collections: 17.

Forest margins and thickets successor to forest-clearing, 10–700 m, locally plentiful on the coastal plain and first foothills of the Andes around the Gulf of Guayaquil in Los Ríos, Guayas and El Oro, and Bahía de Caráquez in Manabí, Ecuador.—Fl. IV–VIII.

11. *Senna fruticosa* (Miller) Irwin & Barneby, comb. nov. *Cassia fruticosa* Miller, Gard. Dict. ed. 8, *Cassia* no. 10. 1768.—“*Cassia fruticosa tetraphylla, siliquis erectis*. Houst[on] Mss.,” the data amplified by Martyn in Miller, Gard. Dict. ed. 9, 1: *Cassia* no. 39. 1797.—“Native of La Vera Cruz . . . received . . . from Dr. Houston.”—Holotypus, ticketed ‘*Cassia tetraphylla* . . . foliolis bijugatis ovato-lanceolatis etc.,’ BM (hb. Mill.)! = NY Neg. 57 = BH Neg. 5167.—*Chamaefistula fruticosa* (Miller) Pittier, Bol. Ministerio de R. R. E. E. 1–3: 122. 1928.—Incorrectly equated by Benth., 1871, p. 521, with *C. bacillaris* Linn. f.

Cassia densiflora Martens & Galeotti, Bull. Acad. Brux. 10(9): 304 (=Enum. Syn. Pl. Phanerogam. Mex. 9(1): 3. 1843.—“Coll. H. Galeotti No. 3183 . . . sur les rochers granitiques, près de l’Océan Pacifique (état d’Oaxaca) . . . Octobre.”—Holotypus, BR! = BH Neg. 2498;

isotypi, G, NY (fragm e G, misit Hochreutiner anno 1924 + tracing)!—*Chamaefistula densiflora* (Martens & Galeotti) Britton & Rose, N. Amer. Fl. 23(4): 235. 1930.

Cassia axillaris Sessé & Mociño, Fl. Mex. 110. 1893.—“Habitat in haereditate Ahueiuyo [?=Ahuijuyo, Colima].”—Lectoholotypus, labeled ‘*Cassia exocea*’ [nom. nud.], MA (hb. S. & M. 1169)! = F Neg. 44242.

Cassia berlandieri Benth, Trans. Linn. Soc. London 27: 520. 1871.—“Mexico near Mirador, Liebmann; near Tampico, *Berlandier*, n. 2294.”—Lectoholotypus, *Berlandier* 2294, labelled ‘de Tula à Tampico, Santa Barbara, Décembre 1830,’ K (hb. Benth.)! = NY Neg. 1413; isotypi, G, GH, US! paratypus, labelled “Inter Boca del Potrero et Tolame,” *Liebmann* 35, F (det. Benth.)!—*Chamaefistula berlandieri* (Benth) Britton & Rose, N. Amer. Fl. 23(4): 234. 1930.

Chamaefistula ignota Britton & Rose, N. Amer. Fl. 23(4): 233. 1930.—“Acapulco, Guerrero, *E. Palmer* 461.”—Holotypus, collected during winter season 1894–5, NY! = NY Neg. 9384; isotypi, F, K, MO, MS (2 sheets)!

Chamaefistula sinaloana Britton & Rose, N. Amer. Fl. 23(4): 234. 1930.—“Estero de Escuinapa, Sinaloa, 1926, *J. G. Ortega* 6172.”—Holotypus, NY! = NY Neg. 9383.

Weak shrubs and slender treelets incipiently sarmentose when crowded, 2–6 m, with terete pliant often semi-pendulous and (distally) \pm abruptly flexuous branchlets, the young annotinous growth and inflorescence pilosulous with spreading, incurved-incumbent or rarely subappressed hairs up to 0.2–0.6(–0.8) mm, the foliage bicolored, the submembranous lflets dull-olivaceous and thinly pubescent or glabrate above, paler and densely pubescent beneath, the inflorescence of solitary racemes at first or permanently leafy-bracteate, but the distal lvs often abruptly reduced or rudimentary and the inflorescence becoming thyrsoid and exserted.

Stipules caducous (little known) erect linear or linear-setiform 4–13 \times 0.3–0.8 mm, absent from many mature flowering and from all fruiting specimens.

Lvs below (and often through) the inflorescence 10–24 cm; petiole including the wrinkled, often twisted pulvinus (1.5–)2–4.7(–6) cm, at middle (0.8–)1–1.8 mm diam, the shallow ventral groove enclosed by stout blunt ribs and \pm dilated upward to the petiolar gland; rachis (0.8–)1.2–4(–4.5) cm, usually a little shorter, rarely longer than petiole; gland 1 between the proximal pair of lflets, sessile or shortly stipitate, in profile including stipe 1.5–4 mm long, the body ovoid to slenderly lance-ovoid obtuse or seldom acute 0.5–1.2 mm diam glabrous; pulvinules (1.5–)2–4 mm; distal pair of lflets obliquely ovate, lance-elliptic, rarely elliptic-obovate, either obtuse, deltately acute, or shortly (either acutely or obtusely) acuminate (6.5–)7.5–14 \times (2.2–)3–6(–7) cm, 2–3(–3.2) times as long as wide, at base rounded (subcordate) to broadly cuneate on proximal side and cuneate on distal one, the margin (adult) plane, the gently incurved midrib with (7–)8–12 pairs of major camptodrome (and sometimes few intercalary) secondary veins slenderly prominulous on both faces but more sharply elevated beneath, the fine tertiary and reticulate venulation likewise subequally prominulous on both faces but sometimes more intricate above than beneath; proximal pair of lflets similar but $\frac{1}{3}$ – $\frac{1}{2}$ as long, proportionately broader.

Racemes densely (4–)8–35-fld, the short axis together with peduncle (1.5–)2.5–8 cm; bracts narrowly lanceolate or subulate 2–4.5 mm, deciduous before or shortly after anthesis; pedicels at and after anthesis (12–)16–36 mm; young buds subglobose, strigulose-pilosulous, opening long before true anthesis; sepals broadly obovate to oblong-obovate, little graduated, the inner becoming 5.5–9 mm, all thinly herbaceous greenish or yellowish often red-tinged or -flecked, in age becoming rather prominently 3–6-nerved, sometimes persisting after fall of petals; petals (of *Bacillares*) yellow, pubescent on both faces but more densely so without, the longest (7.5–)8.5–14 mm; functional stamens 7, the filaments glabrous or puberulent, those of 4 median stamens clavately dilated distally 1.6–2.2 mm, those of

3 abaxial ones filiform 2–4 mm; the anthers glabrous or almost so, of 4 median stamens slightly incurved 4–6 mm, with 2-porose beak 0.2–0.6 mm, of 3 abaxial ones more strongly incurved 4.8–6 mm, with porrect 1-porose beak 0.6–1.3(–1.5) mm; ovary densely pilosulous; style scarcely dilated, 0.45–0.7 mm diam just below the incurved stigma, the stigmatic orifice 0.2–0.35 mm; ovules 78–102.

Pod pendulous stipitate, the stout stipe 2–5.5 mm, the subterete straight or slightly incurved body 10–19(–24) × 1–1.8 cm, evenly cylindroid when perfect but often strangulated where ovules fail to develop, the sutures ±1.5–2 mm wide without any marked thickening of adjacent valves, these green glabrate becoming stiffly papery and brittle, lustrously mahogany- or chestnut brown, faintly or obsoletely transverse-venulose, tardily dehiscent along ventral suture; seeds turned broadside to the septa and embedded in foetid black pulp, 2-seriate, compressed-ovoid or -oblong-ovoid, 5.1–6 × 3.4–4.5 mm, the testa lustrous castaneous or atrocastaneous, bearing on each face a well-defined oblong or elliptic areole 2.7–4 × 1.5–2.3 mm.—Collections: 88.

Moist lowland forest, wooded creek-banks, thickets in disturbed forest, in w. Mexico sometimes in thorn-forest, mostly below 700 m but ascending into the oak-belt up to 1430 m in the valley of Río Santiago in Nayarit and adjacent Jalisco, to 800 m in Chiapas and 1100 m in Honduras, scattered on the coastal plains and around the foothills of the Mexican Plateau and Balsas Depression in e., s.-centr. and w. Mexico from Jalisco to Chiapas, s.-e. San Luis Potosí and Veracruz, on the Pacific slope discontinuously n. to ±25° in Sinaloa (Cerro Colorado, near the Durango line) and on the Atlantic slope to ±20° in Veracruz, thence rarely s. through Guatemala (Santa Rosa) to Honduras (Comayagua, El Paraíso, Morazán).—Fl. (IV, V)–VII–XII(–II).

In lowland southern Mexico and interruptedly southward into Honduras *S. fruticosa*, either alone or accompanied by *S. papillosa*, takes the place of *S. bacillaris*, which occurs only as a cultivated plant in this tract of country. It has long been confused with or lost sight of within *S. bacillaris*, but is perfectly distinct in its revolute, almost always dorsally pilosulous leaflets, small flowers, fewer (78–102, not 122–266) ovules and glossy pod without differentiated borders to the sutures. Bentham possessed too little material of correlated flowers and fruits of this group to illustrate their ranges of dispersal and phenetic variation. As here defined *S. fruticosa* is equivalent to Bentham's *Cassiae berlandieri* and *densiflora* combined, these corresponding with individually obtuse or subacute leaflets. Bentham (1871, p. 522) discussed the history of *C. fruticosa* in some detail. He considered it to be a taxonomic synonym of *C. bacillaris*, but in order to do so he was obliged to suppose that the figure of the pod in *Reliquiae Houstonianae* (t. 17) had been distorted by the artist to fit the page. This drawing, though somewhat crude, is to the contrary a very fair representation of the cigar-shaped pod collected by Houston, the pod that Bentham was describing simultaneously as that of *Cassia berlandieri*.

The synonyms *Chamaefistula sinaloana* and *C. ignota* were based on specimens at different stages of maturity which happen to differ slightly in pubescence and form of petiolar gland, variations which can readily be accepted as falling in the normal range for the species.

For differential characters of *S. papillosa* see discussion of the species (no. 13) next but one following.

12. *Senna affinis* (Bentham) Irwin & Barneby, comb. nov. *Cassia affinis* Bentham in Martius, Fl. Bras. 15(2): 98. 1870.—“ . . . in provincia Rio de Ja-

neiro, ut videtur frequens, a collectoribus per pluribus lecta, e. gr. a Schuch de Capanema, Peckolt, Glaziou 1033., Luschnath . . .; in provincia Minas Geraës: Langsdorff, Sello, Claussen, Ackermann, Warming . . .” Lectoholotypus, *Peckolt 221*, collected III.1859 (fl), BR (hb. Mart., with dissections by R. L. Steyaert)! paratypi, *Schuch s.n.*, BR, M! *Glaziou 1033*, BR! *Langsdorff s.n.*, BR! *Sello s.n.*, K (labelled ‘*C. puberulae* affinis’)! = IPA Neg. 896 = NY Neg. 1441; F (fragm ex B)! *Claussen s.n.*, K! *Warming 212*, F!

Cassia sepium Martius ex Benth in Martius, Fl. Bras. 15(2): 99. 1870, in obs., nom. nud.—

“ . . . e sepibus ad S. João del Rey et Camapuam, prov. Minas Geraës, a cl. Martio lecta . . .”—Spm. authent., *Martius s.n.*, dated Apr. 1818, M! = F Neg. 6257.

Cassia affinis sensu Benth, 1871, p. 520.

Weak shrubs and treelets at anthesis 1–4 m, in habit, stature, foliage and form of inflorescence essentially similar to remotely allopatric *C. fruticosa* but differing in minor details of the androecium and definitively in the pod and seeds, the young branchlets either sharply or obscurely 4-angular and like the foliage and axes of inflorescence variably strigulose-pilosulous with forwardly incumbent, less often straight subappressed or flexuously erect hairs up to 0.15–0.3(–0.5) mm, the foliage bicolored, the membranous lfts above dull or sublustrously olivaceous and minutely puberulent or rarely glabrous, beneath paler and always densely pubescent, the solitary racemes commonly all subtended by ample lvs but some, at least in late anthesis, often forming a shortly exserted leafless panicle, the primary axis in age flexuous or abruptly zigzag.

Stipules caducous (little known), linear-setiform or very narrowly linear-oblan-ceolate straight or incurved $\pm 5\text{--}8 \times 0.25\text{--}0.6$ mm, absent from many flowering and all fruiting spms.

Lvs (disregarding obviously reduced distal ones) 11–34 cm; petiole including pulvinus (2.5–)3–8.5 cm, at middle 1.2–2.8 mm diam, prominently 5-ribbed, the shallow open ventral groove dilated toward the petiolar gland; rachis 1.5–5 cm, a little shorter than petiole; gland 1 sessile or less often shortly stipitate between proximal pair of lfts, including stipe 1.5–3.5 mm tall, the body varying from plumply ovoid or ovoid-pyramidal to narrowly fusiform (0.6–)0.8–2.5 mm diam glabrous; pulvinules (2–)2.5–4.5(–5) mm; distal pair of lfts obliquely ovate- or obovate-elliptic, usually shortly acuminate but either obtusely or acutely so, (8–)10–21 \times 4–9 cm, (1.6–)1.8–2.5 times as long as wide, the base, venation and reticulation as in *C. fruticosa*, but the reticulation of dorsal face quite variable, the ultimate areoles sharply defined on dorsal face $\pm 0.2\text{--}1$ mm diam.

Racemes (4–)8–25-fl'd, the axis including peduncle becoming 1.5–10 cm; bracts early dry deciduous at or before anthesis ovate, narrowly triangular or lanceolate (1–)1.5–3.5 mm; pedicels at and after full anthesis (13–)16–30(–35) mm; young buds globose, glabrous above very base or thinly pilosulous overall; sepals variable in outline and in relative size, the outer sometimes almost as long as inner, sometimes only half as long, all oblong or obovate, concave, always obtuse, the longest inner one 5.5–10.5 mm, at first submembranous and faintly or obsoletely venulose, yellowish-green or red-tinged, becoming dry and rather prominently 3–6 nerved; petals of ser. *Bacillares*, the longest one 12–20 mm; functional stamens 7, the filaments glabrous or puberulent, all filiform (not thickened distally), those of 4 median ones 1.4–2.6 mm, those of 3 abaxial ones 2.5–4(–5.5) mm; anthers glabrous or almost so, those of 4 median stamens slightly incurved (4.3–)4.6–7.5(–8) mm, with divaricate 2-porose beak 0.3–0.55 mm, those of 3 abaxial ones (4–)5.5–10.5(–12) mm, with more strongly incurved body contracted into a porrect, also 2-porose beak 0.8–1.6 mm; ovary densely strigulose; style

little dilated upward, 0.55–0.95 mm diam just below incurved stigma, the ciliolate cavity 0.5–0.8 mm diam; ovules 188–212.

Pod pendulous, stipitate, the stipe 4–6 mm, the cylindric, straight or decurved body 14–24 × 0.7–0.9(–1) cm, the sutures ± 1.5 mm wide, without thickened border, the valves almost imperceptibly strangulated at the transverse septa between seeds; seeds 2-seriate, turned broadside to septa, plumply narrowly obovoid-ellipsoid 4–5.1 × 2–2.4 mm, the testa lustrously atropurpureous, smooth or shallowly pitted, exareolate.—Collections: 69.

Virgin and disturbed or second-growth woodland, 5–850 m, scattered along the coastal plain and Atlantic slope of s.-e. Brazil from e.-centr. Bahia to w. Rio de Janeiro (lat. 14–23°S), sparingly inland to the headwaters of Rio Doce and upper São Francisco valley (Felixlândia; Sa. do Cabral) in s.-e. and centr. Minas Gerais.—Fl. (I–)II–IV.

Within its relatively restricted range of dispersal *S. affinis* is the one member of ser. *Bacillares* in which a single petiolar gland coincides with small flowers (petals mostly 12–18, rarely 20 mm), obtuse sepals, and moderately dimorphic stamens. In the coastal forest of Bahia its range overlaps that of similarly small-flowered *S. quinquangulata*, readily distinguished at all stages of growth by the gland between the distal pair of leaflets and at anthesis by the greatly dilated style; and also that of the very rare and poorly known *S. acutisepala* which appears to differ decisively in its subsymmetrical leaflets and pointed flower-buds. In general appearance *S. affinis* most closely resembles the primarily Mexican *S. fruticosa*, but differs in the terete filaments of the four median stamens, the uniporose beak of the abaxial anthers, the much more numerous (over 180, not 78–102) ovules, the narrower pod (7–10, not 10–18 mm diam), and the somewhat shorter, much narrower exareolate seeds. The sometimes deceptively similar *S. bacillaris*, thought by Bentham to occur in Rio de Janeiro but to be expected there only in gardens, has plane-margined leaflets, prevailing longer petals (2–3, not 1.2–2 cm), and differentiated margins to the pod's valves, while the androecium and areolate seeds more closely resemble those of *S. fruticosa*.

As defined herein *S. affinis* is quite variable in details of vesture, reticulation of leaflets, shape and size of sepals, and degree to which the upper leaves that subtend the always solitary racemes are reduced in size or ultimately suppressed; in fact hardly two populations seem exactly similar in all these features. In forest understorey the leaflets tend to be relatively large, thin-textured and more laxly reticulate than in more exposed or sunny sites; Sellow's collection, provisionally described by Vogel (1837, p. 15) as "*C. puberulae affinis*" and cited by Bentham in the protologue, is of this nature. The calyx varies independently in relative proportions and in outline of the sepals, of which the outer may be nearly as long or only half as long as the innermost and either oblong-ob lanceolate or obovate. A remarkable variant (Irwin *et al.* 27187) from an outlying station on Sa. do Cabral in the São Francisco valley of central Minas Gerais has relatively enormous and heteromorphic stamens, the anthers of the long abaxial ones reaching a length of 8.5–10.5 (as opposed to a usual range of 5–8) mm. Another variant (*B. Gates s.n.* from Sta. Maria Magdalena in e. Rio de Janeiro, NY) is notable for its relatively narrow, lance-ovate leaflets, narrow sepals, and small, exceptionally slender anthers. The corresponding pods are still lacking.

13. *Senna papillosa* (Britton & Rose) Irwin & Barneby, comb. nov. *Chamaefistula papillosa* Britton & Rose, N. Amer. Fl. 23(4): 237. 1930.—Typus infra sub var. *papillosa* indicatur.

Weak shrubs and trees, sarmentose and vinelike when crowded, flowering often when only 1.5–3 m but when adult potentially attaining a stature of 9(–10) m and trunk diam of 1.5 dm, strigulose-pilosulous with fine straight and appressed or forwardly incumbent, less often with erect-incurved, whitish or (distally) faintly lutescent hairs up to 0.1–0.35 mm, the hornotinous branchlets terete striate or bluntly angled by ribs descending from the stipules, the foliage bicolored, the thinly chartaceous lflets dull or sublustrous olivaceous above, paler beneath, the faces equally pubescent or the upper (or both) only thinly so along principal nerves, the solitary, less often geminate racemes all or partly leafy-bracteate or sometimes all exserted from foliage, the primary axis of the commonly pendulous, narrowly thyriform inflorescence at first or in age abruptly flexuous or zigzag.

Stipules caducous, mostly falling before maturity of associated lf, linear-oblan-ceolate acute $4.5\text{--}14 \times 0.6\text{--}2$ mm.

Lvs below (and often through part or all of) the inflorescence 13–27(–32) cm; petiole including pulvinus (1.2–)1.6–4.5(–5) cm, at middle (1–)1.2–2.4(–3) mm diam, the open shallow ventral groove widened upward toward the gland; rachis 1.5–4.5(–5) cm, varying from little longer to little shorter than petiole; gland 1 sessile or subsessile between proximal pair of lflets, in profile 1.5–5(–6) mm tall, the glabrous body varying from stoutly ovoid to lance-ellipsoid, obtuse or acute, 0.5–2.6 mm diam; pulvinules (2.5–)3–7 mm; distal pair of lflets very obliquely elliptic, obovate- or ovate-elliptic acuminate (8.5–)10–23 \times (3.2–)3.6–9.5 cm, 2–3(–3.8) times as long as wide, at base broadly cuneate to rounded on proximal and cuneate on distal side, the margin (adult) plane or almost so, the strongly displaced, forwardly incurved midrib with $\pm(7\text{--})8\text{--}13$ pairs of major camptodrome and usually several intercalary secondary veins together with connecting tertiary and subsequent reticular venulation finely prominulous above and equally or more sharply so beneath, but the ultimate well-defined mesh variable, the smallest areoles either much $>$ or < 1 mm diam.

Racemes densely (4–)7–30(–50)-fld, the axis including the short, sometimes subobsolete peduncle becoming (1–)1.5–9(–14) cm; bracts very early dry caducous, ovate or lanceolate 1.2–3 mm; pedicels mostly 2–4.2, less comonly only 1.2–2 cm; young fl-buds globose, strigulose; sepals either firm throughout or (when broad) firm with membranous margins, only a little graduated in length, varying from broadly obovate very obtuse to obovate and deltately subacute or elliptic-oblong-oblan-ceolate and obtuse, the longest 3–10 mm, all at anthesis obscurely venose but in age becoming more prominently 3–6-veined from base; petals (of ser. *Bacillares*) puberulent dorsally or on both faces, varying in outline from oblong-oblan-ceolate to broadly obovate, the longest (of fully expanded fls) 7.5–23 mm; functional stamens 7, the filaments puberulent, of 4 median stamens filiform or slightly thickened upward 1.4–3.8 mm, of 3 abaxial ones (1.5–)2–5 mm, the anthers puberulent in the grooves, of 4 median stamens gently curved 4–7(–7.5) mm with divaricate 2-porose beak 0.4–0.7 mm, of 3 abaxial ones lunately incurved 3.6–5.5(–6) mm with porrect beak (0.9–)1–2 mm, its orifice 1-porose or divided by a filiform septum; ovary densely strigulose or pilosulous with either whitish or lutescent hairs; style little inflated until after fertilization, at anthesis 0.6–1 mm diam just below the stigmatic orifice, this 0.4–0.7 mm diam; ovules 140–220(–256).

Pod pendulous stipitate, the stipe 5–20 mm, the straight or gently decurved body terete or obscurely compressed-quadrangular (1.5–)2–4(–4.7) dm long, 7–10(–11) mm diam, contracted into a persistent (but fragile, often broken) stylar beak 5–17 mm, the sutures not or scarcely differentiated externally, the valves dull green ripening brown or reddish-brown, very densely coarsely granular-papillate overall, finally dehiscent through ventral suture and explanate to expose the

biseriate seeds embedded, broadside to the septa, in thin slimy foetid pulp; seeds ellipsoid or subreniform-ellipsoid $3.5\text{--}5.7 \times 2\text{--}3$ mm, the atrocastaneous lustrous testa smooth or remotely pitted, exareolate.

The species described above as *S. papillosa* is the same for which Bentham (1871) provisionally but mistakenly took up the name *Cassia inaequilatera* Balbis, a species safely and certainly distinguished from all forms of *S. fruticosa*, *S. bacillaris*, *S. oxyphylla* and *S. dariensis* by the long narrow pipelike, ultimately dehiscent pod coarsely granular-papillate overall and at the same time lacking externally differentiated sutures. In kindred species with terete pod the valves, except where venulose or remotely resinous-verruculose, are perfectly smooth and at maturity often glossy, and the sutures form conspicuous bands down the length of the dorsal and ventral faces, bands emphasized in *S. bacillaris* and *S. oxyphylla* by thickened borders. The pod of *S. fruticosa*, which lacks such borders, is terete like that of *S. papillosa* but at once much shorter and broader, while that of *S. dariensis*, though equally long, is at once narrower and strongly compressed laterally, with coarse salient sutures and seeds marshalled into a single row. The seeds of *S. papillosa* differ from those of *S. fruticosa* and *S. bacillaris* in their ellipsoid form and lack of areole, but except for the generally narrower outline are scarcely different from those of *S. oxyphylla*.

While instantly recognized in the fruiting stage, *S. papillosa* at anthesis cannot, as Bentham realized, be readily distinguished from true *S. bacillaris* or, we must add, from all forms of *S. oxyphylla*, *S. fruticosa* and *S. dariensis*, with each of which it shares part of its range. The problem is aggravated by the fact that the inflorescence, which may be either leafy-bracteate throughout or leafless and exserted, and the individual flower, which varies considerably in length and amplitude and lacks any distinctive feature in the androecium, both tend to resemble in form those of the immediately sympatric relative: in Veracruz and Oaxaca *S. fruticosa*; in middle Central America *S. bacillaris* and *S. dariensis*; in northern South America *S. oxyphylla*. In practice we have identified as *S. papillosa* those Mexican flowering specimens which appear to differ from sympatric *S. fruticosa* by appressed leaf-pubescent and sharply short-acuminate leaflets together with at least 140 (not $\pm 80\text{--}100$) ovules; and those large-flowered Central American ones with proximal leaflets not very highly asymmetric and sepals relatively firm and narrow as compared with *S. bacillaris*. But recognizing the likelihood of error we have taken care to formulate the statement of range on evidence of fruiting specimens alone. These establish for *S. papillosa* a certain northern limit at Misantla on the Gulf slope in Mexico near 20°N and a southern one on Sa. de Macarena in trans-Andine Colombia at 3°N . The apparent absence of *S. papillosa* from east-central Panama may be explained, perhaps, by a fortuitous lack of fruiting material from the area.

At its southern limit *S. papillosa* is represented by a series of populations notable for many geminate racemes in the inflorescence, a tiny calyx, and exceptionally short-pedicelled small flowers. This, already described as *Chamaefistula angusta*, deserves varietal status. The four Brittonian chamaefistulas listed in the synonymy of var. *papillosa* were described without any diagnostic prognosis of substance and can be dismissed without further ceremony.

Key to the Varieties of *S. papillosa*

1. Fls relatively ample, the longer (inner) sepals up to 5.5–10 mm, the longest petal (of truly expanded fls) 12–23 mm; racemes usually solitary at each node of the inflorescence; range of the species n.-ward from Venezuela and middle Magdalena valley in Colombia.

13a. var. *papillosa* (p. 128).

1. Fls very small, the longer sepals 3–4.5 mm, the longest petal 7.5–10 mm; many racemes geminate; e. slope of Colombian Andes in Intendencia Meta. 13b. var. *angusta* (p. 128).

13a. *Senna papillosa* (Britton & Rose) Irwin & Barneby var. *papillosa*. *Chamaefistula papillosa* Britton & Rose, 1930, l.c., sens. str.—“Type from near Santo Domingo, Oaxaca, altitude 300 meters, June 12, 1895, E. W. Nelson 2667.”—Holotypus, US! clastotypus (fragm) + photo, NY!—*Cassia papillosa* (Britton & Rose) Standley, Tropical Woods 34: 40. 1933.

Chamaefistula rowleeana Britton & Rose, N. Amer. Fl. 23(4): 234. 1930.—“Banameto [=Banamito, prov. Limón], Costa Rica, May 1918, W. W. Rowlee & H. E. Rowlee 285.”—Holotypus, NY! isotypus, US!—*Cassia rowleeana* (Britton & Rose) Standley, Field Mus., Bot. 18 (Fl. Costa Rica pt. 2): 517 (“Rowleana”). 1937.

Chamaefistula nicaraguensis Britton ex Britton & Rose, N. Amer. Fl. 23(4): 236. 1930.—“Nicaragua, Aug. 24, 1928, F. C. Englesing 294.”—Holotypus, NY! isotypus, K!—Non *Cassia nicaraguensis* Benthams, 1871.

Chamaefistula fluviatilis Britton & Killip, Ann. N.Y. Acad. Sci. 35: 172. 1936.—“. . . vicinity of Puerto Wilches, Santander, Colombia, 100 m. altitude, November 28, 1926, Killip & Smith 14782 . . .”—Holotypus, NY! isotypus, US!

Chamaefistula curranii Rose ex Britton & Killip, Ann. N.Y. Acad. Sci. 35: 174. 1936.—“Vicinity of Estrella, Caño Papayal, Lands of Loba, Bolívar, Colombia, April–May, 1916, H. M. Curran 348.”—Holotypus, US! clastotypus + photo, NY!

Relatively large-fl'd (as given in key); pedicels of most fertile fls ± 2 –4 cm.—Collections: 147.

Openings and margins of primary and second-growth forest, especially along streams but sometimes in the understorey, persisting in brush or thickets after destruction of original woodlands and becoming weedy in hedges, ascending from coastal lowlands up to 950 m in Mexico, 1500 m in Costa Rica and Panama, 1300 m in Colombia and Venezuela, in Central America entering the oak-forest, interruptedly widespread, especially along the Gulf-Caribbean slope from s.-e. Mexico (Veracruz, Tabasco, Oaxaca, Chiapas) and Belize to w. Panama (e. to Veraguas), reaching the Pacific lowlands only in Oaxaca; apparently absent from centr. and e. Panama but reappearing in n. Colombia (lower Magdalena valley in Bolívar, Magdalena and Santander) and w. Venezuela (Maracaibo basin in Zulia, Cordillera Costanera in Aragua and Cordillera de Mérida in Barinas, Mérida and Táchira).—Fl. mostly (IV–)VI–XII, but perhaps intermittently through the year.—*Cachimillo* (Mexico); *tres lomos* (Oaxaca).

13b. *Senna papillosa* (Britton & Rose) Standley var. *angusta* (Britton & Killip) Irwin & Barneby, stat. nov. *Chamaefistula angusta* Britton & Killip, Ann. N.Y. Acad. Sci. 35: 173, 1936.—“Thickets near Río Guatiquia, Villavicencio, Meta, Colombia, 500 m. altitude, Sept. 1, 2, 1917, Pennell 1585 . . .”—Holotypus, NY! clastotypus (fragm), US!

Small-fl'd (as given in key); pedicels 12–20 mm.—Collections: 12.

Margins of primary and second-growth forest, persisting in thickets of pastured grassland and in hedges, 225–600 m, locally common on the headwaters of Ríos Meta and Guaviare from near Villavicencio s. to Sa. de Macarena in Intendencia Meta, Colombia.—Fl. VI–IX.—*Cambómbulo*.

14. *Senna dariensis* (Britton & Rose) Irwin & Barneby, comb. nov. *Chamaefistula dariensis* Britton & Rose, N. Amer. Fl. 23(4): 238. 1930.—Typus infra sub var. *dariensi* indicatur.

Trees or treelets sometimes flowering precociously as shrubs, when adult 6–18 m with smooth gray trunk up to 1 dm diam, variably pubescent with spreading or appressed hairs up to 0.1–0.3 mm or subglabrous, the pliant, plagiotropic or pendulous hornotinous branchlets canaliculate between prominent obtuse ribs, the foliage strongly bicolored, the lfts submembranous, above olivaceous scarcely or not lustrous, glabrous or remotely puberulent, beneath pallid or glaucous, pilosulous strigulose or glabrous, always prominently venulose, the paniculate inflorescence either leafless and terminal or axillary and included in foliage, its axes always pilosulous.

Stipules early caducous (scarcely known), linear-setiform ± 4 –7 mm.

Lvs (9–)12–35 cm; petiole including moderately dilated, usually discolored pulvinus 0.6–5.5 cm, at middle 1–2.8 mm diam, bluntly 3-ribbed dorsally and laterally, shallowly sulcate ventrally, the sulcus expanded upward toward the gland; rachis 2–5.5(–6.5) cm, except sometimes in var. *hypoglauca* longer than petiole; gland 1 sessile or almost so between first pair of lfts, plumply ovoid or ovoid-ellipsoid 2.2 – 4.5 (–5) \times 1.2 – 2.3 mm glabrous; distal pair of lfts ovate- or subrhombic-elliptic short-acuminate (6.5–)8–27 \times (3.5–)4–11 cm, 1.8–3 times as long as wide, at base either asymmetrically cuneate or on proximal side rounded to subcordate, the margin revolute, the straight or gently incurved, centric or moderately displaced midrib with (7–)8–12(–13) pairs of major camptodrome (and often few intercalary) secondary veins either impressed-depressed or faintly raised above, always highly and sharply prominulous beneath, the tertiary and reticular venulation either prominulous or impressed above, always sharply defined and often pallid beneath; proximal pair of lfts broadly subsymmetrically ovate- or rhombic-ovate-acuminate, ± 0.4 – 0.7 times as long as the distal pair.

Racemes solitary or sometimes (by reduction of a branchlet of the panicle) 2–4 together, densely (6–)10–25-fl'd, the axis including short, sometimes subobsolete peduncle (1–)1.5–10(–13) cm; bracts early dry caducous ovate-deltate or lanceolate 0.8–2.4 mm; pedicels of fertile fls (2–)2.4–4.5 cm; young fl-buds subglobose, either gray-pilosulous or glabrous, opening long before maturity of fl; sepals little graduated, firm or submembranous in texture, oblong-obovate or ovate-oblong obtuse concave, the longest 4.5–9.5 mm; petals pale yellow, puberulent on both faces, the longest (12–)14–25 mm; functional stamens 7, the filaments puberulent, filiform or almost so, of 4 median stamens 1.6–2.5 mm, of 3 abaxial ones a little or no longer, 1.5–3.5(–4) mm; anthers glabrous or variably pubescent, of 4 median stamens slightly incurved 5–8 mm with very short divaricate 2-porose beak 0.3–0.6 mm, of 3 abaxial ones similar or further incurved, 4–6 mm with porrect beak (0.5–)0.7–1.4 mm, the pores separated by a slender septum; ovary densely white-pilosulous-strigulose, the incurved head moderately dilated, 0.8–1.6 mm diam, the stigmatic cavity 0.7–1.2 mm diam; ovules 118–138.

Pod pendulous, stoutly short-stipitate, flexuously linear in outline, ± 2.5 –3 dm long, 4.5–12 mm diam, either strongly compressed laterally and ribbon-like or compressed-quadrangular, dorsoventrally flat-edged by the wide sutures, the thin green valves closely moulded over the 1- or irregularly 2-seriate seeds becoming indistinctly venulose and glabrate, apparently indehiscent, the seeds turned broadside to the valves, released probably by rotting or (if dry) by irregular transverse fracture of the valves; seeds subsymmetrically ellipsoid or oblong-ellipsoid 4 – 6.2 \times 1.8 – 2.8 , the testa (scarcely known fully mature) blackish smooth lustrous.

A species inconveniently difficult to separate, in absence of pods at least half-mature, from sympatric kindred *Bacillares* with one gland on the leaf-stalk, but

because of the usually large and not very markedly asymmetric, marginally revolute leaflets most likely confused with *S. papillosa*. In fact we have found no reliable floral or vegetative character that will identify these two species at anthesis. So far as known from fruiting vouchers *S. dariensis* is actually nowhere sympatric with *S. papillosa*, but occupies that discontinuity in the latter's range that extends from central Panama east to northwesternmost Colombia and extends thence, the only species of its sort, south along the Atlantic lowlands to Esmeraldas, Ecuador. This pattern of dispersal, still no doubt liable to modification or extension as exploration of northern Colombia develops, suggests vicariant subspecific differentiation of one primary specific type; but the ripe fruits of *S. papillosa* and *S. dariensis* are so different at maturity, the first cylindric, densely papillate and dehiscent along the ventral suture, the second compressed, smooth and indehiscent except by rotting or irregular fracture between seeds, that we cannot seriously entertain the view that only one major species is present. Schery (1951) seems to have overlooked or underestimated the carpological characters, subordinating *Chamaefistula dariensis* to *Cassia oxyphylla* and *Ch. gatunensis* to *C. fruticosa* (=our *S. bacillaris*), an arrangement prompted by undue emphasis on orientation of the pubescence.

Variation within *S. dariensis* is clearly correlated with dispersal and involves vestiture, length of petiole, size of perianth-parts and (simultaneously) width and compression of the pod, this being at one extreme a very narrow, strongly compressed ribbon-like legume containing one row of seeds (as that of *S. georgica*, wholly different in the androecium), at the other a broader, compressed-quadrangular bean with seeds aligned in two interdigitating ranks. Except that var. *dariensis* and var. *gatunensis* occur together in Darién (e.g. near El Real, cf. *Stern* 447 and *Duke* 5093, both MO), the four varieties defined below are fully allopatric.

Key to the Varieties of *S. dariensis*

1. Pod 4.5–6.5 mm diam; anthers glabrous or minutely strigulose in the grooves; Costa Rica, Panama and n.-w. Colombia.
 2. Sepals densely gray-puberulent overall, the longest 6–9.5 mm; lfts densely pubescent dorsally; n.-e. Costa Rica; lowland Panama, from Canal Zone e. into n.-w. Colombia.
 3. Lower face of lfts pilosulous with loosely spreading-incurved hairs up to 0.15–0.3 mm; petiole 0.6–1.6(–2.3) cm; sepals persistent under the forming pod.
 - 14a. var. *dariensis* (p. 130).
 3. Lower face of lfts strigulose with forwardly appressed hairs 0.1–0.25 mm; petiole 1.5–4 cm; sepals promptly deciduous.
 - 14b. var. *gatunensis* (p. 131).
 2. Sepals glabrous, the longest 4.2–6 mm; lower face of lfts, except for remotely puberulent major veins, glabrous; cloud forest of Continental Divide in centr. Panama, 300–900 m.
 - 14c. var. *hypoglaucia* (p. 131).
1. Pod 8–12 mm diam; anthers (usually) hispidulous overall with hairs ± 0.2 mm; coastal lowland forest of Ecuador and s.-w. Colombia. Petiole 2–4(–5) cm; lfts densely strigulose beneath; sepals glabrous throughout or beyond middle, the longest 4–8 mm.
 - 14d. var. *smaragdina* (p. 132).

14a. *Senna dariensis* (Britton & Rose) Irwin & Barneby var. *dariensis*. *Chamaefistula dariensis* Britton & Rose, 1930, l.c., sens. str.—"Forest around Pinogana, southern Darién, Panama, April 1914, *Pittier* 6579."—Holotypus, US! clastotypus (fragm), NY!—*Cassia oxyphylla* var. *dariensis* (Britton & Rose) Schery, Ann. Missouri Bot. Gard. **38**(1): [=Fl. Panama **5**(3)]: 79. 1951.

Chamaefistula bolivarensis Britton & Rose ex Britton & Killip, Ann. N.Y. Acad. Sci. **35**: 176. 1936.—"Tierra Alta, Río Sinú, Bolívar [properly Córdoba], Colombia, March 7–10, 1918, *Pennell* 4666 . . ."—Holotypus, NY! = NY Neg. 4961; isotypus, US!

Lf-rachis notably longer than short petiole; lfts incipiently bullate on upper face by depression of midrib and secondary, sometimes of all veins, beneath both villosulous and pallid-glaucous; sepals firm, densely gray-strigulose-pilosulous dorsally, up to 6–9.5 mm, marcescent; petals up to 14–23 mm.—Collections: 18.

Humid forest, often along waterways, sometimes persisting in thickets after forest-clearing, 10–530 m, local in e. Panama (Canal Zone e. through Darién) and extreme n.-w. Colombia (n. Antioquia, adjacent Córdoba, and Chocó).—Fl. III–IV, VI–X, perhaps throughout the year.

- 14b. *Senna dariensis*** (Britton & Rose) Irwin & Barneby var. ***gatunensis*** (Britton & Rose) Irwin & Barneby, comb. nov. *Chamaefistula gatunensis* Britton ex Britton & Rose, N. Amer. Fl. 23(4): 234. 1930.—Type from Gatun, November–December 1859, *S. Hayes 548*.—Holotypus, NY (2 sheets)!—*Cassia fruticosa* var. *gatunensis* (Britton & Rose) Schery, Ann. Missouri Bot. Gard. 38(1) [=Fl. Panama 5(31)]: 81. 1951.

Lf-rachis as long or commonly somewhat longer than petiole; venation of upper lft-face either immersed or prominulous but not or scarcely depressed, the lower face paler than the upper but not notably glaucous; sepals of var. *dariensis* except more promptly deciduous; long petals 15–25 mm.—Collections: 29.

Habitat of var. *dariensis* and sympatric with it in Canal Zone and (locally) Darién, but apparently commonest on the Caribbean slope of the Divide in San Blas, Panama, extending e. and s.-e. to Turbaco in Bolívar, Colombia and centr. Chocó; one disjunct record from n.-e. Costa Rica (Heredia).—Fl. IV–XII, perhaps throughout the year.

Very close to typical var. *dariensis*, indeed identical in the narrow pod, but differing not only in vesture, as overemphasized by Schery (1951), but also in the generally longer petioles, less impressed venation of the leaflets' upper face, and deciduous sepals. Where var. *dariensis* and var. *gatunensis* cohabit, as near Gamboa on the Canal and on the Pacific slope in Darién, they are readily distinguished by these features and we have seen no doubtfully intermediate specimens. Our one record from Chocó (*White & Warner 99*, MO) is unusual in the pallor of the dorsal leaf-venation and exceptionally short-beaked anthers; we lack the pod, necessary to confirm the identity. The var. *gatunensis* was encountered first by Humboldt and Bonpland, in ripe fruit in April, 1801, near Turbaco, Colombia, but the specimens (*Bonpland 1425*, P) were either not seen or ignored by Kunth when he was working up the Caesalpinioideae for *Nova Genera & Species*.

- 14c. *Senna dariensis*** (Britton & Rose) Irwin & Barneby var. ***hypoglauca*** Irwin & Barneby, var. nov., ab arcte affini var. *gatunensi* cum qua habitu toto congruit foliolis inferne glabris insigniter glaucis, sepalis brevibus (4–6.3, nec 6.5–9.5 mm) glaberrimis petalisque brevioribus (12–15, nec 15–25 mm) abstans.—PANAMA. Panamá: Cerro Campana above Su-Lin Motel, 16.IX.1971 (fl), *Al Gentry 1843*.—Holotypus, MO; clastotypus (fragm), NY.

Essentially as var. *gatunensis* except for dorsally glabrous, notably glaucous foliage, small glabrous calyx and generally shorter petals; petioles 3.5–5 cm; rachis 3–4.5 cm, either longer or shorter than petiole.—Collections: 6.

Cloud-forest, 350–900 m, scattered along and near the Continental Divide in centr. Panama, from Santa Fe (Veraguas) to Cerro Pilón (Coclé) and Cerro Campana (w. Panamá).—Fl. VIII–X.

- 14d. *Senna dariensis*** (Britton & Rose) var. ***smaragdina*** Irwin & Barneby, var. nov., habitu, foliorum pube necnon floribus majusculis var. *gatunensi* proxima sed sepalis plerumque parvis (maximo interiori 4–6.3, raro –8 mm) dorso toto vel saltem ultra medium glabris, antheris ubique hispidulo-pilosulis, patria aliena et praecipue legumine (compresse 4-angulo) multo latiori 8–12 mm diam separanda.—ECUADOR. Esmeraldas: along river banks near Borbón, 6.VIII.1967 (fl, fr), *Carlos Jativa & Carl Epling 2162*.—Holotypus, MO (2 sheets); isotypi, NY, US.

Resembling var. *gatunensis* in pubescence, petiole-length, and relatively long corolla, but the calyx usually smaller and externally glabrous from base or middle upward; pod much broader than that of other vars. of *C. dariensis*, 8–12 mm diam, the seeds biseriate.—Collections: 10.

Humid virgin forest, sometimes along streams, persisting in second-growth woodland, below 650 m, coastal plain and first foothills of the Pacific coast of s. Colombia (Nariño) and adjacent Ecuador (Esmeraldas, Imbabura and Los Ríos).—Fl. III–IV, VII–VIII, perhaps through the year.

A clearly distinct senna, perhaps when better known specifically distinguishable from *S. dariensis* by the pod alone, in foliage hardly different from var. *gatunensis*, and resembling distantly allopatric var. *hypoglauca* (of which the pod is still wanting) in the small glabrate calyx. The densely pubescent anthers furnish a good differential character for flowering specimens. The variety was collected first in 1841 at Tumaco by Hinds and Barclay. Their specimens, consisting of foliage with one damaged pod of the preceding season, were among those cautiously identified by Bentham as “*C. bacillari* affin.” Mistakenly referred (*Little 6210*) by Killip (in *Little, Caribbean Forester* 9(3): 243. 1948) to *Cassia scandens* R. & P.

Our one specimen from Los Ríos, Ecuador (*Dodson 5472*, US) differs from the rest in the relatively large calyx (inner sepal to ± 8 mm) and glabrescent anthers. Fruit is required to settle the identity of this population. An indifferent specimen from Tumaco, Nariño (*Romero-Castañeda 2761*, F) with a few broken immature flowers detached from the lvs may belong here, but has glabrous anthers.

- 15. *Senna smithiana*** (Britton & Killip) Irwin & Barneby, comb. nov. *Chamaefistula smithiana* Britton & Rose ex Britton & Killip, Ann. N.Y. Acad. Sci. 35: 172. 1936.—“Santa Marta, Colombia. Type from five miles east of Cienega, September 10, 1898, *H. H. Smith 251*, type (NY), 250.”—Holotypus, NY! isotypi, F, MICH, US; paratypi (250, from Bonda), BR, K, NY, USF!

Fruticose and ultimately arborescent, at anthesis 2–4(–?) m, with habit, stipules and foliage of *S. oxyphylla* var. *oxyphylla* but never pilosulous, the plane-margined lfts strigulose with appressed hairs 0.2–0.4 mm, sometimes glabrate above, the primary axis of the terminal, shortly exserted panicle abruptly zigzag.

Stipules falcately linear-ob lanceolate 0.8–2 mm wide.

Lvs 9–15 cm; petiole 15–35 mm, at middle 0.9–1.3 mm; rachis 14–23 mm, as long or commonly a little shorter than petiole; gland between proximal pair of lfts sessile or substipitate, $2-3 \times 0.7-1.4$ mm glabrous; distal pair of lfts obliquely ovate- or ovate-elliptic-acuminate $6.5-9.5 \times 2-4.5$ cm, 2–3 times as long as wide, the venation as in *S. oxyphylla*; proximal pair obliquely ovate-acuminate $\frac{1}{2}-\frac{2}{3}$ as long, proportionately broader but not strongly cordate-dilated on proximal side at base.

Pedicels 16–33 mm; buds globose glabrous or almost so; sepals membranous

strongly graduated, the inner broadly ovate-orbicular 7–10 mm, the outermost scarcely more than $\frac{1}{2}$ as long; petals variably heteromorphic, the longest 16–24 mm; androecium functionally 6- rarely 7-merous (one abaxial stamen commonly lacking), the anthers as in *S. oxyphylla*, of 4 median stamens 5.5–8 mm with beak 0.5 mm, of 2 (or 3) abaxial ones 2–5 mm, with porrect biporose beak 1.3–1.8 mm; ovary of *S. oxyphylla*, the ovules 108–198.

Pod and seeds unknown.—Collections: 5.

Forest and thickets in disturbed forest, 10–350 m, local, known only from foothills of Sa. Nevada de Santa Marta in n. Magdalena, Colombia, and of Sa. de Perijá in adjacent Zulia, Venezuela.—Fl. IX–XII.

A species ambiguously poised between *S. bacillaris*, of which it has almost the calyx and large flower together with the plane leaflets, and *S. oxyphylla*, similar in size and form of foliage but small-flowered and with revolute leaflets. The loss of one adaxial stamen in most flowers sets *S. smithiana* apart, but this same stamen is much reduced in size in *S. bacillaris* var. *benthamiana* and its full suppression provides only a weak specific character. Possibly *S. smithiana* is merely a local variety of *S. bacillaris* or conceivably a set of populations derived from a *S. bacillaris* \times *oxyphylla* hybrid, entirely plausible so far as geographical dispersal is concerned. The pods of *S. bacillaris* and *S. oxyphylla* are much alike in external form, but the seeds are different, those of the former being distinguished by an emphatic areole. Until seeds of *S. smithiana* become known, the affinities of the species cannot be assessed with any expectancy of finality.

16. *Senna hayesiana* (Britton & Rose) Irwin & Barneby, comb. nov. *Chamaefistula hayesiana* Britton & Rose, N. Amer. Fl. 23(4): 235. 1930.—“Gatun, Panama, October 1859, *S[utton] Hayes* 572.”—Holotypus, NY (hb. Torr.)!—*Cassia hayesiana* (Britton & Rose) Standley, Contrib. Arn. Arb. 5: 75. 1933.

Cassia inaequilatera Ramírez Goyena, Fl. Nicarag. 1: 367. 1909.—“[Nicaragua:] En Rivas.”—No typus found, but the description of androecium decisive.—Non *C. inaequilatera* Balbis ex DeCandolle, 1825.

Chamaefistula maxonii Britton & Rose, N. Amer. Fl. 23(4): 234. 1930.—“Panama. Type from Chiva-Chiva trail above Red Tank, Canal Zone, May 28. 1923, [William R.] Maxon & [Alfred D.] Harvey 6611.”—Holotypus, NY! isotypus, US! *Cassia maxonii* (Britton & Rose) Schery, Ann. Missouri Bot. Gard. 38(1)[=Fl. Panama 5(3)]: 77. 1951, nom. superfluum, because including the typus of *Chamaefistula hayesiana* = *Cassia hayesiana* (1933).

Chamaefistula subpilosa Britton & Rose, N. Amer. Fl. 23(4): 235. 1930.—“Vicinity of Ahuachupan [properly Ahuachapán], El Salvador, January 9–27, 1922, [P. C.] Standley 20022.”—Holotypus, NY! isotypus, US!

Chamaefistula valerioi Britton & Rose, N. Amer. Fl. 23(4): 236. 1930.—“Costa Rica. Type from vicinity of Talaxán [properly Tilarán], Guanacaste, January 10–31, 1926, [P. C.] Standley & [Juvenal] Valerio 44266.”—Holotypus, NY! isotypus, US!—Wrongly equated by Standley, 1937, p. 514, with *Cassia bacillaris*.

Chamaefistula membranacea Britton & Rose, N. Amer. Fl. 23(4): 236. 1930.—“Vicinity of Tonacatepeque, San Salvador, El Salvador, December 30, 31, 1921, [P. C.] Standley 19430.”—Holotypus, NY! isotypus, US!

Chamaefistula williamsii Britton & Rose, N. Amer. Fl. 23(4): 236. 1930.—“Panama. Type from Penomene, February 23–March 22, 1908, *R. S. Williams* 135.”—Holotypus, NY! isotypus, US!

Chamaefistula anconis Britton & Rose, N. Amer. Fl. 23(4): 236. 1930.—“Ancon hill, Canal Zone, Panama. Type collected February 20, 1908, *R. S. Williams* 9, type, fruiting specimen; Killip 12055, October 17, 1922, flowering.”—Holotypus, Williams 9, NY (2 sheets)! isotypus, US! paratypes, Killip 12055, NY, US!

Chamaefistula lanata Britton ex Britton & Rose, N. Amer. Fl. 23(4): 237. 1930.—“Mejicanos, El Salvador, August 1, 1922, *Salvador Calderón* 1103.”—Holotypus, NY! isotypus, US!

Chamaefistula chiapensis Britton & Rose, N. Amer. Fl. 23(4): 238. 1930.—“Between Teneapa

- and Ajalon [properly Yajalón], Chiapas, October 13, 1895, *E. W. Nelson 3289*.—Holotypus, NY! isotypus, US!—*Cassia brittoniana* Lundell, *Phytologia* 1: 214. 1937 (non *C. chiapensis* (Britt. & Rose) Standley, 1939).
- Chamaefistula standleyi* Britton & Rose, *N. Amer. Fl.* 23(4): 238. 1930.—“Vicinity of San José, Costa Rica, December 4, 1925–February 10, 1926, [*P. C.*] *Standley 41236*.”—Holotypus, NY! isotypus, F!—*Cassia standleyi* (Britton & Rose) Standley, *Field Mus., Bot.* 18: 518. 1937.
- Chamaefistula acuminata* Britton & Killip, *Ann. N.Y. Acad. Sci.* 35(3): 173. 1936.—“Independence Park, Medellín, Colombia, March 1927, [*Rafael A.*] *Toro 61* . . .”—Holotypus, NY! = NY Neg. 4969.
- Chamaefistula subcoriacea* Britton & Killip, *Ann. N.Y. Acad. Sci.* 35(3): 174. 1936.—“. . . upper Río Lebrija Valley, Santander, Colombia, 400–700 m altitude, December 29, 1926, *Killip & Smith 16276* . . .”—Holotypus, NY! isotypus, US!
- Chamaefistula apiculata* Britton & Killip, *Ann. N.Y. Acad. Sci.* 35(3): 175. 1936.—“Titiribí, vicinity of Medellín, Colombia, 20.VIII.1927, fl. *R. A. Toro 419*.”—Holotypus, NY! = NY Neg. 4966; clastotypus (fragm), US!
- Chamaefistula deficiens* Pittier, *Bol. Soc. Venezol. Ci. Nat.* 10: 111. 1945.—“VENEZUELA. Mérida: Tabay, 1800–1900 m . . . Setiembre 13, 1930 (*W. Gehriger 445* . . .)”—Holotypus, VEN! = NY Neg. 6320; isotypi, A, F, NY, US!
- Cassia racemosa* Mutis, *Diario* 2: 370. 1958.—“Mariquita [dept. Tolima, Colombia].”—The description, especially of the 4-androus flower, is decisive. Three Mutis specimens of *S. hayesiana* have been seen at MA and US; *Mutis 3597, 4295, 4725*, but none can be positively associated with the description of *C. racemosa*.

Shrubs (1–)1.5–7 m, erect or sprawling, becoming sarmentose when support offers, and both in forest and in open places eventually arborescent to 10(–15) m with trunk up to 7 cm diam, with pliantly plagio- or geotropic hornotinous branchlets, the stems cylindric smooth or striate elenticellate, at first brown becoming grayish, the young growth except for the glabrous or remotely minutely puberulent upper face of lflets pilosulous or strigulose with fine weak hairs up to 0.1–0.45(–0.5) mm, the vesture of lflets mostly spreading (especially along major veins), rarely appressed or vestigial (exceptionally 0), that of the thyriform or thyriform-paniculate inflorescence mostly appressed, rarely loosely incurved, the thinly chartaceous or (mature) subcoriaceous lflets bicolored, olivaceous or brownish and moderately lustrous above, paler brown or subglaucous-green beneath, the mature inflorescence variable in form, the early racemes or early leafless racemiferous branchlets often axillary to lvs (therefore immersed in foliage), the lvs abruptly reduced or eliminated upward and the primary axis of the oblong or subcorymbiform panicle flexuous or zigzag.

Stipules falcately linear-caudate, oblanceolate-acuminate or -acute, or sub-linear, 5–21 × 0.7–6 mm, 1–several-nerved, early caducous or deciduous before the lf.

Lvs below inflorescence 6–25(–28) cm; petiole with often discolored but little swollen pulvinus (1–)1.5–4.2(–5.5) cm, at middle 1.1–2.4(–2.8) mm diam, openly very shallowly sulcate; rachis (1–)1.5–4.4(–5) cm, a little longer or shorter than petiole; glands 1–2(–3), 1 always sessile or subsessile at proximal pair, lance- or ovate-linguiform obtuse, or horn-shaped subacute, glabrous, 1.5–4 mm tall, often 1 similar and smaller between distal pair, the seta in addition (or instead) often glandular-thickened at base with refracted setiform tail or reduced to a small gland standing behind the distal pair of pulvinules; pulvinules usually little swollen, 2–5(–6) mm; distal pair of lflets ovate-, elliptic- or obovate-acuminate 5.5–16(–18) × 2.5–8.5 cm, 1.6–2.9 times as long as wide, the acumen varying from broadly deltate to triangular-subcaudate, rarely reduced to a minute apiculus, the blade at base when relatively narrow subsymmetrically cuneate both sides, with relatively increased width more asymmetric and rounded on proximal or sometimes both sides, the margin revolute, the straight or slightly incurved midrib with 6–12(–14) major camptodrome and often several almost equally strong

intercalary secondaries either finely prominulous or immersed above, or (in age) depressed-canaliculate, beneath sharply prominulous (and often discolored against a pale ground), the tertiary venules and reticulation irregular, prominulous only beneath, the ultimate sharply defined areoles either $>$ or < 1 mm diam.

Peduncles both solitary and, by contraction of a common axis, appearing 2(–3) together in an axil, either ascending from ascending primary axis or refracted from pendulous one, (0.4–)1–3.5(–4) cm; racemes densely (5–)7–30-fl'd, at first subcorymbose, the axis often elongating, in fruit (0.5–)1–5(–8) cm; bracts ovate or lanceolate 2–4.5(–5) mm, subherbaceous membranous-margined, usually early caducous, sometimes persistent into anthesis; pedicels of fertile fls (caveat: apparently open fls may be quite immature and short-pedicellate) 18–40(–46) mm; buds when very young ovate obtuse, thinly strigulose, opening to expose the androecium long before true anthesis, becoming just before anthesis oblong-ovoid; sepals submembranous, little graduated, the inner ones up to (4–)4.5–7(–7.5) mm; petals usually dull, sometimes golden yellow, pubescent dorsally glabrous within, subhomomorphic except the adaxial one often a trifle wider, seldom much expanded, all short-clawed, at full anthesis normally becoming 11–19(–22) mm, sometimes many failing to expand and reaching 8–11 mm, then more densely hairy dorsally; functional androecium 4-merous, the 3 adaxial and 3 abaxial stamens reduced to staminodes or obsolete, the filaments glabrous 1–2(–2.5) mm, the 4 thecae homomorphic, almost straight or gently incurved (5.5–)6–8.5(–9) mm, glabrous or randomly puberulent in the dorsoventral grooves, the very short 2-porose abruptly divaricate beak 0.3–0.7 mm; ovary densely whitish-pilosulous, the short glabrescent incurved style little dilated, 0.6–0.9(–1.1) mm diam, the stigmatic cavity 0.4–0.7 mm diam; ovules 128–192.

Pod pendulous stipitate, the stipe 2–6 mm, often scarcely longer than diam, cuneately dilated into the body, this narrowly cylindroid obtusangulate, straight or slightly decurved, terete unless constricted by atrophy of ovules, (6.5–)10–24 \times 0.8–1.3 cm, the ventral suture 1–2.5 mm wide bordered on either side by a thickening of the valve wall 1.5–3 mm wide, the valves firm, subcoriaceous green becoming brown, smooth or faintly venulose, early glabrate; dehiscence along ventral suture, follicular, the endocarp finally separating as a continuous ribbon; seeds 2-seriate transverse, turned broadside to the septa and embedded in black pulp, compressed-ovoid or obliquely ellipsoid, 3.9–5 \times 2.7–3.5 mm, the testa mahogany-brown, brilliantly lustrous, cross-crackled, exareolate.—Collections: 321.

Wet evergreen and seasonally dry semideciduous woodland, usually in open sunny places along streams, in stony glades, and in forest-savanna ecotone, in Panama and Costa Rica coming out into beach-scrub along the Ocean, in cleared and disturbed forest persisting in thickets and becoming weedy in hedges and neglected pasture, mostly 5–750 m, but recorded from Chiapas up to 1060, from Guatemala to 1200, from El Salvador to 1230, from Honduras to 1300, from Costa Rica to 1130, from Panama (Chiriquí) to 1300 and from Venezuela to 1800 m, widespread from s.-e. Mexico (on Gulf slope from e. Oaxaca to Campeche, on Pacific slope from Istmo de Tehuantepec to highland Chiapas) s.-e. through Central America (all states) to Panama (all departments), thence more rarely e. through lower Cauca and Magdalena valleys and Sa. Nevada de Santa Marta in n. Colombia e. to the upper Río Meta on the Boyacá-Meta boundary and to the Maracaibo slope of Cordillera de Mérida in adjacent Venezuela; cultivated and reported naturalized on Martinique in West Indies.—Fl. abundantly VIII–I, sporadically through the year.

The senna which we describe under the name *S. hayesiana*, common through-

out much of Central America below 18°N and especially abundant in Panama, is in great part that which Bentham (1871, p. 521, t. 61) had in mind as *Cassia oxyphylla*, though not the genuine *C. oxyphylla* Kunth and never fully extricated from *C. bacillaris*. It is distinguished from these, as from all sympatric quadrifoil sennas and indeed from all other *Bacillares* by its functionally tetramerous androecium, from which not only the three adaxial, but also the three, usually heteromorphic abaxial members are suppressed or reduced to rudiments, leaving four stout straight or only slightly incurved anthers erect, parallel to each other, on very short filaments. This columnar androecium determines the shape of the mature corolla which forms around it a campanulate sheath of loosely appressed petals, perceptibly different from the expanded, bowl-shaped flower of *S. bacillaris* or *S. fruticosa*. The pod, finely illustrated in Bentham's plate of *C. oxyphylla*, which we conjecture to be drawn from a Panamanian collection (*Fendler* 88, K), is essentially that of *S. bacillaris* in form, texture and dehiscence, so that fruiting specimens are only with difficulty separated by the less oblique, less intricately venulose leaflets unless, as in *Fendler* 88 (but unfortunately not consistently), the seta terminating the leaf-stalk is transmuted into a gland, a feature foreign to *S. bacillaris*.

Material of *S. hayesiana* at Kew annotated before 1871 by Bentham as *Cassia oxyphylla* includes good tetramerous flowers collected in Mexico by Jurgensen, Liebmann, and E. P. Johnson, in Nicaragua by Oersted, and in Panama by Sutton Hayes, but Bentham made no mention of the androecium. In his monograph (1871, p. 522) he contradictorily cited several of these specimens as a possible variety of *C. bacillaris* differing in their broader, more densely pubescent leaves, but at the same time "evidently nearly allied to *C. oxyphylla*." The species was first fully and correctly diagnosed and characterized by Schery (1951, p. 77) under the technically superfluous name *C. maxonii*, superfluous because a prior *C. hayesiana*, obligatory in the circumstances, was overlooked. In extricating the tetramerous *C. hayesiana* from sympatric heptamerous allies, Schery was able to reduce four Brittonian segregates to one superficially variable entity. Pursuing the same course outside of Panama, we are now obliged to list as synonyms no less than thirteen names proposed by Britton and colleagues together with one of Pittier from Venezuela and the relatively early (but homonymous) *C. inaequilatera* Ram. Goy. The chamaefistulas are mentioned below in relation to internal variation in *C. hayesiana*.

In spite of the elaborate synonymy which suggests the contrary, *S. hayesiana* is not by any means an exceptionally polymorphic senna. Stature of the plant covers a range from a low sprawling shrub to a small forest tree, but this range is common to most *Bacillares*. The vesture of young branchlets and foliage varies (as described above) in density, length and orientation. Young leaves and shade leaves are submembranous, whereas older ones or those borne in the canopy tend to be firmer, sometimes bullate by depression of the secondary and subsequent venulation. The leaflets vary in outline, relatively narrow ones tending to be drawn out into acuminate or even caudate tips, whereas broader ones are more abruptly narrowed into a triangular or deltate point. The normal, fully developed inflorescence is an exserted panicle of racemes, sometimes leafy at the base but leafless distally; but especially out of season, or early in the season of normal bloom, some random racemes are often borne solitary in axils of mature leaves. The floral bracts, ordinarily caducous, occasionally persist into full anthesis. The perianth varies considerably in size, but care must be taken to distinguish between flowers at full anthesis and those which, despite exserted androecia which give an impression of maturity, are in reality not fully blown. The androe-

cium itself is the most stable feature of the species, varying little in size or proportions. The variation on these lines recorded from our now very ample sample of *S. hayesiana* is readily accommodated in one species, showing no internal correlations and no perceptible geographic pattern. The segregates listed in our synonymy exhibit these particular character-combinations:

Chamaefistula valerioi (Costa Rica): average in all respects for the species.

Ch. chiapensis (Mexico) and *Ch. standleyi* (Costa Rica): as *Ch. valerioi* except for somewhat emphasized and subpersistent stipules and bracts. The difference in flower-size claimed in Britton & Rose's key (1930, p. 232) is illusory.

Ch. lanata (El Salvador): exactly = *Ch. valerioi* except for immature panicle, most flowers yet unexpanded and the petals consequently appearing more densely pubescent dorsally. The typus is of interest because it includes thick-textured, incipiently bullate leaflets and thin-textured, finely reticulate ones, ostensibly from one tree.

Ch. membranacea (El Salvador): based on a poorly pressed, insect-ravaged specimen with relatively thin-textured leaflets.

Ch. subpilosa (El Salvador): based on a specimen bearing only the small leaves normally present at base of the terminal panicle.

Ch. maxonii (Panama): exhibits the state of flowering out of season (May 28), with few, few-flowered racemes axillary to ample cauline leaves.

Ch. hayesiana (Panama): the typus closely resembles that of *Ch. membranacea* except for subappressed vesture of lower leaf-face; it has no fully expanded flowers.

Ch. williamsii and *Ch. anconis* (both Panama): normal Panamanian *C. hayesiana* in mature fruit.

Ch. acuminata and *Ch. apiculata* (both from Medellín, Colombia): leaflets thinly strigulose, not pilosulous, beneath, in the first subcaudately acuminate, in the second proportionately broader and abruptly contracted at apex into a small point.

Ch. subcoriacea (Colombia): leaflets intermediate in outline between those of the two last mentioned, but densely villosulous beneath.

Ch. deficiens (Venezuela): leaflets in outline as the preceding, but almost glabrous beneath; petals poorly developed.

17. *Senna macrophylla* (Kunth) Irwin & Barneby, comb. nov. *Cassia macrophylla* Kunth, *Mimoses* pl. 38. 1822 and p. 126. 1823.—Typus infra sub var. *macrophylla* indicatur.

Cassia macrophylla sensu Benthams, 1871, p. 519.

Shrubs and treelets, the latter sometimes sarmentose when crowded, rarely precociously flowering as stout herbs, normally terrestrial but occasionally encountered as epiphyte in crotch of forest-tree, at anthesis (1–)1.5–9 m, the stiff or pliant, terete or obtusangulate branchlets with lf-stalks, axes of inflorescence and lower face (at least along major veins) of lfts densely to very sparsely strigulose or pilosulous with forwardly subappressed, incurved or spreading hairs up to 0.1–0.6(–1.2) mm, the ample, thin-textured subconcolorous, intricately reticulate lft-blades always glabrous above, the short inflorescences either axillary or cauliflorous, then often several in a vertical file.

Stipules caducous (hence poorly known), varying from slenderly setiform to amply foliaceous, 0.45–12 × 0.02–5 cm, when foliaceous resembling the lower pair of lfts but smaller.

Lvs 1.5–7.5 dm; petiole including little swollen but deeply wrinkled pulvinus

1.5–28 cm, at middle 1.2–4.5 mm diam, openly, very shallowly sulcate ventrally; rachis 2–12 cm, a little longer to much shorter than petiole; gland 1 sessile or almost so between proximal pair, ovate- or lance-linguiform obtuse glabrous 2–5(–6) mm tall; pulvinules 2.5–9(–10) mm; distal pair of lfts subsymmetrically ovate, ovate-elliptic or elliptic, shortly acuminate or caudate, 10–44 × 4–18(–24) cm, 1.8–2.7 times as long as wide, at base cuneate to rounded or shallowly cordate on both sides or sometimes cordate only on proximal one, the margin plane or obscurely revolute, the slender straight or slightly incurved midrib above immersed or shallowly depressed, sharply cariniform beneath, the 9–18 major campodrome (with random intercalary) secondary veins and complex reticulation raised on both faces, the ultimate defined areoles of the reticulum <0.5 mm diam.

Axis of compound inflorescence (leafless branchlet) 0–1.5 cm, when 0 the raceme solitary, axillary or shortly supra-axillary; peduncle 0–4 cm; racemes (4–)7–25(–30)-fld, at anthesis rather dense, often subcorymbose, the axis becoming 0.5–5.5 cm; bracts (early caducous, seldom seen) lance- or oblance-elliptic membranous-margined 1.7–3.5 mm; pedicels at full anthesis very slender pliant 1.5–4.7(–6.5) cm, much thickened but little longer in fruit; buds globose when young, glabrous or thinly pilosulous, opening before maturation of androecium; sepals little graduated, when dry prominently pallid-veined against a dull purplish- or grayish-brown field, in outline ovate, elliptic-ovate or -obovate, or oblong-ob lanceolate, always obtuse, the outer ones 6.5–10(–11) mm, all prominently 5–7-veined from base, the veins arborescently branched and the branches anastomosing with their neighbors; petals homomorphic or the adaxial one slightly broader than the rest, pale yellow, when dry pallid (rarely golden) dark-veined, puberulent dorsally especially along prominent veins, beyond the slender claw oblong-ob lanceolate to obovate, obtuse or emarginate, (11–)12–25(–29, reportedly “35”) mm long; functional androecium 7-merous, the filaments puberulent or glabrate, little unequal 1.7–3.7 mm; anthers glabrous 4.5–7.5 mm, of similar size but the 3 abaxial sometimes a little shorter and often more strongly incurved, those of 4 median stamens with abruptly divaricate 2-porose beak 0.4–0.8 mm, those of 3 abaxial ones with sigmoidally porrect beak 0.8–1.8 mm; ovary densely pilosulous, thinly pilosulous or glabrous, the style moderately dilated, at oblique tip 0.7–1.2 mm diam, the orifice (0.3–)0.45–1 mm diam; ovules 152–250.

Pod (of var. *gigantifolia*, that of var. *macrophylla* unknown) pendulous, the stout stipe 4–10 mm, the linear body (10–)15–28 × 0.75–1 cm, abruptly contracted at both ends, somewhat dorsoventrally compressed and sulcate along the sutures, a trifle constricted between the seeds, the green valves becoming thin-textured and nigrescent, the ventral suture 1–2 mm wide, the cavity divided lengthwise by a narrow pithy septum extending from suture to suture; dehiscence unknown, perhaps irregular by rotting; seeds biseriate, turned broadside to the septa, enveloped in thin blackish pulp, narrowly oblong-ellipsoid 3.8–5.3 mm, the testa dull black, exareolate.

A species instantly recognized at anthesis by its prominently venulose, usually glabrous sepals, but variable in other ways, especially in pubescence, in position and elaboration of the inflorescence, in size of leaves and flowers, in proportion of sepals to petals, and in stature as determined by environment and age of the individual plant. In fruit it may be distinguished from sympatric relatives by the intricate reticulation of the leaflet blades combined (at least in the case of var. *gigantifolia*) with a dorsoventrally compressed pod with narrow sutures. The populations found in the inter-Andean valleys of northern and central Colombia (=our var. *macrophylla*) have consistently setiform stipules, almost always rel-

atively small, short-petioled leaves consistently pilosulous beneath, and are not known to bear their consistently smallish flowers otherwise than in simple, solitary racemes axillary to living leaves. The populations within and around the margins of the upper Orinoco and Amazon basins differ in the almost always longer petioles and ampler, often truly immense leaflets, but are perplexingly variable in other characters. The stipules vary from setiform to amply foliaceous, sometimes so large as to resemble a pair of basal leaflets; the vesture varies from rufescently pilose to minutely strigulose; the racemes may be either axillary and solitary as in var. *macrophylla* or borne on condensed leafless branchlets, these either arising from new or from old wood, in the latter case often several together in a vertical supra-axillary file; and the petals vary from 1.5 to 3 times as long as the sepals. We have failed to detect among these often striking individual but apparently random variables any pattern of correlation and we are ultimately able to distinguish the Colombian and marginally Venezuelan and Panamanian var. *macrophylla* from its Hylaeian counterpart only by the usually neater foliage. In consequence we return to Benthams concept of *Cassia macrophylla* sensu lato, recognizing a polymorphic *C. gigantifolia* as a poorly defined variety. Of recent segregates, *Chamaefistula hazenii* is merely a youthful var. *macrophylla*, flowering precociously as a stout herb or weakly woody shrub; whereas *Ch. gigantifolia* (sens. str.) and *Ch. barbinervis* represent the strigulose and pilose states, respectively, of our var. *gigantifolia*, sens. ampliatus.

Key to the Varieties of *S. macrophylla*

1. Lvs extremely large, the larger cauline ones 3–7.5 dm, with petiole (6–)7–28 and rachis 5.5–12 cm, the blades of the distal pair of lflets 18–37 cm; Orinoco and Amazon basins, in Venezuela extending w. and n. to Cordilleras de Mérida (Orinoco slope) and Costanera. 17a. var. *gigantifolia* (p. 139).
1. Lvs of moderate size, 1.5–3.5(–4) dm, with petiole 1.5–6(–8.5) and rachis 2–6.5(–9) cm, the blades of the distal pair of lflets 10–23(–26) cm; inter-Andean valleys of centr. and n. Colombia, thence extending to the e. slope of Cordillera Oriental in Meta and to the Caribbean slope of Cordillera de Mérida in Venezuela. 17b. var. *macrophylla* (p. 140).

17a. *Senna macrophylla* (Kunth) var. *gigantifolia* (Britton & Killip) Irwin & Barneby, stat. nov. *Chamaefistula gigantifolia* Britton & Killip, Ann. N.Y. Acad. Sci. 25(3): 171. 1936.—“ . . . Rio Putumayo, Peru-Colombia Boundary, September 26, 1930, *G. Klug 1622* . . . Mishuyacu, Loreto, Peru, *G. Klug 279*.”—Holotypus, *Klug 1622*, NY! = NY Neg. 4956; isotypi F, MICH, MO, US; paratypes, *Klug 279*, F, NY! —*Cassia gigantifolia* (Britton & Killip) Cowan ap. R. E. Schultes, Bot. Mus. Leaflet. Harvard Univ. 18: 146. 1958.

Chamaefistula barbinervis Pittier, Bol. Soc. Venezol. Ci. Nat. 10: 111. 1945.—“VENEZUELA. Aragua: Entre Guamita y Rancho Grande, 900 m. Parque Nacional, Aragua, . . . Julio 8, 1938 (Ll. Williams 10254, tipo). Distrito Federal: Las Conchitas, 800 m, valle de Puerto la Cruz, Mayo 1926 (A. Jahn 477).”—Holotypus, *Williams 10254*, VEN! = NY Neg. 6331; isotypi, F, US! paratypes, *Jahn 477*, NY, US, VEN = NY Neg. 6330.

Variably pubescent, the hornotinous branchlets, lf-stalks, lower face of lflets and axes of inflorescence varying from minutely subappressed strigulose to villosulous-pilose, the hairs up to 0.1–0.6(–1.2) mm, the vesture either pallid or rufescent; stipules highly variable, either setiform and 9–12 mm, less than 1 mm diam, or oblanceolate acute up to 20 × 2 mm, or greatly enlarged and foliaceous, resembling the leaflets and up to 12 × 5 cm; lvs 3–7.5 dm, the petiole including pulvinus (6–)7–28 cm, at middle 2–4.5 mm diam; rachis mostly 5.5–12(–15) cm,

shorter than petiole; gland 2–5(–6) mm; distal lfts $18\text{--}44 \times 7.5\text{--}18(24)$ cm, the major camptodrome secondary veins 11–18; inflorescence either axillary to living lvs or cauliflorous, consisting either of a condensed leafless branchlet or reduced to 1(–2) shortly pedunculate racemes; sepals of var. *macrophylla*, but sometimes thinly pilosulous dorsally; petals (11–)12–25(–34) mm.—Collections: 106.

Primary and disturbed Hylaeon forest of the upper Amazon and Orinoco basins, commonly on terra firme but occasional in várzea, on a variety of clay and sand soils (sometimes in caatinga), from ± 130 up to 400–1300 m on the e. slope of the Andes in Venezuela, Ecuador and Peru, to 800 m on Guayana Highland (Sa. de Parima) and to 800–1400 m in cloud-forest of Cordillera Costanera in n. Venezuela, widespread as scattered individual trees or shrubs over n.-w. Brazil (Terr. do Roraima, Amazonas, Acre, Rondônia) and adjacent Peru (Cuzco, Huánuco, Loreto, San Martín, Amazonas), Ecuador (Napo-Pastaza), Colombia (Caquetá, Putumayo, Vaupés) and Venezuela (Amazonas), n. in Venezuela round the Andean sources of Río Orinoco in Apure, Barinas and Mérida and reappearing near crest of the coastal cordillera in e. Lara, Aragua and Distrito Federal.—Fl. nearly throughout the year.—*Matarro* (Peru).

Two collections from the Rio Negro-Orinoco divide in Vaupés, Colombia, are notable for elongate pedicels (up to 5.5–6.5 cm) and large flowers (longest petal 2.6–3.4 cm). One of them (*Schultes et al.* 17964, US) was particularly cited by Cowan when he transferred *Chamaefistula gigantifolia* to *Cassia*. Following Cowan, we regard this, with *Fernández* 2126 (US), as remarkable but taxonomically insignificant individual variants.

17b. *Senna macrophylla* (Kunth) Irwin & Barneby var. *macrophylla*. *Cassia macrophylla* Kunth, 1822–3, ll. cc., sens. str.—“Crescit in ripa fluvii Sinu, prope Carthagena (Regno Novo-Granatensi [= Córdoba, Colombia]).”—Holotypus, P (HBK)! isotypus, B (*hb. Willd.* 7934)! = F Neg. 1706.—*Chamaefistula macrophylla* (Kunth) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.

Chamaefistula hazenii Britton & Killip, Ann. N.Y. Acad. Sci. 25(3): 172. 1936.—“... La Palmita, west of Armenia, Caldas, Colombia . . . July 23 1922, Pennell, Killip & Hazen 8613 . . .”—Holotypus, US! isotypus, NY! = NY Neg. 4955.

Cassia macrophylla sensu Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(folio): 340. 1824.

Hornotinous branchlets with lf-stalks and lower face of lfts \pm densely pilosulous with erect or forwardly incurved hairs up to 0.25–0.5 mm; stipules slenderly setiform $4.5\text{--}12 \times 0.2\text{--}0.4$ mm, 1-nerved; lvs 1.5–3.5(–4) dm, the petiole including pulvinus 1.5–6(–8.5) cm, at middle 1.2–2.9 mm diam; rachis 2–6.5(–7) cm, either a little longer or shorter than petiole; gland 2–4 mm; distal lfts $10\text{--}23 \times 4\text{--}10$ cm, the main camptodrome secondary veins 9–14; inflorescence axillary, simply racemose; sepals glabrous or almost so; petals 14–19 mm.—Collections: 39.

Open woods and river banks, mostly 300–1700 m, Cordillera Oriental and Cauca valley in Santander, w. Boyacá, Cundinamarca and w. Meta, Tolima, Caldas, Valle and Cauca, Colombia, n. to the Sinú valley in dpto. Córdoba, e. (and up to 2200 m) to middle Chama valley in Mérida, Venezuela, and w. to Serranía de Pirre in Darién, Panama.—Fl. II–VIII, X–XII, perhaps irregularly throughout the year.

18. *Senna acutisepala* (Benth) Irwin & Barneby, comb. nov. *Cassia acutisepala* Benth in Martius, Fl. Bras. 15(2): 97. 1870.—“Habitat in prov. Espiritu Santo silvis: Princeps Maximilianus Neovidensis.”—Holoty-

pus, dated III.1817, collected therefore somewhere in present s.-e. Bahia, M (3 sheets)! = NY Neg. 9305; isotypus, GOETT!

Cassia acutisepala sensu Bentham, 1871, p. 519.

Shrubs 2.5–3 m of unknown habit, with terete smooth finely striate pale brown annotinous stems, appearing glabrous but the young branchlets, lf-stalks and axes of inflorescence sparsely strigulose with subappressed hairs up to 0.2–0.35 mm, the sepals and upper face of the thinly chartaceous lflets truly glabrous, the lflets olivaceous, faintly bicolored, scarcely lustrous above, dull beneath, the inflorescence an elongate thyriform panicle, the racemes all axillary to and shorter than developed lvs.

Stipules erect setiform 3–9 mm, at base 0.5–0.8 mm wide, early dry, disjoining before the lf.

Lvs 9–17 cm; petiole including slenderly ellipsoid wrinkled pulvinus 1.3–3 cm, at middle 0.8–1.7 mm diam, keeled dorsally, openly shallowly sulcate ventrally, subtriquetrous in section; rachis 1.5–3.2 cm, a little longer or shorter than petiole; gland 1 between the proximal pair of lflets, stipitate, in profile claviform 2–3 mm tall, the glabrous stipe shorter than or \pm as long as blackish head; pulvinules a little dilated, 2.5–3.5 mm; distal pair of lflets subsymmetrically elliptic 6–11 \times 2.2–4.3 cm, acuminate at both ends, at apex obtuse mucronulate, at base on both sides cuneately contracted into the pulvinule, the margin revolute, the centric straight midrib giving rise on each side to \pm 9–14 major camptodrome with some intercalary secondary veins, these with the tertiary connecting and reticular venules all prominulous on both faces, the ultimate defined areoles < 1 mm diam.

Peduncles with raceme-axis (1.5–)3–7 cm, much shorter than subtending lf; racemes loosely shortly 4–14-fld; bracts narrowly lance-attenuate 4–7 mm, deciduous by full anthesis; pedicels at anthesis 16–26 mm; sepals pallid becoming papery, broadly lanceolate acute, subequal in length 10–14.5 \times 3–4.3 mm, strongly nerved dorsally; young fl-buds acute; androecium exposed much before development of petals; petals yellow, puberulent dorsally, beyond the claw ovate-oblong 14–22 \times 5–9 mm, one broader abaxial one obliquely incurved around 2 longer stamens; filaments glabrous or almost so, those of 7 fertile stamens 2–4 mm, of subequal length or the 3 abaxial a little longer, the thecae either glabrous or remotely strigulose distally, those of 4 median stamens 4–7 mm, with abruptly divaricate 2-furcate beak 0.5–0.9 mm, those of 3 abaxial ones 5–7 mm with longer but almost as strongly sigmoid-divaricate beak 1.4–1.6 mm; ovary gray-strigulose; style 4–5 mm glabrescent, incurved distally, strongly dilated behind and below stigma and there 1.2–1.5 mm diam, the stigmatic cavity \pm 0.75–0.9 mm diam; ovules 90–112.

Pod and seed unknown.—Collections: 4.

Mata costeira below 100 m and inland in disturbed mata de cipó at 900 m, apparently local, known only from 4 collections: the typus, surmised by Bentham to have been collected in Espírito Santo, but more likely in southern Bahia inland from or near Ilheus; from Bahia without more exact data (*Blanchet 3638*); from e. of Maracás, Bahia, lat. 13°30'S (*Mori & dos Santos 11783*); and from near Valença, Bahia, lat. 11°30'S (*de Jesus & Santos 345/398*).—Fl. III–VI.

This rare and still not fully described senna appears strongly characterized by the syndrome of leaflets symmetrically cuneate at base, a leafy-bracteate inflorescence, and subequal lanceolate acute sepals glabrous or almost so dorsally.

19. *Senna subtrijuga* Irwin & Barneby, sp. nov., foliolis symmetrice obovato-ellipticis basi utrinque cuneatis dorso glabris *S. acutisepalam* simu-

lans, sed ab ea sepalis oblongo-ovatis obtusissimis ideoque alabastris globosis (nec ovoideis acutis), glandulisque petiolaribus inter amba (nec proximali solo) foliolorum paria cito separanda.—BRAZIL. Bahia: mata costeira, Santa Cruz Cabrália, 8.II.1967 (fl), R. P. Belém & R. S. Pinheiro 3312.—Holotypus, CEPEC; isotypi, NY (2 sheets).

Vines to 10 m, the young branchlets, pulvinules and axes of inflorescence subappressed-pilosulous with weakly incurved or subsinuous hairs up to 0.2–0.3 mm, the smooth glabrate mature branches obscurely angulate, the thinly chartaceous lustrously olivaceous concolorous foliage glabrous or almost so, the small terminal corymbose panicle of racemes leafy-bracteate, not exerted.

Stipules erect narrowly lance-setiform 5–7 mm, at base 0.6–0.9 mm wide, early dry and deciduous before the lf.

Lvs 8–17.5 cm; petiole including cylindric pulvinus \pm 2–4 cm, at middle 1–1.4 mm diam, trigonous, keeled dorsally, coarsely green-margined ventrally, the sulcus a shallow open gutter; rachis of 4-foliolate lvs 1.5–2.5 cm, a little shorter than petiole, that of 6-foliolate lvs up to 5 cm; pulvinules narrowly flask-shaped wrinkled 2–3 mm; glands sessile between each pair of lflets, plumply or narrowly ovoid, 1.6–2.3 mm tall; distal pair of lflets ascending from petiole, symmetrically elliptic-obovate, abruptly short-acuminate (4.5–)6.5–9 \times 2–4 cm, a little over twice as long as wide, at apex obtuse mucronulate, at base symmetrically cuneate, the margins strongly revolute, the stout pallid tapering midrib cariniform beneath, impressed above, giving rise on each side to 9–12 major camptodrome with or without intercalary secondary veins, these with the tertiary connecting and reticular venules subequally prominulous on both faces, the ultimate defined reticulum irregular, the areoles $>$ and $<$ 1 mm diam.

Peduncles with raceme axis 3–5 cm; racemes \pm 7–10-flid; bracts papery yellowish elliptic-cymbiform 3.5–5 mm, thinly puberulent dorsally ciliate, deciduous at anthesis; pedicels 16–23 mm; buds globose glabrous; sepals scarcely graduated, broadly ovate or oblong-ovate obtuse 9.5–11 mm, all yellowish, the outer firm with membranous margins, the inner subpetaloid; petals yellow, pubescent dorsally, especially along the prominent veins, the blades oblong-obovate beyond the short claw, 2–2.2 cm; filaments puberulent, of 3 abaxial stamens 2.5–4.3 mm, of 4 median ones 1.5–2 mm; thecae glabrous, of 4 median stamens 6–7.6 mm, with short divaricate-ascending beak 0.5–0.7 mm, of 3 abaxial ones 6–7 mm with porrectly ascending beak 1.1–1.6 mm; ovary densely silky-pilosulous; style \pm 2.5 mm, thinly strigulose, at apex incurved but little swollen, \pm 0.8 mm diam; ovules \pm 92.

Pod and seed unknown.—Collection: 1.

Littoral forest, known only from the type-locality near Sta. Cruz Cabrália, near 16°20'S on the coast of s.-e. Bahia.—Fl. II.

Senna subtrijuga is perhaps most nearly related to *S. acutisepala*, which is similar in the symmetric outline of the leaflets but different in the lanceolate acute (not broadly obtuse) sepals and consequently in the ovoid acute (not globose) flower buds. The leafstalk of *S. acutisepala* bears only one gland, between the lower pair of leaflets, whereas that of *S. subtrijuga* bears a gland also between the distal pair. No other *Bacillaris* of eastern Brazil resembles *S. subtrijuga* at all closely. The epithet refers to an occasional, possibly freakish 6-foliolate leaf present on branchlets of the type-collection, the only instance that we have come across in ser. *Bacillares* of leaves with more than four leaflets. Until the pod of *S. subtrijuga* is discovered there will be some margin of doubt as to the true

affinity of the species, but the morphology of the flower and the high number of ovules are characteristic of ser. *Bacillares*.

- 20. *Senna latifolia*** (G. F. W. Meyer) Irwin & Barneby, comb. nov. *Cassia latifolia* G. F. W. Meyer, Prim. Fl. Essequib. 166. 1818.—“... ad originem rivi Arowabischikreek Octobre florentem legi.”—Holotypus, consisting of sterile stem with stipules + a detached lf, GOETT!—*Chamaefistula latifolia* (G. F. W. Meyer) Pittier, 3rd Confer. Interamer. Agric. Caracas (Cat. Pl. Venezuel.) 371. 1945.

Cassia sclerocarpa Vogel, Syn. Gen. Cass. 15. 1837.—“*C. bacillaris* W[ilddenow.] Hrb. 7930. Habt. In Brasilia: Sieber leg. pr. Bahia.”—Holotypus, B (*hb. Willd.* 7930)! = F Neg. 1744! an accompanying ticket gives the locality as Surinam and Bahia, the former being the probable true source.

Cassia hoffmannseggii Martius ex Benthām in Martius, Fl. Bras. 15(2): 104, majori pro parte. 1870.—“Habitat typus [i.e. var. typica] in provinciae Paraensis sylvis prope Para: Martius; ad flumen Amazonum infra Obidos: Spruce n. 1110 . . .; in provincia do Alto Amazonas ad ostium fluvii Rio Negro: Spruce n. 1558; in provincia Goyaz [really Pará, near 2°30'S] ad flumen Tocantins inter S. João et Santa Anna: Burchell. . . etiam . . . e Tarapoto in Peruvia: Matthews [sic] n. 1589.”—Lectoholotypus, *Martius s.n.* ‘in sylvis ad Para, provinciae Paraensis. Maio 1820. Vid. Benthām,’ M! isotypi, K! = IPA Neg. 927 = NY Neg. 1446, M (3 sheets) = F Neg. 6238.—Paratypes, *Burchell* 9342, K! *Mathews* 1589, K!, but *Spruce* 1110 and 1558 (K) are *C. bacillaris* var. *benthāmiana*.

Cassia latifolia falcistipula Ducke, Archiv. Jard. Bot. Rio de Jan. 3: 112. 1922, statu inter formam et varietatem ambiguo.—“Belém do Pará n. 17.031, Gurupá n. 16167; vue a Obidos.”—Lectotypus, *Ducke* 17031, R! isotypi, NY (fragm), US!

Cassia ornata Bernhardt ex Benthām, Trans. Linn. Soc. London 27: 522. 1871, pro syn.—“Pl. Kappl[erianae] Surin[amenses] exs. n. 1408.”—Spm. authent., *Kappler* 1408, W = F Neg. 32079!

Bush-ropes highly variable in habit and stature, in capoeira and savanna flowering precociously as weak subshrubs or strong, several-stemmed shrubs (0.5–)2–5 m but occasionally becoming free-standing treelets to 7 m, in older secondary woodland, low forest, or on brushy river-banks becoming sarmentose or scandent and exceptionally to 15 m, the subterete striate or commonly 5-angulate hornotinous stems and the lf-stalks varying from glabrous to densely minutely puberulent or pilosulous with straight appressed, spreading-incurved, or straight spreading hairs up to 0.1–0.25 mm, the chartaceous bicolored lflets above lustrous olivaceous or brownish-olivaceous, beneath duller and paler, either glabrous or thinly puberulent beneath or on both faces, the inflorescence either shortly subcorymbose and immersed in foliage or elongately thyrsiform and leafy-bracteate at base becoming far exserted, its axes always pubescent but the firm globose fl-buds either dull and puberulent or glabrate and waxily lustrous.

Stipules highly variable in length and amplitude 5–32 × 1–27 mm, either foliaceous ovate-suborbicular obtuse, or obliquely to falcately oblanceolate subacute or obtuse, or (rarely) setiform-subulate, in any case deciduous before the lf, when foliaceous pinnately veined like the lflets.

Lvs (12–)14–28 cm; petiole including wrinkled pulvinus (3–)3.5–9(–11) cm, at middle 1.2–2.3 mm diam, widely very shallowly grooved ventrally; rachis (1.5–)2–5.5(–6.5) cm, usually a little shorter, rarely as long as petiole; glands sessile, narrowly or plumply ovoid or dorsoventally compressed-ovoid obtuse (1.5–)2–5(–6) mm tall, one always at or just above first pair of pulvinules, sometimes a smaller one at the distal pair; pulvinules 3.5–7.5(–9) mm; distal pair of lflets asymmetrically ovate, ovate-elliptic or obovate, shortly bluntly (sometimes only obscurely) acuminate, (8.5–)10–17 × (4.5–)5–9.5(–10) a little less to a little

more than twice longer than wide, asymmetric at base varying from broadly cuneate to rounded or shallowly cordate, the margin at first minutely revolute, usually plane and sharp-edged at maturity of blade, the gently incurved midrib impressed or shallowly depressed above, carinate beneath, giving rise on each side to (7-)8-12(-13) major camptodrome with \pm as many intercalary secondary veins, these with tertiary and subsequent venulation prominulous on both faces, the secondaries more so beneath than above but the reticulation often more so above than beneath, the ultimate, sharply defined areoles either $>$ or < 1 mm diam, the proximal pair of lfts similar but $\pm \frac{2}{3}$ as long and often proportionately broader.

Peduncles stout, together with often abruptly tapering raceme-axis (1.5-)2-8(-9) cm; racemes (3-)5-13(-21)-fld; bracts ovate-acute or lanceolate short-acuminate, cymbiform 1.5-4(-5) mm, firm becoming brown dry, deciduous by anthesis; pedicels 14-40 mm; buds globose, the orbicular outer sepals imbricately enveloping the rest of the perianth until just before expansion, all yellow, fuscous-olivaceous, or reddish, the 2 outer (8-)10-17(-21) mm, the 3 inner suborbicular to broadly obovate becoming as long or a little longer; petals deep yellow or orange-yellow, glabrous or dorsally puberulent along the elevated veins, 1 adaxial broadly obovate-flabellate obtuse or emarginate 24-32 mm, the rest similar but commonly less broad, up to 20-30 mm; filaments glabrous or rarely puberulent, those of 4(-5) median stamens 0.9-2.6(-3) mm, those of 3 abaxial ones 2-5.5 mm, the thecae of median ones (6-)6.5-11 mm with divaricate beak 0.4-0.8 mm, of abaxial ones slightly shorter, 4.5-7 mm, but with longer erect or porrect beak 1.4-2.2 mm; ovary glabrous or less commonly strigulose-sericeous; style 2-3 mm, at apex coarsely dilated behind the very oblique stigma and there 1.4-2 mm diam, the orifice of stigma ciliolate (0.4-)0.45-0.9(-1) mm diam; ovules (120-)124-218(-244).

Pod pendulous stipitate, the short stout stipe 4-8 mm, the cylindric body 24-31 \times 1.1-1.3 cm, cuneately contracted at both ends, at apex into the persistent style, the valves becoming stiffly coriaceous, dark brown, coarsely transversely venulose; dehiscence follicular, through the ventral suture; seeds (little known) biseriate, turned broadside to the septa, contained in thin black pulp, obliquely compressed-ellipsoid 7-8 \times 3-3.5 mm, the dark brown testa highly lustrous ex-areolate.—Collections: 126.

Savanna thickets and both virgin and disturbed forest, either on terra firme or seasonally flooded river banks, on a variety of sand and clay soils, mostly below 700 but in inter-Andean valleys up to 1400 m, interruptedly widespread over much of the Amazon Basin, the Guianas and the e. periphery of Guayana Highland: s.-e. Venezuela (Caroní-Orinoco slope in Amazonas and Delta-Amacuro); coastal plain and interior uplands of Guyana, Surinam and French Guiana; valleys of the Amazon and tributaries upstream from the delta to Terr. do Roraima, extreme s.-e. Colombia (Cerro Mitú on upper Rio Vaupés), e.-centr. Peru (Loreto, San Martín, Huánuco, e. Ayacucho and Cuzco, on Río Apurimac reaching s. to 12°30' and on Río Urubamba to 13° lat.) following Rios Purús and Juruá into Terr. do Acre, Brazil and (perhaps isolated) on Río Beni near 15°25'S in n.-e. Bolivia (La Paz) but apparently otherwise absent from the basins of Rios Madeira, Tapajós and Xingú, s. on Rio Tocantins into extreme n. Goiás (near 7°20'S) and adjoining Maranhão.—Fl. (I-)II-VII, fr. VI onward, the ripe and opened pods long persistent.—*Brusquillo* (Venezuela).

Firm glossy reticulate leaflets, inequilateral at base and plane-margined, coinciding with enlarged outer petaloid sepals that enclose the flower until shortly before anthesis characterize this handsome and widely dispersed Hylaeian senna. The tough-walled, coarsely venose pod resembles that of compatriot *S. quin-*

quangulata, but this, more evidently different in its smaller flower and herbaceous sepals that separate long before true anthesis, differs in the hornlike or slenderly claviform (not sessile ovoid obtuse) petiolar glands constantly present between both pairs of leaflets. In its ample calyx *S. latifolia* resembles *S. tapajozensis*, but this is readily distinguished by having three abaxial stamens longer, not shorter, than the four median ones.

Senna latifolia varies considerably in length and dispersal of hairs on stem, leaflet and calyx, and conspicuously in development of the stipules which, although commonly (and typically) foliaceous, can dwindle in outline to narrowly falcate or even subulate-setaceous. An exceptionally pubescent form encountered on the Juruá river (*Prance 13018*) represents an extreme in this direction. The form with narrow falciform stipules described by Ducke from the Amazon delta region is not confined there, but has been collected also in Peru (*Schunke 1867*) and in Guyana (*A. C. Smith 2159*). In lower Amazonia narrow stipules are often associated with a second petiolar gland, between the distal pair of leaflets, such as occurs only very rarely elsewhere in the species. But the variation noted occurs in random combinations without geographic correlation.

It may come as a surprise to find the name *Cassia hoffmannseggii* listed in the synonymy of *S. latifolia*. While Bentham at first classed *C. hoffmannseggii* among his *Speciosae* or *Bacillares* with strongly heteromorphic stamens, it was only the var. *gardnerana* (=our *S. georgica*) that had this type of androecium, the material of typical *C. hoffmannseggii* cited in the protologue representing either the narrow-stipulate form of *S. latifolia* or *S. bacillaris* var. *benthamiana*. For greater detail see our account of 46. *S. georgica* (p. 193).

21. ***Senna herzogii*** (Harms) Irwin & Barneby, comb. nov. *Cassia herzogii* Harms, Meded. Rijks-Herb. 27: 37. 1915.—“[Bolivien] . . . in der Quebrada de Suspiros (Cord. de Santa Cruz), 700 m ([Theodor Herzog] no. 1562.—Febr. 1911.”—Holotypus, †B = F Neg. 1692! clastotypus (fragm lf + broken fl), F!

Amplly leafy shrubs flowering at 2–4 m, very likely potentially arborescent, with obscurely obtuse-angled, arching or flexuous hornotinous branchlets, glabrous or almost so up to the minutely puberulent inflorescence, the foliage bi-colored, the thinly chartaceous lf + fl dull olivaceous above, pale dull and often subglaucescent beneath, the racemes of fl both axillary and paniculate, the panicle either immersed in foliage or shortly exserted.

Stipules foliaceous, falcately oblanceolate or greatly dilated and asymmetrically ovate-deltate above the cuneate base, acute, 8–25 × (1.5–)2.5–20 mm, prominently venulose, deciduous before the lf but not early caducous.

Lvs 18–36 cm; petiole including moderately dilated pulvinus (2–)3–8 cm, at middle 1.8–2.3 mm diam, terete except for open very shallow sulcus; rachis 3–5 cm, of most lvs a trifle shorter than petiole; gland 1 between proximal pair of lf + fl, sessile or shortly stipitate, the body oblong-ovoid obtuse or subacute 1–1.5 mm diam, the whole in profile 2.2–3.5 mm long; pulvinules 5–9 mm; distal pair of lf + fl asymmetrically elliptic- or obovate-elliptic-acuminate 12–22 × 4–8.5 cm, 2.5–3.1 times as long as wide, at base cuneate on both sides but more broadly and decurrently so on proximal one, the margin revolute, the forwardly incurved midrib shallowly depressed-sulcate on ventral and cariniform on dorsal face, the ±9–12 pairs of major camptodrome secondary, the connecting tertiary and subsequent reticular venulation prominulous on both faces but the fine ultimate mesh more pronounced above than beneath.

Racemes solitary (3–)5–17-fl + fr, the axis including peduncle becoming 2–5 cm;

bracts submembranous lanceolate, ovate or obovate acute, 2–3.5 mm, deciduous before or at full anthesis; pedicels 2.5–4 cm; young fl-buds globose, glabrous except for minutely ciliate margins of sepals, opening long before maturity of fl; sepals submembranous reddish with pallid or petaloid margins, moderately graduated, all broadly obovate or suborbicular concave very obtuse, the largest 5–7 mm; petals (of ser. *Bacillares*) homo- or slightly heteromorphic, the adaxial one a little wider and 1–2 lateral a little shorter than the rest, all obovate-spatulate, the longest 14–21 mm; androecium functionally 7-merous, the filaments minutely puberulent, those of 4 median stamens thickened distally 1.5–2.3 mm, those of 3 abaxial ones 2–2.7 mm, the smooth glabrous or subglabrous anthers of median stamens slightly incurved 3.7–6 mm, with 2-porose beak only 0.2–0.3 mm, those of 3 abaxial ones slightly shorter and more incurved 3.5–5.5 mm, with 1-porose, more porrect but very short beak 0.45–0.7 mm; ovary densely gray-puberulent; style dilated, the claviform incurved head 0.9–1.2 mm diam, the orifice 0.4–0.75 mm diam; ovules ± 70 –86.

Pod (immature) ascending stipitate, the stipe 5–6 mm, the linear, falcately incurved body $\pm 12 \times 0.6$ cm, laterally compressed but plumply obtusely 4-angular, ± 3 mm thick, carinate ventrally by the salient suberous suture, the thin-textured valves corrugate over the seeds, these 2-seriate, turned broadside to the valves, not seen fully ripe.—Collections: 11.

Forest margins and thickets in monte, premontane moist forest, and inundated lowland tahuampa forest, 250–1800 m, scattered along the Amazonian slope of the Andes on headwaters of ríos Apurímac, Urubamba, Madre de Dios, Beni and Mamoré in lat. 12–18°S, from depts. Ayacucho (prov. La Mar), Cuzco (prov. s.-w. La Convención, Paucartambo) and Madre de Dios (Manu, Tambopata) in s.-e. Peru s.-e. to Cordillera de Santa Cruz in Santa Cruz, Bolivia.—Fl. I–V.

The close affinity of *S. herzogii* will remain an open question until the genuinely ripe pod and seeds are obtained. Harms compared it with *Cassia latifolia*, similar in the broad foliaceous stipules, but these are now known to vary in both species from leaflike to narrowly falcate-ob lanceolate, and do not provide significant evidence in either direction. It can in any case be separated from *S. latifolia*, at anthesis, by the more thinly chartaceous, less glossy and marginally revolute leaflets coincident with relatively small flowers, the longest sepal only 5–7 (not 10–17) and longest petal 14–21 (not 24–32) mm long. In texture of foliage and general facies *S. herzogii* more closely mimics *S. obliqua*, vicariant in inter-Andine valleys northward from central Peru. This has almost the same glabrous calyx and a corolla of the same size, but the stipules are, so far as known, setiform and the longer-beaked anthers are densely gray-papillate, not smooth and brown when dry. These not very strong characters will need reassessment as the fruits of *S. obliqua* and *S. herzogii* can be compared. For the present it appears that the only *Bacillares* sympatric (and truly comparable) with *S. herzogii* are *S. georgica* var. *bangii*, with equilateral, dorsally villosulous leaflets, much larger flowers and highly heteromorphic stamens, and *S. ruiziana* var. *micrandra* with mostly cauliflorous inflorescence and much smaller flowers. In department Cuzco province Paucartambo the ranges of *S. herzogii* and *S. latifolia* marginally coincide and it is on the sources of Río Urubamba that the problem of their relationship could perhaps best be studied.

22. *Senna lorentensis* (Killip) Irwin & Barneby, comb. nov. *Cassia lorentensis* Killip & Macbride ex Killip, Field Mus., Bot. 13 (Fl. Peru), part 3 (1): 172. 1943.—“ . . . Loreto: Río Mazan, José [M.] Schunke 206, type

...”—Holotypus, collected 9.II.1935 (fl), F! isotypi, GH, NY (2 sheets), SMF, US!—Several paratypes cited in the protologue are conspecific.

Amply leafy bushes and treelets at anthesis 1–8(–10) m, except for the glabrous or almost glabrous sepals and upper face of lfts yellowish- or golden-pilosulous throughout with straight divaricate or more often incurved-ascending to incumbent hairs up to 0.35–0.65 mm, the terete striate hornotinous branchlets in addition minutely livid-punctate or capitate-glandular and glabrescent in lines descending from stipules, the foliage bicolored, the thinly chartaceous lfts lustrously olivaceous, dark green or brownish-green above, paler dull beneath, the inflorescence paniculate, fully or partly exserted.

Stipules (caducous, little known) linear-lance-attenuate 3–7.5 mm, at base scarcely 0.5 mm wide, strongly 3-nerved.

Lvs (except some smaller low within or approaching the panicle, these not further noticed) 1.5–3.6 dm; petiole including pulvinus (1–)2–6 cm, at middle 1.5–3.5 mm diam, subterete, the sulcus extremely shallow; pulvinus (dry) commonly shrunken and narrower than petiole proper; rachis (2.5–)3–9.5 cm, longer than petiole; gland between proximal pair of lfts sessile, narrowly or broadly ovoid-linguiform or fusiform (2–)2.5–4 mm glabrous; seta behind distal pair usually transformed into a similar gland standing behind the pulvinules, these wrinkled (3–)4–8 mm; distal pair of lfts obliquely ovate to elliptic-obovate or subrhombic-elliptic, short-acuminate (10–)13–24 × (5–)6.5–11.5 cm, ±1.7–2.2 times as long as wide, at oblique base on proximal side subcordate to broadly cuneate and on distal one more narrowly cuneate or rounded, the distinctly but very gently incurved midrib immersed or shallowly depressed above, cariniform beneath, the (7–)8–12 major camptodrome secondary veins similar but sometimes prominulous above, the tertiary and subsequent close reticular venulation often more sharply defined above than beneath.

Racemes axillary to upper (diminished) lvs and to bladeless lf-stalks, solitary or few together from short leafless axillary branchlets, mostly 5–12(–15)-fld, the axils including the short or subobsolete peduncle 1–4 cm, the expanded fls subcorymbose; bracts caducous lance- or deltate-ovate 1.5–2.5 mm; pedicels (1.5–)2.2–3.8 cm; buds except for some minutely ciliolate sepals glabrous, subglobose; sepals very broadly obovate or oblong-obovate obtuse little graduated, the largest inner ones 10–13 mm, at early anthesis faintly 5–7-nerved from base but the nerves becoming stronger and prominent dorsally at late anthesis; petals (of ser. *Bacillares*) yellow, pubescent dorsally, the longest (15–)17–23 mm, the veins not strongly discolored when dry; filaments glabrous, those of 4 median stamens 2–2.5 mm, of 3 abaxial ones scarcely longer, 2.5–3 mm; anthers glabrous, those of median stamens 7–9 mm, very slightly incurved, truncate and scarcely beaked, the pores appearing lateral, the anthers of the 3 abaxial ones a trifle shorter, 6.5–7 mm, more curved and with porrect beak ±0.7 mm; ovary densely yellowish-pilosulous, the style at tip incurved, glabrate and 0.6–0.9 mm diam, the orifice 0.4–0.6 mm diam; ovules 77–102, in young pod 2-seriate.

Pod ascending (?), stoutly stipitate, the stipe 5–7 mm, the straight or gently incurved body ±3–9 × 0.6 cm, apparently strongly compressed and the seeds imperfectly 2-seriate; seeds (little known) ovoid, little compressed, ±3.8 × 2.6 mm, the atrocastaneous testa smooth glossy exareolate.—Collections: 22.

Hylaeon and perhaps also sub-Andean wet tropical, non-inundated forest, sometimes in matorral, 110–450 m, local on the forks of the upper Amazon river in Amazonas (prov. Chachapoyas), Loreto (prov. Alto Amazonas, Maynas), San

Martín (prov. San Martín, Lamas, Huallaga) and Madre de Dios (prov. Tambopata), Peru.—Fl. VII–XI, II, the season as yet not well documented.

The notable features of *S. loretensis* are the golden pubescence of the inflorescence, the ultimately exserted panicle, the glabrous or at least distally glabrous, when mature prominently venulose sepals of broad outline, the little differentiated sets of stamens, and the short pod, this scarcely known in mature form but apparently similar to that of *S. obliqua*. The latter, found at middle elevations of the Amazonian Andes (above 1500 m), is readily distinguished by the minute pubescence and much longer petioles (longer, not shorter than rachis), pedunculate racemes, much shorter, only faintly venulose sepals, and smaller androecium. The sympatric Hylaeon *S. ruiziana*, which shares with *S. loretensis* ample (but less pubescent) foliage and a glandiform seta at tip of leaf-stalk, has fully included, often partly cauliflorous inflorescence, much shorter veinless sepals and a strongly curved and laterally compressed pod. The also sympatric *S. macrophylla* var. *gigantifolia*, similar in amplitude of foliage but lacking the distal gland, has sometimes similar sepals but these ordinarily more strongly venulose at maturity; the inflorescence is almost entirely axillary and immersed, as in *S. ruiziana*, so far as known never paniculate and exserted, and the petals ordinarily dry pallid (not golden) with strongly contrasting dark venulation. The pods (not yet well known) appear to be quite different, mostly 1.5–2.5 dm long in var. *gigantifolia*, less than 1 dm in *S. loretensis*.

Fragmentary specimens collected at 400 m at Yapacani, near 17°S on the headwaters of Río Mamoré in Santa Cruz, Bolivia (*O. Kuntze s.n.*, VI.1892, fr), may represent an undescribed relative of *S. loretensis*. The leaflets (perhaps not typical of lower stems) are smaller, whitish rather than yellowish-pilous beneath, and the pod-body is only 2.5–3 cm long; but the glandular seta of the leaf-stalk is similar. For further enquiry.

23. ***Senna obliqua*** (G. Don) Irwin & Barneby, comb. nov. *Chamaefistula obliqua* G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.—“Native of Peru. *Cassia obliqua* Ruiz et Pav. in herb. Lamb[ertiano].”—Lectoholotypus, “*Cassia obliqua* sp. nova. Fl. Per.,” BM! = NY Neg. 146; isotypi, †B = F Neg. 1715, F, FI, K, MA (3 sheets in hb. Pavon., mostly labelled “Muña”)!—*Cassia obliqua* Ruiz & Pavón ex Vogel, Syn. Gen. Cass. 40. 1837.

Cassia obliqua sensu Bentham, 1871, p. 519; Macbride, 1943, p. 175.

Amplly leafy shrubs or treelets up to 6 m, sometimes flowering at 1.5 m, the older branches terete striate, the younger ones angled by ribs descending from the stipules, all these like the petioles minutely, sometimes remotely livid-punctate, appearing glabrous but usually the lower and often both faces of lfts together with inflorescence minutely incurved-puberulent, the foliage moderately bicolored, the membrano-chartaceous lfts dull olivaceous on both faces but paler beneath, the inflorescence of racemes either solitary or 2–3 borne on abbreviated leafless branchlets, either axillary to living lvs and shorter than them or arising from leafless older branchlets.

Stipules caducous, of developed lvs scarcely known, but probably like those of inhibited axillary buds all linear-setiform, the few seen 4–8 × 0.3–0.5 mm.

Lvs 1–4.5 dm, diminishing upward along the branchlets; petiole (2.5–)3–12 cm, at middle 1.3–3.5 mm diam, openly shallow-sulcate; rachis (1.5–)2.5–8 cm; gland between proximal pair of lfts sessile or substipitate, ellipsoid or compressed-ovoid-deltoid 2–3.5 mm, glabrous; pulvinules 5–8.5 mm, wrinkled when dry; distal

pair of lfts ovate to ovate-elliptic-acuminate (9–)10–22 × 4–11 cm, ± 2 –2.5 times as long as wide, at oblique base usually subequilaterally cuneate, the straight or gently incurved midrib either immersed or prominulous above, cariniform beneath, the 8–13 pairs of major camptodrome secondary and all tertiary and reticular venules sharply finely prominulous on both faces; proximal pair of lfts similar, $\pm \frac{2}{3}$ as long, sometimes proportionately broader.

Peduncles 3–7 cm; racemes 7–25-fld, the axis becoming 1–6 cm; bracts (caducous, little known) apparently lance-ovate submembranous ± 2 –4 mm; pedicels 2–4 cm; buds subglobose, glabrous or almost so; sepals elliptic-ovate obtuse ± 5 –6 mm; petals yellow, puberulent dorsally, of subequal size and shape except the vexillar one broader, the longest 16–25 mm; filaments puberulent, those of 4 median stamens 2.5–3 mm, those of 3 abaxial ones 3–4 mm; anthers glabrous but densely papillate, those of 4 median stamens slightly incurved 3.7–4.5 mm, their divaricate beak 0.5–0.9 mm, those of 3 abaxial ones lunate 4.5–5.5 mm, their porrect beak 1–1.2 mm; ovary strigulose; style scarcely dilated, at apex gently incurved and 0.4–0.5 mm diam below the ciliolate stigmatic aperture; ovules 2-seriate, 72–140.

Pod (not seen fully ripe) stipitate, the short stout stipe 3–5(?–10) mm, the cylindroid, perhaps subquadrangulate, straight body 2–3.5 × ?0.5, perhaps up to 12 × 0.6 cm, abruptly contracted at both ends, the valves slightly constricted around seeds, minutely strigulose; ripe seeds not seen.—Collections: 8.

Habitat little recorded, sometimes in gallery forest along rivers, to be expected in monte, ± 1700 –2050 m, local in the inter-Andean valleys of Ecuador (s.-ward from w. Napo) and Peru, where known from the upper Marañón valley in Amazonas (prov. Bongara), the upper ríos Huallaga and Pachitea in Huánuco (prov. Pachitea), Pasco (prov. Oxapampa) and Junín (prov. Tarma).—Fl. VIII, I (the full range unknown), fr. V–VI(–?).

In the context of its sub-Andean range, this poorly known species can be recognized by its partial cauliflory, small calyx, and papillose anthers. The anthers together with petals about 16–20 (not 7–14) mm long distinguish it from compatriot *S. ruiziana*. Speculation as to its relationships within ser. *Bacillares* must wait on discovery of the pod and ripe seeds.

- 24. *Senna scandens*** (G. Don) Irwin & Barneby, comb. nov. *Cassia scandens* Ruiz & Pavón ex G. Don, Gen. Hist. Dichl. Pl. 2: 440. 1832.—“Ruiz et Pav[ón] in herb. Lamb[ertiano] . . . Native of Guayaquil [Ecuador].”—Holotypus, ticketed by Pavón ‘*Cassia scandens* sp. nova de Huayaquil,’ BM! = BUNH Neg. 5137.

Cassia scandens sensu Benthām, 1871, p. 519.

Treelets 3–4 m probably sarmentose-leaning when crowded, with green obtusangulate and sulcate, amply leafy hornotinous branchlets, pilosulous throughout with fine forwardly accumbent hairs up to ± 0.2 –0.35 mm, the adult foliage thinly so, the lft blades membranous strongly bicolored, sublustrously olivaceous above, pallid dull beneath, often minutely purple-spotted on both faces, the slender pliant racemes axillary to and much surpassed by contemporaneous lvs.

Stipules erect, narrowly linear-attenuate 5.5–11 × 0.3–0.5 mm, strongly 1-nerved, deciduous before the lf.

Lvs 18–28 cm; petiole including discolored, when dry shrunken pulvinus 3–5 cm, at middle 1.6–2.1 mm diam, openly shallow-sulcate ventrally; rachis (2–)3.5–5.5 cm, a little longer or shorter than petiole; gland sessile between proximal pair of lfts, plumply or narrowly ovoid 2–2.8 × 1.2–2 mm; pulvinules (3–)4–5

mm; distal pair of lfts obliquely ovate- or obovate-elliptic, obscurely obtusely acuminate $12-17.5 \times 5-6.5(-7.5)$ cm, 2.4–3 times as long as wide, at base shallowly rounded on proximal and cuneate on distal side, the slender, inwardly arcuate midrib with ± 10 pairs of camptodrome secondary veins immersed or almost so above, sharply prominulous beneath, a fine tertiary and reticular venulation raised on both faces or merely discolored beneath.

Racemes laxly $\pm 15-25$ -fld, the flexuous, perhaps geotropic axis becoming $\pm 8-15$ cm, the several expanded fls standing well below the globose, thinly puberulent buds; bracts narrowly lance-attenuate 3.5–5.5 mm, persistent into anthesis of fl, probably then deciduous; sepals submembranous greenish or livid-tinged and membranous-margined, the outer broadly ovate the inner oblong-ovate, all of subequal length 6.5–7.5 mm; petals yellow, externally puberulent, $\pm 16-17$ mm, the 2 abaxial ones slightly narrower and more oblique than the adaxial ones; androecium functionally 7-merous, the staminodes oblanceolate or spatulate 2–2.5 mm, the 7 fertile filaments puberulent, those of 4 median stamens 2–3 mm, of the 3 abaxial ones 1–2.5 mm, the fertile anthers puberulent in the dorso-ventral grooves or glabrate, plumply lance-oblong in profile, including beak $6-8 \times 2.3-2.7$ mm, the 3 abaxial a trifle shorter than the 4 median, the beaks of all 0.6–0.8 mm, biporose, those of 3 abaxial stamens a trifle more porrect than those of the 4 median; ovary densely silky-strigulose, the short style moderately dilated and ± 0.9 mm diam just below the ciliolate stigmatic cavity, this ± 0.5 mm diam; ovules (1 count) 136, biseriate.

Pod and seeds unknown.—Collections: 4.

Margins of wet lowland forest, sometimes along streams, known only from the first foothills of the Andes in Los Ríos and perhaps adjoining Guayas, Ecuador.—Fl. III–IV(–?).

Senna scandens was first collected about 200 years ago, probably by Juan Tafalla after the return to Spain of José Pavón, who sold to Lambert the specimen described by George Don as *Cassia scandens*. The species has been collected since, to our knowledge, only in the Andean piedmont east of Babahoyo in Los Ríos, and the material, all in young flower, provides insufficient data for firm definition of a species in the critical ser. *Bacillares*, several members of which are closely similar in general facies. For geographical reasons *S. scandens* is most likely to be confused with *S. oxyphylla* var. *hartwegii*, endemic to lowland Pacific Ecuador in the same latitudes but apparently in a drier belt between the wet foothill forest and the coast. This differs at anthesis in the revolute margin of mature leaflets and especially in the more obviously dimorphic anthers, the beaks of which are differentiated into two markedly different sets, those of three abaxial ones substantially longer and more porrect. The inflorescence of var. *hartwegii* becomes at full anthesis a terminal panicle of racemes, whereas that of *S. scandens* consists, at least in the examples before us, of weakly spreading or perhaps pendulous racemes axillary to large contemporaneous leaves and much shorter than them. *Senna obliqua*, a habitally similar plant of trans-Andean Ecuador and Peru, resembles *S. scandens* in foliage and lateral inflorescence, but again has strongly dimorphic and in addition pallid-papillate, not smooth brown anthers. For the present, however, no realistic evaluation of *S. scandens* is possible, knowledge of the pod and seeds being essential for this purpose.

25. *Senna ruiziana* (G. Don) Irwin & Barneby, comb. nov. *Chamaefistula ruiziana* G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.—Typus infra sub var. *ruiziana* indicatur.

Amplly leafy subarborescent shrubs and small trees, at anthesis 3–15 m, with terete striate brown, commonly glabrous or subglabrous, less often (var.) pilosulous stems and branchlets, the lower face of the thinly chartaceous lfts with axes of inflorescence strigulose-pilosulous, usually with forwardly impressed or incumbent, less often with erect hairs up to 0.1–0.5 mm, the foliage bicolored, the lf-blades lustrous green above, paler subglaucescent beneath, the inflorescence usually a greatly contracted leafless panicle of racemes (sometimes simplified to a single raceme) arising from 1 or more serial supra-axillary buds associated either with mature living lvs or on old wood, then sometimes clustered on a knotty burl, the whole very much shorter than the lvs, rarely some flowering axes developed and bearing lf and fl simultaneously.

Stipules (caducous, little known) falcately oblanceolate or linear-oblanceolate acute, 4.5–10 × 0.8–3 mm, prominently venulose.

Lvs (2–)2.5–4 dm; petiole including discolored but little swollen pulvinus 2.5–6 cm, at middle (1.5–)1.7–2.9 mm diam, obtusely ribbed both laterally and ventrally so as to appear ventrally 3-sulcate; rachis 2.5–6(–7) cm, a little longer or shorter than the petiole; gland 1 sessile or almost so between the proximal pair, lanceolate or ovate in outline, 2.5–4 mm tall; seta glandular-thickened, appearing as a second gland behind the distal pair of pulvinules, these 6–11(–13) mm; distal pair of lfts obliquely obovate-short-acuminate 15–28 × 6–12.5 cm, ± 2 –2.7 times as long as wide, at base very asymmetrically cuneate on both sides, sometimes (especially on proximal side) broadly so or subcordate, the margins narrowly revolute, the forwardly incurved midrib with (9–)10–14 major (with few random intercalary) secondary veins above immersed or barely prominulous, beneath sharply cariniform, the tertiary venules and fine reticulation subequally prominulous on both faces or subimmersed above, the ultimate defined areoles <1 mm diam; proximal pair of lfts $\frac{1}{2}$ – $\frac{2}{3}$ as long as the distal, proportionately broader and usually broadest below middle, hence obliquely ovate.

Axis of panicle 0–2(–3) cm, on older stems often reduced to a woody knot; axis of individual (6–)10–45-fl'd racemes with peduncle 2–13 cm; bracts submembranous ovate or lance-ovate 1–2.2 mm, caducous from young buds; pedicels at full anthesis slender 1.4–2.6 cm, the few fertile greatly thickened, in fruit becoming 2.5–4.5 cm; buds glabrous or almost so, the sepals sometimes minutely ciliolate; sepals firm yellowish or greenish obovate-suborbicular concave, weakly or subobsoletely (3–)5-nerved, unequal, the outermost \pm half as long as the innermost, this (3.5–)4–6 mm; petals drying dull ocher-yellow, externally puberulent especially along the prominulous veins, subhomomorphic, oblong-oblanceolate or obovate 7–14 mm; stamens 7 homomorphic except for slightly unequal filaments, these 1–2.5 mm puberulent, the shallowly incurved anthers glabrous 2.8–5.5(–6) mm, truncate, the beak divaricate and not over 0.55 mm, sometimes subobsolete; ovary thinly pilosulous, abruptly contracted into an obliquely claviform, hollow stigma 0.7–1.8 mm diam, the ciliolate orifice 0.6–1.2 mm diam; ovules 4-seriate 130–194.

Pod (scarcely known fully ripe) ascending on stiff pedicel, the stout stipe 3–4 mm, the body linear-oblong in outline, falcately or cyclically incurved, abruptly contracted at both ends, ± 6 –12 × 1.4–1.7 cm, strongly compressed laterally, the thick nigrescent glabrate valves flat at maturity and the X-section at middle I-shaped, the ventral suture intruded as a pithy partial septum; dehiscence (if any) unknown; seeds displaced into 2 double rows, one nearer and one further from the ventral suture, turned broadside to the thin blackish pulpy septa, symmetrically narrow-ellipsoid ± 4 –4.8 mm, the brown testa smooth but not highly lustrous, exareolate.

Senna ruiziana is the commonest cauliflorous member of ser. *Bacillares* in western Amazonia, notable for flowers disproportionately small for the ample leaves, which bear behind the pulvinules of the distal pair of leaflets a glandular-thickened seta. The relatively short erect, falcately bent or almost annular, laterally flattened pod containing well over one hundred seeds doubled up into two rows on each side of a shallowly intruded septum is unique, so far as known, in the series. Groups of populations situated to the north and south of latitude 13°S have evolved into taxonomically distinct units.

Key to the Varieties of *S. ruiziana*

1. Fls relatively ample, the petals when fully expanded (8–)9–11.5 mm; anthers 4–5.5(–6) mm; Ecuador, extreme s.-e. Colombia, and trans-Andine Peru s. to Junín and the Mantaro valley in Huancavelica (0–13°S). 25a. var. *ruiziana* (p. 152).
1. Fls small, the petals ± 7 mm; anthers 2.8–4 mm, almost beakless; s.-e. Peru (Cuzco) and Bolivia (lat. 13–17°S). 25b. var. *micrandra* (p. 152).

25a. *Senna ruiziana* (G. Don) Irwin & Barneby var. *ruiziana*. *Chamaefistula ruiziana* G. Don, 1832, l.c., sens. str.—“Native of Guiaquil [but doubtless really from Peru, very probably from Huánuco], *Cassia macrophylla*, Ruiz et Pav. in herb. Lamb[ert].”—Holotypus, BM! isotypi, FI (hb. Webb.), G, MA (hb. Pavon. 14/30) = F Neg. 29410!—*Cassia ruiziana* (G. Don) Vogel, Syn. Gen. Cass. 40. 1837.

Cassia pallidifolia Macbride, Field Mus. Bot. 13 (Fl. Peru), part 3 (1): 176. 1943—“Junín: Chanchamayo Valley, Carlos Schunke 62, type.”—Holotypus, collected X.1929 (fl), F!
Cassia ruiziana sensu Benth. 1871, p. 520; Macbride, 1943, p. 180.

Characters as given in key.—Collections: 75.

Wet tropical forest, monte and secondary woodland, in high forest mostly along streams, sometimes on cliffs, apparently not uncommon at ± 450 –1600 m on the upper tributaries of the Amazon, from Río Putumayo in Colombia s. through the valleys of Ríos Huallaga and Ucayali to Ríos Perene, Ene and Mantaro in Junín and n. Huancavelica, extending more rarely e. into the Hylaeian lowlands, down to ± 300 m, on the Amazon as far as Leticia, Colombia (near 70°W), to be sought in adjoining Amazonas, Brazil.—Collected in fl almost throughout the year, most often X–III.—*Matarro*.

25b. *Senna ruiziana* (G. Don) var. *micrandra* Irwin & Barneby, var. nov., a var. *ruiziana* floribus minimis, petalis ± 7 mm, antheris suberostribus 2.8–4 (nec 4–6) mm tantum longis, necnon distributione australi abstans.—BOLIVIA: Yungas, anno 1890, *Miguel Bang* 464.—Holotypus, NY; isotypi, F, K, M, MICH, MO, NY, US.—Ibid, anno 1885, *H. H. Rusby* 837.—Paratypi, MICH, NY (2 sheets), US!

Characters as given in key and diagnosis.—Collections: 2.

Wooded hillsides and river banks in the monte formation, 700–1800 m, e. foothills of the Andes drained by Ríos Madre de Dios and Beni in lat. 13–17°S, from Cordillera de Carabaya in Cuzco (prov. Paucartambo and Quispicanchis), Peru to Las Yungas in La Paz, Bolivia.—Fl. (in Peru) II–III.

The two Bolivian collections on which we base var. *micrandra* were identified by Rusby (in herb.) as *Cassia affinis* Benth., an obvious mistake corrected in manuscript by Britton, who proposed to describe them as a new species of *Chamaefistula*, using the epithet *boliviensis* under which duplicates may possibly still be filed in some herbaria. The plant is clearly very close to genuine *S. ruiziana*

of the Ecuadorean and Peruvian sources of the Amazon, and until the ripe fruit is secured we shall inevitably be somewhat uncertain of its status in relation to that species. It appears, however, from flowering material to differ principally in the slightly smaller flower, especially in the very small, almost beakless anthers. The young forming pod of *Vargas 15197* from Cuzco (MO) is less than two centimeters long, and the ripe fruit must surely be smaller than that usually encountered in var. *ruiziana*. The vestiture of young stems and inflorescence in the Bolivian material is denser and looser than that of other specimens, but the Peruvian is unexceptional in this regard.

26. *Senna quinquangulata* (L. C. Richard) Irwin & Barneby, comb. nov. *Cassia quinquangulata* L. C. Richard, Actes Soc. Hist. Nat. Paris 1: 108. 1792.—Typus infra sub var. *quinquangulata* indicatur.

Shrubs, weak bushy treelets and sarmentose bush-ropes mostly (1–)1.5–7, occasionally clambering into the forest canopy up to 25 m, the rope becoming 1–5 cm diam but the stems mostly much more slender, the annotinous branchlets either angulate or terete striate, variably puberulent, strigulose or pilosulous with fine incumbent, less often appressed or erect (with few subretorse) hairs up to 0.1–0.4(–0.6) mm, the axes of inflorescence and calyx nearly always gray-puberulent, rarely velutinously pilosulous, the chartaceous lfts strongly bicolored, above lustrously dark- or brownish-olivaceous and either glabrous, puberulent along midrib or finely puberulent (pilosulous) overall, the inflorescence either simply narrowly thyrsiform or more broadly thyrsiform-paniculate, the lower racemes or flowering branchlets mostly leafy-bracteate, the lvs abruptly diminished upward, the upper racemes naked or subtended by vestigial lf-stalks.

Stipules falcately linear-ob lanceolate acute or acuminate (3–)4–10 × 0.5–2.5 mm, the blades green or yellow-green, when over 1 mm wide distinctly venulose, caducous and often absent from mature flowering and from almost all fruiting specimens.

Lvs below inflorescence (8–)10–22(–27) cm; petiole including strongly differentiated, discolored but little swollen, finally wrinkled pulvinus (1.8–)2.2–5.5(–6.5) cm, at middle 0.8–2 mm diam, the wings defining the open shallow ventral sulcus narrow thick, scarcely dilated upward under the pulvinules; rachis (9–)12–32(–40) mm, shorter than petiole; glands (caution: often gnawed) 1 between each pair, arising between or the lower from just above the pulvinules, lanceolate or ellipsoid 0.5–1.5(–1.8) mm diam, either sessile (when tongue- or horn-like) or stipitate (when lance- or claviform), straight or forwardly incurved, in profile (2–)3–6(–7) mm tall, or the proximal one rarely only 1.5–2 mm; pulvinules subcylindric wrinkled (2.5–)3–7 mm, obscurely carinate on anterior side by decurrent lft-blade; lfts of distal pair obliquely elliptic-, ovate-, broadly lance-elliptic- or rarely obovate-acuminate, the acumen varying from short obtuse mucronulate to attenuate acute, the whole blade (5–)6–16 × (2.5–)3–7.5(–8) cm, ±1.5–3 times as long as wide, at base on proximal side broadly cuneate to subcordate, on distal one commonly cuneate, the margins revolute and sometimes also undulate, the gently incurved midrib with (7–)8–13(–14) pairs of major camptodrome (and often some intercalary) secondary veins finely low-prominulous above, more distinctly raised beneath, the tertiary and reticular venulation likewise prominulous on both faces but often more pronounced above than beneath.

Peduncles with raceme-axis (1–)1.5–8(–10.5) cm; racemes (5–)8–21(–26)-fld; bracts obovate- to elliptic-ob lanceolate or lanceolate 1.5–8 × 1–1.8 mm (rarely >3 mm wide but then <5 mm long), incurved over young buds before elongation

of pedicel, either early caducous or persisting into anthesis; pedicels at and after anthesis (10–)12–32 mm; buds globose but the sepals separated before true anthesis by the expansion of petals and androecium; sepals firm subherbaceous, usually densely, often subvelutinosely gray-strigulose externally and puberulent within (rarely glabrate), not much graduated, all convexly ovate, oblong-ovate or suborbicular, always obtuse, the longest (4–)4.5–6.5(–7.5), very exceptionally –9 mm, externally nerveless or faintly 3-nerved; petals firm, biscuit- or darker orange-yellow, pubescent externally and at least near base also within, subhomomorphic except the adaxial one sometimes broader, oblong-obovate or oblanceolate beyond the short claw, (9–)10–15(–17) mm, heavily 3-veined from claw, the veins externally prominent; androecium functionally 7-merous, the filaments puberulent, those of 4 median stamens 0.8–1.8(–2.5) mm, those of 3 abaxial ones (1.5–)2–3.5(–5) mm; anthers glabrous or more commonly either puberulent along the grooves or minutely pilosulous overall, those of 4 median stamens (4–)4.5–9 mm, truncate, with very short 2-porose beak standing at right-angles to the little-incurved body, those of 3 abaxial ones shorter, 3–5.5 mm, with beak hardly longer (–0.9 mm) but slightly more porrect; ovary densely silky-pilosulous or -strigulose, at anthesis incurved over androecium, the more thinly pubescent or glabrate style 2–4 mm, abruptly swollen at apex into a cobra-like head 0.9–2.8(–3) mm diam, the oblique cup-shaped stigmatic cavity 0.6–1.8 mm diam; ovules (112–)122–196(–220).

Pod pendulous short-stipitate, the stipe 2–4 mm, the narrowly subcylindric nearly straight body 11–33.5 × 0.9–2 cm, the firm, coarsely transverse-venulose valves turning brown or fawn-color, dehiscent along ventral suture to expose the seeds clothed in fetid black pulp; seeds (not well known) biseriate, turned broad-side to the septa, broadly oblong or oblong-obovoid compressed, the testa smooth lustrous brown, sometimes broadly but faintly areolate.

Senna quinquangulata is the commonest and most frequently collected of that group of *Bacillares* collectively characterized by lustrous, marginally revolute leaflets, a gland between each (rarely between only the proximal) pair of leaflets, a thyrsoïd-paniculate inflorescence arranged around a straight primary axis, and a pod lacking thickened margins to the sutures. In the lower Amazon valley, interior Guayana, the middle Orinoco basin and parts of northern Venezuela and Panama its range overlaps that of the related *S. undulata*, or perhaps more exactly interfingers with it, for the latter is apparently adapted in equatorial latitudes to more porous sandy soils supporting a savanna climax vegetation and extends northward beyond *S. quinquangulata* onto the karst limestones of Yucatan. In any case within their common range *S. undulata* is instantly recognized at anthesis by the enlarged floral bracts and little dilated style. The largely West Indian *S. viminea* and wholly West Indian *S. nitida* are fully allopatric, the first differing in its short pod and the latter in the loss of one or two of the abaxial set of stamens. The sometimes deceptively similar *S. oxyphylla* has a gland between the lower pair of leaflets only.

As here delimited and as already, at least in some degree, known to Bentham, *S. quinquangulata* is variable in orientation, density and length of pubescence and in amplitude of the petals, although these only exceptionally and locally (e.g. Bahia, Harley et al. 17516, NY) surpass 15 mm in length. In middle Amazonia, especially around Manaus, it is represented by a race with the relatively small, strongly undulate leaflets of *S. undulata*, here considered taxonomically unimportant, and independently on upper Rio Branco in Terr. Roraima and in southern Mexico by forms with densely pilosulous upper branchlets and inflorescence.

Hitherto *S. quinquangulata* has not been recognized from Central America or Mexico, the few collections known to Britton & Rose (1930) having been segregated as the local endemic species *Chamaefistula falcinella*, *villosula* and *rekoi*, separated from each other by impalpable and moreover essentially unquantified states of pubescence and leaflet-shape and nowhere contrasted with South American *S. quinquangulata*. Schery (l.c., sub *Cassia unica*) suggested that *Ch. falcinella*, known only from the holotypus, might represent an individual variant of *S. undulata* in which the bracts had failed, as it were, to become enlarged and persistent; but several modern collections of good *S. quinquangulata* from Panama have rendered this hypothesis superfluous. The type-collection of *Ch. villosula*, from an outlying station in Jalisco, is at first sight remarkable for its dense velutinous-pilosulous branchlets (suggesting South Brazilian *S. angulata*) combined with unusually ample sepals (to 7 mm). It is matched precisely only by one collection from Coalcomán, Guerrero (*Hinton 12547*, K, NY) but both are certainly conspecific in the narrowest sense with a second gathering from Guerrero (near Petatlán, *Langlassé 645*, K) in which the same broad sepals coincide with a thin short but loose pubescence easily matched in Amazonian *S. quinquangulata*. Nearly identical to the last mentioned is a plant collected somewhere in Mexico by Beechey (K), which Bentham never identified, and by the holotypus of *Ch. rekoi* from Oaxaca. The typus of *Ch. collinsii*, amplified by a mature fruiting topotypus (*Gregg 1014*, MO), appears identical with some northern South American *S. quinquangulata*.

A remarkable specimen from Surinam (Lely Mts., 550–710 m, 24.IX.1975, *Lindeman, Stoffers et al. 311*, NY), with leaflets and dilated style of *S. quinquangulata*, but a hornlike gland between the proximal pair of leaflets only, globose flower-buds opening just before true anthesis, and very broad and big inner sepals (to ± 10 mm), suggests a hybrid between *S. quinquangulata* and *S. latifolia*. Found on ferro-bauxite formations, this plant may perhaps, nevertheless, emerge as representative of a distinct, ecologically differentiated taxon. A specimen from Santa Maria Magdalena in eastern Rio de Janeiro (*E. Pereira 1249*, RB) has everything of *S. quinquangulata* except the distal petiolar gland and is provisionally interpreted as a minor variant. If correctly named, this collection establishes an unexpected range-extension southward from Bahia and the population from which it came deserves particular study in the field. A few specimens from humid forest in northwestern Colombia, like the last in lack of the second petiolar gland, have with foliage and flower of *S. quinquangulata* immense pods and massive seeds unmatched elsewhere in the species; these seem sufficiently modified to require taxonomic status.

Key to Varieties of *S. quinquangulata*

1. Pod $11\text{--}28.5 \times 0.9\text{--}1.5$ cm; seeds ± 5 mm in greatest diam; petiolar glands nearly always between each pair of lflets, always so in Colombia; widespread from Mexico to s.-e. Brazil.
26a. var. *quinquangulata* (p. 155).
1. Pod $30\text{--}33 \times 1.8\text{--}2$ cm; seeds $8\text{--}10 \times 6\text{--}8.5$ mm; gland between proximal pair of lflets only; n.-w. Colombia.
26b. var. *meizonoloba* (p. 156).

26a. *Senna quinquangulata* (L. C. Richard) Irwin & Barneby var. *quinquangulata*.
Cassia quinquangulata L. C. Richard, 1792, l.c., sens. str.—“... e Cayenna . . . missarum a domino LeBlond.”—Holotypus, *LeBlond s.n.*, P (hb. Richard.)!—*Chamaefistula quinquangulata* (L. C. Richard) Pittier, Arb. y Arbust. Venez. 123. 1928.

- Cassia falcinella* Standley, Contrib. U.S. Nat. Herb. 18(3): 102. 1916.—“Type . . . US . . . no. 7153333, collected in the vicinity of San Felix, eastern Chiriquí, Panama, altitude 120 meters or less, December, 1911, by H. Pittier (no. 5147).”—Holotypus, US! clastotypus (fragm + photo), NY! isotypus, US (no. 691776)!—*Chamaefistula falcinella* (Standley) Britton & Rose, N. Amer. Fl. 23(4): 238. 1930. *Cassia pittieri* Ghesquière, Bull. Jard. Bot. Bruxelles 9(3): 162. 1932, nom substitut. legit., non *C. falcinella* Oliver, Fl. Trop. Africa 2: 281. 1871. *C. unica* Schery in Woodson, Ann. Missouri Bot. Gard. 38(1) [=Fl. Panama 5(3)]: 76. 1951, nom. substitut. superfluum.
- Chamaefistula villosula* Britton & Rose, N. Amer. Fl. 23(4): 233. 1930.—“Type from San Sebastian, Jalisco, January, February, 1927, *Ynes Mexia* 1523, flowers; 1675, fruit.”—Lectoholotypus, *Mexia* 1523, collected 19.1.27 (fl) at 1500 m, NY! isotypi F, MICH, US! paratypi, no. 1675, MICH, NY, US!
- Chamaefistula reko* Britton & Rose, N. Amer. Fl. 23(4): 233. 1930.—“Cerro Espino, Oaxaca, altitude 400 meters, September, 1917, *B. P. Reko* 3410.”—Holotypus, US! clastotypus (fragm + photo), NY!
- Chamaefistula collinsii* Britton & Rose, N. Amer. Fl. 23(4): 233. 1930.—“Cerro del Cruz, Tepic, October 1, 1923, *G. N. Collins* & *J. H. Kempton* 22.”—Holotypus, US! clastotypus (fragm), NY!
- Chamaefistula klugii* Britton & Killip, Ann. New York Acad. Sci. 35(3): 173. 1936.—“. . . Comisario del Putumayo, Umbría, Colombia, 325 m. altitude, November 11, 1930, *G. Klug* 1751 . . .”—Holotypus, NY! = NY Neg. 4953; isotypi, F, K, US!
- Cassia quinquangulata* sensu Benthham, 1870, p. 99, ex parte, exclus. plantis austrobrasiliens.; 1971, p. 523, ex parte, exclus. plantis antillan.

Characters as given in description and key to varieties.—Collections: 266.

Humid tropical forest, in the Amazonian Hylaea commonly on clays and laterite, often riverine but apparently avoiding varzea lowland, becoming abundant in disturbed or second-growth woodland, thickets and hedges, mostly below 400 m but ascending on the Guayana Highland to 1200, along the e. slope of the Ecuadorian and Peruvian Andes to 700–1000, and in s.-w. Mexico to 1500 m, widespread through the Guianas, the Amazon valley upstream from Amapá and Pará into s.-e. Colombia (Putumayo), adjacent Ecuador (Napo-Pastaza), the Huallaga valley in Peru (San Martín) and the Madeira-Mamoré basin in Rondônia, Brazil, and Santa Cruz, Bolivia, thence s.-e. around Brazil's e. shoulder to Ceará, Paraíba and the coastal forest of Bahia; Tobago (but apparently absent from Trinidad); e. foothills of Cordillera de Mérida in w. Venezuela (Barinas) and adjoining Colombia (Norte de Santander); reappearing in Panama (lowlands of Darién and at 600–900 m in Panamá, Coclé and Veraguas) and Costa Rica (Cord. de Talamanca); local in s. Belize (Stann Creek), adjoining Guatemala (Izabal) and Gulf lowlands of s.-e. Mexico (s.-e. Veracruz); s.-w. Guatemala (Escuintla, Sololá); Sa. Madre del Sur in Mexico (Oaxaca, Guerrero, Jalisco and Nayarit), n. along Pacific slope to s. Sinaloa and adjacent Durango.—Fl. almost throughout the year, but most prolifically X–III.—*Quillo huasca* (Peru).

- 26b. *Senna quinquangulata* (L. C. Richard) var. *meizonoloba* Irwin & Barneby, var. nov., a var. *quinquangulata* imprimis legumine maximo $\pm 30 \times 2$ (nec $11\text{--}28 \times 0.9\text{--}1.5$) cm seminibusque subduplo majoribus $8\text{--}10$ (nec ± 5) mm diam diversa, ulterius glandula inter foliolorum par exterius deficiente in specie sua notabilis.**—COLOMBIA. Chocó: 1–2 km s.-e. of Yuto on road to Lloró (± 30 km s. of Quibdó), 80 m, 7.I.79 (fr), A. Gentry (with E. Rentería A.) 23782.—Holotypus, NY; isotypus, MO.

Characters as given in description and key to varieties.—Collections: 6.

Wet tropical forest, 70–300 m, and surviving in roadside thickets, apparently local in the valleys of ríos Dagua and San Juan in n.-w. Valle and centr. Chocó ($\pm 3^{\circ}30'\text{--}6^{\circ}\text{N}$), n.-w. Colombia.—Fl. VIII–XI, fr. I–II.

27. **Senna undulata** (Benth) Irwin & Barneby, comb. nov. *Cassia undulata* Benth, J. Bot. (Hooker) 2: 76. 1840.—“Woods skirting the savannahs. British Guiana. Schomburgk, n. 86.—Trinidad, Lockhart.”—Lectoholotypus (Britton & Rose, 1930, p. 238, by implication): *Schomburgk* 86, collected in 1836, K (hb. Benth.)! = IPA Neg. 86 = NY Neg. 1442; isotypi, †B = F Neg. 1761, F, and locality ‘Essequibo,’ K, US! paratypus, *Lockhart s.n.*, K (hb. Benth.)!—*Chamaefistula undulata* (Benth) Pittier, Trab. Mus. Com. Venez. 3: 121. 1928.

Cassia bimarginata Grisebach, Bonplandia 6: 5. 1858.—Panama, *Duchassaing*.—No typus found at GOETT, possibly lost at †B, but the description detailed and concordant with *S. undulata*; overlooked by Benth, 1871.

Cassia undulata sensu Benth, 1871, p. 523; Schery, 1951, p. 77; Croat, Fl. Barro Colorado I. fig. 276. 1978.

Chamaefistula undulata sensu Britton & Rose, 1930, l.c.

Awkwardly diffuse or ascending, weakly woody shrubs 1–3 m with more or less plagiotropic branches but in hedges, in forest-savanna ecotone and low forest becoming sarmentose-arborescent or vinelike up to 6 m, the flowering branches then often pendulous from the canopy, the annotinous and older branches subterete striate but the young flowering branchlets strongly angulate-ribbed, highly variable in density and orientation of vestiture, the branchlets, lf-stalks, lower face of lflets and inflorescence either strigulose or pilosulous with truly appressed, incumbent or erect hairs up to 0.1–0.5 mm, the foliage strongly bicolored, the thinly chartaceous, relatively small lflets above dark (when dry often brownish-) green and most commonly lustrous and glabrous or almost so, beneath pale dull finely appressed-puberulent (rarely glabrous or pilosulous throughout), the inflorescence variable in form and complexity, either thyrsiform-leafy throughout or at length (especially from canopy) amply thyrsiform-paniculate and at least distally leafless.

Stipules erect amplexicaul, falcately oblanceolate, linear-oblanceolate or -elliptic, sharply acute or acuminate (5–)6–13(–15) × (1–)1.5–3.5(–4) mm, prominently 1–3-nerved from base, the principal nerves again branched, the blades thinly herbaceous green or yellowish, normally deciduous before the lf.

Lvs (below inflorescence) 7–16(–17.5) cm; petiole including livid wrinkled, often twisted pulvinule 15–37 mm, at middle 0.7–1.2(–1.4) mm diam, not or scarcely widened toward the pulvinules, bluntly carinate dorsally, openly shallow-sulcate ventrally; rachis 9–27(–30) mm, almost always shorter than petiole; glands between each pair of pulvinules erect sessile or commonly shortly stipitate, including glabrous or rarely puberulent stipe 1–3.7(–4.5) mm, the always glabrous body ovoid, lance-ovoid, ellipsoid or narrowly fusiform, obtuse or acute; pulvinules 2–4 mm, wrinkled, often livid; distal pair of lflets obliquely lance-, elliptic- or ovate-acuminate, the acumen usually obtuse mucronulate, the blade 5–10.5 × 1.7–4 cm, ±2–3.3 times as long as wide, at strongly asymmetric base varying with increasing amplitude from cuneate to shallowly cordate, the margin strongly revolute and commonly also undulate, the forwardly incurved midrib shallowly depressed-sulcate above, cariniform beneath, the ±8–12(–15) pairs of major camptodrome secondary veins finely prominulous on both faces, the tertiary and (rarely, in Venezuela) delicate reticular venulation also prominulous at least beneath; proximal pair of lflets similar but only ½–⅓ as long, sometimes proportionately wider.

Racemes axillary to living but upward to progressively reduced or ultimately

rudimentary lvs, solitary or rarely paired, ascending toward the meridian and consequently appearing divaricate from plagiotropic and reflexed from pendulous branchlets, densely or rather loosely (3-)4-20(-22)-fld, the fls either subcorymbose or becoming racemose, the axis including short peduncle 1.5-7(-11) cm; bracts submembranous yellow or greenish-yellow, rhombic-ovate to lance-elliptic acute or attenuate (6-)7-15 × (2-)2.5-7 mm, puberulent dorsally, delicately venulose in age, persisting at least into full anthesis, often thereafter but seldom into fruit; pedicels 1.5-3 cm; young fl-buds subglobose, finely and usually densely silky-puberulent (-pilosulous), the sepals expanding long before maturity of fl; sepals little graduated, obovate-suborbicular or oblong-obovate, the outermost cucullate, the largest inner ones becoming (5.5-)6-8.5 mm, these (or all) rather prominently 5-7-nerved from base; petals yellow ("orange"), puberulent dorsally at least along veins and sometimes also ventrally, subhomomorphic except the adaxial one a little broader and the 2 abaxial a trifle longer and narrower, in outline oblong- or elliptic-obovate beyond the short claw, the longest of fully expanded fls 12-17(-20) mm, but those of many apparently perfect fls not fully developing and only 9-12 mm; androecium functionally 7-merous, the filaments thinly puberulent (hispidulous), those of 4 median stamens 1-2 mm, of 3 abaxial ones 2.5-4 mm, the anthers glabrous or minutely puberulent in the grooves, those of 4 median stamens 5-8 mm truncate, shallowly incurved, the divaricate 2-porose beak ±0.5 mm, those of 3 abaxial ones 2.8-4.5(-5) mm, the beak as in the median ones or a trifle longer and more porrect; ovary densely whitish-strigulose or -pilosulous, the incurved style moderately dilated and 0.6-1.2 mm diam just below the stigma, the ciliolate orifice 0.4-0.8 mm diam; ovules (96-)108-164.

Pod pendulous, the stout stipe 2-4 mm, the straight or slightly incurved body subcylindric 8-20(-26) × 0.9-1.2 cm, the sutures 1.5-2 mm wide, without obvious thickened border, the valves firm, green turning brown, stramineous or ultimately blackish, the dehiscence tardy, follicular; seeds biseriate, turned broadside to the pulpy septa, compressed-ovoid-oblong 4.8-5.2 mm, the testa dark brown moderately lustrous, exareolate.—Collections: 178.

Savanna thickets, forest-margins, secondary brush woodlands and hedges, in its Caribbean range entering pine-savanna, semideciduous woodland and beach-coppice, mostly in light sandy or porous calcareous soils below 500 m but ascending on Guayana Highland to 1200 and in n.-w. Venezuela to 1450 m, interruptedly widespread over parts of North and Central America, from n.-e. Brazil (Amazon valley in Pará and sources of Rio Branco in Terr. do Roraima) and adjoining Guyana through the Orinoco delta to Trinidad and Windward Is. (St. Vincent; not known from Tobago); submontane in n.-w. Venezuela and adjacent Colombia (Cordilleras Oriental and Costanera from Norte de Santander to Yaracuy); Magdalena valley in n. Colombia (Tolima n.-ward); centr. Panama (Veragua and Canal Zone); n.-w. Costa Rica (Guanacaste and Alajuela); Mosquito Coast of e. Honduras (Gracias a Dios) and Nicaragua (Comarca del Cabo; Zelaya) and Costa Rica (Limón); not recorded from El Salvador; reappearing abundantly in Belize and more sparingly in adjoining Guatemala (Petén; Alta Verapaz); Yucatan Peninsula (e. Tabasco to Yucatán and Quintana Roo) and Chiapas in Mexico.—Fl. intermittently through the year.—*Cigarronero*; *botonero* (Venezuela).

Senna undulata is the only member of ser. *Bacillares* in which two petiolar glands coincide with enlarged sepaloid floral bracts. Except for these colored bracts and a usually less dilated style the species closely resembles at all points small-leaved states of *S. quinquangulata*, of which it could perhaps as well be styled a geographic variety. Ease of recognition in practice and a vicariant dis-

persal under seasonally drier climatic conditions are the feeble justifications for maintaining *S. undulata* in its traditional specific status.

28. *Senna nitida* (L. C. Richard) Irwin & Barneby, comb. nov. *Cassia nitida* L. C. Richard, Actes Soc. Hist. Nat. Paris 1: 451. 1792.—Described among plants “e Cayenna . . . missarum a domino LeBlond,” but actually from West Indies, the holotypus labelled “Sti. Johannis-Sti Thomae-Tortolae,” P (hb. Richard.)!—Misidentified by DeCandolle as *C. apoucouita*, and doubtfully referred by Bentham (1871, p. 523) to *C. viminea*, this was recognized as the earlier name for *Chamaefistula antillana* by Amshoff, 1939, p. 22.

Chamaefistula antillana Britton & Rose ex Britton & Wilson, Sci. Surv. Porto Rico & Virgin Is. 5 (Botany . . . Spermatophyta), pt. 3: 369. 1924.—“Type from St. Thomas ([E. G.] Britton and [Delia] Marble 400).”—Holotypus, collected 5–7.II.1913 (fl, fr jun), NY! isotypus, US!—*Cassia antillana* (Britton & Rose) Liogier, Bull. Torr. Club 90: 187. 1963.—*Ch. antillana* sensu Britton & Rose, 1930, p. 233; Addisonia 12 (3): 41, pl. 405. 1927.

Cassia quinquangulata sensu Bentham, 1871, p. 523, p.p., quoad pl. antill. Oersted. et Masson.

Closely akin to and resembling *S. quinquangulata*, weakly fruticose becoming sarmentose to 7 m, appearing glabrous below the minutely incumbent-pilosulous inflorescence but the angulate young branchlets, ventral face of lf-stalks, pulvinules and (often) lower face of lfsts sparsely puberulent with appressed hairs ± 0.1 – 0.2 mm, the bicolored foliage essentially as in *C. quinquangulata* except on average slightly less ample, the leaf-blades often brownish-mottled and pallid-venulose above.

Stipules 4–9 \times 0.4–1.5 mm.

Lvs below inflorescence 8–17 cm; petiole (1–)1.3–3.5 cm, at middle 0.7–1.2 mm; rachis 9–28 mm, shorter than or equalling petiole; glands between each pair of lfsts lance-ellipsoid or narrowly fusiform acute or obtuse glabrous 0.35–0.7 mm diam, including the glabrous or rarely puberulent stipe 1.6–3.5 mm tall; pulvinules (2–)2.5–4.5 mm; distal pair of lfsts 6–11 \times (2.5–)2.8–5(–5.5) cm, ± 1.8 –2.8 times as long as wide.

Peduncles with raceme-axis 2–6 cm; racemes 7–20-flid; bracts obovate or lanceolate obtuse or acute 1.5–4 mm, concave and folded over the young buds but thrown off as pedicel elongates; pedicels 14–28 mm; sepals yellowish, not much graduated, elliptic or narrowly obovate-elliptic obtuse cymbiform up to 3.2–5.4 mm, at anthesis apparently nerveless but becoming rather prominently 3–5-nerved in age, usually minutely puberulent within; petals (of ser. *Bacillares*) up to 16–22 mm when fully expanded; functional stamens 5 or 6, the 4 median always present but 1 or 2 of the 3 abaxial wanting, the filaments puberulent or glabrate, of the 4 median stamens 1.2–1.8 mm, of the abaxial often a little longer up to 2–2.8 mm, the anthers usually puberulent distally, sometimes glabrous, those of 4 median stamens scarcely incurved 3.6–5.7 mm, with very short depressed, often 1-porose beak ± 0.3 – 0.5 mm, those of 1–2 abaxial ones similar but commonly slightly smaller 2.6–4.5 mm, their beak similar or slightly more porrect; ovary densely strigulose; style moderately swollen, 0.7–1.05 mm diam just below the hollow stigma, the orifice 0.3–0.5 mm diam; ovules 76–104.

Pod like that of *S. quinquangulata* except on the average shorter and wider, the stipe 2–4 mm, the body (8–)10–18 \times 1.2–1.9 cm, the ventral suture ± 2 mm wide, without thickened border, the valves coarsely but not very prominently transverse-venulose; seeds biseriate, turned broadside to the septa, compressed-obovoid 6–7.2 \times 4–4.6 mm, the testa atropurpureous lustrous cross-crackled, exareolate.—Collections: 45.

Mountain forest, disturbed woodland, thickets, and persisting at forest border or in hedges, 50–850 m, Porto Rico (w., e.-centr. and e. districts), Virgin Is. (St. Thomas and Tortola), and Leeward Is. (St. Kitts); ?Haiti, cf. discussion).—Fl. VIII–II.

A close relative of *S. quinquangulata* and *S. viminea*, differing from both in the loss of one or two of the abaxial set of stamens, and fully allopatric. Of ser. *Bacillares*, *S. bacillaris* alone shares its insular range between Puerto Rico and St. Kitts and this differs greatly in its strongly asymmetric, plane-margined leaflets, zigzag primary inflorescence-axis, heptamerous androecium and thick-margined sutures of the pod. The fully expanded petals of *S. nitida* are ordinarily longer in relation to the small calyx than those of *S. quinquangulata*, the sepals are more strongly veined in age, the foliage is on the average smaller, the style less dilated under the stigma, and the pod at once broader and shorter; but no one of these differential characters can be relied on absolutely to separate all forms of *S. quinquangulata*, of which the pod, moreover, is still very poorly known. The yet shorter pod is perhaps the best morphological character separating *S. viminea* which, however, is in practice recognized as the only Jamaican representative of this immediate alliance, further notable for its full set of seven anthers. In describing *Chamaefistula antillana* Britton & Rose gave no diagnosis whatever, but in *North American Flora* compared it with *S. viminea*; while their contrast in the pods has proved a valid one, that involving width of leaflets cannot be confirmed in the material now available.

The two specimens of *S. nitida* known to Bentham were referred by him (1971) to *Cassia quinquangulata*, that of Masson from St. Kitts without comment, that of Oersted from St. Thomas with a remark on its nearly glabrous foliage. The correct application of the name *C. nitida*, which Bentham thought to have originated in French Guiana and guessed to be synonymous with *C. viminea*, was first established by Amshoff (1939, l.c.).

A sterile specimen from Haiti (Massif des Matheux, 1500 m, 16.III.26, Ekman 5760, US) is highly suggestive of *C. nitida*, but could also represent an outlying population of Jamaican *C. viminea*. We have seen no other *Bacillares* of this type from Hispaniola.

29. ***Senna viminea*** (Linnaeus) Irwin & Barneby, comb. nov. *Cassia viminea* Linnaeus, Syst. Nat. ed. 10, 1016, 1759 (jun) & Pl. Jamaic. Pugill. 12. 1759 (dec, reprinted in Amoen. Acad. 5: 397. 1760), all based on *Cassia* No. 8 (*viminea* etc.) P. Browne, Civ. & Nat. Hist. Jam. 223. 1756.—“... native of the coldest mountains of Linguanea . . . near Cold-Spring [Hanover Parish].”—Holotypus, LINN 528.6!—*Scolodia viminea* (Linnaeus) Rafinesque, Sylva Tell. 128. 1838. *Chamaefistula viminea* (Linnaeus) Britton & Rose, N. Amer. Fl. 23(4): 232. 1930.

Cassia melanocarpa Bertero ex DeCandolle, Prod. 2: 491. 1825.—“in Jamaica. Bertero.”—Holotypus, labelled “*C. frutescens* Bertero ex Jamaica. herb. Berteroana misit Balbis 1822,” G-DC!—*Chamaefistula melanocarpa* (DeCandolle) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.—Equated with *C. viminea* by Bentham, 1871, l.c.

Cassia frutescens Bertero ex Sprengel, Syst. 2: 335. 1825.—“Jamaica.”—No typus known to survive, but on circumstantial evidence based on an isotypus of the preceding.

Chamaefistula tocotana Rose ex Britton & Killip, Ann. N.Y. Acad. Sci. 35(3): 174. 1936.—“Cuesta de Tocatá, road from Buenaventura to Calí, El Valle, Colombia, December, 1905, Pittier 720 . . .”—Holotypus, US! isotypus, NY!

Sena spuria tetraphylla, *siliqua lata compressa* Sloane, Voy. Jam. 2: 49, t. 180, fig. 6, 7. 1725.

Cassia viminea sensu Bentham, 1871, p.p., quoad pl. jamaic.; Fawcett & Rendle, 1920, p. 103; Adams, 1972, p. 324.

Weak diffuse or trailing shrubs with sometimes virgate flowering branches, becoming vinelike or at forest edge sarmentose-arborescent with trunk up to 4 cm diam, at anthesis 3–13 m, with angulate young and subterete ribbed older branchlets, puberulent with fine incumbent or subappressed, on stems rarely subretorse often lutescent hairs up to 0.1–0.25(–0.3) mm, the foliage strongly bicolored, brownish-olivaceous lustrous and often glabrous or glabrate above, paler and at least thinly puberulent along major veins beneath, the inflorescence thyriform-paniculate leafy at base but distally exserted.

Stipules erect incurved linear-attenuate 3–8 mm, at base 0.25–0.5 mm wide, early dry caducous.

Lvs (below inflorescence, where \pm abruptly diminished) 6.5–13 cm; petiole including the discolored wrinkled pulvinus (1–)1.5–4 cm, at middle 0.5–0.9 mm diam, bluntly carinate dorsally, openly shallowly sulcate ventrally; rachis 5–16 mm, shorter than petiole; glands between the proximal or between both pairs, stipitate, (1.2–)1.5–3.5 mm tall, the body narrowly lance-fusiform, commonly acute 0.35–0.5 mm diam glabrous; pulvinules 1.5–2.5 mm; distal pair of lfts obliquely ovate- or lance-acuminate 4–8 \times (1.4–)2–3.6 cm, 1.6–3.2 times as long as wide, at base rounded on proximal and cuneate on distal side, the margins strongly revolute, the straight or very gently incurved midrib with 8–13 pairs of major camptodrome secondary, connecting tertiary and sometimes in addition finer reticular venulation prominulous on both faces but more sharply so beneath; proximal pair $\frac{1}{3}$ – $\frac{2}{3}$ as long, often proportionately wider.

Racemes solitary 6–20-fl'd, at anthesis subcorymbose, the axis including short peduncle (1–)2–5.5 cm; bracts usually lanceolate acute 3–6 \times 0.6–2 mm, rarely obovate obtuse cucullate up to 3–4 mm wide, caducous; pedicels (at and after full anthesis) (10–)12–25 mm; young buds subglobose, glabrous or puberulent; sepals subpetaloid yellow or yellow-edged, little graduated, oblong-obovate or broadly obovate obtuse concave 3.5–5.5 mm imperceptibly nerved; petals (of ser. *Bacillares*) yellow, puberulent dorsally along and sometimes between veins, very slightly graduated, the longest (abaxial) 13–17.5 mm; androecium functionally 7-merous; filaments either glabrous or puberulent, (1.5–)1.8–3 mm or one of the 3 abaxial longer than the rest and 3–4 mm; anthers glabrous or minutely puberulent distally, differentiated into 4 median slightly incurved truncate 3–4.3 mm with divaricate 2-porose beak 0.2–0.45 mm and 3 abaxial slightly more incurved 2.6–3.8(–4.2) mm with porrect beak 0.5–0.8 mm; ovary densely strigulose-pilous, the short glabrescent style gently incurved but not dilated, 0.35–0.6 mm diam below the minute stigma, the orifice \pm 0.2–0.25 mm diam; ovules (38–)40–60.

Pod (little known) apparently exactly that of *C. insularis*.—Collections: 38.

Scrub thickets, hedgerows and coppiced woodland, ascending into montane rainforest in the central mountains, 100–1650 m, widely dispersed over Jamaica; apparently disjunct and highly localized in centr. Costa Rica (San José), in Cordillera Oriental in n. Colombia (e. Magdalena and Norte de Santander) and Cordillera Costanera in n. Venezuela (near common boundaries of Aragua, Miranda and Distrito Federal), but the extra-Jamaican populations known only in flower and possibly not conspecific.—Fl. (V–)VII–XII(–III).

Very closely resembling *S. quinquangulata* except for the short pod in which it mimics the smaller-leaved *S. insularis*, vicariant on Cuba. On Jamaica the leaf-stalk may bear a gland between each pair of pulvinules or only between the lower ones. The few Venezuelan and Colombian specimens that, following Bentham, we provisionally accept as *S. viminea* lack fruits which alone can prove them conspecific; and the same holds true for the one record (*Skutch* 2980, K, MO,

NY) from Costa Rica. All these continental populations have uniglandular leaf stalks, and the South American ones in this and general habit closely resemble sympatric *S. oxyphylla*, from which they seem different only in the straight primary axis of inflorescence and relatively few (not over 60) ovules. The plant from Manaus, Brazil (*Spruce 1272*) referred by Bentham (1870, p. 100) to *Cassia vinea* represents the small-leaved local population of *S. quinquangulata* mentioned under that heading.

30. *Senna insularis* (Britton & Rose) Irwin & Barneby, comb. nov. *Chamaefistula insularis* Britton & Rose, N. Amer. Fl. 23(4): 239. 1930.—“Type from Tetas de Camarioca, Matanzas, [Cuba], February 7, 1916, *Britton, Britton & Wilson 14012*.”—Holotypus, NY! isotypi, F, US!—*Cassia insularis* (Britton & Rose) R. A. Howard, J. Arnold Arb. 28: 126. 1947.

Cassia absus Sessé & Mocino, Fl. Mex. 102. 1893.—“Incolit aridos Guanabacoae agros.”—No typus seen, but the protologue, except for the epithet presumably derived from Linnaeus, vividly evokes *S. insularis*.—Non *C. absus* Linnaeus, 1753.

Slender shrubs, when unsupported diffusely bushy or trailing, in brush vinelike, sarmentose or scandent, at anthesis 1–4 m, except for dorsally glabrous sepals pilosulous throughout with fine incumbent or (partly or almost wholly) flexuously erect hairs up to 0.15–0.45 mm, the young stems strongly angulate, the foliage bicolored, the lfts sublustrously dark olivaceous or brownish above, paler dull beneath, the inflorescence narrowly thyriform, leafy-bracteate.

Stipules erect, weakly setiform or linear-attenuate, straight or curved, 2–6 mm, at base 0.2–0.5 mm wide, deciduous before or after the lf.

Lvs (1.5–)2–7 cm; petiole including scarcely differentiated pulvinus (5–)7–20(–23) mm, at middle 0.4–0.8 mm diam, the narrow wings not or scarcely dilated distally, the groove shallow and narrow; rachis 2–8 mm; gland 1 erect from immediately above first pair of pulvinules, short-stipitate, very narrowly lance-ellipsoid acute or spiculiform (0.15–)0.2–0.4 mm diam, glabrous or rarely puberulent at base, the whole in profile 1–2.9 mm tall; pulvinules (0.8–)1–2.2(–2.5) mm; distal pair of lfts sharply deflected from top of rachis, obliquely obovate or elliptic obtuse or emarginate, (10–)12–43 × (5–)6–21 mm, a little less than 2 to a trifle over 3 times as long as wide, at base shallowly cordate or rounded on proximal and cuneate on distal side, the margin revolute, the slender, little excentric, straight or obscurely incurved midrib with 5–8(–9) pairs of major camptrodome secondary nerves finely prominulous on both faces but a trifle more so beneath, tertiary venulation faint and irregular or immersed, the proximal pair of lfts $\pm \frac{2}{3}$ as long, often proportionately broader.

Peduncles with raceme-axis 0.5–3.5(–5) cm; racemes subcorymbosely or quite loosely (2–)4–11-fld; bracts papery yellowish-brownish, broadly ovate to elliptic-ob lanceolate acute 1.5–4 × 1.8–2.6 mm, at base half embracing pedicel, deciduous at or before anthesis; pedicels at anthesis 7–12 mm, in fruit much thickened and (7–)9–18 mm; buds globose glabrous, but the sepals minutely ciliolate; sepals subpetaloid yellow or reddish, indistinctly veined, oblong-obovate to -suborbicular very obtuse, little graduated, the longest inner one 5.5–7.5(–8) mm; petals yellow, pubescent dorsally, 3 adaxial subhomomorphic, broadly obovate- or flabellate-cuneate 10–12 mm, 2 abaxial longer, one of them more oblique and enfolding the ovary with 1 stamen, up to 14–21 mm; filaments sparsely pilosulous or glabrous, of 4 median stamens 1.5–2, of 3 abaxial ones (1–)1.8–2.5(–3) mm, the thecae of all either glabrous or thinly pilosulous (3–)3.5–4.5 mm with very short beak 0.2–0.4(–0.5) mm, the two sets of stamens scarcely differentiated;

ovary densely gray-pilosulous, the glabrescent style 1.4–2 mm, gently incurved and just below stigma 0.4–0.6 mm diam, the orifice 0.25–0.5 mm diam; ovules 60–78.

Pod stiffly ascending on rigid pedicel, the stipe 2–4 mm, the body subcylindroid, straight or gently decurved, (2–)3–8.5 × 1–1.6 cm, the valves at first green becoming lustrous blackish glabrescent and papery, indehiscent, the seeds released by tardy rotting of the fruit; seeds biseriate, compressed-obovoid, 4.6–5.2 mm, the testa mahogany-brown, highly glossy, the areole faintly differentiated, obovate in outline 3–4 × 2.6–3 mm.—Collections: 41.

Brushy hillsides, thickets in savanna, sea-cliffs, sometimes weedy in hedges, 5–800 m, scattered almost the length of Cuba (all provinces) and Isla de Pinos.—Fl. (VI–)VII–XI(–I), the fr. ripening slowly and long persisting on the branchlets.—Collections: 39.

Senna insularis has the short plump cylindric, relatively few-seeded and irregularly dehiscent pod of Jamaican *S. viminea*, but differs in the very small obtuse leaflets and in a calyx ampler in relation to the corolla. Vegetatively it more closely resembles east Brazilian *S. rizzinii*, but this has larger floral bracts, more heteromorphic stamens, a longer style (4–5, not 1.5–2 mm), and a seed-coat with no trace of areole. The close relationship of these three species to *S. chrysocarpa* is expressed in a common general facies and all four might perhaps be better evaluated as geographic varieties of one.

31. *Senna trianae* Irwin & Barneby, sp. nov., foliis mediocribus, habitu toto cum inflorescentia *S. undulatae* ut videtur proxima sed stipulis angustissime linearibus, foliolis concoloribus, bracteis parvis deciduis 1.5–3.5 × 1 (nec ±4–20 × 2–7) mm, pedicellis abbreviatis 5–16 (nec 15–30) mm, forsan ulterius legumine gracili ±8–10 × 0.7 cm diversa.—COLOMBIA. Cundinamarca: 14 km w.-n.-w. of Melgar, 330 m, 8.I.1974 (fr), *G. Davidse* 5799.—Holotypus, MO; clastotypus (fragm), NY.—Above Río Sumapaz, 14 km w. of Melgar, 400 m, 13.I.1974 (fl jun), *A. Gentry et al.* 9200.—Paratypus, MO.

Shrubs ±1m with stiff terete annotinous and obtusely angulate hornotinous branchlets, minutely puberulent with forwardly subappressed hairs up to 0.1–0.2 mm, the foliage concolorous, the stiffly chartaceous lflets dull yellowish-olivaceous and remotely puberulent or glabrate on both faces or glabrous above, the inflorescence of short crowded racemes either leafy-bracteate or leafless and terminal, not or only shortly exserted.

Stipules erect firm linear-lanceolate 3–5 × 0.4–0.6 mm, deciduous before the lf.

Lvs 7–21 cm; petiole including the dilated wrinkled pulvinus 1.3–5 cm, at middle 0.7–1.4 mm diam, obtusely ribbed dorso-laterally and openly shallow-sulcate ventrally; rachis 1–3 cm, usually shorter than petiole; glands between each pair of lflets, sessile or short-stipitate 1.5–3.5 mm tall, the ovoid or ellipsoid obtuse or acute body 0.4–0.9 mm diam; distal pair of lflets obliquely ovate- or broadly lance-elliptic, shortly and obtusely acuminate (4–)5–13.5 × (1.5–)2–4.7 cm, ±2.3–3 times as long as wide, at base inequilaterally rounded on both sides, the margin plane or obscurely revolute, the incurved midrib with (6–)7–13 pairs of camptodrome secondary and connecting tertiary veins all bluntly prominulous above and more sharply elevated beneath, the reticular venulation above immersed, beneath prominulous and elaborated into defined areoles ±0.5 mm diam; proximal pair of lflets ±0.5–0.7 times as long as the distal, proportionately only a trifle broader.

Racemes closely ±3–10-fld, the axis including short peduncle 0.5–4 cm; bracts

firm, ovate-elliptic or lance-subulate concave $1.5-4 \times 1-16$ mm, deciduous by full anthesis; pedicels 5–16(–22) mm; buds globose, gray- or yellowish-strigulose; sepals little graduated, firm with yellowish submembranous margins, broadly ovate to oblong-obovate obtuse 5–7.5 mm; petals (little known) of ser. *Bacillares* but very short-clawed, the blade suborbicular, the longest 11–14 mm; functional stamens 7(–8), the puberulent filaments of 4 median stamens 1.2–2 mm, of 3 abaxial ones 2–5 mm, the 4 median anthers slightly incurved 4.5–6 mm, with very short divaricate 2-porose beak 0.3–0.5 mm, the abaxial scarcely different (3.6–)4–6 mm with slightly longer beak 0.4–0.6 mm, the 3 adaxial stamens either minute staminodal or variably developed into effete (or one into functional) anthers; ovary densely puberulent, the dilated stigma ± 1.2 mm diam; ovules ± 100 .

Pod pendulous, the stipe $\pm 2-3$ mm, the body linear-cylindroid $8-10 \times 0.7$ cm, the sutures ± 2 mm wide without obvious thickened border, the firmly chartaceous brown valves becoming coarsely transverse-reticulate-venulose, the dehiscence follicular; seeds (not seen) 2-seriate, embedded in pulp.—Collections: 8.

Dry rocky slopes and probably in thickets or at margin of forest, 300–1300 m, local, known only from the Magdalena valley in Cundinamarca and n. Tolima, Colombia.—Fl. (?) I–III.

Collected twice by Triana over a century ago (1851–7) and several times in recent years, this seems to be a local derivative of the *S. undulata*-*S. quinquangulata* complex, of which it has the biglandular leaf-stalk and small flower. It differs from both *S. undulata* and *S. quinquangulata* in the setiform stipules, the concolorous, scarcely revolute leaflets and small slender pod; and further from *S. undulata*, which it resembles in leaf-size, in the small caducous bracts. It resembles *S. viminea* in the stipules, but that, at least outside Jamaica, has only one petiolar gland, and in its scattered continental range a more ample flower, very markedly bicolored leaflets and a proportionately broader pod. The range of *S. undulata* has been traced south in Colombia just into northern Tolima; but the material seen from the Magdalena valley is an extreme form of the species with greatly dilated bracts and characteristic bicolored foliage greatly different from sympatric or nearly sympatric *S. trianae*.

32. *Senna cuatrecasasii* Irwin & Barneby, sp. nov., foliolis maximis (2.5–3.5 dm usque longis) cum *C. macrophylla* comparanda sed ab ea petiolo 2-glanduloso, calycis segmentis haud reticulatim venulosis necnon inflorescentiae axillaris paniculatae racemis multi- (30–100 nec 4–30)-floris statim separata; ab aliis *Bacillaribus* colombianis petiolo 2-glanduloso praeditis praeter inflorescentiam sese particularem foliolis amplissimis inferne simul pilosulo-puberulis ac pallide papillosis insigniter dissimilis.—COLOMBIA. Valle: Sabaletas, hoyá del río Anchicayá, 25 m, vertiente occidental de la Cordillera Occidental, 16.XI.1945 (fl), *J. Cuatrecasas* 19868.—Holotypus, F (2 sheets, nos. 1303907. fl, 1303906. lf); clastotypus (fragm), NY; isotypus, US.

Shrubby \pm sarmentose to 1 m (ultimate potential stature unknown) with terete purplish-brown, minutely puberulent annotinous branchlets and notably ample chartaceous bicolored lflets, these above glabrous olivaceous scarcely lustrous, beneath yellowish-green and densely minutely pilosulous, the inflorescence composed of leafless panicles of densely many-fl'd racemes arising from axil of living lvs and much shorter than them.

Stipules unknown, doubtless early deciduous.

Lvs 4–5 dm; petiole including discolored wrinkled pulvinus 6.5–10 cm, at middle 3–4 mm diam, subterete, very narrowly obscurely 2-ridged ventrally, the sulcus hence shallow and open; rachis 5.5–7 cm, slightly shorter than petiole; glands 1 or 2 at each pair of lflets sessile, plumply ovoid obtuse 3–6 mm; pulvinules 1.3–1.5 cm, discolored; distal pair of lflets broadly ovate-elliptic, at apex abruptly acuminate, $28\text{--}35 \times 14\text{--}18$ cm, at base asymmetrically rounded (at very base decurrent into pulvinule), the margin revolute, the straight centric midrib with $\pm 14\text{--}15$ pairs of major secondary veins weakly prominulous above, sharply so beneath, the tertiary and subsequent fine reticular venulation scarcely raised above, weakly and bluntly so beneath, the intervenium and reticular venules densely minutely papillate; proximal pair of lflets similar, $\pm \frac{2}{3}$ as long.

Axis of the panicle 1–4 cm, purplish-brown and densely minutely pilosulous; racemes 30–100-fl'd, the axis becoming 5–17 cm; bracts ovate ± 1 mm, deciduous from the very young bud as pedicel begins to elongate; pedicels at anthesis $\pm 10\text{--}12$ mm, to 18 mm in fruit; buds subglobose, opening before true anthesis, puberulent below middle; sepals submembranous, perhaps reddish when fresh, scarcely graduated, broadly elliptic obtuse $5.5\text{--}6.5 \times 3.5\text{--}4$ mm, delicately 3-nerved from base, the nerves not or only faintly branched distally, not reticulately anastomosing toward apex; petals (presumably yellow, when dry pinkish-brown) puberulent dorsally, subisomorphic, elliptic-oblong beyond short claw, $12\text{--}14 \times 6\text{--}6.5$ mm; functional stamens 7 subisomorphic, the puberulent filaments 1.5–2 mm, the purplish-brown glabrous anthers including the short oblique 2-porose beak 5.2–5.7 mm, the beak of the 3 abaxial ones only a trifle longer than that of the 4 median ones and hardly more porrect; ovary puberulent; style claviform incurved, 0.9–1 mm diam just below the hollow stigmatic orifice, this 0.5 mm diam; ovules (1 count) 76.

Ripe pod unknown, when half ripe ± 15 cm, the brown valves densely papillate.—Collection: 1.

Habitat not recorded, known only from the type-locality, near 25 m alt. in the first foothills of the Pacific slope of Cordillera Occidental near $3^{\circ}45'N$ in Valle de Cauca, Colombia.—Fl. $\pm X\text{--}XII$.

Although as yet only dimly known through the flowering type-collection, *S. cuatrecasasii* is easily distinguished from all described *Bacillares* in the combination of biglandular leaf-stalks, immensely ample leaflets papillate as well as pilosulous beneath, axillary panicles of many-flowered racemes and relatively small, short-pedicelled flowers. The leaflets suggest by their great size those of *S. macrophylla*, but this differs fundamentally in the syndrome of 1-glandular leaf-stalks, plane-margined and more sharply reticulate leaflet-blades, reticulately venulose sepals and much shorter, relatively few-flowered racemes, usually solitary in the axils. *Senna huilana*, known to occur also on the Pacific slope of the Western Cordillera, but at greater altitudes, may have leaflets almost as ample as those of *S. cuatrecasasii*, but the blades are glabrous on both faces, there is only one gland on the leaf-stalks, the larger flowers are borne on pedicels 2–5 (not 1–1.2) cm long, and the androecium is differentiated into two sets of strongly dimorphic members. Other Colombian *Bacillares* characterized by biglandular leaf stalks, *S. trianae* and *S. quinquangulata*, have leaflets at most 16 (not 28–35) cm long; the latter, which has been collected near the type-locality of *S. cuatrecasasii*, on Bahia Buenaventura (*Cuatrecasas* 19741, F), differs further in its exserted terminal panicle of racemes. The true affinities of *S. cuatrecasasii* within its series cannot be profitably discussed until the pod and seed become available for comparison. The one immature pod examined (US) has valves densely mi-

nutely verruculose like those of *S. papillosa*, but the surface when ripe cannot be foretold from the scant material at hand.

It is a particular pleasure to associate this noteworthy Colombian *Senna* with the name of José Cuatrecasas, eminent student of the Colombian flora.

33. *Senna rupununiensis* Irwin & Barneby, sp. nov., petiolo 2-glanduloso sepalisque late obovato-suborbicularibus *S. lourteigianae* et *S. undulatae* propiuscula, a priori foliolis angustioribus basi asymmetricis, inflorescentiae axibus petalisque dorso puberulis necnon legumine tereti (nec argute 4-angulo), a secunda imprimis bracteis floralibus parvis angustis (nec dilatatis sepaloideis) ulterius sepalis magnis (interioribus 10–12 nec 6–8.5 mm longis) breviter tantum (nec diu) ante anthesin expansis manifeste diversa.—GUYANA: near mouth of Charwair Creek, basin of Rupununi River, near 2°35'N, 1–4.XI.1937 (fr), A. C. Smith 2358.—Holotypus, NY; isotypi, F, G, K, MO, US. BRAZIL. Terr. do Roraima: Boa Vista, Rio Branco, VII.1913 (fl), J. G. Kuhlmann s.n. in RB 3232—Paratypus (fl), NY.

Vines of unknown length, with terete, in age obtusangulate and pallid branchlets, the lower face of the chartaceous lflets and the inflorescence strigulose-pilulous with subappressed-incumbent hairs up to 0.1–0.25 mm, the foliage bicolored, lustrous olivaceous and sharply venulose above, pale dull and smooth or almost so beneath, the inflorescence of racemes axillary to living lvs or forming a small terminal leafless panicle, this sometimes well exerted from foliage.

Stipules erect firm linear-attenuate 2.5–7 × 0.4–0.5 mm, deciduous.

Lvs 6–12 cm; petiole slender 1.5–3.5 cm, at middle 0.7–1 mm diam, obtusely triquetrous, keeled dorsally, openly shallow-sulcate ventrally; rachis (0.7–)1–2 cm, shorter than petiole; glands between both pairs of lflets, sessile or shortly stipitate, 2–3 mm tall, the head ovoid or claviform glabrous livid; distal pair of lflets narrowly elliptic-oblongate, elliptic, or rarely ovate, obscurely short-acuminate, at very apex obtuse mucronulate or minutely retuse, (4.5–)5–8.5 × (1–)1.3–3.2 cm, 2–4.5(–5.4) times longer than wide, at very base asymmetrically broadly cuneate, the margins revolute (not undulate), the gently incurved midrib bluntly prominulous above, cariniform beneath, the ±10–16 pairs of camptodrome and intercalary secondary veins with tertiary and reticular venulation all strongly prominulous above, faintly so or almost immersed beneath; proximal pair of lflets similar, ½–¾ as long, proportionately scarcely broader or more oblique.

Racemes 3–10-flid, the axis with peduncle becoming 1–8 cm; bracts firm lance-ovate acute 3.5–5.5 × 1.2–1.8 mm, persistent into anthesis but then deciduous; pedicels 16–28 mm; buds globose, thinly puberulent when young, the inner sepals glabrate, these shielding the androecium until shortly before true anthesis; sepals yellowish petaloid-margined, broadly spatulate-obovate or suborbicular, moderately graduated, the outermost 7–8, the inner up to 10–12 mm; petals yellow, puberulent dorsally, beyond slender claw flabellate-obovate subhomomorphic except the adaxial one broadest, the longest up to 16–19 mm; functional androecium 7-merous, the filaments thinly puberulent, those of 4 median stamens ±1.5 mm, those of 3 abaxial ones 3–4 mm, the anthers glabrous, those of 4 median stamens nearly straight 6.5–7.5 mm, with very short divaricate 1- or 2-porose beak, those of 3 abaxial ones slightly more incurved 6–7 mm, with almost erect beak ±1.5 mm; ovary densely strigulose; style very short, not dilated, near apex 0.8 mm diam; ovules ±100.

Pod pendulous short-stipitate, the stout stipe ± 3 mm, the cylindric (by abortion of ovules irregularly constricted or deformed), slightly incurved body $8-12 \times 1.3-1.5$ cm, the sutures apparently without thickened margins, the stiffly coriaceous valves becoming brown smooth or coarsely low-venulose; dehiscence follicular, along the ventral suture; seeds biseriate, turned broadside to the septa, broadly compressed-ovoid $4.5-5.3 \times 3.2-4.2$ mm, the testa mahogany-brown, highly lustrous, cross-crackled, exareolate.—Collections: 3.

Thickets on savanna and margins of gallery forest, $\pm 250-300$ m, apparently localized on and near the Rio Branco-Rupununi divide in n.-e. Território do Roraima, Brazil (near Bôa Vista) and adjoining Guyana (Charwair and Sand creeks).—Fl. VII–IX.

The fruiting type-collection of *S. rupununiensis* was identified as an unnamed relative of *S. undulata*, from which it differed obviously in the narrowly elliptic, almost willow-like leaflets, a character now known not to be truly diagnostic (see *Wilson-Browne* 137, K, with ovate leaflets). Flowering material which we confidently associate with Smith's fruiting typus shows the species to differ gravely from *S. undulata* in the small firm (not large sepaloïd and colored) floral bracts and in substantially larger sepals which remain closed over the androecium, like those of *S. latifolia*, until immediately before true anthesis of the flower. In details of the flower *S. rupununiensis* resembled the equally localized *S. lourteigiana*, which is readily distinguished, however, by the broader, basally symmetrical leaflets glabrous and venulose on both faces, the glabrous inflorescence and petals, and the peculiar quadrangular pod. Marginally sympatric *S. latifolia*, which has as already noted almost the sepals of *S. rupununiensis* and can, very occasionally, have a gland between the distal as well as the proximal pair of leaflets, is more readily separable by the much larger plane-margined, not conspicuously revolute leaflets.

34. *Senna wurdackii* Irwin & Barneby, sp. nov., *S. undulatae* petiolis 2-glandulosis foliisque mediocribus congruenti forsan propiuscule affinis sed stipulis bracteisque parvis angustis, foliolis subsymmetrice ovato-vel lanceolato-ellipticis, calycis glabri longioris sepalo maximo interiori 8.5–11 (nec 6–8.5) mm longo androeciique antheris perfectis una abaxiali manca 6 (nec 7) certe diversa; ab antillana *S. nitida* quoad androecium comparabili foliolorum ambitu calyceque majusculo glabro, a guianensi *S. rupununiensi* quoad foliola elliptica parva simili foliolis supra laevibus (nec alte rugulosis) androecioque reducto ab ambabus patria distans.—VENEZUELA. Terr. Amazonas: Raudal de Atures, 10 km s. of Puerto Ayacucho, 100–200 m, 10.XI.1953 (fl, fr jun), *Maquire, Wurdack & Bunting* 36132.—Holotypus, NY; isotypi, F, US.

Shrubs and treelets at anthesis 2–6 m, with terete brown subglabrous, abruptly flexuous branchlets, the lf-stalks and dorsal face of lflets pilosulous with fine spreading-incurved hairs up to 0.2–0.4 mm, the chartaceous foliage strikingly bicolored, the lflets (dry) lustrously brownish-olivaceous above, pale and brown-nerved beneath, the thinly strigulous few-fl'd racemes both axillary and by reduction of uppermost lvs depauperately cymose-paniculate, mostly immersed in foliage.

Stipules erect, falcately linear-ob lanceolate acute, prominently venulose, $5-8 \times 0.6-1$ mm, deciduous before the lf.

Lvs mostly 10–14 cm; petiole including little dilated pulvinus 20–28 mm, at middle 0.8–1.3 mm diam, openly shallow-sulcate ventrally; rachis 12–21 mm,

shorter than petiole; glands between proximal or (commonly) between both pairs of lfts, sessile or shortly stipitate, including stipe 2.6–3 mm long, the ellipsoid or lance-ellipsoid glabrous body 0.5–0.8 mm diam; pulvinules 3–4 mm; distal pair of lfts subsymmetrically lance-elliptic, almost imperceptibly acuminate, at very apex obtuse, $6\text{--}9.5 \times 2\text{--}3.2$ cm, ± 3 times as long as wide, at base inequilaterally cuneate, the almost straight and centric midrib with 7–9 pairs of major camptodrome secondary and few connecting tertiary veins all immersed above, prominulous beneath, the subsequent reticulation faint; proximal pair similar, $\pm \frac{2}{3}$ as long, proportionately only a trifle broader.

Racemes solitary, shortly 3–12-fld, the axis including peduncle 1.5–4 cm; bracts ovate acute 2.5–3 mm, persistent into anthesis; pedicels 20–28 mm; fl-buds globose, glabrous; sepals subpetaloid, faintly veined, little graduated, broadly ovate or oblong-obovate, the innermost 8.5–11 mm; petals (of ser. *Bacillares*) up to 17–22 mm, the vexillary one broadest; functional androecium 6-merous, glabrous, the filaments of 4 median stamens thickened 2–2.5 mm, those of 2 abaxial linear but thickened at apex ± 3.5 mm, the anthers of 4 median stamens differentiated into slightly unequal pairs, oblong slightly incurved 5.5–9 mm with abruptly divaricate beak 0.3–0.4 mm, those of 2 abaxial ones lance-ovoid 2.5–3.7 mm with nearly erect 2-porose beak 1.2–1.5 mm; ovary densely gray-strigulose; style scarcely or not dilated, ± 0.8 mm diam just below stigma, the orifice ± 0.25 mm diam; ovules ± 120 .

Pod not seen fully formed, apparently like that of *S. oxyphylla*, up to 2 dm long; seeds unknown.—Collections: 5.—Fig. 16.

About granite outcrops in savanna, local, known only from the banks of middle Orinoco River and tributaries between $5^{\circ}30'$ and 7°N in s.-w. Estado Bolívar and adjoining Apure and Territorio Amazonas, Venezuela, and on the Colombian bank in the n.-e. corner of Vichada.—Fl. VI, X–XII.

The flora of the cerros and associated savannas of that segment of the Orinoco valley that separates Venezuela from Colombia has an endemic element to which the Cassieae contribute taxa from two sections of genus *Chamaecrista*: *C. (Xerocalyx) desvauxii* var. *triumvialis* Irwin & Barneby; *C. (Chamaecrista) glandulosa* var. *rapidarum* Irwin & Barneby and var. *crystallina* Irwin & Barneby; and the senna described here as *S. wurdackii*. All of these represent groups widely dispersed over the Neotropical region in patterns so diffuse and generalized as to provide little evidence of origins. The close affinity of *S. wurdackii*, except in a general way to all smaller-leaved *Bacillares*, is difficult to assess. The plant is notable for the syndrome of narrow bracts and stipules, mostly biglandular leaf-stalks, relatively small elliptic, strongly bicolored leaflets with revolute margins, ample glabrous sepals and an androecium peculiar for the loss of one of the three abaxial stamens. In the last character it resembles the West Indian *S. nitida* and the north Colombian *S. smithiana*, but differs from both in the subsymmetrically elliptic leaflets pilosulous on the dorsal face. The perhaps equally related *S. rupununiensis* from the eastern margin of the Guayana Highland resembles *S. wurdackii* in size and outline of leaflets, but these are strongly venulose on the upper face, merely strigulose beneath, and associated with the heptamerous functional androecium normal in ser. *Bacillares*. Fruits and seeds of the more local members of the series are so little known that comparisons are not yet possible.

We take pleasure in dedicating *S. wurdackii* to Dr. John J. Wurdack, Smithsonian Institution, a member of the first New York Botanical Garden expedition and leader of the second that encountered the species in modern times. It was



Fig. 16. *Senna wurdackii* I. & B. Stem $\times\frac{1}{2}$; flower $\times 2$; leaf-rachis with nectaries and detached stamens $\times 4$ (Maguire et al. 36132).

collected first sometime in the XIX century by the French traveller Chauffenon (P).

35. *Senna lourteigiana* Irwin & Barneby, sp. nov., *S. undulata*m foliolis mediocribus basi utrinque cuneatis necnon androecii forma simulans sed ab ea inflorescentia praeter sepala minutim ciliolata glaberrima, floribus majoribus simulque minus numerosis bractea minuta caduca suffultis, et praesertim legumine secus utramque suturam longitrorsus 2-alato ideoque argute quandrangulo, valvulis papilloso-asperatis nec alte venulosis insigniter diversa.—FRENCH GUIANA: forêt dense sur pente, 300 m, sources de la Mana, versant n. des Monts Galbao à 10 km WSW de Saül, 12.V.1973 (fr), *J. J. de Granville 1637*.—Holotypus, NY; isotypus, P!—Saül, sur le tracé Belvédère, 8.III.1972 (fl), *Oldeman B.4339*.—Paratypi (fl), CAY, NY.

Lianas with trunk to 5 cm diam and weak sarmentose treelets of forest understory with dark green or grayish bark and yellow wood, the annotinous branchlets slender terete pliant, remotely livid-punctate, glabrous throughout except for thinly strigulose ovary and (sometimes) residual minute puberulence of lf-stalk, the thin-textured foliage bicolored, glossy dark green above, paler dull beneath, the laxly few-fl'd racemes borne few together on short weak, functionally leafless branchlets axillary to living lvs, not or scarcely exserted.

Stipules (caducous, little known), herbaceous, falcately oblanceolate or linear-oblanceolate acute 4–13 × 0.8–3.5 mm, when relatively wide strongly reticulate-nerved.

Lvs 9–19 cm; petiole including scarcely dilated, often twisted pulvinus variable in length, of 4-foliolate lvs 2–4 cm, of some upper 2-foliolate ones up to 7 cm, at middle 0.8–1.6 mm diam, thence upwardly dilated to the pulvinules, dorsally rounded or bluntly carinate, broadly applanate-sulcate ventrally, in section lunate; glands of 4-foliolate lvs 1 between each pair, shortly stipitate or subsessile, including stipe up to 1.5–2.5 mm long, the body ovoid-ellipsoid or narrowly fusiform glabrous; gland of lower pair sometimes persisting even when the lflets themselves lack; rachis (of 4-foliolate lvs) 1–3.2 cm, a little shorter than petiole; pulvinules 2–3 mm, strongly wrinkled when dry; distal (or only) pair of lflets subsymmetrically broadly elliptic-acuminate 5.5–11.5 × 2.5–5 cm, the acumen retuse, the margin revolute and sometimes undulate, the blade at base almost symmetrically cuneate-decurrent on pulvinule, the straight midrib depressed-canaliculate ventrally, strongly prominent dorsally, the 7–11 pairs of major campitodrome secondary with tertiary and subsequent close reticular venulation all sharply finely prominulous on both faces.

Racemes loosely shortly 3–7-fl'd, the axis including peduncle 2–4.5 cm; bracts (caducous, poorly known) ovate-elliptic cymbiform 2–2.5 mm; pedicels 3–3.6 cm; buds plumply ovoid obtuse glabrous; sepals firm subpetaloid yellow, the inner broadly obovate obtuse 13–15 mm, the outer $\pm \frac{1}{3}$ shorter, all becoming papery and prominently venulose; petals (of ser. *Bacillares*) yellow, glabrous dorsally, the longer up to 27(–31) mm; androecium glabrous, the filaments 1.5–2.5 mm; anthers of 4 median stamens ± 9 mm, very slightly incurved, truncate, with divaricate biporose beak ± 0.5 mm, of 3 abaxial ones much smaller, 2.5–3 mm, contracted into an erect beak ± 1.5 mm; ovary thinly strigulose; style short, the stigmatic orifice 0.5–0.6 mm diam; ovules 108–132.

Pod (1 seen) pendulous, the stout stipe ± 3 mm, the straight body 14.5 × 1.1 cm, abruptly contracted at both ends, quandrangular by production of stiffly

coriaceous free wings ± 2 mm wide from the length of both sutures, the epidermis of valves brown, densely coarsely papillate; seeds (not seen fully ripe) biseriate, turned broadside to the septa, clothed in thin black pulp, ± 5 mm long, angulately ellipsoid-semiobovoid, the testa brown, dullish.—Collections: 22.—Fig. 17.

Montane and lowland, virgin and secondary forest, sometimes on laterite, 10–700 m, known only from French Guiana, especially from the hill country drained by the sources of the Oyapock, Approuague and western affluents of the Maroni river, but occasional also on or near the outer margin of the coastal plain between Kourou and Kaw, to be expected on the Brazilian slope of Sa. Tumucumaque in adjoining Amapá.—Fl. I–IV.

The very distinct *S. lourteigiana* was among the first species of ser. *Bacillares* to be discovered (cf. specimens in the Candolle and Willdenow herbaria at B, G), and has gone undescribed until now only because mistaken either for *Chamaecrista apoucouita* (which has, of course, cupshaped, not claviform petiolar glands) or for *S. georgica*, rather similar in foliage but entirely different in flower and pod. The individual flower of *S. lourteigiana* outwardly resembles that of *S. georgica* in the ample sepals, but has three adaxial stamens notably shorter, not much longer, than the four median ones; and its pod is relatively short and quadrangular, not compressed and narrowly ribbonlike, accommodating the seeds in two rows, not in one. Our diagnosis somewhat arbitrarily compares *S. lourteigiana* with *S. undulata*, not unlike it in general aspect of the foliage and in the presence of a gland between each pair of leaflets. However the enlarged petaloid bracts, smaller flowers, and coarsely venulose cylindric pod of *S. undulata* are markedly different.

We take special pleasure in dedicating to Dr. Alicia Lourteig this handsome senna, which is endemic, so far as known, to French territory. Dr. Lourteig's knowledge of the history and botanical resources of the Muséum d'Histoire Naturelle in Paris is unrivalled, and her generosity in sharing her knowledge with visitors from America is proverbial.

36. *Senna chrysocarpa* (Desvaux) Irwin & Barneby, comb. nov. *Cassia chrysocarpa* Desvaux, J. Bot. 3(2): 72. 1814.—“Habitat in Gujana.”—Holotypus, P (hb. Desvaux.)! isotypus (fragm), F!—*C. chrysotricha* Coladon, Hist. Casses 99, nom. illegit., t. 13. 1816.—“Hab. in Guiana. Patris (v.s. sp. in h. DC.).”—Sp. authent.: “Cayenne,” G-DC!

Cassia virgata L. C. Richard, Actes Soc. Hist. Nat. Paris 1: 108. 1792.—“... e Cayenna ... missarum a domino LeBlond.”—Holotypus, *LeBlond s.n.*, P (hb. Richard.)!—Non *C. virgata* Swartz, 1788.

Cassia chrysogyne Miquel, Linnaea 18: 581. 1844.—“*Crescit* prope Paramaribo in sylva juxta viam ad Kwatta, ad Wanicka, m. Sept. [*H. G. Focke*].”—Holotypus, U, not seen; isotypus, labelled ‘Surinam. Focke [misit] Miquel,’ K (hb. Benth.)! = NY Neg. 1443.—Equated with *C. chrysocarpa* by Bentham, 1871, p. 523.

Weakly woody shrubs and bush-ropes, in open places or on newly cleared land diffusely ascending, becoming sarmentose in older capoeira and at forest margins, the terminal flowering branchlets then often semi-pendulous from the canopy, at anthesis 2–10 m, the stems prominently angulate, variably pilosulous or strigulose almost throughout with appressed, antrorsely or retrorsely incurved, sometimes suberect hairs up to 0.1–0.3(–0.4) mm, the foliage strongly bicolored, the lft-blades sublustrously dark- or brownish-olivaceous above, paler dull beneath, usually pubescent on both faces but sometimes glabrous except along major veins, the gray- or yellow-pubescent inflorescence often elongately narrow-thyriform-



Fig. 17. *Senna lourteigiana* I. & B. Stem and flowering raceme $\times 1$; leafstalk $\times 2$; transverse section of pod $\times 3$ (Sastre 181; de Granville 1637, fr).

paniculate, the lower racemes leafy-bracteate, the upper commonly leafless or subtended by degenerate leafless petioles.

Stipules narrowly setiform incurved 3–8 mm, at base 0.15–0.4 mm wide, early dry and caducous.

Larger lvs 3–8 cm; petiole including discolored, little swollen pulvinus 1–2.5(–3) cm, at middle 0.5–1.1(–1.3) mm diam, openly grooved ventrally, the wings a trifle dilated distally below the first pair of pulvinules; rachis 4–9(–11) mm, shorter than

petiole; gland ascending from slightly above first pair, slenderly lance-ellipsoid acute or obtuse 0.5–1 mm diam, short-stipitate or sessile, glabrous or rarely hispidulous, in profile (2–)2.4–3.8 mm tall; pulvinules variably swollen (1–)1.3–2.7 mm; distal pair of lfsts sharply divaricate from lf-stalk, very obliquely ovate-obovate or ovate-elliptic, broadly obtuse to broadly deltate-acute $23\text{--}60 \times 12\text{--}32$ mm, $\pm 2\text{--}1.3$ times as long as wide, at base cordate on proximal and rounded to cuneate on distal side, the margin revolute, the \pm excentric, almost always incurved midrib and 5–8(–9) pairs of camptodrome secondary veins finely prominulous on upper and sharply so on lower face, the rare intercalary secondary and tertiary venulation faint, further reticulation yet fainter or obsolete.

Peduncles with raceme-axis stiffly incurved-ascending, proximally stout but tapering distally, mostly (1–)1.5–5.5 cm, the racemes (2–)3–9(–12)-fld, when young or when few-fld subumbellate; bracts ovate or lanceolate acute or acuminate $1.5\text{--}3.5(4) \times 1\text{--}2.4$ mm, at base not or only narrowly embracing base of pedicel, deciduous before or very soon after anthesis; pedicels (9–)12–20(–24) mm, early thickened except at very base; buds subglobose, subappressed-pilosulous, rarely glabrescent; sepals yellowish or sometimes red-lineolate, the inner subpetaloid, strongly graduated, the smallest outermost $\frac{1}{2}\text{--}\frac{2}{3}$ the largest innermost, all ovate-, obovate-orbicular or broadly oblong-obovate very obtuse, faintly veined, the longest 8.5–11.5 mm; petals yellow or orange-yellow, puberulent dorsally, 3 adaxial broadly obovate- or flabellate-cuneate up to 13–18(–21) mm, the 2 abaxial longer and narrower, up to (15–)17–29 mm, one of them oblique and incurved around 2 longer stamens; filaments glabrous, those of 4 median stamens 1.5–2.6 mm, those of 3 abaxial ones 2.2–5 mm; anthers glabrous or exceptionally very sparsely puberulent, those of median stamens 4.5–6 mm, with introrsely 2-porose beak 0.2–0.4 mm, those of abaxial ones no longer and usually a trifle smaller, 3.5–5 mm with porrect 2-porose beak 0.5–0.9 mm; ovary densely yellowish-pilosulous; style glabrescent 2–2.7(–3) mm, at apex gently incurved and 0.35–0.6 mm diam, the stigmatic orifice 0.2–0.3 mm diam; ovules 76–108.

Pod stiffly spreading-ascending, stoutly short-stipitate, the stipe 3.5–7 mm, the narrowly cylindroid body $4\text{--}9.5 \times 0.7\text{--}0.95$ cm, abruptly contracted at each end, usually a little decurved, the valves becoming papery blackish lustrous, thinly pilosulous, apparently indehiscent, the seeds released only by rotting of the fruit; seeds biseriate, turned broadside to the septa, embedded in fetid pulp (black when dry), compressed-obovoid 4.1–4.6 mm, the testa brilliantly glossy-castaneous, a faintly differentiated areole $\pm 3.5\text{--}3.8 \times 2.3\text{--}2.7$ mm on each face equally glossy or slightly roughened.—Collections: 72.

Open forest, riverine forest and thickets of sand-savanna, both on várzea and terra firme, becoming locally abundant in capoeira and along highways, mostly, perhaps always, below 300 m, common on the coastal plain and interior lowlands of Guyana (Courantyne valley), French Guiana, Surinam, and n.-e. Brazil (Amapá, Pará and Maranhão), ascending the Amazon and Rio Branco w., in e. Amazonas and Terr. do Roraima, to $\pm 61^\circ\text{W}$, and s. on Rio Araguaia into extreme n.-w. Mato Grosso.—Fl. (VI–)VII–XII(–III).

In its area of dispersal *S. chrysocarpa* is readily recognized by a combination of relatively small leaflets, a solitary petiolar gland, a narrow thyrsiform panicle of subumbellate racemes, and short indehiscent pulpy pods spreading-ascending on stiffened pedicels. It is closely related to the somewhat smaller-flowered, almost isandrous *S. insularis* endemic to Cuba and to *S. rizzinii*, which replaces it in Brazil east- and southward from Ceará; when better known these three may well emerge as no more than geographic expressions of one polymorphic species.

For the present *S. rizzinii* appears somewhat precariously distinct in its less angulate stems, larger floral bracts, longer style and fewer ($\pm 44-58$, not $76-108$) ovules, characters that need confirmation from more numerous specimens than are now available.

The earliest known example of *S. chrysocarpa* is in Aublet's herbarium (BM!) preserved under an unpublished name ("*Cassia aulica*" = MO Neg. 2274). Another, without locality "donné par M. Dupuis," has lain for more than 200 years unidentified in the Lamarckian herbarium (P).

37. *Senna rizzinii* Irwin & Barneby, nom. nov. *Cassia granulata* Rizzini, Leandra 4-5: 16. 1974.—". . . ad Paulo Afonso, Bahia, in Caatinga . . . A. P. Duarte XII-73."—Holotypus not seen, but the protologue conclusive.—Non *C. granulata* (Urban) Macbride, 1919.

Cassia chrysocarpa var. (?) *psilocarpa* Benthām in Martius, Fl. Bras. 15(2): 101. 1870.—". . . in collibus arenosis prope Aracaty provinciae Ceara: Gardner n. 1568."—Holotypus, collected VII.1838 (fl, fr), K! = IPA Neg. 907.

Shrubs 1.5-4 m, pilosulous almost throughout with fine short incumbent and scattered longer, loosely ascending hairs up to 0.35-0.7 mm, the hornotinous branchlets terete or bluntly angled, the small foliage bicolored, the lfts sublustrously olivaceous above, paler dull beneath, usually pubescent on both faces and the hairs on upper face pustulate-dilated at base, sometimes glabrescent ventrally, the inflorescence thyrsoid-paniculate, the lower racemes often leafy-bracteate but the distal naked and well exerted.

Stipules very slenderly pliantly setiform (2-)3-7 mm, at base 0.25-0.45 mm wide, tardily deciduous with or after the lf.

Lvs 3-7 cm; petiole including discolored but scarcely swollen pulvinus (7-)11-26 mm, at middle 0.4-0.8 mm diam, obscurely shallow-sulcate; rachis 4-9 mm; gland 1 between proximal pair, stipitate, slenderly claviform acute 1.1-2.6 \times 0.3-0.6 mm, pilosulous at least at base; distal pair of lfts asymmetrically elliptic, lance-, or ovate-elliptic obtuse or subacute mucronulate (18-)20-45 \times (7-)9-15 mm, $\pm 2-3$ times longer than wide, at base cordate on proximal and cuneate on distal side, the margin revolute, the slender straight or gently incurved midrib with 5-9 pairs of camptodrome secondary veins all prominent on both faces but very finely so above, more sharply so beneath, the tertiary venulation faint and irregular or immersed.

Peduncles with raceme-axis 2-8 cm, the peduncle 0.7-1.8 cm, the raceme rather densely 7-20-fld; bracts firm, yellowish or brownish, elliptic or obovate-elliptic acute 4-7(-10) \times 2-4(-8) mm, at base embracing the pedicel, deciduous at full anthesis or subpersistent; pedicels 10-18 mm; buds globose, thinly pilosulous or glabrate; sepals yellowish, the outer elliptic-obovate 5-6 mm, the inner subpetaloid broadly oblong-obovate or suborbicular 7-9 mm; petals yellow, pilosulous dorsally, scarcely heteromorphic, oblong-obovate beyond the slender claw, the longest (10.5-)14-19 mm; filaments thinly puberulent, of 4 shorter fertile stamens 1.2-2 mm, of 3 long abaxial ones 2.5-5.5 mm; thecae glabrous or thinly pilosulous in dorsoventral grooves, of 4 shorter median stamens 5-5.5 mm, with divaricate beak 0.45-0.6 mm, of 3 longer ones 5-6 mm, with porrect beak 0.6-1.2 mm; ovary densely shaggy-pilosulous, the less densely pubescent style 4-5 mm, gently incurved and 0.45-0.75 mm diam at apex, the stigmatic aperture 0.3-0.4 mm diam; ovules 44-58.

Pod stiffly ascending or geotropic, long-persistent in papery tatters after discharge of seed, the stipe 2-6 mm, the body plumply sausage-shaped terete

$\pm 3.5\text{--}8.5 \times 1.1\text{--}1.7$ cm, abruptly contracted at both ends, the thin valves becoming papery castaneous and ultimately blackish, at first thinly or remotely pilosulous, then glabrate; seeds biseriate, compressed-obovoid, $\pm 5.5\text{--}6 \times 3.1\text{--}3.5$ mm, the testa blackish-brown, brilliantly lustrous, crackled, exareolate.—Collections: 26.

Caatinga, disturbed semideciduous woodland and cerrado, sometimes on stabilized dunes near the coast, from near sea-level n.-e.-ward but up to 1000 m in Bahia, scattered over n.-e. Brazil from s. Ceará e. to interior e. Paraíba, s. to n. and e.-centr. Bahia e. of Rio São Francisco (possibly adjacent Alagoas), on Chapada Diamantina extending s. to Sa. Agua da Rega and the middle Paraguaçu valley; apparently disjunct, in a possibly distinct, as yet poorly known form, on coastal dunes of Ceará and Paraíba.—Fl. (XII–)I–VI.

Senna rizzinii closely resembles *S. chrysocarpa*, which see for differential commentary. In general habit and details of the foliage it is also uncomfortably similar to partly sympatric *S. macranthera* var. *pudibunda*. The mature pedicels of var. *pudibunda* are longer (2.5–5, not less than 2 cm), its petals when fully expanded are longer (up to 22–30, not 14–19 mm), the dimorphism of its fertile stamens is more pronounced, and its relatively many-ovulate gynoeceum ripens to a longer pod. A feature common to both is a relatively long style (3–5 mm) and both are adapted to a seasonally arid regimen. Collectively these two entities go far to bridge the morphological gap between *S. chrysocarpa* and *S. macranthera* sens. lat., species traditionally referred to different groups because of the androecial differences. The technical characters of *S. rizzinii* and *S. macranthera* var. *pudibunda* need careful field-study in northern Bahia, flowers and fruits from the same populations, up till now not available for comparative study, being especially wanted.

In lieu of the holotypus we have taken as representative of *Cassia granulata* specimens from the type-locality, between Alagoas and Paulo Afonso, A. P. Duarte 14180, NY, RB, which correspond closely with the description.

38. *Senna tapajozensis* (Ducke) Irwin & Barneby, comb. nov. *Cassia tapajozensis* Ducke, Archiv. Jard. Bot. Rio de Jan. 4: 57. 1925.—“Habitat in regione fluminis Tapajoz medii loco Repartição (Herb. Jard. Bot. Rio n. 16.990) et ad ejusdem flumen infra cataractas infimas prope Itaituba (. . . n. 16.989) . . . l. A. Ducke, florif. maio et junio.”—Lectoholotypus, R. 16990, R!

Cassia chrysocarpa var. (?) *macrocarpa* Benth. in Martius, Fl. Bras. 15(2): 101. 1870.—“in silvis Capoeiras ad Manáos prov. do Alto Amazonas: Spruce n. 1775.”—Holotypus, collected in 1852 (fl, fr jun), K (hb. Benth.)!

Weak, softly woody shrubs, in open places diffusely ascending or trailing, in brush or forest-savanna ecotone becoming sarmentose with drooping or pendulous branchlets, at anthesis 1–3 m, strigulose-pilosulous throughout with fine incurved, widely spreading or (on lvs) forwardly appressed hairs up to 0.1–0.25 mm, the angulately ribbed hornotinous stems commonly densely so, often subvelutinous, the thinly chartaceous lfts moderately lustrous dark green above, dull but little paler beneath, puberulent on both faces, the always minutely pilosulous inflorescence variable in form, usually thyriform and leafy-bracteate, sometimes paniculate, the uppermost lvs sometimes much reduced and the distal fls then becoming well exerted.

Stipules subulate or linear-setiform, straight or falcate, 2.5–7 mm, at base 0.3–0.6 mm wide, caducous and often lacking from flowering spms.

Adult cauline lvs (4-)7-13(-14.5) cm; petiole including wrinkled but not much dilated pulvinus (1.2-)2-5.2 cm, at middle (0.7-)0.9-1.5 mm diam, shallowly open-grooved ventrally; rachis (3-)4-14 mm, much shorter than petiole; gland 1 sessile immediately above proximal pair of pulvinules, in profile broadly or narrowly lanceolate 3-5(-6) mm tall, a little dorsoventrally compressed, sulcate ventrally; pulvinules 2.5-5 mm, lance-cylindric, wrinkled when dry; distal pair of lfts abruptly divaricate through $\pm 90^\circ$ from lf-stalk, in outline obliquely obovate obtuse to obliquely ovate-subrhombic or -elliptic short-acuminate, (2.5-)3.5-8.5 (-10) \times (1.5-)2.2-4.5 cm, 1.4-2.2 times as long as wide, at strongly asymmetric base broadly rounded to cordate on proximal side, cuneate to narrowly cordate on the distal one, the margin (adult) revolute, the \pm excentric, usually incurved midrib immersed above, carinate beneath, giving rise on each side to (5-)6-9 major camptodrome with or without intercalary secondary nerves, these and the tertiary connecting venules prominulous on both faces but often more strongly so beneath, the areoles of ultimate pronounced reticulation variable in size, the larger either $>$ or $<$ 1 mm diam, the proximal pair of lfts $\pm \frac{1}{3}$ shorter than the distal, proportionately broader, at base broadly and often deeply cordate on proximal side.

Peduncles together with raceme-axis (1-)2-5 cm; racemes (2-)3-7(-10)-fld; bracts ovate or elliptic-ob lanceolate concave 2-4 mm, caducous from young buds; pedicels at and after anthesis (13-)18-32(-37) mm; buds globose, densely pilosulous; sepals firm, the outer greenish or fuscous suborbicular 10.5-14 mm, even in late bud imbricate over the rest, the inner subpetaloid broadly obovate-orbicular very obtuse 12-17 mm; petals waxen yellow or orange-yellow, puberulent dorsally along the strongly elevated nerves, the 3 adaxial usually flabellate beyond slender claw, obtuse or emarginate (22-)24-32 mm, the 2 abaxial either a little longer or shorter but usually narrower, one obliquely incurved over 2 or 3 long stamens; filaments puberulent, those of 4 short fertile stamens 1.8-3.5 mm, of 3 abaxial long ones (3.5-)4-8 mm; thecae glabrous, those of 4 short stamens 6-9.5 mm, the divaricate beak 0.9-1.5 mm, those of 3 long ones 8.5-11, the erect narrowly conic beak 1.1-2 mm; ovary densely pallid- or yellow-sericeous; style 2-3.5(-4) mm, glabrate distally, near apex ± 0.6 -1.3 mm diam, the ciliolate orifice 0.3-0.55 mm diam; ovules 180-220.

Pod pendulous, shortly stipitate, the stout stipe 4-12 mm, the straight or slightly incurved subterete body 14-33 \times 1-1.4 cm, the valves becoming dark brown, glabrescent, coarsely but not very prominently venulose; seeds biseriate, turned broadside to the septa, clad in thin pulp, in outline obliquely or sublunately oblong-ellipsoid 4-5 \times 2.2-3 mm, the brilliant castaneous testa cross-crackled, indistinctly areolate.—Collections: 34.

Forest margins in sand or clay soils on terra firme, s.-ward entering cerrado, in the Hylaea becoming locally abundant in capoeira and along highways, 25-450 m, scattered over w.-centr. Brazil on the middle Amazon-Solimões river and its southern affluents, in w. Pará on Rio Tapajós and in Amazonas upstream from mouth of Rio Maués, thence s. through the basins of the Juruá, Purús and Madeira into Acre and Rondônia, and s.-e. around the periphery of the Amazon basin to the Juruena-Paraguay divide and upper Xingú in centr. and n.-e. Mato Grosso; apparently disjunct on the coastal plain of Terr. Amapá.—Fl. (III-)IV-VII, fr. V-X.

Senna tapajozensis has the general appearance and growth-habit of *S. chrysocarpa*, but the strongly dimorphic fertile stamens of *S. angulata*. It was first provisionally described, from fruiting specimens, as a variety of *S. chrysocarpa*,

a member of Bentham's original series *Bacillares*, although the androecium is that of his ser. *Speciosae*. An exaggerated inequality between two sets of fertile stamens has probably evolved more than once in ser. *Bacillares* sens. lat., for ser. *Speciosae* Benth., degraded by Bentham himself in his monograph (1871, p. 524) to an informal infraserial category, appears a heterogeneous group. For differences between *S. tapajozensis* and *S. angulata*, see discussion of the species next following.

39. *Senna angulata* (Vogel) Irwin & Barneby, comb. nov. *Cassia angulata* Vogel, Syn. Gen. Cass. 16 & Linnaea 11: 658, descr. ampliata. 1837.—Typus infra sub var. *angulata* indicatur.

Habit and adult stature little known, sometimes fruticose from 2 m and sarmentose to 10 m, the annotinous branchlets varying from minutely densely subappressed-puberulent to densely pilosulous with subretorse hairs up to 0.2–0.7 mm, the foliage bicolored, the submembranous lflets dark green or (often) purplish-brown and either glabrous or puberulent above, paler and either strigulose or densely pilosulous beneath, the inflorescence thyrsiform-paniculate, the racemes axillary to developed (but distally smaller) lvs, the fls shortly exerted.

Stipules setiform or linear-falciform 7–14 × 0.3–1 mm, deciduous before the lf.

Lvs (disregarding distal reduced ones) 5–13 cm; petiole including scarcely differentiated pulvinus 15–35(–40) mm, at middle 0.5–0.9(–1) mm diam, shallowly open-sulcate ventrally; rachis 4–9(–11) mm, much shorter than petiole; gland 1 between proximal pair of pulvinules, sessile or stipitate, including the glabrous or pilosulous stipe 1–3 mm tall, the body plumply ovoid to lance-ellipsoid; pulvinules (measured to abaxial base of blade) 1.5–2.7(–3.5) mm; distal pair of lflets asymmetrically ovate or lance-elliptic obtuse, emarginate, or shortly bluntly acuminate, 3–8 × (1.2–)1.6–2.8(–3.1) cm, 1.7–3(–3.3) times longer than wide, the entire margin subrevolute, the straight or slightly incurved midrib giving rise on each side to 8–12(–14) major camptodrome secondary veins either faintly raised or immersed above, beneath finely prominulous, the tertiary venulation faint, the proximal pair of lflets $\pm \frac{1}{3}$ shorter, commonly proportionately broader.

Peduncles together with raceme-axis 2–6.5 cm; racemes (4–)6–12-fl'd; bracts sepeloid, yellowish when fresh becoming brownish, elliptic or ovate-elliptic 8.5–15 mm, cymbiform, in profile ± 2 –3.5 mm wide, persistent into full anthesis; pedicels 18–32(–40) mm, compressed-quadrangular; sepals submembranous, yellow or red-striped or -flecked, ovate to elliptic-oblong or oblong-oblongeolate obtuse, the longer inner ones up to 11–15.5(–17) mm, dorsally glabrous or sometimes proximally puberulent; petals puberulent dorsally along the veins, the larger ones broadly obovate-flabellate obtuse or emarginate up to 24–33.5 mm, one abaxial one oblique; filaments subappressed-pilosulous, those of 3 long abaxial perfect stamens 4–6.5 mm, of the 4 median ones 1.5–2.2 mm; thecae glabrous, of the 3 long stamens 9–13.5 mm contracted into a porrect beak 1–1.8 mm, of the 4 median 6–9.5 mm, their divaricate beak 0.5–0.8 mm, the terminal pores of all stamens either confluent or separated by a slender septum; ovary densely pilosulous, the abruptly incurved glabrescent style ± 1 –1.5 mm, the stigmatic cavity 0.35–0.45 mm diam; ovules 112–160.

Pod pendulous stipitate, the stipe 5–6 mm, the linear-cylindric body ± 17 –20 × 0.8–1.6 cm, abruptly contracted at both ends, the valves becoming pale brown papery smooth, veinless or almost so, dehiscent through the ventral suture; seeds 2-seriate, compressed-obovoid 4.8–7 mm, the testa lustrous dark brown or almost black, exareolate.

In habit and foliage *S. angulata* much resembles the remotely allopatric *S. chrysocarpa* and *S. tapajozensis*, differing from both, however, in the colored sepeloid bracts which persist into anthesis. Strongly heteromorphic sets of fertile stamens are common to *S. angulata* and *S. tapajozensis*, an early collection of which (Spruce 1775 from Manaus, K!) was actually referred by Bentham simultaneously (1870, pp. 101, 102) to *Cassia angulata* and a variety of *C. chrysocarpa*. *Senna tapajozensis* not only lacks the colored bracts of *S. angulata* but differs further in a coarsely venulose pod, substantially more numerous ovules (± 180 –220, not 112–160) and dispersal confined to the Amazonian Hylaea.

As in most *Bacillares* of which we have many samples, the foliage of *S. angulata* varies considerably in amplitude and outline of leaflets, but we regard this type of variation as taxonomically insignificant. There seems to be, however, a racially significant variation in pubescence, the populations along the coast and outer Atlantic foothills being only sparsely puberulent whereas those isolated at greater elevations in southern Sa. do Espinhaço in Minas Gerais have densely velvety-pilose stems. Names for these two aspects of the species were provided by Vogel and are maintained here in genus *Senna*.

Key to the Varieties of *S. angulata*

1. Annotinous branchlets glabrate or puberulent, green or brownish; along the Atlantic coast from s. Bahia to Paraná. 39a. var. *miscadena* (p. 178).
1. Annotinous branchlets densely pilose-subvelutinous with spreading-retrorse hairs; local on and near the Rio Doce–Rio São Francisco divide in s.-centr. Minas Gerais. 39b. var. *angulata* (p. 178).

39a. *Senna angulata* (Vogel) var. *miscadena* (Vogel) Irwin & Barneby, comb. nov. *Cassia angulata* β *miscadena* Vogel, Syn. Gen. Cass. 16 & Linnaea 11: 659. 1837.—“In Brasilia: Luschnath leg. prope Rio [de] Jan[eiro] in monte Corcovado (v.s.s.fr. in Hb. Lucae).”—No typus seen, to be sought at Kiel, but the protologue itself admitting no other interpretation.

Cassia angulata sensu Bentham, 1870, p. 101, t. 32 (optima!); 1871, p. 524, exclus. loc. amazon.

Pubescence as described in key.—Collections: 34.

Open woodland and forest margins, becoming weedy in capoeira and in hedges, scattered along the coastal plain and Atlantic foothills below 500 m from near mouth of Rio Jequetinhonha to Guanabara (± 16 –23°S); apparently disjunct in humid forest of e. slope of Sa. do Mar in Paraná (25–25°30'S).—Fl. III–VI(–IX).

39b. *Senna angulata* (Vogel) Irwin & Barneby var. *angulata*. *Cassia angulata* Vogel, 1837, l.c., sensu str.—“In Brasilia: Sellow leg. in Minas Ger[ais] in montibus.”—Holotypus, †B; neoholotypus, *Sello s.n.*, K! = IPA Neg. 908 = NY Neg. 9306; presumed isotypi, F (fragm, forsan clastotyp.), G (*Sello* 1357)!

Cassia angulata var. (?) *angustifolia* Bentham in Martius, Fl. Bras. 15(2): 102. 1870.—“circa Caxoeira do Campo prov. Minas Geraës: Casaretto.”—Holotypus, *Casaretto* 2941, G! = F Neg. 27997; clastotypus (fragm), F!

Pubescence as described in key.—Collections: 19.

Open woods and capoeira, 750–1800 m, local on and near the Rio Doce–Rio São Francisco divide in lat. $\pm 19^{\circ}30'$ –21°S in s.-centr. Minas Gerais (Sas. Itabira and da Piedade; Cachoeira do Campo and morros about Belo Horizonte and Lagôa Santa; Congonhas do Campo).—Fl. I–IV(–V).

40. *Senna tenuifolia* (Vogel) Irwin & Barneby, comb. nov. *Cassia tenuifolia* Vogel, Syn. Gen. Cass. 16 & Linnaea 11: 657, descr. ampliata. 1837.—“In Brasilia: Sellow leg. pr. Parahyba [Estado Rio de Janeiro].”—Holotypus, †B = F Neg. 1755; neoholotypus, former isotypus, Sellow s.n., K! = IPA Neg. 894 = NY Neg. 1440; isotypus, FI (hb. Webb.)!

Cassia tenuifolia sensu Benthham, 1870, p. 96; 1871, p. 519.

Fruticose but of unknown stature and habit, the terete, finely striate, loosely subcorymbosely forking annotinous branchlets whitish-gray, the hornotinous branchlets with foliage and inflorescence yellowish-pilosulous with spreading or incumbent hairs up to 0.35–0.6 mm, the membranous lfts bicolored when dry, brown, thinly pubescent and sublustrous above, paler and densely incurved-pilosulous beneath, the few-fld racemes axillary to living lvs, immersed or almost so in foliage.

Stipules linear-setiform (?1.5–)3–6 × <0.5 mm, early dry caducous.

Lvs 4–13 cm; petiole including scarcely swollen pulvinus 1–2.5(–3) cm, at middle 0.4–0.9 mm diam, openly shallow-sulcate; rachis 9–10(–13) mm; gland 1 erect from between proximal pair of lfts, slenderly claviform 1.3–3 × 0.3–0.5 mm glabrous; pulvinules 1–2 mm, little dilated but wrinkled when dry; distal pair of lfts obliquely elliptic obtuse mucronulate or subacute 3–7(–8.5) × 1.5–3(–3.5) cm, at base rounded to broadly cuneate on proximal and cuneate on distal side, the margin revolute, the slender straight or gently incurved midrib with ±6–9(–10) pairs of major secondary veins finely prominulous above, a little more sharply so beneath, the tertiary venulation open and irregular; proximal pair of lfts ±½ as large, often proportionately broader.

Racemes loosely, at first subcorymbosely 3–5-fld, the axis including short slender peduncle becoming 1–3 cm; bracts ovate 1.5–2 mm, caducous; pedicels 2–2.5 cm; young buds globose, densely pubescent; sepals elliptic-obovate obtuse 7–8.5 mm; petals yellow, pubescent dorsally on and between veins, the blades oblong-obovate, including short claw 18–23 mm, one dorsal emarginate, the rest obtuse; filaments puberulent, those of 4 median stamens 1.5–3 mm, of 3 abaxial ones 3.5–6 mm; anthers puberulent in the grooves, those of 4 median stamens 3–4.5 mm with very short divaricate beak, those of 3 abaxial ones lunately incurved 5–6.5 mm, with porrect beak ±1 mm dehiscent by slits its whole length; ovary densely pilosulous; style little dilated, ±0.7 mm diam just below the ciliolate incurved stigma, the orifice 0.3–0.4 mm diam; ovules 66–94.

Pod not known ripe, when ± half formed the stipe ±7 mm, the linear straight body 12 cm, the expanding ovules forming 2 overlapping ranks.—Collections: 17.

Habitat unknown, to be sought in moist open woodland near 850–1000 m, apparently local in the Atlantic forest of s.-e. Brazil in Rio de Janeiro (Organ Mountains; Parahyba valley) and extreme e. Minas Gerais (Rio Mucuri to Sa. do Caparaó), 41°30′–43°W, 18°–22°30′S.—Fl. (?)IV–VI, IX–X.

A poorly known, seldom collected senna, resembling in foliage and habit the almost sympatric *S. angulata*, but differing in the pallid epidermis of the terete young branchlets, the small deciduous bracts, the shorter, densely pubescent sepals, and the generally smaller flower (long petals ±18–23, not 24–33 mm). The pod, which appears to be relatively thin-textured, may perhaps furnish further differential characters. Although Benthham referred *C. tenuifolia* to his ser. *Bacillares*, characterized by stamens of about equal length, the androecium is actually, as described by Vogel in *Linnaea*, heteromorphic in the style of ser. *Speciosae*, the three abaxial anthers being both larger and borne on much longer filaments. In this respect it resembles the allopatric *S. macranthera* var. *pudi-*

bunda, which appears however safely distinct in its exserted paniculate inflorescence, larger petals and anthers, and short terete pod.

41. *Senna pinheiroi* Irwin & Barneby, sp. nov., inter *Bacillares* biglandulosas foliolis parvis (5.5 cm usque tantum longis) margine revolutis supra nitidis venulosis antherisque inter se valde inaequilongis 3 abaxialibus caeteras longe superantibus praestans.—BRAZIL. Pernambuco: thicket, Goiana ("Gayanna"), 30.V.1935 (fl), *D. Bento Pickel* 3863.—Holotypus, F.

Relatively small-lvd shrubs 1(?) m with slender obtusangulate stems, the leafless annotinous ones with pallid, cracked epidermis, the annotinous densely leafy, pilose-pilosulous throughout with spreading-ascending hairs up to 0.5–1.2 mm, remotely minutely resinous-verruculose, the foliage bicolored, lustrously olivaceous and sharply venulose above, dull and densely pilosulous beneath, the subterminal inflorescence of 1–few, few-fl'd racemes axillary to diminished lvs or incipiently paniculate, shortly exserted.

Stipules herbaceous erect, falcately linear-ob lanceolate $\pm 4\text{--}7 \times 0.3\text{--}0.6$ mm, deciduous.

Lvs 6–10 cm; petiole including ovoid livid pulvinus 2–3.5 cm, at middle 0.8–1.2 mm diam, bluntly 5-ribbed, shallowly open-sulcate ventrally; rachis 0.6–1.2 cm, much shorter than the petiole; glands between both pairs of lfts (at least of most lvs), subsessile, in profile 2–2.7 mm tall, the reddish, narrowly ovoid glabrous head 0.5–0.9 mm diam; pulvinules $\pm 2\text{--}2.5$ mm; distal pair of lfts obliquely ovate, deltately subacute or broadly obtuse $4\text{--}5.5 \times 1.7\text{--}2.8$ cm, $\pm 2.2\text{--}2.6$ times as long as wide, at base broadly cordate on proximal, less deeply so on distal side, the margins strongly revolute, the slightly excentric midrib almost immersed above, cariniform beneath, the $\pm 6\text{--}9$ pairs of major camptodrome secondary veins with tertiary and reticular venulation all sharply prominulous above, the reticulation only faintly so beneath; proximal pair of lfts almost as wide but $\pm \frac{1}{3}$ shorter.

Racemes subcorymbosely 3–6-fl'd, the axis including peduncle $\pm 1\text{--}2$ cm; bracts narrowly lance-elliptic 3–4 mm, persistent into anthesis; pedicels at anthesis 12–22 mm; buds (not seen) presumably globose, puberulent; sepals thinly herbaceous livid-tinted, not greatly graduated, all ovate obtuse, the longest $9\text{--}10 \times 5\text{--}6.2$, all delicately 3–5-nerved and in age faintly reticulate; petals yellow, puberulent dorsally, subhomomorphic, the longest 20–22 mm; filaments either glabrous or puberulent, those of 4 median stamens $\pm 1.5\text{--}2$ mm, of 3 abaxial ones up to 4 mm, the glabrous anthers of 4 median stamens oblong, slightly curved, 4–5.5 mm, with divaricate beak ± 0.5 mm, those of 3 abaxial ones strongly incurved 6–8 mm, with sigmoidally porrect beak $\pm 0.8\text{--}1$ mm; ovary pilosulous; style pubescent almost to the stigma, not dilated distally, at apex ± 0.5 mm diam; ovules $\pm 96\text{--}110$.

Pod unknown.—Collections: 4.

Thickets and margins of woods on the coastal plain of Brazil, between $7^{\circ}30'$ and 23°S , known only from e. Pernambuco (Goiana), e.-centr. Bahia (Maraú; Itacaré) and w. Rio de Janeiro (Restinga de Tijuca), to be sought in intervening Espírito Santo, n.-e. Bahia, Sergipe and Alagoas.—Fl. V–VI.

Within ser. *Bacillares* biglandular leaf-stalks coincide with highly heteromorphic anthers only in *S. pinheiroi* and *S. rugosa*; as a consequence these two species fall together in our key to the series, but are nevertheless only fortuitously associated. In general aspect, in size and organization of the flowers and racemes, in details of the flower, and particularly in the pallid, cracking epidermis of the annotinous branchlets, *S. pinheiroi* seems much closer to *S. tenuifolia*. This is

likewise coastal, but sympatric only far southward, and clearly different in its uniglandular leaf-stalks and only faintly reticulate upper face of leaflets. On the coastal plain in the same latitudes with *S. pinheiroi* the only other biglandular *Bacillaris* is *S. quinquangulata*, fundamentally different in the androecium and immediately distinguished by the racemose exserted inflorescence and leaves different in outline, texture and venulation. Until mature pods and seeds of *S. tenuifolia* and *S. pinheiroi* can be compared between themselves and with other, possibly related *Bacillares*, no more measured estimate of affinities can be attempted. The earliest collection of *S. pinheiroi*, from an unrecorded locality in Bahia by Blanchet (no. 1592, BM, G) was apparently not seen, or was deliberately overlooked, by Bentham.

The species is dedicated to the gifted collector Raimundo Soares Pinheiro, field assistant at CEPEC near Ilheus, Bahia in 1965–73.

42. *Senna macranthera* (Colladon) Irwin & Barneby, comb. nov. *Cassia macranthera* DeCandolle ex Colladon, Hist. Casses 99. 1816.—Typus infra sub var. *macranthera* indicatur.

Weak leaning or sarmentose, or more often erect and bushy shrubs or treelets at anthesis 1–3 m and slender trees of rapid growth reaching 3–9 m with trunk 6–15 cm diam, the terete or low-ribbed branchlets like the bicolored or subconcolorous foliage variably pilosulous or strigulose with straight spreading, forwardly incurved, or narrowly ascending to subappressed, or truly appressed hairs up to 0.2–0.8 mm, the lflets pubescent beneath even if only thinly so, commonly on both faces, exceptionally subglabrous, the blades chartaceous, either olivaceous or brownish-olivaceous on both faces or paler beneath, sometimes papillate above, the inflorescence usually paniculate and exserted but either fully elevated above developed lvs or the lower racemes subtended by reduced lvs, the distal ones often by bladeless petioles.

Stipules early dry, caducous from a slightly elevated scar before or with full expansion of associated lf, sometimes persistent into maturity of lf but then deciduous, linear-lanceolate to setiform $3\text{--}16 \times 0.25\text{--}0.6$ mm.

Lvs below inflorescence 2–26 cm; petiole including firm, sometimes moderately dilated pulvinus 6–55 mm, at middle 0.4–1.8 mm diam, low-carinate dorsally and laterally subterete, shallowly (sometimes obscurely) open-sulcate ventrally, as long or commonly longer than rachis; rachis (1.5–)2–44 mm; gland between proximal pair of lflets sessile or shortly stipitate varying from depressed-pyramidal to ovoid-acute or -obtuse or clavi- or fusiform $1.2\text{--}4 \times 0.3\text{--}1.7$ mm, a second similar gland sometimes present at tip of lf-stalk, inserted behind the distal pair of pulvinules close next to the seta (or its scar, when fallen); pulvinules (0.8–)1.2–5 mm; distal pair of lflets obliquely lance-elliptic to ovate or obovate, varying from short-acuminate obtuse to deltately acute (1.2–)1.8–16 \times (0.7–)0.8–6(–6.5) cm, 1.8–3.5(–4.5) times as long as wide, at asymmetric base cordate or rounded or broadly cuneate on proximal side, cuneate on distal one, the margin revolute, the straight or gently incurved midrib with 6–12(–13) pairs of major camptodrome and few weak or many almost as strong intercalary secondary veins either prominent or immersed above, sharply prominent beneath, the connecting venules and ultimate reticulation variably defined down to larger areoles $\pm 1\text{--}3$ mm diam.

Peduncles together with raceme axis 2–7.5(–10) cm, the latter 3–14(–17)-fld; bracts lanceolate, triangular, lance-ovate, or elliptic-oblancheolate 1.3–4 mm, caducous with first elongation of young pedicel or rarely persisting into anthesis; buds globose, puberulent or pilosulous; sepals either firm or submembranous, often

yellowish or pallid or pallid-edged, strongly graduated, in outline broadly obovate-suborbicular to elliptic-oblongate, the largest of the inner ones $4-14.5 \times 1.8-8$ mm; petals puberulent dorsally especially along veins, homomorphic except for the often slightly wider adaxial one and for one abaxial slightly more oblique and nodulating the long stamens, all contracted into a slender claw $2-4(-5)$ mm, the blades varying from broadly obovate to oblong-oblongate, all obtuse, the longest $(2-)2.5-4.5(-5)$ cm; filaments either glabrous or puberulent, those of 4 median stamens $1.5-3.5$ mm, those of 3 abaxial ones $(3-)4-9$ mm, the anthers glabrous, puberulent in the grooves or thinly short-pilous, those of 4 median stamens slightly incurved $4-10$ mm, with divaricate beak $0.4-0.7$ mm, those of 3 abaxial ones more strongly incurved $(6.5-)7.5-14.5$ mm with porrect beak $0.8-2$ mm; ovary densely pilous; style $1.5-5$ mm, little dilated at apex, $0.55-0.8(-1)$ mm diam just below the incurved stigma, the cavity $0.2-0.6$ mm diam; ovules $76-208$.

Pod pendulous or (when short) irregularly spreading, the stipe $\pm 4-9$ mm, the subcylindroid body straight or sinuous $6-26 \times 0.6-1.4$ cm, the green valves becoming lustrously castaneous or blackish and glabrate, early corrugated by expression of the valves over the biseriate seeds, tardily dehiscent through the ventral suture and thus exposing the seeds embedded in foetid pulp; seeds turned broadside to the septa, compressed-pyriform $2.4-5.3$ mm, the testa lustrous castaneous or mahogany-brown, cross-crackled, exareolate.

In course of analyzing the very extensive material of ser. *Bacillares* ** *Speciosae* Benth. now at hand for study, our concept of *S. macranthera* has become substantially more comprehensive than that of the recent past, absorbing the Brazilian *Cassia speciosa* and *C. pudibunda* of Benthham's revision, the Venezuelan *Chamaefistula quadrifoliolata* Pitt., and related entities from Andean Peru and Colombia of which specimens have lain unidentified or unappreciated in herbaria. Benthham's definitions, based of course on a relatively poor and fortuitously selected sample, have become unworkable. Ideally his *C. speciosa* and *C. pudibunda* should be alike in pubescence but should differ in size of leaves, amplitude of the panicle, dimensions of calyx and length of pod, while the former should differ from *C. macranthera* sens. str. in loose and copious vesture. Northeastern Brazil and particularly the state of Bahia have now yielded plants (our var. *micans*) which combine the dense pilosity and small calyx proper to *C. speciosa* with the small leaflets and short pod of *C. pudibunda*; others (our var. *calycosa*) have the strigulose vesture, the leaflets and the long pod of *C. macranthera* with the ample calyx of *C. pudibunda*; and from northeastern Colombia we have var. *lindeni*, long mistaken for *C. speciosa*, which differs from the genuine Brazilian species of that name in the short *pudibunda*-like pod associated with exceptionally broad densely pilous leaflets resembling those of *S. bacillaris* var. *benthamiana*. The picture is further complicated by the existence of populations, unknown to Benthham, scattered around the west and north edges of the Amazon-Orinoco Hylaea in Venezuela and Peru that have introduced novel variations on the small-leaved theme of *C. pudibunda* far outside the reasonably expected range of what Benthham knew only as a local northeast Brazilian species. It should be emphasized that throughout this complex of forms the flower, except for great but continuous variation in size of calyx, remains essentially uniform. Our data are still deficient where pods and seeds are concerned, but such as we have suggest no fundamental differences between the described varieties.

As redefined above, *S. macranthera* differs from closely related *S. rugosa* in the longer petiole and in absence of a petiolar gland *between* the distal pair of

leaflets; and from *S. angulata* by the round branchlets and small caducous bracts. Differential characters of *S. splendida* and *S. georgica*, quite similar in form of perianth and androecium, are emphasized under those headings.

A poor specimen from the Andean foothills in southern Santa Cruz, Bolivia (Charagua, 1000 m, V.1934, fl, *Cárdenas* 2686, F), at present unidentified, is highly suggestive of an undescribed, remotely disjunct race of *C. macranthera*. It has the small neat foliage of var. *micans* or var. *pudibunda*, distantly allopatric in eastern Brazil, or of the north-Andean var. *andina*; but without good flowers or ripe fruits must remain an enigma until clarified by further collections.

Key to the Varieties of *S. macranthera*

1. Plants of Atlantic and planaltine Brazil (Piauí and Ceará to s. Goiás and São Paulo). Lvs variable in size; pod variable in length and diam but short (11 cm or less) only n.-ward from centr. Minas Gerais and Bahia.
 2. Calyx relatively small, the largest inner sepal $3.5-7(-9) \times 1.8-4(-5.5)$ mm, if over 4 mm wide less than 7 mm long.
 3. Lfts strigulose with appressed hairs, often beneath only, the blades mostly elliptic. Arborescent when mature; larger lfts 6–16 cm. Ovules 154–192.
 - 42a. var. *macranthera* (p. 183).
 3. Lfts densely softly pilosulous with spreading-incumbent hairs, either on both faces or beneath only. Stature and lfts diverse.
 4. Distal lfts of larger lvs 6–16 cm; arborescent when mature; pod 12–36 cm, (120–)140–208-ovulate.
 - 42b. var. *nervosa* (p. 184).
 4. Distal lfts of larger lvs 2–6(–7) cm; shrubs to $\pm 3(-4)$ m; pod 7–10 cm, 112–140-ovulate.
 - 42c. var. *micans* (p. 185).
 2. Calyx relatively ample, the largest inner sepal $7-14 \times 4.5-8$ mm; shrubs 1.5–3 m. Ovules 92–144.
 5. Distal lfts of larger lvs $(5.5-)-6-11 \times 1.6-3.8$ cm, strigulose beneath; pod 12–20 cm.
 - 42d. var. *striata* (p. 185).
 5. Distal lfts of larger lvs $2-6(-6.5) \times 0.8-2.5$ cm, pilosulous beneath; pod 7–10 cm.
 - 42e. var. *pudibunda* (p. 186).
 1. Plants of Venezuela, Colombia s. Ecuador and n. (Andean) Peru. Lfts variable in size but pod always short (5–11 cm), 76–104-ovulate.
 6. Larger distal lfts ample, $6-9.5 \times 2.5-5.5$ cm; style 3.5–5 mm; Colombia (Cord. Oriental in Santander, Cundinamarca and Boyacá).
 - 42f. var. *lindenii* (p. 187).
 6. Larger distal lfts smaller, $2-5.5 \times 1-2.6$ cm; style 2–3.5 mm; Venezuela, Peru.
 7. Rachis between pairs of lfts 5–12 mm, about as long as true petiole, the proximal pair thus near middle of lf-stalk; n. Venezuela (Lara, Anzoátegui, Bolívar).
 - 42g. var. *quadrifoliolata* (p. 187).
 7. Rachis between pairs of lfts 1.5–8(–12) mm, much shorter than true petiole, the proximal pair thus well above middle of lf-stalk; Peru (Cajamarca) and Ecuador (Loja).
 - 42h. var. *andina* (p. 188).

42a. *Senna macranthera* (Colladon) Irwin & Barneby var. *macranthera*. *Cassia macranthera* DeCandolle ex Colladon, Hist. Casses 99, t. 8. 1816, sens. str.—“Hab. in Brasilia.”—Holotypus, labelled simply ‘Brésil,’ the collector unknown, G-DC! = F Neg. 7009.

Cassia monaden Vellozo, Fl. Flum. 158. 1825 & Ic. 4: t. 63. 1835 (“mon’ aden”).—“Habitat silvis maritimis.”—No specimen known to survive; lecto-holotypus, the plate cited.—Referred by Vogel, 1837, p. 17, to *C. splendida*, but by Bentham, 1871, p. 525, provisionally to *C. macranthera*.

Cassia prominens G. Don, Gen. Hist. Dichl. Pl. 2; 451. 1832.—“Native of Brazil. Sello . . . (v.s. herb. Lamb[ertiano]).”—No typus known to survive, none found at BM or OXF, 1980.—Equated with *C. speciosa* by Bentham, 1871, p. 524, but the lfts described as glabrous. Perhaps based on an isotypus of the following.

Cassia multiflora Vogel, Syn. Gen. Cass. 39 & Linnaea 11: 683 (descr. ampliata). 1837.—“In

Brasília: Sellow leg. inter Campos et Victoria [either s. Espírito Santo or adjacent Rio de Janeiro].”—Holotypus, †B = F Neg. 1705! neoholotypus, *Sellow s.n.*, K! = IPA Neg. 1448.—Equated with *C. macranthera* by Bentham, 1870, p. 104.

Cassia macranthera sensu Vogel, 1837, p. 40; Bentham, 1870, p. 104; 1871, p. 524.

Arborescent, flowering at 3–9 m with trunk 6–15 cm diam, when free-standing with rounded crown, sometimes in closed woodland incipiently sarmentose, the branchlets and foliage strigulose with narrowly ascending or truly appressed hairs 0.2–0.35 mm, the lfts often glabrous above; gland often but not always present behind distal pulvinules; lfts mostly elliptic acute; panicle when mature leafless and far-exserted; ovules 154–192; pod mostly 1.5–3.5 dm.—Collections: 73.

Open woodlands of the Atlantic slope and inland in gallery forest and chapadão, spreading and persisting in capoeira, 10–1450 m, coastal hills, Sa. dos Orgãos and Sa. da Mantiqueira in Rio de Janeiro (with Guanabara) and s. Espírito Santo, n. along the highlands of s. Sa. do Espinhaço to Sas. de Caraça and do Cipó and Pico de Itambé in Minas Gerais, also cultivated within and beyond its native range, as a garden and street tree (e.g. in São Paulo, Curitiba and Florianópolis).—Fl. (I–)II–IV(–V).

42b. *Senna macranthera* (Colladon) var. *nervosa* (Vogel) Irwin & Barneby, comb. nov. *C. nervosa* Vogel, Syn. Gen. Cass. 39 & Linnaea 11: 682 (descr. ampliata). 1837.—“In Brasília: Sellow leg. ad Barra do Brumado [near 44°15'W, 20°10'S, s.-centr. Minas Gerais].”—Holotypus, †B = F Neg. 1746! neoholotypus, *Sellow s.n.*, K! = IPA Neg. 915 = NY Neg. 1445; clastotypus ex B (fragm), F! isotypus, W!—*C. speciosa* var. *nervosa* (Vogel) Bentham in Martius, Fl. Bras. 15(2): 103. 1970.

Cassia bijuga Vogel, Syn. Gen. Cass. 17 & Linnaea 11: 661 (descr. ampliata). 1837.—“In Brasília: Sellow leg.”—Holotypus, †B; neoholotypus, *Sellow s.n.*, K! = IPA Neg. 916 = NY Neg. 1444; isotypus, W!—Equated with *C. speciosa* by Bentham, 1870, p. 103; 1871, p. 524.

Habit and stature of var. *macranthera*, differing only in the longer and looser (often lutescent or golden) vesture of lvs and inflorescence, the lfts either elliptic acute as var. *macranthera* or varying to elliptic-ovate or obovate and obtuse; ovules (120–)140–208.—Collections: 68.—*Pecegueiro bravo* (bark yields a brown dye).

Gallery forest, thickets along streams, chapadão, outcrops in cerrado, thriving in disturbed or relic woodland and sometimes in hedges, mostly 700–1350(–1600) m, interruptedly widespread over the highlands of s.-e. Goiás (including Distrito Federal) and w. Minas Gerais s.-ward from lat. 13° (near Arraias) just into Rio de Janeiro (Itatiaia), e. across S. Francisco valley in Minas to s. and n.-centr. Sa. do Espinhaço, thence (transient into var. *micans* and var. *calycosa*) extending into coast forest and disturbed woodlands of s.-e. Bahia; extensively cultivated within and beyond its native range, an abundant and decorative street tree in Brasília, São Paulo, Belo Horizonte, Rio de Janeiro and other cities of s.-e. Brazil, collected as early as 1827 in e. São Paulo by Burchell but not recorded there as native in modern times.—Fl. (XII–)I–IV.

This is the *Fedegoso* commonly cultivated as “*C. speciosa*” in parks and avenues in southeastern Brazil, rivalled for popularity only by the equally showy and floriferous *Senna multijuga* and *Cassia fistula*. Except for the pilosulous pubescence and a greater range in leaflet-outline it is essentially like var. *macranthera*, the flower and pod being identical, as is the gland, often but not always

present in either, perched at tip of the leaf-stalk between the seta and the pulvinules of the distal pair. In north-central Sa. do Espinhaço (n.-ward from Sêro and Datas) the calyx tends to be larger and the pod (little known) shorter than on the Goiás highlands, and some specimens from this region and adjoining Bahia seem directly transitional into var. *micans* and var. *striata*.

- 42c. *Senna macranthera* (Colladon) var. *micans* (Nees) Irwin & Barneby, stat. nov. *Cassia micans* Nees, Flora (Regensb.) 4: 303. 1821.—No locality given, collected in Brazil by Maximilian zu Wied-Neuwied.—Holotypus not known to survive; neoholotypus, *Maximilian 43*, dated III.1817, collected therefore in s.-e. Bahia, probably in the Contas valley, BR! isotypi listed under the next following.**

Cassia speciosa Schrader, Götting. Gelehrt. Anz. 1: 718. 1821.—“[. . . der Prinz Maximilian von Neuwied . . . in Brasilien gesammelten Gewächse] no. 43.”—Holotypus, *Maximilian 43*, dated III.1817, GOETT! isotypi, BR (v. supra), G-DC (misit Schrader)!—*Chamaefistula speciosa* (Schrader) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.

Cassia speciosa sensu Vogel, 1837, p. 39; sensu Bentham 1870, p. 103 & 1871, p. 524, amb. minore pro parte.

Like var. *nervosa* in vesture and calyx, the longest sepal $5-9 \times 2-4$ mm, but shrubby or weakly arborescent, when adult 1.5–6 m, and the pod only (?4–)5–11 cm; ovules 112–140.—Collections: 17.

Caatinga and carrasco, 600–1500 m, apparently uncommon, s. Ceará (Chapada de Araripe) s. along crest and e. slope of Chapada Diamantina to Rio das Contas in Bahia (lat. 7–14°S), in valley of Rio Paraguacú extending out into the lowlands to Sapé Acú.—Fl. I–III, VI–VIII.

Very close to var. *nervosa*, but seldom more than shrubby when fully grown and small-leaved. The pod, unknown to Bentham, is of the short type hitherto thought proper to *Cassia pudibunda*, our var. *pudibunda*, from which it differs in the small, golden-hairy calyx.

To contemporary botanists it was well known from the first that *Cassia micans* and *C. speciosa* were described from parts of one collection, thought by Bentham to have originated in Espírito Santo, but, if the date given on duplicate labels at Brussels and Göttingen is correct, certainly from southeastern Bahia. Maximilian described his plant as 5–6 foot tall, and it is matched at all points by modern collections from the Contas valley which have the relatively low stature, small leaves and short pod here considered diagnostic of the variety. Except for the type of *C. speciosa* all collections cited by Bentham under this name in *Flora Brasiliensis* represent the much commoner, arborescent, larger-leaved var. *nervosa*, which has consequently usurped the name *C. speciosa* in all subsequent literature. The epithet *speciosa* having been misapplied for so long, it seems advisable to discard it altogether and adopt for genuine *C. speciosa*, at the varietal level, the epithet *micans*, free of misleading connotations.

- 42d. *Senna macranthera* (Colladon) var. *striata* (Vogel) Irwin & Barneby, comb. nov. *Cassia striata* Vogel, Syn. Gen. Cass. 39 & Linnaea 11: 648. 1837.—“In Brasilia: Sellow leg.”—Holotypus, †B; no isotypus or phototypus known to survive.—*C. splendida* var. *striata* (Vogel) Bentham in Martius, Fl. Bras. 15(2): 105. 1870.**

Fruticose, adult when 1.5–4 m; stipules 6–16 mm; distal lfts elliptic or elliptic-ob lanceolate (5.5–)6–11 \times 1.6–3.8 cm, pubescent on both sides or only beneath,

the hairs forwardly appressed or accumbent up to 0.2–0.5 mm; sepals submembranous, the long inner ones up to $8-14.5 \times 5.5-7.5$ mm; style 3.5–5 mm; ovules (96–)100–144; pod 12–20 cm.—Collections: 16.

Caatinga, mostly below 600 m, scattered through the hill country of e.-centr. Brazil from e. Pernambuco s. on the Atlantic slope to the Pardo valley in s. Bahia (lat. 8–15°S); Espigão Mestre and S. Francisco valley in w. Bahia (Rio Itaguari s. of Cocos; Cristópolis) and adjacent Goiás (Posse).—Fl. III–VII.

The var. *striata* resembles var. *nervosa* and var. *macranthera* in its leaflets and relatively long pod, but is apparently a less arborescent plant adapted to a more xeric climate and has the large membranous calyx of var. *pudibunda*. It may perhaps consist of luxuriant states of the latter, found in nearly the same latitudes and environments, but for the present the long pod and larger leaflets appear sufficiently distinct. The situation will need reappraisal as more fruiting material accumulates.

We have adopted the epithet *striata* with some misgiving, for we have found no authentic material of *Cassia striata* and the type-locality is not recorded. Vogel's full description in *Linnaea* is, however, in full agreement with our present concept. Benthams, who may well have seen genuine *C. striata*, reduced it to a variety of *C. splendida*, from which he separated it by the pubescent stems and foliage and the long setiform stipules, characters that fit our var. *striata* to the letter.

The variety is cultivated in southern California (LASCA).

42e. *Senna macranthera* (Colladon) var. *pudibunda* (Benthams) Irwin & Barneby, stat. nov. *Cassia pudibunda* Martius ex Benthams in Martius, Fl. Bras. 15(2): 102. 1870.—“Habitat locis siccis sylvaticis mediterraneis prov. Bahiae: Martius; in sylvis prope Boa Esperança prov. Piauí: Gardner n. 2120 (specimina omnia florida); in sepibus ad Salgado prov. Minas Geraes: Martius (specimen fructiferum).”—Lectoholotypus, Martius s.n., labelled ‘in sepibus ad Salgado. Aug. 1818’ (fl! nec fruct.), M (2 sheets)! = F Neg. 6255; paratypi, Gardner 2120, dated ‘March 1829’ (fl!), K! = IPA Neg. 911; Martius s.n., labelled ‘prov. Bahiens. mediterraneis siccis sylvaticis, 1818’ (fruct. jun!, nec fl.), M!

Adult at 1–3.5 m; distal lfts of larger lvs $2-6 \times 0.8-2.5$ cm, pubescent on both faces, papillate above, incurved-pilous beneath; no distal gland seen; calyx submembranous, thinly puberulent or glabrate, the larger inner sepals $7-10.5 \times 4.5-8$ mm; ovules 92–120; pod 7–10 cm.—Collections: 28.

Caatinga and perhaps (s.-ward) cerrado, mostly below 450 m, scattered over e. Brazil from Ceará (between Fortaleza and Russas), n.-w. Rio Grande do Norte (Mossoró) and e.-centr. Piauí (mun. Jaicós) s. to centr. Bahia (upper Paraguaçu valley near 13°S) and (to be confirmed) to middle São Francisco valley near 16°S in n. Minas Gerais.—Fl. II–VIII.

Closely akin on the one hand to var. *striata*, similar in the enlarged membranous calyx but different in the long pod and larger leaves, and on the other to var. *micans*, which has a similar short pod but the small firmer calyx of var. *nervosa*. Field study is required to confirm the correlation between characters of leaf, calyx and fruit, and the relation of each to dispersal patterns and ecology. The occurrence of var. *pudibunda* in Minas Gerais, as indicated by Martius alone, will remain under suspicion until verified by a modern collection.

- 42f. *Senna macranthera* (Colladon) var. *lindenii* Irwin & Barneby, var. nov., a var. *nervosa* quacum (sub nomine *Cassia speciosa*) hucusque confusa praesertim legumine abbreviato (± 6 –11 nec 14–36 cm longo), ± 76 –84-ovulato, insuper patria remotissima abstans.—COLOMBIA. Boyacá: Soatá, prov. Tunja, 1842–3, *J. Linden* 1336.—Holotypus, K.**

Cassia speciosa sensu Benthams, 1871, p. 524, quoad pl. colomb.; *Chamaefistula speciosa* sensu Britton & Killip, 1936, p. 134, pro parte; non *C. speciosa* Schrad. sens. str.

Arborescent, flowering at 2.5–7.5 m, with the ample, densely pilosulous foliage and small calyx of var. *nervosa*; lf-stalk stout, the petiole 1–3.7 cm, the rachis 1–2.5 cm; stipules (little known) ± 4 mm; distal lflets of larger lvs obliquely ovate-elliptic 6–9.5 \times 2.5–5.5 cm, the proximal lflets yet more broadly and obliquely ovate (as those of *S. bacillaris* var. *benthamiana*); pedicels in fruit 2.5–5 cm; long inner sepals 6–7 \times 3–4.5 mm; style 3.5–5 mm; ovules ± 76 –84; pod 6–11 cm.—Collections: 8.

Thickets in fields and relic scrub forest, ± 1500 –2500 m, on both slopes of Cordillera Oriental in Santander, Boyacá and Cundinamarca, Colombia.—Fl. IX–I.

First collected near Soatá in 1842–3 by the Belgian horticultural explorer Jean Jules Linden, whose specimens, in flower only, were identified by Benthams as *Cassia speciosa* (= *S. macranthera* var. *nervosa*). The resemblance is close, but later collections from Cordillera Oriental show that the pod of var. *lindenii* is much shorter than that of genuine var. *nervosa*, which occurs in the wild state only in southeastern Brazil, its nearest known station distant some 3500 km across the Hylaeon forest. The var. *nervosa* is sympatric with and closely resembles in foliage and dense soft vesture the pubescent form of *S. bacillaris* var. *benthamiana*, but is instantly distinguished at anthesis by the strongly anisomorphic fertile stamens proper to *S. macranthera*. Britton confused the two, the *Chamaefistula speciosa* of Britton & Killip (1936, l.c.) including elements of each. The Venezuelan *S. macranthera* var. *quadrifoliolata*, geographically nearest to var. *lindenii*, has a similar pod but leaflets only 2–5.5 (not 6–9.5) cm long.

- 42g. *Senna macranthera* (Colladon) var. *quadrifoliolata* (Pittier) Irwin & Barneby, stat. nov. *Chamaefistula quadrifoliolata* Pittier, Bol. Soc. Venezol. Ci. Nat. 7(48): 145. 1941.—“Anzoátegui: Entre Taguatagua y Santa Ana . . . flores y frutos, Diciembre 28, 1940 (Pittier 14.460, tipo).”—Holotypus, *Pittier 14640* (non 14460), VEN! = NY Neg. 6327.—*Cassia quadrifoliolata* Pittier, Cat. Pl. Venezol. 1: 371, pro syn. 1945.**

Chamaefistula larensis Britton & Pittier ex Pittier, Cat. Pl. Venezol. 1: 371. 1945, nom. nud. *Cassia larensis* Britton & Pittier ex Pittier, l.c., pro syn.—Spma authent., *Pittier 13093*, El Tocuyo–Humocaro, Lara, 6.I.29 (fl, fr), A, K, NY, US, VEN = NY Neg. 6323, 6324.

Fruticose, at anthesis to ± 1.5 m, scarcely different from distantly allopatric var. *pudibunda* except in the more open panicle and longer pedicels; petiole 6–22 mm; rachis 5–12 mm; stipules 5–10 mm; longer distal lflets either obovate obtuse or elliptic-oblong acute 2–5.5 \times 1.2–2.6 cm; pedicels 2.5–5 cm; long inner sepals 6.5–9 \times 4–6 mm; style 2.5–3.5 mm; ovules 82–98; pod 5–10 cm.—Collections: 8.

Arid hillsides, in xeromorphic brush-woodland-savanna, and in hedges, below 500 m, local in Venezuela: on the Caribbean slope in Lara (upper Río Tocuyo) and Anzoátegui (Río Güera); and on the lower Orinoco in Monagas and Bolívar.—Fl. I, IV, IX, XII, perhaps through the year.

In the context of the Venezuelan flora var. *quadrifoliolata* is readily recognized

and easily distinguished from all native *Bacillares* by the syndrome of small neat foliage and large flowers with pronouncedly anismorphic fertile stamens. It is only with greatest difficulty, however, separated from Brazilian var. *pudibunda*, of which it has essentially the same leaves, calyx and pod, by the more open panicle of longer-pedicelled flowers. These are weak differential characters, and var. *quadrifoliolata*, as also indeed var. *andina*, may really represent no more than remotely detached populations of one major taxon. Whether taxonomically distinct or not, these cassias present evidence, reinforced by examples in *Chamaecrista* (e.g. *Ch. viscosa* (H.B.K.) sens. lat., *Ch. orenocensis*, (Benth.), *Ch. glandulosa* (L.) sens. lat.) of connections and pathways through and around the Amazonian Hylaea between xeromorphic floras of the two hemispheres.

42h. *Senna macranthera* (Colladon) var. *andina* Irwin & Barneby, var. nov., a var. *pudibunda*, remote in Brasilia orientali allopatrica, praesertim pedicellis elongatis 25–36 (nec 15–25) mm longis parum absimilis, a var. *quadrifoliolata* vix nisi foliolorum paribus approximatis (inferioribus supra nec versus medium petiolum insertis) dispar.—PERU. Cajamarca, prov. Jaén: Pucará, across Río Huancabamba opposite town, alt. 930 m, 18.I.1964 (fl, fr jun), *P. C. Hutchinson & J. K. Wright 3602*.—Holotypus, NY; isotypi, F, K, US.

Fruticose, flowering at 0.5–3 m; petiole proper 8–15, rachis 2–8 mm, both very slender; distal lfts of larger lvs obovate $1.8\text{--}3.6 \times 1\text{--}1.8$ cm, the proximal smaller pair inserted above middle of lf-stalk; pedicels 2.5–3.5 cm; long inner sepals submembranous $7\text{--}10 \times 5\text{--}8$ mm; style 2–3.5 mm; ovules 90–104; pod 6–8 cm.—Collections: 5.

Dry rocky slopes, hedgerows and along drainage runoff channels, 930–1600 m, local, known only from the valleys of río Huancabamba between Choloque and Pucará in prov. Jaén (and presumably adjoining Cutervo), dept. Cajamarca, of río Marañón in extreme s. prov. Chachapoyas, dept. Amazonas and n. prov. Bolívar, dept. La Libertad, Peru, and from near Vilcabamba in Loja, Ecuador.—Fl. I, IV–VI, X, perhaps intermittently through the year.

For commentary on this greatly isolated race of *S. macranthera* see under the preceding.

43. *Senna rugosa* (G. Don) Irwin & Barneby, comb. nov. *Cassia rugosa* G. Don, Gen. Hist. Dichl. Pl. 2: 440. 1832.—“Native of Brazil. Sello (v.s. in herb. Lamb[ertiano]).”—Holotypus not located (not at BM!); presumed isotypi, F (fragm ex †B), G, W (*Sello 1818/IV*)!

Cassia rugosa sensu Vogel, 1837 (1), p. 17 & 1837 (2), p. 662; Bentham, 1870, p. 103; 1871, p. 524.

Erect or ascending, 1–few-stemmed shrubs or subshrubs from a xylopodium, at anthesis mostly 5–16(–20) dm, exceptionally subarborescent to 25 dm, pilosulous throughout or almost so with straight spreading or (wholly or partly) incurved, pallid or in the inflorescence often yellowish hairs up to (0.3–)0.35–0.7(–0.8) mm, the branchlets subterete or faintly ribbed, the firm lfts bicolored, sublusitrously green or brownish-green above, paler beneath, usually pubescent on both faces but more thinly so above, occasionally glabrescent above or on both faces, ciliolate, the inflorescence racemose-paniculate, exserted.

Stipules erect, narrowly subulate or linear-setiform, (2–)3–9(–12) mm, at folded base 0.25–0.6 mm wide, caducous.

Lvs below inflorescence (4–)6–13(–14) cm, short-petiolate or subsessile; petiole including slightly dilated firm pulvinus (1.5–)2.5–12(–20) mm; rachis (10–)12–26(–30) mm, rounded dorsally, depressed-flattened ventrally; glands between each pair of lfts, mostly sessile, ovoid or plumply ovoid-ellipsoid 0.8–2.2 mm tall, the slightly smaller distal one sometimes stipitate and then ellipsoid-fusiform, the proximal one often dorsoventrally compressed and plumply linguiform, both usually hispidulous, rarely glabrate; distal pair of lfts beyond the semi-cordate base subsymmetrically elliptic to elliptic-oblongate or obliquely ovate-obovate, obtuse or emarginate (exceptionally deltate) at apex, of larger lvs (4–)4.5–10(–10.5) \times (1.5–)1.8–4(–4.5) cm, \pm 1.6–3 times longer than wide, the margins \pm revolute, the straight or slightly incurved midrib giving rise on each side to 6–11(–12) major secondary venules, these above pallid and finely prominulous, beneath sharply elevated and giving rise to a prominent reticulum of venules enclosing sunken areoles up to \pm 0.5–1.5 mm diam; proximal pair shorter and often proportionately broader.

Peduncles mostly from axils of greatly reduced or obsolete lvs, together with raceme-axis 3–9 cm; racemes shortly and loosely 2–12-fld; bracts submembranous ovate-elliptic, obtuse or acute, cymbiform, 2–4 mm, caducous; pedicels at full anthesis and in fruit (2–)2.5–4.5 cm; sepals submembranous yellowish, at full anthesis widely spreading or deflexed, silky-pilous dorsally, the longest oblong to obovate obtuse 6.5–10 \times 3–6(–6.5) mm; petals bright yellow, dorsally pubescent (exceptionally glabrous), (17–)20–31(–33) mm, the claw 2–4 mm, that of the slightly wider adaxial petal slightly longer than the rest, the blades obovate-suborbicular to oblong-obovate emarginate, 5-nerved from claw; filaments pilous (exceptionally glabrous), of 3 long stamens (2.7–)3–8 mm, of 4 short perfect ones 1.5–3.5 mm; thecae of 3 long stamens 7–11.5 mm with porrect beak 1–1.7(–2) mm, of 4 short ones 4.7–8 mm with abruptly divaricate beak 0.4–0.8 mm, the apical pores of all confluent into a U-shaped slit; staminodes to 3 mm; ovary densely pilous, the gently incurved glabrescent style 2.5–5 mm, incrassate and 0.55–0.9 mm diam distally, the stigmatic orifice 0.3–0.55(–0.6) mm diam; ovules (48–)54–94(–102).

Pod pendulous, stoutly short-stipitate, the stipe 4–7 mm, the plumply cylindric, straight or slightly incurved body 4–11(–12) \times 1.2–2 cm, abruptly obtuse at both ends, the valves at first green turning lustrous black, the immersed sutures brown, the cavity pulpy, the pulp nigrescent; seeds biseriate, turned broadside to the septa, compressed-pyriform but either rounded or depressed at distal pole, 7–8 \times 4.5–6 mm, the brilliantly lustrous testa castaneous or mahogany brown, the faintly differentiated areole obovate-oblongate in outline, 5–6 \times 2.5–3.5 mm.—Collections: 210.—Fig. 11 (androecium), 12 (pod, seed).

Cerrado, commonly on red clay or gravelly soils, locally on limestone or quartzite outcrops, or (in Pará) in campina, mostly between 500 and 1200 m but in e.-centr. Goiás ascending to 1300, in s.-centr. Minas Gerais to 1500 m and descending in Bolivia to 370, in s.-w. Pará to 420, and in n. Goiás to 300 m, widespread and locally abundant, often as an element of regenerating scrub-woodland and as a roadside colonist, over much of the Brazilian Planalto, from Sa. do Cachimbo in s.-w. Pará and headwaters of Rio Xingú in n.-centr. Mato Grosso w. and s.-w. to the upper Río Guaporé in s.-e. Rondônia and Sta. Cruz, Bolivia and to Sa. de Amambay along the Brazil-Paraguay border, e. across Goiás to w. and centr. Bahia (Espigão Mestre and Chapada Diamantina), centr. Maranhão, s. Ceará, w. Pernambuco and s. Piauí, in Goiás n. to near 7°20' in Sa. das Cordilheiras (s. of Araguaína), across Minas Gerais to the crest of Sa. do

Espinhaço and locally to its e. slope on upper Rio Jequetinonha and Rio Pardo, there entering s.-e. Bahia; s. from Minas, becoming less frequent, through e.-centr. São Paulo to the sources of Rios Ivaí and Paranapanema in n. and n.-e. Paraná.—Fl. X–VI(–VIII), most prolifically I–V; fr. mostly (IV–)V–IX.

Among *Bacillares* as a whole and especially among the large-flowered group with two strongly dimorphic sets of anthers, *S. rugosa* is a pygmy, either functionally herbaceous from a xylopodium or weakly suffruticose, and at maturity seldom above 1.5 and often less than one meter tall. It is closely related to the emphatically fruticose or arborescent *S. macranthera*, of which it has essentially the flower; but may always be recognized with ease by the abbreviated true petiole, which is shorter than the stalk between the two pairs of leaflets, by the presence of a gland between the distal pair of pulvinules, and by the alveolately reticulate dorsal surface of the leaflets. The short, plumply sausage-shaped, internally pulpy pod, from which the seeds are tardily released by weathering, is almost that of the much smaller-flowered group related to *S. chrysocarpa*. The species is one of the two or three commonest true sennas of the Brazilian cerrado and characteristic of it, extending only weakly northward into floristically related savanna and deciduous scrub-woodland communities.

44. ***Senna splendida*** (Vogel) Irwin & Barneby, comb. nov. *Cassia splendida* Vogel, Syn. Gen. Cass. 17. 1837.—Typus sub var. *splendida* indicatur.

Weak, diffuse or ascending shrubs and slender, commonly sarmentose treelets at anthesis (1–)2–6(–10) m, except for always strigulose ovary and often dorsally puberulent petals and pedicels wholly glabrous, or the stems and lf-stalks exceptionally thinly incumbent-pilosulous, the young branchlets smooth subterete, the foliage bicolored, lustrously olivaceous above, paler dull beneath, the thyriform-paniculate inflorescence mostly leafy-bracteate, or by atrophy of some distal lvs shortly exerted.

Stipules usually falcate linear-oblongate or oblongate (5–)7–20 × (0.5–)0.7–5 mm, rarely dilated and obliquely obovate-cuneate to 10 mm wide, caducous, present at base of young lvs but lacking from many mature specimens.

Lvs (5–)6–13(–15.5) cm (some distal ones smaller); petiole including wrinkled but little dilated pulvinus (8–)10–35(–42) mm, at middle (0.4–)0.5–0.9(–1) mm diam, bluntly low-carinate dorsally, shallowly grooved ventrally; rachis (4–)6–18(–21) mm, shorter than petiole; seta filiform persistent or deciduous; gland 1 inserted immediately above lower pair of pulvinules, clavi- or linguiform stipitate, in profile 1.5–4.5(–5) mm tall, the ovoid or narrowly lance-ellipsoid body decurrent around sides of the ventrally sulcate stipe and either longer or shorter than it; pulvinules discolored wrinkled 1.3–3.2(–3.5) mm; distal pair of lflets ovate to lance-elliptic, elliptic, or seldom linear-elliptic, obtuse or subemarginate, often minutely mucronulate, of larger lvs (4–)5–10.5 × (1.2–)1.5–3.5(–3.8) cm, mostly 2–4 times, when linear-elliptic 4–6.5 times as long as wide, at base subsymmetrically rounded on both sides or broadly cuneate on the distal one, the entire margin either plane or revolute, narrowly sharply membranous-margined, the slender straight midrib giving rise on each side to (9–)11–19(–24) major camptodrome and ± as many intercalary widely ascending secondary veins, these all with the tertiary venulation finely prominulous on both faces, the reticulation of the lower face carried out to areoles <0.5 mm diam.

Peduncles with raceme-axis (0.7–)1–7 cm; racemes (1–)2–10(–12)-fld, the fls subumbellate when few, racemose when over 3; bracts ovate or lanceolate obtuse

or acute 2–5(–6) mm, persistent into anthesis, then deciduous; pedicels at and after full anthesis 2–4.5 cm; buds either obtuse or acute; sepals submembranous, olivaceous, fuscous, red-flecked internally, or dull red, glabrous dorsally, heteromorphic either in length or shape (described in varietal key), the longest inner ones oblong-ob lanceolate to suborbicular (8.5–)10–30 mm; petals yellow short-clawed, heteromorphic, 1 adaxial flabellate-emarginate or obcordate, 28–44 × (16–)20–33 mm, the rest varying from broadly obovate to oblanceolate obtuse, narrower than the adaxial one but either a little longer or shorter, one abaxial one oblique; filaments glabrous, those of (2–)3 abaxial stamens (4–)7–12.5 mm, the one furthest from the oblique petal shorter, those of 4(–5) median ones 2.5–4 mm, the thecae glabrous, of 3 long stamens 11–17 mm with porrect beak (1–)1.2–2.3 mm, of 4 median ones 5.5–9(–10) with divaricate-appressed beak 0.45–1.2 mm, the pores confluent; ovary gray-strigulose, quickly elongate-veriform after fertilization, the short glabrescent style 0.6–0.9 mm diam just below the oblique stigmatic cavity, this 0.2–0.5 mm diam; ovules 160–240.

Pod pendulous stipitate, the stipe 10–17 mm, the teretely subcylindric body 17–36(–49) cm, constricted only where ovules abort, 8–13(–15) mm diam, the thin, finally papery and lustrous valves green turning brown, smooth or faintly transverse-venulose; dehiscence tardy, along ventral suture; seeds (little known) either 1- or 2-seriate, turned broadside to the septa, compressed-pyriform 5–6 mm, the testa castaneous lustrous, exareolate.

Among large-flowered *Bacillares* with strongly dimorphic sets of fertile stamens the appropriately named *S. splendida* is readily recognized by its relatively small ovate- or lance-elliptic, bilaterally subsymmetrical leaflets prominently but finely venulose with widely ascending secondary veins and thence delicately reticulate. The leaf-blades vary considerably in outline, but the relatively uncommon forms with narrowly lance-elliptic leaflets, Bentham's var. *angustifolia*, are of sporadic occurrence in the southern half of the whole range of the species and are not sharply distinguished morphologically. On the other hand a marked variation in the sepals, with consequences in the outline of the flower-buds, is definitely linked with north-south dispersal and deserves taxonomic notice. The extremely long and narrow multiovulate pod of *S. splendida* elongates with great rapidity after fertilization, its length finally accommodating the seeds in either one or two rows. It has been collected only rarely in fully ripe condition and it is too early to say whether the arrangement of the seeds is taxonomically significant or not.

The neat foliage and large lustrous golden flowers of *S. splendida* will recommend it to tropical gardeners who have place for an ornamental vine that can be trained to a pergola or planted so as to scramble through small trees. In Brazil it has been used most effectively as a free-standing round-headed tree in city parks.

Key to the Varieties of *S. splendida*

1. Sepals at once strongly graduated and all obtuse, the 2 outermost broadly obovate-suborbicular 5–10(–11) mm, $\frac{1}{4}$ – $\frac{2}{3}$ as long as the long inner ones; fl-buds subglobose, very obtuse.
44a. var. *splendida* (p. 191).
1. Sepals not strongly graduated but differentiated in shape, the outer lance-acuminate with recurving tips, (16–)18–28 mm, nearly as long as the obtuse inner ones; fl-buds ovoid-apiculate or -acuminulate.
44b. var. *gloriosa* (p. 192).

44a. *Senna splendida* (Vogel) Irwin & Barneby var. *splendida*. *Cassia splendida* Vogel, Syn. Gen. Cass. 17 & Linnaea 11: 660 (exclus. syn. dub. Velloz.). 1837.—“In Brasilia: Sellow leg. inter Rio [de Janeiro] et Ba-

hia.'—Holotypus, †B = F Neg. 1747! neoholotypus, *Sellow s.n.*, K! = NY Neg. 1449; isotypi, F (fragm), FI (hb. Webb.)!

Cassia splendida var. *angustifolia* Benth in Martius, Fl. Bras. 15(2): 105. 1870.—“... in provincia Bahia: Blanchet n. 1937.; ad Aracaty prov. Piauiensis: Gardner n. 1571.; in provincia Minas Geraës: Sello, Claussen, St. Hilaire, Widgren; e. gr. in sepibus ad Rio do Peixo et Mariana: Martius; ad Caldas: Lindberg, Regnell I n. 70.; ad Lagoa Santa: Warming; in prov. S. Paulo: Burchell n. 4627.”—Lectoholotypus, *Regnell I/70*, K!—The paratypi cited are all referred hither, except *Gardner 1571* which = var. *gloriosa*.

Cassia splendida sensu Benth, 1870, p. 105, quoad var. typ., exclus. syn. Velloz.; 1871, p. 524, p.p.; De Wit, 1955, p. 268; Graf, Exotica, ed. 9: 1036. 1978.

Characters of the species except as modified in the key.—Collections: 113.

Margins of dense forest, open scrub forest, disturbed woodland, entering diverse associations (coastal forest, mata de cipó, cerrado, caatinga), surviving disturbance in capoeira, hedges and cocais, widespread along the Atlantic slope of Brazil, mostly from near sea level to 900 but locally in Sa. do Espinhaço up to 1300 m, from s. Sergipe s. to Sa. do Mar in Paraná, less frequently inland to the middle and lower São Francisco basin and thence locally just in s. Piauí, the Triângulo Mineiro and centr. São Paulo; collected once on upper Río Apa in s.-e. Paraguay; reported by Sellow from Uruguay, perhaps only cultivated; occasionally planted for ornament in Brazilian gardens (e.g. Rio de Janeiro; Lavras and Viçosa in Minas Gerais) and likewise in tropical Africa and Malay Peninsula.

44b. *Cassia splendida* Vogel var. *gloriosa* Irwin & Barneby, var. nov., a var. *splendida* sepalis exterioribus quam interiores vix brevioribus lanceolato-acuminatis (16–)18–28 mm longis apice recurvis, alabastris ideo ovato-acuminatis (nec subglobosis) diversa.—BRAZIL. Minas Gerais: 13 km by road w. of Januária on road to Serra das Araras, 575 m, 19.IV.1973 (fl), W. R. Anderson 9148.—Holotypus, RB; isotypi, MO, NY, US.

As var. *splendida*, except for shape of sepals and consequently outline of fl-buds, as described in key.—Collections: 40.

Thickets and thin savanna woodlands, particularly in caatinga and cerrado, thence extending out into mata costeira on stabilized Atlantic dunes, widespread from near sea-level up to 610 m over the seasonally arid states of n.-e. Brazil, from Ceará to Pernambuco, interruptedly s. up the Rio São Francisco through e. Bahia just into northern Minas Gerais.—Fl. (III–)IV–X(–XI).—*Aracino prato*; *canela de veado*; *sabiá branca*.

45. *Senna gardneri* (Benth) Irwin & Barneby, comb. nov. *Cassia gardneri* Benth in Martius, Fl. Bras. 15(2): 120. 1870.—“Habitat in Serra d’Açuruá prov. Bahia: Blanchet n. 2890.; prope Oeiras prov. Piahy, rarior: Gardner n. 2123.”—Lectoholotypus, *Gardner 2123*, collected IV.1829 (fl), K (hb. Hook.)! = IPA Neg. 978 = NY Neg. 1461; isotypus, BM! paratypi, *Blanchet 2890*, BM, FI, K = NY Neg. 979, NY, P!

Cassia gardneri sensu Benth, 1871, p. 537.

Slender arborescent shrubs at anthesis 1.2–4 m, glabrous except for minutely puberulent pedicels, the hornotinous branchlets smooth castaneous, the epidermis in age cracking lengthwise, the coriaceous foliage subbicolorous, the firm plane lfts dull on both faces, a little paler and sometimes obscurely glaucescent beneath.

Stipules (caducous, little known) linear-oblongate 1.5–3.5 mm.

Lvs (3–)3.5–7 cm; petiole including livid swollen pulvinus (9–)12–24 mm, at middle 0.5–0.6 mm diam subterete; rachis 3–8 mm, obscurely sulcate ventrally; gland between proximal pair plumply obovoid-pyriform or clavate, in profile 1.2–2.5 mm tall, the livid lustrous body 0.5–1.2 mm diam; lfts 2 pairs, the distal ones broadly obovate obtuse or emarginate (18–)22–38 × (13–)15–20 mm, 1.2–2 times as long as wide, at base very slightly or obscurely asymmetrical, the centric midrib with 6–11 major (and some intercalary) secondary veins either prominent on both faces or subimmersed above, the major secondary ones widely ascending to margin and there anastomosing with a prominently raised marginal or subintramarginal nerve, the tertiary connecting venules prominent at least beneath to form an open coarse reticulum, the proximal pair of lfts similar but shorter and proportionately wider, sometimes suborbicular.

Racemes few from axils of distal lvs (often reduced to glanduliferous lf-stalk) 1–4-fld, the peduncle 0.5–1.5 cm, the axis almost 0; bracts subulate ±1–1.5 mm, caducous; pedicels 1.7–2.5 cm; buds plumply obovoid glabrous; sepals (apparently reddish pallid-margined) broadly oblong-obovate obtuse unequal, the inner ±10–12 mm, the outermost ±½ shorter; petals (little known) yellow glabrous up to ±23 mm; androecium glabrous, the filaments of 4 median stamens ±2 mm, of 3 abaxial ones 5–9 mm, the anthers of 4 median stamens 4.5–5.5 mm nearly straight up to the abruptly divaricate 2-porose beak ±0.5 mm, those of 3 abaxial ones lunately incurved, the body 7–9 mm contracted into a subulate erect, slightly incurved 2-porose beak 1–1.5 mm; ovary glabrous or strigulose; style ±2.5 mm, little dilated distally, ±0.4–0.6 mm diam below the stigma, the stigmatic aperture 0.2–0.45 mm diam; ovules ±80–90.

Pod (little known) spreading-recurved, the stipe ±0.8 cm, the narrowly cylindrical body ±14 × 0.6 cm, when ripe apparently resembling that of *C. splendida*, the ventral suture 1.5–2 mm wide, the valves castaneous smooth or faintly venulose, the biseriate seeds (not seen) reportedly (*Sucre 10254*, RB) embedded in sweet pulp sought by ants.—Collections: 7.

Caatinga thickets below 700 m, known only from scattered stations in n. Piauí (Lagôa do Potinho), centr. Piauí (Oeiras) and Chapada Diamantina in centr. Bahia (Sa. d'Açuruá).—Fl. IX–X, II, IV, the full season unknown.

Bentham described *Cassia gardneri* from two flowering specimens and provisionally referred it, along with *C. corifolia*, to a ser. *Coriaceae* of sect. *Prososperma*, some members of which have similar flowers and androecium. The flower, however, is also essentially that of *S. splendida* and *S. georgica* and the pod, collected recently for the first time in northern Piauí, turns out to be the tubular one of sect. *Chamaefistula* ser. *Bacillares*, with seeds lying across the long axis of the valves in a bed of pulp. Among east Brazilian *Bacillares* with strongly dimorphic stamens *S. gardneri* now emerges as closest to the two species just mentioned, differing from *S. georgica* in the much smaller leaflets, from *S. splendida* in the obovate-suborbicular, proportionately much broader leaflets, and from both (as indeed from all members of the series) in the strong marginal nerve which forms an elevated rim around the leaflets connected to the midrib by straight, widely ascending secondary venation.

46. *Senna georgica* Irwin & Barneby, nom. & stat. nov. *Cassia hoffmannseggii* var. *gardneriana* Bentham in Martius, Fl. Bras. 15(2): 104. 1870.—
Typus infra sub var. *georgica* indicatur.

Shrubs and treelets at anthesis (1–)2–5(–6) m, erect when free-standing but with

plagiotropic or pendulous young branches, when crowded becoming sarmentose or vinelike, commonly appearing glabrous below the exerted, lateral or terminal panicles of racemes but the terete striate branchlets and usually also all lf-stalks and lower face of lflets minutely strigulose (or in var. *bangii* villous-pilosulous) with hairs up to 0.05–0.9 mm, the thinly chartaceous lf-blades subbicolored, lustrous olivaceous above, a little paler and duller beneath, the primary axis of the leafless or basally leafy-bracteate panicle usually abruptly flexuous, each peduncle subtended by a vestigial lf reduced to petiole and gland.

Stipules caducous long before associated lf (absent from many specimens, hence poorly known), linear attenuate, straight or arcuate, (3–)4.5–11 × 0.4–0.9 mm.

Lvs (11–)14–32 cm; petiole with little swollen pulvinus 2–6(–6.5) cm, at middle 1.2–2.5 mm, subterete except for narrow shallow ventral groove; rachis (1.5–)2–5 cm, a little longer or shorter than petiole; gland 1, sessile or almost so immediately above proximal pair of pulvinules, plumply ovoid to oblong-ovoid or -ellipsoid (1.5–)2–4 mm; pulvinules cylindric wrinkled (2.5–)3–7 mm; distal pair of lflets subsymmetrically ovate- or elliptic-acuminate (7–)8–17(–19) × (3.5–)4–9.5(–11) cm, at base on each side subequally rounded to broadly cuneate or obscurely cordate, the plane or subrevolute margin pallid, sharp-edged or slightly thickened, the centric straight or almost straight midrib giving rise to (9–)10–17(–19) major campitodrome and often some intercalary secondary venules, the midrib above either impressed or immersed, very prominent beneath, the secondary and subsequent venulation finely prominulous above, more sharply so beneath, the larger areoles of the reticulum there mostly >1 mm diam, but a faint further mesh also often visible.

Racemes shortly or subumbellately 2–10-fl'd, the axis together with short stout peduncle 1–4.5(–5.5) cm; bracts ovate or lanceolate, 2–3.5 mm, very early caducous from below young buds; pedicels at full anthesis and thereafter 2–6 cm; sepals submembranous hyaline-margined, olivaceous or subpetaloid, very unequal, the longer inner ones broadly obovate-suborbicular (10–)12–16 mm, ± twice as long as the outermost; petals golden-yellow, puberulent dorsally, heteromorphic, 4 subsymmetrically obovate-oblongeolate beyond a slender claw and 1 of these (adaxial) broader and shorter than the rest, the longest of the four 2.5–4 cm, the fifth petal (abaxial) longest of all, obliquely oblongeolate 2.7–4.8 cm, distally twisted and nidulating the 2 longest stamens; filaments puberulent or glabrous, of 4 median stamens 1.7–3.3 mm, of 3 longer ones 5–12 mm, that of the stamen next the displaced pistil shortest; thecae glabrous, of 4 median stamens 5–8 mm, with divaricate beak 0.4–0.8 mm, of 3 long ones 9–12 mm, with erect or sigmoidally porrect beak 1.8–2.3 mm, its pores either separate or confluent; ovary densely strigulose; style incurved ±2 × 0.6–0.9 mm, the stigmatic aperture up to 0.3 mm diam; ovules (124–)148–172.

Pod pendulous stipitate, the stipe 6–10 mm, the body narrowly linear ribbon-like, laterally compressed 15–25(–?) × 0.5–0.65 cm, the sutures remaining buff-brown but the thin valves nigrescent, the valves when dry fragile and readily breaking between seeds, apparently never separating along the sutures; seeds 1-seriate, turned broadside to the incomplete septa and embedded in thin blackish pulp, in outline compressed-oblong-elliptic 3.5–4.5 mm, the faces obscurely ridged lengthwise, the testa brilliant castaneous, cross-crackled, faintly areolate.

This handsome senna, which in the recent past has usurped in herbaria the name *Cassia hoffmannseggii* (q.v. in synonymy of *S. latifolia*) is readily recognized by the following syndrome: almost symmetrical distal leaflets; a largely

leafless panicle of racemes organized around a zigzag primary axis; large asymmetric flowers with fertile anthers strongly differentiated into sets of four and three; and a remarkable elongate, narrowly ribbonlike (compressed) pod that grows out to accommodate about 150 ovules in a single row. Absolute mature and entire fruits are not known to us, but it appears that the ripe pod breaks up into one-seeded segments by transverse fracture through the septa. Except for a rather striking pubescence-variant, described below as var. *bangii*, the species varies little.

Key to Varieties of *S. georgica*

1. Hornotinous branchlets and lower face of lfts minutely strigulose with appressed hairs up to 0.05–0.15 mm; widespread in Amazonian and e. Brazil, ascending Ríos Beni and Mamoré to ± 550 m in n.-e. Bolivia (Pando, Beni, Santa Cruz). 46a. var. *georgica* (p. 195).
1. Hornotinous branchlets and lower face of lfts villous-pilosulous with spreading and incurved-spreading hairs up to 0.45–0.9 mm; local at 700–1000 m in the Andean foothills of North and South Yungas, on sources of Río Beni in La Paz, Bolivia. 46b. var. *bangii* (p. 195).

46a. *Senna georgica* Irwin & Barneby var. *georgica*. *Cassia hoffmannseggii* var. *gardneriana* Benth, 1870, p. 104.—“ . . . in sylvis prope Maranhão: G. Don; ad Pernambuco: Gardner n. 990.; prope Pará: Burchell; secus Rio Tocantins: Weddell; etiam in Cayenna: Rothery.”—Lectoholotypus, *Gardner 990* from Pernambuco, collected X.1837 (fl, fr jun), K! = NY Neg. 1447 = IPA Neg. 926; paratypi, *G. Don 69*, BR (hb. Mart.)! *Weddell 2329*, K! *Rothery s.n.*, K! Burchell’s spm from Pará (no. 9928, K!) = *S. quinquangulata* + fl of var. *georgica* probably misplaced from *Burchell 9616*.

Characters as given in key.—Collections: 56.

Forest margins and clearings, often in sandy ground, on terra firme, of scattered and discontinuous (known) range in Guayana, Brazil and n.-centr. Bolivia: coastal plain of French Guiana (Grand Matoury near Cayenne); lower Amazon valley in Pará, downstream from mouth of Rio Tapajós, thence s. on Rio Tocantins to centr. Goiás (Crixás) and on the Beni, Mamoré and Guaporé forks of Rio Madeira into n. and centr. Bolivia and the Paraguay divide in w.-centr. Mato Grosso; apparently disjunct in caatinga of n.-e. Brazil, from s. Ceará to e. Pernambuco and n.-e. Bahia.—Fl. VI–XI, fr. VIII–XII(–?).—Records (as *Cassia hoffmannseggii*) from centr. and Peruvian Amazonia and from Cuba are based on specimens of related species.

The var. *georgica* was first collected on the lower Amazon between 1801 and 1807 by Friedrich W. Sieber (*B-WILLD 7935*, sub *Cassia arcuata* Hoffgg., ined), and was cultivated on Mauritius as early as 1835 (*Bouton*, P).

46b. *Senna georgica* Irwin & Barneby var. *bangii* Irwin & Barneby, var. nov., a var. *georgica* ramulis hornotinis cum foliorum pagina inferiori pilis patulis incurvisque 0.45–0.9 mm usque longis absimilis.—BOLIVIA. La Paz: Mapiri, VII–VIII.1892 (fl, fr jun), *Miguel Bang 1561*.—Holotypus, US 941685; isotypi, F, K, M, MICH, MO, NY, US (nos. 33077, 202267, 8).

Characters as given in key.—Collections: 5.

Rain forest, 700–1000 m, North and South Yungas, on Mapiri and Bopi forks of upper Río Beni (between 15° and 17°S) in La Paz, Bolivia.—Fl. VII–X.

47. *Senna huilana* (Britton & Killip) Irwin & Barneby, comb. nov. *Chamaefistula huilana* Britton & Killip, Ann. N.Y. Acad. Sci. 35(3): 172. 1936.—“Cordillera Oriental, east of Neiva, Huila, Colombia, 2000–2500 m . . . August 1–8, 1917, *Rusby & Pennell 639*, type . . . 856!”—Holotypus, NY! = NY Neg. 4954; clastotypus, US! paratypus (no. 856), NY!

Chamaefistula micradenia Britton & Killip, Ann. N.Y. Acad. Sci. 35(3): 175. 1936.—“La Virginia, Libano, Tolima, Colombia, 1200–2500 m. altitude, December 22, 1917, *Pennell 3278* . . .”—Holotypus, NY! isotypus (fragm), US!

Weak, sometimes sarmentose shrubs 2–3(–?) m, glabrous up to the thinly or remotely puberulent inflorescence, the pliantly spreading or pendulous hornotinous branchlets terete striate or obscurely angulate, the firmly chartaceous or (probably in shade) submembranous foliage concolorous or almost so, the lflets sublustrously olivaceous and reticulately venulose on both faces, the inflorescence either terminal, when either paniculate or reduced to one raceme, or at least partly axillary when shorter than the subtending lf.

Stipules (caducous, little known) erect setiform 4–10 × 0.4–0.5 mm.

Lvs 14–42 cm; petiole including shrunken pulvinus (1.8–)3.5–11 cm, at middle 1.6–2.9 mm diam, subterete except for shallow open ventral sulcus; rachis (1.5–)2–9 cm, of major cauline lvs shorter than petiole; gland 1 between proximal pair of lflets, either stipitate or sessile, including stipe 2–3.5 mm tall, the glabrous body ovoid or obovoid obtuse or narrowly ovoid-ellipsoid acute; distal pair of lflets subsymmetrically ovate- or obovate-elliptic short-acuminate, 11–22 × 4.5–9.5 cm, 2.2–3.4 times as long as wide, at base subequilaterally rounded or broadly cuneate on both sides, the margin plane, the straight or very slightly incurved midrib on ventral face usually depressed, sometimes prominulous, on dorsal face cariniform, the ±6–9 pairs of major camptodrome secondary nerves and subsequent reticulation sharply prominulous on both faces but less emphatic in ample shade-lvs; proximal pair similar, sometimes slightly broader in outline, ± $\frac{2}{3}$ as long.

Racemes 5–17-fl'd, solitary, the axis including peduncle 3.5–10 cm; bracts caducous (little known) lance-ovate acute 1.2–3 mm; pedicels slender pliant 2–4.5(–5.2) cm; buds subglobose, puberulent; sepals submembranous often reddish, faintly 5-nerved, unequal, the large inner ones either ovate or oblong but always obtuse 8–11.5(–12) mm; petals yellow, puberulent on major veins, very unequal, the banner and 1 adjacent petal largest, the banner either obovate-flabellate or broadly oblanceolate 23–37.5 mm, 1 abaxial smallest and the other commonly nidulating one long anther; functional stamens 7, the filaments either glabrous or puberulent, those of 4 median stamens commonly dilated upward 1.4–2.2 mm, those of 3 abaxial ones filiform 2.5–5 mm, the median anthers usually in 2 unlike pairs, the more dorsal larger, all little incurved (3–)4–8.5 mm, with divaricate beak 0.5–0.7 mm, the abaxial ones always conspicuously larger and hamately incurved 6–11 mm, with porrect beak 1–1.5 mm; ovary densely white- or lutescent-strigulose or -pilosulous; style scarcely or not dilated, 0.5–0.6 mm diam at the stigma; ovules ±74–86.

Pod pendulous, the stout stipe ±6 mm, the body (known from only one pressed example) apparently cylindroid ±18 × 1.2 cm, the ventral suture 2 mm wide without obvious thickened border, the dehiscence unknown; seeds (not seen fully ripe) 4–4.4 mm, the testa dull black (perhaps becoming lustrous at maturity).—Collections: 8.

In and at edge of forest, 700–1800 m, Andes of centr. Colombia in lat. 3°–7°, scattered on both slopes of middle Magdalena valley from s.-w. Santander and n. Tolima upstream to Huila and (unknown as yet from Cauca valley) reappearing on the Pacific slope of Cordillera Occidental in Antioquia and Valle del Cauca.—Fl. III–VIII.

A species still poorly known, but apparently related to distantly allopatric *S. georgica*, which it resembles in the subsymmetrical leaflets, large irregular flowers, and strongly dimorphic stamens. The pod, if we correctly associate the fruiting typus of *Ch. micradenia* with our other material of *S. huilana*, all in flower only, is apparently quite different, twice as broad, probably pipelike before pressing, and enclosing two rows of seeds. The combination of glabrous foliage and highly differentiated androecium serve to distinguish *S. huilana* from all other Colombian *Bacillares*.

The supposedly small gland of *Chamaefistula micradenia*, incautiously emphasized by Britton & Killip in the protologue, is merely damaged by insects.

48. *Senna caudata* (Standley) Irwin & Barneby, comb. nov. *Cassia caudata* Standley, Contrib. U.S. Nat. Herb. 18: 102. 1916.—Typus infra sub. var. *caudata* indicatur.

Slender, amply leafy shrubs 1–2 m with terete, remotely minutely livid-verruculose hornotinous branchlets, glabrous up to the minutely puberulent terminal panicle of ± 2 –5 short racemes of large fls, the thinly chartaceous olivaceous dull or sublustrous lfts concolorous or weakly brunnescent beneath, the inflorescence surpassed by foliage.

Stipules (scarcely known) subulate, 2–? mm, caducous.

Lvs 3–4.5 dm; petiole including wrinkled (when dry shrivelled) pulvinus 6–12 cm, at middle 1.6–2.5 mm diam, except for prominulous ribs subterete, very shallowly grooved ventrally; glands between lower or both pairs, sessile or almost so, ovoid or oblong or oblong-ovoid obtuse 1.6 – 3×0.7 – 1.8 mm glabrous; rachis 3.5–6.5 cm, shorter than petiole; distal pair of lfts subsymmetrically ovate or ovate-elliptic, caudately acuminate (acumen ± 1.5 – 3 cm) 15 – 25×5.5 – 10 cm, ± 3 – 4.5 times as long as wide, at base subequally cuneate or rounded-cuneate on both sides, the margin plane, the almost straight centric midrib above immersed or canaliculate-depressed, beneath cariniform, the ± 9 – 12 pairs of major campitodrome secondary veins and subsequent tertiary venulation finely prominulous on both faces but a trifle more pronounced beneath, the ultimate areoles mostly >0.5 mm diam.

Racemes 6–14-fl'd, the axis including short peduncle 2–4.5 cm; bracts ovate-acuminulate ± 1.5 mm deciduous; pedicels 2.5–4 cm; buds globose when young, puberulent, expanded before anthesis of fl; sepals subpetaloid, strongly graduated, ovate-oblong or broadly obovate obtuse, the short outermost one 4–5 mm, the largest inner one 8 – 9×4.5 – 6 mm, all delicately 4–6-nerved; petals yellow, dorsally puberulent along veins, glabrous within, \pm heteromorphic, the adaxial one longest or broadest or both, obovate-flabellate 20–30 mm, the rest obovate to oblong-oblancheolate, either narrower or shorter, one abaxial one involutely cupping 2 long stamens; androecium functionally 7-numerous; filaments remotely or thinly puberulent, of 4 median stamens 1.7–2.7 mm, dilated (especially distally), of 3 abaxial ones 2.5–5 mm, the anthers glabrous, finely papillate, those of 4 median stamens oblong slightly incurved 4–6.5 mm, graduated into 2 sets (the pair more abaxial smaller), with divaricate biporose beak ± 0.5 mm, those of 3

abaxial ones deeply lunate-incurved 7–9 mm, with sigmoidally porrect beak 0.8–1 mm, the orifice divided by a slender septum; ovary densely strigulose; style slender, scarcely dilated at tip, 0.5–0.7 mm diam just below stigma, the orifice ± 0.3 mm diam; ovules (of var. *caudata*) ± 110 .

Pod (of var. *diadena*) described under that variety.

A rare species, known to us by only five collections from two restricted areas, one in eastern Panama and the other in southern Costa Rica, the pod and seeds, moreover, from Costa Rica only, a sample inadequate to demonstrate the full range of morphological variation. In consequence the specific status of *S. caudata* and the taxonomic rank assignable to the two varieties described below must remain provisional. The whole species appears very closely related to and perhaps not distinct from Colombian *S. huilana*, similar in details of the flower but different in the sharp and intricate reticulation of most leaf-blades, which are, in addition, less abruptly and more shortly caudate or merely bluntly acuminate at apex. Panamanian var. *caudata* differs further from vicariant *S. huilana*, which appears to grow at submontane elevations in the northern Andes and not in the wet Pacific lowlands, in the relatively small flower; whereas Costa Rican var. *diadena*, which may possibly deserve specific status, differs from both of these in a second petiolar gland. The only pod seen, from Puntarenas, Costa Rica, is unlike that of any other member of ser. *Bacillares* in the narrowly winged valves and thickened spongy septum separating the two files of seeds. In practice *S. caudata* has been distinguished from sympatric *Bacillares* by the strongly differentiated sets of stamens, the androecium being almost that of distantly allopatric South American *S. georgica*.

Key to the Varieties of *S. caudata*

1. Gland between proximal pair of leaflets only; long interior sepals ovate ± 4.5 mm wide; petals up to 20–26 mm; e. Panama. 48a. var. *caudata* (p. 198).
1. Glands between both pairs of lflets; long interior sepals obovate-suborbicular ± 6 mm wide; petals up to 26–30 mm; s. Costa Rica (Pacific slope). 48b. var. *diadena* (p. 198).

48a. *Senna caudata* (Standley) Irwin & Barneby var. *caudata*. *Cassia caudata* Standley, 1916, l.c. sens. str.—“Type in [US] no. 679652, collected in forest of the upper Mamóní River, Province of Panama, Panama, altitude 150 to 400 meters, October, 1911, by H. Pittier (no. 4491).”—Holotypus, US! clastotypus (lf) + photo (*s.n.*), NY!—*Chamaefistula caudata* (Standley) Britton & Rose, N. Amer. Fl. 23(4): 237. 1930.

Cassia caudata sensu Schery, 1951, p. 82, p.p. (exclus. pl. costaric.).

Characters as given in key to varieties; pod unknown.—Collection: 1 (typus).

48b. *Senna caudata* (Standley) var. *diadena* Irwin & Barneby, var. nov., a var. *caudata* imprimis petiolo 2-glanduloso, ulterius ut videtur sepalis latioribus inter se magis inaequilongis petalisque maximis absimilis.—COSTA RICA. San José: in forest, 1000 m, vicinity of El General, VI.1936 (fl), A. F. Skutch 2655.—Holotypus, US (no. 1642726); isotypi, K, MO, NY (fragm).

Characters as given in key to varieties; pod cylindroid straight ± 16 – 20×1.2 cm, the ventral suture ± 2.5 mm wide, without thickened margins, the valves becoming leathery atrocastaneous, transversely lenticellate and at length transversely fissured, narrowly 2-winged lengthwise near the middle, the cavity ap-

parently devoid or almost so of foetid pulp, the 2 files of seeds separated by a thick spongy septal wall connecting the 2 sutures; seeds symmetrically oblong-ellipsoid, little compressed, $5.5\text{--}6 \times 2.5\text{--}2.7$ mm, the testa smooth fuscous, scarcely lustrous, exareolate.—Collections: 4.

Humid forest near 1000–1200 m, local, known only from the Pacific slope of Cordillera de Talamanca, in the basin of río Grande de Térreba, in San José and Puntarenas, Costa Rica.—Fl. VIII–XI.

49. *Senna cornigera* Irwin & Barneby, sp. nov. quoad perianthii formam androecique filamenta cum antheris inter se valde inaequalia cum *S. georgica*, ulterius foliis parum inaequilateris simili, comparanda sed ab ea ut a caeteris *Bacillaribus* praeter *S. uncatam* omnibus foliorum petiolo vero abbreviato racheosque seta terminali in cornu rigidum vulnerans indurata insigniter diversa, a *S. uncata* propius affini notulis sub ea (sequenti) enumeratis separanda.—BRAZIL. Pará–Amapá boundary: Rio Jarí, Monte Dourado, Planalto B, 11.X.1968 (fl), *Nilo T. Silva* 1187.—Holotypus, R; isotypi, K, NY, US.

High-climbing vine flowering in forest-canopy, the rope unknown, the horn-tinuous branchlets terete striate, appearing glabrous throughout but the lower face of lfts and axes of inflorescence minutely strigulose with appressed hairs to 0.15 mm, the foliage bicolored, gray-olivaceous sublustrous above, brownish dull beneath, the inflorescence of simple racemes or of short leafless few-branched panicles arising from axils of living lvs, shortly or not exerted.

Stipules caducous, not present on material seen.

Lvs 16–20 cm; petiole including wrinkled discolored pulvinus 6–16 mm, at middle 1.7–2.5 mm diam, openly shallowly sulcate, much shorter than rachis; rachis 4–5.5 cm, produced beyond distal pair of lfts into a rigidly vulnerant, abruptly divaricate, distally slightly incurved, horn-shaped appendage (seta) 7–10 mm; gland 1 sessile between proximal pair, plumply deltate-linguiform obtuse $\pm 3\text{--}4$ mm, glabrous; pulvinules strongly wrinkled 3–5 mm; distal pair of lfts sub-symmetrically broadly ovate, very shortly deltate-acuminate, $10\text{--}14 \times 7\text{--}8.5$ cm, at base rounded-subcordate on proximal and broadly cuneate-rounded on distal side, the margin revolute, the slender straight centric, ventrally immersed midrib with $\pm 8\text{--}10$ pairs of major camptodrome, ventrally prominulous secondary veins all sharply cariniform beneath; the tertiary and reticular venulation more evident above than beneath; proximal pair of lfts similar, $\pm \frac{2}{3}$ as long.

Peduncles 2.5–8.5 cm; racemes loosely openly 12–25-fl'd or some subterminal to the panicle only 2–5-fl'd, the axis (1–)3–11 cm; bracts ovate obtuse 2–3 mm, persistent into anthesis; pedicels at full and late anthesis 4–5.5 cm; buds globose glabrous; sepals submembranous yellowish, all broadly ovate-orbicular obtuse, strongly graduated, the 2 large innermost 11–15 mm, the small outermost scarcely half as long; petals yellow, puberulent dorsally along major veins, somewhat heteromorphic, the adaxial one broadest $\pm 25 \times 22$ mm, beyond the short claw suborbicular-emarginate, the two lateral similar except a trifle shorter and obtuse-truncate, the two abaxial slightly longer and proportionately narrower, broadly oblance-obovate up to $26\text{--}30 \times 16$ mm, one of them cupping the two longest stamens; androecium functionally 7-merous, the filaments remotely minutely puberulent, of 4 median stamens 2.5–3 mm, of 1 abaxial stamen 3–4 mm, of 2 abaxial ones 6.5–8 mm, the anthers glabrous, of 4 median stamens nearly straight 5–7 mm, contracted into a very short obtuse 1-porose beak ± 0.5 mm, of 3 abaxial ones strongly incurved and 12–15 mm, contracted into a porrect beak ± 1.5 mm;

ovary densely strigulose, the short style very slightly dilated, ± 0.5 mm diam at the bend below the stigma, the orifice 0.3 mm diam; ovules (1 count) 154.

Pod not seen fully formed, when young narrowly ribbonlike up to 2 dm.—Collection: 1 (typus).—Fig. 18.

Forest, on terra firme, probably below 250 m, known only from the type-locality on Rio Jarí in n.-e. Brazil.—Fl. X–XI.

A notably distinct species, characterized by the syndrome of short-petiolate leaves, subsymmetrically ovate leaflets, large flowers with highly differentiated stamens, and especially by the seta terminating the leaf-stalk, here modified into a stout, divaricate, prickle-like horn. The flower and leaflet-shape suggest *S. georgica*, which differs in its much longer petioles (2–6, not 0.6–1.6 cm), and in the filiform, early dry and deciduous seta. The very young pod of *S. cornigera* resembles that of *S. georgica* at the same stage of growth, and it is possible that the seeds of *S. cornigera* will also be found to be uniseriate. The remarkable hornlike seta must be related to the liane habit of *S. cornigera*, found by the collector climbing a tree 35 m tall; it could well function as a grappling hook like the similar but backwardly hooked seta of remotely allopatric Peruvian *S. uncata* which combines with almost the same flower a reportedly arborescent growth-habit, substantially smaller leaves subtending the racemes and plane-margined leaflets.

50. *Senna uncata* Irwin & Barneby, sp. nov., petiolis brevissimis, perianthii androecique forma et imprimis racheos seta indurata vulneranti *S. cornigerae* manifeste affinis sed ab ea habitu arborescenti (nec scandenti), foliorum (superiorum tantum notorum) breviorum 6–13 (nec 10–20) cm longorum rachi abbreviato 1–2.3 (nec 4–5.5) cm longo foliolisque distalibus parvis 4.5–9.5 (nec 10–14) cm longis plano-marginatis (nec revolutis), seta indurata abrupte uncato-recurvata (nec prorsus patula), sepalo interiori maximo minori ± 10 (nec 11–15) mm longo, patriaque remotissima peruviana dispar.—PERU. Amazonas: Quebrada Chichijam Entsa, monte, 1100 ft [± 330 m], 24.IV.1973 (fl), *Ernesto Ancuash* 289.—Holotypus, NY; isotypus, MO.

Arborescent vines of unknown stature, the flowering branchlets stout stiff terete striate, the young parts and axes of inflorescence strigulose with incumbent hairs 0.1–0.2 mm, the lflets bicolored, dull brownish-olivaceous glabrous above, paler dull and densely puberulent beneath, the inflorescence elongately thyriform-paniculate, distally exserted from foliage.

Lvs at base of inflorescence 6–13 cm, those lower on stems unknown (perhaps larger); petiole including shrunken pulvinus 8–13 mm, at middle 1.2–2.4 mm diam, obscurely shallow-sulcate; rachis 10–28 mm, longer than petiole, produced beyond the distal pair of lflets as a rigid, backwardly arcuate, vulnerantly acute hooklike seta 4–8.5 mm; gland 1 sessile between proximal pair of lflets, plumply ovoid obtuse $3\text{--}4.5 \times 1.8\text{--}3.3$ mm glabrous; pulvinules 3–5.5 mm; distal pair of lflets symmetrically ovate abruptly obtusely short-acuminate $4.5\text{--}9.5 \times 3\text{--}5.4$ cm, 1.3–1.7 times as long as wide, at base equilaterally shallow-cordate, the margin plane but \pm undulate, the straight centric midrib impressed on upper and cariniform on lower face, the 8–12 major camptodrome secondary with connecting tertiary venulation finely prominulous on both.

Racemes solitary or rarely geminate, $\pm 7\text{--}20$ -fld, the axis including stout, stiffly erect peduncle 5–12 cm; bracts ovate-elliptic or -deltate 1.5–2.5 mm, early dry and deciduous at or soon after anthesis; pedicels at anthesis 3–3.5 cm; buds

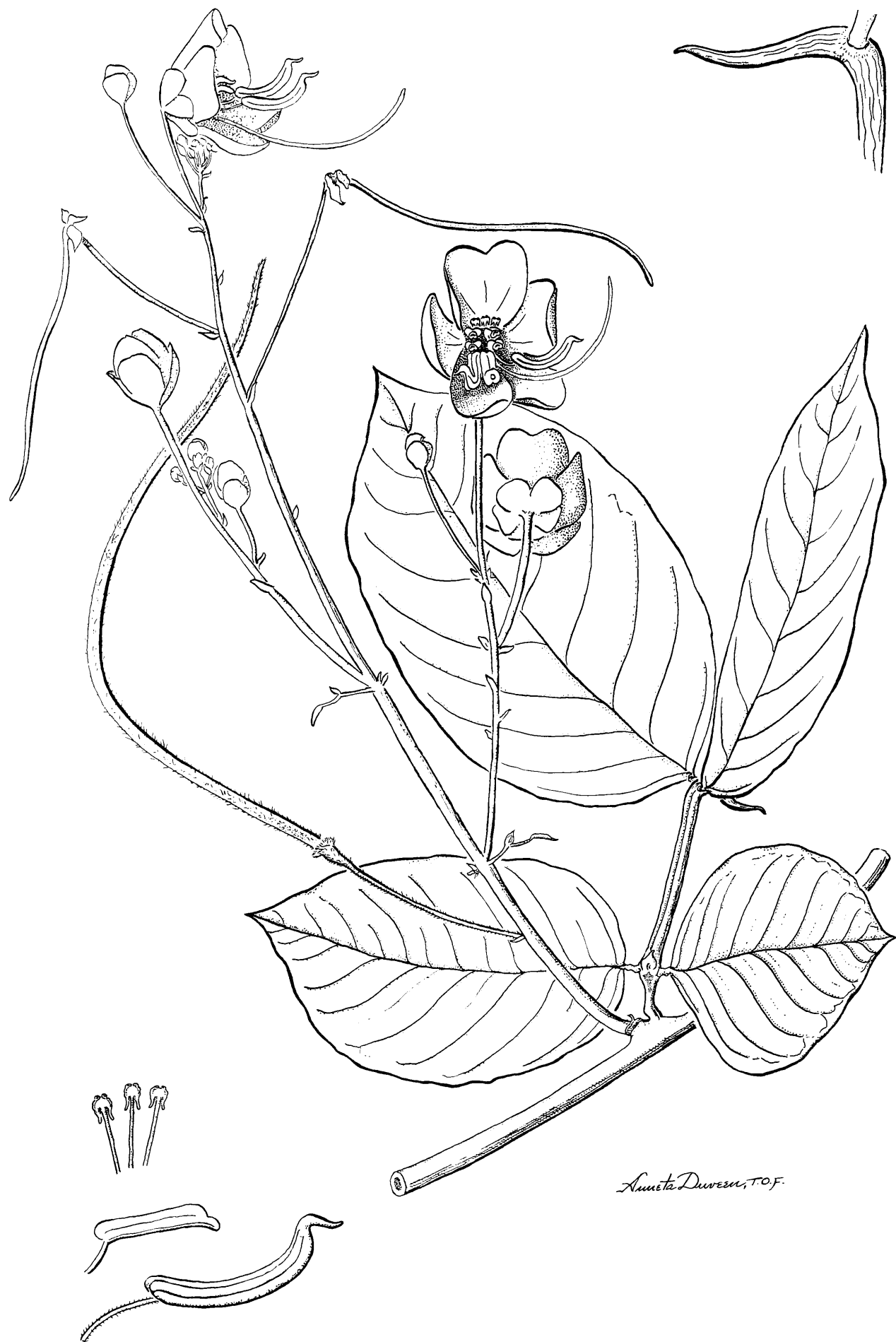


Fig. 18. *Senna cornigera* I. & B. Flowering branchlet $\times\frac{1}{2}$; seta of leafstalk and detached stamens $\times 1$ (N. T. Silva 1187).

nodding globose, glabrous except at very base; sepals strongly graduated, the outermost \pm half as long as the innermost, all submembranous, delicately venulose, broadly obovate-suborbicular, the largest ± 10 mm; petals exactly of *S. cornigera*, the adaxial one 23–25 mm; functional stamens 7, the filaments thinly puberulent, those of 4 median and 1 abaxial 2–2.5 mm, swollen distally, of 2 abaxial 4–5.5 mm, the anthers glabrous or nearly so, those of 4 median stamens slightly incurved 6–7.5 mm with divaricate 2-porose beak ± 0.5 mm, those of 3 abaxial ones lunately incurved 12.5–14.5 mm with porrect beak 1–1.3 mm, two of them cupped in an abaxial petal; ovary densely gray-strigulose; style scarcely dilated, ± 0.7 mm diam just below stigma, the orifice 0.2 mm diam; ovules ± 124 .

Pod geotropic, the stout stipe ± 1 cm, the body up to 30×1 cm, laterally compressed but up to 0.5 mm thick, in cross section oblong-elliptic, the broad sutures 2–3 mm wide, undulately depressed between seeds, the faces low-convex, the thin-textured valves becoming purplish-brown, closely investing the seeds, apparently at length breaking transversely along the septal lines; seeds 1-seriate, turned broadside to the septa, in wider profile $\pm 9 \times 5.5$ mm, 3 mm thick, the lustrous castaneous testa crackled, exareolate.—Collections: 2.—Fig. 19.

In the virgin monte at 200–350 mm, apparently rare, known only from the middle Mara  n and lower Santiago valleys in Amazonas, Peru.—Fl. IV–V. *Tampush*; *na  k tampush*.

Due to paucity of collections our accounts of *S. uncata* and *S. cornigera* are obviously incomplete, and firm differential characters can only emerge as the species become better known. Together with *S. acuparata* they are distinguished from all other *Bacillares* by the modified seta of the leaf-stalk, a shared feature which, reinforced by essentially similar flowers, suggest a close relationship. While the setae are homologous, they differ in form, that of *S. cornigera* being turned back at right angles from the leaf-stalk and its tip lifted a trifle forward, whereas that of *S. uncata* is abruptly recurved into a grappling hook. We have seen of each only leaves associated with the thyrsiform panicle, but these are shorter in *S. uncata*, the pairs of leaflets are separated by a shorter rachis, and the blade-margins are undulate but not revolute as in *S. cornigera*. The known ranges of the two species stand about 2800 km apart near opposite margins of the Amazonian Hylaea. Comparison of the pods must await discovery of that of *S. cornigera*. In general morphology and arrangement of the seeds the pod of *S. uncata* resembles that of *S. georgica* but is nearly twice as wide.

51. ***Senna acuparata*** Irwin & Barneby, sp. nov., affinitatis inter *Bacillares* veras flore deficienti incertae sed ob foliorum rachin in spinulam rigide refractam ultra foliola distalia productam cum *S. cornigera* necnon *S. uncata* comparanda, ab illa petiolo gracili ac legumine abbreviato ± 6 –7 (nec 20 usque) cm longo, ab hac habitu debili scandenti (nec arboreo), ab ambabus foliolis longe acuminatis margine planis remote undulatim denticulatis primo intuitu diversa, ulterius inter *Bacillares* amazonicas foliolorum pari inferiori ut videtur semper deficienti notabillima.—PERU. Loreto, prov. Maynas: woods near Iquitos, 2–8.VIII.1929 (fr jun), *E. P. Killip & A. C. Smith* 27392.—Holotypus, NY; isotypus, US.

Cassia hoffmannseggii sensu Macbride, Field Mus., Bot. 13 (Fl. Peru), part 3(1): 168. 1943; non Martius ex Benth.

Slender herbaceous vines of unknown stature, with terete striate branchlets,



Fig. 19. *Senna uncata* I. & B. Flowering branchlet $\times\frac{1}{2}$; leafstalk $\times 3$; detached flower $\times 2$; detached stamen $\times 3$ (Ancuash 289).

finely pilosulous with spreading-incurved filiform and scattered minute thickened resinous hairs, the former up to 0.25 mm, the foliage dull olivaceous concolorous, the chartaceous, intricately reticulate lflets glabrous above, pilosulous beneath, the inflorescence a weakly ramified panicle of 2–3 short few-fl'd racemes shortly exerted from foliage, the plant remarkable among *Bacillares* for the undulate-denticulate leaflet-margin and the absence (possibly only fortuitous on the few specimens seen) of the proximal pair of lflets and the (presumably characteristic) reflexed persistent seta terminating the lf-stalk.

Stipules erect linear-attenuate $4\text{--}6.5 \times \pm 0.4$ mm deciduous.

Lvs 10–16 cm; petiole proper (measured from pulvinus to petiolar gland) 10–17 mm, at middle 0.9–1.1 mm diam, rounded dorsally, flattened and shallowly open-sulcate ventrally; rachis 17–33 mm, longer than petiole, produced into a backwardly refracted indurated hooklike seta 3.5–4.5 mm; gland 1 below middle of naked lf-stalk, shortly stipitate, obtusely claviform 1.8–2.7 mm, glabrous; distal (only) pair of lflets ovate-acuminate $7\text{--}11.5 \times 3.5\text{--}5.3$ cm, \pm twice longer than wide, the slender acumen $\pm 1.5\text{--}2$ cm and acute at very apex, the blade at base rounded on proximal and broadly cuneate on distal side, the margin plane, irregularly low-sinuate-denticulate, the almost straight centric midrib above canaliculate in lower half thence immersed, beneath prominent cariniform, the $\pm 10\text{--}14$ pairs of major camptodrome with some intercalary secondary veins and the tertiary and reticular venules all sharply prominulous on both faces, the ultimate defined areoles much less than 1 mm diam.

Racemes $\pm 7\text{--}14$ -fl'd, the axis including short peduncle 1.5–3 cm; bracts lanceolate 3–3.5 mm, tardily deciduous; pedicels becoming 3–3.5 cm; sepals (seen only marcescent) oblong-obovate obtuse moderately graduated, the longer inner ones ± 9 mm, delicately 5–6-nerved from base; fl otherwise unknown; ovary strigulose; style scarcely swollen, ± 0.7 mm diam; ovules ± 52 .

Pod (not seen fully ripe) stoutly short-stipitate, the stipe 4–6 mm, the body $\pm 6\text{--}7 \times 0.7$ cm, its compression not interpretable from the material seen, the apparently fleshy valves nigrescent; seeds 2-seriate, not seen ripe.—Collection: 1.—Fig. 20.

Habitat scarcely known, to be sought along forest margins or in disturbed thickets near 100–130 m along the upper Amazon River, known only from the type-station near Iquitos, in Loreto, Peru.—Fl. X.

A remarkable senna with which we have as yet only tantalizingly imperfect acquaintance, but clearly distinct from all described *Bacillares* in the subsymmetrically ovate-acuminate, undulate-denticulate leaflets combined with stiffly persistent hooked seta terminating the leafstalk. All leaves of the material seen are bifoliolate, and it is a question whether or not a proximal pair may occur in some leaves at the normal site on the leafstalk here marked only by the stipitate gland. The two other *Bacillares* characterized by hooked or pronged seta that appear modified as grappling-hooks, *S. uncata* and *S. cornigera*, differ substantially from *S. acuparata* in habit and technical characters, especially in the obtuse or only obscurely and obtusely acuminate, entire-margined leaflets. Whereas *S. acuparata* was seen by the collectors as an herbaceous vine, *S. uncata* is arborescent and *S. cornigera* a vigorous liana climbing into high forest canopy. The seta of *S. cornigera* is not hooked backward but sigmoidally divaricate; the petiole proper is almost none, the leaf-margin is revolute and the pod a long ribbon, up to 2 (not less than 1) dm long. The seta of *S. uncata* is that of *S. acuparata*, but its paniculate exerted inflorescence of much longer racemes, the leaflet outline and venulation, and the montane Andean habitat are decisively different.

The type collection of *S. acuparata* was referred by Macbride (l.c.) to *Cassia*



Fig. 20. *Senna acuparata* I. & B. Flowering stem $\times \frac{1}{2}$; leafstalk $\times 3$ (Killip & Smith 27392).

hoffmannseggii auct. (=our *S. georgica* var. *georgica*); this, not known to occur in the upper Amazon valley, has distal leaflets of similar outline but differs in the deciduous seta, the constantly 4-foliolate leaves, a larger calyx (long sepals 12–20, not 9 mm), and a slender compressed elongate pod like that of *S. cornigera*.

BACILLARES IMPERFECTE NOTAE

Chamaefistula elegans G. Don, Gen. Hist. Dichl. Pl. 2:451. 1832.—“Native of Peru.”—Holotypus, ticketed ‘*Cassia* sp. nova. Peru,’ presumably ex

hb. Lambert., BM! = NY Neg. 168.—*Cassia peruviana* Vogel, Syn. Gen. Cass. 40. 1837; non *C. elegans* H.B.K., 1824.

Habit unknown, appearing glabrous but the ventral face of lf-stalks, the axes of inflorescence and the dorsal face of petals puberulent with appressed hairs to ± 0.15 mm, the lflets also minutely puberulent dorsally, and the ovary canescently strigulose, the foliage bicolored, lustrous and sharply reticulate-venulose above, paler dull and more simply venulose beneath, the racemes axillary to contemporary lvs of annottinous branchlets.

Stipules caducous, not seen, but probably linear like those of axillary buds.

Lvs 12–19 cm; petiole ± 3.5 –5 cm, at middle 2 mm diam, shallowly openly grooved ventrally; rachis (1.5–)2–3 cm; glands between each pair of lflets, subsessile, in outline lanceolate obtuse 2.5 – 3.5×0.5 – 1.2 mm; distal pair of lflets obliquely ovoid-acuminate 7 – 10×3.5 – 5 cm, obtuse at very apex, at oblique base cuneate on distal and rounded on proximal side, the incurved midrib subimmersed above, cariniform beneath, giving rise to ± 8 – 10 pairs of major camptodrome secondary veins prominulous on both faces, the connecting tertiary and subsequent reticular venulation more sharply raised above than beneath.

Racemes shortly 5–6-fld, their peduncle 4.5–6 cm, their axis at anthesis less than 1 cm; bracts caducous, not seen; calyx glabrous, the firm brownish, faintly nerved sepals subequal ovate-elliptic obtuse 7–8.5 mm; petals unequal, oblanceolate or obovate beyond the slender claw, 2 – 2.5×1 – 1.6 cm; androecium functionally 7-merous, the filaments puberulent, those of 4 median stamens 4–4.5 mm, of 3 abaxial ones 3–4 mm, the anthers of 4 median stamens ± 5 mm, with very short divaricate beak, the body of the 3 abaxial ones 5–5.5 mm, their porrect beak ± 0.5 mm, the orifice U-shaped 1-porose; style slightly dilated at apex, ± 0.8 mm diam.

Pod unknown.—Collection: 1.

Habitat and distribution unknown, collected in Peru by Ruiz & Pavón or perhaps by Dombey, the specimens sent to Lambert by Pavón without more exact data.

An obscure species, the typus of which is not exactly matched by any modern collection. *Chamaefistula elegans* was referred to the synonymy of *Cassia obliqua* by Bentham (1871, p. 51), who stated that he could find no distinguishing character in the Pavón material at BM. Bentham either overlooked, or considered unimportant, the second petiolar gland, described by Don, and inexplicably characterized the leaf of *C. obliqua* as uniglandular. The significance of a distal gland will not be determined until truly ripe fruit not only of uniglandular *S. obliqua* but also of the similar biglandular plant are obtained. The flower of *Ch. elegans* cannot be analyzed satisfactorily from the type-specimen, but the beak of its abaxial anthers appears substantially shorter than anything seen in *S. obliqua*. We refrain from transferring *Ch. elegans* to *Senna* pending clarification of its status.

***Cassia mariquitensis* Mutis, Diario 2: 388. 1958.**

This was carefully described and likened to *C. viminea*; it is certainly a member of ser. *Bacillares* but cannot be positively identified. Mariquita lies within the range of the Colombian endemic *S. macrophylla* var. *macrophylla*, of which 5 Mutis collections, none identified as to origin, survive (US); Mutis also encountered somewhere on his travels the still ambiguous *Chamaefistula toroana* mentioned below (Mutis 2056, US), and sterile, therefore doubtful, *S. bacillaris* (Mutis 2451, US).

Chamaefistula tolimensis Britton & Rose ex Britton & Killip, Ann. N.Y. Acad. Sci. 35(3): 175. 1936.—“Edge of forest, Honda, Tolima, Colombia, 300–500 m altitude, January 3, 4, 1918, *Pennell 3559* . . .”—Holotypus, NY! clastotypus (fragm), US!

The holotypus of this ambiguous proposal consists of a leafy branch bearing two old flowers (one now at US) and one pod, probably of mature length but as yet not fully filled out by seeds. No complete androecium is present, but the flower at US retains one abaxial anther, this depauperate like the central abaxial one of *S. bacillaris* var. *benthamiana*. The foliage resembles that of glabrescent var. *benthamiana* in the marked asymmetry of the proximal pair of leaflets, but the sepals (± 6 mm) and petals (to ± 14 mm) are entirely too small for *S. bacillaris* sens. lat. The most remarkable feature of *Ch. tolimensis* is the presence of glands between both pairs of leaflets, never encountered in *S. bacillaris*. In the middle Magdalena valley the only *Bacillares* known to share it are *S. undulata* and *S. trianae*, both substantially different in foliage. Superficially the foliage and general aspect of *Ch. tolimensis* suggest *S. hayesiana*, but in that species the distal petiolar gland, when present, is situated behind, not between, the pulvinules; and the anther already mentioned (at US) is of a type never encountered in *S. hayesiana*. The disposition of *Ch. tolimensis* must be held in abeyance until complete material can be obtained.

Chamaefistula toroana Britton & Killip, Ann. N.Y. Acad. Sci. 35(3): 175. 1936.—“Fredonia, vicinity of Medellín, Colombia, December 20, 1927, [*Rafael A.*] *Toro 848* (type) . . . Popayán, *Lehmann 8478*.”—Holotypus, *Toro 848*, NY! paratypus, *Lehmann 8478*, F, K!

Slender trees 4–6 m, in pressed spms closely resembling glabrescent forms of *S. oxyphylla*, with terete or obtusangulate hornotinous branchlets, minutely pilosulous with incumbent hairs up to 0.15–0.25 mm, the thinly chartaceous foliage scarcely bicolored, the lflets olivaceous on both faces, above glabrous or almost so, scarcely lustrous, beneath dull puberulent, the inflorescence of simple racemes axillary to living lvs or distally, by suppression of lvs, forming a small panicle immersed in foliage, the primary axis scarcely flexuous, not zigzag.

Stipules erect linear-attenuate 4–6 \times 0.3–0.5 mm, caducous.

Lvs 12–25 cm; petiole 2.2–5.2 cm, at middle (0.9–)1.2–2 mm diam, openly shallowly sulcate ventrally; rachis 1.5–4 cm, either a little longer or shorter than the petiole; gland 1 sessile between proximal pair, narrowly or plumply ovoid 1.6–3 mm glabrous livid; pulvinules narrowly flask-shaped wrinkled (3–)3.5–6 mm; distal pair of lflets asymmetrically ovate-acuminate (7–)9–16 \times (3–)4–7 cm, ± 2 –2.6 times longer than wide, at base rounded to broadly cuneate on proximal side and cuneate on distal one (at very base decurrent on pulvinule), the margins revolute, the gently incurved midrib immersed or shallowly depressed above, cariniform beneath, giving rise to ± 10 –14 pairs of major camptodrome and often several intercalary secondary veins bluntly prominulous above and sharply so beneath, the tertiary and reticular venulation (of mature blades) prominulous on both faces, the ultimate areoles less than 1 mm diam; proximal pair of lflets similar but $\frac{1}{4}$ – $\frac{1}{3}$ shorter and proportionately broader.

Racemes ± 7 –17-fld, the axis including peduncle 4–9 cm; bracts lanceolate 2–3 mm, either persistent into anthesis or early caducous; pedicels at anthesis 16–30, in fruit 24–40 mm; buds subglobose puberulent; sepals of *S. oxyphylla*, the largest ovate or ovate-oblong 4–5.5 mm; petals yellow, puberulent externally, oblong-ob lanceolate little heteromorphic 12–16 mm; androecium functionally 7-merous, the filaments puberulent, those of 4 median anthers 1–1.5 mm, of 3 adaxial ones

1–3 mm, the anthers of all subhomomorphic (or the 3 abaxial slightly shorter), the body 4.2–6 mm, the biporose beak 0.5–0.7 mm; ovary strigulose; style 0.6–0.9 mm diam; ovules (of typus) ± 134 .

Pod unknown in mature state, apparently ± 7 –14 cm, the compression, texture of valves, mode of dehiscence and seeds all unknown.

Margins of woods and thickets, 1600–2100 m, Cordilleras Occidental and Central from vicinity of Medellín s. to Popayán, in Antioquia, Valle and Cauca, Colombia.—Fl. IX–III.

The material cited below, with which we confidently associate the type-collection of *Chamaefistula toroana*, is reminiscent of some forms of *S. papillosa*, *S. dariensis* and especially of the thinly pubescent Venezuelan races of *S. oxyphylla*, but is not exactly like any of them, and we are at a loss to dispose of it systematically due to our ignorance of the fruit. Unripe pods of *Cuatrecasas 20529* have a suggestion of ridges along the sutures such as occur in true *S. oxyphylla*, but those of the typus of *Ch. toroana* appear to have been fleshy as in *S. dariensis* var. *smaragdina*. Neither has papillose valves, which can normally be recognized at an early stage of maturity. All other specimens seen have flowers only and seem to differ materially from *S. oxyphylla* var. *oxyphylla* only in the less zigzag inflorescence-axis and slightly larger anthers. In this connection a fruiting collection from the lower Cauca valley (Pto. Valdivia, 2.II.1943, Br. Daniel 3392, US) may be highly significant, but until flowers can be obtained from the same place the identity of the plant must remain doubtful. The foliage of Bro. Daniel's senna is persuasively suggestive of *Chamaefistula toroana* while the pod and seeds seem indistinguishable from those of *S. oxyphylla*. If the ripe fruit of montane *Ch. toroana* proves to be the same, the material cited below may all be referable to *S. oxyphylla* sens. lat., filling in the distributional gap between var. *oxyphylla* as treated in this revision and Ecuadorian var. *hartwegii*. We lack data to resolve this problem.

SPECIMENS SEEN: COLOMBIA. Antioquia: Medellín, typus; ibid., Uribe 1176 (US); s. loc., Jervize s.n. (K), Mutis 2056 (US); Río Anorí s.-w. of Zaragoza, 16.XI.74 (fr. immat.), J. Denslow 2493 (NY). Valle de Cauca: Quindío, Triana s.n. (K); Cord. Central, vertiente occidental, Río Bugalagrande, Cuatrecasas 20529 (F, US); Cord. Occidental, vertiente oriental, Cuatrecasas 18393, 19565, 22019 (all F, US). Cauca: Popayán, Lehmann 8478 (F, US); mun. Calí, 1600 m, 12.III.37 (fl), J. M. Duque 516 (US) & s.d. no. 1677 (US).

BACILLARES INDETERMINATAE

Glaziou 12616 (BR, K), without further locality than "Environs de Rio Janeiro," but, according to Glaziou's *Liste* and label at P (coll. 8.VIII.81) from Santa Quiteria, Minas Gerais (now become a suburb of Belo Horizonte).—At first sight suggesting *S. macranthera* var. *macranthera*, of which it has the androecium and large flowers (long petals to ± 23 mm), but the sepals lanceolate subacute up to 10×3 mm. The sepals suggest *C. acutisepala*, which differs in the small abaxial anthers and in the basally subsymmetric leaflets. The specimens can be assimilated into no described species, and are best left unnamed until matching material, accompanied by reliable locality-data, are procured.

J. T. Baldwin Jr. 3268 (US): BRAZIL. Amazonas: Providencia, Rio Negro, 12.II.1944 (fl).—Resembling in the small lvs (distal lfts asymmetrically elliptic up to 7 cm) both *S. rupununiensis* and *S. wurdackii*, but differing from both in having only 1 petiolar gland and in details of the androecium. The latter is functionally 7-merous, as that of *S. rupununiensis*, but the 3 abaxial anthers (± 5 mm) are markedly shorter than the 4 median ones (7–8 mm). The androecium of *S. wur-*

dackii is functionally 6-merous, through suppression of one abaxial stamen, and its leaflets, unlike those of *S. rupununiensis* and *Baldwin 3268*, are almost smooth (not prominently venulose) on the upper face. More material from the upper Rio Negro is needed to settle the status of a probably undescribed species.

Dodson & McMahon 4296 (US): ECUADOR. Los Ríos: rain forest, 150–220 m, Río Palenque Biological Station, 31.III.71 (fl jun), probably = *Jameson s.n.* (K) from “Pichincha.”—A possibly undescribed entity, suggestive of *S. caudata* in the foliage and small terminal inflorescence immersed in ample foliage, but the flower apparently very much smaller (not examined in detail, perhaps not yet collected in mature state).

López & Sagástegui 6610 (US): PERU. Cajamarca, prov. Cutervo: quebrada, 2000 m, San Andrés, 1.VII.67 (fl jun).—Incomplete specimens, but foreshadowing a strongly characterized species notable for golden pubescence of young stems and foliage, one petiolar gland, subsymmetrically elliptic-acuminate, dorsally villous leaflets, and heteromorphic fertile stamens, 2 or 3 abaxial ones elevated on pubescent filaments ± 7 –10 mm long.

Bv. ser. HARLEYANAE Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Harleyanae** Irwin & Barneby, ser. nov., foliis 4-foliolatis, perianthio toto necnon androecio *Bacillares* nonnullas parvifloras arcte simulans, sed legumine plano-compresso intus sicco semina minus numerosa 1-seriata valvulis (nec septis) parallele compressa continenti graviter incongruae.—Sp. unica: **S. harleyi** Irwin & Barneby.

Perianth, androecium and brachystylous ovary of smaller-fld *Bacillares*, the petals drying yellow, one abaxial one asymmetric; ovules 30–42; pod plano-compressed, its cavity pulpless; seeds 1-seriate, turned broadside to the valves, ex-areolate.—Shrubs; lfts 2 pairs; petiolar gland between proximal pair; inflorescence subcorymbose-paniculate, terminal to hornotinous branchlets.—Sp. 1, of caatinga formations in Bahía, Brazil.

Flowering specimens of *S. harleyi* cannot be distinguished from ser. *Bacillares* except by the low ovule-number, 30–42, a range that is occasionally entered by Jamaican *S. viminea*, which can have as few as 38 ovules. The species agrees perfectly with ser. *Bacillares* in habit, foliage, perianth and androecium, a syndrome which we take to express its true affinity. Its pod, however, differs from that of all *Bacillares*, and especially of those which have or may have less than 50 ovules (*S. viminea* and *S. rizzinii*), in its strong compression, dry cavity, and single row of seeds turned broadside to the valves. The detached pod and seed of *S. harleyi* are essentially those of ser. *Pachycarpae*, but these differ fundamentally in form and texture of the anthers and are distinguished in practice by their ordinarily pinnate, not exactly quadrifoliolate leaves. *Senna harleyi* cannot be inserted into any preformulated category in the genus.

52. Senna harleyi Irwin & Barneby, sp. nov., a *Bacillaribus* jam supra in seriei *Harleyanarum* diagnosi separata.—BRAZIL. Bahia: caatinga woodland ± 700 m, 23 km s. of Aracatú on road BA 630 from Vitoria da Conquista to Brumado, 13.I.1974 (fl), R. M. Harley (with Renvoize, Erskine, Brighton & Pinheiro) 15020.—Holotypus, CEPEC; isotypi, K, MO, NY, P.

Spreading-ascending shrubs 1–2 m branched from base, finely, at first densely pilosulous throughout with flexuously incurved, forwardly appressed and a few random spreading hairs up to ± 0.25 –0.5 mm, the annotinous branches minutely lenticellate, the foliage moderately bicolored, the thinly chartaceous lfts dull olivaceous on both faces but paler beneath, the terminal inflorescence subcorymbose-paniculate, at least at base leafy-bracteate, either not or shortly exerted from foliage.

Stipules erect setiform (2–)3–7 mm, at base not over 0.6 mm wide, persistent.

Lvs 3–6 cm; petiole including obscurely differentiated pulvinus 7–17(–20) mm, at middle 0.4–0.8 mm diam, obscurely sulcate; rachis 4–9 mm; gland between proximal pair stipitate, in profile 1.5–2.5(–3) mm tall, the slender stipe puberulent, the fusiform acute or obovoid obtuse head 0.15–0.45 mm diam; pulvinules 0.8–1.3 mm; lfts 2 pairs, the distal subsymmetrically elliptic or broadly oblance- to obovate-elliptic obtuse or broadly acute 2.2 – 3.7×0.9 – 1.8 cm, at base shallowly cordate on proximal side, rounded to broadly cuneate on distal one, the margin revolute, the very slender straight subcentric dorsally cariniform midrib giving rise to 5–8 pairs of secondary nerves, these finely prominulous on both faces, the tertiary venulation visible but only faintly prominulous, the ultimate reticulation irregular and open; proximal pair of lfts $\pm \frac{2}{3}$ as long, proportionately broader.

Peduncles with raceme axis 2–6 cm; racemes at first subcorymbose, sometimes considerably elongating, 6–35-fld; bracts narrowly lanceolate 4–8 mm, persistent into anthesis, then deciduous; pedicels at anthesis very slender, somewhat thickened in fruit, 15–28 mm; sepals submembranous becoming thinly papery, 3-nerved from base and in age visibly reticulate-nerved, subequal in length or the 2 outermost a trifle shorter than the rest, all in outline lance-oblong or oblong-elliptic, acute or obtuse, (5.5) – 6 – $13.5 \times (2.5)$ – 3 – 4.2 mm; petals pale yellow, puberulent dorsally and along slender short claws, 3 adaxial oblong-ob lanceolate or the central one obovate-flabellate 12 – 14.5×4.5 – 8 mm, the 2 abaxial either slightly longer or shorter, 13 – 15×4.5 – 9 mm, one of them broader and nidulating 2 of the 3 abaxial anthers; filaments puberulent, little or not different in length, 1–3 mm; anthers glabrous, brown when dry, those of 4 median stamens 3.5–4.8, with divaricate beak 0.5–0.8 mm, those of 3 abaxial ones 4.2–4.8 mm, with slender erect beak 1.2–1.5 mm; ovary densely silky-strigulose-pilosulous, the glabrate incurved style 1.5–2.5 mm, near apex 0.3–0.5 mm diam, the obliquely terminal stigmatic cavity 0.15–0.25 mm diam; ovules 30–42.

Pod pendulous, the stipe ± 3.5 mm, the body linear-oblong 5.5 – 14×0.8 – 0.9 cm, plano-compressed, the valves becoming papery, pallid along the moderately thickened sutures and nigrescent medially, densely strigulose and in addition remotely pilosulous, scarcely raised over each seed; seeds 1-seriate, turned broadside to the valves, plumply obovoid $\pm 4 \times 2.5$ mm, the testa lustrously castaneous, with a dark spot (but no true areole) on each broad face.—Collections: 11.—Fig. 21.

In caatinga, ± 350 – 900 m, local in Chapada Diamantina (near Morro do Chapéu) and its e. foothills (Machado Portela) and in Sa. Geral, particularly in the valley of Rio Contas, between 12° and $14^\circ 45'S$ in centr. and s.-e. Bahía.—Fl. I–III(–VI).

Bvi. ser. SPINESCENTES Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Spinescentes** Irwin & Barneby, ser. nov., caulibus aculeis conicis infra stipulas cito evanidas armatis necnon legumine (parum autem noto) elongatim lineari plano-compresso, maturo lomentiformi per septa interseminalia in segmenta monosperma dissoluto



Fig. 21. *Senna harleyi* I. & B. Flowering stem $\times 1$; petiolar gland $\times 5$; detached stamens $\times 5$; pod $\times 1$; seed $\times 5$ (Harley 15020, fl; Rose & Russell 21402, fr).

notabiles, a ser. *Skinneranis*, legumine lomentaceo comparandis, caule aculeato, semine transversali (nec subverticali) patriaque riparia macrothermica hylaeana abstantes.—Sp. typica: *Senna spinescens* (Vogel) Irwin & Barneby.

Corolla zygomorphic and sepals much or little graduated, the petals long-clawed; androecium functionally 7-merous, the anthers firmly subcoriaceous, those of 4 short median stamens straight, their beak latero-terminal biporose, those of 3 long abaxial ones (the centric often a trifle longer than its neighbors) incurved, their beak porrectly produced beyond the separated, obliquely extrorse pores into a blunt triangular or sharply subulate appendage; style stout and short (–2.5 mm, but sometimes obscurely differentiated), the minute stigmatic cavity obliquely terminal; ovules 30–66; pod linear plano-compressed, often much elongated, when ripe breaking up, through the very narrow interseminal septa, into 1-seeded segments; seeds transverse 1-seriate, strongly compressed parallel to the valves; areole present.—Amplly leafy vines and arborescent shrubs armed with conical stipular thorns developing from the pediment of evanescent stipules; glands between all pairs of lfts; lfts 2–9 pairs, symmetrically ovate-acuminate; racemes 3–40-fld, the fls large and handsome.—Spp. 3–4 (most of them incompletely known), of riparian habitats in the Amazon and Orinoco basins in Venezuela, s.-e. Colombia, Brazil, and trans-Andean Peru and Bolivia, one of them remotely disjunct in Costa Rica.

Of the two *Spinescentes* described prior to 1871, Bentham knew *S. spinescens* only from Vogel's description and *S. longiglandulosa* from one collection in flower, still the only known representative of its species. The protologue of *S. spinescens* suggested affinity to our sect. *Isandra* ser. *Interglandulosae*, but the zygomorphic corolla is that of sect. *Senna* and the androecium is much better matched by that of ser. *Bacillares*, *Coriaceae* or *Laxiflorae*. It was in the last-named group that Bentham placed *S. longiglandulosa*, emphasizing its remarkable hispid vesture but unaware that the stipular thorns, which are really the pediment of fugacious stipules and not the stipules themselves, were structurally identical with those of *S. spinescens*. This unusual feature occurs elsewhere in *Senna* only in the North American *S. peralteana*, which differs in the extreme asymmetry of its corolla, typical of sect. *Isandra*, and which must have acquired its grappling thorns by parallel evolution. The pod of *S. spinescens* was first described by Ducke (as that of *Cassia secedens*); its separation into semisuberos, buoyant one-seeded propagules is beautifully adapted to dispersal over great distances by flood-water. Whether or not all members of ser. *Spinescentes* prove to have exactly similar lomentiform pods, we have no doubt that all are closely related, the stipules and floral morphology being quite uniform.

Key to Species of ser. *Spinescentes*

1. Hornotinous branches glabrous or finely pilosulous with hairs less than 0.5 mm; lfts 2–7 pairs.
 2. Petiole 0.8–3.5 cm; lfts of major lvs 4–7 pairs; mostly high-climbing vines, if treelike then calyx with densely golden-strigulose sepals; e. Peru to Orinoco valley in Venezuela and the Brazilian Amazonia; s.-w. Costa Rica. 53. *S. spinescens* (p. 213).
 2. Petiole 5–7 cm; lfts of major lvs 2 or 3 pairs; inner sepals glabrous; arborescent shrubs 3–5 m; local on e. affluents of lower Rio Negro in e. Amazonas, Brazil. *Senna* sp. Manaus (p. 216).
1. Hornotinous branches densely hispid with lustrous brown, horizontally spreading setae up to 2–2.7 mm; lfts 7–9 pairs, fuscous-pilosulous on both faces; Amazon valley in Brazil, but no exact station known. 54. *S. longiglandulosa* (p. 215).

53. *Senna spinescens* (Vogel) Irwin & Barneby, comb. nov. *Cassia spinescens* Hoffmannsegg ex Vogel, Syn. Gen. Cass. 27 & Linnaea 11: 675, descr, ampli. 1837.—Typus infra sub var. *spinescente* indicatur.

High-climbing riparian vines or (reportedly, when free-standing) arborescent shrubs, at anthesis 4 m upward, variably pubescent with subappressed or erect and incurved hairs up to 0.2–0.45 mm, the obtusely ribbed hornotinous stems and foliage either pubescent or glabrous, the ample bicolored lfts when dry dark brown above, paler reddish-brown beneath, dull on both faces or sublustrous above, the always rufous- or golden-pilosulous thyrsoide-paniculate inflorescence leafy-bracteate proximally, becoming leafless distally and exserted, sometimes up to 1 m long.

Stipules (caducous, little known) elevated on a coarse conical spur, falcately linear-attenuate or subsetiform up to 10×0.6 mm, the persistent lignescent spurs ascending or recurved (2–)4–11 mm prickly-like, functioning as grapples.

Major lvs (1–)1.5–3.5 dm; petiole including dilated pulvinus 0.8–3.5 cm, at middle 0.8–2.5(–3) mm, not or obscurely sulcate; rachis 5–19 cm, the shallowly sulcate segments between lfts (1.2–)1.5–4.5(–5) cm; glands erect from lf-stalk between all pairs of lfts, oblong-ellipsoid or hornlike obtuse or acute glabrous (1.3–)1.6–3 \times 0.7–1.1 mm; pulvinules 1.5–5.5 mm; lfts 4–7 pairs, accrescent (exceptionally decrescent) upward along rachis, symmetrically ovate or oblong-ovate short-acuminate, the distal pair 5–16 \times 2–7.5 cm, all at base equilaterally rounded or shallowly cordate, the margins revolute, the straight centric midrib depressed on upper and cariniform on lower face, the (9–)10–15 pairs of camptodrome (with random intercalary) secondary veins immersed or almost so above, sharply prominent beneath, the connecting tertiary and reticular venulation variable; proximal (smallest) pair of lfts ovate 2–7 cm, fewer-nerved, often caducous.

Racemes 4–40-fl'd, the axis including the stout, widely ascending or strict peduncle becoming 4.5–20(–24) cm; bracts caducous, lanceolate or broadly deltate and abruptly shortly caudate-acuminulate 1.5–4.5 mm; pedicels 2.5–4 cm; buds subglobose when very young, the sepals separating long before anthesis of fl; sepals firm with narrow submembranous margins, little or strongly graduated, the longest 7–15 mm (described further under the vars.); petals yellow subhomomorphic except the adaxial ones broader, all slenderly long-clawed and puberulent dorsally, 25–38 mm long, the obovate or spatulate obtuse or emarginate or obcordate blades 16–24 mm wide; androecium functionally 7-merous, the filaments puberulent or pilosulous, of 4 median stamens 2–4.5 mm, of 3 abaxial ones 4–17 mm, that of the centric one usually longest, its 2 neighbors variably dilated, the anthers glabrous or rarely puberulent, of 4 median stamens in 2 sets, the more adaxial slightly longer, all very slightly incurved 6.5–12 \times 2–2.5 mm, their lateral 2-porose beak scarcely 0.5 mm, the 3 abaxial anthers lunately incurved (7.5–)9.5–20 \times 1.2–2.4 mm, abruptly contracted into a sigmoidally porrect beak 1–2 mm; ovary densely strigulose-pilosulous, the vesture commonly golden or rufous; style glabrescent, obscurely differentiated or up to 2.5 mm long, at apex incurved just below the minute terminal stigmatic cavity and there 0.4–0.7 mm diam; ovules 30–66.

Pod pendulous, the stout stipe 6–10 mm, the linear plano-compressed straight or almost straight body (10–)15–50 \times 1.1–1.5 cm, 2-carinate by the slender, shallowly undulate sutures, the firmly pithy valves flat or very slightly elevated (and discolored) over the seeds, the seed-locules 5–9 mm long separated by narrow suberous septa, dry within, finally breaking apart into 1-seeded indehiscent lomentiform segments; seeds transverse, obovate-oblong very strongly compressed

parallel to the valves, $\pm 6-7 \times 4-5$ mm, the atrofuscos testa smooth dull, the sublustrous black areole narrowly or broadly oblong-elliptic $4-4.5 \times 1.6-2.2$ mm.

Except for its two poorly known allies described immediately below, which see for further comment, *S. spinescens* is unique among Hylaeae sennas in its stipular thorns that actually or potentially serve as grappling hooks for the sarmentose branchlets. These thorns are not the stipules themselves, which are setiform and caducous, but enlarged lignescent pediments, each bearing at tip a scar from which the true stipule has fallen. A similar modification has taken place in the stipules of *S. peralteana* of Yucatan and neighboring Guatemala, but combined with a much smaller, highly asymmetric corolla and quite different androecium and pod. The very large flowers and pendulous tapelike pod are equally distinctive of *S. spinescens*. In the protologue of *Cassia secedens*, Ducke was the first to describe the lomentaceous nature of the fruit, which breaks up when fully ripe into oblong-rhombic one-seeded suberous water-borne segments. This method of dispersal is neatly adapted to the riparian habitat of *S. spinescens* and goes far to explain the wide interrupted range of the species along the Amazon and Orinoco valleys. A similar but shorter pod is found in the xeromorphic Mexican and Caribbean *S. skinneri*, otherwise very different in habit and foliage and presumably not closely related.

Over most of its range *S. spinescens* is a woody vine and essentially monomorphic in details of flower-structure and pubescence; but a notable variant known from several collections from river-banks near the Brazil-Colombia border country, said to be a small free-standing tree rather than a liana, is, with the same pod, abruptly different in details of pubescence, foliage, anthers and style, and cannot be passed over without taxonomic recognition.

Key to the Varieties of *S. spinescens*

1. Lfts glabrous above; sepals strongly heteromorphic, the inner ones (mostly glabrate, rarely velutinous) $11-15 \times (5-6-12)$ mm; longest anther (excluding beak) $7.5-13.5$ mm; style usually less than 1, rarely up to 2.5 mm, ± 0.4 mm diam; high-climbing vines, widely dispersed in Amazon and Orinoco basins; s.-w. Costa Rica. 53a. var. *spinescens* (p. 214).
1. Lfts pilosulous on both faces; sepals subequal, $6-8.5 \times 2.5-3$ mm, except toward margin densely golden-strigulose dorsally; longest anther (excluding beak) $14-20$ mm; style $1-2 \times 0.6-0.7$ mm; said to be trees $4-7$ m; local on Vaupés and Apaporis rivers in s.-e. Colombia and adjacent Amazonas, Brazil. 53b. var. *schultesiana* (p. 215).

53a. *Senna spinescens* (Vogel) Irwin & Barneby var. *spinescens*. *Cassia spinescens* Vogel, 1837, ll. cc., sens. strict.—“Hrb. W[illdenov.] 7960 . . . Hbt. In Brasilia pr. Bahia.”—Holotypus, collected by Friedrich Wilhelm Sieber, probably on the lower Amazon in Pará, B (*hb. Willd.* 7960)! = F Neg. 1748.

Cassia secedens Ducke, Arch. Bot. Jard. Rio de Janeiro 3: 113. 1922.—“ . . . ad margines inundatos fluvii Xingú inferioris affluentis Tucuruhy prope locum Victoria, 5-8-1918, [RB] n. 17.164, et in palude prope Gurupá, 10-8-1918, [RB] n. 17.191; [legit] A. Ducke.”—Lectoholotypus, Ducke in RB 17164, RB; isotypi, G, P! paratypi Ducke in RB 17191, G!

Characters as given in key; vascular bundles of mature stems separating (always?) into independent ropes.—Collections: 18.

River banks, lake-shores and lowland swamp forest or igapó, 5–175 m, discontinuously widespread and either rare or inaccessible (therefore overlooked), along the main streams and major affluents of the Orinoco and Amazon rivers in Venezuela (s.-w. Amazonas, w. Bolívar, s.-e. Apure, Delta Amacuro), Peru (Loreto), Brazil (upper Solimões and Madeira basins in Amazonas and Rondônia, middle

Araguaia basin in Goiás and lower Amazonia in Pará and Amapá) and adjacent Bolivia (Pando); remotely disjunct in s.-w. Costa Rica (Golfo Dulce, Puntarenas); described, probably mistakenly, from Bahia, whence there are no confirming records.—Fl. primarily IX–IV, intermittently through the year.—*Retama conespina* (Peru).

All specimens of var. *spinescens* that we have seen from stations peripheral to its whole South American range, in Venezuela, Peru, Rondônia, Goiás and lower Brazilian Amazonia, are alike in having highly heteromorphic sepals, the outer more or less pilosulous, the inner glabrous and about 9–12 mm wide. About São Paulo de Olivença on the Solimões and Jandiatuba rivers in western Amazonas, Brazil, otherwise identical plants (*Krukoff 8974*, *Ducke 1504*, *Mori & Prance 9143*) have all sepals golden-strigulose and the inner ones relatively narrow (12–15 × 5–6 mm). The vesture of the calyx might suggest transition to var. *schultesiana*, but foliage and androecium are in no way different from those of typical var. *spinescens*. The disjunct Costa Rican plant appears wholly typical.

53b. *Senna spinescens* (Vogel) Irwin & Barneby var. *schultesiana* Irwin & Barneby, var. nov., a var. *spinescente* foliolis cum caulibus ubique moliter minutim pilosula (nec superne vel utrinque glabris), foliolorum pulvinulis abbreviatis 1.5–2.5 (nec 3–5.5) mm longis, antheris abaxialibus elongatis rostro excluso 15–20 (nec 7.5–13.5) mm usque longis, sepalis subaequilongis 6–8.5 tantum (nec 11–15 usque) mm longis, styloque saepissime longiori ac crassiori 1–2 × 0.7 (nec × 0.4) mm abstans.—COLOMBIA. Vaupés: Río Apaporís at Soratama (above mouth of Río Kananarí, ±270 m, 6.II.1952 (fl), *Richard Evans Schultes & Isidoro Cabrera 15183*.—Holotypus, US.

Characters as given in key and diagnosis.—Collections: 7.

Riparian forest, at least sometimes inundated at flood seasons, 170–270 m, along ríos Apaporís and Vaupés (Caiari) in Comisaría de Vaupés, Colombia and on upper ríos Negro and Vaupés in n.-w. Amazonas, Brazil.—Fl. I–IV.

Flowering specimens of var. *schultesiana* are sharply distinguished from var. *spinescens* by the pubescent foliage, diminished calyx and very large anthers, but the pods are identical. While all collectors agree that var. *spinescens* is a woody climber, sometimes working its way high into the canopy, Schultes and Zarucchi saw var. *schultesiana* in three stations as a tree 4–7 m, Steward as a treelet 3 m tall. If the difference in habit can be confirmed, the status of var. *schultesiana* may require reevaluation. The presence of recurving spines suggests, however, that a potentially lianallike or at least sarmentose habit of growth is a basic attribute of the species.

54. *Senna longiglandulosa* (Bentham) Irwin & Barneby, comb. nov. *Cassia longiglandulosa* Bentham in Martius, Fl. Bras. 15(2): 119. 1870.—“Habitat in sylvis secus fluv. Amazonum: Martius.”—Holotypus (2 sheets), M! = F Neg. 6245.

Cassia longiglandulosa sensu Bentham, 1871, p. 537 (“*longeglandulosa*”).

Habit and stature unknown, but the presence of stout recurving stipular thorns suggesting a tall vine or sarmentose bush-rope similar to *S. spinescens*, the stout, angulately ribbed hornotinous branches densely hispid with erect lustrous livid-brown setae up to 2–2.7 mm mixed with shorter fuscous incurved hairs, the foliage thinly pilosulous on both faces, the inflorescence an exserted panicle of racemes.

Stipules of *S. spinescens*, but the caducous linear blades setose-ciliate, the persistent conic base $\pm 5\text{--}9$ mm.

Lvs apparently like those of *S. spinescens* in texture and shape, those at base of panicle alone known, the lfts of these 6–9 pairs, the distal pair oblong-ovate-acuminate from symmetrically shallow-cordate base up to $\pm 5 \times 2.5$ cm; petiole hardly longer than first segment of rachis; glands between each pair of lfts hornlike $2\text{--}4.5 \times 0.55\text{--}0.8$ mm acute.

Fl-buds pilosulous at base, glabrate distally; sepals obovate, strongly graduated, the smallest outer one $\pm 4.5\text{--}5.5$ mm, the innermost and largest $\pm 10 \times 7$ mm; petals and androecium of *S. spinescens*, the longest petal ± 3 cm; 4 median anthers 8–11 mm, the lateral beak almost 0; body of 3 abaxial anthers 11–14 mm, the sigmoidally porrect beak ± 1.5 mm; androecium densely rufous-pilosulous; style scarcely differentiated from ovary, just below the minute terminal stigmatic cavity incurved and ± 0.4 mm diam.

Pod unknown.—Collection: 1.

Habitat and range unknown, to be sought in riparian forest along the Amazon and its tributaries.—Fl. season unknown.

Bentham provisionally referred *C. longiglandulosa* to his series *Laxiflorae* next to *C. appendiculata* (our *Senna australis*) and *C.* (our *S.*) *cana*, but we think this was almost certainly a mistake, for it lacks the pedicellar glands characteristic of the other *Laxiflorae*. The protologue of *C. longiglandulosa* is at fault in describing the *stipules* as 2–3 lines long, thickened and reflexed; the organs described are the thickened thornlike bases from which the caducous setiform stipule-blades have fallen. These stipular thorns, like the perianth and androecium, are closely matched in *S. spinescens*, so closely, in fact, that we can imagine *S. longiglandulosa* as little more than a setose form of that species, comparable to the occasional setose forms of *S. scabriuscula*. The status of the species is contingent on rediscovery of the plant and on knowledge of its mature foliage and pod; but for the present the setose armament of the stems combined with leaflets a little more numerous, even in the few known upper leaves, than in the largest leaves of *S. spinescens*, must serve to distinguish it.

SPINESCENTES IMPERFECTE COGNITAE

Senna sp. (Manaus).

Arborescent, sometimes sarmentose shrubs at anthesis 3–4 m, glabrous below the minutely rusty-puberulent inflorescence, the ample, stiffly chartaceous lfts bicolored, when dry lustrous brown above, paler dull beneath, the racemes axillary to diminished distal lvs forming a small panicle.

Stipules caducous, not seen, but their base or pediment becoming on anctuous stems a lignescent cone or stout thorn 1–5 mm.

Lvs below inflorescence 2–3.4 dm; petiole including discolored wrinkled pulvinus 5–7 cm, at middle 1.2–1.8 mm diam, shallowly narrowly sulcate; rachis 2.7–9.5 cm, the 1–2 interfoliolar segments 2.2–5 cm; glands (much eaten) between all pairs of lfts hornlike or conic-subulate $2\text{--}3 \times 0.7\text{--}1.4$ mm obtuse or subacute; pulvinules wrinkled discolored 5–8 mm; lfts 2–3 pairs accrescent distally, symmetrically ovate- or ovate-oblong-acuminate $9.5\text{--}16 \times 4\text{--}6.5$ cm, 2.2–2.8 times as long as wide, at base rounded or very widely shortly cuneate, the acumen obtuse or emarginate, the margin plane or almost so, the midrib depressed-sulcate ventrally, cariniform dorsally, the 10–13 pairs of camptodrome secondary and the open tertiary and reticular venulation all subequally prominulous on both faces.

Racemes loosely (subumbellately) 3–10-fl'd, the axis including peduncle 4.5–14 cm; bracts caducous (little known), narrowly lanceolate ± 3 mm; pedicels at full anthesis 24–36 mm; calyx of *S. spinescens* var. *spinescens*, the sepals strongly graduated, the outermost puberulent 4.5–5.5 mm, the innermost glabrate obovate-suborbicular 11–14 \times 9–10 mm; corolla, androecium and pistil of var. *spinescens*, the style 1.5–2.5 mm, golden-strigulose almost to tip, there 0.6–0.8 mm diam; ovules ± 34 .

Pod unknown.—Collections: 3.

A handsome large-flowered senna, apparently closely related to *S. spinescens* var. *spinescens* and perhaps merely a form or variety of that species, but differing in the long petiole and few pairs of leaflets, the blades of which are more highly lustrous and more sharply reticulate-venulose. Collectors describe it as a shrub or small tree, not as a vine, but the specimen may be from young plants in disturbed igapó woodland. The stipular thorns characteristic of ser. *Spinescentes* are present on old wood, but appear less well developed than those of *S. spinescens*. The pod is required before the entity can be evaluated.

SPINESCENTES INDETERMINATAE

Buchtien 1778 (NY): Poor specimens, lacking the pod which alone can be decisive, appear to represent a fourth member of ser. *Spinescentes*. They were collected at Mapirí, Bolivia at 850 meters elevation, remote both in distance and environment from the nearest known populations of *S. spinescens*, and were described by the collector as *hoherer Baum*. The flowering branchlets show no stipular thorns, but these *could* be present on older stems. The leaves are long-petiolate as in the unnamed species from Manaus described above, but they are only three pairs and are accompanied by the glands of ser. *Spinescentes*. The calyx is golden-strigulose, much smaller than that of *S. spinescens*, the outer sepals ± 2.5 mm, the inner only 5 mm long. The petals, while of the same form, are only ± 25 mm long and more shortly clawed. The androecium is that of *S. spinescens* except a little smaller.

Bvii. ser. SKINNERANAE Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Skinneranae** Irwin & Barneby, stat. et nom. nov.
Phragmocassia Britton & Rose, N. Amer. Fl. 23(4): 245. 1930, pro gen.—Species unica: *Ph. skinneri* (Benth) Britton & Rose \equiv *Cassia skinneri* Benth \equiv ***Senna skinneri*** (Benth) Irwin & Barneby.

Fl essentially that of ser. *Laxiflorae* and *Coriaceae*, but style gently incurved distally, the stigmatic orifice obliquely terminal; ovules 16–24; pod linear plano-compressed, the sutures undulately constricted between seeds, the valves when ripe disjoining through the interseminal septa into 1-seeded indehiscent loments; seeds basipetally descending, subquadrate, turned broadside to the valves; areole present.—Shrubs, sometimes arborescent, variably rufescent-pilosulous; glands between proximal and sometimes succeeding pairs of lfts; lfts 3–7 pairs, ample; racemes mostly 1–5, rarely ± 15 -fl'd, the fls large and showy.—Sp. 1, of lowland and submontane s. Mexico, Central America and Venezuela.

Senna skinneri is isolated in the Mexican and Central American floras but has close resemblance and presumably genetic affinity to the largely Brazilian ser. *Coriaceae* and *Laxiflorae*, from which it differs in lack of pedicellar glands and in the lomentiform pod. The pod resembles that of ser. *Spinescentes*, a small

Amazonian and disjunctly Costa Rican group of mostly vinelike riparian sennas equipped for climbing with stout conical stipular spurs, which belongs no doubt to the same circle of affinity but differs greatly in habit and ecology. Before it was awarded generic status by Britton & Rose, *S. skinneri* had been placed by Bentham at the end of sect. *Chamaesenna* ser. *Pachycarpae*, with the comment that it combined the pod of some other series with the foliage of ser. *Corymbosae* and the flower of some *Bacillares*. Bentham, however, saw only fragmented pods of *S. skinneri*. He could not have guessed that fracture through the interseminal septa into achenelike one-seeded segments is the normal dispersal mechanism for the species, nor that the seeds themselves are basipetally descending within their segment, a feature that would forcibly have suggested transfer to sect. *Prososperma*.

55. *Senna skinneri* (Bentham) Irwin & Barneby, comb. nov. *Cassia skinneri* Bentham, Trans. Linn. Soc. London 27: 542. 1871.—“Guatemala, *Skinneri*.”—Holotypus, CGE (hb. Lindl.)! = NY Neg. 9690.—*Phragmocassia skinneri* (Bentham) Britton & Rose, N. Amer. Fl. 23(4): 245. 1930.

Cassia nelsonii Rose, Contrib. U.S. Nat. Herb. 5: 135, fig. 1. 1897.—“Collected by E. W. Nelson between San Geronimo and La Venta, State of Oaxaca, July 13, 1895 (No. 2783) and also along road from Ocuilapa to Tuxtla, State of Chiapas . . . August 29, 1895 (No. 3069); also by Mr. C. G. Pringle . . . near Cuernavaca . . . (no. 6340).”—Lectoholotypus, *Nelson 2783*, US! paratypes, *Nelson 3069*, US! *Pringle 6340*, NY, US!—Equated with *C. skinneri* by Standley, 1922, p. 408.

Cassia trichoneura T. S. Brandegee, Univ. Calif. Pub. Bot. 6: 179. 1915.—“. . . near San Geronimo, Oaxaca. [*C. A. Purpus*] No. 7153 . . .”—Holotypus, UC 17075! isotypi, F, MO, NY!—Equated with *C. skinneri* by Standley, 1922, l.c.

Peirania falconensis Pittier, Bol. Soc. Venezol. Ci. Nat. 10: 110. 1945.—“Falcón: entre Coroy Alta Gracia; flores Mayo 1, 1917 ([H. M.] Curran & [M.] Haman 740, tipo.)”—Holotypus, VEN 3601! = NY Neg. 6326.—isotypi, GH! and numbered 740 but dated 24.IV, US!

Cassia skinneri sensu Standley, 1922, p. 408.

Potentially arborescent shrubs, at anthesis (1–)1.5–7(–10) m, with tortuous glabrate, brown, castaneous or nigrescent, prominently lenticellate older and densely pubescent younger branchlets, the latter with lf-stalks, lower face (overall or along nerves) and margins of lflets, and axes of inflorescence variably strigulose, pilosulous or pilose with subappressed, incurved or spreading, often yellowish or rufescent hairs up to 0.2–1.3 mm, the foliage bicolored, the usually ample lflets above rich green (when dry commonly rubescent) glabrous or thinly pilosulous, not or scarcely lustrous, paler beneath, the few-fl'd racemes either axillary to distal lvs and immersed in foliage or forming a corymbiform, shortly exserted panicle.

Stipules straight erect, or divaricate from pulvinus and sinuately incurved to erect, linear-attenuate (6–)7–16 × 0.2–0.6 mm, the firm blades 1-nerved, deciduous before the lf.

Lvs (3–)4–10(–11) cm; petiole including moderately swollen pulvinus 12–20(–23) mm, at middle subterete except for narrow ventral sulcus, (0.3–)0.4–0.8(–1) mm diam; rachis 1.5–4.5(–5) cm; gland erect between proximal pair of lflets, stipitate or less often sessile, in profile (0.7–)1–2.7(–3) mm tall, the stipe either puberulent or glabrous, the slenderly ellipsoid or ovoid head 0.3–0.45 (–0.6) mm diam, sometimes similar glands at second or third pair; pulvinules 0.8–2.2 mm; lflets (2–)3–7 but of almost all lvs 4–6 pairs, emphatically accrescent distally, the proximal pair half or less as long as the distal and proportionately much

broad, the distal pair cuneate-obovate to broadly cuneate-oblongate from an obliquely dilated base, obtuse or shallowly emarginate $22-52 \times 10-22$ mm, 1.7–2.7(–2.9) times as long as wide, the straight centric midrib cariniform beneath, giving rise to $\pm 6-9$ pairs of camptodrome secondary nerves, these either finely prominulous (and often differentiated by pale coloring) on both faces or only beneath, a yet finer open mesh of connecting tertiary venules sometimes also prominulous.

Peduncles 1–35 mm; racemes shortly or subumbellately 1–5 (rarely to 5–15)-fld, the axis becoming (0–)1–6 (rarely 20–40) mm; bracts firm oblanceolate to lance-elliptic or -attenuate (3–)4–10 mm, persistent into anthesis, then dry deciduous; pedicels (22–)25–45 mm; young fl-buds obovoid-subglobose pilosulous, but the inner sepals and petals expanding long before true anthesis; sepals firm ovate, oblong-obovate or suborbicular, strongly graduated, the dorsally pilosulous outer ones only $\pm \frac{1}{2}$ as long as the glabrous inner ones, these greenish (6–)7–12 mm, faintly 5–7-nerved from base; petals golden-yellow, all conspicuously clawed, puberulent or pilosulous dorsally at least along nerves, the 3 abaxial ones amply ovate-cordate, the vexillar one emarginate, the 2 abaxial obliquely obovate or oblong-elliptic and slightly longer, the longest (25–)28–39 mm; androecium functionally 7-merous, the puberulent filaments of 4 median stamens 2–4.5 mm, of 3 (or at least 2) abaxial ones 4.5–9 mm, the glabrous or thinly pilosulous anthers of 4 median stamens slightly graduated by pairs, 4.5–6 mm, straight or a little incurved distally, the divaricate-truncate beak 0.3–0.5 mm, those of 3 abaxial ones strongly incurved 8–12 mm, the porrect beak 0.6–1 mm, the beaks of all dehiscent by parallel slits; ovary densely white-strigulose; style filiform 4.5–7 mm, gently incurved but not dilated distally, at apex 0.3–0.45 mm diam.

Pod pendulous, the stipe 7–15(–18) mm, the linear, straight or slightly decurved, strongly compressed ribbonlike body 8–14(–16) \times 0.7–0.95 cm, the sutures undulately constricted at each isthmus, the green, ultimately coriaceous, brownish-nigrescent valves becoming sinuously reticulate-venulose, not elevated over the greatly flattened seeds, the interseminal septa very narrow, early forming lines of fracture, the 1-seeded segments 7–9.5 mm long, dispersed as indehiscent loment; seeds (poorly known) subquadrate 4.7–5 \times 4–4.3 mm, the testa castaneous, slightly roughened sublustrous, the narrowly elliptic areole $\pm 1.5 \times 0.4-0.6$ mm.—Collections: 71.

Seasonally dry oak or pine-oak woodlands, thorn forest, savanna thickets and mixed deciduous xerothermic brushlands, in places aggressively abundant following disturbance or grazing, sometimes forming roadside hedges, from sea-level on the Pacific coast of Mexico and Honduras up to 950 m in Morelos, 1100 m in Oaxaca, 1350 m in Chiapas and 1100 m in Nicaragua, interruptedly dispersed from s. Mexico to n. Venezuela: Balsas Depression from e. Michoacán to s. Puebla; Pacific lowlands and interior hill country from w. Guerrero to Oaxaca (especially common around Tehuantepec) and highland interior Chiapas; s.-e. Guatemala in Jalapa and Zacapa (where attaining the Caribbean drainage); lowlands around Gulf of Fonseca in s.-e. Honduras (Valle and Choluteca) and adjacent coastal (León) and submontane (Estelí) Nicaragua; lowland n.-w. Costa Rica (Guanacaste); unknown from Panama or Colombia but reappearing in Venezuela: Caribbean lowlands of Falcón; savannas around n. edge of Orinoco valley at $\pm 600-1200$ m in Portuguesa (Acarigua), Cojedes (El Pao), and n. Guárico.—Fl. in Mexico and Central America (V–)VI–X; in Venezuela VII–IX.—*Chiquichiqui* (Venezuela); *parácata* (Michoacán).

Bviii. ser. CORIACEAE (Bentham) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Coriaceae** (Bentham) Irwin & Barneby, comb. nov.
Cassia sect. *Prososperma* ser. *Coriaceae* Bentham, Trans. Linn. Soc.
 London 27: 537. 1871, ex parte, char. mut.—Sp. lectotypica: *C. cori-
 folia* Bentham = **Senna corifolia** (Bentham) Irwin & Barneby.

Corolla zygomorphic, but sepals strongly graduated; fertile stamens 7, 4 median shorter, 3 abaxial longer (the centric one often a little narrower and shorter than its neighbors), the anthers subcoriaceous, all shortly beaked, the beaks 2-porose, those of median stamens divaricate, those of abaxial ones porrect but not longer; style linear-attenuate straight 4.5–10 mm, symmetrically truncate; ovules 18–46; pod linear plano-compressed, the ripe valves obscurely corrugate unappendaged; seeds 1-seriate transverse, narrowly oblong or oblong-ellipsoid compressed parallel to valves.—Shrubs, some weakly arborescent in age; stipules either dilated herbaceous or subulate fugacious; glands between all pairs of lflets, ovoid or patelliform; racemes loosely 3–35-fl'd, the pedicels charged, commonly near or above middle, rarely (*S. kuhlmanii*) at base, with a fusiform or claviform gland.—Spp. 3, handsome, large-fl'd, 2 of the Brazilian Planalto in s.- and e.-centr. Goiás, centr. Minas Gerais and s.-e. Bahia, 1 of Sa. do Cachimbo in s.-w. Pará and in s.-w. Rondônia.

While the epithet *Coriaceae* is an old one, our concept and definition of the series are new. Bentham was acquainted with both flower and pod of *S. reniformis* and associated it with the Old World *S. auriculata* in an artificial group of chamaesennas characterized principally by the broad herbaceous stipules; but he did not fail to notice its resemblance to some compatriot prosospermas, meaning our ser. *Laxiflorae*. *Cassia corifolia*, known in flower only, was paired by Bentham with the likewise imperfectly understood *C. gardneri* to form a ser. *Coriaceae* provisionally subordinated to sect. *Prososperma*. Now that its pod is known, *S. gardneri* is recognized as belonging to the bijugate ser. *Bacillares*, whereas *S. corifolia* has precisely the fruit of *S. reniformis*, with which it agrees further in the foliaceous stipules and the gland perched high on one edge of the flattened pedicel. *Senna reniformis* and *S. corifolia* are, in fact, close relatives, collectively resembling ser. *Laxiflorae* in floral morphology but different in position of the pedicellar gland and in absence of the accessory ridge on the pod's valves. To this firm nucleus we somewhat reluctantly add the more recently discovered *S. kuhlmannii*, fully compatible as to flower and fruit but having the pedicellar gland basal as in *Laxiflorae*, small caducous stipules, and discoid petiolar glands unique in *Senna*. This peculiar species could logically form a monotypic series coordinate with *Coriaceae* and *Laxiflorae*, but its intimate affinity with the former would then be obscured.

Key to the Species of ser. *Coriaceae*

1. Stipules foliaceous, many-nerved from base, amplexicaul-auriculate, persistent; petiolar glands fusiform; racemes (6–)10–35-fl'd; gland near or above middle of pedicel; ovules 30–46; widespread over highlands of Brazilian Planalto in s.-e. Bahia, Minas Gerais and Goiás.
2. Lflets ovate- or obovate-acuminate to ovate- or lance-elliptic, the margin revolute; stipules obtusely auriculate at base on side further from petiole, abruptly acuminate-caudate distally; centr. Minas Gerais and s.-e. Bahia. 57. *S. reniformis* (p. 223).
2. Lflets broadly oblong, ovate-oblong or oblong-elliptic, very obtuse or emarginate, the margin plane; stipules truly reniform, broadly rounded at both the amplexicaul auricle and distally; e.-centr. Goiás and n.-centr. Minas Gerais. 56. *S. corifolia* (p. 221).
1. Stipules setiform, 1-nerved, fugacious; petiolar glands depressed-discoid; racemes 3–11-fl'd; gland at base of pedicel; ovules 18–26; s.-w. Pará and s.-e. Rondônia. 58. *S. kuhlmanii* (p. 224).

56. *Senna corifolia* (Bentham) Irwin & Barneby, comb. nov. *Cassia corifolia* Bentham in Martius, Fl. Bras. 15(2): 120. 1870, sens. ampliatis.—Typus infra sub var. *corifolia* indicatur.

Shrubs, sometimes arborescent in age, at anthesis 1–3 m, the trunks reaching 6 cm diam, the anthesis branchlets and lf-stalks livid-castaneous smooth, either glabrous throughout, or the young stems, lf-stalks and rarely the dorsal face of lflets pilosulous with ascending pale or rufescent hairs up to 0.2–0.4(–0.5) mm, the ample stiffly chartaceous foliage and foliaceous stipules all olivaceous sublustrous above, paler dull or sometimes subglaucous beneath, intricately reticulate on both faces, the inflorescence an open pyramidal panicle of racemes well exerted from foliage.

Stipules foliaceous amplexicaul persistent, transversely reniform (0.7–) 1–3 × (1.5–)2–5.5 cm, broadly rounded at both ends, palmately many-nerved from base, thence intricately reticulate like lflets.

Lvs (disregarding depauperate ones subtending lower racemes) 1–2 dm; petiole including livid wrinkled pulvinus 1.5–3.5(–4) cm, at middle subterete 1.2–2.2 mm diam, distally like rachis openly sulcate ventrally; rachis 2–9.5 cm; glands between all pairs of lflets sessile or almost so, plumply ovoid, ovoid-ellipsoid or subglobose, acute or obtuse, 0.9–1.6 × 0.6–1.4 mm; pulvinules wrinkled (2–)2.5–5.5 mm; lflets 2–5 pairs, scarcely or little accrescent distally, broadly oblong, ovate-oblong or oblong-elliptic, rarely asymmetrically ovate-suborbicular, always obtuse or emarginate, at base inequilaterally rounded or cordate on both sides, the distal pair ±4–10 × 1.5–7 cm, 1.1–2.6 times as long as wide, the margins plane, often sharp-edged beyond the marginal nerve, the straight subcentric mid-rib scarcely or not elevated above, cariniform beneath, the ±8–13 pairs of major camptodrome with intercalary secondary veins and tertiary reticulation all sharply prominulous beneath, often almost as emphatic above but there sometimes subimmersed.

Peduncles incurved-ascending 2.5–10 cm; racemes loosely (6–)10–35-fl'd, the axis becoming 3–12(–16) cm, the fls in bud elevated above those expanded; bracts (caducous, little known) ovate- or lance-acuminate ±4–5 mm, membranous-margined; pedicels (at and after anthesis) 1.5–4 cm, charged laterally, well above middle, with a sessile or substipitate ovoid or ellipsoid gland 0.7–1.4 mm; buds plumply ovoid-ellipsoid very obtuse glabrous; sepals subpetaloid, at middle yellow, greenish or red-tinged, hyaline-margined, strongly graduated, all obovate concave, the small outer ones 4.5–8.5 mm, the largest inner one 14–21 mm; petals yellow glabrous, finely brown-veined when dry, subhomomorphic except the banner a little smaller and 2 abaxial ones a little larger and more oblique than the rest, all in outline obovate or obovate-flabellate beyond the slender claw, the adaxial ones ±20–25 mm, the larger abaxial ones 24–29 mm; androecium glabrous, the filaments of 4 median stamens 1.5–2.5 mm, of the central abaxial one 3.5–5.5 mm, of 2 lateral-abaxial ones (dilated, ribbonlike 1.2–1.8 mm wide) 10–13 mm, the anthers of 4 median ones 4.5–6.5 mm nearly straight subtruncate, the divaricate beak ±0.6–0.8 mm, of 3 abaxial ones lunately incurved with porrect beak ±0.8–1 mm, the body of the central one 6–8 mm, of its 2 neighbors 10–13 mm, the beaks of all 2-porose; ovary either glabrous or densely ascending-pilosulous; style straight filiform 5.5–6.5 mm, at apex symmetrically truncate and 0.3–0.5 mm diam; ovules 30–45.

Pod declined at random angles, long persistent, the stout stipe 3–8 mm, the body in profile linear-oblong 8–20 × 1–1.4(–1.5) cm, straight or lunately decurved, plano-compressed, margined by the stout riblike straight or undulately constricted sutures, the stiffly chartaceous livid-castaneous, finally nigrescent

valves finely transverse-venulose, scarcely elevated over seeds, the narrow but thick interseminal septa 3.5–5 mm apart; seeds (little known) narrowly oblong-ellipsoid compressed parallel to the pod-valves, $5.5\text{--}6 \times \pm 2.5$ mm, the testa castaneous lustrous finely minutely pitted, the smooth linear-elliptic areole $\pm 3 \times 0.5$ mm.

Cassia corifolia was described by Benthham from a single flowering collection and placed provisionally in sect. *Prososperma*, its close affinity to *C.* (sect. *Chamaesenna*) *reniformis* going unrecognized. We now have pods of *S. corifolia* from the type-locality near Niquelândia in central Goiás and these, like the seeds, the perianth with androecium, and especially the peculiar gland situated high on one margin of the compressed pedicels, are closely comparable only with those of *S. reniformis*.

Our comprehensive description of *S. corifolia* includes not only the original plant of Benthham, still known from only one locality, but also the more widely dispersed *Cassia caesia* Harms, unknown to Benthham, of which *S. corifolia* sens. str. appears to us to be little more than a striking local variant differing in the fewer broader leaflets, but virtually identical in flower and fruit. In describing *C. caesia*, Harms repeated Benthham's error in assessment of affinities, aligning his new species not among the chamaesennas where it properly belonged but with *C.* (sect. *Prososperma*) *appendiculata* (= *S.* (ser. *Laxiflorae*) *australis* (Vell.) Irwin & Barneby). For both Harms and Benthham the dilated reniform stipules were no doubt a decisive factor.

Key to the Varieties of *S. corifolia*

1. Lfts 3–5 pairs, relatively narrow, $(3.7\text{--})4\text{--}9 \times 1.5\text{--}4$ cm, 1.8–2.6 times as long as wide; local but widespread in highland e.-centr. and s.-e. Goiás and Sa. do Espinhaço in n.-centr. Minas Gerais. 56a. var. *caesia* (p. 222).
1. Lfts 2 pairs, relatively broad, the distal pair $\pm 5\text{--}10 \times 4\text{--}7$ cm, less than 1.5 times as long as wide; very local on headwaters of Rio Tocantins in centr. Goiás. 56b. var. *corifolia* (p. 222).

56a. *Senna corifolia* (Benthham) var. *caesia* (Taubert ex Harms) Irwin & Barneby, stat. nov. *Cassia caesia* Taubert ex Harms, Feddes Repert. 24: 123. 1924.—“Brasilien: Minas Geraes, Rio das Pedras au Valu (Glaziou n. 19078; 1891/92).”—Holotypus, †B = F Neg. 1666! neoholotypus, collected V. 1892, P (3 sheets)! isotypus, K! = NY Neg. 1547.—*C. caesia* Harms ex Glaziou, 1906, p. 167, nom. nud.

Characters as given in key.—Collections: 25.

Cerrado, especially about quartzite outcrops, 800–1600 m, scattered over the highlands of e.-centr. and s.-e. Goiás (Chapada dos Veadeiros, Sa. Geral do Paranã, Sa. Dourada, Sa. dos Cristais) and of Sa. do Espinhaço (between Grão Mogol and Diamantina) in n.-centr. Minas Gerais.—Fl. III–VI; pods long persistent after fall of seeds.

A handsome senna, notable for the combination of foliaceous amplexicaul stipules, few firm obtuse, intricately reticulate leaflets, and exserted panicle of large glabrous flowers produced during the early months of the dry season. The pistil varies from quite glabrous to densely pilosulous, but the variation is not related to dispersal. We find no significant differences between the populations to east and west of the São Francisco valley, so often a significant phytogeographic boundary.

56b. *Senna corifolia* Benthham var. *corifolia*. *Cassia corifolia* Benthham, 1870, l.c., sens. str.—“Habitat inter Corral [=Cocal] et Trahiras prov. Goyaz:

Pohl.'—Holotypus, *Pohl s.n.*, M! = F Neg. 6230; isotypi (*Pohl 1852*), M = F Neg. 6230, NY, W!—*C. corifolia* (sphalm. '*gorifolia*') sensu Bentham, 1871, p. 537.

Characters as given in key.—Collections: 2.

Cerrado, on stony hillsides near 1000 m, very local, known only from Sa. do Cocal s.-w. of Niquelândia near 14°50'S in centr. Goiás.—Fl. V, the fruits persisting into I–II.

57. *Senna reniformis* (G. Don) Irwin & Barneby, comb. nov. *Cassia reniformis* G. Don, Gen. Hist. Dichl. Pl. 2: 440. 1832.—“Native of Brazil, Sello.”—Holotypus, presumably once in herb. Lambert., not found; neoholotypus, *Sellow s.n.*, K! = IPA Neg. 991 = NY Neg. 10480.

Cassia reniformis sensu Vogel, 1837, p. 25–26, cum var. β ; Bentham, 1870, p. 124; 1871, p. 547.

Amplly leafy, weakly arborescent shrubs at anthesis (1–)2–6 m, highly variable in pubescence, the smooth or bluntly ribbed annotinous branchlets, lf-stalks and one or both faces with margins of lflets minutely puberulent, or both pilosulous and puberulent, or simply pilosulous, with spreading-ascending or subappressed, pallid or lutescent hairs to 0.1–0.6 mm, or sometimes subglabrous throughout, the lf-blades always sprinkled with minute orange or livid thickened trichomes, the foliage moderately 2-colored, the chartaceous brownish-olivaceous blades dull or sublustrous, a little paler beneath, the inflorescence an exserted subcorymbose panicle of racemes.

Stipules foliaceous persistent amplexicaul, in outline semi-ovate-auriculate 11–33 \times 6–18 mm, the descending auricle broadly rounded, the erect or incurved tip deltately acute, triangular or subulate-caudate, the whole blade flabellately several-nerved on broad side of midrib, this sometimes exactly marginal, always very strongly displaced.

Lvs 18–28 cm; petiole including little-swollen discolored pulvinus 1.2–4(–5) cm, at middle 1–3.3 mm diam terete or bluntly carinate dorsally, shallowly open-sulcate ventrally; rachis (3–)4–9.5(–12.5) cm; glands between all pairs of lflets sessile or stoutly short-stipitate 1–2.4 mm tall, the squatly ovoid to slenderly lance-ellipsoid, usually acute head 0.4–1.5 mm diam; pulvinules stout wrinkled 2–5 mm; lflets (2–)3–5, commonly 3 or 4 pairs, little or conspicuously accrescent upward along rachis, in outline ovate- or obovate-acuminate to ovate- or lance-elliptic, rarely ovate obtuse, the distal pair 4.5–12 \times 1.7–4.5(–5) cm, 2–3(–3.2) times as long as wide, at symmetrical base varying from broadly cuneate to rounded or (when broad) subcordate, the margins revolute, the centric straight midrib impressed above, cariniform beneath, the 6–13 pairs of major camptodrome and irregular intercalary secondary veins with subsequent reticulate venulation prominent on both faces, sometimes only faintly or bluntly so above, sharply so beneath.

Peduncles stout incurved-ascending (1–)3–12 cm; racemes (5–)10–35-fl'd, the axis becoming (1–)2–20 cm; bracts (caducous, little known) narrowly lanceolate or lance-caudate 3–6 mm; pedicels at and after anthesis \pm 2–4 cm, charged laterally near or well above middle with a substipitate ellipsoid or conic acute gland 1.3–2.5 mm; fl-buds obliquely obovoid-ellipsoid obtuse, externally puberulent at base, the inner sepals glabrous dorsally, minutely ciliolate; sepals subpetaloid yellowish but toward middle greenish or red-tinged, all elliptic-obovate to suborbicular, strongly graduated, the small outer ones (4.5–)5–9 mm, the innermost 12–16 mm; petals yellow, when dry finely brown-veined, glabrous or dorsally puberulent along and near the claw, in outline like those of *C. corifolia*, the long

abaxial ones up to 21–32 mm; androecium glabrous, the filaments of 4 stamens 2–3.5 mm, of 2 latero-abaxial ones dilated (0.8–1.5 mm wide) 7–10 mm, of the central abaxial one 5–7 mm, the anthers of 4 medium stamens 4–8 mm, obliquely truncate and little curved, of the central adaxial stamen similar but 7–9 mm, of 2 latero-abaxial ones (6–)9.5–13 mm lunately incurved, the beaks of all 0.5–1 mm, biporose, those of the 4 medium divaricate, those of the rest obliquely erect; ovary pilosulous, puberulent, or both; style linear straight 4.5–8 mm, subsymmetrically truncate at apex and there 0.25–0.4 mm diam; ovules (30–)32–46.

Pod erratically declined or pendulous, the stipe 2–5 mm, the linear plano-compressed, usually decurved body (7–)10–19 × 0.9–1.2 cm, carinate by the cordlike straight or undulately constricted sutures, the livid-castaneous, finely transverse-venulose, finally stiffly chartaceous and nigrescent valves scarcely elevated over seeds, the interseminal septa thick but narrow, 3.5–5 mm apart; seeds (few seen) narrowly oblong in outline $\pm 6 \times 2$ mm, bluntly compressed-quadrangular, the testa smooth lustrous castaneous, the linear-elliptic areole $\pm 4 \times 1$ mm.—Collections: 56.

Cerrado, margin of gallery forest, thickets in brejo, and about rock outcrops, commonly on quartzitic and ‘canga’ soils, (800–)950–1800 m, scattered along the crest and both slopes of Sa. do Espinhaço, between 16°30' and 20°30'S, in centr. Minas Gerais; apparently disjunct on the Pardo-Contas divide near 14°50'S in s.-e. Bahia.—Fl. (XII–)II–VIII, the pods long persistent.

A handsome floriferous senna, readily recognized by the syndrome of reflexed foliaceous stipules, broad leaflets symmetrical at base, pedicels charged above middle with a stalked gland, and broad plano-compressed pod. The partly sympatric *S. cana* is similar in the stipules, but has basally oblique leaflets, the gland at base of the pedicels, and a much narrower tetragonal pod.

Specimens labelled ‘*Riedel* 526. In ripa rivi Guaporé, apr. 1828’ (LE) are probably associated with the wrong ticket. It seems unlikely that *S. reniformis*, otherwise endemic to Sa. do Espinhaço, should occur on the Brazil-Bolivia border in northeast Mato Grosso or Rondônia where Riedel found himself in April of 1828. Interestingly enough Bentham, who saw and correctly identified these specimens, cited in *Flora Braziliensis* only Riedel’s collection from Minas Gerais.

58. *Senna kuhlmannii* Hoehne, Comm. Linh. Telegr. Matto Grosso Amaz., Bot., pte. 12: 12, t. 185, fig. 1. 1922.—“No. 2043 *Kuhlmann*, Campos do Puté, entre Barão de Melgaço e Pimenta Bueno, Rondonia, Matto Grosso [$\pm 61^\circ$ W, $11^\circ 45'$ S], em Junho de 1918.”—Named from fragmented material, overlooked by us at R, but the reconstructed figure (l.c.), except for lack of glands at base of pedicels, fully agreeing with the following.

Cassia cachimboënsis Irwin & Barneby, Brittonia 28(4): 432, fig. 3, 4. 1976.—“BRAZIL. Pará: Eleri, Rio Cururú, Alto Tapajós, 25.VIII.1959 (fl, fr), W. A. Egler 848.”—Holotypus, IAN! isotypus, NY!

Amplly leafy shrubs of rounded outline 1–2.5 m, with blackish trunks, smooth atropurpureous hornotinous branchlets clothed in stiffly chartaceous foliage, except for the strigulose ovary glabrous, or the young lvs minutely fugaciously puberulent, the penniveined lfts bicolored, lustrous above, paler and dull beneath.

Stipules erect linear-subulate 2.5–4.5 mm, fugacious, lacking from mature lvs.

Lvs ascending 5–13 cm; petiole with pulvinus 5–14 mm, the latter 2–5.5 mm slightly inflated, wrinkled when dry, the petiole proper, like each segment of the lf-stalk, openly sulcate ventrally, the sulcus gradually dilated upward; glands

between or immediately contiguous to each pair of pulvinules sessile or subsessile, round or broadly elliptic in outline (1.3–)1.6–3 mm diam, disci- or shallowly patelliform, coarsely blunt-margined; lfts (1–)2–3 pairs ascending from rachis face upward on dilated, when dry wrinkled, sulcate pulvinules 2–4.5 mm, accrescent distally, in outline subsymmetrically obovate to broadly oblanceolate obtuse, minutely or widely emarginate (1.5–)2.5–8 × (1–)1.2–3(–3.8) cm, at base subequally rounded to broadly cuneate, the margin revolute, the straight midrib from base finely penniveined, with (5–)6–9(–10) pairs of widely ascending camptodrome secondary veins prominulous on both faces but more sharply so beneath, a fainter tertiary reticulation raised beneath.

Racemes short-pedunculate from upper lf-axils, loosely 3–11-fld, the peduncle and axis together 3–8 cm; bracts minute caducous, accompanied on one or other side (alternately) by a deciduous claviform-stipitate gland; pedicels widely ascending 2.5–3.5 cm; sepals subpetaloid membranous-margined, all obovate obtuse but very unequal in size, 1 dorsal and 1 ventral exterior 3.5–5 mm, 3 inner larger up to 11–14 mm; petals yellow glabrous, all obovate obtuse or emarginate, narrowed at base into a slender claw ± 3 –5 mm, the vexillary and lateral ones plane, the 2 abaxial concave, all coarsely 3-veined from claw, the central vein arborescently branched upward; androecium 10-merous, of 3 staminodes ± 5 mm, 4 fertile stamens with short filament and thecae ± 6 –6.5 mm, and 3 abaxial fertile with filament ± 5 mm and thecae 9–15 mm, the fertile thecae all contracted at apex into a biporose beak 0.7–1.2 mm; ovary strigulose; style ± 1 cm, incurved and slightly dilated at tip; ovules 18–26.

Pod linear straight, strongly compressed, including short stipe and setiform beak 7.5–11.5 × 0.9–1.1 cm, the ripe valves nigrescent papery, tardily and inertly dehiscent along ventral suture; seeds oblong compressed 4.8–5.3 mm, the testa dull castaneous bearing on either face a paler, slightly depressed, oblong areole $\pm 2.5 \times 0.5$ –0.6 mm.—Collections: 12.

Thickets in campo cerrado, on sandy soils or about sandstone outcrops, 140–460 m, locally abundant on and about the Sa. do Cachimbo in s.-w. Pará and apparently disjunct on the Jiparaná-Roosevelt divide in s.-e. Terr. do Rondônia.—Fl. V–VIII, the fruit long persistent.

Bix. ser. LAXIFLORAE (Benth) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Laxiflorae** (Benth) Irwin & Barneby, comb. nov. *Cassia* sect. *Prososperma* ser. *Laxiflorae* Benth, Trans. Linn. Soc. London 27: 537. 1871—Sp. lectotypica: *C. velutina* Vogel \equiv **Senna velutina** (Vogel) Irwin & Barneby.

Corolla zygomorphic, but sepals strongly graduated; fertile stamens 7 heteromorphic, 4 median short, their 2-porose beak divaricate, 3 abaxial long (the centric somewhat shorter and narrower than its neighbors), their beak porrect, produced at apex into an upwardly introrse pollen-cup divided by a slender septum; style linear-attenuate almost straight 3.5–9.5 mm, at apex symmetrically truncate; ovules 20–45; pod narrowly linear compressed or compressed-tetragonal, 9–22 cm, the valves charged on each face with an accessory vertical nerve running parallel to the ventral suture and either close to it or displaced to middle of valve, the nerve itself sometimes produced as a narrow wing; seeds 1-seriate, basipetally subvertical or (*S. lechriosperma*) horizontal, lying broadside to the valves; seeds areolate.—Softly woody, precociously flowering shrubs, \pm rusty-pubescent; stipules commonly but not always dilated herbaceous; glands between all or all but

proximal and distal pairs of lflets; racemes (5-)7-50-fl'd, each pedicel subtended laterally by a stipitate or sessile fusiform gland.—Spp. 4 (perhaps 5, cf. discussion of *S. cana*) of tropical e. Brazil (Maranhão and Ceará s. to Rio de Janeiro, w. to Mato Grosso), 1 extending w. into s.-e. Bolivia and centr. Paraguay and remotely disjunct in Guyana and Terr. Amazonas, Venezuela.

The two *Laxiflorae* known to Vogel (1837) formed an element in his *Cassia* sect. *Prososperma* and were carried over by Bentham (1870, 1871) into a somewhat extended section of the same name. The group remains well characterized by glands at base of the pedicels coincident with a narrow compressed pod crested lengthwise by a thick accessory nerve; since the discovery of *Senna* No. 62, however, vertical orientation of the seeds, the signature of *Prososperma*, is no longer a common attribute. The *Laxiflorae* are closely related to ser. *Coriaceae* which are similar in habit and details of androecial structure but different in lack of accessory nerve on the plane pod-valves and in the insertion of the gland near or above middle of the pedicel.

The members of this series are closely related to one another and difficult to separate morphologically in absence of the seldom collected pod. Flowering *S. cana* can generally be recognized by the relatively small corolla, and leaflets either small or numerous compared with the rest; and it has longer-beaked median anthers. The rest are fully vicariant in dispersal and therefore easily identified if the source is known.

Key to the Species of ser. *Laxiflorae*

1. Lflets (2-)3-5(-6) pairs, the blade of distal pairs (4-)4.5-11 cm; gland always present between proximal pair; fls large, the longer petals 2.5-3.5 cm; beak of 4 median anthers 0.3-0.7 mm, its channels at apex contiguous but separate; accessory rib on each face of pod displaced to near middle of valve; range of the series, but scarcely impinging on that of the next.
2. Pod 9-10 mm wide; seeds transverse, with large areole ($\pm 3 \times 1$ mm); style 5-9.5 mm; n.-e. Brazil (Maranhão to Ceará). 62. *S. lechriosperma* (p. 236).
2. Pod 3-5 mm wide; seeds basipetally vertical, with small areole ($\pm 1-1.5 \times 0.4-0.8$ mm); style 3.5-7 mm; allopatric in Brazil to s. and s.-w., one disjunct in Guyana and s.-w. Venezuela.
3. Cerrado of Brazilian Planalto w. from R. São Francisco, from w. Minas Gerais to Mato Grosso, centr. Paraguay and s.-e. Bolivia, disjunct in Guyana and Venezuela; lflets of distal pair mostly oblong-elliptic or -obovate and (2-)2.2-3 times as long as wide, commonly but not always pilose on upper face, their secondary camptodrome veins 10-16(-18) pairs; sepals all pilose dorsally. 60. *S. velutina* (p. 235).
3. Restinga and coastal shrub-woodland of Atlantic seaboard from s. Bahia to Rio de Janeiro; lflets of distal pair broadly obovate and 1.3-1.8 times as long as wide, consistently glabrous on upper face, their secondary camptodrome veins 7-10 pairs; inner sepals glabrous dorsally. 61. *S. australis* (p. 232).
1. Lflets 3-8 pairs, the blade of distal pairs 2-6.5 cm; gland nearly always lacking between proximal though present between succeeding pairs; fls mostly smaller, the longer petals 1.6-2.6 cm; beak of 4 median anthers 0.7-1.6 mm, its twin channels fused to apex; accessory rib on each face of pod closely approximate to the ventral suture, often narrowly winged; Bahia to e.-centr. Goiás, s. to n.- and w.-centr. Minas Gerais and centr. Espírito Santo. 59. *S. cana* (p. 226).

59. *Senna cana* (Nees & Martius) Irwin & Barneby, comb. nov. *Cassia cana* Nees & Martius, Nov. Acta Phys.-Med. Acad. Caes. Leopold.-Carol. 12: 34. 1825.—Typus infra sub var. *cana* indicatur.

Freely branched, densely leafy, potentially or actually arborescent shrubs at anthesis (1-)1.5-6 m, with ribbed or obtusangulate atrocastaneous or gray-fuscos hornotinous branchlets, except for often glabrescent fl-buds and inconspicuously hairy upper face of lflets villosulous or pilosulous throughout with fine incumbent, flexuous or crisped and entangled, whitish or rufescent hairs up to 0.1-0.5 mm

sometimes mixed with random longer hairs, small thickened ones, or livid setae, the foliage conspicuously bicolored, the often firm-textured but sometimes membranous lfts glossy dark green above, whitish- or tawny-tomentulose or -pilosulous beneath, the inflorescence a panicle of racemes axillary to upwardly diminishing lvs, shortly or scarcely exerted from foliage.

Stipules varying in form from erect and linear-attenuate to greatly dilated and auriculately amplexicaul, 3–12 mm long from point of attachment, the blades when dilated reflexed, either tardily deciduous or caducous before full expansion of lf.

Lvs (below inflorescence) 5–15(–16.5) cm; petiole including the little differentiated pulvinus 4–18(–20) mm, at middle 0.8–2.3 mm diam, obscurely ribbed dorsally, narrowly margined ventrally; rachis 2.5–9.5(–11) cm, each interfoliolar segment slightly dilated upward; glands nearly always lacking at first and often at distal pair but present between all the rest, stipitate or sessile, in profile (0.8–)1–3(–3.5) mm long, the glabrous or puberulent, ovoid, clavi- or fusiform acute or obtuse head 0.3–1.2(–1.4) mm diam; pulvinules moderately swollen, scarcely wrinkled 0.6–3 mm; lfts 3–8 pairs, \pm accrescent distally but either the distal or the penultimate pair longest, these obliquely elliptic, ovate-elliptic, narrowly oblong-ovate or lance-elliptic, less often oblance-elliptic or narrowly obovate, obtuse mucronulate to deltately or truly acute, 2–6.5(–7) \times (0.7–)0.8–2.5(–2.7) cm, (1.7–)2.3–3.3(–3.8) times as long as wide, at base either inequilaterally cordate or cordate only proximally and cuneate distally, the margins strongly revolute, the straight or gently incurved midrib immersed or impressed above, cariniform beneath, the 5–12(–13) pairs of major (and rare random intercalary) secondary veins strongly raised beneath, anastomosing close to the margin, the tertiary venulation sometimes fully immersed, sometimes delicately but sharply raised on one or on both faces.

Racemes (5–)7–25(–30)-fld, the fls at anthesis raised about to the level of unopened buds, the axis little elongating, together with the short peduncle becoming 2.5–11(–13) cm; bracts firm or foliaceous, lanceolate or rarely ovate-acuminate, 3–12 \times 1–4 mm, either caducous or persisting through anthesis; mature pedicels (10–)16–37 mm; young fl-buds subglobose glabrous or pilosulous, the early emergent inner sepals always glabrous dorsally but ciliolate; sepals strongly graduated, obovate obtuse concave, the inner subpetaloid, up to (–7)7.5–13(–17) mm; petals (of ser. *Laxiflorae*) golden-yellow, pilosulous dorsally, the longest 16–26 mm (caveat: corollas precociously expanded before true anthesis appear much shorter); androecium functionally 7-merous, the filaments usually and the grooves of the anthers sometimes pilosulous, the filaments of 4 median stamens 1.5–3(–3.5) mm, the centric abaxial one (2–)3–8(–11) mm, of 2 latero-abaxial ones dilated ribbonlike (3–)4–11(–13) mm, the anthers of 4 median (differentiated into unequal pairs) nearly straight 3–6.5(–8.5) mm, the divaricate biporose beak \pm 0.7–1.6 mm, the anthers of the centric abaxial one 6–8.5(–11) mm and of 2 latero-abaxial ones lunately incurved (8–)9–13.5(–15) mm, these contracted into a porrect scooplike beak (0.5–)0.7–1.1 mm, its orifice divided by a slender septum; ovary densely rusty-pilosulous; style straight, gradually attenuate distally, 5–8.5 mm, at symmetrically truncate stigma 0.2–0.35(–0.4) mm diam; ovules 20–32.

Pod (poorly known) variously ascending-spreading, outwardly arcuate or almost straight, the stipe 3–6 mm, the narrowly linear body 9–15 \times 0.4–0.55 cm, compressed-tetragonal, the accessory rib parallel and approximate to the ventral suture dilated into a narrow wing, the sutures commonly undulately strangulate between seeds, the interseminal septa marked externally by a shallow groove, the seed-locules 4–5.5 \times 2.5–4 mm, obviously longer than wide; seeds basipetally vertical, oblong-obovate in outline, compressed parallel to the valves,

$\pm 3.5\text{--}4 \times 1.8\text{--}2.4$ mm, the testa dull brown or dull purplish-brown, the elliptic areole $1\text{--}1.5 \times 0.4\text{--}0.6$ mm.

As defined in the foregoing description, *S. cana* is a polymorphic species, variable like its close ally *S. velutina* in form and duration of the stipules, but much more so in pubescence of the foliage, in flower size, and some other details. It differs from *S. velutina* and also from *S. australis* in the generally shorter or narrower leaflets, in the almost constant absence of a gland between the proximal pair of leaflets, in the more contracted, subcorymbose racemes of ordinarily smaller flowers and, so far as appears at present from scanty evidence, in the narrowly winged rather than merely ribbed valves of the pod. None of these differences is profound, and some large-flowered *S. cana* from the western margin of the species' range, where it abuts on that of *S. velutina*, come close to bridging the gap. A case could be made on technical grounds for combining all members of ser. *Laxiflorae* into one megaspecies consisting of seven or eight geographic elements which, whatever taxonomic status may be thought appropriate, are most probably recent derivatives of a common ancestral stock. A still poorly understood lowland form of *S. cana* var. *pilosula* from Espírito Santo closely simulates in its relatively broad leaflets *S. australis* native to nearby coastal restinga, and a firm distinction between var. *pilosula* and *S. lechriosperma*, or between var. *pilosula* and the unnamed senna from Chapada dos Veadeiros mentioned below, is unattainable if the pod (not certainly known as yet to be diagnostic) is lacking. Consequently, until much more can be learned about the fruits and seeds, which ripen tardily when few botanists are in the field, we propose to follow the most conservative policy consistent with the data available.

The prime focus of interspecific variation in *S. cana* lies in the uplands of interior Bahia and north-central Minas Gerais, where the species, in whatever form it may take, is the only member of ser. *Laxiflorae* encountered. The most widespread variety, characterized by variably dilated stipules and tomentulose vesture, is var. *cana*, which ranges along both slopes of Chapada Diamantina from northern Bahia south into northern Sa. do Espinhaço in Minas Gerais, thence extending across the São Francisco valley, in Bahia to Espigão Mestre and immediately adjoining Goiás and in Minas to the Paracatú-Paranaíba watershed. The very similar var. *hypoleuca*, identical in pubescence but different in the narrow caducous stipules, somewhat fewer and larger leaflets and a more emphatically four-winged pod, apparently replaces var. *cana* very locally on upper Rio de Contas. Along the Atlantic slope from Sa. do Sincorá south to Rio Doce in Minas Gerais and adjoining Espírito Santo, *S. cana* is represented by a series of forms essentially identical to var. *cana* in habit, inflorescence and dilated stipules, but collectively different in the loosely pilosulous vesture of the leaves and stems. This series readily subdivides into a southern group, var. *pilosula*, ranging southward from Rio Pardo, with small deciduous bracts like those of var. *cana* or var. *hypoleuca*, and a northern var. *phyllostegia*, common in Sa. do Sincorá but collected once in the northeastern corner of Minas Gerais, differing from all other forms of the species in broad foliaceous, relatively persistent bracts. The pods of the two last are unfortunately unknown and their status, possibly as a species distinct from tomentulose *S. cana* sens. strictior., may well require re-evaluation.

Key to the Varieties of *S. cana*

1. Vesture of the lower face of lflets tomentulose, composed of tightly crisped, \pm matted hairs mostly 0.1–0.25 mm, commonly concealing the whole surface, the intervenium, however,

sometimes more thinly hairy than the always pannose-tomentulose veins; upland interior and w. Bahia to adjac. e.-centr. Goiás and n.-centr. and w.-centr. Minas Gerais.

2. Stipules \pm dilated at base, the herbaceous blade reflexed and auriculate-amplexicaul, at point of attachment 1–7 mm wide, persistent into maturity of lf; lf's 4–8 pairs; valves of pod narrowly winged along each side of the ventral suture only, the seed-locules extending to the dorsal margin of the fruit; widely dispersed as above. 59a. var. *cana* (p. 229).
2. Stipules linear-setiform erect, at base less than 1 mm wide, early caducous; valves of pod narrowly winged along each side of both sutures, the seed-locules consequently extending to neither margin of the fruit; local on upper Rio Contas in Bahia.
59b. var. *hypoleuca* (p. 230).
1. Vesture of lower face of lf's pilosulous with loosely incumbent, weakly sinuous hairs up to 0.3–0.6 mm, or minutely sparsely strigulose, or quite glabrous; Atlantic slope of Chapada Diamantina s. through e. Minas Gerais to Rio Doce in Espírito Santo.
3. Lower face of leaflets incumbently pilosulous.
4. Bracts narrowly lance-acuminate or -caudate $4-8 \times 1.4-2.8$ mm, deciduous; relatively southern from Rio Pardo s.-ward. 59c. var. *pilosula* (p. 230).
4. Bracts foliaceous, ovate-acuminate $(4-6)-12 \times 2.5-4$ mm, long persistent; locally abundant in Sa. do Sincorá and vicinity, s. just into n.-e. Minas Gerais.
59d. var. *phyllostegia* (p. 231).
3. Lower face of leaflets glabrous or minutely sparsely appressed-strigulose; bracts early caducous; n. Sa. do Sincorá and vicinity. 59e. var. *calva* (p. 232).

59a. *Senna cana* (Nees & Martius) Irwin & Barneby var. *cana*. *Cassia cana* Nees & Martius, l.c., sens. str.—“Circa *Barra das Varredas* [=valley of Rio Pardo near $41^{\circ}30'W$, $15^{\circ}30'S$, just within Minas Gerais].”—Holotypus, collected by Maximilian zu Wied-Neuwied, BR! = NY Neg. 10481 & 10482; isotypus, LE!

Cassia cana sensu Vogel, 1837, p. 22; Bentham, 1870, p. 118; 1871, p. 537.

At anthesis 1.5–5 m, the trunk up to 1 dm diam but usually much less; leaflets usually densely pannose-tomentulose beneath, the pubescence all white, or pallid striped with rufous along the veins, or all rufescent, rarely glabrescent but the hairs still very short and crisped; stipules reflexed, lunately lance-acuminate or very obliquely semi-ovate-caudate, from point of attachment 3–12 mm long and there (1–)1.5–7 mm wide, palmately venulose, the blades resembling lf's in texture, pubescence and revolute margins, deciduous rather tardily but before the lf; glands usually between all pairs but the proximal, rarely there also, at distal pair 0–2, when 2 one between and one behind the pulvinules; lf's 4–8 pairs, the distal (or penultimate) pair $2-6.5(-7) \times (0.7-)0.8-2.2$ cm, $(1.8-)2-3.3(-3.5)$ times as long as wide; floral bracts $3-5.5 \times 1-2$ mm; pod (little known) broadly V-shaped in cross section, the wings forming the extremities of the V's arms; seed-locules $5-5.5 \times 3.5-4$ mm.—Collections: 25.

Cerrado and caatinga thickets, sometimes among tumbled rocks along streams, 530–1125 m, locally common along the crest and both slopes of Chapada Diamantina and Sa. do Espinhaço in lat. $10^{\circ}20'-19^{\circ}S$, between Sa. do Curral Feio in n.-centr. Bahia and mun. Diamantina in centr. Minas Gerais, and scattered around the w. sources of Rio São Francisco from Rio Preto in n.-w. Bahia s. along Espigão Mestre and Sa. Geral de Goiás to the headwaters of Rio Paracatú in w. centr. Minas Gerais.—Fl. I–IV(–V).

We include in var. *cana* what appears to be a clinal series progressing from small-leaved bushes, seldom over 2 m tall, with 4–8 pairs of relatively small leaflets (–3.5, rarely –4 cm), to potentially or actually arborescent, ampler-leaved and sometimes larger-flowered types, with only 4–6 pairs of longer leaflets (to 3–6.5 cm). The series coincides roughly with dispersal, the smallest forms being found on the heights of north-central Bahia, the largest in northern and western

Minas Gerais. The extremes are visually striking, but we have found no decisive discontinuity in the series. A marked minor variant (*Harley 15994*, K, M, NY) from Sa. do Sincorá differs in its vesture of appressed rufous hairs and is perhaps more closely related to sympatric *S. cana* var. *phyllostegia*, although retaining the small floral bracts of var. *cana*.

- 59b. *Senna cana* (Nees & Martius) Irwin & Barneby var. *hypoleuca* (Bentham)**
 Irwin & Barneby, stat. nov. *Cassia hypoleuca* Martius ex Bentham, in Martius, Fl. Bras. 15(2): 117. 1870.—“. . . in campis districtus Adamantium, provinciae Minas Geraës: Martius; inter Cavalcante et Conceição prov. Goyaz: Burchell.”—Holotypus, *Martius s.n.*, labelled “Campi distr. adam[antini] et in inter[iori] prov. Bahiensis,” M! = F Neg. 6239.—The paratypus, presumably *Burchell 7933* listed by Bentham (1871, p. 584), was overlooked by us at K; presumably it represents the undescribed entity indicated immediately following var. *phyllostegia* below.

Cassia hypoleuca sensu Bentham, 1871, p. 537.

At anthesis (1–)2–6 m; pubescence of var. *cana*; stipules erect, linear-attenuate straight $3\text{--}5.5 \times 0.5\text{--}0.8$ mm, caducous before full expansion of lf; glands between proximal pair 0, between second and third pair subsessile stoutly claviform-ovoid $0.8\text{--}2.5$ mm, between distal pair either 0 or, when present, situated behind the pulvinules, next to or adnate to the subulate seta; lflets 3–5(–6) pairs, the distal pair $(3.2\text{--})3.5\text{--}6.5 \times 1.3\text{--}2.5(2.7)$ cm, (1.7–)2–3 times as long as wide; floral bracts $3\text{--}6.5 \times 1.6\text{--}2$ mm; pod $10\text{--}15 \times 0.4\text{--}0.55$ cm, compressed-tetragonal, the wings corresponding to the accessory nerves parallel to the ventral suture 1–1.8 mm wide, those parallel to the dorsal suture much narrower; seed-locules $4.5\text{--}5.5 \times 2.5\text{--}3.5$ mm.—Collections: 8.

Disturbed cerrado on sandstone or quartzite, 980–1300 m, highly localized on the upper Rio de Contas in s.-centr. Bahia, especially in the foothills of Pico de Almas near the town of Rio de Contas and the s. foothills of Sa. do Sincorá near Barra da Estiva.—Fl. I–IV.—*Açoita-cavalo*.

At anthesis var. *hypoleuca* differs materially from larger-leaved forms of var. *cana* only in the narrow, less persistent stipules, just as so-called *Cassia dysophylla* was supposed by Bentham to differ from *C. velutina*. It is now known that the stipular character of *C. dysophylla* is supported by no other morphological difference and is not correlated with dispersal, and we have been obliged to reduce that species to *S. velutina*. Here, however, the pod associated with the setiform stipule differs from that of broad-stipulate var. *cana* in developing not one but two winglike flanges from each valve, one approximate and parallel to the ventral suture, the other approximate and parallel to the dorsal one, yielding a sharply X-shaped cross section.

- 59c. *Senna cana* (Nees & Martius) Irwin & Barneby var. *pilosula* Irwin & Barneby, var. nov., a var. *cana*, caeterius simillima, pube foliolorum pilosula (nec pannoso-tomentella) e pilis debilibus flexuosis sed haud crispatis constanti diversa.—BRAZIL. km. 5–10. da rod. Rio de Janeiro-Bahia no n. de Vitória da Conquista, 15.II.1972 (fl), T. S. Santos 2242.—Holotypus, NY.**

At anthesis 1–3 m; vesture of loose rusty sinuous hairs up to $\pm 0.3\text{--}0.6$ mm,

the hornotinous branchlets, lf-stalks and lower face of lflets all densely pilosulous; stipules essentially of var. *cana*, (4–)6–10 × (1–)2–4 mm, at base auriculate-amplexicaul; glands usually 0 at proximal and distal pairs, elsewhere stipitate; lflets 4–6 pairs, varying from elliptic-oblongate to narrowly obovate, either obtuse-mucronulate or deltately acute, 3–6.5 × 1.1–2.6 cm, 2.1–3 times as long as wide; floral bracts 4–8 × 1.4–2.8 mm; fls relatively small, the long petal 16–20 mm; pod unknown.—Collections: 4.

Habitat scarcely known, sometimes in caatinga thickets or about rock outcrops, ±300–700 (?) m, local in the valleys of Rios Pardo and Jequetinonha in s.-e. Bahia and adjoining Minas Gerais, and in aberrant (possibly distinct) form in the valley of Rio Doce in centr. Espírito Santo (Colatina); cultivated in Rio de Janeiro (RB).—Fl. II–III.

This and the variety next following seem clearly distinct from var. *cana* in their looser and longer pubescence of incumbent or sinuously ascending, not crisped and matted hairs, but resemble it in all other respects. Their status is, however, provisional, pending discovery of the pod. Our one collection from Espírito Santo (*Duarte 9010*, M, NY) is notable for the presence of a gland between the proximal pair of leaflets and for leaflets themselves rather broader and more nearly obovate than usual in *S. cana* sens. lat. Its general habit somewhat suggests the coastal *S. australis*, but the flower is much smaller and the foliage of thinner texture and less prominently reticulate. Here again the pod may provide crucial evidence.

59d. *Senna cana* (Nees & Martius) Irwin & Barneby var. *phyllostegia* Irwin & Barneby, var. nov., cum var. *pilosula* pube, cum var. *cana* caeteris omnibus congruens, ab ambabus bracteis floralibus foliosis ovato-acuminatis 2.5–4 (nec lanceolatis 1–2.8) mm latis diversa.—BRAZIL. Bahia: mata higrófila entre Itiruçu e Maracás 23.I.1965 (fl), *E. Pereira 9658* e *G. Pabst 8547*.—Holotypus, NY; isotypi, BRADE, M.

At anthesis 1.5–3 m; vesture of var. *pilosula*; stipules lance-caudate, falcately incurved to vertical, from point of attachment 4.5–10 mm long, at base variably dilated and reflexed 0.7–2(–3) mm wide, when much dilated auriculate-amplexicaul; glands at all except proximal and distal pairs, stipitate; lflets (4–)5–7(–8) pairs, the distal pair elliptic or lance-elliptic acute or obtuse (2.3–)2.5–5 × (0.7–)0.9–1.5(–1.9) cm, 2.3–3.3(–3.8) times as long as wide; floral bracts foliaceous ovate-acuminate (4–)6–12 × 2.5–4 mm, persistent into full anthesis; longest petal 18–24 mm; pod unknown.—Collections: 7.

Disturbed woodland and rocky slopes along rivers, on sandstone or laterite, 400–1000 m, locally abundant on the sources of rios Paraguaçu and de Contas in Sa. do Sincorá, and at one distant station on Rio Jequetinonha (Itaobim) in n.-e. Minas Gerais.—Fl. I–IV.

This variety closely resembles the last at all essential points, but differs in the enlarged and apparently more persistent bracts which lend a distinctive aspect to the flowering raceme. Contrary to a general rule, that bracts and stipules in Cassieae tend to increase or wane together, the stipules of var. *phyllostegia* are on the average less, not more dilated than those of var. *pilosula*. In Sa. do Sincorá var. *phyllostegia* is easily distinguished from vicariant (perhaps marginally sympatric) vars. *cana* and *hypoleuca* by a combination of pilosulous vesture and broad bracts. Its disjunct occurrence within the range of var. *pilosula* in north-eastern Minas Gerais is difficult to explain. The station lies on the main Brasília-

Salvador highway at the crossing of the Jequetinonha, and the possibility that this floriferous senna is only adventive outside Sa. do Sincorá cannot be ruled out.

- 59e. *Senna cana* (Nees & Mart.) var. *calva* Irwin & Barneby, var. nov., var. *phyllostegiae* (subsympatricae) arcte affinis, foliolis utrinque glaberrimis vel pagina inferiori parce fusco-strigulosis (nec pilosulis) bracteis ante anthesin caducis diversa.—BRAZIL. Bahia: Sa. do Sincorá, 3 km s.-w. of Mucugé on Cascavel road, 900 m, 27.III.1980 (fl), R. M. Harley 21056.—Holotype, K; isotype, NY.**

Closely resembling var. *phyllostegia*, but the leaflets glabrous or thinly fuscous-strigulose beneath with minute appressed hairs; bracts early caducous.

Campo rupestre, 800–1000 m, locally abundant and sometimes dominant about the sources of R. Paraguaçu in centr. highland Bahia (Lençóis, Mucugé, Seabra).—Fl. III–VI.

This was taken at first to be a simple glabrate variant of var. *phyllostegia*, but with seven collections now available for comparison it emerges as a distinct entity differing not only in the hairless or almost hairless foliage but also in the early caducous bracts.

Unaccounted for up to this point in our census of ser. *Laxiflorae* is a set of ambiguous, mostly maimed or imperfect specimens from southwest Pará (Sa. do Cachimbo), east-central Goiás (Chapada do Veadeiros), adjoining Bahia (Espigão Mestre), southern Maranhão (Rio Balsas region, where sympatric with *S. lechriosperma*) and southern Piauí (near Caracol) which seem to represent an independent entity, as yet indefinable in exact terms, both morphologically and geographically intermediate between *S. cana* and *S. velutina*, while retaining a certain individuality of facies. These plants have the pod and elongate inflorescence of *S. velutina*, but their larger leaves have more numerous, proportionately narrower leaflets (± 3 –4.5, not 2–3 times as long as wide). The short pilosulous vesture of leaves together with dorsally glabrous sepals and 5–8 pairs of leaflets suggest a robust form of *S. cana* var. *pilosula*, but the compressed, laterally costate but not winged pod cannot be accommodated in *S. cana*. Our material (cf. Irwin et al. 14806, 24336, NY; de Haas et al. 292, NY; Eiten 4618, NY; Luetzelburg 1534, M = IPA Neg. 1375) consists largely of immature flowering and over-mature fruiting specimens to which we do not venture to attach a name. May through July are the months during which full anthesis and early fruit can be expected. A collection from Sa. do Cachimbo in southwest Pará (Prance et al. 25056, US), barely flowering in November, suggests either a westward extension of the foregoing or a distinct but closely related form.

- 60. *Senna velutina* (Vogel) Irwin & Barneby, comb. nov. *Cassia velutina* Vogel, Syn. Gen. Cass. 24 & Linnaea 11: 670 (descr. ampliata). 1837.—“In Brasilia: Manso et Lhotzky leg. in regione Cujaba prov. Matto Grosso [fide Bentham, 1870, p. 118: ‘in saxosis Morro D’Ernesto prope Cuia-ba, Silva Manso in Martius herb. Brasil. 220’].”—Holotypus, presumably †B, not seen; neoholotypus, Martius Herb. 220, K! = NY Neg. 1459; isotypus, NY!**

Cassia dysophylla Bentham in Martius, Fl. Bras. 15(2): 117. 1870.—“Habitat in prov. Goyaz, e. gr. . . . prope Salinas: Weddell; . . . prope Conceição: Gardner n. 3694; prope Pilar [=Pilar, near Crixas, w.-centr. Goiás]: Pohl; ad Rio Paranahyba et Tocantins: Burchell.”—Lectoholotypus, Gardner 3694, K (hb. Benth.)! isotypi, †B = F Neg. 1685, BM, K (hb. Hook.)!

paratypi, Weddell 2102, K! Pohl 1821, M! Pohl s.n., K! = IPA Neg. 967 = NY Neg. 1458; Burchell 6045, K!

Cassia velutina + *C. dysophylla* sensu Benth, 1871, p. 537.

Coarsely leafy, erect or diffusely ascending, weakly woody shrubs of rapid growth, at anthesis 1–3 m, densely silky-pilose or -tomentulose throughout, except for sometimes glabrous upper face of lflets, with fine mostly sinuous or entangled, subappressed or partly spreading hairs to 0.5–1.5 mm, the vestiture of inflorescence, pods and often of distal (sometimes all) lvs rufous, the foliage bicolored, the lflets above brownish-olivaceous dull or (when glabrous) lustrous, paler beneath, the many-fl'd racemes of large fls axillary to distal lvs or subpaniculate, not or only shortly exerted from foliage.

Stipules sometimes persistent, but usually deciduous before the associated lf, (10–)15–35(–55) mm long, varying from falcately semi-lanceolate-caudate and expanded only at base on exterior side of midrib to broadly semi-cordate-acuminate or caudate with obliquely descending amplexicaul obtuse auricle and a blade expanded on both sides of midrib, the blade at broadest part (2–)3–16(–27) mm wide.

Lvs (small distal ones disregarded) 11–28 cm; petiole including little differentiated pulvinus (1.2–)1.5–3.2(–4) cm, at middle 1.4–3 mm diam, rounded dorsally, openly shallow-sulcate ventrally; rachis 5–11(–14.5) cm; glands between all pairs of lflets, shortly stipitate or sessile 1.6–3 mm, the stipe when present pilosulous, the body in profile mostly lanceolate acute, sometimes ovate obtuse, 0.4–0.8 mm diam; pulvinules 2.5–4.5(–5) mm; lflets 3–6, in most lvs 3 or 4 pairs, accrescent distally, mostly oblong-, lance- or oblance-elliptic, less often ovate, oblong or obovate, at apex triangular, deltate or obtuse, commonly mucronulate or caudate-acuminate, the distal pair 4.5–11 × (1.5–)2–4.4(–5) cm, (2–)2.2–3 times as long as wide, at base inequilaterally rounded or subcordate, the margins obscurely revolute, the centric midrib and (9–)10–16(–18) pairs of widely ascending secondary nerves immersed above, prominulous or cordlike beneath, the secondaries mostly more densely rufous-pilosulous than the intervenium, camptodrome only close to margin of blade, the tertiary venulation faint or fully immersed.

Peduncles stout incurved-ascending 2–8 cm; racemes mostly (6–)10–50-fl'd, the axis becoming 5–26 cm, the buds elevated above level of at least the earlier fls; bracts deciduous from swelling buds, broadly lance- or ovate-acuminate, acute or caudate (4–)5–11(–15) mm; pedicels at and after anthesis 17–37 mm, subtended laterally at base by a hornlike (sometimes deciduous, often eaten) gland 1.5–2.5(–3) mm; buds obliquely obovoid, densely rufous-pilosulous; sepals except for sometimes glabrate submembranous margins firm and pilosulous dorsally, broadly obovate, ovate-elliptic or orbicular, strongly graduated, the smaller outer one 6.5–11.5 mm, the largest inner one 13–18 mm; petals yellow, when dry delicately brown-veined, all pubescent dorsally, the 3 adaxial subsymmetrically obovate-flabellate, the banner often emarginate, these 17–25 mm, the 2 abaxial slightly longer and more oblique, mostly 25–35 mm; filaments pilosulous or puberulent, those of 4 median stamens 1–3 mm, of the central abaxial ones 5–8 mm, of the two latero-abaxial ones dilated (1–1.6 mm wide) 7–12 mm, the anthers glabrous or rarely puberulent in the grooves, those of 4 median ones (in two slightly graduated sets) straight or almost so, (4–)5–8.5 mm, with obliquely divaricate beak 0.4–0.7 mm, that of the centric abaxial stamen slightly incurved 7–10.5 mm, those of 2 latero-abaxial ones lunately incurved 10.5–15.5 mm, the beaks of the 3 abaxial anthers not over 1 mm long, obliquely truncate, those of all anthers 2-porose; style 3.5–5 mm, straight linear, truncate at apex, 0.25–0.4 mm diam; ovules 22–45.

Pod declined at random angles, often persisting through a full season on an-
notinous branchlets, the stipe 2–5 mm, the narrowly linear body simply or sig-
moidally decurved (10–)12–22 \times 0.3–0.4(–0.45) cm, compressed-quadrangular,
carinate by the thick sutures and by a rib running the length of the valves a trifle
closer to the dorsal than to the ventral suture, the stiffly papery, densely rusty-
pilosulous or -strigulose valves scarcely raised over seeds but marked at the
interseminal septa by shallow transverse sulci, these distant 4–7 mm; seeds ver-
tically aligned along pod, in outline oblong or obtusely rhombic (3–)3.3–4.2 \times
1.7–2.4 mm, the testa lustrous olivaceous or brown smooth, the oval or elliptic
areole 1–1.5 \times 0.4–0.8 mm.—Collections: 49.—Fig. 9 (petiolar nectary), 22 (pod).

Cerrado, usually in red sandy soils, becoming locally abundant in disturbed
environments, sometimes forming extensive thickets along roadsides,
(200–)400–1050 m, common and widespread over the Brazilian Planalto w. of Rio
S. Francisco, from the middle Tocantins valley in Goiás w. to the sources of Rio
Xingú in Mato Grosso, thence s. through Goiás to the upper Paracatú and Pa-
ranaíba in w. Minas Gerais, and s.-w. through centr. and s. Mato Grosso just into
centr. Paraguay and s.-e. Bolivia; disjunct on Rio Mogi-guaçu in centr. São Paulo
(mun. São Carlos), and remotely so on savannas of upper Mazaruni River in
Guyana and along middle Orinoco River in Amazonas, Venezuela.—Fl. (I–)II–VI.

A handsome but rather coarse senna, which might be considered the prototype
of ser. *Laxiflorae*, notable for the dense, loosely pilose vesture of leaves and
flowers, for the characteristic gland at base of each pedicel, and for the narrow
compressed pod keeled along each valve by a prominent rib and divided into
seed-locules longer than their diameter. It is closely related to the coastal *S.*
australis and to *S. cana*, vicariant in the drier cerrado and caatinga country to
the northeast, which see for differential characterization.

As implied in the foregoing synonymy, we have drawn the description of *S.*
velutina so as to include *Cassia dysophylla* Benth. From the first *C. dysophylla*
has been thought to differ only in the narrow deciduous rather than foliaceous
and subpersistent stipules, but these, while striking in their extreme expressions,
which alone were known to Benthham, are now found to be highly variable. In
reality the stipules are never really setaceous from the base, as described for *C.*
dysophylla, but are always a little dilated proximally even though not, at their
narrowest, auriculately amplexicaul. From this narrow type of blade we can now
trace an uninterrupted series increasing by increment on the side exterior to the
petiole, passing through a semicordate into a fully foliaceous type dilated and
pinnately veined (like leaflets) on both sides of the midrib. Broad amplexicaul
stipules of the *velutina* type are relatively rare within the whole range of the
species as here defined. They have been collected most frequently on the Xingú-
Araguaia divide in northeastern Mato Grosso but even here they do not wholly
replace the semicordate type, which is associated with precisely the same leaf,
flower and pod. Both sorts of stipule were collected at points 20–25 km south of
Xavantina (*Philcox & Ferreira* 3838; *Hunt & Ramos* 5986, both NY), and again
far to the east on Sa. Geral northeast of Formosa in Goiás (*Irwin et al.* 15134,
15182, both NY), where narrow stipules appear dominant. Transitions between
semicordate and narrowly semi-lanceolate stipules are frequent (cf. *Irwin* 2530,
Mendes Magalhães 18998, both NY, from between Uberlândia and Monte Alegre
in the Minas Triângulo).

The flowering plants collected by Schomburgk (BM, K) in Guyana seem not
to differ in any way from some narrow-stipulate *S. velutina* from Goiás. It is the
Cassia arowana Schomb., *Reise Guiana*, 1206, mentioned by Benthham (1871, p.
582) as a nomen nudum.

61. *Senna australis* (Vellozo) Irwin & Barneby, comb. nov. *Cassia australis* Vellozo, Fl. Flum. 166. 1825 & Ic. 4: t. 65. 1827.—“Habitat silvis Regii Praedii S. Crucis [=Fazenda de Sta. Cruz near Itaguaí, s.-w. Rio de Janeiro].”—Lectoholotypus, the cited plate!

Cassia appendiculata Vogel, Syn. Gen. Cass. 24. & Linnaea 11: 670 (descr. ampliata). 1837.—“In Brasilia: Sellow leg.; Luschnath leg. in convallibus montis Serra d’Estrella [edo. Rio de Janeiro] . . .”—Holotypus, presumably †B, not seen; neoholotypus, Sello s.n., K! = NY Neg. 1460; isotypus, Sello 641, BM!—Equated with *C. australis* even by Vogel, Syn. Gen. Cass. in addendis. 1837, and by Bentham, 1870, 1871, ll. cc.

Cassia appendiculata sensu Bentham, 1870, p. 119, t. 36; 1871, p. 537.

Cassia australis sensu Burkart, Contrib. U.S. Nat. Herb. 29(12): 546. 1957; Ochioni, Leandra 8-9: 132 + pl. 1981.

Crookedly erect or diffusely ascending, amply leafy shrubs at anthesis 1–4 m, with obtusely angulate hornotinous branchlets, the young stems, lf-stalks, margins and dorsal face (or dorsal venation) of lflets and all axes of inflorescence pilosulous with rusty ascending hairs up to 0.4–0.85 mm, the foliage bicolored, the firmly chartaceous lflets lustrous olivaceous drying brown above, paler beneath, the inflorescence of simple racemes axillary to fully developed distal lvs either immersed in foliage or in age shortly exserted.

Stipules foliaceous persistent deflexed against stem, very obliquely incurved-semicordate 12–27 × 5–15 mm, at base broadly bluntly auriculate amplexicaul, at apex acuminate-caudate, the blades radially venulose from point of attachment and then reticulate like lflets.

Lvs 10–18 cm; petiole including little differentiated pulvinus (1–)1.5–3(–3.5) cm, at middle (1–)1.2–2 mm diam, rounded dorsally, openly shallow-sulcate ventrally; rachis 4–8.5 cm; glands (often eaten) between all pairs of lflets sessile or shortly stipitate, in profile 1.4–2.3 mm, the stipe when present glabrous, the ovate acute or subulate-ellipsoid body 0.6–1 mm diam; pulvinules (2.5–)3–4.5 mm, densely pilosulous; lflets 3–5, of most lvs exactly 4 pairs, accrescent upward, the blades broadly obovate from inequilaterally rounded to subcordate base, at apex very obtuse (sometimes minutely mucronulate) or openly emarginate, the distal pair 4.5–8.5 × (2.8–)3–4.7 cm, 1.3–1.8(–2) times as long as wide, the margins revolute, the straight centric midrib immersed above, cariniform beneath, the 7–10 pairs of camptodrome secondary nerves and subsequent reticulation prominent on both faces, sometimes more emphatic beneath.

Peduncles stout (0.6–)1.5–6 cm; racemes ±(5–)10–25-fl'd, the axis becoming (1.5–)2–12 cm; bracts caducous from below young fl-buds, firm ovate-acuminate 3–5 mm; pedicels at and following anthesis 1.5–3 cm, subtended laterally at base by 1(–2) sessile or stipitate fusiform-ellipsoid or ovoid glands 1.5–3 mm; fl-buds obliquely obovoid puberulent at base or over the surface of the small exterior sepals, the inner sepals glabrous dorsally, ciliolate; sepals firm, brownish or livid, obovate-suborbicular concave, very unequal, the smallest exterior (abaxial) 4.5–7 mm, the largest interior one 12–16 mm; petals and androecium of *C. velutina*, except the filaments glabrous; style filiform straight 4–7 × 0.3–0.4 mm.

Pod usually ascending and arched outward, the stipe 3–5 mm, the body narrowly linear, ±15–20 (fide Bentham, –25) × ±0.5 cm, compressed-quadrangular, stoutly keeled by the undulately constricted sutures and by a prominent rib running the length of the rufous-pilosulous valves, the interseminal septa ±6 mm apart forming locules longer than wide; ripe seeds not seen, but apparently quite similar in attitude and form to those of *C. velutina*.—Collections: 24.

Thickets in restinga below 30 m, and perhaps also in the foothills back from

the ocean, scattered along the coastal plain of s.-e. Brazil between extreme s. Bahia (near Alcobaça) and s.-w. Rio de Janeiro.—Fl. XII–IV(–VIII).

Senna australis is the coastal analogue of interior *S. velutina*, readily distinguished by ecology and dispersal but only precariously separated in morphological terms by the broader, more simply venose, less pubescent leaflets, always lustrous and glabrous above, and the dorsally glabrous inner sepals. The pod, said by Bentham to be glabrous, but pubescent in all modern collections, may be on the average a trifle broader than that of *S. velutina*, but is structurally identical, as are the perianths and androecia. The material of *S. australis* that we have seen is virtually monomorphic and shows no sign of that variation in development of the always foliaceous amplexicaul stipules which is a feature of kindred *S. velutina*.

In abandoning for this species the name *Cassia appendiculata*, used by Bentham, we follow Burkart (1957, l.c.) and the Code. The supposed obstacle to *C. australis* Vell. is merely the later homonym *C. australis* Sims, a taxonomic synonym of *C. odorata* Morris (cf. Symon, 1966, p. 102). Although no authentic specimen of *C. australis* Vell. is known to survive, its identity has been plainly known to all students of *Cassia* through the vividly exact portrait in Vellozo's Icones.

62. *Senna lechriosperma* Irwin & Barneby, sp. nov., *S. velutinae* et *S. australi* arcte affinis et cum iis leguminis valvulis nervo crasso submediano longitrorsus percursis congrua, foliolis latis (sed apice deltatis subacutis nec emarginatis) sepalisque intimis dorso glabris huic forsan propior, ab ambabus legumine latiori plano-compresso \pm 9–10 (nec \pm 2–5) mm lato et seminibus transversis ideoque leguminis loculis latioribus quam longioribus, his notis ab aliis seriei *Laxiflorarum* speciebus insigniter diversa.—BRAZIL. Pernambuco: Fazenda Experimental de Pesqueira, 23.XI.1962 (fl,fr), J. C. Gomes 1247.—Holotypus, NY.

Shrubs of unknown stature, except for more acute lflets resembling *C. australis* in general habit, apart from dorsally glabrous inner sepals rusty-pilosulous or -strigulose throughout with ascending or subappressed, straight or sinuous hairs up to 0.5–0.8 mm, the young stems, lf-stalks and axes of inflorescence densely, the bicolored foliage more thinly so, the (dry) lflets brownish, above dull or sublustrous, beneath paler dull, \pm pilosulous on both faces, the inflorescence wholly of *C. australis*.

Stipules foliaceous persistent, reflexed against stem, very obliquely incurved-semicordate 10–15 \times 4–10 mm, at base dilated into a broadly obtuse descending amplexicaul auricle, at apex contracted into a slender, sometimes setiform acumen, the blades radially venulose from point of attachment, pubescent on both faces.

Lvs 6.5–14.5 cm; petiole including little differentiated pulvinus 7–21 mm, at middle \pm 1–1.5 mm diam, beyond middle shallowly open-sulcate; rachis (2–)2.5–5.5 cm; glands (often eaten) between all pairs of lflets stipitate, including the usually puberulent stipe 1.5–3 mm, the ovoid acute or fusiform body 0.45–1.1 mm diam; pulvinules 2–3.5 mm, densely pilosulous; lflets (2–)3–4, in most adult lvs exactly 4 pairs, accrescent distally, the distal pair obliquely obovate or elliptic-obovate from inequilaterally rounded or subcordate base, (4–)4.5–8.5 \times 2–4 cm, 1.6–2.1 times as long as wide, at apex deltate-mucronulate, the margins revolute, the centric straight or slightly incurved midrib with 9–11 pairs of major camptodrome secondary veins immersed above, strongly prominulous beneath, the ter-

tiary connecting venules faintly prominulous on one or both faces but not forming a regular reticulum.

Peduncles 1–2.5 cm; racemes ± 15 –30-fl'd, the axis becoming 4–10 cm; bracts early deciduous firm ovate acute to narrowly lance-subulate 2.5–4.5 mm; pedicels at and after full anthesis 2.5–4 cm, subtended laterally at base by a slenderly stipitate, narrowly fusiform gland 2–3 mm; fl-buds rusty-puberulent, at least in lower half, when young, the later-expanding inner sepals glabrous dorsally; sepals obovate-suborbicular very unequal, the outermost (abaxial) one 4–8 mm, the innermost 10–15 mm; petals and androecium of *C. velutina*, the abaxial petals 25–32 mm; ovary densely rusty-pilosulous-strigulose; style linear straight 5 – 9.5×0.3 mm.

Stipe of pod ± 3 mm, the linear straight or decurved body 9 – 15×0.9 – 1 cm, plano-compressed, bicarinate by the often undulately constricted sutures, the stiffly chartaceous livid-castaneous valves scarcely constricted over seeds, charged lengthwise with a single coarse nerve running parallel to the sutures a little displaced from center toward abaxial one, the thick but very narrow inter-seminal septa 3.5–4 mm apart, the seed-locules in consequence broader than long; seeds (few seen) horizontal to long axis of pod or very obscurely oblique, oblong-obovoid $\pm 4.6 \times 3$ mm, the testa smooth brown but not highly lustrous, the areole oblong-elliptic $\pm 3 \times 1$ mm.—Collections: 6.—Fig. 22.

Habitat poorly known, recorded from chapada and disturbed taboleiro thickets, ± 300 – 750 m, known from scattered stations in s.-e. Maranhão, Piauí, Ceará and Pernambuco, in e. Brazil.—Fl. IX, II, IV, VI, perhaps irregularly following rains.

This well-marked species was independently recognized as new by the late Dr. D. Andrade-Lima, who did not live to describe it, as we had hoped. The epithet *lechriosperma* alludes to the transverse orientation of the seeds, in the context of the genus nothing extraordinary, but hitherto thought impossible for a member of sect. *Prososperma*, of which seeds turned downward along a narrow pod are the diagnostic feature. We interpret the direction taken by the seed within its locule as merely a function of the pod's width, and feel confident that this species is a genuine member of ser. *Laxiflorae* with which it agrees in all details of foliage, of glands on leaf-stalk and subtending the pedicels, of perianth and androecium, and especially in the prominent cordlike nerve running the length of the pod's valves, the hallmark of the *Laxiflorae* pod.

The earliest collection of this senna known to us is *Gardner 2124* (BM), collected in southern Piauí early in 1839. The specimens, in young flower, are unusual in having only two or three pairs of leaflets to the leaf, but seem otherwise a good match for the plants from Pernambuco. We surmise that the *Cassia velutina* reported from Ceará by Fernandes & Bezerra (XXIII Cong. Nac. de Bot., Belo Horizonte, I. 1977) is actually this species.

Bx. ser. TRIGONELLOIDEAE (Colladon) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Trigonelloideae** (Colladon) Irwin & Barneby, comb. nov. *Cassia* sect. *Chamaesenna* ser. *Trigonelloideae* DeCandolle ex Colladon, Hist. Casses 95 (statu categorico haud indicato). 1816; DeCandolle, Prod. 2: 493. 1825.—Sp. lectotypica: *C. tora* Linnaeus \equiv **Senna tora** (Linnaeus) Roxburgh.

Cassia sect. *Prososperma* Vogel, Syn. Gen. Cass. 7, 9, 23. 1837.—Sp. lectotypica (Symon, 1966, p. 76): *C. tora* Linnaeus \equiv **Senna tora** (Linnaeus) Roxburgh.—*Cassia* subgen. *Senna* sect. *Prososperma* (Vogel) Benth in Martius, Fl. Bras. 15(2): 114. 1870. *Cassia* sect. *Prososperma* ser. *Torae* Benth, Trans. Linn. Soc. London 27: 535. 1871.



Fig. 22. *Senna lechriosperma*. Flowering stem $\times \frac{1}{2}$; detached stamens $\times 4$; pod (upper left) $\times \frac{1}{2}$ + seed $\times 3$ (Gomes 1247). *S. velutina* (Vog.) I. & B. Pod (upper right) $\times \frac{1}{2}$ (Irwin et al. 16160).

Emelista Rafinesque, Sylva Tell. 127. 1838, pro gen.—Generitypus: *E. obtusifolia* (Linnaeus)

Rafinesque \equiv *Cassia obtusifolia* Linnaeus \equiv *Senna obtusifolia* (Linnaeus) Irwin & Barneby.

Diallobus Rafinesque, Sylva Tell. 128. 1838, pro gen.—Generitypus: *Cassia tora* [“thora”] Linnaeus \equiv *Senna tora* (Linnaeus) Roxburgh.—Inferentially equated with *Emelista* by Britton & Rose, 1930, p. 242, in syn.

Vogelocassia Britton ex Britton & Rose, N. Amer. Fl. 23(4): 258. 1930, pro gen.—Sp. typica:

V. leiophylla (Vogel) Britton & Rose \equiv *Senna leiophylla* (Vogel) Irwin & Barneby.

Emelista sensu Britton & Rose, 1930, p. 242; Britton & Killip, 1936, p. 178.

Corolla zygomorphic; sepals unequal, the inner longer, or broader, or both; fertile stamens 7, the 4 median shorter, the beak of their anthers latero-terminal, dehiscent by parallel slits, the 3 abaxial stamens subequal, the porrect beak of their anther either short or tubular, obliquely truncate, 1- or 2-porose; style

2.5–9(–10) mm terete, slightly thickened distally, either symmetrically or obliquely truncate or, just below apex, narrowed to the introrse stigmatic cavity; ovules (16–)20–52; pod linear, often much elongated, when fully ripe compressed 4-angular, the valves charged with an accessory keel running parallel and contiguous to each suture, the keels in 1 sp. winged; seeds 1-seriate, either obliquely transverse or basipetally descending, compressed either parallel to the valves or parallel to the septa, but the areole always turned to face the former, the seeds in very narrow pods often prismatically or irregularly distorted by confinement.—Herbs, monocarpic or perennial but then of short duration, some softly suffrutescent in age; lfts 1–3 pairs, ample; petiolar glands always present between proximal, sometimes between other pairs of lfts; racemes 1–3-fld, the axis without glands.—Spp. 9, all but *S. tora* tropical American, the weedy *S. obtusifolia* extending n. into temperate United States and naturalized in Old World tropics, *S. cobanensis* weedy in Malaya.

The ser. *Trigonelloideae* as defined above is equivalent to *Cassia* ser. *Torae* of Benthams revision, enriched by *S. leiophylla* (and segregated *S. cobanensis*) transferred from sect. *Chamaesenna* ser. *Rostratae* Benth. and by the more recently described *S. paraënsis* and *S. apsidoneura*. DeCandolle coined the epithet *Trigonelloideae* in reference to the pod of *S. tora* and *S. obtusifolia* which in outward form and curvature suggests that of the common fenugreek, *Trigonella foenum-graecum* L. These remain the nucleus of the group which, except that we prefer to exclude the carpologically specialized *S. uniflora*, here reacquires the limits set by DeCandolle in Colladon's monograph and in the Prodrumus. Vogel (1837) shifted the emphasis from the pod's form to the orientation of the seeds which, in the proportionately narrow pluriovulate pod of *S. tora* or *S. obtusifolia* are turned subvertically downward in narrow elongate locules longer than wide. Based on this feature, *Cassia* sect. *Prososperma* (displaced seed) was so defined by Vogel as to embrace along with the herbaceous *Trigonelloideae* sens. str. the shrubby Brazilian *S. velutina* and *S. australis* (= *Cassia appendiculata*) and, almost accidentally, for the pod and seed were then unknown, the leafless *S. aphylla*. Benthams adopted *Prososperma* in a somewhat extended sense but divided it into series: typical ser. *Torae*, consubstantial with *Trigonelloideae* DC.; *Confertae*, an indefensible category comprising the wholly different *S. villosa* (sect. *Astroites*) and *S. uniflora* (ser. *Confertae*, sens. restr.) which see for commentary; *Laxiflorae*, housing the shrubby Brazilians known to Vogel and others allied to them; and *Coriaceae*, of which the fruits, unknown at the time, have proved to be of other types indicating different affinities.

With the passage of time vertical basipetal orientation of the seed thought to characterize sect. *Prososperma* has in practice become increasingly difficult to apply as a fundamental criterion in *Senna*. The pod of *S. obtusifolia*, as described in detail below, varies in diameter between populations, and in the broadest, where the individual ovule enjoys space for expansion, the axis of the resulting ripe seed lies obliquely across the pod's vertical axis, while in some of the narrowest, one or more distal segments, free of mutual pressure from above and below, expand to accommodate oblique seeds even where all below them are vertically aligned. In *S. paraënsis*, unknown to earlier monographers of *Cassia*, the pod is proportionately wider and shorter than that of its obviously close relative *S. pilifera*; it is essentially like the pod of *S. cobanensis* and *S. leiophylla*, species referred by Vogel and by Benthams to sect. *Chamaesenna* but in other respects fully consonant with ser. *Trigonelloideae*. Under *S. pilifera* we call attention to a plant (*Krapovickas* 31293, from Corrientes, Argentina), normal for

the species in stature, stipules, vesture and foliage but remarkable for an abbreviated pod in which the seeds, packed into relatively short and broad locules, have become trapezoid and exactly transverse, even though the obliquely drawn areole betrays the true direction of the ovule within. The easy transition between a common type of thickly plano-compressed pod to one narrower and when ripe subtetragonal is exemplified by the pair *S. leiophylla* (sens. nostr.) and *S. mucronifera* which, with common facies and in particular similar sets of modified, long-beaked abaxial anthers not found in other *Trigonelloideae*, differ from one another in width-breadth ratio of the fruit and consequently in attitude of the seeds. Interpreting seed orientation as a functional adjustment of the swelling ovule to the space available, we abandon Vogel's section entirely and disperse the species arranged under that heading by Bentham among our ser. *Trigonelloideae*, our two monotypic series *Confertae* (*S. uniflora*) and *Astroites* (*S. villosa*) and the shrubby Brazilian ser. *Coriaceae* and *Laxiflorae*, collectively different in having glands associated with the pedicels. The residual ser. *Trigonelloideae* forms a coherent group of eight species characterized by essentially herbaceous life-form, few ample leaflets, and shortly pedunculate 1–3-flowered racemes devoid of glands. The androecium of ser. *Trigonelloideae* is somewhat heteromorphic, that of *S. pilifera* being hardly different from that of some *Bacillares*, whereas the strongly beaked abaxial anthers of *S. mucronifera* or of *S. pentagonia* suggest ser. *Interglandulosae*, dissimilar in other respects. In the majority of *Trigonelloideae* the peduncle of each 1–3-flowered raceme is shorter than the pedicels and in some the later racemes tend to fall into a narrow thyrses subtended by rudimentary leaf-stalks. In either case the habit recalls the common *Basiglandulosae* such as *S. occidentalis* or *S. hirsuta*, which are readily separable by the infrafoliolar insertion of the petiolar gland.

Key to American Species of ser. *Trigonelloideae*

1. Peduncles 0–5(–7) mm.
 2. Lfts 2–3 pairs.
 3. Flowering specimens:
 4. Fls relatively small, the longer sepals 6–9 mm, the longest petal 9–15 mm.
 5. Beak of 3 longer abaxial anthers 0.3–0.6 mm; widespread and abundant. 69. *S. obtusifolia* (p. 252).
 5. Beak of 3 longer abaxial anthers 1–2 mm; rare and local. 70a. *S. pentagonia* var. *pentagonia* (p. 256).
 4. Fls larger, the petals at least 16 and up to 33 mm, the sepals (except in *C. cobanensis*) 10+ mm.
 6. Foliage pilosulous or strigulose, the lfts usually pubescent on both faces, always on the dorsal one.
 7. Longest sepal 8–12 mm; body of 3 abaxial anthers 6–10 mm, their beak 1–1.6 mm; n.-w. Bolivia to Mexico. 68. *S. cobanensis* (p. 250).
 7. Longest sepal 12–20 mm; body of 3 abaxial anthers 11–14 mm, their beak 1.4–3 mm; n.-e. Bolivia to Paraguay and interior e. Brazil. 66. *S. mucronifera* (p. 247).
 6. Foliage glabrous or almost so, the lfts sometimes minutely ciliolate but glabrous on both faces.
 8. Lfts strongly venulose on both faces, the tertiary connecting venules elevated; local in s. Paraguay and adjoining Argentina and Brazil. 67. *S. leiophylla* (p. 248).
 8. Lfts not strongly venulose, only the secondary veins prominulous; Brazilian Planalto (w. Bahia, e. Goiás, s. Maranhão). 70b. *S. pentagonia* var. *valens* (p. 257).
 3. Fruiting specimens:
 9. Pod broadly winged along either side of each suture, the wings 2.5–4 mm wide. 70. *S. pentagonia* (p. 255).

9. Pod not winged.
10. Pod at once extremely long and extremely narrow, $\pm 18-25 \times 0.2-0.3$ cm; Brazilian Planalto and adjacent Bolivia and Paraguay. 66. *S. mucronifera* (p. 247).
10. Pod either broader, or shorter, or both.
11. Tertiary venulation of lfts elevated on both faces, these glabrous; local in s. Paraguay, adjacent Argentina and extreme s. Brazil. 67. *S. leiophylla* (p. 248).
11. Tertiary venulation imperceptible or fully immersed; widespread.
12. Seed-locules 2–3 mm long, 4–6 mm wide. 68. *S. cobanensis* (p. 250).
12. Seed-locules (3–)3.5–5.5(–6.5) mm long, 2–4.5 mm wide. 69. *S. obtusifolia* (p. 252).
2. Lfts exactly 1 pair (glabrous, intricately venulose); Bolivia. 65. *S. apsidoneura* (p. 246).
1. Peduncles (0.7–)1–10 cm.
13. Lfts exactly 2 pairs; widespread in n. and s. America. 63. *S. pilifera* (p. 241).
13. Lfts of almost all lvs 3 pairs; local in Amazon Basin, n.-e. Brazil to n. Bolivia. 64. *S. paraënsis* (p. 245).

63. *Senna pilifera* (Vogel) Irwin & Barneby, comb. nov. *Cassia pilifera* Vogel, Syn. Gen. Cass. 23. 1837.—Typus infra sub var. *pilifera* indicatur.

Herbaceous or softly suffrutescent in age, variable in habit and stature, sometimes flowering precociously and appearing monocarpic, at anthesis 1.5–24 dm, variably pubescent with usually 3 sorts of hair: a) minute thickened livid trichomes, b) short soft subappressed, incurved-ascending or spreading villi <1 mm, and c) erect lustrous setae up to 2–4.5 mm, the 3 sorts variably dense and variably proportioned, either of the first 2 sometimes lacking and setae either present on all axes or confined to stipules (exceptionally 0), the foliage \pm bicolored, the ample lfts dull green above, paler or glaucescent beneath, either softly pilosulous on both faces, or beneath only, or glabrous, the umbellately (1–)2–3-fld racemes pedunculate in lf-axils, ascending toward the meridian, immersed in foliage or shortly exserted.

Stipules erect or subfalcately ascending, narrowly linear-attenuate or setiform (3–)4–14(–15) \times 0.2–0.8 mm, firm green, prominently 1-nerved, deciduous with or before the lf.

Lvs 3–12(–15) cm, 4-foliolate; petiole including the (when dry) wrinkled pulvinus (0.8–)1–6 cm, at middle 0.5–1.5(–1.7) mm diam, narrowly obtusely thick-margined and openly sulcate ventrally; rachis (2–)3–16 mm; glands ascending from between each pair (the distal rarely lacking), stipitate, the slender stipe either glabrous or puberulent, the whole in profile 1.5–4(–4.5) mm tall, the slenderly ovoid or lance-fusiform acute head either longer or shorter than stipe, 0.2–0.5(–0.6) mm diam; lfts 2 pairs, heteromorphic, the distal pair longer and often proportionately narrower, these varying (sometimes on one stem) from broadly obliquely obovate and obtuse to obliquely rhombic-elliptic and obtuse, deltately acute or rarely emarginate, or (less commonly) lance-ovate-elliptic and acute, 2–6.5(–8) \times 1–3.5 cm, 1.3–3(–3.3) times as long as wide, the straight or obscurely incurved midrib with (5–)6–9(–11) pairs of camptodrome and (rarely) a few random intercalary secondary nerves prominulous on both faces, or only beneath, where tertiary and reticular venulation either elevated or not.

Peduncles (0.7–)1–9(–11) cm, pseudo-umbellately (1–)2–3-fld, the axis not over 1 mm; bracts 2–3 firm lanceolate, ovate or subulate 1.5–4 mm, tardily deciduous; pedicels (1.3–)1.5–5 cm; young fl-buds oblong-obovoid obtuse, either glabrous, thinly pilosulous or setose-hispid, separated by the emergent petals long before true anthesis; sepals herbaceous, green with paler margins, commonly heteromorphic but not strongly graduated, the larger inner ones ovate, obovate, elliptic-

or lance-oblong obtuse 4.5–13.5 mm, faintly or prominently 5–8-nerved from base; petals yellow, puberulent dorsally, beyond the claw obovate, oblong-obovate or broadly oblance-elliptic, all obtuse or the vexillary one commonly broader and emarginate, of subequal length or the 2 more oblique abaxial ones either a little longer or shorter than the adaxial, the longest petal (12–)13–36 mm; androecium glabrous, functionally 7-merous, the filaments of 4 median stamens 2–3.5 mm, of 3 abaxial ones (4–)5–9(–10) mm, the anthers of 4 median stamens (the anterior pair larger) 3–9 mm, their divaricate 2-porose beak 0.2–0.4 mm, those of 3 abaxial ones lunately incurved, the body 4.5–10 mm, the porrect beak 0.6–1 mm, its pores fully separated but sometimes only by a thin septum; ovary either strigulose or pilose, the vesture not correlated with that of stems or foliage; style filiform, sometimes lengthening after anthesis, then (4–)5–9(–10) mm, gently incurved distally and variably dilated; ovules (26–)30–50.

Pod ascending, variably arched outward, narrowly linear 10–24 × 0.25–0.4 cm, at base attenuate into a scarcely differentiated stipe, at apex into the persistent style, the body compressed-quadrangular, bluntly bicarinate along each suture, these constricted only where ovules abort, the stiffly papery valves nearly plane, finely venulose lengthwise, strigulose or pilose (subtomentose), the interseminal septa 4–9 mm apart; seeds basipetally oriented along the pod's long axis, obliquely quadrate-oblong 3–6.6 mm long, the testa smooth lustrous, the linear-oblong-elliptic areole 2–3 × 0.3–0.75 mm.

As defined by Benth (1870, l.c.), *Cassia pilifera* was inordinately polymorphic in stature, in pubescence, in outline, texture and venation of leaflets, in size of flower-parts, and in seeds. Benth noted the more coriaceous, prevailing broad leaflets of plants from southern Brazil, but dismissed this feature as systematically unimportant because it seemed not correlated with flower-size, which he found equally variable in South and North America. With more material for comparison, we can now perceive, to the contrary, strong relations between geographic dispersal on one hand and on the other phenetic characters of habit, leaf-texture, flower-size and seed which enable us to restore to varietal rank the taxon described long ago by Vogel as *Cassia maritima*, our var. *subglabra*, now believed to be the only representative of *S. pilifera* in the northern hemisphere and to extend southward interruptedly in Brazil to the Amazon-Paraná watershed. A form of the species resembling var. *subglabra* in most characters but with a greatly dilated, trumpet-shaped style and an allopatric range within that of var. *pilifera* can be segregated without difficulty as var. *tubata*.

Key to the Varieties of *S. pilifera*

1. Stems either diffusely weakly ascending or prostrate and distally incurved, mostly 1.5–5, exceptionally to 10 dm; lf-rachis 7–15 mm; fls relatively large, the longest sepal 8–13 mm, the longest petal 24–36 mm; anthers of 3 abaxial stamens (excluding beak) (9–)10–15 mm; seeds 5.5–6.6 mm long, the testa atropurpureous; around and within Gran Chaco and floristically related savanna regions in S. America s.-ward from lat. 24°S: s.-e. Bolivia, n.-w. and n.-e. Argentina, e. to the Paraná-Paraguai slope of the Brazilian planalto, s. to e. São Paulo, centr. Paraná, e. Rio Grande do Sul and Uruguay. 63a. var. *pilifera* (p. 243).
1. Stems erect or strongly assurgent (0.6–)1–2.4 m; lf-rachis 3–6(–9) mm; fls smaller, either the long sepals 4.5–7.5(–8.5) mm or the longest petal (12–)13–23(–26) mm, or both; anthers of 3 abaxial stamens 4.5–10 mm; seeds 3–5 mm long, the testa castaneous; allopatric, except for emphatically smaller-fl'd var. *tubata*.
2. Style only slightly dilated distally, widest shortly below apex, there 0.3–0.6 mm diam and thence contracted to a narrower, introrsely directed stigmatic cavity; lfts membranous, puberulent on both faces, obscurely reticulate dorsally; anthers of 3 abaxial stamens 6.5–10 mm; Mexico to Panama, n. Colombia, the Pacific slope in Ecuador, n. Peru;

Cuba; disjunctly in n. & e. Venezuela and in e. Brazil from the Amazon delta s. to centr. Mato Grosso, Distrito Federal, s. Minas Gerais and e. S. Paulo.

63b. var. *subglabra* (p. 243).

2. Style trumpet-shaped, distally dilated up to the suberect stigmatic cavity, this 0.7–1 mm diam; lfts glabrous on both faces and, when mature, coarsely reticulate dorsally (as var. *pilifera*); anthers of 3 abaxial stamens 4.5–5.5 mm; Andean foothills in Bolivia and local (riparian or weedy, possibly introduced) on the Paraná and Paraguai rivers in Paraguay and s.-w. Brazil (Mato Grosso).

63c. var. *tubata* (p. 245).

63a. *Senna pilifera* (Vogel) Irwin & Barneby var. *pilifera*. *Cassia pilifera* Vogel, l.c. & *Linnaea* 11: 668, descr. ampliata. 1837.—“In Brasilia: Sellow leg.”—Holotypus, †B = F Neg. 1730; neoholotypus, former isotypus, K! = NY Neg. 1457; isotypi FI (hb. Webb.), G, LE, W!—*Emelista pilifera* (Vogel) Pittier, J. Wash. Acad. Sci. 19: 176. 1929, nom. subnud.

Cassia pilifera fma. *sericea* Chodat & Hassler, Bull. Herb. Boiss. II, 4: 692. 1904.—“... prope Caraguatay, Sept., n. 3266; in campis Cordillera de Altos, Jan., n. 3736; in campo Arroyo Primero, Febr., n. 8434.”—Lectoholotypus, Hassler 3266, G! isotypi, G, K, W!

Cassia pilifera fma. *pilosa* Chodat & Hassler, l.c. 1904.—“in campo pr. Igatimi, Dec. n. 5627. [5 paratypi cited].”—Lectoholotypus, Hassler 5627, G!

Cassia tōra fma. *hirsuta* Chodat & Hassler, op. cit. 693. 1904.—“... in campo Ipe hu, Serra de Maracayu, Oct., n. 5071.”—Holotypus, G! isotypi, K, NY!

Cassia ignorata Hoehne, Rev. Mus. Paulista 10: 661, pl. 8. 1918.—“Museu Paulista: n. 1409, Alberto Lofgren, Campo Secco, Casa Branca, S. Paulo, 23/IX/89 . . . Horto ‘Oswaldo Cruz’ Butantan, n. 1750, F. C. Hoehne, Tatuhy, Campo de Sta. Cruz, 30/I/17.”—Holotypus not seen; duplicate of Mus. Paulista 1409 = Löfgren 159, C!

Cassia pilifera sensu Bentham, 1870, p. 115 & 1871, p. 536, utroque loc. ex parte, synonym. et planta centrali-americana exclus.

Herbaceous from slender oblique blackish, sometimes rhizomelike rootstock; petioles 1–4 cm, mostly 0.7–1.5 mm diam; distal lfts 2–6.5(–8) × 1–3.5 cm, the tertiary and reticular venulation prominulous usually on both faces, always sharply so beneath; pedicels (1.3–)2–5 cm; style 0.3–0.6 mm diam just below apex, thence narrowed to the oblique stigmatic cavity; locules of pod 6–9 × 2.7–4 mm; areole of seeds 2.5–3 × 0.5–0.75 mm; otherwise as given in key.—Collections: 77.

Campos, pastures, periodically flooded pastizal or brejo, becoming weedy in trampled and grazed savanna, degraded cerrado, along roadsides and in regenerating woodland, mostly 200–550 m, up to 850 m in Goiás and ±1200 m along the Andean piedmont, widely interruptedly dispersed through and around the Paraguai-Paraná basin in s.-e. Bolivia (Sta. Cruz), n.-w. and n.-e. Argentina (Jujuy and Salta; Corrientes and Misiones), Paraguay and s.-e. Brazil (s. Mato Grosso, s.-w. Goiás, the Triângulo Mineiro and São Paulo, there disjunctly e. to long. 47°, s. to centr. Paraná and w. Rio Grande do Sul), reported from Uruguay (Bentham, 1871, l.c.).—Fl. X–V(–VI).

This is the decumbent, large-flowered *garbanzo del campo*, described by Burkart (1952, pp. 166 in clave, 168) as rhizomatous and sometimes for that reason difficult to extirpate from tilled land. It is strikingly different from the erect, non-rhizomatous, small-flowered types which have passed as *Cassia pilifera* in Mexico and Central America but not always very clearly, at least in the herbarium, from relatively large-flowered forms of var. *maritima* native to south-central Goiás. For commentary see under the next.

63b. *Senna pilifera* (Vogel) var. *subglabra* (S. Moore) Irwin & Barneby, comb. nov. *Cassia pilifera* var. *subglabra* S. Moore, Trans. Linn. Soc. Lon-

don II, 4: 346. 1895.—“In paludibus ad Carandajinho juxta Corumbá [, Mato Grosso] . . . Jan. [1892] (N. 919).”—Holotypus, BM! = IPA Neg. 1439 = MO Neg. 2067 = NY Neg. 158.

Cassia maritima Willenow ex Vogel, Syn. Gen. Cass. 23 & Linnaea 11: 668, descr. ampliata. 1837.—“W[illdenow] Hrb. 7928.”—Holotypus, B (*hb. Willd.* 7928)!

Cassia mattogrossensis Malme, Arkiv f. Botanik 23A(13): 60. 1931.—“Santa Anna da Chapada [=Chapada dos Guimarães, n.-e. of Cuiabá, Mato Grosso], 18.V.1903 [(fl,fr.), Regnell] 11:3380 . . .”—Holotypus, S! = NY Neg. 10476.

Cassia pilifera sensu Benthham, 1871, p. 536, magna ex parte, syn. incl.

Emelista pilifera sensu Britton & Rose, 1930, p. 243, basionym. exclus. & syn. ‘*C. cubensis*’; Schery, 1951, p. 70.

Herbaceous from fibrous roots, sometimes appearing monocarpic, sometimes suffruticose in age, normally much taller and more erect than var. *pilifera*, the foliage thinner-textured, usually glaucescent beneath, usually finely puberulent on both faces, exceptionally glabrous; petioles 2–6 cm, mostly 0.5–1.2 mm diam; distal lfts 3–6(–7.5) × 1.5–3.4 cm, the tertiary and reticular venulation scarcely or not visible above, faintly raised beneath; pedicels 1.5–2.6 cm; style of var. *pilifera*; areole of seeds 2–2.5 × 0.3–0.6 mm.—Collections: 52.

Thickets, open or disturbed woodland, riverbanks and shores, southward along gallery margins in cerrado, becoming locally weedy in hedges and pastures, near sea-level up to 1400 m in Mexico, 1450 m in Peru, 1050 m on the Brazilian Planalto, widespread but highly scattered through parts of tropical N. and S. America: w. and s. Mexico (Sinaloa, near 25°N, to Oaxaca, Chiapas and Veracruz); e. Cuba (Oriente); centr. Panama (Panamá and Canal Zone); Cordillera Oriental in n. Colombia (Santander); lowland Pacific Ecuador (Guayas); sources of R. Huancabamba in s.-e. Piura and Cajamarca, Peru; remotely disjunct in the Orinoco valley in Bolívar and Guárico, Venezuela and in lower Amazonian and e. Brazil, from the delta region in Pará s. to the headwaters Rio Araguaia in Mato Grosso, of Rio Tocantins in Goiás, the São Francisco-Doce watershed in s. Minas Gerais, and e. São Paulo (Bocaina)—Fl. in Mexico IX–II, Cuba and Panama IX–II, in n. S. America IV–V, in Brazil III–VII.—*Acahualera* (s. Mexico).

There can be little question that the Mexican, Cuban, Panamanian and Amazonian plants referred by Benthham and by Britton & Rose to *Cassia* (or *Emelista*) *pilifera* are distinct from genuine *S. pilifera* of tropical Argentina and adjoining states, for they differ in habit, probably in duration of the root, in size of all flower parts and, most importantly, in the shape of the seed-locules as determined by the smaller size of the differently colored seeds. Collectively they might well be construed as an independent species, but the populations known from Maranhão, Goiás and Minas Gerais, while for the most part firmly linked to the northern ones by their seeds and habit of growth, have larger flowers, the measurements of all organs independently overlapping, if only a little, those of typical *S. pilifera*; and a few of these are ambiguous as to growth-habit, taller certainly than var. *pilifera* of extreme southeastern Brazil and Argentina but described as diffuse. A line drawn along the Amazon-Paraná watershed through the Federal District effectively separates the ranges of the varieties but as they approach this line, from either direction, the more obvious differences become muted. Unfortunately we have as yet too few examples of seeds from the Planalto, which might prove critical in the case of ambiguous specimens.

Unlike var. *pilifera*, the present variety is rather uniform in pubescence of the foliage, the leaflets being almost always puberulent on both faces; but the ovary may be either strigulose or pilose, its vesture varying independently of that of

the stems or of geography. The holotypus of var. *subglabra* and Irwin *et al.* 15267 from Sa. do Morcêgo on the Goiás-Minas border near 15°S are notable for the complete loss of the long lustrous setae usually thought characteristic of *C. pilifera*, but are not otherwise different from compatriot populations. The epithet *subglabra* is for the most part inappropriate and misleading.

- 63c. *Senna pilifera* Vogel var. *tubata* Irwin & Barneby, var. nov., omnino fere cum var. *subglabra* congruens sed stylo in ipsum apicem 0.7–1 (nec 0.3–0.6) mm diam dilatato tubiformi foliolisque utrinque glaberrimis dorso prominule reticulatim venulosis absimilis.**—BOLIVIA. La Paz, prov. Larecaja: Mapiri, IV.1866 (fl,fr), *H. H. Rusby* 984.—Holotypus, NY; isotypus, NY.

Habit of var. *subglabra*, the (? always) solitary erect or ascending stem 5–15 dm; long sepals 5–6 mm; longest petal 13–17 mm; otherwise as in key.—Collections: 10.

Habitat not recorded, to be expected in brush or pastures near 900–1500 m, Andean foothills on the sources of Río Beni in La Paz (Larecaja; Las Yungas), Bolivia; also in cultivated ground or at edge of woods, near 300 m, at scattered points on the upper Paraguai and Paraná rivers in Paraguay (Alto Paraguay) and Brazil (Bataguazú, Mato Grosso), here perhaps only ruderal.—Fl. IV–V, IX.

This has the habit, the thin-textured, dorsally glaucescent leaflets and the small flowers and seeds of var. *subglabra*, but is allopatric and notable in the species as a whole for the dilated, trumpet-shaped style. We surmise that it is native in the foothills of the Bolivian Andes and only of secondary occurrence as an agricultural weed along the great rivers southward.

- 64. *Senna paraënsis* (Ducke) Irwin & Barneby, comb. nov. *Cassia paraënsis* Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 113. 1922.—“[BRAZIL. Pará:] . . . Arumanduba prope Almeirim . . . [RB] n. 2.565 . . . prope Obidos . . . [MG] n. 16.338 et [RB] n. 1.277, l[egit] A. Ducke.”—Lectoholotypus, MG 16338, collected 12.VIII.1916 (fl), MG! isotypus, G! paratypi, RB 1277 & 2565, RB!**

Coarse, ultimately suffrutescent, erect or diffusely ascending herbs at anthesis ±5–11 dm, softly pilosulous throughout with fine incurved short hairs but the angulate stems and some lf-stalks in addition hispid with slender erect sordid setae up to 1.2–3 mm, the foliage bicolored, the lflets dull dark (when dry brownish-) green above, pallid beneath, the 1–3-fl'd racemes axillary to cauline lvs, not or scarcely exserted.

Stipules linear-attenuate, erect or incipiently falcate, 6–10 × 0.3–0.7 mm, at first herbaceous, early dry and deciduous before the lf.

Lvs 3.5–8.5 cm; petiole including discolored but little swollen pulvinus 8–18 mm, at middle 0.6–1.2 mm diam, carinate dorsally, very narrowly obtusely margined and openly sulcate ventrally; rachis 6–16 mm, either longer or shorter than petiole; glands between proximal and second but apparently never between distal pair of lflets, sessile or almost so, slenderly lance-fusiform acute 1.2–2 × 0.15–0.3 mm; pulvinules 1.2–2 mm; lflets of almost all lvs 3 pairs, strongly accrescent distally, the distal pair broadly oblanceolate to narrowly obovate or elliptic-oblong-obovate, obtuse mucronulate 2.5–5.5 × 1–2 cm, 2–2.8 times as long as wide, at base cordate on proximal and cuneate on distal side, the midrib with 6–8 pairs of camptodrome (and rare intercalary) secondary veins faintly defined above, sharp-

ly prominulous beneath, the tertiary connecting venules finely evident beneath only.

Peduncles 11–26 mm; raceme-axis 0–1.5 mm; bracts ovate 1.5–2 mm, early dry caducous; pedicels 12–17 mm; young fl-buds nodding subglobose, hispidulous throughout or at base only, the dorsally puberulent petals emergent well before anthesis; sepals moderately graduated, oblong-obovate, the long inner ones 5.5–6 mm, prominently 5-nerved from base, the nerves simple; petals of ser. *Trigonelloideae*, the slightly longer abaxial ones 10–13 mm; androecium glabrous except for sometimes puberulent filaments, these of 4 median stamens 1.2–2 mm, of 3 abaxial ones 2.5–3 mm, the anthers of 4 median stamens 3.5–4 mm, their very short biporose beak divaricate, those of 3 abaxial ones 4–5.8 mm, contracted into an almost erect beak ± 0.7 mm, this obliquely biporose; ovary spreading- or ascending-pilose; style 2.5–3.8 mm, a little dilated upward 0.5–0.6 mm diam, incurved only at very apex where contracted into the oblique stigmatic cavity; ovules 28–32.

Pod ascending and gently curved outward, narrowly linear 9–12.5 \times 0.4–0.45 cm, contracted at base into a stout stipe 2–3 mm, at apex into the persistent style, bicarinate by the sutures, at first strongly compressed but bluntly subtetragonal at maturity, the interseminal septa ± 4 mm apart, the locules \pm as wide as long; seeds obliquely descending across the pod-cavity, ± 4 mm long, the testa apparently atropurpureous lustrous, the oblong-elliptic areole ± 2 mm.—Collections: 5.

Annually flooded savannas and river banks, below 100 m, apparently local in n.-e. Amazonian Brazil: Rio Branco near 2°30'N in Terr. do Roraima; and along the lower Madeira and Amazon rivers and the latter's immediate tributaries from Itapiranga in e. Amazonas downstream to Almeirim in Pará; disjunct on río Yacuma near 14°S, 66°W in Beni, Bolivia.—Fl. VIII–II.

As noted by Ducke, *S. paraënsis* combines the pedunculate raceme and setose vesture of *S. pilifera* with the trijugate leaflets of *S. obtusifolia* or, we might add, of *S. cobanensis*, in both of which the racemes are subsessile. It is not reliably distinguished from *S. pilifera*, as Ducke thought, by flower-size, for the marginally sympatric (but consistently bijugate) *S. pilifera* var. *subglabra* can have equally short sepals and petals. On the other hand the distantly allopatric *S. cobanensis*, which resembles *S. paraënsis* not only in leaflet-number but also in the pod, really is larger-flowered, the longer petals almost always well over 15, not 10–13 mm long.

65. *Senna apsidoneura* (Irwin & Barneby) Irwin & Barneby, comb. nov. *Cassia apsidoneura* Irwin & Barneby, *Brittonia* 28(4): 430, fig. 1, 2. 1976.—“BOLIVIA. Santa Cruz: . . . *D. Bourke-Borrowes s.n.* in 1928.”—Holotypus, K! = NY Neg. 9194.

Reportedly suffruticose ± 6 dm, the root unknown, wholly glabrous except for randomly setose-ciliate stipulés and lflets and for appressed-puberulent pedicels and outer face of petals, the stems, petioles and pedicels prominently ribbed, the ample 2-foliolate, reticulately veiny concolorous lvs pallid-glaucous.

Stipules stiffly erect, linear-acuminate ± 10 mm, commonly 3-nerved, charged toward tip with a few fine spreading setae 2–2.5 mm.

Lvs 5–8.5(–?) cm; pulvinus and pulvinules ellipsoid 3–3.5 mm, wrinkled when dry; petiolar gland 1, erect from between the pulvinules, narrowly ovoid-fusiform 3–3.5 \times 1–1.4 mm, purplish; lflets tilted backward from tip of petiole, turned half face-to-face, to bring the midrib to horizontal, the plane, stiffly chartaceous blades

in outline obliquely reniform obtuse, minutely mucronulate, $2.5\text{--}5.5 \times 5.3\text{--}6.6$ cm, at base broadly flabellate or truncate, from base 5-nerved by the straight midrib and on its broad side 3, on its narrow side 1 short, incurved-ascending primary nerves, the midrib thence penniveined with 5–8 pairs of major obliquely ascending camptodrome secondary veins well within the sharp cartilaginous margin, these all again branched into a prominent quaternary reticulum of venules prominulous on both faces.

Peduncles from upper lf-axils 1–3.5 cm, at apex 2-fld; bracts broadly subulate ± 2 mm; pedicels at anthesis 1+, in fruit to 2.5(–?) cm; sepals firmly herbaceous glabrous oblong-obovate obtuse to 8–9.5 mm, from base coarsely 4–6-nerved, the nerves branched distally; petals (presumably yellow) when dry pinkish-brown, subappressed-puberulent dorsally, all broadly obovate and contracted into a narrow claw ± 2 mm, the vexillum deeply emarginate at apex, 20×11 mm, the rest obtuse, slightly longer, the 2 lateral plane, the 2 abaxial concave, enveloping the 3 long stamens; androecium 10-merous of 3 adaxial staminodes 5 mm, 4 intermediate fertile stamens each consisting of short stout filament and forwardly directed thecae $6.5\text{--}8 \times 2$ mm, and 3 abaxial fertile ones with filament ± 6 mm and incurved thecae $10.5\text{--}12 \times 2$ mm, the 7 fertile all contracted at apex into a biporose beak ± 0.4 mm; ovary strigulose; style strigulose, ± 8 mm, slightly dilated and incurved at apex.

Pod when half formed narrowly linear ± 13 cm, the sutures already becoming prominent, probably subquadrangular when mature.—Collection: 1.

Senna apsidoneura has the petiolar gland, the few-flowered axillary racemes, the perianth and androecium, and the elongately linear pod of ser. *Trigonelloideae*, but stands alone in the series because of its bifoliolate, thick-textured, pallidly glaucescent leaves.

66. *Senna mucronifera* (Benth) Irwin & Barneby, comb. nov. *Cassia mucronifera* Martius ex Benth in Martius, Fl. Bras. 15(2): 116. 1807.—“... ad ripas fluminis S. Francisco prope Malhada [at mouth of R. Carinhanha, on Minas Gerais boundary] prov. Bahiens: Martius; inter Lavrinha et Rio Maranhão prov. Goyaz: Pohl; in prov. Minas Geraës: Regnell III. n. 477.; ... Sorocaba prov. S. Paulo: Lund.”—Lectoholotypus, *Martius s.n.*, collected at Malhada in late XI. 1818 (fl. fr jun), M! = F Neg. 6247; paratypes, *Pohl 1702*, K! *Regnell III/477*, K! = IPA Neg. 960, 961, S! *Lund in hb. Warming. 190*, C!—*Emelista mucronifera* (Benth) Pittier, J. Wash. Acad. Sci. 19: 176, comb. subnud. 1929.

Coarse suffrutescent weakly malodorous herb with few erect or assurgent virgate, simple or distally few-branched, bluntly angulate stems at anthesis 9–24 dm, densely pilosulous throughout or almost so with rather stiff erect, ascending or loosely incurved, sometimes distally (in inflorescence) subappressed, often sordid hairs up to 0.2–0.45 mm, the foliage bicolored, the firmly membranous lfcs dull dark green above, paler beneath, nearly always pubescent on both faces, the lvs abruptly or gradually diminished distally, the inflorescence an exserted thyrses or thyrsoid panicle of subsessile 1–2-fld racemes terminating the main axis and its distal branches.

Stipules erect herbaceous, falcately linear-lanceolate (5–)6.5–15 \times 0.8–2 mm, strongly carinate-nerved, deciduous before the lf.

Lvs (disregarding depauperate distal ones) 5–13 cm; petiole including little swollen pulvinus (0.8–)1–3.5 cm, at middle 0.8–2 mm diam, ribbed dorsally and

laterally, openly shallow-sulcate ventrally; rachis 1–3.5 cm, shorter or little longer than petiole; glands always between proximal, usually between the second (of 3), less often between distal pairs, sessile or short-stipitate, in profile 1.2–3(–4) mm tall, the reddish-brown, narrowly lance-fusiform obtuse or acute body 0.3–0.8 mm diam; pulvinules (0.8–)1–3 mm; lfts 2 or (in most larger primary cauline lvs) 3 pairs, accrescent distally, the distal pair broadly or narrowly obovate-cuneate or obovate, obtuse mucronate or deltately to subacuminately acute, (2.6–)3–6(–6.5) × (1.2–)1.4–3(–3.4) cm, 1.5–2.5 (commonly ± 2) times as long as wide, at base cordate on proximal and cuneate on distal side, the centric straight midrib with (7–)8–12(–14) pairs of camptodrome secondary veins prominulous on both faces, more sharply and coarsely so beneath, there giving rise to a pronounced tertiary or reticular venulation.

Peduncles 0–3.5 mm; racemes 1- or 2-fld, the axis 0–1.5 mm; bracts ovate- or lance-acuminate 2–3.5 mm, caducous; pedicels (at and after full anthesis) 18–42 mm; fls in attitude and form like those of *C. cobanensis* except a little larger; long sepals broadly obovate or oblong 12–20 mm, the nerves becoming prominent and anastomosing distally; petals either pale or orange-yellow, the longer ones 22–31 mm; androecium glabrous or the filaments sometimes puberulent, those of the 4 median stamens 1–2 mm, of 3 abaxial ones (3.5–)5–10 mm, the anthers of 4 median stamens 6–8.5 mm, their divaricate biporose beak ± 0.3 mm, those of 3 abaxial ones 11–14 mm, abruptly contracted into an erect beak 1.4–3 mm, this abruptly bent forward near or beyond middle and dilated into a semicircular pollen-cup not divided by a septum; ovary strigulose; style 2.5–3 × 0.3–0.4 mm, gently incurved just below the small stigmatic cavity; ovules 44–52.

Pod (little known) erect but slightly or strongly, either simply or sigmoidally recurved, narrowly linear ± 18 –25 × 2–4 mm, resembling that of *S. pilifera*, the seed-locules ± 4 –6 mm long; seeds narrowly oblong-subcylindroid ± 5.1 –5.8 × 1.8–2.7 mm, the testa castaneous lustrous, the areole linear 4.0–5.2 × 0.5–0.8 mm.—Collections: 32.

Campo, cerrado, disturbed woodland, ± 300 –1000 m, local, scattered over the Planalto between the s. headwaters of the Amazon in Bolivia (Santa Cruz) and Brazil (Mato Grosso and Goiás), the São Francisco valley on the Minas-Bahia boundary, s.-e. Paraguay, and the headwaters of Rio Tieté in e. São Paulo.—Fl. in Brazil and Bolivia (I–)III–VIII, in Paraguay XI–II, the full season probably not known.

Senna mucronifera closely resembles some larger-flowered forms of *S. cobanensis*, from which it differs principally in the long narrow pod. This, in its early stages of development, when it is rapidly elongating but not yet filled out with seeds, resembles that of *S. obtusifolia* or *S. hirsuta* var. *hirta*, and when ripe is about twice as long but less than half as wide as that of *S. cobanensis*. More subtle and less consistent differential characters of *S. mucronifera* are the longer sepals, commonly longer petals, larger and longer-beaked abaxial anthers, more coarsely reticulate leaflets, and a more decisively exserted inflorescence. The two species are allopatric, but separated in Bolivia, so far as known at present, only by the valley of Río Mamoré, and thus are virtually vicariant in dispersal. Relationship with *S. leiophylla* is discussed under the next.

In the protologue Bentham described the central abaxial stamen as sterile and much smaller than the neighboring pair, but we have not confirmed this condition in any flower examined.

67. *Senna leiophylla* (Vogel) Irwin & Barneby, comb. nov. *Cassia leiophylla* Vogel, Syn. Gen. Cass. 25 & Linnaea 11: 672, descr. ampliata. 1837.—

“In Brasilia: Sellow leg.”—Holotypus, †B, labelled ‘Cach[oeira] de . . . 20 Mayo 1823,’ when Sellow was in the valley of Rio Jacuí near Cachoeira do Sul, Rio Grande do Sul, = F Neg. 1701; neoholotypus, former isotypus, K! = IPA Neg. 980 = NY Neg. 1462; isotypi, LE, W!—*Vogelocassia leiophylla* (Vogel) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 259. 1930, solum quoad nom.

Cassia leiophylla sensu Benth, 1870, p. 120 & 1871, p. 542, var. extrabrazil. exclus., emend. Brenan, Kew Bull. 21(1): 51. 1967.

Coarsely leafy, large-fl'd suffruticose herb at anthesis 7–15 dm, glabrous throughout except for sometimes puberulent pedicels and minutely ciliolate lflets, the smooth, bluntly angled stems branched distally, the foliage subconcolorous, the lflets dull olivaceous, the subsessile 1–2-fl'd racemes at first axillary to developed cauline lvs, distally forming a \pm exserted thyse.

Stipules erect herbaceous, narrowly linear-attenuate 10–18 \times 0.6–1 mm, deciduous before the lf.

Lvs (below inflorescence, where abruptly diminished) 6–12 cm; petiole including pulvinus 6–16(–22) mm, at middle \pm 1–1.6 mm diam, bluntly narrow-margined and openly sulcate ventrally; rachis 1–3 cm, commonly but not always longer than petiole; gland between proximal pair, sessile or almost so, in profile ovate-acuminate \pm 1.5–2.5 \times 0.7–1 mm; lflets of all lvs exactly 2, or of some lvs 3 pairs, strongly accrescent distally, the distal pair varying from obovate to oblanceolate or elliptic, obtuse mucronulate or deltately acute, 3.5–9 \times 1.6–3.7(–4) cm, 1.7–3.1 times as long as wide, the midrib with (8–)9–14 pairs of camptodrome and often some random intercalary secondary nerves together with connecting tertiary and reticular venulation all coarsely prominulous on both faces, slightly more pronounced beneath.

Peduncles 1–3 mm; bracts ovate-acuminate 2–3 mm caducous; pedicels 28–48 mm; fl-buds nodding glabrous, plumply obovoid, the sepals separated by emergent petals long before anthesis; sepals well graduated, thinly herbaceous, broadly obovate or suborbicular 13–15 mm, 7–9-nerved from base, the nerves prominent, branched distally and anastomosing; petals of ser. *Trigonelloideae* but ample and glabrous or nearly so, the longer ones \pm 26–33 mm; androecium glabrous, the filaments of 4 median stamens 1–1.5 mm, of 3 abaxial ones 5.5–9 mm, the anthers (in two sets) of median stamens 5.5–7.5 mm, their very short divaricate beak biporose, those of 3 abaxial ones 9–12 mm, abruptly narrowed into a beak 1.8–2 mm, the orifice of this as in *C. mucronifera* but the septum between the pores usually persistent; ovary strigulose; style \pm 3.5 \times 0.5 mm, scarcely dilated distally, narrowed to the stigmatic cavity; ovules \pm 46.

Pod when fully formed but unripe resembling that of *S. cobanensis* at the same stage of maturity, \pm 8–9 \times 0.45–0.5 cm, the seed-locules wider than long and the orientation of the young seeds transverse.—Collections: 4.

Campo below 300 m, apparently rare and local, known only from scattered stations in s. Paraguay (prov. Guaira), n.-e. Argentina (Misiones, near Posadas, and Corrientes, depto Paso de los Libres) and the Jucuí valley in centr. Rio Grande do Sul, Brazil.—Fl. I–V.

We here adopt without reservation Brenan's narrow and precise redefinition (1967, l.c.) of *Cassia leiophylla*, a warm temperate South American senna which had been interpreted by Britton & Rose so as to include the much commoner and more widespread, wholly intertropical *S. cobanensis*. It resembles the latter in the relatively broad, plano-compressed pod and transverse seeds, but differs in the glabrous, sharply reticulate leaflets. The habitally similar *S. mucronifera*,

vicariant in dispersal between *S. cobanensis* and *S. leiophylla* and morphologically intermediate in pubescence and venulation of the leaflets, differs from both in the greatly elongate and narrow pod.

68. *Senna cobanensis* (Britton & Rose) Irwin & Barneby, comb. nov. *Vogelocassia cobanensis* Britton ex Britton & Rose, N. Amer. Fl. 23(4): 259. 1930.—“Coban, Alta Verapaz, Guatemala, December 1907, *H. von Tuerckheim* 2056.”—Holotypus (no. 2056 of Collection II), NY! = K Neg. 7291 = NY Neg. 9400.—*Cassia cobanensis* (Britton & Rose) Lundell, Phytologia 1: 214. 1937.

Cassia leiophylla var. *pubescens* Benth. Trans. Linn. Soc. London 27: 542. 1871.—“... Peru, near Tarapoto, *Spruce*, n. 4299; ... Nicaragua, *Oersted*; ‘New Spain,’ Pavon [=Sessé ex Pavón]; near Jalapa [Veracruz], *Galleotti*, n. 3312.”—Lectoholotypus, *Spruce* 4299, K (hb. Benth.)! isotypus, K (hb. Hook.)! paratypi, as cited, K!

Cassia humilis sensu Martens & Galeotti, Bull. Acad. Bruxelles 10(9): 307 [=Enum. Synopt. Pl. Phanerog. Mex. 9: 6]. 1816.—*C. pumila* Martens & Galeotti ex Benth. 1871, l.c., pro syn., lapsu pro ‘*C. humilis*’; listed in Index Kew., but nom. nud. *Vogelocassia leiophylla* sensu Britton & Rose, 1930, p. 259; *Cassia leiophylla* sensu Standley, 1922, p. 408; Schery, 1951, p. 68; omn. exclus. basionym.

Cassia cobanensis sensu Brenan, Kew Bull. 21(1): 51–52. 1967.

Coarsely leafy, precociously flowering but ultimately weakly suffrutescent herb with 1 erect or several incurved-ascending, rarely prostrate, obtusely angulate, simple or few-branched stems at anthesis (1.5–)2–12(–15) dm, pilosulous or less often strigulose throughout with rather stiff, ascending erect or less often forwardly appressed hairs up to (0.2–)0.3–0.7 mm or the leaflets exceptionally (in Peru) glabrous above, the foliage scarcely bicolored, the lflets dull green above, a trifle paler beneath, the fls borne in subsessile umbellately 1–3-fl'd racemes, these at first axillary to and shorter than lvs, sometimes at length forming a shortly exerted terminal thyse.

Stipules herbaceous erect, narrowly linear-attenuate or subsetiform 5–17(–23) × 0.2–1.2(–1.8) mm, strongly carinate-nerved, deciduous before the lf.

Lvs (3.5–)5–12(–14.5) cm; petiole including wrinkled, often discolored pulvinus 0.6–3.5(–4) cm, shorter or less often a trifle longer than rachis, at middle 0.6–1.7(–2) mm diam, widely open-sulcate ventrally; rachis (1.2–)1.5–4 cm; glands erect from between proximal and nearly always the second but never between the distal pair, short-stipitate, in profile 1.2–2.7 mm tall, the narrowly fusiform or lance-ellipsoid acute or obtuse body 0.15–0.6 mm diam; pulvinule 1–2.5 mm; lflets of all (or almost all) lvs 3 pairs, accrescent distally, the distal pair from oblique base obovate-cuneate, asymmetrically obtusely rhombic-obovate or -oblanceolate 2.5–6(–7) × (1–)1.2–3.2(–3.8) cm, (1.5–)1.7–2.5 times as long as wide, at apex obtuse mucronulate, deltately subacute or (rarely) subacuminate, the midrib with (5–)6–9(–10) pairs of camptodrome (and occasionally random intercalary) secondary veins finely prominulous beneath or on both faces, tertiary venulation usually faint or, if at all raised, fine and open.

Peduncles 0–5(–7) mm, a succession of them sometimes forming a pseudo-raceme; bracts triangular-subulate or linear 1.5–3 mm caducous; racemes 1–2-fl'd, the axis not over 1 mm; pedicels at maturity (17–)20–40(–53) mm; fl-buds nodding, when young obliquely obovoid obtuse, puberulent, the sepals separated by emergent petals well before anthesis; sepals thinly herbaceous green, strongly graduated, the long inner ones broadly obovate or broadly oblong-oblanceolate, the longest (7–)8–12 mm, all weakly 5-nerved from base; petals yellow, withering by noon on bright days, thinly puberulent dorsally, in form like those of *S. pilifera*,

the longest petal (12–)16–25 mm; androecium glabrous (the anthers exceptionally puberulent), functionally 7-merous, the filaments of 4 median stamens \pm dilated 1–1.7 mm, those of 3 abaxial ones (3.5–)4–5 mm, the anthers of 4 median stamens 3.5–7 mm, their divaricate biporose beak 0.2–0.5 mm, those of 3 abaxial ones (5.5–)6–10 mm, contracted into a porrect beak (0.8–)1–1.6 mm, this dilated distally into a pollen-cup divided by a slender septum; ovary strigulose; style 3–4 mm, at apex slightly dilated 0.4–0.7 mm diam, then gently incurved to the slightly narrower stigmatic cavity; ovules 26–42(–50).

Pod stiffly ascending but arcuate outward, lunately or sometimes through half a circle, the narrowly linear body (6–)7–13 \times 0.45–0.6 cm, contracted at base into a stout stipe 3–6 mm, at apex into the persistent style, at first strongly compressed-quadrangular but at length somewhat turgidly expressed over the seeds, stoutly carinate by the tardily dehiscent sutures, the greenish valves turning brown and stiffly papery, the broad interseminal septa 2–3 mm apart; seeds oriented obliquely downward across the pod-cavity, obovoid or oblong-obovoid (some distorted by crowding), usually compressed parallel to the septa but sometimes to the valves, (2.7–)3–4.8 \times (1.5–)1.7–2.8 mm, the smooth lustrous castaneous testa often crackled when mature, the elliptic or linear-oblong areole (on the narrower, less often on the broader faces of seed) 2.1–3.2 \times 0.35–0.7 mm.—Collections: 88.

Disturbed woodlands, thickets, pastures, orchards and roadsides, on a great variety of soils, sometimes on malpais, colonial and weedy, mostly between 350 and 1000 m, but in Central America descending on both coasts to 10 m, reaching 1300 m in Veracruz and 1380 m in w. Panama, discontinuously widespread from s. Mexico (Colima and far w. Michoacán; centr. Veracruz; n., w. and s. Oaxaca; Tabasco and Chiapas) s. through Belize, Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica to Panama; unknown from Colombia or continental Ecuador; isolated at 680–850 m on upper ríos Huallaga and Perené in San Martín (prov. San Martín), Huánuco and Junín (prov. Tarma), Peru, and in trans-Andean foothill valleys on the sources of ríos Madre de Dios, Beni and Mamoré in Cuzco, Peru and in La Paz (Larecaja) and Cochabamba (Yungas), Bolivia; adventive in the upper Manapiare valley in Amazonas, Venezuela, on Galapagos Is. (San Salvador), and in Malaya.—Fl. in Mexico and Central America (IX–)XI–III(–VI), in South America IV–VI, IX.

In concept and circumscription of *S. cobanensis* we follow Brenan (l.c.), the species thus coinciding, except for basionym, with *Vogelocassia leiophylla* sensu Britton & Rose (1923). It is closely related on the one hand to pan-tropical weedy *S. obtusifolia*, recognized by the smaller flower, dilated stigma and narrow pod, and on the other to the genuine *S. leiophylla* and to *S. mucronifera*, both allopatric in southern Brazil and adjoining territories, which see for discussion of differences. We agree fully with Brenan that contrasts between populations in shape of leaflets and orientation of vestiture are of no taxonomic consequence, for the different states occur independently of each other and at random within the range of the species, though we must qualify that statement to the extent that leaflets glabrous on the upper face are known only from Peru. The Peruvian and Bolivian populations otherwise closely match some from Central America. The weedy nature of *S. cobanensis* makes it hazardous to hypothesize about its center of origin or possibly derived presence in one or other hemisphere; like some other non-weedy sennas which are certainly autochthonous north and south of the Amazon Basin, it may be native in the eastern Andes as well as northward from Panama.

69. *Senna obtusifolia* (Linnaeus) Irwin & Barneby, comb. nov. *Cassia obtusifolia* Linnaeus, Sp. Pl. 377. 1753.—“*Habitat in Cuba.*”—Lectoholotypus (Brenan, Kew Bull. 1958(2): 250. 1958): Dillenius, Hort. Eltham. Pl. Rar. 71, t. 62, 1732! typotypi, OXF (hb. Dillen.), G (hb. Burman. ex hort. eltham.)!—*C. tora* var. *obtusifolia* (Linnaeus) Haines, Bot. Bihar & Orissa 304. 1922.

Cassia tora β [C.] *humilis* Persoon, Syn. Pl. 1: 456. 1805, based on *Cassia tora* β Linnaeus, Sp. Pl. ed. 2, 582. 1762.—Holotypus, Plumier, Pl. Amer. Fasc. 4, t. 76, fig. 2. 1756!—*C. humilis* (Persoon) Colladon, Hist. Cass. 96. 1816.

Cassia toroides Rafinesque, Med. Bot. 96. 1828.—“Georgia to Kentucky.”—No typus known to survive but the description, in context of the dispersal, decisive.—*Diallobus falcatus* Rafinesque, Sylva Tellur. 128. 1838, nom. illegit.

Senna toroides Roxburgh, Fl. Indica 2: 341. 1832.—“The seeds of this plant were sent from Mysore to the Botanic Garden at Calcutta by Dr. Buchanan in 1800 and about the close of 1801 the plants bloomed.”—No typus seen, but the description and discussion decisive.—*Cassia toroides* Roxburgh, Hort. Bengal. 31. 1814, nom. nud.

Diallobus uniflorus Rafinesque, Sylva Tellur. 128. 1838.—“*C. bicapsularis* [sensu] Miller & C. . . Antilles, Madera.”—No typus known to exist, the name referred here by Britton & Rose (1930, sub *Emelista tora*).

Cassia obtusifolia sensu De Wit, 1955, p. 254; Brenan, 1967, p. 77; Isely 1975, p. 115, 206, map 50; Mulick & Krishna, 1978, fig. 6 (seed).

Cassia tora sensu Benthams, 1870, p. 115 & 1871, p. 535, quoad pl. amer., exclus. syn. plur.; sensu Schery, 1951, p. 69; Gleason, 1952, p. 386 (cum fig.); Dimitri & Rial Alberti, 1954, fig. 4 (optima!) et auct. plur. post-benthamsian. *Emelista tora* sensu Britton & Rose, 1930, p. 242, exclus. basionym. et syn. plur.—Non *C. tora* Linnaeus (1753).

Essentially monocarpic but sometimes of long duration, in extratropical climates plainly annual, when starved or crowded flowering as a diminutive, single-stemmed plant less than 1 dm but normally 3+ dm and amply leafy, commonly erect, branched distally or bushy-branched from base, sometimes diffuse, in favorable conditions becoming softly fruticose, the roots black with yellow growing tips, the terete or obscurely angulate pale green stems up to 20(–24) but commonly less than 12 dm, these with lf-stalks and pedicels either glabrous or thinly strigulose (pilosulous) with appressed, incurved or (rarely) erect hairs up to 0.2–0.6 mm mixed with (or replaced by) minute thickened or verruculiform trichomes, the thin-textured malodorous foliage slightly bicolored, the always ciliolate lflets either glabrous on both faces, or glabrous above only, or pubescent throughout, the 1–2-fld racemes subsessile in axils of cauline lvs and shorter than them, sometimes late in season forming a small terminal corymb.

Stipules herbaceous, incurved to erect, linear attenuate at both ends (3.5–)5.5–15(–17) \times 0.4–1.5 mm, strongly 1-nerved or (when broad) obscurely penniveined, deciduous before the lf.

Lvs (disregarding those of depauperate dwarfs or of drought-inhibited late-season branches) 3.5–15(–17) cm; petioles including discolored pulvinus 1–4(–5.5) cm, often progressively shorter upward along stem, at middle 0.5–1.7 mm diam, rounded or bluntly carinate dorsally, openly shallow-sulcate ventrally; rachis (0.8–)1.5–4 cm, either longer or shorter than petiole; gland between proximal and sometimes between the second (but never between the third) pair, sessile or shortly stipitate, glabrous, in profile (1–)1.4–3 mm tall, the lance-fusiform obtuse or subacute head 0.3–0.8 mm diam; lflets of almost all lvs exactly 3 pairs, much accrescent upward, the distal pair broadly obovate to cuneate-obovate or broadly cuneate-oblongate, obtuse mucronulate or obscurely depressed-acuminulate (1.7–)2–6.5 \times 1–4 cm, 1.6–2.5 times as wide as long, at base rounded or cordate on proximal and cuneate on distal side, the margin plane subhyaline, the centric midrib and (6–)7–10 pairs of camptodrome (with rare intercalary) secondary veins

faintly prominulous above, sharply so but slender beneath, the tertiary venulation imperceptible above, often faintly discolored but hardly raised beneath.

Peduncles 0–5(–8, but few over 4) mm; bracts ovate-acuminate or lanceolate 2–5 mm deciduous; pedicels at anthesis filiform (7–)9–25(–28) mm, in fruit much thickened (9–)12–35(–40) mm; fl-buds nodding subglobose, the thinly herbaceous sepals pale green, usually glabrous dorsally but ciliolate, sometimes fully glabrous or dorsally puberulent, the larger inner ones obovate or oblong-obovate (5.5–)6–9(–9.5) mm, 5-nerved from base; petals pale yellow, either glabrous or thinly puberulent dorsally, the vexillar one obcordate or cuneate-obcordate, the rest oblong-obovate, the 2 abaxial ones \pm asymmetrical and either a little longer or shorter than the rest, the longest of all 9–15 mm, but the petals in some late-season fls apparently not fully expanding; androecium glabrous, the filaments of 4 median stamens 1–3 mm, of 3 abaxial ones (1.5–)2–4(–4.5) mm, the anthers of 4 median stamens oblong (1–)1.4–2.8 mm, the biporose beak very short or almost 0, those of 3 median ones 2–4.5(–5) mm, contracted into a porrect or suberect beak (0.3–)0.4–0.6 mm, this usually dehiscent by one shallowly U-shaped slit, but a septum rarely dividing the orifice into 2 pores; ovary strigulose, rarely subpilosulous; style 1.7–4 mm, distally incurved and sometimes a little dilated, at the oblique stigmatic orifice 0.3–0.55 mm diam; ovules (16–)20–34(–38).

Pod stiffly ascending almost straight (when short) or more commonly arched out- and downward, sometimes through \pm half a circle, narrowly linear attenuate at both ends (6–)7–16(–18) \times 0.25–0.55(–0.6) cm, when first formed green and compressed-hexagonal, carinate by the sutures and on each face by two ribs parallel and approximate to the sutures, when ripe brown and more turgid, compressed tetragonal, the keeled sutures depressed and the parallel ribs becoming more prominent, the mid-strip of the valves faintly venulose, the valves becoming papery, tardily separating through both sutures, the interseminal septa well developed, the seed locules (3–)3.5–5.5(–6.5) \times 2–4.5(–5.5) mm, varying from a little wider than long to twice as long as wide; seeds in broader pods obliquely descending across the cavity, in narrower ones almost parallel to its long axis, compressed-rhomboid or (when crowded) irregularly distorted, or in narrow pods subcylindroid-oblong, 3.2–5.3(–6) \times 2–3.3 mm, the testa castaneous lustrous, crackled in age, the linear areole 2.5–4.2 \times 0.25–0.5 mm; $n = 13, 14$ (Irwin & Turner, 1960, p. 311); $2n = 24$ (Mahler, 1970, p. 71).—Collections: 339.

Lakeshores, river-banks and -beds, becoming a rank colonial weed of pastures, plantations, orchards, roadsides and waste places about farms and habitations, mostly 0–500 m, but up to 1100 m in Mexico, Colombia, the Brazilian Planalto and n.-w. Argentina, to 1680 m in Tropical East Africa, probably native of the Americas but now of almost circumtropical (and in N. and S. America and Asia warm temperate) dispersal: in North America circum-Caribbean and extending through the Mexican tierra caliente on the Pacific coast to s. Sonora, on the Gulf coast to Veracruz, apparently not recorded from Tamaulipas but n. through the Gulf coastal plain in United States from e. Texas to Florida, Missouri, Kentucky and tidewater Virginia (a fleeting waif n. of lat. 37°); in s. America scattered from n.-centr. Colombia to the Guianas and Tobago, discontinuously through the Amazon basin in Peru, Bolivia and Brazil, thence s. over the Planalto and the Atlantic states to Paraná, Paraguay, and n.-e. (Corrientes, Misiones) and n.-w. (Salta, Tucumán) Argentina; lowland Pacific Ecuador and Galápagos Is. Widespread in Tropical Africa; tropical Asia (Indomalaya; Sri Lanka; Indochina), Malesia, s. China; Philippine Is.—Fl. in temperate U.S.A. VII–XII, in s. peninsular Florida, Antilles, Mexico, Central America mostly (IV–)VI–III, in equatorial latitudes

throughout the year especially in wet periods, in s. Brazil and Argentina mostly X–V.—*Hediondilla*; *matapasto*; *charamazca* (Michoacán).

Our concept of *S. obtusifolia* is essentially that of Brenan (1958, l.c.), who also examined the nomenclature and rejected a faulty typification by De Wit; in this place we can add only some comments on internal variation in the New World.

The vernacular names *Hediondilla* and *Matapasto* provide a sort of shorthand description of this weedy malodorous senna which, like many other plants that have become, as it were, commensal with man, is genetically complex and phenetically heterogeneous. Three chromosome levels have been reported in *S. obtusifolia*, but we have not learned to relate this to any phenetic formula or indeed to recognize them in dried specimens. Growth form is known to be potentially hereditary, for while in Texas the senior author grew side by side from seed strains of *S. obtusifolia*, one of which, originating in Texas, maintained the erect habit of its parent and flowered in late summer, while the other, originating on the white sands of the Guyana near-interior, remained diffuse like its parent and failed to flower at all when translated northward through 30 degrees of latitude. Moreover it seems probable that small genetic differences can be handed down indefinitely from one generation to the next, for the flower is commonly, perhaps always, fertilized in late bud, the style being then curved inward so as to present the stigmatic cavity directly into the face of the precociously dehiscent anthers.

From early times it has been known that the petiolar glands of *S. obtusifolia* may be either solitary between the first pair or one each between the first and second pairs of leaflets; and Bentham wondered (1871, sub *C. tora*) whether there might not be two real races different in length and curvature of the pod, a feature that had been supposed, as we now know erroneously, to distinguish *S. obtusifolia* from *S. tora*. In America a second gland is relatively rare and of sporadic occurrence through the range of the species; plants with or without it may occur in the same habitat, without relation to other variable features. The pod and its seeds, however, do show some interesting correlations with distribution. On the Pacific coast of Mexico and southward through Central America, Colombia, Ecuador and Venezuela, the pod is apparently always narrowly needlelike, (2–)2.5–3.5 mm diam when fully ripe and often strongly curved out- and downward. In pods of this type the seed locules are much longer than wide and the oblong-cylindroid seed lies almost vertical along the pod's long axis. Throughout United States and the West Indies the pod is broader, 3.5–6 mm diam when fully ripe and on the average less curved; its locules are about 1–1.5 times as long as wide, housing compressed-rhomboid seeds obliquely tilted across the pod's long axis. In the Guianas and Amazonia, eastern Brazil and Argentina, a narrow pod is prevalent, but a broad one appears at scattered points, perhaps chiefly suburban. On the other hand broad pods alone are on record from Bolivia and Paraguay. Whether these two fruiting types had originally discrete ranges which have become obscured by artificial dispersal we cannot now tell. And there are individual specimens with pods ± 3.5 mm diam which would be hard to place in either category. The width of the pod has a bearing on the question of origin of the now almost pantropical *S. obtusifolia*, which we suppose, following Irwin & Turner (1960, p. 316), to be aboriginally neotropical. All African specimens of which good fruit has been available for study have the broad pods of Antillean or United States *S. obtusifolia*, which suggests that the African races of the species are derived from Caribbean stock. The Indian, Indomalayan and Chinese material that we have seen is of the same type, and could have been carried eastward from Africa. But the Philippine form of *S. obtusifolia* has the needlelike pod of the plant prevalent in Pacific Mexico, and we cannot help wondering whether it

is not derived from seeds brought across the Pacific over the Spanish trade route between Acapulco and Manila. Perhaps a biosystematic study will provide an answer to these questions. It may be worth mentioning that our study of American *S. obtusifolia* confirms Brenan's view that genuine *S. tora*, which differs in its usually shorter pedicels, always truncate abaxial anthers and broad areole on the seeds, is foreign to the New World, ranging from peninsular India and Sri Lanka to Fiji and Samoa.

The foliage of *S. obtusifolia* is said to furnish a vegetable, a purgative drug, and poultices for sores, ulcers and insect-bites. The seeds have been used as a substitute for or an adulterant of coffee, and furnish a mordant for dyeing blue cloth. Burkart (1952, p. 169, sub *C. tora*) mentions a large-seeded form of the species, distinct from that wild in Argentina, which is cultivated for its laxative properties by Japanese settlers under the name of *habuso*. Not seen by us, it should be compared with the broad-podded Antillean-African-Indian forms mentioned above which might have reached South America independently from eastern Asia. The macerated leaves furnish the Bora Indians of Río Yaguasyacu in Loreto, Peru with a dye for *Astrocaryum* hammocks (Balick *et al.* 1037, MO).

70. *Senna pentagonia* (P. Miller) Irwin & Barneby, comb. nov. *Cassia pentagonia* P. Miller, Gard. Dict. ed. 8, *Cassia* no. 18. 1768.—Typus infra sub var. *pentagonia* indicatur.

Coarse erect malodorous monocarpic herbs with habit of *S. obtusifolia*, at anthesis 2–24 dm, subcorymbosely few-branched distally, appearing glabrous but the lfcs always minutely ciliolate and the young stems and lf-stalks often thinly minutely puberulent, the green membranous lfcs glabrous on both faces, paler or subglaucous beneath, the inflorescence of axillary subsessile 1–2-fl'd racemes immersed in foliage or in age forming a small terminal corymb.

Stipules erect linear- or narrowly lance-attenuate 8–18 × 0.7–2 mm, the thinly herbaceous blades strongly 1-nerved, deciduous before the lf.

Lvs 5–13.5 cm; petiole including discolored pulvinus (1.5–)2–5.5 cm, at middle 0.6–1.6 mm diam, carinate dorsally, openly shallow-sulcate ventrally; rachis (1.2–)1.5–3 cm, usually a little shorter than the petiole; gland between proximal and rarely also between the second pair of lfcs stipitate or subsessile, in profile (1.3–)2–4 mm tall, the narrowly lance-ellipsoid obtuse body 0.3–0.6 mm diam; pulvinules 1.2–2.5 mm; lfcs 3 pairs, accrescent upward, the distal pair broadly obovate or subrhombic-obovate, obtuse mucronate or obscurely deltate-acuminate (2.2–)2.5–6 × 1.3–2.6 cm, 1.4–2.4 times as long as wide, the margin and venation as in *S. obtusifolia*.

Peduncles 0–3 mm; racemes 1–2-fl'd, the axis not over 1 mm; bracts lance-attenuate 3–5 mm, caducous; pedicels at anthesis 13–32 mm, in fruit much thickened and 14–40 mm; fls of *S. obtusifolia*, except (as described under vars.) sometimes larger, but the 3 abaxial anthers more strongly beaked, the beak (1–)1.2–5 mm; ovary strigulose; style almost linear 3–8 mm; ovules 20–28.

Pod stiffly ascending and slightly arched outward, the stipe 6–10 mm, the body 5.5–8 cm long, including the wings 8–11 mm diam, the body itself compressed quadrangular 4–5 mm diam, its cavity divided by complete septa into locules 2.5–4 mm long, the valves stiffly papery, the ridges parallel and approximate to the sutures produced as papery wings 2.5–4 mm wide; seeds descending obliquely across the cavity, obovoid compressed usually parallel to the septa, 3.5–4.2 × 2–3 mm, the castaneous sublustrous testa minutely pitted or granular, the linear or linear-elliptic areole 2–3 × 0.3–0.6 mm.

While *S. pentagonia* becomes instantly recognizable so soon as its curiously winged ovary begins to expand, its smaller-flowered forms are at anthesis scarcely distinguishable from *S. obtusifolia* except by the longer (at least 1, not ± 0.4 –0.6 mm) beak of the three abaxial anthers. The likeness is so faithful that there can be little doubt that *S. pentagonia* originated by mutation from the common sickle-pod or an immediate ancestor. These related species were both first described by contemporaries of Linnaeus, but while the former has long been recognized as almost circumtropical in dispersal the latter, although similarly weedy in behavior, has proved singularly rare and local, the few known populations being loosely concentrated bicentrically in extra-Amazonian south Brazil and in northern Central America and adjoining Mexico. The plants of the northern hemisphere are all, so far as known, relatively small-flowered, as are those of Brazil southward along the S. Francisco valley from western Bahia to eastern São Paulo. From a still meager sample it appears that the anther-beaks of the Brazilian plants are shorter than those of North American ones, about 1–1.5, not 1.8–2 mm long, but the difference, if real, is inconsiderable, being unsupported by other characters. In the central Brazilian highlands the species is represented by a large-flowered race with extraordinarily long anther-beaks, described below as var. *valens*. Difficulty must be expected in separating fruiting material of var. *valens* from var. *pentagonia*, which are virtually identical in vegetative characters and in the pod; in fact a specimen from southern Goiás (Goiás Velho, *Burchell* 7062, LE, NY) already presents this problem. The range of var. *valens* overlaps that of the similarly large-flowered *S. mucronifera*, which may be separated without difficulty by the greatly elongate and very narrow wingless pod and at anthesis by the pubescent, emphatically venulose leaflets.

Key to Varieties of *S. pentagonia*

1. Fls relatively small, the longest sepal 7–9 mm, the longest petal 11–15 mm; style 3–4 mm; body of 3 abaxial anthers 3–4 mm, their beak 1–2 mm; dispersal bicentric: s. Mexico to Honduras; s.-e. Brazil. 70a. var. *pentagonia* (p. 256).
1. Fls larger, the longest sepal 13–15 mm, the longest petal 21–30 mm; style 6.5–8 mm; body of 3 abaxial anthers 9–10 mm, their beak 4–5 mm; Brazilian Planalto (s. Maranhão, e.-centr. Goiás and w. Bahia). 70b. var. *valens* (p. 257).

70a. *Senna pentagonia* (P. Miller) Irwin & Barneby var. *pentagonia*. *Cassia pentagonia* P. Miller, 1768, l.c., sens. str.—“*Senna spuria* . . . *siliqua pentagona alata*. Houston MSS . . . sent me from Campeachy by the late Dr. Houston.”—Holotypus, so ticketed in Houston’s hand and annotated by Solander, BM! = BH Neg. 5164 = NY Neg. 159. The pod had been illustrated earlier by P. Miller, Fig. t. 82, fig. c. 1760, but there mistakenly associated with a plant of *C. bicapsularis*. Erroneously equated by Martyn, Gard. Dict. ed. 9, and by Britton & Rose, 1930, p. 242 (sub *Emelista*) with *C. tora*; restored by Bentham, 1870, p. 114, t. 34, fig. II; 1871, p. 535.

Fruiting pedicels 14–22 mm; otherwise as given in key.—Collections: 13.

Disturbed thickets, weedy grassland, roadsides, ditches and lake shores, not known to occur on limestone and certainly not confined to calcareous soils, mostly below 750 but ascending in Chiapas to 1270, in Honduras to 1200 m, rare and scatterd: s. Mexico (Gulf slope in Chiapas and Campeche; Pacific slope in w. Guerrero), and Honduras (Morazán); s.-e. Brazil (w. Bahia to s.-centr. and s.-e. Minas Gerais and e. S. Paulo).—Fl. in N. America IX–X, in Brazil III–IV.

- 70b. *Senna pentagonia* (P. Miller) var. *valens* Irwin & Barneby, var. nov., a var. *pentagonia* florum multo majorum sepalo maximo 13–15 (nec 7–9) mm usque longo, petalo longissimo 21–30 (nec 11–15) mm longo, antherisque staminum abaxialium trium longius rostratis, rostro tubuloso 2-poroso 4–5 (nec 1–2) mm longo absimilis.**—BRAZIL. Goiás: roadside capoeira, 600 m, Sa. São Roque between Posse and Alvorada, 17.IV.1966 (fl, fr), *Irwin, Grear, Souza & Reis dos Santos 14940*.—Holotypus, R; isotypi, F, K, LE, P, NY, UB, US.

Fruiting pedicels 20–40 mm; otherwise as given in key.—Collections: 5.

Disturbed campo cerrado and caatinga forest, in Goiás and Bahia on limestone, ±500–800 m, apparently local along and near the divide between the upper Rio Tocantins to the w. and the left affluents of Rios Parnaíba and S. Francisco to the e. in lat. 7°–15°30'S, s. Maranhão, e.-centr. Goiás and w. Bahia.—Fl. II–V.

Bxi. ser. CONFERTAE (Bentham) Irwin & Barneby

Senna* sect. *Chamaefistula* ser. *Confertae* (Bentham) Irwin & Barneby, comb. nov. et char. mut. *Cassia* sect. *Prososperma* ser. *Confertae* Bentham, Trans. Linn. Soc. London 27: 536. 1871, ex parte.—Sp. lectotypica: *C. sericea* Swartz = ***Senna uniflora* (P. Miller) Irwin & Barneby.*

Sericeocassia Britton ex Britton & Rose, N. Amer. Fl. 23(4): 246. 1930, pro gen.—Sp. typica (unica): *S. uniflora* (P. Miller) Britton & Rose = ***Senna uniflora* (P. Miller) Irwin & Barneby.**

Resembling small-fl'd *Trigonelloideae* in habit and floral structure, the short style dilated, incurved distally, symmetrically truncate, precociously fertile; ovules (5–)6–12; pod erect, linear-oblong in outline, compressed-tetragonal, the valves charged with an accessory nerve running parallel and close to the stout sutures, deeply impressed between seeds; seeds 1-seriate, obliquely descending across the pod-cavity, the narrow areole nearly as long as the seed-face.—Coarse annual herbs, rufescent-pilose; petiolar glands between 2–4 pairs of lf's; lf's ample 3–5 pairs; racemes 2–7-fl'd, the pedicels no longer than sepals, often subtended by a gland resembling those of lf-stalk.—Sp. 1, a colonial weed of disturbed habitats in Mexico, n. Centr. America, Antilles, and e. Brazil, adventive in Venezuela and Galápagos Is.

The foetid, coarsely weedy *S. uniflora* has something of the habit of ser. *Trigonelloideae*, but is readily distinguished from all of the latter's monocarpic members by the short-pedicelled flowers, rufous setose vesture, and especially by the short straight erect, very narrowly oblong pod deeply sulcate between the seeds. The color and quality of the trichomes, the grooved pod and the gland often present at base of pedicels are all highly suggestive of ser. *Laxiflorae*, which differ in shrubby habit, in the large, normally chasmogamous flowers with pluriovulate ovary and erect straight linear style. It seems likely, however, that *S. uniflora* is a specialized offshoot from this group or from a common precursor. The species was associated by Bentham, in a ser. *Confertae* of sect. *Prososperma*, with the taxonomically isolated *S. villosa*, wholly different in its shrubby habit, stellate pubescence, androecium and truly lomentaceous fruit, and inherits from this the epithet *Confertae* by lectotypification. Some members of ser. *Brachycarpae* are similar in foliage and in the erect, tardily dehiscent pod, but this is never transversely sulcate and contains seeds of rather different shape marked on each face with a little round unilicoid, not linear-oblong areole.

Senna uniflora must be considered as biologically advanced. Its flowers are very small, fugacious and probably in most cases autogamous, the trumpet-shaped style being recurved in bud to stand opposed to the precociously dehiscent anthers and the whole pistil beginning to expand before the petals. As a result of autogamy the populations are extremely uniform in essential characters even though the individual plants vary much in stature and vigor. Moreover interpopulational differences are scarcely perceptible, despite the discontinuous North American area of dispersal and the great disjunction between this and the Brazilian. Possibly *S. uniflora* may have arisen in Brazil, the country in which sennas of the *Prososperma* type have their present center of diversity, and is only a weed of long residence in Mexico and the Caribbean. It was encountered in northeastern Brazil ca. 1640 by Georg Marcgrav, who described and figured it (Hist. Rer. Nat. Bras. 10, fig. 1. 1648) as the second sort of *paiomirioba* or *matopasto*, the name (shared with *C. obtusifolia*) by which it is still known to country folk in Maranhão and elsewhere in interior Brazil. The first records from Jamaica and Yucatán Peninsula are a century later. The plant appears exclusively weedy in North America and seems certainly introduced in Venezuela and the Galápagos. Its apparent absence from Costa Rica and Panama would be difficult to explain if *S. uniflora* is aboriginally native in Central America. However the true origin can now only be inferred.

71. *Senna uniflora* (P. Miller) Irwin & Barneby, comb. nov. *Cassia uniflora* P. Miller, Gard. Dict. ed. 8, *Cassia* no. 5. 1768.—“*Senna spuria herbacea orobi Pannonici foliis* . . . Houston MSS . . . Sent me from Campeachy by the late Dr. Houston.”—Holotypus, labelled “Campeachy, Houston, 1730,” ticketed by Houston and by Miller, BM (plant second from left only)! = BH Neg. 5165 = NY Neg. 113.—*C. sericea* Swartz, Prod. 66. 1788 & Fl. Ind. Occ. 2(1): 724. 1798, nom. substit. illegit. *C. monantha* DeCandolle, Prod. 2: 506. 1825, nom. illegit. *Sericeocassia uniflora* (P. Miller) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 246. 1930.

Cassia ornithopoides Lamarck, Dict. 1: 644. 1785.—“ . . . croît dans l’Amérique méridionale . . . communiquée par M. Thouin.”—The only spm in P-LAM is a lf acquired from Aublet, possibly clastotypic. Neotypus, labelled “*C. ornithopoides*,” collected in Santo Domingo by Poiteau, FI (hb. Webb. via Desfont.)!

Cassia sensitiva Jacquin, Collectanea 362. 1789 & Ic. Pl. Rar. 3: t. 459. ±1790.—“Jamaica patria est.”—Holotypus, grown at Schönbrunn, W. (hb. Jacqu.)!

Cassia ciliata Hoffmannsegg, Verzeichniss Pflanzenkult. 208. 1824.—“H. in Cuba.”—Described from cultivated plants, thought to differ from a description of *C. sericea* by Link, but certainly *C. uniflora* e descr.—*C. sericea* (?) var. β [*C.*] *ciliata* (Hoffmannsegg) Vogel, Syn. Gen. Cass. 24. 1837.

Emelista mucronulosa Pittier, Jour. Wash. Acad. Sci. 19: 176. 1929.—“Lara: vicinity of Barquisimeto; flowers and fruits July, 1925 (*J. Saer d’Heguert* 282 . . .).”—Holotypus, US!

Cassia sericea sensu Bentham, 1870, p. 116, t. 35, fig. 1; 1871, p. 536, the illegitimate epithet preferred because more appropriate.

Coarse malodorous monocarpic herbs from shallow blackish root, usually stiffly erect and simple or paniculately few-branched distally, rarely branched from base, diminutive when starved or crowded but commonly at anthesis 2–12, rarely 20 dm tall, variably pubescent with extremely fine short whitish villi mixed with stouter, forwardly subappressed or some spreading rufescent setae up to (0.8–)1–2 mm, only the lower stem and some early lvs glabrate, the subconcolorous lfts always setose dorsally (especially along veins) and setose-ciliate, on the upper face thinly or densely (even subvelutinosely) villosulous, the shortly pedunculate

racemes of few small short-pedicelled fls axillary to and shorter than all major lvs.

Stipules erect or subfalcately erect, narrowly linear-attenuate or -caudate (5-)7-24 \times 0.3-1.2 mm, the thinly herbaceous blades asymmetrically 1-nerved, deciduous before the lf.

Lvs (disregarding those of late depauperate branchlets) 5-16 cm; petiole including moderately swollen pulvinus 1.5-4(-4.5) cm, at middle 0.7-1.7 mm diam, bluntly 3-ribbed dorso-laterally, narrowly margined and open-sulcate ventrally; rachis (1-)1.5-6(-6.5) cm, usually a little longer than the petiole; glands between all except the distal (or distal and penultimate) pairs, stipitate, the slender stipe villosulous, the whole in profile 2-4.5(-5) mm tall, the narrowly lance-attenuate body 0.2-0.4 mm diam; pulvinules 1.2-2.3 mm; lfts 3-5 pairs, \pm accrescent distally but either the distal or the penultimate pair largest, these broadly obovate-cuneate, obovate, or subrhombic-obovate 2-5.5 \times 1-3.1(-3.4) cm, 1.5-2 times as long as wide, at apex rounded or depressed-deltate-acuminulate, conspicuously mucronate, at oblique base inequilaterally rounded or distally cuneate, the midrib and 4-6 pairs of camptodrome secondary veins immersed or almost so above, sharply prominulous and often pallid beneath, the tertiary venulation imperceptible or almost so.

Peduncles (3-)5-17(-20) mm; racemes shortly or subumbellately 2-6(-7)-fld, the axis 0-4(-7) mm in fruit; bracts resembling stipules but smaller, 2-7(-10) mm; pedicels at anthesis no longer than sepals, often but not always subtended on one side or another by a gland resembling those of petiole, in fruit stiffly erect-ascending, much thickened, 2.5-5.5 mm; fl-buds nodding subglobose, pilosulous at or toward the base but glabrate distally; sepals thin-textured, greenish at middle but pallid or yellowish toward margins, moderately graduated, oblong-obovate or suborbicular, the longer inner ones up to 3-4.3 mm; petals yellow, often fading (or drying) brick-red, not strongly veined, glabrous dorsally, fleetingly expanded and lasting no more than 1 day, sometimes remaining crumpled and scarcely longer than calyx, in outline obovate-cuneate obtuse or subemarginate, the 2 abaxial ones slightly oblique, the longest petal (3-)4-8 mm; androecium glabrous, the 3 staminodes minute, the 7 fertile members all similar but slightly accrescent toward abaxial side of fl, the filaments 0.6-1.7 mm, the anthers lanceolate or lance-ovate in outline 0.9-2.4 mm, slightly incurved, contracted near apex into a beak 0.2-0.5 mm, this precociously dehiscent into a 1-pored pollen-cup facing inward; ovary densely white-setose-pilose; style (1.2-)1.4-2.4 mm, strongly incurved, at apex dilated and (0.35-)0.4-0.6 mm diam at the truncate orifice; ovules (5-)7-12.

Pod erect, long persistent (even after fall of all lvs), sessile or almost so, linear-oblong in outline, straight or slightly incurved, 2.5-5.5 \times 0.3-0.4(-0.45) cm, bluntly compressed-tetragonal, bicarinate by the thick cordlike sutures, the turgid valves at first firm green, turning brown or ultimately blackish, venulose and rufous-setose, deeply impressed-sulcate over each intraseminal septum and thus appearing but not truly lomentaceous, the seminal cavities (3-)3.5-5 mm long; dehiscence tardy, basipetal through both sutures; seeds obliquely descending across the cavity, irregularly compressed-rhomboid 3.2-4.4 \times 2-3 mm, the testa smooth or minutely granular, brownish-olivaceous or finally castaneous, crackled or eventually flaking, the lustrous oblanceolate areole straight or commonly incipiently sigmoid, nearly as long as the seed-face, 2.8-4.2 \times 0.6-1 mm.—Collections: 170.—Fig. 10 (androecium), 14 (pod + seed).

Waste places, both urban and rural, disturbed brush-woodlands, savannas,

shores and beaches, becoming a troublesome colonial weed of pastures where avoided by herbivores, primarily of the lowlands but ascending to 700 m in Brazil, 1200(–1750) m in Mexico and 1300 m in Honduras, bicentrically dispersed in eastern Brazil and in n. Central America, Mexico and the Antilles, sporadically weedy elsewhere: Brazil (s. Maranhão to Ceará, Bahia, n.-w. Minas Gerais and e.-centr. Goiás); Bahamas, Cuba, Jamaica, Hispaniola, Puerto Rico; Mexico (s. Tamaulipas to Yucatan Peninsula, Chiapas, across the s. states to Jalisco and thence n. along the Coastal Plain to s. Sonora); Guatemala, Belize, El Salvador to Nicaragua; Barbados; n. Venezuela (Lara, e. to Nueva Esparta); Ecuador (Galápagos Is.).—Fl. throughout the year except when drought-inhibited, sometimes surviving the dry season and regenerating as softly woody herbs.—*Charamasca*, *frijolillo* (Mexico); *xtulú-bayá* (Maya); *pica-pica* (Venezuela); *matopasto* (Brazil).

Bxii. ser. BRACHYCARPAE (Bentham) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Brachycarpae** (Bentham) Irwin & Barneby, comb. nov. *Cassia* sect. *Chamaefistula* ser. *Brachycarpae* Bentham, Trans. Linn. Soc. London 27: 529. 1871.—Sp. lectotypica (Irwin & Barneby, 1975, p. 7): *C. roemeriana* Scheele ≡ **Senna roemeriana** (Scheele) Irwin & Barneby.—Non *Cassia* sect. *Chamaesenna* ser. *Brachycarpae* Bentham, op. cit., p. 552, quae = **Senna** P. Miller ser. **Senna**.

Earleocassia Britton ex Britton & Rose, N. Amer. Fl. 23(4): 247. 1930, pro gen.—Generitypus: *E. roemeriana* (Scheele) Britton & Rose = **Senna roemeriana** (Scheele) Irwin & Barneby.—*Cassia* subgen. *Senna* sect. *Earleocassia* (Britton & Rose) Irwin & Barneby, Sida 6(1): 7. 1975.

Corolla zygomorphic, the petals like the sepals of subequal length; 7(–10) fertile stamens subhomomorphic except slightly accrescent toward abaxial side of fl, the thin-textured, laterally discolored anthers slenderly lanceolate in outline, variably incurved, at apex simply attenuate or constricted shortly below apex and thence dilated, in either case either obliquely or horizontally truncate 1-porose; style either filiform, or subuliform, or stout and dilated, the stigmatic cavity terminal; ovules 14–44; pod usually ascending, rarely declined, laterally compressed but turgid or subterete 1–8 cm long, the interseminal septa either broad or subobsolete; dehiscence apical and downward through both sutures, the valves commonly gaping to release the seeds; seeds either transverse or obliquely basipetal, 1- or 2-seriate, mostly turned broadside to their neighbors but (*S. lindheimerana*, *S. foetidissima*) some at either end of pod sometimes broadside to the valves, plumply obovoid, compressed-pyriform or paddleshaped; areole present, often umbilicoid.—Herbs from black roots, sometimes softly suffrutescent in age, perennial or monocarpic; lfts 1–9 pairs; petiolar gland between proximal or all pairs; racemes 1–45-fld, the pedicels only exceptionally subtended by a gland.—Spp. 16, of Mexico and s.-w. United States, few (more primitive) of tropical savanna-woodland, the majority of arid grassland, thorn-forest and deserts, most highly developed in and around the Chihuahuan Desert.

The series *Brachycarpae* was interpreted by Bentham as a group of chamaefistuloid cassias forming passage between genuine sect. *Chamaefistula* and sect. *Oncolobium* and was so maintained by Britton & Rose, unaltered except by addition of a few new species and elevation in rank to generic status as *Earleocassia*. Subequal calyx-lobes, subhomomorphic fertile anthers and relatively short turgid pods containing seeds (either 1- or 2-seriate) turned broadside to each

other contribute to define the series by characters shared only by the related but more highly modified junciform *S. armata*, adapted to extreme desert, and the acaulescent *S. pumilio*. The first three species, *S. foetidissima*, *S. lindheimerana* and *S. orcuttii*, which have relatively many leaflets and pods almost of ser. *Pachycarpae*, occasionally with some (exceptionally all) seeds turned broadside to the valves, might be considered ambiguous members of the series, but these have in high degree the characteristic perianth and androecium of *Brachycarpae*. The group seems allied to ser. *Trigonelloideae* and its satellites, all of which differ, however, even when pod and seeds are similar, in the heteromorphic sepals and strongly differentiated fertile stamens.

Collectively the *Brachycarpae* display a line of xeromorphic modifications in which the leaflets have undergone progressive loss in number with compensatory gain in size, the raceme has become progressively shortened and simplified, the pod has shortened but with little loss of ovules, and the consequently crowded seeds are displaced into two rows, at first interdigitating, then separate and parallel. This morphological sequence has coincided with adaptation to progressively arid and continental or desert climates and northward migration into the temperate highlands of the Mexican Plateau, west-central Texas and the Sonoran Desert. So far as linear sequence permits, the order of presentation follows this theoretical evolutionary line.

Key to Species of ser. *Brachycarpae*

1. Lfts 2–9 pairs.
 2. Stipules 1–3 mm wide; lfts (4–)5–9 pairs; racemes 7–45-flid; seeds 1-seriate.
 3. Anthers 5–12 mm; style 3–5 mm; pod stipitate (stipe 2–4 mm) turgid; foliage bright green; Mexico s.-ward from Transverse Volcanic Range. 72. *S. foetidissima* (p. 264).
 3. Anthers 3–5 mm; style 1.2–2.2 mm; pod sessile or almost so, strongly compressed laterally; foliage pallid; extratropical n.-e. Mexico and s.-w. United States.
 4. Stems and lf-stalks densely pilosulous with fine erect or widely descending hairs; foliage densely subappressed-pilosulous; petals (10.5–)11.5–16 mm; pod mostly $3.5\text{--}6.5 \times 0.6\text{--}0.85$ cm; widespread over range indicated. 73. *S. lindheimerana* (p. 266).
 4. Stems, lf-stalks and foliage minutely antrorsely strigulose, the lfts glaucescent; petals 8–10.5 mm; pod 4–9(–12) $\times 0.35\text{--}0.65$ cm; local in trans-Pecos Texas, extreme s.-e. New Mexico and n. Coahuila. 74. *S. orcuttii* (p. 268).
 2. Stipules 0.2–1 mm wide; lfts 2–5 pairs; racemes (1–)2–9(–10)-flid; seeds 2-seriate except in *S. argentea*, the racemes then 2–5(–6)-flid.
 5. Pubescence of stems antrorse or horizontally erect (not retrorse); stipules 7–23 mm, some over 10 mm; pod 1–2 cm; faces of seed neither coarsely folded nor sinuously colliculate.
 6. Lfts (2–)3–5 pairs; ovules 22–32; pod 11–20 mm. 75. *S. crotalarioides* (p. 268).
 6. Lfts exactly 2 pairs in almost all lvs; ovules 14–21; pod 10–14 mm. 76. *S. demissa* (p. 270).
 5. Pubescence of stems retrorse; stipules 3–9 mm; pod 2–8 cm; either the faces of seed coarsely folded or the testa sinuously colliculate (or both).
 7. Faces of seed elaborately folded; stipules glandless; plants of Sonoran Desert or floristically related regions in s.-w. United States, Baja California, and in continental Mexico s. to n. Sinaloa, entirely w. of Continental Divide, extending into the Tropics only in the Cape district of Baja California.
 8. Lfts either 2–3 or 3–4 pairs, only very exceptionally all lvs 4-foliolate; larger distal lfts 1.4–3 cm; setae of pod subappressed or truly appressed 0.5–0.8 mm; seeds 2.7–3.7 mm, their testa rugose but otherwise smooth; s.-e. California and extreme n.-e. corner of Baja California to s. point of Nevada and across w. and s. Arizona to s.-w. New Mexico, s. through lowland Sonora just into n.-w. Sinaloa. 80. *S. covesii* (p. 276).
 8. Lfts of almost all lvs exactly 2, in random lvs 1 or 3 pairs; larger distal lfts 2–4.7 cm; setae of pod ascending 1.2–2.2 mm; seeds 3.8–4.3 mm, their testa

- both coarsely rugose and sinuously colliculate overall; Baja California and adjacent Gulf islands s.-ward from lat. 29°N. 81. *S. confinis* (p. 278).
7. Faces of seed not folded; stipules commonly charged at base on one side with a gland resembling that on lf-stalk; plants of s.-centr. continental Mexico s.-ward from s. margins of Meseta Central, entirely below the Tropic line.
9. Style filiform 1.8–2 mm, at apex not dilated, the stigmatic cavity 0.15–0.2 mm diam. Pod and seeds of *S. arida* (see next below); local in s.-e. Puebla. 78. *S. apiculata* (p. 273).
9. Style short and stout, 0.6–1.2 mm long, at apex a little dilated and 0.3–0.5 mm diam at stigmatic orifice.
10. Pod 3–4 cm; seeds crowded and displaced into 2 interdigitating files; stems usually setulose only (exceptionally long-setose); scattered around s. edge of Mexican Plateau and disjunct on Puebla-Oaxaca border. 79. *S. arida* (p. 275).
10. Pod 4–8 cm; seeds 1-seriate; stems pilose with fine lustrous horizontal setae up to 2.5–3 mm; e. arm of Balsas Depression in e. Michoacán, adjacent Guerrero, Morelos and Puebla; centr. Oaxaca. 77. *S. argentea* (p. 272).
1. Lfts of all lvs 1 pair.
11. Lfts relatively ample, broadly obovate (1.5–4 × 1–2.3 cm), 1.3–1.8 times as long as wide.
12. Sepals marcescent around forming pod; petals 8.5–10 mm; anthers constricted just below the symmetrically terminal pore; style 1.8–3.2 × 0.15–0.25 mm; ovules 16–26; seeds 1-seriate, their faces rugose but the testa itself smooth, dull pinkish or grayish-fawn; trans-Pecos Texas and periphery of Mapimí Depression in Coahuila and adjacent Chihuahua and Durango. 82. *S. pilosior* (p. 279).
12. Sepals promptly deciduous with the petals; petals 7–13 mm, but 11–13 mm in range of *S. pilosior*; anthers conical at apex, the pore obliquely introrse; style 1–1.7 × 0.3–0.45 mm; ovules 38–44; seeds 2-seriate, their brown faces both rugose and sinuously rugulose-colliculate; range bicentric, one var. within Mexican range of *S. pilosior*, the other distantly allopatric on the Gulf Coastal Plain of extreme s. Texas, Tamaulipas and extreme e. San Luis Potosí. 83. *S. durangensis* (p. 281).
11. Lfts relatively narrow, elliptic, oblong-obovate, -elliptic or lanceolate, (1.5–)2–9 times as long as wide.
13. Lfts narrowly lanceolate or lance-oblong, the larger ones 2–6 cm, 4–9 times as long as wide; style linear 0.1–0.25 mm diam; centr. and w. Texas, s. New Mexico, s. feebly into Coahuila and n. Nuevo León. 84. *S. roemeriana* (p. 282).
13. Lfts oblong- or obovate-elliptic, variable in size, but the larger ones only 1.5–4 times as long as wide; if sympatric with the last then either the style dilated upward and 0.4–0.6 mm diam or the lfts not over 2 cm.
14. Style linear, 0.2–0.3 mm diam; testa of seeds smooth; relatively local species of the middle and s. Chihuahuan Desert, s.-ward from trans-Pecos Texas, one extending into Hidalgo.
15. Lfts of most lvs longer than their lf-stalk; petals (11–)12–18 mm; style 1.5–2 mm; ovules 34–42; pod 23–35 mm; seed-faces folded, the testa dark brown-olivaceous, the areole 0.3–0.4 mm diam; extreme s. Coahuila s.-ward. 85. *S. mensicola* (p. 284).
15. Lfts of most lvs shorter than their lf-stalk; petals 8.5–9.5 mm; style 3–3.5 mm; ovules 18–28; pod 15–24 mm; seed-faces not folded, the testa pinkish-brown, the areole 0.45–0.7 mm diam; local in trans-Pecos Texas, Coahuila and n. Zacatecas. 86. *S. ripleyana* (p. 285).
14. Style short, stout and distally dilated, less than 1.5 mm long, at apex 0.4–0.6 mm diam; testa of seeds sinuously rugulose-colliculate; widespread and common from n.-centr. Arizona to n.-e. Sonora, e. to centr. and s. Texas and n.-e. Nuevo León. 87. *S. bauhinioides* (p. 286).

72. *Senna foetidissima* (G. Don) Irwin & Barneby, comb. nov. *Cassia foetidissima* [“Ruiz & Pavón,” properly] Sessé & Mociño ex G. Don, Gen. Hist. Dichl. Pl. 2: 441. 1832.—Typus infra sub var. *foetidissima* indicatur.

Erect coarsely leafy herbs and soft-woody, rarely subarborescent shrubs at anthesis 0.8–2.5(–3) m, pilosulous throughout or almost so with largely spreading,

largely subappressed, or mixed shorter appressed and long ascending or horizontal, sometimes lutescent hairs up to (0.4–)0.5–1.2(–1.4) mm, the strongly ribbed stems often flexuous distally, the malodorous foliage bicolored, the lfts above dull green, thinly pubescent or glabrate, beneath pale and densely pubescent, the inflorescence at first axillary, distally becoming paniculate exserted.

Stipules caducous (lacking from fruiting specimens) herbaceous reflexed, in outline obliquely or falcately lance- or semiovate-acuminate or -caudate $4\text{--}9 \times 1\text{--}3$ mm, the margins revolute.

Lvs (disregarding depauperate distal ones) 9–21(–23) cm; petiole including little dilated pulvinus 1.5–4(–5) cm, at middle 0.7–1.4(–1.8) mm diam, obtusely 3-ribbed, shallowly narrowly sulcate ventrally; rachis (4–)5–12 cm; gland sessile or obscurely stipitate between the proximal pair, ovoid, pyriform or fusiform, acute or obtuse, $1.3\text{--}2.1 \times 0.4\text{--}1.2$ mm, similar but usually smaller glands often present between 1–3 distal pairs; petiolules 1.7–2.5(–3) mm; lfts (4–)5–9 pairs, accrescent upward along rachis, the distal pair elliptic, elliptic-obovate or broadly lance-elliptic, obtuse mucronate or deltately acute, $(23\text{--})28\text{--}63 \times (8\text{--})10\text{--}24$ mm, $\pm 2\text{--}3$ times as long as wide, at little asymmetric base either broadly cuneate or subcordate, the margin plane or incipiently revolute proximally, the centric midrib immersed above, prominulous beneath, the 5–9 pairs of very slender secondary veins and sometimes a faint open tertiary venulation visible only beneath.

Peduncles (2–)2.5–6 cm; racemes loosely (7–)10–45-fl'd, the nodding, glabrous or thinly puberulent buds at least at early anthesis of the raceme raised above open fls, the axis becoming (1.5–)2–10(–14) cm; bracts lance- or ovate-acuminate 2.5–5.5 mm, early dry caducous; pedicels at and after anthesis 8–24 mm; fl-buds oblong-ellipsoid or narrowly oblong-obovoid, obtuse; sepals submembranous, brownish with pallid scarious margins, of subequal length, the outer ones narrowly oblong or oblong-elliptic up to 6.5–15 mm, the innermost 2 usually a little broader; petals yellow drying (promptly or eventually) whitish and brown-veined, of subequal length and outline or the vexillar one a little broader and the 2 abaxial a little longer than the rest, in outline oblong-oblancheolate to obovate, obtuse, truncate or emarginate, the longest (9–)10–23 mm; androecium glabrous, the filaments 1.4–3.8(–4.5) mm, of subequal length or those of 2 lateral oppositipetalous stamens a trifle shorter than the rest, the anthers very slenderly linear-lanceolate in outline, gently incurved throughout or more strongly so beyond middle, the 7 fertile ones of subequal length, the longest 5–12(–13) mm, the thecae sagittate at base, at very apex abruptly dilated, horizontally truncate and 1-pored; ovary thinly puberulent or canescently strigulose; style filiform 3–6 mm, gently incurved, the minute stigmatic cavity exactly terminal.

Pod obliquely ascending or widely spreading-incurved, the stipe 2–4 mm, the linear-oblong, lunately incurved or rarely almost straight body (3–)3.5–7.5 \times (0.35–)0.4–0.65(–0.7) cm, cuneate at base, attenuately contracted at apex into the \pm marcescent style-base, bicarinate by the stout sutures, the purplish-castaneous, finally coriaceous, almost veinless valves becoming convexly dilated, the interseminal septa less than 0.5 mm high; dehiscence not known, but apparently apical through the sutures; seeds (of var. *grandiflora* alone known) 1-seriate, obliquely basipetal, most turned broadside to their neighbors, plumply obovoid or oblong-obovoid moderately compressed $3.6\text{--}5 \times 2.5\text{--}3$ mm, the testa dull brown smooth, the elliptic-oblong areole $1.6\text{--}2.3 \times 0.8\text{--}1$ mm.

This highly distinctive Mexican senna, which Bentham provisionally but mistakenly identified with the purely Antillian *C. mexicana* Jacqu., is instantly recognized by the peculiar androecium of which the seven fertile anthers are of

about equal length, of characteristic linear-lanceolate outline, and horizontally truncate at apex, where they dehisce by a truly terminal pore looking upward. The fertile anthers of *C. mexicana* are strongly dimorphic, two adaxial ones being carried up on much longer filaments than the rest, and are obliquely prolonged at apex, beyond the oblique orifice, into a pollen-cup. Habitally *C. mexicana* sometimes resembles the small-flowered var. *foetidissima*, but has shorter, fewer-flowered racemes, the axis less than 2 (not mostly 2–10) cm long at maturity.

The range of *C. foetidissima* is highly discontinuous, and the racial situation within it is peculiar and unexpected. Typical var. *foetidissima*, which has relatively short perianth and short, evenly incurved anthers, is known only from a limited area on the south slope of the Transverse Volcanic range in eastern Michoacán and adjoining México. The much larger-flowered var. *grandiflora* is known from scattered stations in western Michoacán and southern Sinaloa to the west of var. *foetidissima* and reappears disjunctly to its south and east in southern Guerrero, Veracruz and southward.

Key to the Varieties of *C. foetidissima*

1. Fls relatively small, the buds just before anthesis shortly oblong-ellipsoid, the longest sepal 6.5–8.5 mm, the longest petal (9–)10–13.5 mm; anthers gently lunate-incurved, 5–6.5 mm; s.-w. México and adjoining Michoacán. 72a. var. *foetidissima* (p. 264).
1. Fls larger, the buds just before anthesis narrowly oblong-ellipsoid, the longest sepal 8.5–12(–13) mm, the longest petal (14–)15–23 mm; Veracruz and s.-e. Guerrero to Chiapas; w. Michoacán; s. Sinaloa. 72b. var. *grandiflora* (p. 264).

72a. *Senna foetidissima* (G. Don) Irwin & Barneby var. *foetidissima*. *Cassia foetidissima* Sessé & Mociño ex G. Don, 1832, l.c., sens. str.—“... in herb. Lamb[ert.] . . . Native of Mexico.”—Presumed holotypus, labelled “*C. foetidissima*. Nueva España,” BM (ex hb. Pavon.)! isotypus, Hb. S. & M. 1156, MA! = F Neg. 44428.—Equated with *C. mexicana* Jacqu. by Bentham, 1871, p. 530.

Cassia foetida Sessé & Mociño, Fl. Mex. 100. 1894.—“Habitat in circuitibus Temascaltepec, ad latera itineris in ambulacrum Sancti Jacobi ducentibus.”—Holotypus = the cited isotypus of *C. foetidissima*, MA! non *C. foetida* Salisbury, 1796, nom. illegit.

Cassia stenosepala Smith & Schubert, Contrib. Gray Herb., new ser. 127: 21. 1939.—“MEXICO: Mexico: dist. Temascaltepec, Nanchititla . . . Aug. 31, 1934, Hinton et al. 6530 . . .”—Holotypus, GH! isotypi, K, NY!

Characters as given in key; lfts (4–)5–6 pairs.—Collections: 10.—Fig. 23.

Openings in mixed woodland, disturbed grassland in the *casahuate* (*Ipomoea*) scrub-woodland, becoming locally abundant along roadsides, 1800–2300 m, local around the s. foothills of the Transverse Volcanic Range in s.-w. México (mun. Villa Guerrero, Sultepec, Temascaltepec) and adjoining Michoacán (mun. Zitácuaro, Jungapeo).—Fl. VII–XII, the pods sometimes persistent into a second year.

72b. *Senna foetidissima* (G. Don) Irwin & Barneby var. *grandiflora* (Bentham) Irwin & Barneby, comb. nov. *Cassia mexicana* var. *grandiflora* Bentham, Trans. Linn. Soc. 27: 530. 1871.—“Mexico, between Vera Cruz and Orizaba, Fred. Müller; Alpatlahua, Liebmann.”—Lectoholotypus, Müller 150, K (hb. Hook.)! isotypi, Müller s.n. in 1883, NY, US, W! paratypus, Liebmann 91, collected IX.1841 (fr), K!

Peiranisia simulans Britton & Rose, N. Amer. Fl. 23(4): 266. 1930.—“Type from between Te-neapa and Yajalon, Chiapas, October 13, 1895, E. W. Nelson 3266.”—Holotypus, US! iso-



Fig. 23. *Senna foetidissima* (G. Don) I. & B.: var. *foetidissima*: Flowering stem + lower cauline leaf $\times \frac{1}{2}$; anther + staminode (top right) $\times 3$ (Barneby 17780). var. *grandiflora* (Benth.) I. & B.: flower (bottom) $\times 2$ + anther and staminode $\times 3$ (Breedlove 10445); pod $\times 1$ + seed $\times 3$ (Hinton 13582).

typus, GH! clastotypus + photo, NY!—*Cassia simulans* (Britton & Rose) Lundell, *Phytologia* 1: 216. 1937.

Characters as given in key; lfts potentially up to 9 pairs.—Collections: 31.—Fig. 23 (fl, anthers, pod, seed).

Grassy or stony hillsides in the oak-belt, disturbed thickets, sometimes in hedges, mostly 1000–2250 but in Sinaloa down to 200 m, scattered across s. and s.-w. Mexico, the populations remotely disjunct: abundant in highland Chiapas (mun. Cintalapa e. to mun. Comitán); local on the Gulf slope of Sa. Madre Oriental in Veracruz (Alpatlahua to Orizaba); Sa. Madre del Sur in w. Michoacán (mun. Coalcomán), e. Guerrero (mun. Tixtla de Guerrero) and adj. Oaxaca (Putla; Juxtlahuaca), and apparently isolated near 24°15' in the foothills of Sa. Madre Occidental in Sinaloa (mun. Cosalá).—Fl. (VI–)VII–XII.—*Chile de Gato* (Veracruz); *hediondilla* (Oaxaca).

73. *Senna lindheimeriana* (Scheele) Irwin & Barneby, *Phytologia* 44(7): 500. 1979. *Cassia lindheimeriana* [sic] Scheele, *Linnaea* 21: 457. 1848.—“... nördlich von Neubraunfels [=New Braunfels, Comal Co., Texas]; Lindheimer.”—Holotypus, †B; neoholotypus, provisionally proposed by Isely, 1975, p. 204; Lindheimer III/380, NY! isotypi, GH, MO!—*Earleocassia lindheimeriana* Britton ex Britton & Rose, *N. Amer. Fl.* 23(4): 249. 1930.

Cassia lindheimeriana sensu Bentham, 1871, p. 530; Wooton & Standley, 1915, p. 334; Kearney & Peebles, 1951, p. 406; Turner, 1959, p. 76, map 38 (Texas); Isely, 1975, p. 109, map 47 (U.S.A.); Correll & Johnston, 1970, p. 791.

Stout, amply leafy herbs with 1–several erect or assurgent stems (2–)3–12(–15) dm arising annually from a blackish root and ultimately a shortly branched caudex, the stems and lf-stalks densely pilosulous or subvelutinous with fine erect or widely descending straight hairs up to 0.3–1 mm usually mixed with either shorter, antrorsely accumbent or minute clavate yellowish hairs (frequently with both) and the inflorescence and some lfts sometimes charged in addition with few random fine weak setae up to 1.5–2.5 mm, the pallid-green lfts subappressed-pilosulous on both faces, usually yellowish-green above and ashen beneath, the inflorescence of axillary racemes at first lateral to stem and either longer or shorter than the subtending lf, later or sooner forming a shortly exserted corymbose panicle.

Stipules erratically ascending, spreading or deflexed, the herbaceous lance-attenuate or -caudate blade 8–18 × 1–2.5 mm, early dry caducous.

Lvs below inflorescence 6–16 cm (some distal ones, not further described, shorter); petiole including firm, scarcely swollen pulvinus (1–)1.5–4.5(–6) cm, at middle 0.6–1.7 mm diam, bluntly 3-ribbed dorso-laterally, narrowly grooved ventrally; rachis 1.5–8(–10.5) cm; glands between all pairs or all but the distal pair of lfts stipitate, in profile (1–)1.5–5 mm, the slender stipe pilosulous, the narrowly subuliform or linear-fusiform acute head 0.1–0.35 mm diam, not or little wider than stipe; lfts 4–8, in most lvs of most plants 5–7 pairs, the proximal pair smallest but otherwise little graduated, the penultimate often a little longer than the distal, all asymmetrically oblong-, ovate- or obovate-elliptic, obtuse mucronate or apiculately acute, the larger ones 20–46(–50) × 8–18(–20) mm, 1.9–3.2(–3.5) times as long as wide, at base cordate on proximal and either rounded or cuneate on distal side, the plane margin often a trifle thickened, the midrib carinate dorsally, immersed or weakly prominulous above, giving rise dorsally on proximal or on both

sides to (2-)3-6(-7) secondary veins, these usually expiring well within the margin, sometimes weakly camptodrome.

Racemes loosely (5-)7-25-fl'd, the axis and peduncle together becoming (3-)5-14 cm; bracts resembling stipules in form and texture (3-)4-13 mm, early brown dry, deciduous before or at anthesis, some rarely more persistent; pedicels (6-)10-22 mm, little thickened in fruit; young fl-buds nodding, obovoid or oblong-ellipsoid obtuse pilosulous; sepals pale green, pinkish or rarely subpetaloid and yellow, elliptic or oblong-obovate of subequal length but the innermost a little broader and membranous-margined, the longest (5-)6-8.5(-9) mm; petals subequal, light bright yellow drying whitish or stramineous brown-veined, in outline obovate- or oblong-obovate-cuneate (10.5-)11.5-16 mm, expanding and withering in one day; androecium glabrous, functionally 7-merous, the 3 adaxial staminodes narrowly spatulate, the 7 fertile stamens subhomomorphic except the 2 next the staminodes a trifle shorter, the filaments 1.4-2.7 mm, the anthers all narrowly lanceolate in profile, lunately incurved, the larger of a set $3-5.1 \times 0.6-0.7$ mm, just below apex strangulated and then a little dilated, dehiscent by an oblique terminal pore, the thecae bicolored, the connectival grooves and dorsoventral faces brown, the sutural faces yellow (exceptionally all yellow); ovary densely white-pilosulous; style glabrous linear-attenuate incurved $1.2-2.2 \times 0.1-0.2$ mm, the minute stigmatic cavity obliquely terminal; ovules 20-28.

Pod ascending or sometimes spreading in age, sessile or almost so but sometimes attenuate at base and pseudostipitate, in profile linear, gently incurved, (3-)3.5-6.5 \times (0.5-)0.6-0.85(-0.9) cm, abruptly contracted at apex into a subulate beak, strongly compressed laterally, 3-carinate ventrally, the thin green or purplish valves becoming brown or blackish except for paler sutural margins, at first plane but a little distended and low-corrugated over the seeds, thinly strigose with appressed straight hairs up to 0.6-1.2 mm, inertly dehiscent downward through both sutures, the interseminal septa very narrow, the cavity therefore continuous; seeds 1-seriate and separated by distances about equal to their narrow diameter, most of them turned with broader face to the septa but 1 at each end often turned to face the valves, compressed but plump, in broader outline obovate or oblong-obovate 3-4.8 \times 1.8-3.2 mm, often distorted or deformed, the testa brown, dull, minutely rugulose overall or when fully ripe becoming smooth and crackled, the areole elliptic or oblong-elliptic 0.4-1 \times 0.3-0.6 mm; $n = 14$.—Collections: 69.

Stony hillsides, washes, talus under cliffs, in *Larrea* scrub, mesquite grassland and chaparral, 200-1900(-2100) m, widespread, mostly on limestone, over the n. Chihuahuan Desert in trans-Pecos Texas, s. New Mexico, extreme s.-e. Arizona (Cochise Co.), n.-e. Sonora (río Bavispe), centr. Chihuahua, thence s.-e. in Texas down the Rio Grande valley and along the s. margins of Edwards Plateau to the Colorado valley and Balcones Escarpment, and in Mexico interruptedly to e.-centr. Coahuila and the e. foothills of Sa. Madre Oriental in Nuevo León and Tamaulipas, there extending s. just to the Tropic of Cancer; reported (Isely, l.c.) from the Gulf Coastal Plain in Cameron Co., Texas, where perhaps only adventive.—Fl. IV-XI, the fruits long persisting.—*Pata de Buey* (Chihuahua).

A handsome but somewhat coarse herbaceous senna, the pallid silvery-gray foliage contrasting effectively with the panicle of golden flowers. It is widely sympatric with related *S. roemeriana*, but obviously different, most distinctively in the several pairs, not exactly one pair, of leaflets. In southeastern Arizona and adjoining New Mexico the range of *S. lindheimeriana* overlaps that of *S. covesii*,

which is, however, readily distinguished by the narrow, setiform stipules, fewer (mostly 2–4, not 4–8) pairs of leaflets, fewer (mostly 4–8, not 7–25)-flowered racemes and particularly by the short turgid pod that contains more numerous seeds stacked contiguously into two files. More closely related is the south Mexican, fully tropical *S. foetidissima*, similar in stature, in broad herbaceous stipules, in number of leaflets and in uniseriate seeds; this differs, however, in the malodorous, bright green, not pallid foliage, in the elongate anthers (5–12, not 3–5 mm) and style (3–5, not 1.2–2.2 mm) and in the genuinely stipitate turgid (not subsessile and strongly compressed) pod.

- 74. *Senna orcuttii*** (Britton & Rose) Irwin & Barneby, *Phytologia* **44**(7): 500. 1979. *Peiranisia orcuttii* Britton & Rose, *N. Amer. Fl.* **23**(4): 267. 1930.—“Near Sanderson [Terrell Co.], Texas, June 26, 1924, *C. R. Orcutt* 653.”—Holotypus, US! clastotypus (fragm) + photo, NY!

Closely related to *S. lindheimeriana* and similar in habit, at anthesis 3–6 dm tall, the smooth brown or stramineous stems distally, like the lfts and axes of inflorescence, strigulose with forwardly appressed hairs up to 0.2–0.7 mm, the mature foliage dull glaucescent, the paniculate inflorescence shortly exserted, the stems at base sometimes charged with sparse long lustrous horizontal setae but sometimes glabrous.

Stipules linear-attenuate 2.5–9 × 0.2–0.5 mm, caducous.

Lvs 5–10 cm, the petiole 1–3, the rachis 2–4 cm; glands between proximal or all pairs of lfts, slenderly phalloid acute 1–3 × 0.2–0.35 mm; lfts (3–)4–6 pairs, not or scarcely accrescent distally, plane thick-textured, oblong- or ovate-elliptic mucronate, the distal pair 1.5–4 × 0.7–1.3 cm, the secondary venation almost or quite immersed.

Fls of *S. lindheimeriana* except a trifle smaller, the sepals 4–7 mm, the petals 8–10.5 mm; style subulate 1–1.2 mm.

Pod ascending, linear straight or slightly incurved 4–10(–12) × 0.35–0.65 cm, turgid but 2-carinate by the sutures, the coriaceous brown valves strigulose.—Collections: 7.

Stony hillsides and boulder-strewn canyon floors, 1300–1800 m, local in the limestone mountains of the n. Chihuahuan Desert, from Sa. de Santa Rosa and the Serranías del Burro in n. Coahuila to trans-Pecos Texas (Brewster and adjacent Terrell cos.), and apparently disjunct on the Guadalupe Mts. in s.-e. New Mexico.

This relatively scarce senna is closely related to *S. lindheimeriana* and occurs in similar habitats within its range. Nevertheless the syndrome of appressed pubescence, glaucescent foliage, slightly smaller flowers and more slender pod is consistently diagnostic.

- 75. *Senna crotalarioides*** (Kunth) Irwin & Barneby, *Phytologia* **44**(7): 499. 1979. *Cassia crotalarioides* Kunth, *Mimoses* 132 (“*crotallarioides*”), t. 40. 1822–3.—“Crescit in collibus siccis inter fodinam La Valenciana et urbem Guanaxuato, alt. 1100 hex. (Regno Mexicano).”—Holotypus, labelled ‘n. 4256. Mexico,’ P-HBK!—*Chamaefistula crotalarioides* (Kunth) G. Don, *Gen. Hist. Dichl. Pl.* **2**: 452. 1832. *Earleocassia crotalarioides* (Kunth) Britton ex Britton & Rose, *N. Amer. Fl.* **23**(4): 249 (“*crotolarioides*”). 1930, exclus. syn. ult.

Cassia vogeliana Schlechtendal, *Linnaea* **12**: 342. 1838.—“Ad Reglam et aquas calidas [=Atonilco El Grande, Hidalgo] (C. Ehrenberg).”—Holotypus presumably †B; no isotypus

found, but the ample protologue decisive.—*Earleocassia vogeliana* (Schlechtendal) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 248. 1930. *Cassia crotalarioides* var. *vogeliana* (Schlechtendal) Irwin & Barneby, Sida 6(1): 8. 1975.

Cassia crotalarioides sensu Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(qu): 346. 1824; Benth, 1871, p. 529, exclus. syn. Martens.

Cassia vogeliana sensu Benth, 1871, p. 530.

Diffuse leafy perennial herbs with lignescent blackish roots and sometimes a shortly branched aerial caudex, the several hornotinous stems procumbent and incurved-ascending, deeply canaliculate distally, at anthesis (1.5–)2–6.5 dm, either simply pilosulous throughout with subappressed and incurved or partly spreading hairs less than 1 mm or both short-pilosulous and the stems, lf-stalks and inflorescence (exceptionally the lf-stalks) in addition charged with fine lustrous horizontal or ascending setae up to 1.5–4 mm, the short vestiture of stems antrorse, the density and proportions of longer to shorter hairs highly inconstant, the lf-stalks pubescent on both faces or exceptionally glabrous above, the axillary racemes at first lateral and surpassed by stem, later forming a leafy-bracteate, shortly exserted corymbose panicle.

Stipules flexuously ascending, herbaceous, narrowly lance- or linear-attenuate (6–)8–23 × (0.3–)0.4–1 mm, 1-nerved proximally, early brown and dry but long persistent.

Lvs (3–)4–10(–12) cm; petiole including sometimes discolored but little swollen pulvinus mostly 1.5–4(–4.5) cm, of some diminished distal lvs (not further noticed) shorter, at middle 0.5–1.1 mm diam, strongly 3-ribbed dorso-laterally, the ventral sulcus very narrow; rachis 1.5–4.5(–5) cm; glands ascending from between proximal and often next succeeding 1–3 (but only exceptionally the distal) pairs, slenderly stipitate, in profile 1.5–5(–5.5) mm, the stipe glabrous or puberulent, the slenderly lance-fusiform or dorsiventrally compressed and liguliform head 0.15–0.45 mm diam; pulvinules 0.7–1.5 mm; lf-stalks (2–)3–5 pairs, subequal or a little accrescent distally, either the distal or the penultimate pair largest, these obliquely oblong-, ovate- or obovate-elliptic, obtuse mucronulate or commonly deltate-apiculate 15–37(–40) × 6–15(–19) mm, (1.8–)2–3 times as long as wide, at base cordate (rounded) on proximal and cuneate on distal side, the margin plane, the upper face of blade veinless, the slender midrib prominulous beneath and giving rise to 2–5(–6) pairs of weakly raised secondary veins, these often visible only below middle of blade, all expiring short of anastomosis.

Peduncles mostly 1.5–4.5(–5) cm, some depauperate distal ones shorter; racemes (2–)3–8(–9)-fld, the axis (2–)4–12(–15) mm; bracts resembling stipules but shorter, 3–10 × 0.6–1.3 mm, early dry brunnescent, deciduous by or soon after anthesis; mature pedicels (6–)7–14 mm; fl-buds nodding, oblong-obovate obtuse pilose-pilosulous; sepals elliptic or oblong-elliptic obtuse, scarcely or little graduated, the glabrescent inner ones 6–9.5 mm; corolla zygomorphic, the petals yellow glabrous subisomorphic, spatulate or obovate-cuneate (9–)11–14.5 mm; androecium functionally 7-merous, the 3 staminodes narrowly oblanceolate, the 7 fertile stamens isomorphic except for length, their anthers narrowly lanceolate in outline, gently incurved, just below apex strangulated and thence dilated into a small urn-shaped 1-porose cup, the 2 stamens next the staminodes short, their thecae 1.9–2.8 × 0.5 mm, the 5 abaxial equal or the 3 opposed to sepals larger, the filaments 2.4–3.3 mm, the anthers 3–4.7 × 0.45–0.65 mm, the thecae of all 7 fertile stamens bicolored, castaneous with a yellow stripe along the lateral grooves; ovary either densely white-pilose or glabrous except for a ventral crest of hairs; style glabrous filiform, distally incurved (2.6–)2.8–4.4 × 0.15–0.2 mm, at apex conical, the stigmatic orifice minute terminal; ovules 22–32.

Pod ascending or variously declined, sessile, plumply oblong-ellipsoid, straight or slightly incurved $(11-12-19(-20) \times (4-5-7(-7.5))$ mm, laterally compressed but turgid, rounded at base, obliquely cuspidate at apex, the cross section elliptic, the thin green valves strigose-pilose with stiff appressed or ascending bulbous-based setae up to 1–1.5 mm or sometimes glabrous, becoming brown and papery, differentiated into broad sutural margins and fuscous central band shallowly corrugate over the seeds, dehiscent downward from the beak, the valves only narrowly gaping to emit the seeds; seeds stacked in 2 interdigitating ranks with broad faces of each turned to its neighbor's, sometimes distorted by crowding but basically compressed-pyriform, when not deformed $2.6-3.1 \times 2-2.4$ mm, the light brown testa smooth but scarcely lustrous, neither folded nor colliculate, the elliptic areole $0.5-0.8 \times 0.3-0.5$ mm; $x = 28$.—Collections: 25.

Stony hills, plains and waysides, mostly in chaparral and mesquite-grassland, 1100–2100 m, locally plentiful around the w., s. and s.-e. margins of the Mexican Plateau within and near the s. lobe of Chihuahuan Desert, from n. Durango to Guanajuato, Hidalgo, centr. San Luis Potosí and s.-w. Tamaulipas.—Fl. V–XI, the fruits long persistent, often contemporary with young fls.

Among *Brachycarpae* with short plump pods enclosing two parallel rows of seeds *S. crotalarioides* and *S. demissa* are together distinguished by erect or antrorse stem-pubescence. The weak differences between this pair of species are given in our key and mentioned again under *S. demissa*. We lately maintained (Irwin & Barneby, 1975, l.c.) a taxonomic distinction within *S. crotalarioides* between a typical short-pilosulous variety and a var. *vogeliana* both pilosulous and pilose with fine shining white setiform trichomes up to 4 mm long. Accumulated evidence, however, shows that these pubescence forms, which are otherwise identical, have essentially the same range of dispersal. They have been found in close proximity in Durango and San Luis Potosí and in a mixed population near Zimapán, Hidalgo (Irwin 1342). An erratic expression (or suppression) of setose vestiture occurs elsewhere in *Senna* (e.g. *S. mutisiana*) and is commonplace in *Chamaecrista* sect. *Chamaecrista*.

76. *Senna demissa* (Rose) Irwin & Barneby, *Phytologia* 44(7): 499. 1979. *Cassia demissa* Rose, *Contrib. U.S. Nat. Herb.* 10: 97. 1906.—Typus infra sub var. *demissa* indicatur.

Either diminutive and loosely tufted or taller but then slender decumbent perennial herbs from blackish woody root and branched, sometimes adventitiously rooting caudex, the hornotinous stems at anthesis 4–35 cm, strigulose throughout or both strigulose and pilosulous or pilose with straight appressed or spreading gray hairs up to 0.7–2 mm, the vestiture of stems either appressed or horizontal (but not retrorse), the lfts concolorous and gray-pubescent on both faces or brighter green and glabrescent (glabrous) above, the slenderly pedunculate few-fl'd racemes axillary and lateral, becoming subterminal and shortly exserted.

Stipules flexuously erect, linear-caudate $7-18 \times 0.3-0.6$ mm, early dry castaneous but long persistent, often after fall of associated lf.

Lvs 1.5–8 cm; petiole including scarcely differentiated pulvinus 1–3(–3.8) cm, at middle 0.35–0.6 mm diam, obscurely 3-ribbed, very narrowly sulcate ventrally; rachis 1.5–9(–11) mm; gland between proximal pair of lfts, stipitate, in profile 1–3.5 mm, the linear-fusiform acute reddish head 0.15–0.35 mm diam; lfts of all or almost all lvs 2 (of random lvs on few plants 3) pairs, the distal pair larger, these ovate-, obovate- or oblong-elliptic obtuse mucronulate or deltately apiculate $6-28(-34) \times 3.5-12(-14)$ mm, $\pm 1.7-2.3$ times as long as wide, at oblique base

cordate proximally and cuneate distally, the margin plane, the slender midrib always and sometimes 2–5 pairs of weak secondary veins finely prominulous beneath, the blades otherwise veinless.

Peduncles 1.3–4 cm; racemes shortly or subumbellately 2–5-fl'd, the axis 1–4 mm; bracts narrowly lanceolate 3–5 mm, often persistent into anthesis, then deciduous; pedicels (4–)5–12 mm; young fl-buds obovoid, pilosulous or strigulose; sepals subequal, oblong- or ovate-elliptic obtuse (4.5–)5–6.5(–7) mm; corolla and androecium of *S. crotalarioides* except a trifle smaller, the petals (7.5–)8–13 mm, the filaments of 5 abaxial stamens 1.9–2.7 mm, their anthers (2–)2.5–3.7 × 0.5–0.7 mm; ovary densely white-pilose; style filiform glabrous 2.5–3.7 × 0.1–0.2 mm; ovules 14–21.

Pod essentially that of *S. crotalarioides* in posture, structure and texture of valves but averaging smaller, in outline oblong-elliptic (8–)10–13(–14) × (4.5–)5–6 mm, the valves pilosulous with stiff, narrowly or widely ascending setules up to 0.5–1.1 mm interspersed with minute thickened trichomes; seeds (little known) apparently like those of *S. crotalarioides*, the testa smooth.

Senna demissa, endemic to dry limestone mountains of the central Chihuahuan Desert and adjoining west slope of Sierra Madre Oriental, is closely related to the vicariant *S. crotalarioides*, with which it shares antrorse or spreading (but not retrorse) vesture of the stems, conspicuously elongate and long-persistent glandless stipules, a filiform style, a short plump pod and smooth seeds. It differs from *S. crotalarioides* in the smaller size of most parts, in the almost complete stabilization of leaflet number at two pairs, and reduction of ovules to 14–21 (not 22–32). Two weakly differentiated varieties are recognized:

Key to the Varieties of *S. demissa*

1. Stems decumbent from a loosely branched, often adventitiously rooting caudex, at anthesis 1–3.5 dm, pilose-pilosulous with spreading-ascending or horizontal hairs up to 0.8–2 mm; relatively widespread in centr. and s.-e. Coahuila, disjunct in s.-w. Tamaulipas. 76a. var. *radicans* (p. 272).
1. Stems compactly tufted 4–10 cm, strigulose with subappressed hairs 0.6–1 mm; local in extreme s. Coahuila, adjacent Zacatecas and centr. Nuevo León. 76b. var. *demissa* (p. 271).

76a. *Senna demissa* (Rose) var. *radicans* (Irwin & Barneby) Irwin & Barneby, Phytologia 44(7): 499. 1979. *Cassia demissa* var. *radicans* Irwin & Barneby, Sida 6(1): 9. 1975.—“MEXICO. Coahuila: s.-w. end of Sa. de la Fragua, 1–2 km n. of Puerto Colorado, 2.IX.1941 (fl, fr), I. M. Johnston 8774.”—Holotypus, TEX! isotypus, GH!

As described in key.—Collections: 11.

Hillsides and canyons, in izotal and chaparral and ascending into pinyon woodland, 1400–2100 m, scattered through the mountains of centr. and s. Coahuila from Sa. de la Madera s. through Sas. de Fragua and de Organos to Sa. de Parras and the Sa. Madre immediately s.-e. of Saltillo; collected once in s.-w. Tamaulipas, close to a population of *S. crotalarioides*, and perhaps there intergradient.—Fl. VI–IX.

The earliest collection of var. *radicans*, Gregg 244, was misidentified by Bentham (1871, p. 530) as *Cassia vogeliana*, i.e. the setose aspect of *S. crotalarioides*. The second, Palmer 281, contributed to Rose's original concept of *C. demissa*. We here give var. *radicans* precedence over the rarer and, we suspect, more derived var. *demissa*, which represents the pygmy extreme of its group.

- 76b. *Senna demissa* (Rose) Irwin & Barneby var. *demissa*.** *Cassia demissa* Rose, 1906, l.c., sens. restr. (exclus. *Palmer 281*).—"Type [US] 280167, collected by C. G. Pringle near Carneros Pass, Coahuila, 1889 (no. 2783); also by Dr. E. Palmer in the Sierra Madre south of Saltillo, 1880 (no. 281)."—Holotypus, *Pringle 2783*, US! isotypus, GH! clastotypus, NY!—The paratypus, *Palmer 281*, NY, US! = var. *radicans* (q.v. supra).—*Earleocassia demissa* Britton, N. Amer. Fl. **23**: 248. 1930.

Cassia demissa var. *demissa* sensu Irwin & Barneby, Sida **6**(1): 9. 1975.

As described in key.—Collections: 5.

Rocky hillsides and rough meadows in the pinyon belt, 2300–2800 m, local in the calcareous mountains of extreme s.-e. Coahuila, adjoining Zacatecas and Nuevo León in lat. $\pm 24^{\circ}30' - 25^{\circ}10'N$.

- 77. *Senna argentea* (Humboldt, Bonpland & Kunth) Irwin & Barneby, comb. nov.** *Cassia argentea* Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. **6**(qu): 358. 1824.—"Crescit in Regno Mexicano, ad ripam fluminis Mescala [Guerrero], alt. 270 hex."—Holotypus, collected by Humboldt & Bonpland IV.1803 (fr), labelled 'no. 3948, Mescala,' P-HBK! isotypus, B-WILLD 7951!—*Earleocassia argentea* (H.B.K.) Britton ex Britton & Rose, N. Amer. Fl. **23**(4): 250. 1930.

Cassia longicoma Greenman, Proc. Amer. Acad. **39**: 79. 1903.—"MEXICO. State of Morelos: Jojutla, altitude 1000 m, 12 June, 1901, and 30 August, 1902, C. G. Pringle, nos. 9674, 8665."—Lectoholotypus, *Pringle 8665* (fr), GH! isotypi, MEXU, MO, NY! paratypi, *Pringle 9674*, GH, US!—Equated with *C. argentea* by Britton & Rose, 1930, l.c.

Cassia argentea sensu Standley, 1922, p. 407.

Precociously flowering, weakly suffrutescent 1–few-stemmed (acc. Kunth fruticose many-branched) herbs from blackish roots at anthesis 1–5 (acc. Kunth –12) dm, softly gray-pilosulous with accumbent shorter hairs and the stems, lf-stalks and peduncles in addition pilose with fine lustrous horizontal setae up to 2.5–3 mm, the short vesture of stems retrorsely, of lf-stalks antrorsely accumbent, the foliage subbicolored, yellowish-tinged above and silvery-gray beneath, the few-fl'd racemes axillary to and \pm as long as almost all primary lvs, produced over a long season, the ripe pods and expanded fls often contemporary.

Stipules erect or in age spreading-declined, thinly herbaceous, narrowly lance-attenuate $4-9 \times 0.5-1$ mm, charged at base on one side with a stipitate gland like those between lf-stalks, tardily dry deciduous.

Lvs 5–8.5 cm; petioles including discolored but little swollen pulvinus 2–3.5 cm, at middle 0.5–0.8 mm diam, strongly 3-ribbed dorso-laterally, very narrowly sulcate ventrally; rachis 1–2.7 cm; glands between proximal pair of lf-stalks, slenderly stipitate, in profile 1.5–2.5 mm, the stipe pilosulous, the narrowly lance-fusiform acute reddish head 0.2–0.3 mm diam; pulvinules 1–2 mm; lf-stalks 2 or 3 pairs, accrescent distally, the distal pair broadly obliquely obovate or elliptic-obovate obtuse mucronulate or apiculate $2.2-4 \times 1-1.8$ cm, 1.4–2.2 times as long as wide, at oblique base cordate on proximal and cuneate on distal side, the margin plane, the midrib and 4–5 pairs of weak secondary veins immersed or almost so above, prominulous beneath, tertiary venulation invisible.

Peduncles stiffly ascending 3–6 cm; racemes loosely (1–)2–5-fl'd, the axis becoming (0–)3–20 mm; bracts 3–5 mm resembling stipules and like them sometimes subtended by a subulate gland, deciduous; mature pedicels 11–15 mm; fl-buds oblong-obovoid obtuse, finely setose; sepals thinly herbaceous, the inner glabrous

and hyaline where covered in bud, all oblong-ob lanceolate or -elliptic obtuse scarcely graduated 6.5–9 mm, deciduous with the petals; petals yellow glabrous, obovate-cuneate subequal 10.5–12.5 mm; androecium glabrous, functionally 7-merous, the stamens nearly isomorphic, the filaments 2.2–2.5 mm, the anthers slenderly lance-oblong almost straight $3\text{--}3.7 \times 0.6$ mm, brown with yellow stripe in the lateral grooves, at apex obtusely conic and dehiscent by an oblique pore; ovary densely white-pilosulous; style 0.6–1 mm, stout and a trifle dilated upward, at truncate apex 0.3 mm diam; ovules 28–36.

Pod widely ascending, sessile or almost so, linear-ob lanceolate attenuate at both ends, straight or slightly incurved $5.5\text{--}8 \times 0.55\text{--}0.65$ cm, moderately compressed but turgid, the green valves becoming papery brown with broad paler sutural margins, shallowly corrugated over the seeds, both minutely puberulent and strigose with coarser appressed setules up to 0.8–1 mm, dehiscent downward through both sutures but scarcely gaping; seeds 1-seriate, each turned with broad face appressed to its neighbors and oriented obliquely basipetal to the pod's long axis, compressed-pyriform $(2.3\text{--})2.5\text{--}3.2 \times 2.2\text{--}2.8$ mm, the testa khaki-brown sublustrous, incipiently colliculate but not boldly wrinkled, the round or broadly elliptic areole 0.4–0.5 mm diam.—Collections: 13.

Habitat not recorded, but to be looked for in matorral on limestone, 450–1450 m, local in the e. arm of Balsas Depression in extreme e. Michoacán, Morelos, and adjoining Guerrero and Puebla, thence s.-e. into centr. Oaxaca.—Fl. and fruiting continuously IV–II(–IV), perhaps often monocarpic.

Senna argentea and the two species next in order, *S. arida* and *S. apiculata*, are closely related and could perhaps be considered as no more than varieties of one. They differ collectively from *S. crotalarioides* in the retrorsely oriented short pubescence of the stems, in the presence of a stipitate gland at base of the stipules as well as between the leaflets, and in the more or less colliculate (not smooth) testa of the seeds, a seldom observed character that will, however, need confirmation in future collections. In the short thick style, only 2–3 times as long as its apical diameter, *S. argentea* resembles *S. arida* only, and differs from it in the elongate pod (4–8 not 3–4 cm) which, furnished with about the same number of ovules, accommodates the ripe seeds in a single vertical rank, not doubled up, as in all kindred species, into two interlocking rows. The long lustrous setae of the stems, so striking superficially, offer a practical diagnostic feature so far as known at present, but cannot be relied on in the context of the group.

Our description of *S. argentea* records the fruticose stature assigned to it in the protologue, but we suspect that an error of memory or of interpretation is involved. The type-collection could well have come from a softly woody herb like all examples of *S. argentea* since encountered.

78. *Senna apiculata* (Martens & Galeotti) Irwin & Barneby, comb. nov. *Cassia apiculata* Martens & Galeotti, Bull. Acad. Roy. Bruxelles 10(9): 304 [Enum. Synopt. pl. phanerogam. Mex. 9: 3]. 1843.—Typus infra sub var. *apiculata* indicatur.

Slender prostrate or diffusely ascending, precociously flowering perennial herbs from an ultimately woody blackish root, at anthesis 0.6–3 dm, strigulose-pilosulous throughout with shorter incumbent and longer straight appressed or ascending (spreading) hairs to $\pm 0.6\text{--}0.8$ mm, the short vesture of stems retrorse, the whole vesture of both faces of lf's antrorsely appressed-silky, the lf-blades bi-colored, yellowish-green above and gray beneath, the few-fl'd racemes axillary surpassing their lf, all lateral and not forming a terminal panicle.

Stipules ascending, when long flexuously so, linear-attenuate or setiform $3-8 \times 0.3-0.6$ mm, often charged at base on one side with a small fusiform gland, this however often minute or wanting, the blades becoming dry and mostly deciduous before the lf.

Lvs (2.5-)3-13 cm; petiole including firm discolored, hardly swollen pulvinus 13-50 mm, at middle 0.4-0.6 mm diam, narrowly obscurely sulcate ventrally; rachis 10-45 mm, either longer or shorter than petiole; gland (often eaten) between proximal pair only, slenderly stipitate, in profile 0.8-2 mm, the stipe usually puberulent, the lance-fusiform acute orange head 0.1-0.2 mm diam; pulvinules 0.5-1.3 mm; lfts 3-5 pairs, little accrescent distally, obliquely elliptic or obovate-elliptic obtuse mucronulate or deltately apiculate, the largest (10-)12-40 \times 5-14 mm, (2-)2.2-2.5 times as long as wide, at oblique base cordate on proximal and cuneate on distal side, the margin plane, the faces veinless except for the slender midrib prominulous only dorsally, this sometimes giving rise to 1-3 pairs of weak secondary veins visibly raised only on proximal half of lft.

Peduncles (2-)2.5-10 cm; racemes loosely (1-)2-5(-6)-fld, the axis (0-)2-20(-25) mm; bracts narrowly lanceolate 2-4.5 mm, persistent into or past anthesis, then deciduous; pedicels 5-20 mm; fl-buds nodding, plumply obovoid pilosulous; hypanthium deeply concave, urn-shaped in fruit; sepals elliptic or oblong-elliptic obtuse, the outer greenish, the inner with petaloid dark-venulose margins, all of \pm equal length (4.5-)5-11 mm, deciduous with or shortly after petals; corolla zygomorphic, the yellow petals drying yellow or stramineous dark-veined, glabrous or dorsally pubescent near claw, almost isomorphic 11-16 mm, the blades beyond short claw obovate or oblong-obovate obtuse or emarginate; androecium glabrous, functionally 7-merous, the 3 staminodes narrowly oblanceolate, the 7 fertile stamens alike except slightly accrescent toward abaxial side of fl, the filaments 1.6-2.5 mm, the slenderly lance-oblong, gently incurved anthers $1.8-4 \times 0.55-0.7$ mm, brown striped with yellow in the lateral grooves, at apex bluntly conical and obliquely 1-porose; ovary densely white-pilosulous; style glabrous linear $1.8-2.5 \times 0.15-0.2$ mm, the minute stigmatic cavity symmetrically terminal; ovules 22-24.

Pod widely ascending, perhaps sometimes humistrate, sessile, in profile narrowly oblong-elliptic or -oblanceolate, slightly incurved or almost straight, $2-2.5 \times 0.5$ cm, obliquely cuspidate at apex, compressed but plumply turgid at maturity, the papery valves in texture and corrugation like those of *S. crotalarioides*, at once minutely puberulent and strigulose or hispidulous with ascending or subappressed straight setules up to 0.5-0.8 mm; seeds 2-seriate in 2 interdigitating ranks, oriented as in *S. crotalarioides* and similar in outline, $\pm 2.8-3.7 \times 1.8-2.4$ mm, the testa densely intricately rugulose-colliculate overall, the sculpture pale against the almost concealed fuscous background, the areole $0.5-0.7 \times 0.3-0.5$ mm.

This local and seldom collected senna was referred by Bentham to *Cassia crotalarioides* and has not been extricated from it since. It does indeed resemble some slender forms of *S. crotalarioides* in general habit but differs in the retrorse short vesture of the stems, in the presence of a gland on the stipules, in the bluntly conic-tipped, not infra-apically strangulated anthers, and particularly in the elaborately sculptured testa of the seeds. In all these characters it agrees rather with *S. argentea* and *S. arida*, but differs from both in the filiform style about ten times as long as its apical diameter.

Key to the Varieties of *S. apiculata*

1. Larger lfts $1-2.7 \times 0.5-1.1$ cm; peduncles 2.5–8.5 cm; pedicels 5–10 mm; sepals 4.5–6 mm; petals 11–12 mm; s.-e. Puebla. 78a. var. *apiculata* (p. 275).
1. Larger lfts $\pm 4 \times 1.7$ cm; peduncles 8–10 cm; pedicels 18–20 mm; sepals 10–11 mm; petals $\pm 15-16$ mm: Hidalgo. 78b. var. *longipes* (p. 275).

78a. *Senna apiculata* (Martens & Galeotti) Irwin & Barneby var. *apiculata*. *Cassia apiculata* Martens & Galeotti, 1843, l.c., sens. str.—“H. Gal[eotti] No. 3218 . . . Se trouve dans la plaine cactifère et sur les montagnes calcaires de Tehuacan de las Granadas [Puebla], de 5,000 à 6,500 pieds.”—Holotypus, collected VIII.1840 (fl), BR! = BH Neg. 2497; isotypus, K (hb. Hook.)!—Incautiously referred by Bentham, 1871, p. 530, to synonymy of *Cassia crotalarioides* H.B.K.

Relatively small-leaved, with small, short-pedicelled flowers, the dimensions indicated in the key.—Collections: 6.

Grassy or weedy flats and stony hillsides in mesquital or thorn-cactus scrub, $\pm 1500-2100$ m, known only from the valley of río Salado from Chilac upstream to near Yehualtepec in s.-e. Puebla, Mexico.—Fl. VI–XII, so long as moisture permits growth.

78b. *Senna apiculata* (Martens & Galeotti) var. *longipes* Irwin & Barneby, var. nov., a var. *apiculata* floribus, foliis caeterisque majoribus, pedicellis elongatis 18–20 (nec 5–10) mm, sepalis 8–10 (nec 4.5–6) mm, petalis 15–16 (nec 11–12) mm longis diversa.—MEXICO. Hidalgo: en matorral bajo, 1350 m, Barranca de los Venados, Metzitzlán, 27.VI.1958 (fl, fr), *R. Rita* 3536.—Holotypus, MEXU.

Relatively large leaves and much larger, long-pedicelled flowers, as noted in key above, distinguish this, perhaps specifically distinct plant.—Collections: 1.

Along stream-beds in low thorn-scrub, ± 1350 m, known only from the type-locality in n.-e. Hidalgo.—Fl. V–VII(–?).

79. *Senna arida* (Rose) Irwin & Barneby, comb. nov. *Cassia arida* Rose, Contrib. U.S. Nat. Herb. 10: 97. 1906.—“Type [US] no. 453267, collected by J. N. Rose and Jos. H. Painter, near Higuierillas, Querétaro, August 23, 1905 (no. 9778).”—Holotypus, US!—*Earleocassia arida* (Rose) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 249. 1930.

Closely related to *S. argentea* and differing in the following respects: setose pubescence of stems and lf-stalks shorter or sparser or both, the longest trichomes 0.8–1.5(–3.5) mm; lfts mostly 2 or 3, occasionally 4 pairs; peduncles up to 8.5 cm; pedicels 8–20 mm; filaments 2.3–3 mm, the anthers gently incurved (1.8–)2–2.8 \times 0.5–0.7 mm; style 0.6–1.2 \times 0.3–0.5 mm, 2–3 times as long as apical diam; pod linear-oblong 3–4 \times 0.5–0.6 cm, the long vesture of the valves composed of ascending setae up to 1–1.4 mm; ovules 30–36; seeds more crowded than those of *S. argentea*, hence disposed in 2 interdigitating ranks.—Collections: 9.

Matorral, disturbed oakwoods and mesquite-grassland, 1600–2000 m, in scattered stations around the s. edge of the Mexican Plateau in s.-w. Zacatecas (San Juan Capistrano), Guanajuato, Querétaro (Higuierillas, Querétaro) and Hidalgo

(Tasquillo, Orizabita), and disjunctly in n.-w. Oaxaca (distr. Teposcolula and Huajuapán) and immediately adj. Puebla (Caltepec).—Fl. V–VIII.

Senna arida has been collected seldom and its full dispersal and range of morphological variation can only be guessed at. For the present it appears very close to *S. argentea*, of which it has the habit and short thickened style, but it differs in smaller anthers and shorter pod with seeds consequently crowded and displaced into two rows. The collections from the Oaxaca-Puebla border seem essentially identical to those from the southern edge of the Mexican Plateau. One plant from Querétaro (*Rose 11184*, ex parte, NY) and another from Guanajuato (*Kenoyer 2285*, A, described by the collector as a shrub) have stems hispid with lustrous setae up to 2.5–3.5 mm long, suggestive of *S. argentea*, but with the short pod of *S. arida*. The amply documented instability in vestiture of *Senna* generally and ser. *Brachycarpae* in particular induces us to make light of this visually arresting variation.

80. *Senna covesii* (A. Gray) Irwin & Barneby, *Phytologia* **44**(7): 499. 1979. *Cassia covesii* A. Gray, *Proc. Amer. Acad.* **7**: 399. 1868.—“Camp Grant, and south of Prescott, Arizona, Dr. Elliott Coues (to whom the species is dedicated) and Dr. Edward Palmer.”—Lectoholotypus (Isely, 1975, p. 201), *Coues & Palmer 171*, GH!—*Earleocassia covesii* (A. Gray) Britton ex Britton & Rose, *N. Amer. Fl.* **23**(4): 249. 1930.

Cassia covesii sensu Jepson, *Fl. Calif.* **2**: 242. 1936; McMinn, *Ill. Man. Calif. Shrubs* 228, fig. 257. 1939; Jaeger, *Desert Wild Fls.* 102, fig. 213. 1940; Kearney & Peebles, 1951, p. 406; Munz & Keck, *Calif. Fl.* 800. 1959; Isely, 1975, p. 77, map 55 (excluding records from centr. and w. San Diego Co., Calif).

Precociously flowering perennial, in age weakly suffrutescent herbs of bushy outline arising from stout lignescent dark brown or blackish root, the (1–)2–several simple or proximally few-branched stems at anthesis 2–6.5 dm, densely gray-pilosulous throughout with shorter soft subappressed and longer ascending-spreading hairs, the short vestiture of stems retrorse, elsewhere forwardly accum-bent, the longer hairs up to 0.5–1 mm or rarely some setiform to 1.5–2.5 mm (occasionally almost 0), the foliage bicolored, the lfts yellowish-green above, pallid beneath, the inflorescence of axillary few-fl'd racemes arising from many successive axils over a long season, the fls raised beyond the subtending lf.

Stipules erect or spreading linear-attenuate or setiform (3.5–)4.5–8 (–11) × 0.2–0.6 mm, the rather firm blades persisting into maturity of lf, then dry deciduous.

Primary lvs (2–)3–8.5(–10) cm; petiole including poorly differentiated pulvinus (0.5)1–3.5 cm, at middle 0.5–1 mm diam, shallowly openly sulcate ventrally; rachis 0.5–2.5(–3, seldom over 2) cm, its setiform appendage early caducous; petiolar glands (much eaten) always between proximal, commonly between all pairs, stipitate, in profile (0.5–)0.9–2.5(–3.5) mm, the stipe pilosulous, the slenderly fusiform acute reddish head 0.1–0.2 mm diam; pulvinules (0.5–)0.8–1.6(–2) mm; lfts 2–4, in most plants 2 and 3, in some 3 and 4, exceptionally in all lvs exactly 2 pairs, accrescent distally (but the penultimate pair sometimes largest), the distal pair broadly obovate, elliptic-obovate or oblong-elliptic obtuse mucronulate or deltately apiculate (1–)1.4–3(–3.8) × (0.55–)0.7–1.7(–1.9) cm, (1.4–)1.6–2.4 times as long as wide, at oblique base broadly rounded or cordate on proximal side, the margin plane, the midrib and (3–)4–6(–7) pairs of secondary veins weakly prominulous beneath, fully immersed above, the secondary veins usually expiring intramarginally before anastomosis.

Peduncles stiffly ascending (2-)3-8 cm; racemes shortly or subumbellately (2-)4-8(-10)-fld, the axis becoming (0.5-)1-3.5 cm; bracts linear-lance-attenuate $3-7 \times 0.4-1$ mm, caducous well before anthesis; pedicels at and after anthesis 8-17 mm; fl-buds obovoid pilosulous; sepals submembranous pale green, pinkish or yellowish, glabrate and hyaline where covered in bud, in outline elliptic-oblong, -obovate or -oblanceolate obtuse, little graduated, $5-7.6 \times 2.4-3.4$ mm, deciduous with or soon after the petals; corolla, androecium and pistil exactly zygomorphic, petals golden-yellow drying stramineous dark-veined, isomorphic except the 2 abaxial a trifle narrower, all \pm broadly obovate beyond the short claw (9-)10-14(-15) $\times 4.5-9(-10)$ mm; androecium glabrous except sometimes puberulent at base of filaments, functionally 7-merous, the 3 adaxial staminodes pallid oblanceolate 1.5-3.5 mm, the 7 fertile stamens isomorphic except the pair next the staminodes a little shorter, the filaments 1.8-3 mm, the linear-lanceolate, gently incurved anthers $2.5-4.2 \times 0.6-0.9$ mm, brownish but yellowing in the lateral grooves, just below conic-obtuse apex faintly constricted, terminally dehiscent by a single obliquely introrse pore; ovary densely white-pilosulous; style glabrous filiform or slightly tapering distally 2-3.1 mm, incurved from ovary thence almost straight, at apex 0.1-0.2 mm diam, the minute stigmatic cavity terminal; ovules (28-)30-38(-42).

Pod erect subsessile, in profile narrowly oblong-elliptic or oblanceolate, gently incurved or almost straight, the body (18-)20-32(-34) $\times 5-7.5(-8)$ mm, abruptly contracted distally into an erect subulate beak 2-3.5 mm, a little laterally compressed but strongly turgid, the cross section broadly elliptic, the green or reddish valves pubescent with fine short and longer appressed or ascending setiform hairs up to 0.5-0.8 mm, becoming papery and differentiated lengthwise into broad pallid sutural margins and a brown or nigrescent band shallowly corrugated over the seeds, dehiscent through beak and downward, narrowly gaping to release the seeds; seeds stacked horizontal to pod's long axis into 2 interdigitating ranks, each turned with broad faces to its neighbors, all closely contiguous at the hilar end but separated distally by incomplete endocarpic septa (fleshy when fresh, castaneous membranous when dry), their broad faces basically paddle-shaped but often distorted by crowding, (2.5-)2.7-3.7 $\times 1.9-3$ mm, irregularly carinate around periphery, the faces variably coarsely undulate-rugose, the smooth sublustrous testa fawn- or pinkish-brown, crackled when old, the round or elliptic areole $0.3-0.5 \times 0.2-0.3$ mm.—Collections: 52.

Sandy and gravelly flats, washes and stony hills with *Larrea* and *Prosopis* or in cactus-thorn-forest, 10-1125 (mostly below 800) m, commonly and widely dispersed over the floor of the Sonoran Desert in the basin of the Gila River in s. and w. Arizona, extending weakly into extreme s.-w. New Mexico, n. along the Colorado River just into Clark Co., Nevada and by way of Grand Canyon into Coconino Co., Arizona, w. becoming less common to the n. and w. edges of the Colorado Desert in e. Riverside and San Diego counties, California, and s. along the coastal plain from the n.-e. corner of Baja California Norte through Sonora to the Fuerte valley in n.-w. Sinaloa.—Fl. prolifically in spring and fall, but intermittently through the year, the pods persisting indefinitely even on dead stems.

Senna covesii and *S. confinis*, a closely related vicariant pair of species adapted to austere desert climates, are distinguished among *Brachycarpae* with retrorsely hairy stems and 2-4-jugate leaflets by glandless stipules, crumpled seed-face, and ecology. Of the two *S. covesii* is the more slender and more freely branching plant, becoming a small bush in age. Its leaflets are commonly more than two,

not exactly two pairs, and smaller, its pods are appressed-setulose and not hispid, and the testa of the somewhat smaller seeds is simply crumpled into coarse folds but not further colliculate. The erect pods of both these sennas persist on the old dying or dead stems long after dehiscence and the seeds are shaken out of the gaping valves in the so-called censer fashion.

Coues's senna—it was dedicated by Asa Gray to the ornithologist Elliott Coues, 1842–1899—was first collected by Sessé or some other member of the Spanish expedition to New Spain, presumably either in Sonora or Sinaloa in 1791–1792, and was shortly thereafter in cultivation at the Madrid Botanical Garden under the unpublished name “*planiflora*.” It is, however, not to be recognized among the cassias described in either of Sessé's posthumously published floras. In the Desert House at New York Botanical Garden it is cultivated without difficulty or special attention, its thin gray foliage and golden yellow flowers forming a quietly effective picture almost throughout the year.

81. *Senna confinis* (Greene) Irwin & Barneby, comb. nov. *Cassia confinis* Greene, Pittonia 3: 225. 1897.—“Los Angeles Bay, Lower California, Dr. Edward Palmer, 1887.”—Holotypus, ND? (not seen); isotypus, NY!—*Earleocassia confinis* (Greene) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 249. 1930.

Cassia confinis sensu Goldman, Contrib. U.S. Nat. Herb. 16: 335. 1916; Wiggins in Shreve & Wiggins, 1964, p. 619.

Coarse malodorous, ultimately suffrutescent but precociously flowering and often short-lived herbs with 1–few stout stems erect or incurved-ascending from blackish roots, commonly 3–9(–11, said by Goldman, l.c., to attain 20) dm, densely subvelutinosely pilose-pilosulous throughout with spreading-ascending, mixed shorter and (fewer) longer hairs up to 0.8–1.3 mm, the short vestiture of stems \pm retrorse, elsewhere ascending, the longer hairs all spreading-ascending and a few of them sometimes becoming setiform and up to 3 mm, the whole vestiture yellowish when young, gray at maturity, the short few-fl'd racemes axillary to several successive lvs along the stem, the peduncles as long or longer than the lf.

Stipules sinuously incurved or erect, linear-attenuate or setiform 3–9 \times 0.3–0.9 mm, persistent to maturity of associated lf, ultimately dry deciduous.

Primary cauline lvs 4.5–10 cm (of some axillary spurs, not further mentioned, smaller); petiole stout, including firm, little dilated pulvinus (1.4–)1.8–4 cm, at middle 0.7–1.1 mm diam, obtusely carinate dorsally, widely shallowly sulcate ventrally; rachis 7–22 mm, its terminal appendage setiform retroarcuate; petiolar glands between all pairs, slenderly stipitate, in profile 1–2.6 mm tall, the stipe densely pilosulous, the slenderly fusiform reddish head shorter than stipe, 0.15–0.25 mm diam; pulvinules 1–2 mm; lfts of most lvs exactly 2, or few random lvs 1 or 3 pairs, the distal pair largest, these broadly elliptic or obovate (ovate)-elliptic obtuse mucronate (apiculate) 2–4.7 \times 1.2–2.7 cm, 1.4–2.1 times as long as wide, at base broadly cordate proximally, rounded or broadly cuneate distally, the margin plane, the midrib and 5–7 pairs of secondary veins prominulous beneath only, tertiary venulation fully immersed; smaller proximal lfts either similar in outline or proportionately broader.

Peduncles stiffly ascending (3.5–)4–9 cm; racemes shortly or subumbellately 3–10-fl'd, the axis becoming 3–20(–30) mm; bracts linear-attenuate 3–7 mm, commonly persistent into anthesis, then dry deciduous; pedicels at and after full anthesis 6–13(–15) mm, thickened and erect in fruit; fl-buds obovoid, densely pilosulous; sepals submembranous, where covered in bud glabrate and hyaline-

margined, nearly isomorphic except the innermost a trifle longer, all oblong or oblong-elliptic obtuse 5–6.5 mm; corolla zygomorphic, the petals bright yellow drying stramineous or whitish brown-veined, thinly pilosulous at claw and along some veins dorsally, all broadly obovate or the 2 abaxial ones narrower and a trifle shorter, the longer ones $11\text{--}14 \times 5.5\text{--}8$ mm; androecium glabrous, functionally 7–10-merous, 1–3 adaxial often reduced to linear-spatulate staminodes but sometimes all 10 fertile, the 4 median and 3 abaxial stamens isomorphic except slightly accrescent toward abaxial side of fl, the filaments 2–3 mm, the anthers linear-oblong $3\text{--}4 \times 0.8\text{--}1$ mm, slightly incurved thin-textured bicolored, when dry castaneous with broad lateral yellow stripe along the sutures, at apex conical and 1-porose; ovary densely white-pilose; style (1.5–)2–3 \times 0.2 mm, incurved from ovary but thence almost straight, not at all dilated distally; ovules 26–34.

Pod stiffly erect subsessile oblong-ellipsoid straight (20–)22–32 \times 6–7 mm, a little laterally compressed but strongly turgid, abruptly contracted distally into the subulate persistent style-base, the stiffly papery valves early becoming ochraceous or dark brown with pale differentiated border parallel to the sutures, densely pilosulous with mixed short fine hairs and coarse setae up to 1.2–2.2 mm, when fully ripe low-corrugate over the seeds, dehiscent downward \pm halfway through both sutures, narrowly gaping to emit the seeds but not twisted; seeds closely crowded in 2 interdigitating ranks, each turned edgewise to the valves, in broad profile paddle-shaped (but often distorted by crowding) $\pm 3.8\text{--}4.3 \times 2.6\text{--}3.2$ mm, bluntly keeled around periphery, sinuously ridged on broad faces, the testa pale drab- or grayish-olivaceous dull, colliculate and crackled overall, the deeply engraved areole elliptic or subcircular $0.35\text{--}0.5 \times 0.3\text{--}0.4$ mm.—Collections: 16.

Desert flats, washes and stony hills below 400 m, widespread and locally plentiful along the Gulf slope and shore of Baja California and off-shore islands from Isla Angel de la Guarda and Bahía de los Angeles s. to Cabo San Lucas, in lat. $23^{\circ}\text{--}29^{\circ}30'\text{N}$.—Fl. primarily I–IV, sporadically throughout the year, prolifically following chubascos, the pods long persisting.—*Oyasón*, used at La Paz for poultices.

Closely akin to the preceding, which see for differential commentary. Below the Mexican boundary the ranges of *S. covesii* and *S. confinis* are almost fully separated by the Gulf of California and they are everywhere morphologically clearcut. On and near Tiburon Island, however, they are either actually sympatric or close neighbors and we have seen one specimen from the southeast side of Isla San Esteban in lat. $28^{\circ}41'\text{N}$ (*Moran 28168*, SD) ambiguous between them in characters of the seed. Whether this represents recent hybridization or the undifferentiated stock from which sibling species arose is not determinable.

82. *Senna pilosior* (Macbride) Irwin & Barneby, *Phytologia* 44(7): 500. 1979. *Cassia bauhinioides* var. *pilosior* Robinson ex Macbride, *Contrib. Gray Herb.*, n. ser. 59: 27. 1919 —“TEXAS: Bofecillos Mts. [s. Presidio County], Sept., 1883, *Havard*, no. 14 . . . MEXICO: Torreon, Coahuila, Oct. 13–20, 1898, *Palmer*, no. 455; 75 miles southwest of Parras, Coahuila, May, 1880, *Palmer*, no. 2132.”—Holotypus, *Havard 14*, GH! paratypes, *Palmer 455*, GH, NY, US! 2132, GH, US!—*Cassia pilosior* (Macbride) Irwin & Barneby, *Sida* 6(1): 10. 1965.

Cassia durangensis sensu Turner, 1959, p. 74, map 35 (Texas); Correll & Johnston, 1970, p. 788;

Isely, 1975, p. 81, 198, 201, map 28 (Texas).

Cassia pilosior sensu Isely, 1975, p. 227.

Erect herbs from dark brown or blackish, sharply tapering taproot, monocarpic or sometimes persisting over winter to a second season, at anthesis (1–)1.5–6.5 dm, the 1–several simple or few-branched stems with lf-stalks and axes of inflorescence densely pubescent throughout with a) a dense undercoat of short soft, loosely retrorse hairs mixed with minute yellow glandiform trichomes, b) stiffer ascending or incurved setules up to 0.4–1 mm, and c) few or many subhorizontal weak lustrous spiral setae up to 2–4 mm, the ample 2-foliolate lvs bicolored, the lf-tips densely antrorsely pilosulous on both faces, gray-silvery beneath and golden-tinted above, the few-fl'd racemes lateral and axillary to most major lvs, only late in season becoming subpaniculate.

Stipules loosely ascending-spreading, narrowly lance- or linear-caudate (3–)4–12 × 0.3–0.7 mm, at first herbaceous, early dry and fragile but only tardily deciduous.

Lvs (1.5–)2.5–7.5 cm; petiole including scarcely differentiated pulvinus 1–3.5(–4) cm, at middle 0.4–1.1 mm diam, the narrow shallow ventral sulcus concealed by pubescence; gland between the single pair of lf-tips, slenderly stipitate, in profile (0.7–)1–2.4 mm, the stipe pilosulous, the narrowly fusiform or ovoid-fusiform acute head 0.1–0.35(–0.4) mm diam; lf-tips broadly obliquely obovate or amply oblong-obovate obtuse mucronulate or shallowly emarginate, the larger of any plant (15–)18–40 × 10–23 mm, (1.3–)1.4–1.8 times as long as wide, at base deeply widely cordate on proximal side, the margin plane, the blade essentially veinless above, the midrib prominulous beneath and there giving rise on each side to 3–6 incurved-ascending secondary veins, these expiring well short of anastomosis.

Racemes loosely and shortly or subumbellately (2–)3–5(–6)-fl'd, the peduncle and axis together becoming 2.5–8.5 cm; bracts narrowly lance-acuminate or -caudate, early dry but long persistent, sometimes under ripe fruits; pedicels narrowly ascending, at full anthesis and afterward 6–15 mm; fl-buds horizontal or nodding, obovoid obtuse pilosulous and commonly also setose; sepals pale green, the slightly broader inner ones pallidly membranous-margined, all elliptic or obovate-elliptic obtuse, of subequal length (4.5–)5–6.5 mm, marcescent around base of forming pod but commonly shed before its maturity; petals glabrous yellow drying stramineous or whitish brown-veined, spatulate or obovate-cuneate of subequal length, 8.5–10 mm; androecium glabrous, the staminodes oblanceolate obtuse or emarginate, the 7 fertile members homomorphic except slightly accrescent toward abaxial side of fl, the filaments 1.8–2.6 mm, the lunately narrowly lance-oblong anthers in profile 2.3–3.7 × 0.6–0.65 mm, just below apex slightly strangled, dehiscent by a single subsymmetrically terminal pore; ovary densely white-pilosulous; style glabrous linear-filiform (1.8–)2–3.2 × 0.15–0.25 mm; ovules (16–)18–26.

Pod erect sessile, in profile narrowly oblong or oblong-elliptic (2–)2.3–3.5(–4) × 0.55–0.75 cm, at apex abruptly contracted into a symmetrically erect subulate beak, bicarinate by the sutures, strongly compressed laterally but turgescerent and low-corrugate over seeds, the green early papery and fuscous valves paler along the sutural margins, densely minutely retrorse-pilosulous and more thinly hispid with antrorsely ascending straight setae up to (1–)1.2–1.7(–2) mm, downwardly dehiscent the length of both sutures, long persistent after seeds are shed; seeds turned with broader faces to the very narrow septa, stacked contiguously in 1 file along the laterally compressed cavity, in outline compressed-pyriform 3.2–3.8 × 2.2–2.8 mm, the faces raised in 3–4 obtuse folds radiating from the areole, the almost smooth testa dull pinkish or grayish-fawn, not rugulose-colliculate, the elliptic or round areole ±0.3 × 0.15–0.3 mm; $n = 14$.—Collections: 30.—Fig. 1 (petiolar nectary).

Sandy banks, desert washes, talus under cliffs, in *Larrea* desert and mesquite-grassland, 670–1500 m, locally plentiful in the Big Bend of the Rio Grande, s.-centr. Trans-Pecos Texas, s. (interruptedly?) to the periphery of Mapimí Depression and the lower Nazas valley in centr. and s.-w. Coahuila and adjoining n.-e. Durango.—Fl. continuously while soil-moisture allows, mostly III–X but sometimes arrested during drought and regenerating after storms, witness fls and ripe pods often present on the same stem.

The collections of *S. pilosior* and the closely related *S. durangensis* acquired from the pioneer travellers Karwinski, Berlandier, Edward Palmer and the Boundary Survey botanists were at first misinterpreted as broad-leaved forms of the more widespread, at that time still poorly known *S. bauhinioides*. They differ from this collectively in their ample leaflets and linear styles, and from each other in length and diameter of style, in ovule-number and consequently different arrangement of seeds in the ripe pod, and in surface ornamentation and color of the seeds, points brought out in detail in our key to the series. The marcescent sepals of *S. pilosior* are unique in this group. The confused history of the pair has been told elsewhere (Irwin & Barneby, 1975, p. 10–11) and is implicit in the synonymy given herein.

83. *Senna durangensis* (Rose) Irwin & Barneby, *Phytologia* 44(7): 499. 1979. *Cassia durangensis* Rose, *Contrib. U.S. Nat. Herb.* 10: 98. 1906.—Typus infra sub var. *durangensi* indicatur.

Monocarpic or biennial, at anthesis 1–3.5 dm, in habit of growth, vesture, stipules, ample 1-jugate lfts and inflorescence closely resembling *S. pilosior*, but the long spiral setae few and scattered or wanting.

Larger lfts broadly obliquely obovate, obtuse mucronulate or subemarginate $\pm 2\text{--}4 \times 1.4\text{--}2.3$ cm, 1.2–2.1 times as long as wide.

Sepals mostly 5–8 mm, promptly caducous with the corolla; petals 7–13 mm; fertile stamens accrescent toward abaxial side of fl, the anthers $2.2\text{--}3 \times 0.65\text{--}0.8$ mm, colored as those of *S. pilosior* but more abruptly conic at apex and dehiscent by an obliquely introrse pore; style short straight $1\text{--}1.7 \times 0.3\text{--}0.45$ mm; ovules 38–44.

Pod of *S. pilosior* but more turgid, the vesture of short hairs erect, the hispid setae 1.2–1.8 mm, the interseminal septa better developed; seeds oriented as in *S. pilosior*, stacked in 2 interdigitating ranks, much distorted by crowding, the perfect ones paddle-shaped or compressed-pyriform $2.5\text{--}3.2 \times 1.7\text{--}2.3$ mm, sometimes carinate around the wide diameter, the faces coarsely erratically rugose or folded, the lustrous brown or olive-brown testa intricately sinuous-rugulose, the areole $0.3\text{--}0.4 \times 0.2\text{--}0.3$ mm.

Comments on the similarities and differences between this species and its sibling *S. pilosior* will be found under the preceding. *Senna durangensis* has a remarkable bicentric range, partly in the Conchos and Nazas valleys west of Mapimí Depression at the edge of the Chihuahuan Desert, partly on the Gulf Coastal Plain in extreme southern Texas and northeastern Mexico, a situation that has led to divergence into slightly but significantly modified varieties:

Key to the Varieties of *S. durangensis*

1. Racemes mostly 2–5-fld; petiolar gland elevated on a distinct pilosulous stipe; petals 11–13 mm (in this differing from sympatric *S. pilosior*); n.-e. Durango and s. Chihuahua $\pm 1400\text{--}1570$ m. 83a. var. *durangensis* (p. 282).
1. Racemes 1–2-fld; petiolar gland sessile or almost so; petals 7–12 mm; Gulf Coastal Plain and alluvial valley floors at e. foot of Sa. Madre Oriental below 300 m in extreme s. Texas, Tamaulipas and extreme e. San Luis Potosí. 83b. var. *iselyi* (p. 282).

- 83a. *Senna durangensis* (Rose) Irwin & Barneby var. *durangensis*.** *Cassia durangensis* Rose, 1906, l.c., sensu str.—“Type [US] no. 304717, collected by Dr. E. Palmer near Durango in 1896 (no. 271); also near the same place by E. W. Nelson in 1898 (no. 4595).”—Holotypus, US! isotypi, GH, NY! paratypus (*Nelson 4595*), US!—*Earleocassia durangensis* (Rose) Britton ex Britton & Rose, N. Amer. Fl. **23**(4): 248. 1930, quoad nom., exclus. pl. tex.

Cassia durangensis var. *durangensis* sensu Irwin & Barneby, Sida **6**(1): 10. 1975.

Characters as given in varietal key.—Collections: 5.

Mesquite grassland and stony hills or riverbeds in *Larrea* desert, 1400–1570 m, local, known only from upper forks of Ríos Conchos and Nazas in s.-e. Chihuahua and e. Durango (lat. $\pm 24^{\circ}30' - 27^{\circ}N$).—Fl. V–X.

- 83b. *Senna durangensis* (Rose) var. *iselyi* (Irwin & Barneby) Irwin & Barneby,** Phytologia **44**(7): 499. 1979. *Cassia durangensis* var. *iselyi* Irwin & Barneby, Sida **6**(1): 11. 1975.—“MEXICO. Tamaulipas: San Fernando à Jiménez [Santander], X.1830 (fr), *J. L. Berlandier 840*.”—Holotypus, NY! isotypi, G, K, P!

Cassia bauhinioides variant I, Isely, Mem. N.Y. Bot. Gard. **25**(2): 70, map 20 (Texas). 1975.

Cassia durangensis var. *iselyi* sensu Isely, op. cit. 227. 1975.

Characters as given in varietal key.—Collections: 10.

Mesquite thickets and along roadsides and canal banks of the Gulf Coastal Plain and alluvial valleys issuing from foot of Sa. Madre Oriental, in sandy or sandy loam soils below 300 m, lower Rio Grande valley in Texas (Zapata to Cameron Co.) s. through Tamaulipas just into San Luis Potosí.—Fl. IV–X, plants from seed germinating in later summer appearing annual.

- 84. *Senna roemeriana* (Scheele) Irwin & Barneby, comb. nov.** *Cassia roemeriana* [sic] Scheele, Linnaea **21**: 457. 1848.—“Auf felsigen Boden am obern Guadeloupe [=Comal Co., Texas, or vicinity]: Lindheimer.”—Holotypus, †B; neoholotypus, following Isely, 1975, p. 208: *Lindheimer III 381*, s.d. (fl, fr), 1846, NY! isotypi, GH, MO!—*Earleocassia roemeriana* (Scheele) Britton ex Britton & Rose, N. Amer. Fl. **23**(4): 247. 1930.

Cassia roemeriana sensu A. Gray, Boston J. Nat. Hist. **6**(2): 180. 1850; Bentham, 1871, p. 529; Wootton & Standley, 1915, p. 334; Turner, 1959, p. 74, map 36 (Texas); Isely, p. 122, map 55 (U.S.A.).

Perennial herbs from tough blackish woody root, at anthesis (1.5–)2–7 dm, the 1–several erect or assurgent, simple or few-branched, distally sulcate stems with all lf-stalks and axes of inflorescence densely minutely pilosulous with fine erect or subretorse hairs usually mixed with scattered ascending or antrorsely accumbent setules up to 0.2–0.7 mm, the 2-foliate lvs \pm bicolored, yellowish-green above and pallid- or bluish-green beneath, the lfts usually strigulose or antrorsely pilosulous on both faces, sometimes only thinly so or glabrous above, the axillary racemes at first lateral and shorter than or subequalling the subtending lf, later forming a shortly exserted corymbose panicle.

Stipules widely ascending linear-attenuate or setiform 3–9(–11) \times 0.2–0.4(–0.5) mm, at first green, early dry caducous, lacking from most fruiting specimens.

Lvs 2.5–9.5 cm; petiole including the firm, scarcely swollen pulvinus 1–3(–3.8)

cm, at middle 0.3–0.8(–1) mm diam, the shallow ventral groove almost closed; gland between the 1 pair of lfts, shortly stipitate or subsessile, in profile (0.3–) 0.6–1.6 mm, the stipe puberulent, the narrowly fusiform or lance-subuliform orange (much eaten) head 0.1–0.35 mm diam; pulvinules discolored 0.9–1.8(–2.2) mm; lfts ascending subvertically from petiole, in outline narrowly lance-oblong or lanceolate acute, obtuse mucronulate or apiculate, the larger ones (2–) 2.5–6(–7) × 0.4–1.2(–1.4) cm, (3.6–)4–8(–9) times as long as wide, at base cordate on proximal and cuneate on distal side, the margin plane, the midrib immersed above, prominent beneath and there giving rise, often on broader side of lft only and not above $\frac{2}{3}$ from base of blade, to 1–5(–6) weak secondary veins, these usually expiring well within the margin and short of anastomosis, the upper face of blade essentially veinless.

Racemes loosely but shortly (1–)2–5-fl'd, the peduncle and axis together 2.5–6.5(–8) cm; bracts linear-attenuate 1.5–5 mm, deciduous at or before anthesis; pedicels 9–16 mm; fl-buds horizontal or nodding, subglobose becoming obovoid, thinly strigulose-pilosulous; sepals submembranous pallid or tinged with pale green or pinkish-brown, of nearly equal length but varying from narrowly elliptic to obovate, the longest 5.5–7.3(–8.2) mm, all deciduous with the corolla; petals yellow or orange-yellow, wilting after one day, drying stramineous or whitish brown-veined, of subequal length or the vexillar one slightly shorter, obovate-cuneate obtuse or openly widely emarginate, including short claw (11–) 12–16(–17) × (4–)5.5–11 mm; androecium glabrous, the staminodes narrowly oblanceolate or spatulate, the 7 fertile members similar in form but graduated in length, the 2 next the staminodes shortest, their filament 1.5–2.5, their anther 1.7–2.4 mm, the 2 latero-abaxial longest, their filament 2.6–4.5, the anther (2.2–)2.5–3.3 mm, the 3 others intermediate, the anthers of all lunately oblong or lance-oblong in profile 0.5–0.8 mm diam, strangulated just below apex and thence slightly dilated into the subsymmetrically terminal pore, their walls thin bicolored, castaneous along connectival grooves, yellow laterally; ovary densely white-pilosulous; style glabrous, gently incurved, linear or a trifle narrowed distally 1.2–2.4 mm, at apex 0.1–0.25 mm diam, the minute stigmatic cavity symmetrically terminal, ciliolate; ovules (22–)26–40.

Pod erect or narrowly ascending, linear-oblong or narrowly oblong-oblanceolate in profile, straight or gently incurved, (20–)23–32(–35) × (0.45–)0.5–0.65 mm, laterally compressed but strongly turgid, the green or red-tinged valves thinly setulose with appressed or subappressed stiff hairs up to 0.5–0.8(–1) mm, becoming firmly papery dark brown but paler along the wide sutural margins, at middle low-corrugate over the seeds, dehiscent downward through both sutures, the cavity broadly membranous-septate, the whole pod often long persisting, even on dead dry stems; seeds turned fully or obliquely to face the septa, stacked closely into 2 separate parallel or incipiently interdigitating files, often distorted by crowding, the perfect ones compressed-pyriform or paddle-shaped 2.5–3.3 × 1.7–2.7 mm, the moderately lustrous testa brown, pinkish-brown or when long ripe graying and crackled, densely sinuously rugulose-colliculate overall, the elliptic or round areole 0.4–0.7 × 0.4–0.6 mm; $n = 14$.—Collections: 76.—Fig. 10 (androecium), 14 (pod, seed).

Mesquite-grassland, chaparral, ascending w.-ward into draws in short-grass prairie and barren hillsides and washes of n. Chihuahuan Desert, 200–2050 m, widespread and locally abundant over most of centr. and trans-Pecos Texas, especially vigorous and common on limestones of Edwards Plateau, extending n. to the Red River in s. and s.-w. Oklahoma, up the Pecos River valley in New Mexico

to Quay County and the White Mountains, s. just into n.-e. Chihuahua, centr. Coahuila, and n.-centr. Nuevo León; one station w. of the Rio Grande in s.-w. New Mexico (Sierra County).—Fl. IV–IX(–X).

A senna widespread and familiar in the arid grasslands and mesquite plains of southwestern United States and northeastern Mexico, where it is distinguished from other bifoliolate *Brachycarpae* by the long, proportionately narrow leaflets combined with a linear style. It is closely akin only to *S. mensicola*, next following, which see for comment.

85. *Senna mensicola* (Irwin & Barneby) Irwin & Barneby, *Phytologia* 44(7): 500. 1979. *Cassia mensicola* Irwin & Barneby, *Sida* 6(1): 12. 1975.—“MEXICO. San Luis Potosí: Charcas, VII–VIII. 1934 (fl, fr), C. L. Lundell 5345.”—Holotypus, CAS! isotypi, MEXU, TEX!

Low erect or diffusely assurgent herbs, perennial but precociously flowering and of only few seasons' duration, the simple or few-branched stems arising from slender blackish root, at anthesis 0.5–2(–2.5) dm, together with lf-stalks and axes of inflorescence densely pilosulous with retrorsely descending or accumbent shorter hairs mixed with fewer ascending coarser setules up to 0.4–1 mm, the foliage either subconcolorous, dark green on both faces, or gold-green above, always densely subappressed-pilosulous above and below, the axillary few-fl'd racemes a little shorter or longer than the lf, never aggregated into a terminal panicle.

Stipules widely spreading-ascending linear-attenuate (3–)4–9 × 0.4–0.6 mm, at first herbaceous becoming dry and deciduous before the associated lf.

Lvs (2–)2.5–5.5(–7) cm; petiole including discolored but scarcely swollen pulvinus 10–27(–32) mm, at middle 0.4–0.7 mm diam, the shallow ventral groove almost closed; gland erect from between the 1 pair of lflets ± at right angles to petiole, shortly stipitate, in profile 1.2–1.8 mm, the stipe puberulent, the slenderly lance-fusiform acute head 0.1–0.2 mm diam; lflets narrowly oblong or oblong-elliptic obtuse mucronulate, the larger ones of a plant 16–45(–50) × 6–15(–19) mm, 2.4–3.3 times as long as wide, at base deeply cordate on proximal and cuneate on distal side, the margin plane, the upper face of blade veinless, the midrib prominulous beneath and there giving rise on each side, or only on the broader side of blade, to 2–6 weak ascending secondary veins, these expiring well within the margin.

Racemes 1–3(–4, commonly 2)-fl'd, the short axis and peduncle together (2–)2.5–5(–6) cm; bracts linear-lance-attenuate 2.5–5 mm, becoming dry but only tardily deciduous; pedicels 4–10(–12) mm; fl-buds subglobose becoming obovoid, pilosulous; sepals thin-textured pale green, scarcely or little graduated, in outline elliptic or elliptic-obovate obtuse, the inner ones 5.5–8.5(–9.5) × 2.2–3.8 mm, all deciduous with the corolla; petals glabrous, yellow drying whitish dark-veined, broadly oblanceolate or obovate-cuneate (11–)12–16.5(–18) × 6–12 mm; androe-cium glabrous, functionally 7-merous, the staminodes narrowly spatulate, the 7 fertile members homomorphic but a trifle accrescent toward abaxial side of fl, the filaments 1.8–3.1 mm, the oblong, gently incurved anthers 2.6–3.6 × 0.6–0.85 mm, at apex abruptly conical and there dehiscent by a single introrse pore, the anther-walls thin-textured bicolored, castaneous along the connectival grooves, laterally yellow; ovary densely white-pilosulous; style glabrous, narrowly cylindric, incurved from ovary but thence straight or almost so, (1.1–)1.4–2.1 × 0.25–0.3 mm, the symmetrically terminal stigmatic cavity ciliolate; ovules 34–42.

Pod ascending sessile, in outline, compression, texture and color essentially

like that of *S. roemeriana*, 23–35 × 4–6 mm, hispid with stiffly ascending setae 0.7–1.2 mm; seeds biseriate, often deformed by crowding, when perfect compressed-pyriform or paddle-shaped 2.3–2.7 × 1.6–2.2 mm, the moderately or highly lustrous brown or brown-olivaceous testa irregularly coarsely folded but not rugulose-colliculate, the round or broadly elliptic areole 0.3–0.4 mm diam.—Collections: 12.

Gravelly clay flats and stony hillsides in microphyllous matorral, desert shrub and desert grassland communities of the Mexican Plateau, sometimes colonial on roadsides, mostly on limestone or gypsum, 900–2300 m, extreme s.-e. Coahuila s. through San Luis Potosí and adjoining Zacatecas to the Moctezuma valley in n. Hidalgo (Ixmiquilpan), except in the latter state entirely within the s. lobe of the Chihuahuan Desert.—Fl. (V–)VI–IX.

Senna mensicola is closely related to *S. bauhinioides* and *S. roemeriana*. Prior to its description it had been confused with *S. bauhinioides*, but differs in the larger flower and the cylindric, not dilated and funnelform style. From *S. roemeriana*, similar in corolla and gynoecium, it differs in generally lower stature, relatively broad blunt leaflets about 2.5–3.5, not 4–8 times as long as wide and a loosely hispid rather than appressed-strigose pod. The seeds of *S. roemeriana* and *S. bauhinioides* are similarly sinuous-rugulose overall, whereas those of *S. mensicola* are smooth. The androecia of *S. bauhinioides* and *S. roemeriana* are alike in that the fertile stamens are strongly accrescent toward the abaxial side of the flower, the two latero-abaxial being longest of all; in *S. mensicola* this asymmetry is less emphatic and sometimes barely perceptible. The discrete range of *S. mensicola*, lying southward from latitude 25°S, is further distinctive.

86. ***Senna ripleyana*** (Irwin & Barneby) Irwin & Barneby, *Phytologia* 44(7): 500. 1979 (lapsu “*ripleyi*”). *Cassia ripleyana* Irwin & Barneby, *Sida* 6(1): 13, fig. 1. 1975.—“MEXICO. Chihuahua: . . . 18 km w. of Jiménez . . . 2.X.1965 (fr), *H. D. Ripley & R. C. Barneby 13,904.*”—Holotypus, NY!

Cassia ripleyi Irwin & Barneby ex Isely, *Mem. N.Y. Bot. Gard.* 25: 226. 1975, nom. nud.

Dwarf, loosely caespitose subcaulescent and shortly caulescent perennial herbs from woody taproot and ultimately a branched caudex, including the exserted peduncles 4–14 cm, pilosulous throughout with coarser, antrorsely incurved-ascending hairs less than 1 mm and a few weak spreading filiform ones up to ±2–2.5 mm, the 1 pair of lfts ashen beneath, greener above, pubescent on both faces, the 1(–2)-fld axillary racemes exserted from the tufted foliage.

Stipules erect often recurved at tip, narrowly linear-caudate (4–)6–10 mm, strongly 1-nerved, persistent.

Lvs 1–5 cm; petiole stiff 1–2.5(–3.2) cm, at middle 0.4–0.5 mm diam, ribbed dorsally, the ventral groove almost closed; petiolar gland divaricate from between the 2 lfts, stipitate, in profile 0.7–2.7 mm, the slenderly lance-fusiform acute head 0.1–0.2 mm diam; lfts oblong- or obliquely obovate-elliptic obtuse mucronulate or subapiculate (6–)8–20 × 3–10 mm, at base broadly cordate on proximal and cuneate on distal side, the margin plane, the slender midrib prominulous beneath, the blades otherwise veinless.

Peduncles stiffly erect or in fruit declined, 2.5–6 cm, 1-, rarely 2-fld; bracts lanceolate or triangular-subulate 1–2.5 mm, early dry deciduous; mature pedicels 5–10 mm; fl-buds nodding, obovoid pilosulous; sepals of subequal length 5–6.5 mm, the outer elliptic-oblancheolate the inner obovate, all membranous-margined;

petals yellow drying whitish brown-veined, glabrous, spatulate-oblongate beyond the short claw, $8.5-9.5 \times 5-6$ mm; androecium of *S. bauhinioides*, the fertile anthers $\pm 3-3.5$ mm; ovary densely white-pilose; style filiform $3-3.5 \times 0.2-0.3$ mm, decurved from ovary and thence incurved to the truncate stigma; ovules 18-28.

Pod obliquely ascending sessile, in profile narrowly oblong or oblong-oblongate, straight or slightly incurved $(13-15-24 \times 5-8)$ mm, abruptly subulate-beaked, strongly turgid, the ripe valves papery brown, paler along the sutural margins, faintly corrugate over the seeds, pubescent with short appressed and stiffly ascending setules up to $\pm 0.7-1$ mm, dehiscent downward along both sutures, narrowly gaping to release the seeds; seeds closely stacked in 2 interdigitating rows, basically paddle-shaped but often distorted by crowding, the well-formed ones $\pm 2.5-3 \times 2$ mm, the testa pinkish-brown, olivaceous or ochraceous, smooth and highly lustrous, not wrinkled, the elliptic areole $0.45-0.7 \times 0.3-0.4$ mm.—Collections: 5.

Gravelly hilltops and flats in arid grassland and *Larrea* desert, 1400-1700 m, apparently rare (but perhaps overlooked or passed over as *S. bauhinioides*), centr. Chihuahuan Desert from trans-Pecos Texas (Brewster Co.) to s.-e. Chihuahua and n. Zacatecas.—Fl. VII-X.

Clearly related to sympatric *S. bauhinioides*, but distinguished by the cespitose habit, wiry subscapiform peduncles, filiform style and lustrously smooth olivaceous to pinkish-brown seeds.

- 87. *Senna bauhinioides*** (A. Gray) Irwin & Barneby, *Phytologia* **44**(7): 499. 1979. *Cassia bauhinioides* A. Gray, Boston J. Nat. Hist. **6**(2): 180 (in nota). 1850.—“On the Rio Grande, Texas, August (in fruit), Mr. Charles Wright. Santa Rosalia, Northern Mexico (in flower only), Dr. Gregg. Between El Paso and Chihuahua, August, Dr. Wislizenus.”—Lectotypus (Isely, 1975, p. 198), *Wright s.n.*, GH! paratypes, *Wislizenus s.n.* GH! *Gregg s.n.*, NY (hb. Torr., adnot. Benth.)!—*Earleocassia bauhinioides* (A. Gray) Britton ex Britton & Rose, N. Amer. Fl. **23**(4): 248. 1930.

Cassia bauhinioides var. *arizonica* Robinson ex Macbride, Contrib. Gray Herb., n. ser. **59**: 27. 1919.—“ARIZONA: Mule Mts., July 20, 1894, *Toumey*, n. 31 . . .”—Holotypus, GH! paratypes, *Lloyd in 1890*, *Davidson 1342*, *Wright 1030*, all GH! presumed isotypus, *Toumey s.n.*, dated 20.VII.94 but from the Galiuro Mts., NY!—Referred to *C. bauhinioides* by Isely, 1975, l.c.

Cassia bauhinioides sensu Bentham, 1871, p. 529; Wootton & Standley, 1915, p. 335; Kearney & Peebles, 1951, p. 406; Turner, 1959, p. 73, map 33 (Texas); Wiggins in Shreve & Wiggins, 1964, p. 619; Isely, 1975, p. 69, map 20 (U.S.A.), exclus. “variant 1,” quod = *Senna durangensis* var. *iselyi*.

Precociously flowering perennial herbs from blackish taproot, the 1-few erect or diffuse stems simple or branched below middle, at anthesis $(0.6-1-3(-3.5))$ dm, the stems and lf-stalks densely pilosulous with shorter, retrorsely accumbent soft hairs and stiffer, spreading or incurved-ascending setulose ones up to $(0.2-0.3-0.8(-1))$ mm, the lf-stalks pilosulous on both faces with incurved, sinuous or straight subappressed hairs, the stems in addition and lf-margins rarely bearing a few (many) fine spiral setae up to 2.5 mm, the foliage almost concolorous but the upper face of lf-stalks sometimes yellowish- and the lower bluish-green, the 1-3-fld racemes axillary and lateral, all but the latest subterminal ones shorter than their accompanying lf.

Stipules at first ascending, often spreading-reflexed in age, narrowly lance-attenuate, linear-caudate or setiform $2.5\text{--}7 \times 0.3\text{--}0.6$ mm, becoming dry and tardily deciduous.

Lvs $1.5\text{--}5.5$ cm; petiole $(0.5\text{--})0.8\text{--}2.6(-3.2)$ cm, at middle $0.3\text{--}0.65$ mm diam, obscurely ribbed dorsally, the ventral groove shallow and almost closed; gland between the one pair of lfts stipitate or subsessile, in profile $(0.5\text{--})0.6\text{--}1.4$ mm, the stipe usually pilosulous, slender or rarely incrassate and thicker than the head, this (much eaten) slenderly (plumply) ovoid or lance-fusiform acute $0.1\text{--}0.3(-0.5)$ mm diam; pulvinules $0.5\text{--}2$ mm; lfts obliquely oblong or ovate-oblong obtuse mucronulate or deltately apiculate $(8\text{--})12\text{--}36(-46) \times 5\text{--}13(-16)$ mm, $2\text{--}3.7(-4.1)$ times as long as wide, at base deeply cordate on proximal and cuneate on distal side, the margin plane, the blade veinless above, the midrib prominulous beneath and commonly giving rise to $1\text{--}3$ secondary veins palmately radiating into the cordate base of blade and sometimes on the same or on both sides to $1\text{--}3(-4)$ weak pinnate ones, these expiring well short of anastomosis.

Peduncles ascending $6\text{--}30$ mm, all 1- or most (all) $2\text{--}3$ -fld, the raceme-axis $0\text{--}6(-8)$ mm; bracts resembling stipules but only $1.5\text{--}4$ mm; pedicels $3\text{--}9(-11)$ mm; fl-buds when young nodding subglobose pilosulous; sepals thinly herbaceous, membranous where covered in bud, elliptic or obovate-elliptic obtuse, scarcely graduated, the innermost $(4\text{--})4.5\text{--}6.5(-7)$ mm, all deciduous with the petals; petals glabrous or externally puberulent at the claw, yellow drying whitish brown-veined, obovate-cuneate $(5\text{--})6\text{--}9(-10)$ mm, sometimes not fully expanding but if so lasting only one day; androecium glabrous, functionally 7-merous, the fertile members accrescent toward the abaxial side of fl, the 2 next to the minute spatulate staminodes shortest, their filament $1.1\text{--}1.8$ mm, their anther $1.5\text{--}2$ mm, the 2 latero-abaxial (oppositipetalous) longest, their filament $2.5\text{--}4$ mm, their anther $(1.8\text{--})2\text{--}2.8$ mm, the 3 other intermediate, the anthers of all narrowly oblong obtuse, lunately incurved $0.6\text{--}0.8$ mm diam, dehiscent at apex by an obliquely terminal pore, their walls thin-textured bicolored, castaneous along the connectival grooves, yellow laterally and there only obscurely sulcate; ovary densely white-pilosulous; style incurved from ovary $(0.5\text{--})0.7\text{--}1.4$ mm, distally dilated into a symmetrically or obliquely truncate membranous-margined stigmatic cavity $0.4\text{--}0.6$ mm diam; ovules $(22\text{--})25\text{--}36$.

Pod ascending or (from prostrate stems) humistrate, sessile or almost so, in profile narrowly oblong to oblong-oblongeolate, lunately incurved or rarely straight, abruptly contracted at apex into a short subulate beak, the strongly turgid body $17\text{--}30 \times 4.5\text{--}6.5$ mm, the thin green puberulent and setulose valves early dry brown and papery, differentiated into a central darker band low-corugate over the seeds and broad paler sutural margins, dehiscent downward through both sutures, the interseminal septa broad membranous castaneous, the whole dehiscent pod long-persistent on the drying stems; seeds turned with broad faces to the septa, stacked into 2 crowded files and often distorted by mutual pressure, the perfect ones compressed-pyriform or paddle-shaped $(2.2\text{--})2.4\text{--}3.2(-3.7) \times 1.8\text{--}2.3(-3)$ mm, the testa brownish-olivaceous becoming when fully ripe gray or pinkish-gray and crackled, sinuously colliculate-rugulose overall, the round or elliptic areole $0.35\text{--}0.5 \times 0.25\text{--}0.4$ mm.—Collections: 53.

Stony hillsides, plains, bajadas, gullied bluffs along streams or dry washes, sometimes prolifically colonial on roadsides, mostly in *Larrea* scrub, mesquite or desert grassland at $500\text{--}1800$ m, widespread over the n. Chihuahuan Desert and around the margins of the Gila Basin in s.-e. Arizona, immediately adjoining Sonora, s. New Mexico and trans-Pecos Texas s. to centr. Coahuila, extending

feebly n. in Arizona to the Little Colorado River (Coconino Co.) and in Texas and presumably adjoining Mexico s.-e. along the Rio Grande and down to ± 80 m as far as Starr County n. of the border and the e. piedmont of Sa. Madre Oriental in n.-centr. Nuevo León.—Fl. IV–XI, and even through winter if moisture permits.

From the viewpoint of floral specialization *S. bauhinioides* is the most advanced of ser. *Brachycarpae*. The short funnel-shaped style upturned to receive pollen from the accompanying anthers and the small ephemeral corolla that sometimes fails to expand fully before fertilization are sure signs of autogamy. The species consists of populations internally very uniform in details of vesture and ovule-number but different among themselves in these features, a situation that is perpetuated by self-fertilization and the development of pure lines of inheritance. Like many xerophytic herbs, *S. bauhinioides* responds quickly to rainfall at any season of the year. Plants a few weeks old bearing flowers and fruits might be mistaken for monocarpic and perhaps do sometimes perish in the first season. Normally, however, they will survive two or several periods of quiescence brought on by either cold or drought or both, becoming clearly perennial though never developing a true caudex.

Bxiii. ser. THARPIA (Britton & Rose) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Tharpia** (Britton & Rose) Irwin & Barneby, comb. nov. *Tharpia* Britton & Rose, N. Amer. Fl. 23(4): 246. 1930, pro gen.—Sp. unica: *T. pumilio* (A. Gray) Britton & Rose \equiv ***Senna pumilio*** (A. Gray) Irwin & Barneby.—*Cassia* sect. *Earleocassia* ser. *Tharpia* (Britton & Rose) Irwin & Barneby, Sida 6(1): 8. 1975.

Cassia sect. *Chamaefistula* ser. *Brachycarpae* sensu Bentham, Trans. Linn. Soc. London 27: 529. 1871, minore ex parte, exclus. typ.

Essentially like smaller bifoliolate members of ser. *Brachycarpae* but the roots tuberously thickened, the firm, narrowly lance-acuminate or oblanceolate lfts acute at apex, symmetrically cuneate at base, callous-marginate, and ovules only 6–12.—Dwarf caespitose perennial herbs, acaulescent or shortly caulescent; petiolar gland obscure, often reduced to a rudimentary stipe, the head obsolete, non-secretory; peduncles subscapose 1-fl'd; sepals persistent; pod plumply oblong-obovoid or obovoid, broadly septate within, the transverse seeds turned broadside to the septa.—Sp. 1, of centr. and w. Texas and n. Mexico.

The unmistakable *S. pumilio*, aptly likened by Isely (1975, p. 122) to a small buttercup, culminates the line of xeric modifications traced through ser. *Brachycarpae*. This relationship was perceived by Bentham and was re-emphasized by us when we reduced *Tharpia* to serial status under a section *Earleocassia*, herein regarded as a coordinate series within *Senna* sect. *Chamaefistula*.

88. *Senna pumilio* (A. Gray) Irwin & Barneby, Phytologia 44(7): 500. 1879. *Cassia pumilio* A. Gray, Boston J. Nat. Hist. 6(2): 180. 1850.—“[*Lindheimer s.n.*] . . . On the Llano and Pierdenales [=Pedernales rivers, Texas]. ‘Only two small specimens seen.’ Rio Grande, Texas, Mr. Charles Wright.”—Lectoholotypus, *Wright 412* from Llano and Pedernales rivers, May, Oct. 1847, GH (top right of sheet, which contains also an unnumbered collection of *Lindheimer* (fasc. IV) lacking locality, *Wright s.n.* from Rio Grande in 1848, these considered paratypes, and 2 collections posterior to 1850); *Wright 153*, FI, NY, dated 1849, are

not considered paratype.—*Tharpia pumilio* (A. Gray) Britton & Rose, N. Amer. Fl. 23(4): 247. 1930.

Cassia pumilio sensu Bentham, 1871, p. 529 (erroneously attributed to New Mexico, a misconception long perpetuated); Turner, 1959, p. 73, map 34 (Texas); Isely, p. 120, map 54 (Texas).

Small tufted acaulescent or shortly caulescent perennial herbs from blackish subterranean caudex and oblique, irregularly thickened or fusiform woody roots, at anthesis (3–)4–12(–17) cm tall, the slender stems 0–5(–8) cm, these and the firm pallid or glaucescent bifoliolate lvs thinly strigulose with appressed or narrowly ascending straight hairs up to 0.25–0.8 mm, the callous-margined lflets either glabrous ciliolate, or strigulose beneath only, or exceptionally strigulose on both faces, the scapose or cauline axillary erect 1-fl'd peduncles \pm equalling the lvs or shortly exserted.

Stipules erect firm linear-lanceolate (2–)3–10(–12) \times 0.4–0.9 mm, carinate dorsally by the prominent midrib, persistent.

Lvs dimorphic, the earliest (not further described) commonly much shorter and their lflets broader than the rest, those associated with peduncles (1.5–)2.5–8(–10) cm; lf-stalk including discolored but otherwise undifferentiated pulvinus 6–32 \times 0.4–0.6 mm, bluntly carinate dorsally, openly narrowly sulcate ventrally, shorter than their pair of lflets; gland between the lflets mostly reduced to a linear-subulate glabrous or puberulent stipe 0.2–1 mm, the head 0 or vestigial; lflets suberect from tip of lf-stalk subsessile, narrowly lance-acuminate or oblanceolate and then more abruptly acute and mucronate, either involute or conduplicate, 1–4.5(–5) \times 0.2–0.5 cm, \pm recurved distally, carinate dorsally by the midrib, smooth and veinless ventrally.

Peduncles erect 2–7(–12) cm; bract ovate or lanceolate 1–3 mm, setulose-ciliolate persistent; pedicel 6–16(–21) mm; bud nodding, obovoid-ellipsoid obtuse strigulose or pilosulous; sepals pale green membranous-margined oblong-elliptic of subequal length 5.5–9.5 mm, becoming strongly 3-nerved and marcescent about base of pod; petals glabrous pale yellow drying stramineous or whitish dark-veined, subhomomorphic obovate- or oblong-elliptic-cuneate (5.5–)6.5–10 mm, equalling or slightly surpassing the sepals; androecium glabrous, functionally 7-merous, the linear-lanceolate staminodes 0.4–0.7 mm wide, the fertile stamens homomorphic except slightly accrescent toward distal side of fl, the filaments 1–2.2 mm, the anthers in profile narrowly lance-acuminate 2.9–4 \times 0.6–0.8 mm, straight proximally, at or beyond middle strongly incurved and distally tapering into an obliquely terminal, shortly 2-lipped pore, the walls of thecae brownish-yellow laterally, paler yellow dorsoventrally and at apex; ovary strigulose or granular-puberulent; style filiform 2.3–3 \times 0.1–0.2 mm, the stigmatic cavity symmetrically terminal; ovules 6–12.

Pod declined sessile, plumply obovoid or oblong-obovoid (8–)10–15 \times 5–8 mm, a little laterally compressed but strongly turgid, the densely strigulose valves becoming papery brown, tardily dehiscent downward through both sutures, the cavity broadly septate; seeds turned with broad faces to the septa, in outline broadly paddle-shaped or compressed-pyriform 3.2–4.5 \times 3–4.3 mm, the brown dull or sublustrous testa finely, sometimes obscurely rugulose, the transversely elliptic areole 0.5–0.7 \times 0.8–1 mm; $n = 14$.—Collections: 34.

Gravelly clay knolls, clay flats and playas in *Larrea* scrub and arid grassland, almost always on limestone, caliche or gypsum, 150–2000 m, local but locally plentiful over centr. and s.-w. Texas, from the headwaters of Brazos and Colorado rivers s. and s.-w. over Edwards Plateau to s.-e. trans-Pecos and the lower Rio Grande valley, thence sparingly s. around margin of Chihuahuan Desert to

n. Durango, s. Coahuila and n.-w. Nuevo León.—Fl. III–VII and again, following summer rains, VIII–X.

Bxiv. ser. NANAE Irwin & Barneby

Senna sect. *Chamaefistula* ser. *Nanae* Irwin & Barneby, ser. nov., statura nana, foliis plerisque 2-foliolatis foliolisque albomarginatis ser. *Tharpia* simulantes sed ab illa necnon ab affini ser. *Brachycarpis* sepalis inter se valde inaequalibus (nec subaequilongis) et staminibus 7 fertilibus more seriei *Coluteoidearum* affiniumque dimorphis, antheris 2 antepetalis abaxialibus quam caeteras longioribus simul ac magis incurvis diversae.—Sp. unica: *S. nana* (Bentham) Irwin & Barneby.

Diminutive subcaulescent herbs from woody roots, but these not tuberously thickened and the 1(–2) pairs of callous-margined leaflets broadly obovate; petiole gland between the first (or only) pair of lfts; racemes 1–2-fld; sepals strongly graduated; androecium of 3 staminodes, 4 short median stamens, two longer heteromorphic antepetalous fertile ones, and between these a centric sterile one, the anthers of fertile ones subtruncate at apex; pod turgidly oblong, septate within, the seeds turned broadside to the septa.—Sp. 1, of Uruguay and n.-e. Argentina.

The diminutive *S. nana* was referred by Bentham to his ser. *Brachycarpae* (of sect. *Chamaefistula*, not of sect. *Chamaesenna*), an otherwise closely coherent group of xeromorphic sennas centering on the Mexican Plateau and adjoining deserts and well characterized by subequal sepals and seven almost homomorphic fertile stamens. *Senna nana* derives a strong superficial resemblance to *S. bauhinioides* and *S. pumilio* from its dwarf stature and pallidly corneous-margined leaflets borne in one or rarely two pairs; but the androecium and graduated sepals are more like those of ser. *Trigonelloideae* or ser. *Coluteoideae*, and suggest derivation from some autochthonous South American group rather than from the distantly allopatric *Brachycarpae*.

89. *Senna nana* (Bentham) Irwin & Barneby, comb. nov. *Cassia nana* Bentham in Martius, Fl. Bras. 15(2): 110. 1870.—“Habitat locis deustis prope Belem et ad rivulum Garapinta in Banda Oriental del Uruguay: St. Hilaire.”—Holotypus, St. Hilaire C2/2550bis, P! phototypus s.n., NY!

Senna nana sensu Burkart, Darwiniana 13: 428, fig. 1. 1964.

Dwarf, loosely tufted, shortly caulescent perennial herb from black woody roots, at anthesis ± 7 –10 cm, the petioles, dorsal face and sometimes the corneous margin of the 1(–2)-jugate lfts pilosulous with fine whitish spreading hairs 0.4–0.9 mm, the foliage subconcolorous, bright green or glaucescent, the few 1–2-fld racemes axillary to distal lvs and about as long as them.

Stipules erect, firmly herbaceous linear-lanceolate 2 – $4.5 \times \pm 0.5$ mm, persistent.

Lvs mostly 3–6 cm; petiole 13–27 mm, at middle 0.5–0.8 mm diam, strongly 3-ribbed dorso-laterally, shallowly sulcate ventrally; gland sessile or almost so at tip of petiole, obovoid or depressed-hemispherical, in profile 0.3 – 1.3×0.5 – 0.7 mm; lfts mostly 1, rarely 2 pairs, when 2 these separated by a rachis up to 4 mm long, all obliquely obovate or elliptic-obovate obtuse 1.6 – 3.4×1 – 2 cm, at strongly asymmetric base cordate on proximal and cuneate on distal side, the margin thickened into a conspicuous pallid cordlike rim 0.2–0.3 mm diam, the blades

almost veinless above, the midrib and 5–6 pairs of secondary veins pallid and prominent beneath, the latter anastomosing well within the margin, the tertiary venulation faint and erratic.

Peduncles ± 1.5 cm; bracts 3.5 mm; pedicels ± 17 mm; sepals thinly herbaceous or the inner ones membranous, oblong-obovate or -elliptic obtuse, the outer ones pilosulous dorsally ± 6 mm, the inner 8.5–11 mm; petals yellow glabrous, when dry stramineous faintly brown-veined, in outline oblance-obovate obtuse 13–15 mm, apparently forming a regularly zygomorphic perianth; staminodes linear-oblong ± 0.5 mm wide; 4 median stamens: filaments ± 2 mm, anthers straight or almost so 3.5×1 mm, at apex obliquely rounded-truncate and 1-pored; 2 latero-abaxial stamens: filaments ± 4.5 mm, anthers lunate 5×1.2 mm, at apex like the shorter ones; abaxial centric stamen sterile, its anther much narrower than that of the juxtaposed antepetalous pair; ovary gray-strigulose; style linear $\pm 2.5 \times 0.3$ mm, very slightly incurved distally, glabrate, the barbellate stigmatic cavity latero-introrse.

Pod (scarcely known) turgidly oblong $\pm 3.5 \times 1$ cm; seeds apparently 2-seriate, turned broadside to membranous septa, areolate.—Collections: 3.

Habitat scarcely known, to be expected in exposed sunny places in grassland, apparently rare and local below 250 m in n. and w.-centr. Uruguay, s.-w. Misiones, Argentina (dept. Posadas), and to be expected in w. Rio Grande do Sul, Brazil.

Bxv. ser. ARMATAE Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Armatae** Irwin & Barneby, nom. et stat. nov.
Xerocassia Britton & Rose, N. Amer. Fl. 23(4): 246. 1930, pro gen.—
 Generitypus: *X. armata* (S. Watson) Britton & Rose \equiv *Cassia armata* S. Wats. \equiv ***Senna armata*** (S. Watson) Irwin & Barneby.

Corolla zygomorphic, the petals like the sepals of subequal length; fertile stamens subhomomorphic except slightly accrescent toward abaxial side of fl, the anthers slenderly lanceolate, obliquely truncate 1-porose, their walls thin-textured, brown-striped along sutures; style subulate, gently incurved, the minute stigmatic cavity terminal; ovules 6–12; pod ascending, turgidly linear-ellipsoid, its interseminal septa subobsolete, tardily dehiscent downward through both sutures; seeds obliquely basipetal, plump, the areole small umbilicoid.—Weakly suffruticose xeromorphic, sparsely leafy or juncous perennial herbs, the stems retrorsely strigulose; petiolar gland rudimentary or 0; lfts 1–5 pairs, opposite or irregularly inserted, small fleshy caducous; inflorescence an exserted thyrses of 1–2-fl'd sessile or subsessile racemes.—Sp. 1, of Mohave and Colorado deserts, s.-w. United States and n. Baja California.

The obviously isolated, xeromorphically modified *S. armata* seems most closely akin to ser. *Brachycarpae*, the oblong-elliptic subequal sepals, the almost homomorphic fertile stamens and the short erect pod finding their closest analogy in that group. The pod differs in the almost complete suppression of internal septa and in orientation of the seeds, which are turned downward in the direction of the pedicel in the attitude supposed to characterize the section *Prososperma*. The seeds themselves, larger and plumper than those of ser. *Brachycarpae*, have the same tiny umbilicoid areole but situated erratically to one side of the misshapen faces. The junciform habit of growth, unlike that of any other North American senna, recalls that of some Argentine species of ser. *Aphyllae*; but these differ in their heteromorphic stamens, ribbonlike pendulous pods, and seeds com-

pressed parallel to the flat valves. The similarity is due to convergent evolution, at work independently in sundry genera in the *Larrea* deserts of California and Argentina.

The inflorescence of *S. armata* is almost consistently described in the literature as a terminal raceme, but this is incorrect. In reality it consists of a series of depauperate, 1–2-flowered racemes sessile in the axils, not of bracts, but of diminished cauline leaves, and is therefore properly described as a thyriform panicle.

90. *Senna armata* (S. Watson) Irwin & Barneby, comb. nov. *Cassia armata* S. Watson, Proc. Amer. Acad. Sci. 11: 136. 1876.—“... found by Dr. J. G. Cooper in the mountains of S. California, between Fort Mohave and Cajon Pass, and also by Lieut. Wheeler in W. Arizona.”—Lectoholotypus (Isely, 1965, p. 197): *Wheeler s.n.* GH! paratypus, *Cooper s.n.* (fragm), GH!—*Xerocassia armata* (S. Watson) Britton & Rose, N. Amer. Fl. 23(4): 246. 1930 (the ‘type locality’ retroactively incorrect).

Cassia armata sensu Jepson, 1936, p. 241, fig. 175; McMinn, 1939, p. 229, fig. 258; Jaeger, 1936, fig. 212; Munz & Keck, 1959, p. 800; Kearney & Peebles, 1960, p. 405; Wiggins in Shreve & Wiggins, 1964, p. 615; Isely, 1975, p. 64, map 17.

Sparsely leafy, by midsummer leafless and junceous, softly woody or merely suffruticose, freely branched xeromorphic bushy herbs or subshrubs of rounded outline, at anthesis 4–14 dm tall and up to 1.5 times as wide, the hornotinous stems clad in a dense coat of minute lustrous, retrorsely appressed, at first silvery later lutescent hairs, the foliage and inflorescence glabrate or thinly puberulent with looser or forwardly appressed hairs to 0.2–0.45 mm, the small fleshy green distant lfts early deciduous from thickened recurving lf-stalks, the inflorescence a long narrow far-exserted panicle of sessile (or subsessile) 1–2-fl'd racemes subtended by diminished lvs or linear phyllodes.

Stipules 0.

Lvs below the inflorescence mostly 2–8(–9) cm, the obscure pallid pulvinus inactive, the pulvinules almost 0, the fleshy green lf-stalks rounded dorsally, flattened and not or very obscurely sulcate ventrally, (0.4–)0.6–1.6(–2) mm wide, tapering distally into a sharp dry but not vulnerant point or exceptionally expanded into a linear blade; petiolar gland usually 0, exceptionally rudimentary, then inserted on rachis above first lft; lfts (0–)2–8(–10), either paired or irregularly inserted along rachis, the first often inserted next to pulvinus, all sessile or almost so or exceptionally confluent with lf-stalk, decrescent upward, the plane, essentially veinless blades obliquely ovate, rhombic-ovate or ovate-reniform, obtuse or subacute, the longest 2–9 × 1–6 mm, at base obliquely cuneate or semicordate-auriculate.

Peduncles obsolete (exceptionally to 5 mm), the fls appearing axillary, solitary or paired; bracts linear-subulate 0.8–3 mm caducous; pedicels slender, widely ascending (8–)9–21 mm, little thickened in fruit; fl-buds ascending-spreading, plumply obovoid obtuse, glabrous or thinly puberulent; sepals submembranous often petaloid, yellowish or fuscous-yellow with pale margins, little graduated in length, elliptic- or oblong-obovate obtuse, the longest 5–7 mm; petals golden-yellow, dark-veined when dried, glabrous, subhomomorphic except the 2 abaxial sometimes a trifle longer than the rest, obovate-cuneate or flabellate, the longest (7.5–)8–11.5(–13) mm; androecium glabrous, functionally 7-merous, the fertile stamens not differentiated into two sets but slightly accrescent abaxially, the

filaments 1–2.2(–2.6) mm, the anthers in profile slenderly lanceolate, slightly incurved, 3–4.3 mm, either gradually tapering distally or commonly a trifle constricted 0.3–0.6 mm below the obliquely truncate terminal pore; ovary strigulose, sometimes thinly so; style slenderly subulate incurved 1.1–2 mm, at apex 0.1–0.2 mm diam; ovules 6–12, usually only 2–5 maturing.

Pod stiffly ascending, linear-ellipsoid (2–)2.5–4.5 × (0.45)–0.5–0.65 cm, tapering at base into an almost obsolete stipe and at apex into the persistent style-base, at first compressed but becoming strongly turgid at maturity, then obtusely carinate by the sutures, the papery brown sublustrous glabrescent valves slightly paler and thickened toward the sutures, obscurely venulose at the middle, the interseminal septa almost obsolete; dehiscence apical and downward through the sutures, long delayed; seeds basipetally descending along the pod's long axis, plumply obovoid and variably distorted by crowding or incipiently folded and ridged, the testa smooth or finely pitted, dull fawn- or darker brown, crackled, the excentric areole circular ± 0.3 mm diam.—Collections: 39.—Fig. 11 (androecium), 14 (pod, seed).

Desert washes and outwash fans of desert mountains, in the *Larrea* zone, 150–1100 m, locally abundant and common over the Mohave Desert s. from Amargosa Valley, Inyo Co., California and s. half of Clark Co., Nevada to the Salton Basin and Colorado trench in interior Riverside, San Diego and Imperial cos., weakly e. into Mohave Co., Arizona, and along the e. margin of Colorado Desert s. into n. Baja California.—Fl. (III–)IV–VI, the fruits long persisting on leafless and withered stems.

Bxvi. ser. *PACHYCARPAE* (Bentham) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Pachycarpae** (Bentham) Irwin & Barneby, comb. nov. *Cassia* sect. *Chamaesenna* ser. *Pachycarpae* Bentham, Trans. Linn. Soc. London 27: 538. 1871, ex parte, exclus. spp. plur.—Sp. lectotypica: *C. versicolor* Meyen ex Vogel \equiv **Senna versicolor** (Vogel) Irwin & Barneby.

Pod either plano-compressed or variably turgid but always broader between sutures than between valves, the interseminal septa subobsolete or, when well developed, thin and pulpless, the seed-locules always 1-seriate; seeds lying broadside to the valves (in anomalous *S. arnottiana* turned broadside to the septa), their testa marked on each broad face with a sharply defined areole; androecium functionally 6- or 7-merous, the centric abaxial stamen either like its neighbors, or sterile, or rarely (*S. brongniartii*) wanting; style (0.4–)1–11.5 mm; ovules (5–)7–28(–31).—Leaflets 2–14(–15) pairs or exceptionally (*S. brongniartii*) 1 pair; petiolar gland always between proximal pair of lflets, often between succeeding pairs also.—Spp. 12, several local or composed of relatively localized varieties, 7 of tropical and extratropical Andes and Pacific S. America, 4 of tropical s. Mexico and Central America s. to Nicaragua, 1 of desert centr. Baja California.

The series *Pachycarpae* as originally conceived was an admittedly artificial group, probably more heterogeneous than Bentham would have allowed had he known the fruit of all. The core of it consisted of Andean sennas, some with areolate and others with unmarked seeds, and its unifying character was explicitly stated to be beakless anthers by which, within the boundary of sect. *Chamaesenna*, the series differed from ser. *Rostratae* (our *Senna* ser. *Interglandulosae*). The narrower definition presented herein excludes from *Pachycarpae* a) species with unmarked seeds, removed to a cognate ser. *Stipulacae* if pauciovulate and

having seeds broadside to the valves or to ser. *Coluteoideae* if multiovulate and having seeds broadside to the septa; b) *Cassia bahamensis* which has areolate seeds but, as shown by Lasseigne (1979), the androecium of *Oncolobium*; and c) the isolated *C. skinneri*, the remarkable lomentoid pod of which was still unknown in 1871. By loss of these and by increment of novelties, mostly Mexican, the series emerges as a group technically homogeneous in its androecium, pod and seeds, and we suppose it to be a genuinely natural group. Without conviction but for lack of alternatives we include provisionally in ser. *Pachycarpae* two species known only from flowering specimens. The Mexican *S. koelziana* is anomalous in the series by reason of its high ovule-number (± 64) but resembles the also Mexican *S. multifoliolata* in organization of perianth and androecium; and the Bolivian *S. weddellii*, the general aspect and ample leaflets of which suggest some members of ser. *Coluteoideae*, but which would be anomalous there also in the few (15–18) ovules almost certainly indicating a plano-compressed fruit. Seeds of these are required before the question of real affinity can be settled. Finally, the Andean *S. arnottiana*, which has the relatively few areolate seeds of ser. *Pachycarpae* contradictorily turned to face the septa in a pronouncedly tumid pod, is obviously anomalous for its seed-orientation in this series but is nevertheless drawn into it by gravitational attraction to its apparently close relative *S. urmenetae*, very similar in habit and ecology. It is the only one of four Argentine *Pachycarpae* sensu Bravo (1981) that we retain in the section.

Key to the Species of ser. *Pachycarpae*

1. Lfts 1 pair; centric abaxial stamen wanting; pod strongly arcuate-recurved; Pacific foothills of the Andes in lat. 15°–25°S. 102. *S. brongniartii* (p. 322).
1. Lfts 2–14(–15) pairs; centric abaxial stamen present, either fertile or sterile; pod not or only obscurely recurved.
 2. Lfts 2–7 pairs.
 3. Plants of Mexico and Central America.
 4. Style 8–11 mm; ovules 16–20; local in montane w. Jalisco (if ovules approaching 60, cf. 92. *S. koelziana*). 93. *S. talpana* (p. 301).
 4. Style 0.5–4.5 mm; ovules 7–14.
 5. Plants of extratropical central Baja Californian desert below 500 m (lat. 28°–29°N); lvs 2–5 cm; style 3–4.5 mm. 101. *S. purpusii* (p. 319).
 5. Plants of tropical montane e. Mexico and Centr. America at 1000–2000 m; lvs 8–30 cm; style 0.4–1(–2) mm. 94. *S. guatemalensis* (p. 302).
 3. Plants of Andean and Pacific S. America (Argentina, Chile, Bolivia).
 6. Of coastal cordillera and coastal plain below 500 m in n. and n.-centr. Chile (Coquimbo, Antofagasta and Atacama); style 2–9.5 mm. 98. *S. cumingii* (p. 312).
 6. Of high Andes and trans-Andean slope and foothills, in Chile not below 1500 m; style 1–1.8 mm.
 7. Lvs 2–6 cm; larger distal lfts obovate or lanceolate, usually subcarnosulous, less than 3 cm long, their margin plane; secondary pinnate veins 2–6 pairs, often faint or immersed; xeromorphic shrubs 1.5–10 dm of extratropical Argentina and Chile.
 8. Lfts 3–6, rarely 6–8 pairs, obovate or rarely oblong-elliptic, the distal pair 7–14 mm; pod 11–16 mm wide, its seeds lying broadside to the septa; both slopes of the Andes, n. in Chile to Illapel in Coquimbo ($\pm 31^{\circ}40'S$) and in Argentina to Mendoza ($\pm 33^{\circ}N$). 99. *S. arnottiana* (p. 316).
 8. Lfts 2–4 pairs, lanceolate or ovate-elliptic, the distal pair 16–28 mm; pod 5–7 mm wide, its seeds lying broadside to the valves; Chilean Andes in lat. 27°–33°S. 100. *S. urmenetae* (p. 318).
 7. Lvs 7–19 cm; larger distal lfts broadly lance-acuminate, thin-textured, the distal pair 4–8 cm, their margin strongly revolute; secondary pinnate veins of lfts 9–12 pairs, strongly prominulous on lower face; mesomorphic shrubs and treelets 1.5–4 m of Cordillera de Cochabamba, Bolivia. 103. *S. weddelliana* (p. 323).

2. Lfts 8–14(–15) pairs.
9. Plants of the Andes s.-ward from Ecuador.
 10. Widespread from Ecuador s. to basin of Lago Titicaca in Peru and adjoining Bolivia; lfts olivaceous on upper face, markedly darker green or brownish beneath; longest petal (11.5–)12–16 mm; style 1–3.5 mm; pod at once relatively long and long-stipitate, the stipe 5–14 mm, the body 5–11 × 0.9–2 cm.
 95. *S. versicolor* (p. 307).
 10. Local either along e. margin of Bolivian Plateau from Cordilleras Real and de Cochabamba to Potosí or on the Pacific slope in dept. Lima, Peru; lfts olivaceous subconcolorous, not darker beneath; longest petal 8–11 mm; style 0.6–1 mm; pod shorter, the stipe 1.5–3 mm, the body 3–5.5 × 0.7–1.1 cm.
 11. Stems and foliage early glabrate; ovary thinly pilosulous, the vesture not concealing the form; body of pod ±4–5.5 cm, the valves glabrous or almost so; Bolivian Plateau.
 96. *S. aymara* (p. 310).
 11. Stems and foliage densely canescently pilosulous; ovary barbate, cocoon-like, the vesture concealing the form; body of pod ±3 cm, the valves densely pilosulous; Pacific slope of Andes in dept. Lima.
 97. *S. malaspinae* (p. 311).
9. Plants of Mexico and Centr. America.
 12. Style 1.5–11.5 mm; lfts 8–14 pairs; longer petals 14–32 mm; Sa. Madre del Sur, Mexico (Michoacán to Oaxaca).
 91. *S. multifoliolata* (p. 295).
 12. Style 0.4–1 mm; lfts 6–9 pairs, but in Mexico less than 8 pairs; longer petals not over 7 mm; cf. *S. guatemalensis* var. *guatemalensis*.

NOTE: 92. *S. koelziana*, perhaps of this series but not treated in key, differs from all in extremely large flower, the longest petal nearly 4 cm, and has the multiovulate ovary (ovules ±64) of ser. *Corymbosae*, q.v.

91. *Senna multifoliolata* (P. G. Wilson) Irwin & Barneby, comb. nov. *Cassia multifoliolata* P. G. Wilson, Kew Bull. 1958(1): 159. 1958.—Typus infra sub var. *multifoliolata* indicatur.

Arborescent shrubs and slender trees at anthesis 2.5–8 m, variably pilosulous with subappressed or spreading-ascending pallid hairs up to 0.3–0.8 mm, the subterete hornotinous branchlets and lf-stalks densely so, the ample plurifoliolate lvs bicolored, the dull olivaceous lfts always glabrous above, paler and either glabrous or thinly pilosulous beneath, the inflorescence composed of several or many pedunculate, densely few-fl'd racemes axillary to and shorter than fully developed lvs.

Stipules herbaceous or chartaceous, relatively ample but variable in form and pubescence, as described under the varieties, mostly 1–2 cm.

Lvs 13–31 cm; petiole (4–)5–9 cm, at middle 1.2–1.9 mm diam, bluntly 3-ribbed latero-dorsally, shallowly sulcate ventrally; rachis (6.5–)8–18 cm, the longer interfoliolar segments 6–15(–19) mm; glands between proximal (1–)2–4, sometimes between all pairs, the further distant smaller, all stipitate, in profile 1.2–2.4 mm, the ovoid to narrowly fusiform acute head 0.3–1 mm diam, the depauperate distal glands becoming linear-spiculiform; lfts (7–)8–14 pairs, ascending from rachis face upward on pulvinule 1.6–2.6(–3) mm, in outline oblong-elliptic or ovate obtuse mucronulate, the lowest smallest but the rest of subequal length, 16–42 × 6–16 mm, 2–4.1 times as long as wide, at asymmetric base either broadly cuneate or rounded-subcordate, the margins plane, antrorsely ciliolate, the centric straight midrib prominulous only beneath, the ±8–12 pairs of camptodrome secondary veins very slender and immersed on both faces, the tertiary venulation faint or 0.

Peduncles 5.5–9.5 cm; racemes (4–)6–16-fl'd, the axis becoming (0.4–)1–3.5 cm; bracts variable like the stipules, mostly persistent through anthesis, finally deciduous; pedicels at anthesis 1.5–2.5, in fruit 2.5–3 cm; buds ovoid obtuse, nodding before anthesis, thinly pilosulous; sepals moderately graduated, the outer thinly

pubescent and brownish dorsally, the inner glabrous petaloid-margined, all oblong-obovate or -elliptic obtuse concave, the innermost 8.5–17 mm; petals yellow drying pallidly stramineous brown-veined, all glabrous, highly heteromorphic, the 3 adaxial obovate or obovate-flabellate, the vexillar one openly retuse becoming obcordate, this $20\text{--}27 \times 16\text{--}25$ mm, the 2 abaxial ones oblanceolate, downwardly attenuate into a long claw, $16\text{--}32 \times 5\text{--}10$ mm, their blades imbricated by their external edge and nidulating the 3 long stamens; androecium glabrous, the filaments of 4 median stamens 3–5.5 mm, of 3 abaxial ones 6–22 mm, the anthers smooth brown, in outline narrowly lanceolate from bluntly short-sagittate base, bluntly triangular but not constricted at apex, those of 4 median stamens 5–9 mm, straight and pitched slightly forward from tip of filament, those of 3 abaxial ones gently incurved (5.5–)6–11 mm, all opening by 2 minute infraterminal slits looking inward; ovary strigulose; style filiform incurved at apex 2–11.5 mm; ovules 14–31.

Pod obliquely pendulous, very shortly stipitate, the plano-compressed body linear or linear-oblong in profile, straight or slightly incurved, including stipe $8\text{--}14(-16) \times 1.1\text{--}1.8$ cm, the brown or purplish, early glabrate, when ripe papery valves finely transverse-venulose; seeds obovoid, lying broadside to the valves, compressed or subquadrangular, $6.2\text{--}8.2 \times 3.5\text{--}4.5$ mm, the buff-olivaceous testa smooth but scarcely lustrous, the oblong-elliptic areole $4\text{--}6.5 \times 1.4\text{--}2.9$ mm.

A handsome arborescent senna without close known relatives, *S. multifoliolata* is unlikely to be confused with any other Mexican species, few of which in any case enter its cool upland forest habitat. The relatively many leaflets and petiolar glands, the contrast between the three broad adaxial petals and two imbricated oblanceolate abaxial ones between which nestle the three long abaxial stamens, and the dehiscence of the anthers by vertical, shortly infraterminal slits are all highly characteristic at the flowering stage. In fruit *S. multifoliolata* might be likened to *S. guatemalensis*, but all Mexican forms of the latter, which occur only in the eastern Sierra Madre, have at the very most 7 (not 8–14) pairs of leaflets; their much smaller brachystylous flower is decisively different. A perianth similar to that of *S. multifoliolata* is found in the still imperfectly known *S. koelziana*, which is native to similar habitat in western Jalisco and is perhaps a true relative. This like *S. guatemalensis* has at most 7 pairs of leaflets, flowers larger than the largest known in var. *multifoliolata*, and ovules (± 64) twice or more than twice as many, precursory, we cannot doubt, to a pod either much longer or more tumid.

Senna multifoliolata is known from four populations scattered through the cool mesophytic woodlands of the Sierra Madre crest between southwestern Michoacán and southern Oaxaca, a member of an endemic tropical-montane flora that is difficult of access and still poorly known. Our sample is obviously not yet adequate for final taxonomic decisions, but contains too much variation to rest comfortably under one comprehensive name. The plants of the two more western populations are alike in their narrow, plane, early papery stipules, but differ one from another in flower size and length of style; the two more eastern ones are alike in their firm broad semicordate and replicate stipules but have diverged even further in proportions of androecium and style. For the present we recognize each as a variety, but suspect that the brachystylous and short-podded var. *eurystegia* may eventually deserve specific status.

Key to the Varieties of *S. multifoliolata*

1. Stipules early brown and papery, subsymmetrically or subfalcately lanceolate $10\text{--}23 \times 4.5\text{--}6$ mm, the blades plane; bracts similar in texture and outline $\pm 7\text{--}11$ mm; ovules 23–31; s.-e. Jalisco, s.-w. Michoacán and far w. Guerrero.

2. Fls very large, the long sepal ± 17 mm, the longest petal ± 30 mm, the 3 long abaxial filaments 17 mm, their anther ± 10 mm; style 10–11.5 mm; pod ± 12 – 14×2 cm; s.-w. Michoacán (Sa. Espinazo del Diablo) and s.-e. Jalisco (Sa. de Manatlán).
91a. var. *multifoliolata* (p. 297).
2. Fls of moderate size, the long sepal ± 11 mm, the longest petal ± 24 mm, the 3 long abaxial filaments 12–13 mm, their anther ± 7 mm; style 6–6.5 mm; body of pod 10 – 12×1.1 – 1.3 cm; high Sa. Madre del Sur in w. Guerrero. 91b. var. *metaxi* (p. 297).
1. Stipules long or permanently herbaceous, asymmetrically rhombic-ovate from semicordate base, mostly 8 – 12×6 – 8 mm, the blade extrorsely complicate; bracts similar in texture and outline, $(3$ – $4)$ – 10.5 mm; ovules 14–26; Sa. Madre del Sur in centr. Guerrero and s. Oaxaca.
3. Fls dolichostylous, the style 6.5–10 mm and the filaments of 3 long abaxial stamens 10.5–12.5 mm, their anther ± 8 mm; ovules 20–26; s. Oaxaca (mun. Miahuatlán and Pochutla). 91c. var. *mimetes* (p. 297).
3. Fls brachystylous, the style 2–2.5 mm, the filaments of 3 long abaxial stamens $(5.5$ – 6 – 6.5 mm, their anther ± 6 mm; ovules 14–18; centr. Guerrero (Cerro Teotepec).
91d. var. *eurystegia* (p. 298).

91a. *Senna multifoliolata* (P. G. Wilson) Irwin & Barneby var. *multifoliolata*. *Cassia multifoliolata* P. G. Wilson, 1958, l.c., ex parte, quoad typum solum.—“MEXICO. State of Michoacan: District of Coalcoman; Sierra Torrecillas, 2360 m . . . 12 Oct. 1938 (fl), *G. B. Hinton 12352*. . .”—Holotypus, K! isotypus, NY!

Trees or shrubs 3–8 m; stipules and fls as described in key to varieties.—Collections: 3.

Mountain forest, 1700–2360 m, known only from Sa. Espinazo del Diablo e. of Torrecillas in mun. Coalcomán, Michoacán, and in Sa. de Manatlán in e. Jalisco. Fl. X–I(–?).

91b. *Senna multifoliolata* (P. G. Wilson) var. *metaxi* Irwin & Barneby, var. nov., stipulis chartaceis planis ovulorumque numero cum var. *multifoliolata* congruens sed florum minorum sepalo intimo ± 11 tantum (nec 17) mm, petalis 2 angustis ± 24 (nec 30–32) mm, filamentis abaxialibus 12–13 (nec 17–22) mm longis styloque breviori ± 6.5 (nec 10–11.5) mm longo diversa.—MEXICO. Guerrero, [Distr. Mina] mun. Zirándaro: Paracho, 2350 m, 1.XII.36 (fl), *G. B. Hinton 9945*.—Holotypus, NY; isotypi, K, US.—Mun. Zirándaro: Armenia, 10.V.37 (fr mat), *Hinton 10177*.—Paratypi fruct., K, NY.

Shrubs 4–5 m; stipules of var. *multifoliolata*, but flower smaller and style shorter, as given in key and diagnosis.—Collections: 2.

Pine-oak forest, 2350–2400 m, known only from near crest of Sa. Madre del Sur near Cerro Carboneras ($\pm 101^{\circ}20'W$, $18^{\circ}10'N$) in mun. Zirándaro, Guerrero.—Fl. XII–I.—*Parrácata*.

The two collections on which we base var. *metaxi* were cited in the protologue of *Cassia multifoliolata* as paratypes. The physical distance between vars. *multifoliolata* and *metaxi*, so far as now known, is not much more than 150 km, but is traversed by the Infernillo gorge of the lower Balsas River, a significant barrier.

91c. *Senna multifoliolata* (P. G. Wilson) var. *mimetes* Irwin & Barneby, var. nov., a var. *multifoliolata* et var. *metaxi* imprimis stipulis bracteisque asymmetricè rhombico-ovatis basi subcordatis replicatis (nec planis), ulterius ab illa floribus minoribus (petalis longioribus 2–2.3 cm, nec 3 cm), a var. *eurystegia*, quoad stipularum bractearumque formam comparabili, stylo 6.5–10 (nec 2–2.5) mm longo et ovulis magis numerosis (20–26, nec 14–18) diversa.—MEXICO. Oaxaca: pine-oak forest, 8000

ft, San Miguel Suchixtepec, Río Molino, mun. Miahuatlán, 6.I.71 (fl), *D. T. MacDougall s.n.*—Holotypus, NY.

Shrubs and treelets at anthesis (1.5–)2–5 m, closely resembling var. *metaxi* in flower-size, androecium, length of style and ovule-number, but resembling var. *eurystegia* in the broad herbaceous replicate stipules, different from the latter in the longer androecium, long style (6.5–8, not 2–2.5 mm) and more numerous (20–26, not 14–18) ovules.—Collections: 9.

Pine-oak forest with *Alnus*, \pm 1950–2600 m, apparently local, known only from the upper Pacific slope of Sa. Madre del Sur in mun. Pochutla and Miahuatlán, near 96°30'W, s. Oaxaca.—Fl. VI–I.—*Alcaparra* (a generic name for senna); *huajites*.

Distinct from var. *metaxi* in the backwardly folded herbaceous stipules and from var. *eurystegia* in the dolichostylous flower, this variety is separated from the rest of its species by a gap of about 400 km along the Sierra Madre crest.

91d. *Senna multifoliolata* (P. G. Wilson) var. *eurystegia* Irwin & Barneby, var. nov., ab omnibus caeteris speciei formis floribus parvulis brachystylis, stylo 2–2.5 tantum (nec 6.5–11.5) mm longo, necnon legumine brevialato \pm 8.5 \times 1.7 cm pauciovulato (ovulis 14–18, nec 20–31) abstans.—MEXICO. Guerrero: \pm 2 km al n.-e. del Campamento El Gallo, estribaciones s.-w. del Cerro Teotepec, 17°28'N, 100°13'W, 2650 m, 28.I.1965 (fl, fr jun), *J. Rzedowski & R. McVaugh 187*.—Holotypus, MICH.

Treelets 6–8 m; stipules and pod as described in key to varieties; long abaxial petals 16–17 mm; stamens relatively short, the anthers of 3 abaxial ones \pm 6 mm, scarcely shorter than their filament.—Collections: 2.

Dense mixed mesophytic forest, sometimes along streams, 2600–2700 m, known only from the slopes of Cerro Teotepec near 100°10'W in Sa. Madre del Sur, s.-centr. Guerrero.

This variety was collected first by George Hinton in 1939 but was left unnamed when his Mexican collections were under study at Kew. It is the most sharply marked form of *S. multifoliolata*, the broad folded stipules and the unexpectedly abbreviated androecium and style with proportionately diminished perianth being unmistakable.

92. *Senna koelziana* Irwin & Barneby, sp. nov., corollae androeciique forma *S. multifoliolatae* ut videtur affinis, ab ea caulibus foliisque glabris, floribus maximis (petalis 2 angustis abaxialibus 37–40 nec 14–32 mm), ovarioque glaberrimo satis distincta.—MEXICO. Jalisco: 13–16 mi up lumber road into Sa. del Halo that leaves Colima highway 7 mi s.-s.-w. of Tecalitlán, 2000–2200 m, 28–30.XI.1959, *Rogers McVaugh & Walter N. Koelz 1163*.—Holotypus, MICH = NY Neg. 9686.

Amplly leafy, large-fl'd shrubs, at anthesis 2–4.5 m, with terete striate hornotinous branches, except for subappressed-strigulose axes of inflorescence and minutely ciliolate outer sepals wholly glabrous, the foliage bicolored, the lfts dull olivaceous on both faces but above paler along principal veins and beneath pallidly subglaucescent overall, the inflorescence a series of few-fl'd racemes either sessile and terminal to axillary branchlets or simply axillary, in either case shorter than the large primary cauline lvs.

Stipules (of branchlets, otherwise not seen) narrowly lanceolate \pm 15 mm, early papery deciduous.

Main cauline lvs $\pm 2-3$ dm; petiole including scarcely differentiated pulvinus 6-9 cm, at middle 1.5-2.8 mm diam subterete; rachis 8-15 cm, the intrapetiolar segments 2-2.5 cm, ventrally flattened but not sulcate; glands between proximal 1-2 pairs stipitate 1.5-2.5 mm, the livid glabrous head ovoid-fusiform acute 0.3-0.6 mm diam; lfts 5-7 pairs, ascending from rachis face upward on angulate pulvinule 3-6 mm, the lowest pair smallest, the rest scarcely graduated, in outline ovate or oblong-ovate obtuse mucous 4.5-5.5 \times 2.5-2.7 cm, at base subsymmetrically broadly cuneate, the straight centric midrib and ± 8 pairs of secondary veins all very slender and immersed or almost so on both faces, subsequent venulation scarcely perceptible; lvs of axillary branchlets only 7-15 cm, with 2-4 pairs of smaller but otherwise similar lfts.

Racemes loosely 5-8-fld, either normally pedunculate, the peduncle 5-6 cm, or sessile, the first 1-3 fls then subtended by diminished lvs, the rest by bracts resembling stipules in form and texture, these deciduous; pedicels at and shortly after anthesis widely ascending 2.1-3.7 cm; buds plumply ovoid-ellipsoid obtuse, nodding until shortly before anthesis; sepals submembranous brownish-tinged, pallidly membranous-margined, delicately several-nerved from base, broadly elliptic-obovate obtuse, little graduated in length but the innermost broader and up to 17-18 mm long; petals golden-yellow drying stramineous brown-veined, glabrous, highly heteromorphic: 3 adaxial broadly obovate-cuneate or flabellate 3.1-3.5 cm, the middle (vexillary) one broadly openly retuse becoming obcordate; 2 abaxial narrowly oblanceolate, $\pm 3.7-4$ cm, attenuate downward into a long slender claw, the distally incurved blades 9-10 mm wide, their outer margins imbricated to form a keel nidulating the long stamens; androecium functionally 7-merous glabrous, the filaments of 4 median stamens erect straight 4-5 mm, of 3 abaxial ones divaricate together from torus (opposed to pistil) and incurved distally 17-25 mm, the smooth brown anthers of 4 median stamens directed forward from tip of filament, almost straight 6-7 mm, of 3 abaxial ones lunately incurved 10-12 mm, all dehiscent by 2 pores looking upward; ovary glabrous; style filiform 8-10 mm, its hamately incurved tip not dilated; ovules (1 count) 64.

Pod unknown.—Collections: 2.—Fig. 24.

Disturbed forest margins in the pine belt, 1860-2200 m, known only from near crest of Sa. del Halo in s.-e. Jalisco.—Fl. XI-XII.

In our diagnosis we have compared *S. koelziana* with *S. multifoliolata*, a species similar in ecology of which the longistylous varieties have quite similarly organized flowers. The nodding buds, broad obcordate vexillum and narrow abaxial petals connivent to form a keel around the long stamens are especially suggestive of affinity in this direction, although this must remain in question until the pod can be obtained. The relatively numerous (± 64) ovules may foreshadow a turgid pod similar to that of *S. bicuspidata* or *S. pendula*, and consequent kinship to ser. *Coluteoideae*. *Senna koelziana* and *S. talpana*, each known from one station in mountainous Nueva Galicia, also require detailed comparison, for which flowers of the latter as well as pods of the former are still lacking. While these two species are rather similar in foliage and in their long filiform styles, *S. talpana* is already clearly distinguished by its relatively few (16-20, not ± 64) ovules.

From the holotypus of *S. koelziana* we have described the racemes as terminal to axillary branchlets, for in this specimen the first one to three flowers are subtended by diminished pinnate leaves appearing to rise directly from the raceme-axis. It seems probable, however, that these small leaves are homologous with bracts, and that the so-called axillary branchlet is no more than a simple raceme bearing a few abnormally foliose bracts. This is borne out by Boutin &

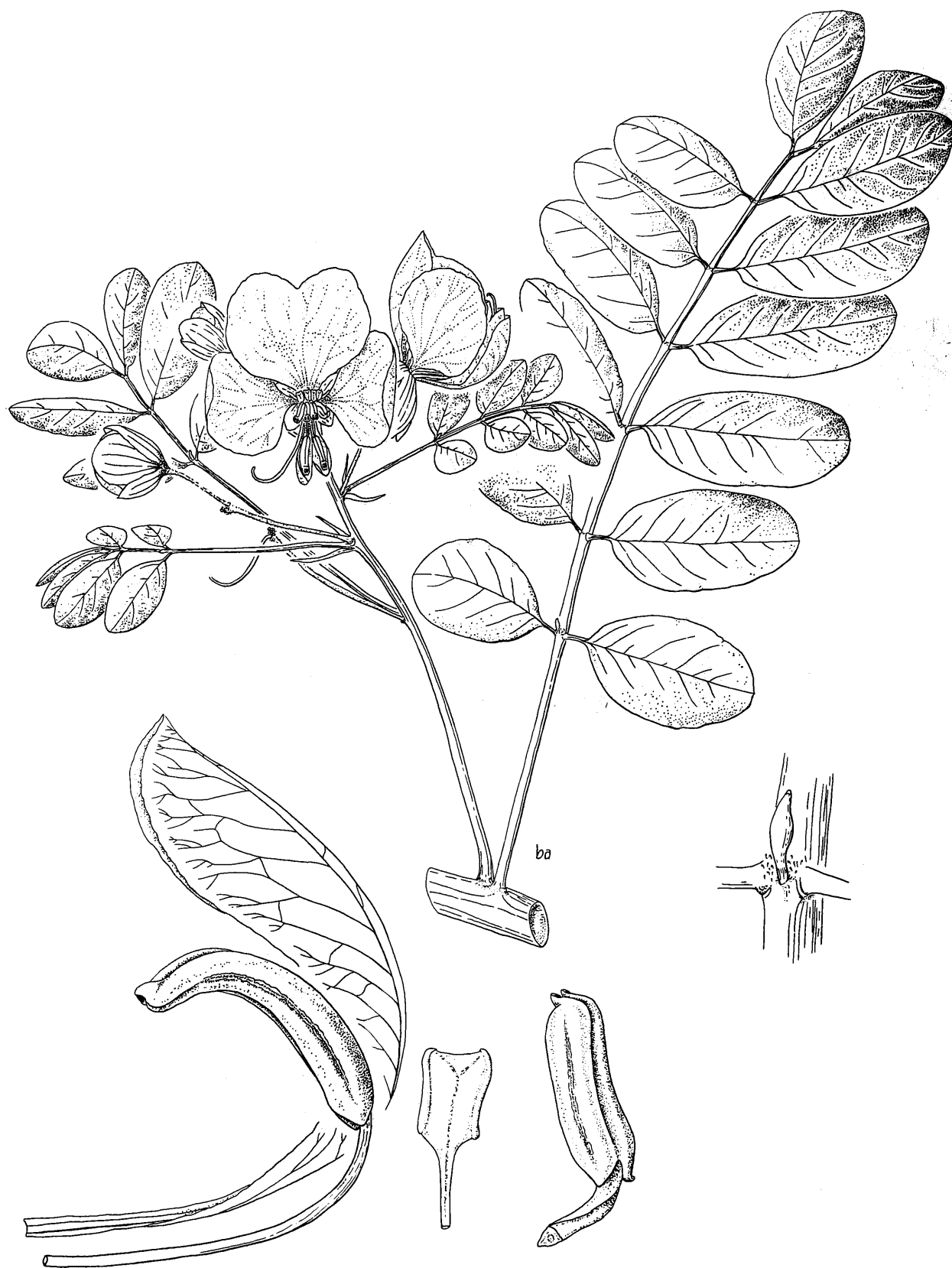


Fig. 24. *Senna koelziana* I. & B. Leaf + raceme $\times \frac{1}{2}$; petiolar gland $\times 4$; one abaxial petal + detached stamens and staminode $\times 3$ (McVaugh & Koelz 1163).

Brandt 2383 (MEXU) in which the racemes are normally pedunculate in distal leaf-axils.

The handsome foliage and sumptuous flowers of *S. koelziana* recommend it for trial in frostless gardens that can furnish conditions suitable for a Mediterranean flora.

93. *Senna talpana* Irwin & Barneby, sp. nov., flore deficiente affinitatis inscrutabilis, sed ex similibus speciebus mexicanis notularum harum coitu extricanda: foliola ampla penninervia 4–5-juga $\pm 5.5\text{--}7 \times 2.5\text{--}3$ cm usque; stylus filiformis ± 11 mm; legumen plano-compressum $\pm 8\text{--}9 \times 0.7$ cm, 16–20-spermum.—MEXICO. Jalisco: barranca in steep mountains 11–12 miles s. of Talpa de Allende in headwaters of a w. branch of Río Talpa, ± 1650 m, 23–25.XI.1960 (fr jun), *Rogers McVaugh 21334*.—Holotypus, MICH; isotypus, NY.

Amplly leafy shrubs at anthesis ± 2 m with terete striate green annotinous branchlets, appearing glabrous but the lf-stalks and axes of inflorescence incurved-puberulent and the thin-textured subciliolate lflets thinly or remotely strigulose on both faces with straight appressed hairs up to 0.5–0.8 mm, the foliage strongly bicolored, dull dark green above, pallid-glaucous beneath, the axillary racemes much surpassed by their subtending lf, all lateral to leafy stems.

Stipules caducous, not seen.

Lvs 14–26 cm; petiole including discolored, when dry shrunken pulvinus 4–8.5 cm, at middle 1–2 mm diam, rounded dorsally, shallowly openly sulcate ventrally; rachis 7.5–11 cm, the longest interfoliolar segment 25–32 mm; petiolar glands (much eaten) between all but the distal pair of lflets stipitate, in profile 1.3–2.7 mm tall, the slenderly ovoid-ellipsoid acute body $\pm 0.4\text{--}0.7$ mm diam; pulvinules 2.5–3 mm; lflets 4–5 pairs, moderately accrescent distally, in outline obovate-elliptic obtuse but obscurely apiculate, the distal pair $5.5\text{--}7 \times 2.5\text{--}3$ cm, 2.1–2.4 times as long as wide, at base subsymmetrically cuneate, the margin plane, the slender midrib and 7–8 pairs of filiform camptodrome secondary veins prominulous beneath only, tertiary venulation scarcely perceptible.

Racemes shortly (7–)10–22-fld, the axis together with slender peduncle 6–11 cm; bracts deciduous, not seen; fruiting pedicels 13–19 mm; perianth not seen; ovary puberulent; style filiform, persistent on young pod, ± 11 mm; ovules 16–20.

Pod variably spreading-ascending, the stipe 1–1.5 mm, the (immature but almost fully formed) body linear plano-compressed $\pm 8\text{--}9 \times 0.7$ cm, bicarinate by the gently undulate sutures, the stiffly papery valves brown glabrescent veinless, slightly raised over each forming seed, the seed-locules 4.5–5 mm long, as wide as the pod's cavity, the septa between them very narrow or almost 0; seeds not seen ripe, but evidently oriented with broader faces to the valves and bearing an areole on each.—Collection: 1.

Openings in forest of oaks, *Carpinus*, *Distylium*, *Magnolia* and *Podocarpus*, ± 1650 m, locally abundant in the barranca of a w. source of Río de Talpa, mun. Talpa de Allende, far w. Jalisco, Mexico; known only from the type-locality.—Fl. \pm X.

Because sound classification of *Senna* requires data from perianth, androecium, pod and seed, the affinity of *S. talpana*, described from a single collection bearing immature pods, cannot be justly evaluated at present. In gross aspect it suggests some form of distantly allopatric *S. guatemalensis*, but differs in the long filiform style (± 11 , not 1–2 mm) which implies a substantially larger flower. *Senna multifoliolata*, a species of mountainous southern Mexico, has a similar pod and seeds, but differs in the more numerous (7–14, not 4–5) pairs of leaflets. *Senna koelziana*, which occurs in similar cool upland habitat not far distant from Talpa on Sa. del Halo in southeastern Jalisco, has a similarly elongate style but ovules very much more numerous (± 64 , not 16–20) which prognosticate a pod (unfortunately not yet collected) either longer, plumper, or both. In the event that the pod of *S. talpana* breaks up, when fully ripe, into one-seeded segments, the

species will be compared to *S. skinneri*; but this is obviously different in the shorter leaves (3–11, not 14–26 cm), solitary petiolar gland, shorter style (4.5–7, not 11 mm) and xeric habitat. All forms of the polymorphic *S. pallida* have characteristic 2–3-flowered racemes and glands at base of the pedicels, these wanting in *S. talpana*. No other Mexican or Central American senna bears any close resemblance to it.

94. *Senna guatemalensis* (Donnell Smith) Irwin & Barneby, comb. nov. *Cassia guatemalensis* Donnell Smith, Bot. Gaz. (Crawfordsville) 23: 6. 1897.—Typus infra sub var. *guatemalensi* indicatur.

Softly woody 1–several-stemmed shrubs at anthesis commonly 0.8–3, in age sometimes arborescent and up to 5(–6) m tall, with terete, when young bluntly ribbed hornotinous branchlets densely leafy distally, these with lf-stalks, margin and often dorsal face of lflets, and all axes of inflorescence strigulose, pilosulous or pilose with subappressed, incurved-ascending or widely divergent, pallid or lutescent hairs up to 0.3–1(–1.2) mm, the membranous or firmly chartaceous, dull or sublustrous foliage scarcely bicolored, the lf-blades olivaceous or rich green on both faces or sometimes paler beneath, always glabrous above, the vestiture of lower face often reduced to a patch of hairs on proximal side of midrib, the inflorescence of simple racemes mostly axillary to developed lvs and often shorter than them, or later ones forming an exserted, leafless or at base depauperately leafy panicle.

Stipules erect-spreading, narrowly oblong-ob lanceolate or oblance-acuminate or -caudate, straight or incipiently falcate, 8–17 × (0.8–)1–3 mm, the thinly herbaceous blades early dry deciduous.

Lvs 8–22(–32) cm; petiole including pulvinus 2–7 cm, at middle (0.7–)0.9–2(–2.3) mm diam, bluntly 3-ribbed dorso-laterally, shallowly open-sulcate ventrally; rachis (2.5–)3–18(–21) cm; pulvinules 2–3.5(–4) mm; glands (caveat: much eaten) always at proximal pair of lflets, erect stipitate or subsessile, in profile 1.3–3.5 mm tall, the lance-ellipsoid acute or fusiform, less often ovoid body 0.4–1.1 mm diam, similar but commonly more slender ones sometimes between the second or between all pairs; lflets 3–9 pairs, either conspicuously or not at all accrescent distally, the ultimate (or largest) pair varying in outline from broadly obovate obtuse or emarginate to elliptic or oblong-elliptic obtuse, or (rarely) ovate or lance-ovate and deltately acute, 3–7 × 1.3–2.8 cm, 1.5–2.7(–3.7) times as long as wide, at ± oblique base varying from broadly cuneate to subcordate, the margin plane, the straight centric midrib immersed or depressed-sulcate on upper face, cariniform beneath, the (5–)6–11(–14) pairs of major camptodrome (and often some intercalary) secondary nerves either immersed or finely prominulous above, a tertiary venulation, if any, visible only beneath and not or scarcely raised.

Peduncles 3–10 cm; racemes 6–70-fl'd, the buds pyramidally crowded above the open fls, the axis becoming 1–16 cm; fl-buds subglobose, glabrous or often thinly puberulent; sepals scarcely or weakly graduated, the firm outer ones brownish obovate 3–5 mm, the broader, thinner-textured, membranous-margined inner ones 4–6.5 mm; petals yellow fading whitish brown-veined, the 3 abaxial obovate-cuneate or broadly lanceolate obtuse or the vexillary one emarginate, the 2 abaxial either as long or slightly longer but narrower, mostly oblanceolate, folded around the long abaxial stamens, the longest petal 5.5–11.5 mm; androecium glabrous, the filaments of 4 erect median stamens (1.3–)1.8–2.6(–3) mm, of 3 forwardly divaricate abaxial ones 2–4(–6) mm, the anthers of 4 median ones oblong, slightly curved backward 2–3.5 mm, those of 3 abaxial ones subequal or the central one

a trifle shorter than its neighbors, gently incurved, the longest 2.5–4.5 mm, the thecae of all anthers shortly sagittate at base, at apex obliquely truncate and 2-porose; ovary strigulose; style 0.4–1(–2) mm; ovules 8–14.

Pod randomly spreading-pendulous, the stipe 2–7 mm, the linear-oblong or -elliptic, straight or slightly incurved body 3.5–9.5 × 0.6–1.25 cm, compressed but when ripe slightly turgid, the stiffly papery brown or purplish-brown, often green (when dried pallid)-margined valves finely venulose, early glabrate, finally separating along the bluntly cariniform sutures; seeds obovoid compressed but not strongly bifacially flattened, 6–8 × 3.5–5 mm, the fawn-brown testa dull, commonly crackled, the oblong, obovate or elliptic areole 3–5.5 × 1–3.5 mm.

Comparison of the somewhat heterogeneous material that has accumulated under the names *Cassia guatemalensis* and *C. chiapensis*, of which the collective range extends from southern Tamaulipas to northern Nicaragua, imposes a broad specific concept. As defined in the foregoing description, *Senna guatemalensis* sens. lat. is readily distinguished from other Mexican and Central American sennas by the syndrome of relatively few (3–9) pairs of leaflets up to 3–7 cm long, small flowers with longest petal only 5.5–11.5 mm long, and fertile stamens differentiated into two sets of four and three, this feature immediately separating the species from partly sympatric *S. foetidissima*.

The known populations and groups of populations that we refer to *S. guatemalensis* are insulated one from the next by gaps that seem to have allowed some degree of evolutionary drift, expressed in phenetic terms of flower and leaflet numbers, shape of leaflets, number of petiolar glands, and size of perianth and pod. As a consequence we are able to recognize six geographically disjunct varieties.

Key to the Varieties of *S. guatemalensis*

1. Racemes 6–20-fl'd, the fruiting axis 1–3 cm; s.-w. Guatemala (Santa Rosa) to n.-w. Nicaragua (Jinotega). 94a. var. *oligantha* (p. 303).
1. Racemes 20–70-fl'd, the fruiting axis 3–16 cm; s.-centr. Guatemala and n.-w. into Mexico.
 2. Lfts 6–9 pairs; pod 9.5–12 mm wide; areole of seed-face 2–3.5 mm wide; highland Guatemala, from Sa. de Cuchumatanes to dept. Chimaltenango. 94b. var. *guatemalensis* (p. 304).
 2. Lfts 3–6(–7) pairs; allopatric, and if pod as wide then the areole narrower; Mexico.
 3. Lfts obovate, obtuse or emarginate; Hidalgo, Puebla, Chiapas.
 4. Fls small, the longest sepal 4–4.5 mm, the longest petal 5.5–8.5 mm; petiolar glands 2 or more on each lf-stalk; stems usually pilosulous with widely spreading hairs; highland Chiapas. Pod small, the body 4–5 × 0.6–0.7 cm. 94c. var. *chiapensis* (p. 305).
 4. Fls larger, the longest sepal 5–6 mm, the longest petal 8–11.5 mm.
 5. Pod relatively small ±4–5 × 0.6–0.7 cm; local in s.-e. Puebla and n.-w. Oaxaca, Mexico. 94d. var. *scopulorum* (p. 305).
 5. Pod larger, ±6.5–8 × 0.8–1.1 cm; local in n.-w. Hidalgo, Mexico. 94e. var. *hidalgensis* (p. 306).
 3. Lfts lance-ovate, deltate- or triangular-acute. Petiolar gland between proximal pair only; s.-w. Tamaulipas (Sa. de Guatemala) Mexico. 94f. var. *calcareia* (p. 306).

94a. *Senna guatemalensis* (Donnell Smith) var. *oligantha* Irwin & Barneby, var. nov., a var. *guatemalensi* (sensu nostro) foliolis minus numerosis 4–6 (nec 6–9)-jugis, racemo pauci (6–20 nec 20–65)-floro, legumine breviori 3.5–7 (nec 7–9.5) cm longo, necnon seminis areola angusta 1–1.6 (nec 2–3.5) mm lata absimilis.—HONDURAS. Intibucá: between El Pelón and Camaco on Cordillera Opalaca, road to Gracias, 1800 m, 25.III.1969 (fr), A. Molina R. 24468.—Holotypus, NY!

Cassia guatemalensis sensu Donnell Smith, 1897, l.c., pro parte, quoad Heyde & Lux 4176; non sensu nostro, infra.

Usually thinly pilosulous with narrowly ascending hairs, rarely loosely pilose, the longest hairs 0.5–1.1 mm; glands between first and second pairs of lfts; long lfts 3–6 × 1.3–2.8 cm, 2.1–2.7 times as long as wide; outer sepals 4–4.5 mm, the inner ones 5.5–6.5 mm; longer petals 10–11 mm; style 0.6–1.1(?–2) mm; pod as broad as that of var. *guatemalensis* but a little shorter, the stipe 3.5–7 mm.—Collections: 8.

Mixed montane rain forest, becoming abundant along roads and in newly cleared pasture, 1650–2250 m, scattered along the cordilleras of s.-w. Guatemala (Sta. Rosa), El Salvador (Sta. Ana, Chalatenango), Honduras (Intibucá) and n.-w. Nicaragua (Jinotega).—Fl. IX–I.

This seems clearly distinct from typical var. *guatemalensis* of the central and northwestern highlands of Guatemala in its fewer leaflets, short, relatively few-flowered racemes, and somewhat shorter pod. The earliest known collection, Heyde & Lux 4176, contributed something to the original concept of *Cassia guatemalensis*, but, as shown below, was not the crucial or diagnostic element.

Poor flowering specimens from the Sierra Madre of Chiapas, (Siltepec, X, XI.1940, fl, Matuda 4125, MICH, NY) agree in almost all details with var. *oligantha*, but the style is ± 2 mm long, about twice the length observed in any other specimen of *C. guatemalensis* sens. lat. Until fruit can be obtained it seems prudent to postpone definite identification and the locality has not been included in our statment of range.

94b. *Senna guatemalensis* (Donnell Smith) var. *guatemalensis*. *Cassia guatemalensis* Donnell Smith, 1897, l.c., sens. restr.—“Buena Vista, Depart. Santa Rosa, Guat[emala], alt. 5500 ft., Dec. 1892, Heyde & Lux, no. 4176 . . . Between San Martin and Todos Santos, Depart. Huehuetenango, Guat[emala], alt. 7000–8500 ft., Dec. 1895, E. W. Nelson no. 3626.”—Lectoholotypus, Nelson 3626, the “more complete specimens with pods that require the assignment of the plant to a different section of the genus,” US! clastotypus, NY!—*Peiranisia guatemalensis* (Donnell Smith) Britton & Rose, N. Amer. Fl. 23(4): 266. 1930, praeter loc. typ. cit.

Cassia caeciliae Harms, Bull. Herb. Boissier 7: 549. 1899.—“Habitat in Guatemala, in dept. Huehuetenango, ad Todos los Santos, in fruticetis: Sel[er] n. 3172.”—Holotypus, presumably \dagger B; neoholotypus, former isotypus, GH!

Either thinly subappressed-pilosulous or the stems densely shaggy-pilosulous, the longest hairs ± 0.4 –0.9 mm; glands at 2 proximal, sometimes at further pairs of lfts; long lfts 3–5 × 1.3–2.3 cm, ± 2.1 –2.7 times as long as wide; outer sepals 3–3.5 mm, the inner ones 4.5–5.5 mm; longer petals 6–6.5 mm; stipe of pod 2–5 mm, the body 7–9.5 × 0.95–1.2 cm; interseminal septa 0.—Collections: 8.

Brushy banks, creek- and woodland-margins, residual thickets in cleared forest, 2100–3300 m, locally plentiful along and near the Continental Divide in s.-w. Guatemala, from Huehuetenango (Sa. de Cuchumatanes) s.-e. to Chimaltenango (Cerro de Tecpán).—Fl. VI–IX(–XII).

The typical variety of *S. guatemalensis* differs from var. *oligantha*, vicariant southward, in its elongately many (20–65)-flowered racemes of smaller flowers, more numerous (6–9, not 4–6) pairs of leaflets, and the broad areole on each face of the seed; and from var. *chiapensis*, vicariant northwestward, which has es-

entially the same inflorescence and flower, in leaflet number and broad pod (9.5–12, not 6–7 mm wide). These three varieties differ collectively from the more northern Mexican representatives of *C. guatemalensis* in the presence of two glands (or more) on each leaf-stalk, not just one between the first pair of leaflets.

In typifying *C. guatemalensis* by Nelson 3626, we reject Britton & Rose's inferential choice of Heyde & Lux 4176 from Santa Rosa, which is in young flower only. The latter had been tentatively referred by Micheli to *Cassia corymbosa*, and the differential characters were explicitly taken by Donnell Smith from Nelson's fruiting specimens. *Cassia caeciliae*, described from almost the same locality and only two years later than *C. guatemalensis*, is an inadvertent duplication implying no taxonomic disagreement.

- 94c. *Senna guatemalensis* (Donnell Smith) var. *chiapensis* (Standley) Irwin & Barneby, stat. nov. *Cassia chiapensis* Standley, Contrib. U.S. Nat. Herb. 19: 215. 1919.**—"Type [US] 470740, collected at Teopisca, Chiapas, Mexico, May 7, 1904, by E. A. Goldman (no. 939). Also . . . between San Cristóbal and Teopisca, Chiapas . . . by E. W. Nelson (no. 3481a)." —Holotypus, as cited, US! clastotypus, NY! paratypus (*Nelson 3481a*) US! —*Peiranisia chiapensis* (Standley) Britton & Rose, N. Amer. Fl. 23(4): 267. 1930.

Pilosulous with erect hairs up to 0.5–1 mm, the stems and lf-stalks often densely so; glands between 2 proximal or all pairs of lflets; long lflets obovate or oblong-obovate 3–5.5 × 1.5–2.2 cm, 1.6–2.6 times as long as wide; outer sepals 3–3.5, the inner ones 4–4.5 mm; longer petals 5.5–8.5 mm; style 0.5–0.6 mm; stipe of pod 3–6.5 mm, the body 4–5 × 0.6–0.7 cm; interseminal septa 0.—Collections: 13.

Brushy or open wooded hillsides in the pine-oak belt, mostly between 1700 and 2500 but descending along barrancas to 1050 m, local on both slopes of the central highland of Chiapas in mun. Huistán, San Cristóbal, El Zapotal, Teopisca, Amatenango del Valle and Comitán de Domínguez.—Fl. (VI–)VII–XII.

The var. *chiapensis* is often visually arresting because of its dense spreading vesture, but this is variable in length and concentration and falls short of being diagnostic. In the long multiflorous racemes of small flowers it closely resembles var. *guatemalensis*, but the leaflets are fewer (3–5, not 6–9 pairs) and the pod decidedly more slender. No ripe seeds have been available for study, but these should certainly be compared for size and areole with seeds of var. *guatemalensis*.

The protologue of *Cassia chiapensis* mentions small flowers as the distinctive character in the context of sect. *Chamaesenna*, but made no reference whatever to the equally small-flowered *C. guatemalensis*. These two entities were separated by Britton & Rose (1930, sub *Peiranisia*) by a tenuous key character derived from pubescence states of the dorsal face of leaflets. In our view these two sennas are no more than elements in a replacement series readily accommodated within one species.

- 94d. *Senna guatemalensis* (Donnell Smith) var. *scopulorum* (Britton & Rose) Irwin & Barneby, stat. nov. *Peiranisia scopulorum* Britton & Rose, N. Amer. Fl. 23(4): 266. 1930.**—"On rock, Cerro Baxtla [=Cerro Paxtle], Puebla, August, 1907, C. A. Purpus 2661." —Holotypus, UC! clastotypus (fragm) + photo, NY!

Thinly strigulose (the young stems more densely ascending-pilosulous) with subappressed hairs up to 0.5–0.7 mm; a gland between proximal pair of lfts only; lfts 5–7 pairs, broadly obovate emarginate, the distal ones $\pm 20\text{--}33 \times 11\text{--}16$ mm; outer sepals ± 4 mm, the inner 5–5.5 mm; longer petals ± 8 mm; style scarcely 1 mm; stipe of pod ± 2 mm, the body $\pm 4\text{--}5 \times 0.6\text{--}0.7$ cm; interseminal septa 0.—Collections: 2.

Rocky places, probably near 2000–2300 m, known only from the type-locality in the mountains of s.-e. Puebla and adj. mun. Coixtlahuaca in n.-w. Oaxaca.—Fl. VII–IX.

The var. *scopulorum* appears from present evidence to be morphologically and geographically intermediate between var. *chiapensis*, of which it has the small pod, and var. *hidalgensis*, which it resembles in foliage, pubescence and flower-size, characters which require confirmation from further collections.

94e. *Senna guatemalensis* (Donnell Smith) var. *hidalgensis* Irwin & Barneby, var. nov., a var. *guatemalensi*, cui caeterius persimilis, glandula petiolari singula, foliolis saepissime minus numerosis 3–5(–7)-jugis, floribus majoribus (petalis 8–11.5 nec 6–6.5 mm longis) necnon leguminis valvulis intus inter semina septis angustis instructis abstans.—MEXICO. Hidalgo: 10 mi n. of Zimapán, 29.VIII.1957, (fr), *H. S. Irwin 1343*.—Holotypus, NY; isotypus, MICH.

Thinly strigulose-pilosulous with hairs to 0.6–1.2 mm, the basal angle of midrib on dorsal side of lfts always more densely pilose; gland between proximal pair of lfts only; long lfts broadly obovate or elliptic-obovate $3\text{--}7 \times 2\text{--}3.7$ cm, $\pm 1.5\text{--}2$ times as long as wide; racemes and fls of var. *guatemalensis* except the sepals less strongly graduated, the outer 4–5 mm, the inner 5.5–6 mm long; longer petals 8–11.5 mm; style 0.7–1 mm; stipe of pod ± 2 mm, the body $6.5\text{--}8 \times 0.8\text{--}1.1$ cm, the interseminal septa 0.5–1 mm high.—Collections: 7.

Mixed pine-oak-juniper woodland, coming out onto roadsides, $\pm 1900\text{--}2500$ m, local on the Gulf slope of Sa. Madre Oriental, in drainage of Rio Moctezuma, n.-w. Hidalgo.—Fl. VII–VIII.

A combination of solitary petiolar glands, 3–5 pairs of ample obovate leaflets and the inflorescence of var. *guatemalensis* neatly characterize this local Mexican senna. The pod is exactly that of var. *guatemalensis* except for the internal development of distinct cross-walls between the individual seed-cavities, and the seed itself is marked by a narrower areole 1–1.5 (not 2–3.5) mm wide. Probably more closely related are the geographically nearer vars. *scopulorum* and *calcareia*, both of which have solitary petiolar glands. For differences see discussion of the varieties preceding and following.

The var. *hidalgensis* was collected first in Mexico, very likely near Zimapán by Thomas Coulter. The specimens (K), which now lack locality data, were referred by Bentham (1871, p. 541) to his mixed concept of *Cassia botteriana* and said to have originated in Nayarit (“between San Blas and Tepic”).

94f. *Senna guatemalensis* (Donnell Smith) var. *calcareia* Irwin & Barneby, var. nov., ab aliis speciei varietatibus foliolis ovatis vel ovato-lanceolatis deltatis acutis diversa, caeterius var. *hidalgensi* nisi floribus antherisque paullo minoribus simillima.—MEXICO. Tamaulipas: Sa. de Guatemala, mun. Gómez Farías, 22.VI.1971 (fl), *J. R. Sullivan 548*.—Holotypus, NY.

Pilosulous with incurved-ascending yellowish hairs up to 0.3–0.55 mm; gland solitary between first pair of lflets; longer lflets ovate or lance-ovate, at apex deltate- or triangular acute (2.8–)4–7.5 × 1.5–2.2 cm, 2.1–3.7 times as long as wide; racemes 20–35-fl'd, the axis and peduncle together 9–15 cm; outer sepals \pm 4.5 mm, the inner ones 6 mm; longer petals 7.5–8 mm; pod and seed unknown.—Collections: 4.

Humid pine-oak forest on karst limestone, 1500–1700 m, descending on río Guayalejo to 300 m, known only from Sa. de Guatemala, a spur of Sa. Madre Oriental near 23°20'N in s.-w. Tamaulipas.

The var. *calcareia*, the northernmost known expression of *S. guatemalensis*, derives from its ovate acute leaflets a facies distinct from all other forms of its species. Otherwise it closely resembles var. *hidalgensis*, especially in the solitary petiolar gland and in form of the inflorescence, but a close comparison of the flowers reveals in var. *calcareia* slightly shorter petals (the longest 7.5–8, not 8–11.5 mm) and decidedly shorter anthers, those of the 3 abaxial stamens 3–3.5 (not 4–4.5) mm long. Sierra de Guatemala lies about 180 km north of the nearest known station for var. *hidalgensis*, the range of which is separated from that of var. *calcareia* by the depression in the Sierra crest formed by the barrancas of the Rio Verde system.

95. *Senna versicolor* (Vogel) Irwin & Barneby, comb. nov. *Cassia versicolor* Meyen [Reise 1: 483. 1834, nom. nud.] ex Vogel, Syn. Gen. Cass. 29. 1837.—Typus infra sub var. *versicolori* indicatur.

Densely leafy, clumped or mounded subshrubs becoming straggling shrubs or (in forest) spindly treelets, at anthesis (0.6–)1–4 m, appearing glabrous but the angulate hornotinous branchlets, lf-stalks and inflorescence at least thinly (rarely quite densely) pilosulous or strigulose with straight appressed or loosely ascending filiform hairs often mixed with short thickened livid trichomes, the thick-textured foliage strongly bicolored, the lflets dull olivaceous or yellowish-green above, darker green or brownish beneath, the inflorescence a squat pyramidal or subcorymbiform, immersed or shortly exerted panicle of racemes.

Stipules ascending or in age variably spreading or deflexed, thinly herbaceous becoming dry and brownish, in outline lance- or triangular-acuminate (4–)5–18 × (1–)1.5–6(–7) mm, symmetrical or at base quite inequilaterally dilated, the margins early replicate, the blades deciduous before the associated lf.

Lvs often crowded toward end of branches, (of some axillary branchlets (5–)8–19(–22) cm, in expanded outline oblong-elliptic, the proximal and distal lflets slightly decrescent; petiole subangulate when dry, including discolored pulvinus (2–)4–15(–19) mm, at middle 0.8–1.8(–2) mm diam, openly shallowly grooved ventrally; rachis mostly 5.5–16(–18) cm, charged at insertion of lflets with a conspicuous tuft of spicules; gland between proximal pair of lflets erect or incurved stipitate, including stipe (1.5–)1.7–3.4 mm, the ovoid to lancoid acute or obovoid claviform head 0.45–1 mm diam; pulvinules 1–1.7(–2) mm; lflets (6–)8–13(–15) pairs, in outline narrowly ovate, lanceolate or narrowly lance-elliptic, obtuse mucronulate or subacute, the longer ones (1.8–)2–3.6 × (0.45–)0.5–1.1 cm, (2.3–)3–4.2(–5) times as long as wide, at base inequilaterally rounded or broadly cuneate, the margins plane, the coarse centric midrib prominent beneath only, the venation of upper face fully immersed, but 6–11 pairs of camptodrome with rare intercalary secondary veins sometimes faintly raised or immersed but discolored beneath.

Racemes (7–)12–45-fl'd, the 1–3 simultaneously open fls raised \pm to level of the

nodding buds, the axis including peduncle becoming 5–16(–22) cm; bracts resembling stipules in texture, lance- or ovate-acuminate (3–)4–9.5 × (0.8–)1.2–3 mm, deciduous as the pedicel elongates; pedicels at and after anthesis 1.4–3(–3.3) cm; buds subglobose, remotely strigulose-pilosulous or the sepals merely ciliolate; sepals submembranous pale yellow commonly fuscous-tinged, oblong-obovate not much graduated, the outer pair (4–)5.5–8, the inner (5–)6.5–9 mm; petals yellow glabrous, broadly oblanceolate or obovate-flabellate, the vexillary one often a little broader than the rest, the longest 11.5–16 mm; androecium glabrous, the filaments of 4 median stamens 2–3.5 mm, of 2 latero-abaxial ones (3–)5–8 mm, of centric abaxial one 2.5–5 mm, the anthers of 4 median stamens 3–5 mm, of 2 latero-abaxial ones (3.5–)4–7 × 1.2–1.7 mm, of the centric abaxial one (3.2–)3.8–5 × 0.7–1.4 mm; ovary pilosulous; style linear incurved (0.8–)1–3.5 mm, at apex 0.2–0.5 mm diam, the stigmatic cavity terminal; ovules (10–)12–28.

Pod obliquely spreading-declined from ascending pedicel, the stout stipe 5–15 mm, the broadly linear straight or decurved body 5–11 × 0.9–2 cm, bicarinate by the stout sutures, the stiffly papery brown valves low-corrugate over the seeds, the cross-section elliptic; seeds either narrowly or broadly, but always plumply obovoid 4.5–8 × 3–4.7 mm, the broadly elliptic-obovate areole 1.7–4.8 × 0.8–1.5 mm.

Along the central and southern Peruvian Andes between Ancash and Lake Titicaca, around which it extends a short distance into Bolivia, *S. versicolor* is the most common and abundant senna of the puna formation, descending only sporadically on river gravels and rocky quebradas below 2800 meters. Dried specimens of it are readily recognized by the curious reversed coloration of the leaflets which, contrary to the common rule in *Senna*, are brighter or lighter green above than beneath. In general habit it resembles the sympatric but less common *S. birostris* var. *huancavensis*, which see for comment on differences. Despite this resemblance, the sharply differentiated areole on the seed faces of *S. versicolor* suggests less affinity with *S. birostris* than with the four Andean sennas described next below.

Beyond the range just mentioned *S. versicolor* reappears locally and, to our present knowledge, disjunctly near 7°S latitude in the Marañón valley in Cajamarca, and again near latitude 2–3°S in the Andes of Ecuador. The Ecuadorian plant, of which the pod is still as yet unknown, cannot at present be separated from common Peruvian *S. versicolor*, but that from Cajamarca differs abruptly in number of ovules and size of seeds, and cannot be taxonomically ignored. It is described below as var. *heterosperma*.

Our concept of *S. versicolor* differs somewhat from that of our predecessors. Bentham considered Meyen's plant from Titicaca as the same as *Bridges 10* and *Mandon 751*, relatively small-flowered sennas here referred respectively to *S. aymara* and *S. birostris* var. *controversa*, which see for discussion. The exceptionally clear photograph of the holotypus, now lost, includes a cleanly laid out flower from which the petals can be measured at near 15 mm long, altogether too long for either *S. aymara* or *S. birostris*. Furthermore we now have almost exact topotypes of *S. versicolor* in the shape of *Ugent 5252* (NY) which to our mind leave no doubt as to the identity of the species, the only senna of its type which has been collected in the past century on the shores of the lake. Thus Bentham's *S. versicolor* is a composite without fixed identity. Macbride, on the other hand, referred (1943, p. 168) *C. versicolor* and similar material from southeastern Peru to *Cassia hookerana*, which he thought perhaps only varietally distinct from *C. latopetiolata*, supposed to differ (in key) in the less unequal filaments of the

stamens, the less acute leaflets, and the subsessile pod (the stipe described, nevertheless, as "scarcely 5 mm long"). We have found Macbride's key characters of no assistance in defining two entities in the Peruvian material, and inaccurate if used to distinguish genuine Peruvian *S. versicolor* from *S. birostris* var. *hookerana* of southern Bolivia and Argentina. In equating *C. versicolor* with *C. latopetiolata*, which were published simultaneously, we have preferred to perpetuate in *Senna* the former epithet as the more descriptive and memorable, calling to mind the reversed discoloration of the leaflets.

Key to the Varieties of *S. versicolor*

1. Ovules 10–18; seeds $5.5\text{--}8 \times 3\text{--}4.7$ mm, occupying locules 4.5–7 mm long, their areole $(2.2\text{--})3\text{--}4.8 \times (0.9\text{--})1\text{--}1.5$ mm; Peru s. from Ancash into w. Bolivia (La Paz); Ecuador. 95a. var. *versicolor* (p. 309).
1. Ovules 24–28; seeds $4.5\text{--}5 \times 3.2\text{--}4$ mm, occupying locules 2–3 mm long, their areole $1.7\text{--}2 \times 0.8$ mm; Marañón valley in Cajamarca, Peru. 95b. var. *heterosperma* (p. 309).

95a. *Senna versicolor* (Vogel) Irwin & Barneby var. *versicolor*. *Cassia versicolor* Meyen ex Vogel, 1837, l.c., sens. str.—"In Peruvia pr. lacum Titicaca. (v.s.s.fr. comm. a cl. Meyen.)."—Holotypus, collected (Meyen, 1834, l.c.) on the w. shore of the lake between Chucuito and Puno, †B = F Neg. 1766! no isotypus found.—*Cassia versicolor* Meyen, Obs. Bot. in itinere circum Terram (Nov. Acta Acad. Caes. Leop.-Carol. Nat. Curios. 19, suppl. 1) 39. 1843.—"In altis Peruviae circa Laguna de Titicaca."

Cassia latopetiolata Dombey ex Vogel, Syn. Gen. Cass. 29. 1837.—"In Peruvia aut Chile in montibus: Dombey leg."—Holotypus, †B (hb. Kunth.) = F Neg. 1698; isotypi, NY, P!
Cassia pazensis Rusby, Bull. N.Y. Bot. Gard. 8(28): 94. 1912.—". . . La Paz, [Bolivia,] 11,500 ft., Aug. 21, 1901 ([R. S. Williams] No. 2344.)"—Holotypus, NY!
Cassia versicolor sensu Bentham, 1871, p. 540, majori ex parte, specimenibus nonnullis exceptis.
Cassia latopetiolata sensu Bentham, 1871, p. 539; Macbride, 1943, p. 171.
Cassia hookerana sensu Macbride, 1943, p. 168, majori ex parte, quoad syn. & specimina cit., non Gillies ex Hooker.

Characters as given in description and key.—Collections: 42.

Dry stony hillsides, gravelly washes and rocky ravines in the puna formation, sometimes colonial along road banks and stone walls, descending rarely into the edge of the monte, (2100–)2800–4150 m, common and locally abundant along the crest and plateau of the Peruvian Andes from Ancash to Lago Titicaca in Puno, thence extending into n. La Paz, Bolivia; apparently greatly isolated in similar xeromorphic associations in the Andes of s.-centr. Ecuador (Cañar, Pichincha, possibly elsewhere).—Fl. almost throughout the year.—*Tumbo*.

In describing *Cassia pazensis*, Rusby suggested that it was related to *C. laevigata* (=our *Senna floribunda*), and associated with it *Bang* 1985, which is *S. mandoni*, and *Mandon* 751 which, as to fruit, but not flower, is *S. aymara*. The holotypus of *C. pazensis* is unusual in the species for the low number of leaflets, mostly 6–7 pairs; but these are mostly leaves of lateral branchlets, the primary cauline ones having already fallen.

95b. *Senna versicolor* (Vogel) Irwin & Barneby var. *heterosperma* Irwin & Barneby, var. nov., a var. *versicolori* ovulis magis numerosis 24–28 (nec 10–18) seminibusque parvis $4.5\text{--}5$ (nec $5.5\text{--}8$) mm longis in loculis brevioribus 2–3 (nec $4.5\text{--}7$) mm longis confertis abstans.—PERU. Cajamarca, prov. Celendín: canyon of Río Marañón above Balsas, 5 km

below summit of road to Celendín: 24.V.1964 (fl, fr), *P. C. Hutchinson & J. K. Wright 5306*.—Holotypus, NY; isotypi, GH, K, US.

Characters as given in key; style perhaps longer than that of var. *versicolor*, 2–3.5 (not 1–2) mm.—Collections: 3.

Open and brushy or partially wooded canyon slopes near 2900–3000 m, known only from the valley of Río Marañón in s.-e. Cajamarca and perhaps adjoining s. Amazonas, Peru.—Fl. III–VIII.

A handsome shrub, introduced to cultivation by way of seeds of the type-collections, grown for ornament in California (*A. Griffiths 5651*) and under glass in New York. It is the *C. latopetiolata* of Isely, 1975, p. 105.

96. *Senna aymara* Irwin & Barneby, sp. nov., *S. versicolori* affinis, ab ea leguminis abbreviati 4–5.5 (nec 6–11) cm longi stipite simul brevissimo 1.6–2.8 (nec 5–14) mm longo, petalisque angustioribus 8–10 (nec 12–16) mm longis facile distinguenda.—BOLIVIA. La Paz: near La Paz, IV.1885 (fl, fr), *H. H. Rusby 980*.—Holotypus, NY; isotypi, K, NY.

Cassia versicolor sensu Bentham, 1871, p. 540, ex parte (saltem quoad *Bridges 10*); non Meyen.

Shrubs of bushy outline, at anthesis 0.4–1.2 m, with prominently ribbed and sulcate, nearly always purplish-castaneous branchlets beset with small thickened trichomes, appearing glabrous but the youngest growth, lf-stalks and axes of inflorescence (or some of them) thinly pilosulous-strigulose with straight or incurved hairs to 0.2–0.45 mm, the foliage subconcolorous, the firm lfsts dull olivaceous and glabrous on both faces, the inflorescence a dense terminal corymbiform panicle of leafy-bracteate but usually shortly exserted racemes.

Stipules erect or incurved to erect, lanceolate or lance-attenuate (4–) 5–12 × (0.6–)0.8–1.6(–2) mm, the firm brown or castaneous blades when relatively broad oblique at base and incipiently replicate, tardily deciduous.

Lvs 6–12(–16.5) cm, in expanded outline oblong-elliptic, the lfsts slightly decrescent at both ends of rachis; petioles (0.7–)1.2–3(–3.5) cm, at middle 0.5–1 mm diam, terete except for narrow ventral groove; rachis (3.5–)4–8.5(–10.5) cm; gland between proximal (and sometimes also the second) pair of lfsts, stipitate (subsessile), in profile (1.3–)1.7–3(–3.5) mm tall, the ovoid or fusiform obtuse or acute head 0.2–0.8 mm diam; pulvinules 0.6–1.3(–1.5) mm; lfsts (7–)8–11(–13) pairs, in outline narrowly lance-, oblong- or narrowly ovate-elliptic, obtuse mucronulate, the larger ones (11–)13–26(–30) × 3.5–8 mm, 2.5–4 times as long as wide, at base asymmetrically rounded or broadly cuneate, the margins plane, the venation except for stout, dorsally cariniform midrib fully immersed, invisible above, (4–)5–7 pairs of weakly camptodrome secondary veins faintly discolored beneath but not at all elevated.

Racemes 6–14(–16)-fld, the fls at anthesis raised to or beyond level of nodding glabrous fl-buds, the axis including peduncle becoming 5–11 cm; bracts resembling stipules in texture, narrowly lance-attenuate involute 4–7.5 × 0.8–1.6 mm, deciduous at or shortly before anthesis; pedicels (11–)12–19 mm; sepals purplish-fuscosubglaucescent, with pallid membranous margins, in outline oblong-obovate very obtuse, little graduated, the outer 5–6.3 mm, the longest inner one 5.5–7 mm; petals yellow (not whitening when dry) glabrous, oblanceolate or the vexillary one narrowly obovate, all of about equal length, the longest 8–10 × 2–4.5 mm; androecium glabrous, the oblanceolate staminodes 0.7–1 mm wide, the filaments of 4 median stamens 1.7–2.5, of 2 latero-abaxial ones 3.7–4.5 mm, of central abaxial one 3–3.5 mm, the anthers of 4 median stamens 2.5–3.3 mm,

of 3 abaxial ones 3.4–4.6, these subhomomorphic, all anthers obliquely truncate biporose; ovary thinly pilosulous laterally, sometimes only proximally; style 0.6–0.9 mm, 0.2–0.3 mm diam at incurved apex; ovules 8–12.

Pod obliquely pendulous, the stipe 1.6–2.8 mm, the narrowly oblong or oblong-elliptic, plano-compressed body $4\text{--}5.5 \times 0.9\text{--}1.1$ cm, the firmly papery valves obscurely elevated over the seeds, the seed-locules 3–3.5 mm long, as wide as the cavity; seeds plump, only a little compressed parallel to the valves, in outline oblong-obovate or narrowly oblong-elliptic $(4.1\text{--})4.5\text{--}7 \times 2.5\text{--}3.5$ mm, the brown or blackish-brown testa dull, the elliptic areole $1.5\text{--}2.3 \times 0.8\text{--}1.2$ mm.—Collections: 15.

Stony hillsides in puna at 3100–3950 m, descending e.-ward in canyons to 2600 m, locally plentiful along the e. margin of the Bolivian Altiplano from Cordilleras Real and de Cochabamba s. into Potosí.—Fl. II—VIII.

This well marked species has passed in herbaria either as *Cassia latopetiolata* (=our *S. versicolor*), of which it has the often dilated stipules and subequal sepals, or as *C. hookerana* (= *S. birostris* var.), which it resembles in the relatively short and shortly stipitate pod. It seems closer akin to the former, with which it shares seeds marked with a sharply defined areole, but is distinguished from it by the small flower and by the features of the pod just mentioned.

Pods of *S. aymara* misplaced in mounting were described by Bentham as the fruit of *Cassia glaucescens*; others have clouded the history of our *S. birostris* var. *huancavensis* (p. 341).

97. *Senna malaspinae* Irwin & Barneby, sp. nov., affinitatis defectu seminis maturi inter ser. *Stipulaceas* et *Pachycarpas* ambiguae sed verosimiliter hujus seriei juxta *S. aymaram* quacum androecio necnon legumine brevistipitato brevi sub-9-spermo congrua inserenda, sed primo visu pube pilosula canescenti, ovario albobarbato necnon patria remota cis-Andina recedens.—PERU. Lima, prov. Canta: along Río Chillón above Obrajillo, 3100–3200 m, 13–23.VI.1925 (fl), *F. W. Pennell 14424*.—Holotypus, NY; isotypus, US.

Diffuse shrubs of unknown potential stature, the annotinous stems and lf-stalks densely pilosulous with spreading hairs up to ± 1 mm and the foliage with subappressed and forwardly incurved somewhat shorter ones, the lvs silky-canescant in youth, later subconcolorous, the lflets when dry brownish-olivaceous dull and subequally pubescent on both faces, the racemes axillary to distal lvs forming a shortly exerted panicle.

Stipules ascending herbaceous, falcately linear-lance-acuminate $9\text{--}12 \times \pm 1$ mm, caducous.

Lvs 8–14 cm; petiole including pulvinus $\pm 8\text{--}22$ mm, at middle 0.9–1.2 mm diam, shallowly sulcate ventrally; rachis 9–10.5 cm, the longer interfoliolar segments 8–15 mm; glands between proximal and sometimes the second pair of lflets, including short stipe 1.5–2 mm, the linear-ellipsoid acute body 0.5–0.7 mm diam; lflets 8–10 pairs, slightly decrescent at each end of rachis, in outline oblong-elliptic obtuse, minutely mucronulate, the longer ones $18\text{--}26 \times 6\text{--}9$ mm, all at base inequilaterally rounded, the margin plane, the midrib prominent beneath only and there canescently pilosulous, the 5–6 pairs of weak secondary veins immersed on both faces, discolored beneath.

Racemes incurved-ascending, loosely 20–25-fl'd, the thinly pilosulous globose fl-buds raised beyond level of 1–3 expanded fls, the axis including peduncle be-

coming 10–17 cm; bracts linear-attenuate 2.5–4 mm, early dry caducous; pedicels at and after anthesis 13–22 mm; sepals (dry) livid-brown with paler margins, little graduated, the broadly obovate inner ones 7–8 mm; petals yellow drying dark or brownish-yellow, except for the more pronounced claw of the vexillar one essentially homomorphic, obovate-flabellate $\pm 9.5\text{--}11 \times 6$ mm; androecium glabrous, the staminodes narrowly oblanceolate, their blade $\pm 2 \times 0.7\text{--}0.8$ mm, the filaments of 4 median stamens 1.6–2.5 mm, of 3 abaxial ones 2.6–4 mm, the 7 fertile anthers thin-walled, truncate and almost beakless, 2-porose at apex, those of 4 median stamens pitched forward from filament and ± 3.4 mm, those of 3 abaxial ones gently lunate-incurved $4 \times 1\text{--}1.2$ mm; ovary at anthesis 3 mm long, densely white-barbate, the glabrous subulate style $\pm 1 \times 0.3$ mm, scarcely incurved; ovules 9.

Pod obliquely ascending or declined, the stipe ± 2.5 mm, the narrowly oblong plano-compressed, gently incurved body $\pm 3 \times 0.7$ cm, abruptly contracted at apex into an erect subulate point 2–2.5 mm, the papery valves (not seen fully ripe) densely pilosulous; seeds not seen.—Collections: 2.

Habitat not recorded, to be expected on brushy hillsides or talus of quebradas near 3000 m, collected first by the botanists of the Malaspina expedition, ca. 1790, probably near Lima, known precisely only from the upper Chillón valley in the province of Canta, Peru.—Fl. VI–VII.

Mid-Andean *Senna* has been indifferently collected and in consequence is not taxonomically stabilized; we are reluctant to multiply future problems by describing species from inadequate material. However we feel confident of the specific status of *S. malaspinae*, unique in its region because of the copious pubescence, tiny cocoon-like brachystylous ovary and short pauciovulate plano-compressed pod. The flowering typus was set aside during our preliminary work as probably undescribed, and it was an unexpected pleasure to discover in Madrid and Florence (hb. Webb.) that excellent fruiting material had been collected by botanists of the Malaspina expedition, presumably by Nee or Haenke, almost two centuries ago. In the diagnosis we have compared *S. malaspinae* with *S. aymara*, which has flower and pod of similar proportions, and consequently refer it to ser. *Pachycarpae*, but we cannot be certain of the relationship until fully ripe seeds are obtained, the presence or absence of areole on the testa being critical in this connection. *Senna malaspinae* is dedicated to the memory of the able but unfortunate navigator Alessandro Malaspina who, after years of brilliant service to the Spanish crown, died, an exile from his adopted country, near La Spezia in northern Italy, 9 April 1809, aged 55.

98. *Senna cumingii* (Hooker & Arnott) Irwin & Barneby, comb. nov. *Cassia cumingii* Hooker & Arnott in Hooker, Bot. Miscell. 3(2): 211. 1829.—
Typus infra sub var. *cumingii* indicatur.

Shrubs variable in habit, either erect or diffuse, then bushy and sometimes wider than tall, at anthesis (0.3–)0.6–3 m, the old bark dark gray, the annotinous branchlets, lf-stalks and axes of inflorescence puberulent or pilosulous with forwardly subappressed-ascending, mostly straight or simply incurved, pallid lutescent hairs of variable length, the longest up to 0.1–1.1 mm, the dull olivaceous foliage subconcolorous, the lflets firm when mature, minutely or conspicuously ciliolate, usually glabrous on upper face but rarely puberulent along midrib, the dorsal face either glabrous or sparsely pilosulous, the inflorescence of leafy-bracteate racemes sometimes at first lateral but eventually or from the first forming a shortly exserted subcorymbiform panicle.

Stipules erect, thinly herbaceous, linear-lanceolate, linear, linear-attenuate or subulate (1–)2–10(–12) \times 0.2–0.8 mm, deciduous before the lf but not precociously caducous.

Lvs (3.5–)4–12 cm; petiole including the scarcely swollen pulvinus (2.5–)4–16 mm, at middle 0.4–1 mm diam, bluntly 3-ribbed dorso-laterally, the shallow, narrowly thick-margined ventral sulcus narrow or closed; rachis (2–)2.5–6.5(–8) cm; gland (much eaten) between proximal pair of lflets shortly stipitate or subsessile, in profile 0.7–1.6 mm, the ovoid acute or fusiform body (0.1–)0.2–0.5 mm diam, rarely a similar gland between second pair; pulvinules (0.5–)0.6–1.2(–1.5) mm; lflets 4–7(–8) pairs, highly variable in length and width, at narrowest linear-acuminate, at broadest obovate obtuse or emarginate, usually little or not at all accrescent distally, the outline, dimensions and venation described under the vars., the venation in general subsimply pinnate with 2–5 pairs of camptodrome secondary veins prominulous on both faces or only beneath, the margin plane or incipiently revolute near the pulvinule.

Racemes mostly (5–)6–13, some rarely to 30-fld, the usually 2 or more simultaneously expanded fls raised \pm to level of the nodding obovoid glabrous or proximally puberulent buds, the axis together with peduncle becoming 5–10(–14) cm; bracts submembranous, narrowly lance-elliptic, linear-attenuate or subulate (1.5–)3–9(–11) \times 0.4–1(–2) mm, deciduous by or shortly before anthesis; mature pedicels (9–)11–26 mm; sepals usually fuscous or purplish with broad pallid or petaloid margins, delicately immersed-venulose, oblong-obovate or -elliptic obtuse, a little graduated, the longer inner ones 6–11.5(–12) mm; petals glabrous, rich golden- or orange-yellow, when dry remaining yellow brown-venulose, of subequal length but the vexillar one broadest, its blade flabellate-emarginate, the rest a little narrower obovate or broadly oblanceolate in outline, the longest petal 9–26 mm; androecium glabrous, the 3 cordate staminodes 1.4–1.9 mm wide, the filaments of 4 median stamens (1–)1.2–1.8 mm, of 2 long abaxial ones 5–17 mm, of the centric abaxial one 2–3.5 mm, the anthers of 4 median stamens 3.2–5 mm, of 2 long abaxial ones (4.5–)5–7.6 \times 1–1.6(–1.7) mm, of the sterile centric abaxial one 1.5–7 \times 0.2–1 mm, the fertile anthers all subhorizontally truncate or the orifice of the 2 longer ones obliquely dilated into an obscure pollen-cup up to 0.4 mm; ovary pilosulous or strigulose; style 2–9.5 mm, not or scarcely dilated upward, \pm 0.2–0.35 mm diam at gently incurved apex; ovules 10–24.

Pod at first obliquely ascending, in age randomly declined, the stipe 2.5–6 mm, the straight or slightly decurved linear or linear-oblong body 4–10 \times 0.6–1.1 cm, commonly strangulate at some abortive locules, compressed but when ripe turgidly expressed over the seeds, the green valves becoming stiffly papery and when ripe pale brown, broadly paler-margined along each suture, the interseminal septa well developed, the locules 4.5–9 mm long; seeds plumply disciform or oblong-obovoid, 4.6–7.2 \times 4–6.3 mm, usually compressed parallel to the valves but when crowded into narrow locules becoming obtusely 4-angular, the dull brown or blackish testa smooth, the broadly elliptic or circular areole 3–5.5 \times 2–5 mm.—*Alcaparra*.

Our concept of *S. cumingii* is expanded here over that of *Cassia cumingii* sensu Bentham so as to absorb without strain *C. coquimbensis* Vog., *C. eremobia* Phil. and *C. alcaparra* Phil., as well as the long-established synonyms *C. flaccida* Clos and *C. acuta* Meyen ex Vog. Each of these was described originally from one or few individual plants which now fall into place as points along a sequence of vicariant variations; while different in relative amplitude of foliage, in flower size, in length of long filaments and in ovule-number, the constituent elements of

the species are held together by an essentially uniform androecium, pod and seeds, and by a continuous range in arid Pacific extratropical Chile. The process of assembling these under one specific title began with the protologue of *C. cumingii* itself, where Hooker & Arnott listed as an unnamed variety the first collection of what would later be segregated by Philippi as *C. alcaparra*. More recently Johnston has voiced the suspicion that *C. eremobia* is no more than a northern variety of *C. cumingii*. The steps leading from *C. alcaparra*, which has almost as ample leaves but a rather shorter style, to large-flowered dolichostylous *C. coquimbensis* on the one hand and to small-flowered brachystylous narrow-leaved *C. cumingii* are equally short and easy.

The close affinity of *S. cumingii* sens. lat. seems to lie with the high Andean or trans-Andean *S. versicolor* and *S. arnottiana* which have very similar pods and seeds. The former differs in the mostly 8–13 (not 4–8) pairs of leaflets characteristic in color; the latter in the succulent foliage and dwarf stature. *Senna birostris*, of which two varieties are adapted to arid coastal hills ecologically similar to the preferred habitat of *S. cumingii*, differ at once in leaflet-number, broader pods and unmarked seeds.

Key to the Varieties of *S. cumingii*

1. Fls relatively small, the longest petal 9–16 mm; filaments of 2 long abaxial stamens 4.5–8.5 mm; style 2–5 mm; pod (at fertile segments) ± 6 –9 mm wide; ovules 10–16.
2. Lfts of major lvs linear-lanceolate or -elliptic, the longer ones ± 20 –35 \times 3–7 mm and 4–10 times as long as wide; style 2–3 mm. 98a. var. *cumingii* (p. 314).
2. Lfts of major lvs either of broader outline or shorter, or both.
3. Major lfts at once short and broad, ± 12 –16 \times 3.5–5.5 mm; style ± 2 mm; local between 25° and 25°30'S in Antofagasta. 98b. var. *eremobia* (p. 314).
3. Major lfts up to 23–32 \times 7–10 mm; style 4–5 mm; Coquimbo. 98c. var. *alcaparra* (p. 315).
1. Fls larger, the longest petal 15–26 mm; filaments of long abaxial stamens 10–17 mm; style 5–9.5 mm; pod 9–11 mm wide; ovules 16–24; Coquimbo. 98d. var. *coquimbensis* (p. 315).

98a. *Senna cumingii* (Hooker & Arnott) Irwin & Barneby var. *cumingii*. *Cassia cumingii* Hooker & Arnott, 1829, l.c., sens. str., exclus. var.—“Coquimbo, *Cuming* (N. 874).”—Holotypus, K (hb. Hook.)! = NY Neg. 1567; isotypus, K (hb. Benth.)!

Cassia acuta Meyen [Reise 1: 376. 1834, nom. nud.] ex Vogel, Syn. Gen. Cass. 42. 1837.—“In Chili: Pr. Copiapo. (v.s. comm. a cl. Meyen.)”—Holotypus, †B = F Neg. 1680! no isotypus known to survive.—Equated with *C. cumingii* by Benthams, 1871, p. 539.

Pubescence usually short and scanty, the hairs up to 0.1–0.35 mm, whitish or rarely lutescent; stipules (1–)2–5(–6) \times 0.2–0.5 mm; lfts (4–)5–7(–8) pairs, as described in key, either obtuse or acute, the secondary venulation immersed or almost so on upper face; long sepals 6–9 mm; petals up to 9–13.5 mm; seeds ± 4.6 –6 \times 4–4.5 mm, the areole 3–3.7 \times 2–2.2 mm.—Collections: 10.

Rocky hillsides, quebradas, stony riverbeds, 5–1000 m, coastal cordillera of centr. Chile between 25° and 29°30' (?–30°) S in s. Antofagasta, Atacama and n. Coquimbo.—Fl. IX–I.

98b. *Senna cumingii* (Hooker & Arnott) var. *eremobia* (Philippi) Irwin & Barneby, stat. nov. *Cassia eremobia* Philippi, Anal. Univ. Chile 84: 443. 1893.—“In deserto Atacama l. d. Breas [inland from Taltal near 25°30'S] invenit Alamirano Larrañaga.”—Holotypus seen at SGO by Johnston (Contrib. Gray Herb. n. ser. 85: 48. 1929).

Pubescence and fls of var. *cumingii*, but the lfts all relatively short and broad, as described in key, the secondary venulation of the upper face commonly prominent.—Collections: 4.

Rock outcrops on the coastal plain and stony beds of quebradas in the foothills of the Coastal Cordillera between $\pm 25^\circ$ and $25^\circ 30'S$ in s. Antofagasta, Chile.—Fl. X–XII.

The var. *eremobia* owes its individuality of facies solely to its condensed and diminished foliage, for the flowers and pods are identical to those of var. *cumingii*, which reaches its northern known limit in the same latitudes, at the mouth of Taltal river. The modification of leaves appears a slight and easy step, for occasional axillary branchlets of otherwise typical var. *cumingii* (cf. *Bridges* 1295, BM) bear leaves of the same compressed type and leaflets of some upper vigorous leaves of the widely distributed *Werdermann* 844 are plainly transitional in outline.

98c. *Senna cumingii* (Hooker & Arnott) var. *alcaparra* (Philippi) Irwin & Barneby, stat. nov. *Cassia alcaparra* Philippi, *Linnaea* 33(1): 61. 1864.—“Prope Illapel [prov. Coquimbo near $31^\circ 35'S$] frequens . . . Attulit orn. Landbeck.”—Holotypus to be sought at SGO. Spms collected at Illapel by Philippi himself in XII.1862 ($\dagger B = F$ Neg. 1651, MA, NY, W!) serve as standards for comparison but are not typi.—Overlooked by Bentham, 1871.

Cassia cumingii var. β Hooker & Arnott, *Bot. Miscell.* 3(2): 211. 1829.—“Alcapassa, south of Coquimbo, Mr. Cruckshanks.”—Spm. authent., P, K!—Referred by Bentham, 1871, p. 541 to *C. coquimbensis*.

Intermediate between vars. *cumingii* and *coquimbensis* in width of lfts (as described in key) and in style-length, like the former in sepals, pod and seed, only the petals sometimes longer, the longest 11–16 mm.—Collections: 6.

Habitat not recorded, presumably similar to that of the next following, vicariant immediately n.-ward, apparently local in the Coastal Cordillera, known certainly only from depto. Illapel (Salamanca, Illapel) near $31\text{--}32^\circ$ in Coquimbo, Chile.—Fl. X–XII(–?).

The alternative identifications of Cruckshanks’s collection of var. *alcaparra*, first by Hooker & Arnott as a variety of *Cassia cumingii* and later by Bentham as *C. coquimbensis*, neatly illustrate the morphological intermediacy of its sort. Curiously, however, var. *alcaparra* is situated geographically to the south of var. *coquimbensis* and not between that and var. *cumingii*. In the context of its species and of those thought most nearly related, dolichostylous var. *coquimbensis* would appear to be the derived form which has replaced brachystylous forms of *S. cumingii* in one segment of its full range. The Alcapassa of the protologue of *C. cumingii* is not a place name but a misreading of the vernacular *alcaparra*, applied to this and other Chilean sennas.

98d. *Senna cumingii* (Hooker & Arnott) var. *coquimbensis* (Vogel) Irwin & Barneby, stat. nov. *Cassia coquimbensis* Vogel, *Syn. Gen. Cass. & Linnaea* 11: 674, descr. ampliata. 1837.—“In Chili: Gaudichaud leg. pr. Coquimbo. (v.s.s.fr. in Hrb. K[un]th.)” —Holotypus, *Gaudichaud* 115-a, $\dagger B = F$ Neg. 1675! neoholotypus, former isotypus, P! isotypus, K!

- Cassia flaccida* Clos in Gay, Fl. Chile 2: 238. 1854.—“... en las provincias centrales, en Quintero, Valparaiso, etc.”—Lectoholotypus, Gay 139 from La Serena in 1836, P! paratypus, Gay 115, s. loc., P!—Equated by Bentham, 1871, p. 541, with *C. coquimbensis*.
- Cassia coquimbensis* sensu Bentham, 1871, p. 540, exclus. syn. *C. cumingii* β ; Hooker fil., Curtis's Bot. Mag. III, 44: t. 7002. 1888.—raised at Kew from seed collected by British Consul J. Grierson at Coquimbo, and represented at K by vouchers of wild and cultivated material!

Differing from other forms of *S. cumingii* in ample foliage, larger dolichostylous fls and more numerous ovules, the pubescence on average longer and more often yellow; lfts 4–6(–7) pairs, varying in outline from broadly obovate to elliptic-obovate or oblance-elliptic, commonly obtuse or obtuse-mucronulate, rarely emarginate or depressed-acuminulate, the larger ones (10–)13–31 \times (4.5–)7–16 mm, 1.4–2.6(–3) times as long as wide, the secondary venulation usually prominulous on both faces, more sharply so beneath: seeds 5.5–7.2 \times (4–)5–6.3 mm, the areole 4–5.5 \times 4.3–5 mm; otherwise as given in key.—Collections: 20.

Coastal hills and gulches leading to the ocean, not recorded from above 300 m but probably ascending somewhat higher in interior valleys, Coastal Cordillera of centr. Chile between 29°30' and 32°S in deptos. La Serena, Coquimbo and Ovalle of province Coquimbo.—Fl. primarily IX–II, sporadically later, sometimes while bearing mature pods.

A handsome floriferous senna, worthy of trial in gardens that can provide Mediterranean conditions. In the field it is likely to be confused only with *S. candolliana*, which has very similar individual flowers but more elaborately venulose leaflets, a subterete pod and unmarked seeds.

- 99. *Senna arnottiana* (Hooker) Irwin & Barneby, comb. nov. *Cassia arnottiana* Gillies ex Hooker, Bot. Miscell. 3(2): 211. 1829.**—“El Valle del Atuel and El Valle de las Leñas Amarillas, Andes of Mendoza, Dr. Gillies. Cordillera of Chile, *Macrae*.”—Lectoholotypus (*Gillies*, fr) and paratypus (*Macrae*, fl), mounted on one sheet, K (hb. Hook.)! = NY Neg. 1568; isotypus (*Gillies*), FI!

Cassia andina Philippi, Linnaea 28: 685. 1858.—“In Andibus depart. Linares invenit ornat. Germain.”—No typus seen; the sheet at \dagger B = F Neg. 1650 from Cord. de Linares, marked as a typus, is attributed on the label to Philippi, not to Germain; specimens of Germain at BM, BR, FI, K, P, W! from Cord. de Maule have, like that at B, only 4–5 (not 8) pairs of lfts.—*C. arnottiana* var. *andina* (Philippi) Reiche, Fl. Chile 2: 40. 1897.—Reduced to *C. arnottiana* by Bentham, 1871, p. 539.

Cassia lorentzii Niederlein ex Lorentz & Niederlein in Roca, Informe Ofic. Exped. Río Negro 2(Botánica): 210, pl. V, fig. 1. 1881.—“Se encontró... en las pendientes de las barrancas del Río Neuquen y despues entre Curruleubú y la Pampa de Tilqui.”—No typus examined, but the protologue together with F Neg. 1704! of isotypus at \dagger B, decisive.—Equated with *C. arnottiana* by Burkart, 1952, p. 166.

Cassia arnottiana sensu Clos in Gay, 1854, p. 235 (“*arnoltiana*”); Bentham, 1871, p. 539; Reiche, 1897, p. 40; Boelcke, Darwiniana 7(2): 302, t. VIII, fig. f (seed); Burkart, 1952, p. 166; Bravo, 1981, p. 265, fig. 3, 5.

Low several-stemmed shrubs of bushy outline 1.5–8 dm, with leafless trunks at first brown smooth corpulent, then gray or grayish-brown and toughly woody, up to \pm 1 cm diam, permanently angulate by prominent, dorsally blunt-keeled lf-spurs distally wider than the associated lf-stalk, the densely leafy young stems, lf-stalks and axes of inflorescence minutely pilosulous or remotely puberulent with fine spreading, incumbent or curly white hairs up to 0.15–0.3 mm, the firmly chartaceous or subsucculent foliage olivaceous or glaucescent, often yellowing in age, the subconcolorous lfts glabrous or remotely ciliolate only along midrib beneath, the leafy-bracteate few-fl'd racemes subterminal, shortly exserted.

Stipules erect herbaceous linear-lanceolate or -subulate $2-5 \times 0.4-0.9$ mm, tardily deciduous.

Lvs (1.3-)2-5 cm; petiole including wrinkled pulvinus (1.5-)2.5-10(-13) mm, at middle 0.7-1.2 mm diam, when dry carinate dorsally, the ventral sulcus narrow shallow; rachis (5-)9-32 mm; gland between proximal pair (rarely also between second pair, or only one and this displaced to rachis between proximal and second pairs), shortly or subobsoletely stipitate, in profile 0.6-1.7 mm tall, the erect or incurved, slenderly ovoid acute or subulate head 0.15-0.5 mm diam, the whole gland not seldom degenerate, spiculiform or even 0; pulvinules variably dilated, usually yellowish and wrinkled when dry, 0.4-0.9(-1.2) mm; lfts commonly 3-6, locally (in Chile) up to 6-8 pairs, little or not graduated along the rachis, mostly broadly obovate obtuse or emarginate (obscurely deltate-acuminulate) or less often oblong-elliptic obtuse up to 7-14 mm, at scarcely or slightly oblique base either rounded or cuneate, the margin plane, the venation (both between plants and between lvs of one plant), variable, of thick-textured lfts fully immersed except for the midrib dorsally, of thinner (or immature) ones the midrib giving rise to 2-4 pairs of camptodrome (and rarely 1-2 faint intercalary) secondary veins raised \pm sharply on dorsal but at best faintly so on ventral face, a tertiary venulation rarely incipient, then weak and irregular.

Racemes loosely 2-5-fld, the first open fls raised to or beyond level of nodding buds, the axis together with peduncle becoming 2.5-5.5 cm; bracts submembranous elliptic obtuse cymbiform 2.5-5 mm, usually persistent into early anthesis, then deciduous; mature pedicels 12-25(-31) mm; fl-buds subglobose, usually puberulent at base, glabrous distally; sepals subpetaloid, yellowish or brownish, delicately several-nerved from base, not much graduated, all obovate or broadly oblong-ob lanceolate obtuse, the longest 7-10 mm; petals orange-yellow, when dried brown-veined but not whitening, of subequal length, the 3 abaxial ones broadly obovate-flabellate obtuse or shallowly emarginate, the 2 abaxial narrower, elliptic-obovate or -oblanceolate, nidulating the long stamens, the longest petal 12-14.5 mm; androecium glabrous, the staminodes obovate or obcordate 1.1-1.5 mm wide; filaments of 4 median stamens 2-2.8 mm, of 2 longest abaxial ones 4-8.5 mm, of the centric abaxial one 2.5-7.5 mm, the anthers of 4 median stamens 3.6-4.3 mm, of the long pair of abaxial ones $5-5.5 \times 1.1-1.3$ mm, of the centric abaxial one $4-4.6 \times 1-1.3$ mm, all anthers obliquely truncate at apex and dehiscent by 2 short slits separated by a shallow notch; ovary either glabrous or puberulent; style linear-subulate, evenly incurved $0.9-1.6(-1.8) \times 0.2-0.3$ mm, the minute stigmatic cavity terminal; ovules (5-)6-14.

Pod obliquely spreading-declined from ascending pedicel, its stout stipe 2-3 mm, its body narrowly oblong, straight or decurved, often variably and randomly distorted or strangulated where ovules abort, $(2.5-)3.5-7 \times 1.1-1.6$ cm, laterally compressed but turgidly mounded over the expanded ovules, bicarinate by the sutures, the thin-textured valves becoming brown and papery, pallid or yellowish along the sutures, delicately cross-nerved, the membranous interseminal septa well-developed, the seed-locules broader than long; seeds vertical to the pod's long axis but turned edgewise to the valves and presenting their broad faces to the septa, plumply compressed-obovoid or oblong-obovoid $6-8.5 \times 3.8-7$ mm, the dull chocolate-brown testa smooth, the areole broadly elliptic-obovate $4-5.2 \times 3-4$ mm.—Collections: 20.

Dry stony hills and talus slopes of rocky quebradas, ascending from the e. foothills of the Andes at (800-)900-2500(-2800) m along and w. of the crest, locally plentiful along the main Cordillera, in Argentina from Mendoza s. through Neuquén to s.-w. Río Negro (lat. $33^{\circ}-41^{\circ}25'S$) and in Chile from e. margin of

Coquimbo (dept. Illapel) s. to Bio Bio (lat. $31^{\circ}40'$ – $37^{\circ}30'S$).—Fl. X–XII.—*Sen; tara; trapela guen*; said to furnish a yellow dye.

This is an easily recognized senna, the generally xeromorphic habit, the sturdy leafless old stems angulately ribbed by proportionately exaggerated leaf-spurs, the thick-textured, at first glaucescent but later yellowish foliage and the coarse turgid pods all contributing to a peculiar facies. It is somewhat variable in number and venulation of the leaflets. On the Argentine slope of the Andes, where the species ranges from the foothills to the high valleys near the watershed, the leaflets are consistently few, in larger leaves 4–6 pairs, and lack externally visible venulation other than the dorsally prominulous midrib. On the Chilean slope, where *S. arnottiana* is not recorded from below 2000 m, the leaflets vary from veinless to sharply penniveined dorsally and rise in some populations to 6–8 pairs. With increase in number the leaflets dwindle in size and tend to shrink from broadly obovate-obcordate to oblong-elliptic. From the protologue it appears that *C. andina* was based on specimens in which visible venulation coincided with 8 pairs, but we now know that number and prominence of the veins are not correlated and that relatively numerous leaflets are not geographically segregated. In consequence we follow Bentham, Burkart, and annotations by Sandwith at Kew, in accepting *C. andina* as a synonym of *S. arnottiana*.

Cassia arnottiana var. *sericea* Burkart ex Bravo, Darwiniana 23(1): 266, fig. H. 1981, based on *R. Martínez Crovetto* 32 (SI, not seen) from the department of Huiliches, Neuquén, appears to be an individual variant with densely pubescent branchlets.

100. *Senna urmenetae* (Philippi) Irwin & Barneby, comb. nov. *Cassia urmenetae* Philippi, Anal. Univ. Chile 41: 708. 1872.—“De la alta cordillera de la provincia de Santiago.”—Holotypus (SGO 50702, fide Muñoz Pizarro, 1960, p. 73), not seen; isotypi, †B = F Neg. 1762, NY, W!—*Philippi s.n.*, G, though dated 1876, may be isotypic also.

Cassia glaucescens Bentham, Trans. Linn. Soc. London 27: 539. 1871.—“... Chile, near Copiapo, Pearce.”—Holotypus, collected at 8000 ft in Cordillera de Copiapo, XI.1863, K! = NY Neg. 1569.—The associated pods, accepted as pertinent by Bentham, represent *S. aymara* Irwin & Barneby collected by Pearce near La Paz in 1865, probably misplaced in mounting.—Non *C. glaucescens* Hoffmannsegg, 1824.

Cassia oreades Philippi, Anal. Univ. Chile 84: 443. 1893.—“In Andibus provinciae Santiago januario 1878 lecta fuit.”—Holotypus, SGO 39978 or 50704 (fide Muñoz Pizarro, 1960, p. 73), not seen; presumed isotypi †B = F Neg. 1720! distributed by F. Philippi as “*Cassia cumingii*” without further data, BM!—Equated by Reiche, 1897, p. 38 with *C. urmenetae*.

Cassia urmenetae sensu Reiche, 1897, l.c.

Bushy shrub 3–10 dm, the leafless old trunks clad in smooth brown, ultimately fissured bark, the densely leafy hornotinous branchlets and foliage pallid olivaceous and pilosulous throughout or almost so with fine, vertically erect pallid hairs 0.1–0.3 mm, the concolorous, dull or scarcely lustrous, usually thick-textured lfts sometimes glabrescent above in age, the few-fl'd leafy-bracteate racemes arising from distal axis to form a small, scarcely exerted corymbose panicle.

Stipules erect, subulate or setiform 0.5–2 mm, early dry caducous.

Lvs (2–)2.5–6 cm; petiole including moderately dilated, scarcely wrinkled pulvinus (3–)4–13(–15) mm, at middle 0.6–1 mm diam, rounded dorsally, deeply narrowly grooved ventrally; rachis (0–)4–22 mm; pulvinules 0.4–1 mm; gland between proximal (or only) pair stipitate, in profile 0.7–1.6 mm tall, the slenderly subuliform acute body 0.15–1.3 mm diam; lfts (1–)2–4 pairs a little accrescent distally, in outline most often lanceolate or lance-elliptic, rarely broader and

ovate, in either case deltately acute mucronulate, the distal pair $16-28 \times 3.5-9(-12)$ mm, $(1.7-)$ 2–5 times as long as wide, at base asymmetrically rounded or broadly cuneate, the margin plane, the centric midrib alone prominulous on dorsal face, the blades otherwise veinless superficially or with 4–6 pairs of either simple or weakly camptodrome secondary venules weakly bluntly prominulous beneath.

Racemes loosely 3–6-fld, the axis together with peduncle becoming 2.5–7 cm; bracts (caducous, little known) subulate $\pm 1-2.5$ mm, exceptionally modified into depauperate lvs; pedicels in fruit 12–17 mm; fl-buds obovoid glabrous; expanded fls not seen; ovary pilosulous; style $\pm 1-1.5$ mm; ovules 8–12.

Pod obliquely declined from ascending pedicel, the densely minutely pilosulous stipe 2.5–4 mm, the linear but nearly always undulately constricted, straight or gently declined body $5-7 \times 0.7-0.9$ cm, cuneate at both ends, bicarinate by the cordlike sutures, laterally compressed but turgidly expanded over developed seeds, the valves becoming papery stramineous or brownish, prominently venulose, sparsely minutely puberulent at maturity, the membranous interseminal septa complete, the locules $\pm 7-9$ mm long; seeds obovoid or obtusely rhombic-obovoid $6.5-7 \times 4.5-5.2$ mm, a little compressed parallel to the valves, the smooth testa olive-drab or brownish-olivaceous, not or scarcely lustrous, the cordate or ovate areole $2.4-3 \times 1.4-2$ mm, commonly emarginate proximally.—Collections: 5.

Dry rocky slopes and talus, 1550–2500 m, along the Chilean slope of the Andes in lat. $27^{\circ}-33^{\circ}\text{S}$, from centr. Atacama s. to Santiago—Fl. X–I.

This still imperfectly known montane xeromorphic senna is apparently related to *S. arnottiana*, which resembles it in habit but differs in the broadly obovate or elliptic-oblong, not lanceolate (rarely ovate) leaflets, the broader pod, and the seeds turned edgewise to the valves and facing the septa, not oriented in the ordinary way with the broad faces opposed to the valves. The scanty material of *S. urmenetae* falls into two groups: three collections from departments Copiapó and Vallenar in central and southern Atacama, characterized by two to three pairs of thick-textured leaflets essentially veinless externally; and two from Cordillera de Santiago in which the three to four pairs of slightly thinner-textured leaflets are faintly penniveined dorsally. Although we have not seen fully expanded flowers, which could, of course, furnish surprising differential characters, we judge these to be in a broad sense conspecific, for they involve no greater phenetic diversity than is well documented in *S. arnottiana*. Exploration of montane Coquimbo, from which we have as yet no record for *S. urmenetae*, must be expected to disclose geographically intermediate populations which will obviously be crucial in final evaluation of the species.

Bentham singled out his *Cassia glaucescens* as a connecting link between his *Chamaesennae Pachycarpae* and his *Chamaefistulae Brachycarpae*, but he had at the time no means of guessing that the material at his disposal consisted of a mixture of flowering *S. urmenetae* and misplaced fruits of *S. aymara*.

101. *Senna purpusii* (T. S. Brandege) Irwin & Barneby, comb. nov. *Cassia purpusii* T. S. Brandege, *Zoe* 5: 234 ("Purpusi"). 1906.—"Collected near Calmalli, Baja California, by Dr. [C. A.] Purpus, 1898, and in fruit by E. A. Goldman at Rosarita, near San Andreas, B.C., Sept. 25, 1905, No. 7160."—Lectoholotypus, *Purpus* 107, UC (2 sheets)! paratypes, *Nelson & Goldman* 7160, NY, US!—*Adipera purpusii* (T. S. Brandege) Britton & Rose, *N. Amer. Fl.* 23(4): 240. 1930.

Cassia purpusii sensu Goldman, Contrib. U.S. Nat. Herb. 16: 335. 1916; Standley, 1922, p. 408; Wiggins in Shreve & Wiggins, 1964, p. 616.

Bushy drought-deciduous, stiffly sometimes awkwardly branched but not thorny desert shrubs $\pm 9\text{--}15$ dm, the older stems clothed in gray fissured and flaking bark, the densely leafy annotinous branchlets castaneous or livid smooth, together with lf-stalks and dorsal face of lflets strigulose with fine appressed pale hairs up to $0.1\text{--}0.3$ mm, the lf-stalks sometimes charged in addition with scattered thickened trichomes, the thick-textured foliage glaucous concolorous, the racemes axillary to lately expanded lvs on young branchlets, forming an irregular \pm corymbose, usually shortly exerted panicle.

Stipules erect, linear or linear-lanceolate, straight or subfalcate, $2\text{--}7 \times 0.4\text{--}0.6$ mm, the green or purplish blades early dry brunnescent deciduous.

Lvs alternate on vigorous young branchlets and fasciculate on brachyblasts lateral to older ones, $2\text{--}5$ cm; petiole slender, including the moderately swollen pulvinus $(4\text{--})6\text{--}15$ mm, at middle $0.4\text{--}0.6$ mm, terete except for narrow ventral groove; rachis $5\text{--}23$ mm, the longer interfoliolar segments $4\text{--}9$ mm; petiolar gland between proximal pair, slenderly or stoutly stipitate, in profile $1.5\text{--}2.5$ mm, the ovate or lance-fusiform acute head reddish or livid $(0.3\text{--})0.4\text{--}1$ mm diam; pulvinules $0.6\text{--}1.4$ mm; lflets of primary lvs $2\text{--}4$, of brachyblast lvs 2 or 3 pairs, not or a little accrescent distally, the distal pair broadly elliptic or elliptic-obovate obtuse or emarginate $(7\text{--})9\text{--}19\text{--}(20) \times (5\text{--})6\text{--}12$ mm, $1.4\text{--}1.7$ times as long as wide, at base inequilaterally rounded or subcordate, the margin plane, the blade except for dorsally raised midrib often apparently veinless, but $2\text{--}4$ pairs of weakly campodrome secondary venules sometimes faintly prominulous on either face.

Racemes loosely $2\text{--}6\text{--}(9)$ -fld, the expanded fls elevated to or beyond level of buds, the axis including peduncle $1.5\text{--}5\text{--}(6)$ cm; bracts elliptic-oblong cymbiform $1.5\text{--}2.5$ mm caducous; pedicels at full anthesis and afterward $12\text{--}22$ mm; young fl-buds subglobose, puberulent or almost glabrous; sepals submembranous pinkish-fuscos hyaline-margined, not much graduated, all obovate or suborbicular, the outermost $5\text{--}7$ mm, the innermost $6.5\text{--}8.5$ mm; corolla zygomorphic, bright yellow drying yellow brown-veined, the vexillar petal and its 2 neighbors short-clawed $11\text{--}13$ mm, their blades cordate at base and $9\text{--}10$ mm wide, the 2 abaxial petals oblanceolate narrowed to a slender claw, $\pm 13 \times 5\text{--}6$ mm; androecium glabrous, functionally 7-merous, the 3 staminodes $1.4\text{--}1.7$ mm wide, the filaments of 4 median stamens $1.5\text{--}2.5$ mm, of 3 abaxial ones $6.5\text{--}8$ mm, the 7 fertile anthers thin-walled yellowish, those of 4 median stamens oblong nearly straight $3\text{--}3.5 \times 1\text{--}1.2$ mm, those of 3 abaxial ones gently incurved $3.7\text{--}4.3 \times 1\text{--}1.3$ mm, the centric one sometimes a trifle smaller, all anthers at apex obscurely strangulated but not beaked, obliquely truncate, 2-porose; ovary strigulose; style linear-filiform $3\text{--}4.5 \times 0.2$ mm, gently incurved but not or scarcely dilated distally, the stigmatic cavity minute terminal; ovules $7\text{--}10$ (seldom all maturing).

Pod obliquely pendulous, the stipe $5\text{--}8$ mm, the body potentially broadly linear-oblong abruptly obtuse at both ends and $5\text{--}9$ cm long, gently incurved, but frequently following abortion of ovules shorter and variously distorted, at fertile segments becoming $10\text{--}14$ mm diam, laterally compressed but strongly turgid when ripe, bicarinate by the sutures, the papery, dull brown sometimes red-tinged valves delicately venulose toward the margins, inertly dehiscent basipetally through both sutures; seeds obliquely horizontal, compressed parallel to the valves but remaining plump, in profile broadly obovate or suborbicular-flabellate, emarginate distally, $7\text{--}10 \times 6\text{--}9$ mm, the testa smooth but dull, ochraceous-olivaceous, ultimately crackled, the areole oblong or elliptic $1.8\text{--}3 \times 1.2\text{--}2$ mm.—Collections: 18.—Fig. 25.



Fig. 25. *Senna purpusii* (T. Brandg.) I. & B. Habit $\times 1$; detached staminode + stamens $\times 5$; seed $\times 2$ (Spellenberg 3324, fl; Díaz Luna 4154, seed).

Desert flats, washes and canyon terraces, in matorral often incorporating *Idria* and *Pachycormus*, 10–420 m, locally plentiful on the Pacific slope of Baja California between Punta Canoas and Calmallí (lat. 28–29°30'N).—Fl. primarily XII–IV(–VI), and also sporadically following rains.

An ornamental desert shrub, its neat glaucous foliage contrasting happily with the corymbose panicle of golden yellow flowers, *S. purpusii* should be tested for cultivation in dry temperate gardens. The only Baja Californian senna at all similar in habit is *S. polyantha*, found further south on the peninsula; it may be distinguished at anthesis by the more numerous (at least 7, not 2–4) pairs of leaflets and subsequently by the plano-compressed (not turgid), marginally winged pod. *Senna purpusii* is taxonomically as well as geographically isolated, having no obvious relatives elsewhere in Mexico and only somewhat doubtful affinities with such western South American *Pachycarpae* as *S. glaucescens* or *S. mandoni*. Britton & Rose associated it in the genus *Adipera* with our *S. septemtrionalis*, *S. pendula* and their kindred (=our ser. *Coluteoideae*). From these it differs in the relatively few ovules and in the areolate seeds.

- 102. *Senna brongniartii* (Gaudichaud) Irwin & Barneby, comb. nov.** *Cassia brongniartii* Gaudichaud, Voy. Bonite, Bot., Atlas t. 10, 1841 & (auct. d'Alleizette) Explic. Planches 59. 1866.—No locality recorded.—Holotypus, collected by Gaudichaud VII. 1836 (fl, fr) at Cobija, Antofagasta, Chile, P! isotypus, G!

Cassia (?) *misera* Philippi, Florula Atacam. 17. 1860.—“Una cum priori inveni” i.e. “In valle Guanillo prope Paposa [near 25°S lat. in Antofagasta, Chile] ad c. 2500 p. s. m.”—Holotypus, SGO (cf. Muñoz Pizarro, 1960, p. 73), not seen but description decisive and already equated with *C. brongniartii* by I. Johnston, 1929, l.c. infra.—*C. misera* Philippi, Linnaea 33: 60, descr. secus pl cultam perfecta. 1864.—Overlooked by Bentham, 1871.

Cassia conjugata Ruiz & Pavón ex Bentham, Trans. Linn. Soc. London 27: 540. 1871.—“Peru, Ruiz and Pavon in herb. Lambert now British Museum; Cobija, Gaudichaud.”—Holotypus, BM! = NY Neg. 166; the paratype, *Gaudichaud s.n.* = holotypus of *C. brongniartii*, q. v. supra; isotypi (ex hb. Pavon.), FI (hb. Webb.), G, MA (hb. Pavon. 14/14), P!

Cassia misera sensu Reiche, 1897, p. 35.

Cassia brongniartii sensu I. Johnston, Contrib. Gray Herb., new ser. 85: 47, 149. 1929.

Cassia conjugata sensu Macbride, 1943, p. 160.

Small microphyllous, ephemerally green subshrub or shrublet, precociously flowering as a tap-rooted herb but in age developing a twiggy blackish caudex giving rise to incurved-ascending leafy stems, at anthesis 1.5–5 dm becoming wider than tall, appearing glabrous but the smooth terete annotinous branchlets, the axillary buds, the lf-stalks and dorsal face of lflets (or some of them) puberulent with fine appressed or incurved whitish hairs up to 0.3–0.5 mm, the subcarneous lflets bicolored, olivaceous above, darker green beneath, the inflorescence composed of axillary and lateral few-fl'd racemes.

Stipules erect submembranous flaccid subulate or filiform 0.6–2.6 mm caducous.

Lvs mostly 2.5–5 cm (some smaller borne on axillary spurs not further mentioned); lf-stalk 13–33 mm, either longer or shorter than the 1 pair of lflets, at middle 0.4–0.8 mm diam, terete except for very narrow ventral groove; gland between the lflets, stipitate or sessile, in profile 0.6–2 mm tall, the subuliform slenderly fusiform acute body 0.15–0.4 mm diam; pulvinules 0.8–1.6 mm; lflets broadly or narrowly obovate or elliptic-obovate obtuse or obscurely emarginate, sometimes minutely apiculate 11–24 × 5–15 mm, ±1.6–2 times as long as wide, at base inequilaterally rounded or broadly cuneate, the membranous, when fresh orange-tinged margin plane, the blades veinless on upper face, the lower face carinate by the weakly prominulous centric midrib and faintly penniveined with 3–5 pairs of incompletely camptodrome secondary veins.

Racemes loosely 2–3-fl'd, the axis including slender ascending peduncle 1.5–3.5 cm; bracts linear-lanceolate 1.2–2 mm caducous; mature pedicels 10–15 mm; fl-

buds subglobose glabrous; sepals petaloid yellow or brown-tinged, obovate or oblong-obovate, moderately graduated, the outermost 4.5–7 mm, the longest inner one 7–10.5(–12) mm; petals orange-yellow, drying pale yellow brown-veined, all glabrous, the 3 abaxial ones obovate beyond the claw, obtuse or emarginate, the 2 abaxial a little narrower but hardly or not longer, the longest petal 12.5–17 mm; androecium glabrous, functionally 6-merous, the 3 adaxial staminodes either oblong emarginate or obcordate 0.6–1 mm, 1–2 of them sometimes transitional in form to adjoining stamens; filaments of 4 median stamens 2–3.5 mm, of 2 latero-abaxial ones 2.5–4.5 mm, the centric abaxial stamen 0, the anthers of 4 median stamens $3\text{--}4.2 \times 0.8\text{--}1$ mm, of 2 abaxial ones $4.7\text{--}7.5 \times 1.2\text{--}1.5$ mm, very gently and shallowly incurved, all anthers obliquely truncate and dehiscent by short slits separated by a shallow notch; ovary pilosulous; ovules 10–16; style filiform, gently incurved $2.5\text{--}3.3 \times \pm 0.2$ mm.

Pod divaricate from ascending pedicel, the stipe 2.5–3 mm, the linear plano-compressed, nearly always strongly evenly retroarcuate body $3.5\text{--}6 \times 0.75\text{--}0.9$ cm, bicarinate by the sutures, the thinly papery stramineous or purple-tinged valves only slightly elevated over the seeds, remotely strigulose, finely venulose, the interseminal septa membranous narrow, the seed-locules 3–5 mm long, as wide as the cavity; seeds oblong-obovoid or pyriform, a little compressed parallel to the valves but plump, $3.6\text{--}4.7 \times 2\text{--}3.5$ mm, pinched at the hilum, the brown or brownish-olivaceous, dull or sublustrous testa smooth or almost so, the areole circular or elliptic dimple-like $0.5\text{--}0.8 \times 0.4\text{--}0.5$ mm.—Collections: 10.

Arid rocky crests, banks and washes in desert and (n.-ward) in rainy-green loma formation, 100–1100 m, discontinuously dispersed along the Andean foothills and coastal hills from centr. Peru (Lima) to n. Chile (Antofagasta), in lat. $12^{\circ}\text{--}25^{\circ}\text{S}$.—Fl. IV–V, VII–X.

A species readily distinguished from all others in Pacific South America by the bifoliolate leaves and papery pods curved backward in a strong but variable arc. According to Bentham (1871, l.c.), occasional quadrifoliolate leaves occur, but as we have not encountered such in any modern collection of *S. brongniartii*, we believe they must be of a random or freakish nature and accordingly have omitted mention of them in the foregoing description.

The synonymy, worked out by Johnston (1929), is firmly established and requires no comment. It seems probable that Bentham considered *Cassia brongniartii* to be an unpublished name, for he examined the material of it in Paris and perfectly understood its identity. The protologue consists of the plate alone, unaccompanied by descriptive matter other than captions published subsequently; but under Article 44 of the Code the conditions for validity are amply met.

103. *Senna weddelliana* Irwin & Barneby, sp. nov., affinitatis fructu ignoto incertae sed ad aspectu toto *S. lasseignianam* arcte simulans et quoad pube, stipulas aliasque notulas ei vero simillima, sed foliolis lanceolato-acuminatis nec ellipticis, anthera centrica abaxiali cassa necnon ovulis minus numerosis $\pm 15\text{--}18$ (nec 28+), ulteriusque patria procul aliena certe diversa.—BOLIVIA. Cochabamba: Liriumi, 2570 m, III.1946 (fl), *M. Cárdenas* 3636.—Holotypus, US 1564478 = NY Neg. 10597.

Shrubs and slender trees at anthesis 1.5–4 m, the terete brown hornotinous stems, lf-stalks and axes of inflorescence pilosulous with erect or widely ascending yellowish hairs up to 0.35–0.55 mm, the ample thin-textured foliage bicolored, the lfts above dark green puberulent or glabrate, beneath paler and charged with

minute thickened orange trichomes mixed with soft weak hairs, the inflorescence of racemes at first axillary to and surpassed by lvs, these becoming smaller distally and the latest racemes often paniculate and shortly exerted.

Stipules reflexed, thinly herbaceous or submembranous, lanceolate plane $3.5-6 \times 0.7-1.2$ mm, early dry deciduous.

Lvs 7-19 cm; petiole including the wrinkled pulvinus 2.5-6 mm, sometimes reduced to the pulvinus itself, 1-1.5 mm diam; rachis (4-)5-11 cm, bluntly narrow-margined and openly shallowly sulcate ventrally, the longer interfoliolar segments 15-22 mm; glands between proximal only or sometimes also between 1-2 succeeding pairs of lfts, sessile or substipitate, in profile $1-1.6 \times 0.5-0.7$ mm, the body ovoid-acuminate or obpyriform; lfts 4-6 pairs, strongly accrescent distally, all broadly lance-acuminate, the distal pair $4-8 \times 1.1-2.3$ cm, 3.2-4 times as long as wide, at very tip abruptly acute mucronulate, at base cordate or broadly rounded on proximal and rounded or broadly cuneate on distal side, the margin strongly revolute, the centric midrib depressed-sulcate above, cariniform beneath, the $\pm 9-12$ pairs of slender camptodrome with faint random intercalary secondary veins delicately raised beneath only, subsequent venulation immersed.

Racemes densely $\pm 15-35$ -fld, the 2-several simultaneously expanded fls raised to level of the crowded spreading-ascending, densely pilosulous subglobose fl-buds, the axis with peduncle together 5-11 cm; bracts submembranous lance-acuminate $4-8 \times 0.8-2$ mm, early dry, deciduous before or by anthesis; pedicels at anthesis very slender 16-25 mm; sepals obovate subpetaloid, yellowish faintly veined, moderately graduated, the firmer outermost one 3.5-4.5 mm, the largest dorsally glabrescent inner one 5-6.5 mm; petals glabrous orange-yellow drying pale yellow delicately brown-veined, zygomorphic, the vexillary one widest obcordate, the longest 8-12 mm; androecium glabrous, functionally 6-merous, the filaments of 4 median and the centric abaxial stamens 2-2.5 mm, of the 2 long abaxial ones 3.5-4 mm, the anthers brown, those of 4 median stamens straight obliquely truncate $2.7-3.2 \times 0.8-0.9$ mm, of the centric abaxial one sterile $2.5-3 \times 0.4-0.6$ mm, of two long abaxial ones $3.5-4.8 \times 1-1.2$ mm, subhorizontally truncate at apex, 2-porose; ovary rather thinly pilosulous; style glabrous linear $1.8-2 \times 0.2$ mm, incurved from ovary but straight or almost so distally, the stigmatic cavity terminal; ovules (2 counts) 15-18.

Pod and seeds unknown.—Collections: 3.

Moist forested hillsides near 2500-2700 m, apparently local on headwaters of Ríos Beni and Mamoré in Cordillera de Cochabamba, near 17°S, in centr. Bolivia.—Fl. XII-III.

Senna weddelliana has been compared in our diagnosis with *S. (Coluteoideae) lasseigniana*, superficially similar, but is nevertheless provisionally assigned to a different series on account of the low ovule number which in all probability foretells a compressed pod and seeds broadside to the valves appropriate to ser. *Pachycarpae*. Within its range of dispersal it will be readily recognized by the syndrome of ample subsessile leaves, 4-6 pairs of broadly lance-acuminate, marginally revolute leaflets, small brachystylous flower and 15-18-ovulate pistil. Its systematic relationships will not be ascertained until the pod and seed are known. The species is named in memory of Hugh Algernon Weddell, who first collected it on Río Ayopaya in December 1846.

Bxvii. ser. STIPULACEAE Irwin & Barneby

Senna sect. *Chamaefistula* ser. *Stipulaceae* Irwin & Barneby, ser. nov., inter ser. *Coluteoideas* et *Pachycarpas* ambigens, ab illis, seminum testa areola

orbata congruis, ovulis minus numerosis 5–28 (nec (22–)28–152) nec non seminibus parallele leguminis valvulis compressis, ab his, ovulorum numero seminumque attitudinem convenientibus, non nisi seminum testa areola conspicua ornata diversa.—Sp. typica: *S. stipulacea* (Aiton) Irwin & Barneby.

Pod plano-compressed, the interseminal septa very narrow or subobsolete and pulpless, the seeds 1-seriate; broader faces of seed turned toward the valves, their testa exareolate; androecium functionally 6- or 7-merous, the centric abaxial anther either like its neighbors or sterile and shrunken; style always short (1–3.5 mm); ovules 5–28.—Lfts (2–)3–14(–16) pairs; petiolar gland between proximal and often some distal pairs of lfts.—Spp. 7, of both slopes of the Andes from Ecuador s. to n.-w. Argentina and centr. Chile (to 40°S), and of the Atlantic slope in s.-e. Brazil in lat. 20°–26°S.

The small ser. *Stipulaceae* accommodates those chamaefistulas in which the seed-testa, like that of ser. *Coluteoideae*, is unmarked, but which have the relatively few, mostly less than 23 (exceptionally up to 28) ovules (or seeds) of ser. *Pachycarpae* and the seeds themselves, again as in ser. *Pachycarpae*, oriented broadside to the valves. The members of the series known to Bentham were referred in his revision to sect. *Chamaesenna* ser. *Pachycarpae*, a group diagnostically inseparable from his sect. *Chamaefistula* ser. *Corymbosae* (=our *Senna* ser. *Coluteoideae*) except by orientation of the seeds, a character that fails, as we have remarked under ser. *Pachycarpae*, in the systematically troublesome *S. arnottiana*. The segregation of a technically homogeneous and apparently natural ser. *Stipulaceae* permits us to maintain an old and still useful distinction between newly and more rigorously defined series *Coluteoideae* and *Pachycarpae*.

The bicentric dispersal of ser. *Stipulaceae* between the Andes on one hand and the Atlantic escarpment of southeastern Brazil on the other is notable although not without precedent in other groups (e.g. *Myrtaceae*). Lowland Chilean *S. cruckshanksii*, highland Peruvian-Bolivian *S. mandoni*, north Peruvian *S. praeterita* and Brazilian *S. organensis* are closely similar in general aspect and in fine detail, in fact enough so as to make identification of specimens lacking data of origin a difficult task, although these species are adapted to profoundly different ecological regimes within widely disparate floristic provinces. We suppose that a link between them must have existed during a past warm period when a uniform mesophytic flora existed over what is now arid or semi-arid temperate Argentina.

Key to Species of ser. *Stipulaceae*

1. Plants of wet montane habitats on the Atlantic slope of s.-e. Brazil, from Pico de Bandeira in s.-w. Espírito Santo s.-w. to Sa. do Mar in Paraná (lat. ± 20 –26°S).
 2. Pod 6–10 \times 0.8–1.1 cm, the valves prominently reticulate-venulose; known only from Sa. de Caparaó on the Espírito Santo–Minas Gerais boundary; petiole 8–17 mm; petiolar gland 1. 105. *S. pneumatica* (p. 329).
 2. Pod 3–6.5 \times 1.1–1.5(–1.7) cm, the valves imperceptibly venulose; occupying the whole range given, but represented on Sa. de Caparaó only by var. *organensis* which has petioles 15–30 mm and more than 1 petiolar gland. 104. *S. organensis* (p. 326).
1. Plants of the Andes and Pacific coast ranges from n.-w. Argentina and centr. Chile to Bolivia and Ecuador.
 3. Stipules foliaceous mostly 4–10 mm wide; bracts rhombic-elliptic 2–5 mm wide; lfts mostly broadest below middle; Chile. 109. *S. stipulacea* (p. 334).
 3. Stipules sublinear 0.3–1.5 mm wide; bracts not over 1 mm wide; lfts mostly broadest at or above middle, obviously so if Chilean.

4. Lfts 3–5 pairs.
5. Ovules 9–11; coast range of centr. Chile, near 500 m or lower. Style ± 1.8 –2.2 mm, gently or scarcely incurved. 106. *S. cruckshanksii* (p. 330).
5. Ovules 12–25; e. slope of Peruvian and Bolivian Andes.
6. Style 2.5–3 mm, at apex abruptly incurved through at least 300°; longest petal 9.5–14.5 mm; s.-e Peru (s.-ward from near 13°S in Cuzco) and Bolivia, at ± 1600 –2650 m. 107. *S. mandoni* (p. 331).
6. Style 1.2–1.5 mm, gently incurved through less than 45°; longest petal ± 7.5 mm; n. Peru (Amazonas, near 6°S), probably well below 1000 m. 108. *S. praeterita* (p. 333).
4. Lfts 6–14(–16) pairs; widespread and polymorphic Andean and sub-Andean sp. ranging from n.-w. Argentina and extreme n. Chile to Ecuador. 110. *S. birostris* (p. 337).

104. *Senna organensis* (Harms) Irwin & Barneby, comb. nov. *Cassia organensis* Glaziou ex Harms, Feddes Repert. Sp. Nov. 24: 123. 1924.—Typus infra sub var. *organensi* indicatur.

Shrubs of rounded outline, some arborescent in age, at anthesis 0.7–3 m, with brown or pallid subterete, sometimes striped or lenticellate branchlets naked after first season but densely leafy distally, these and lf-stalks thinly subappressed-pilosulous or more densely hirsutulous with pallid or lutescent hairs up to ± 0.2 –0.55 mm, the foliage bicolored, the lfts either dull or lustrous olivaceous above, paler and sometimes glaucescent beneath, ciliolate or not but facially glabrous except for a tuft of hairs sometimes present in proximal angle of midrib beneath, the racemes all axillary to distal lvs, the subcorymbose fls immersed in foliage or shortly exserted.

Stipules subfoliaceous erect, straight or incipiently falcate, in outline oblanceolate attenuate downward and sometimes acuminate distally, (5–)6–15 \times 0.7–6(–7) mm, tardily deciduous.

Lvs (4–)5–11.5 cm; petiole including dilated pulvinus 0.6–3.5 cm, rounded dorsally, narrowly sulcate ventrally; rachis (1.2–)2–6 cm; pulvinules 1–2.2 mm; glands between proximal or between all pairs of lfts, shortly stipitate, in profile 0.8–2 mm, the obovoid or ellipsoid obtuse or acute body 0.3–0.8 mm diam; lfts 3–8 pairs, accrescent upward, in outline broadly obovate, oblong-obovate, -oblanceolate or broadly oblong-elliptic, obtuse or emarginate, the distal pair (13–)18–44(–45) \times (7–)9–22 mm, 1.8–2.5 times as long as wide, at base broadly cuneate to rounded or cordate on proximal side, narrower on distal one, the straight centric midrib with 5–8 pairs of camptodrome secondary veins either prominulous or immersed, the tertiary venulation sometimes prominulous and reticulate on one or both faces.

Peduncles 2.5–5.5 cm; racemes at first densely (5–)10–35-fl'd, the axis becoming (0.6–)1–4.5(–6) cm, the expanded fls raised \pm to level of unopened buds; bracts resembling stipules in shape and texture (3–)4–8 \times (0.8–)1–2.2 mm, persistent into full anthesis; pedicels 12–28 mm; fl-buds globose, the sepals glabrous except for sometimes minutely ciliolate margins; sepals except for pallid membranous margins firm brownish or red-speckled, little graduated, all broadly obovate-suborbicular, the inner ones ± 4.5 –6.5 mm; petals glabrous yellow, when dry paler and arborescently brown-veined, subhomomorphic except the banner slightly longer or wider (or both) and the abaxial pair a trifle more oblique, all obovate-cuneate or -flabellate obtuse or emarginate, the longest 7–12 mm; androecium glabrous, the filaments of 4 median stamens ± 2 –2.5 mm, of 3 abaxial ones 2–5.5 mm, the anthers (when dry dark brown) of 4 median stamens oblong almost straight 2–4.5 mm, of 3 (or 2) abaxial ones gently incurved 3.2–6.5(–7) mm, all abruptly contracted and truncate at apex, shortly bluntly sagittate at base; ovary

glabrous or strigulose, the style 1–2 mm, not dilated and only 0.2–0.3 mm diam immediately beneath stigma; ovules (6–)8–14.

Pod (of vars. *organensis* and *extratropica*, otherwise unknown) spreading at random angles or declined, the stipe 1.5–4 mm, the oblong almost straight plano-compressed body (3–)3.5–6.5 × 1.1–1.5(–1.7) cm, prominently margined by sutures, the purplish-brown, finally papery valves scarcely raised over seeds, the intraseminal septa very narrow, 4–5 mm apart; seeds oblong-obovate compressed 6–7.5 × 4–4.5 mm, the testa atrocastaneous lustrous, a large shadowy spot but not truly differentiated areole on either face.

This neatly ornamental even though small-flowered senna resembles Andean *S. mandoni* in foliage and pod but differs in the longer stipules and bracts, the more abruptly truncate anthers and especially in the shorter style not hooked at apex. Chilean *S. cruckshanksii*, although distantly allopatric in the coastal cordillera of central Chile, is too closely similar to be other than a close genetic relative which we can distinguish only by the narrower stipules and floral bracts and a more slender style, weak and perhaps not specifically adequate characters. For comment on two related sennas sympatric with *S. organensis* var. *organensis* in Espírito Santo and Rio de Janeiro see our accounts of *S. pneumatica* and *S. itatiaiae*. The habitally similar and partly sympatric *S.* (ser. *Corymbosae*) *oblongifolia* is distinguished at anthesis by the infrafoliolar petiolar gland of most leaves and at least 32 (not 6–14) ovules, and later on by the narrower tumid pod and unmarked seeds turned broadside to the septa.

The known populations of *S. organensis* as defined in the foregoing description are heteromorphic in number of leaf-stalk glands, in number, texture and venulation of the leaflets, and sometimes further in proportion of the abaxial stamens, but all retain a common facies, a characteristic perianth and, so far as known, a characteristically short but broad, plano-compressed pod of papery texture. Two variants emerge as clearly defined geographic varieties, a var. *organensis* in Rio de Janeiro and adjoining Minas Gerais and Espírito Santo which is replaced on Serra do Mar in Paraná by var. *extratropica*. With these relatively well documented entities we associate, under the provisional title of var. *heterandra* and var. *friburgensis*, two peculiar sennas from within the range of var. *organensis*. The pod of neither is known and their taxonomic status will require reappraisal as and when new data permit.

Key to the Varieties of *S. organensis*

1. Filaments of 3 abaxial stamens 2–3 mm and their anthers ±3–4 mm long; range of the species.
 2. Lfts 4–8 pairs; gland between proximal and some distal pairs of lfts; venulation of upper face of lfts immersed or very faintly raised; ovary strigulose; Rio de Janeiro and adjacent Minas Gerais–Espírito Santo. 104a. var. *organensis* (p. 328).
 2. Lfts 3–5 pairs; gland between proximal pair only; venulation of both faces prominulous, at least in mature blades; ovary glabrous; e. Paraná. 104c. var. *extratropica* (p. 328).
1. Filaments of 2 or 3 abaxial stamens 4.5–5.5 mm, their anthers 5–7 mm long; local on Sas. da Mantiqueira and dos Orgãos in Rio de Janeiro.
 3. All 3 abaxial stamens elongate and subisomorphic, fertile; gland between proximal pair of lfts only or between proximal and 1–2 penultimate pairs; lfts relatively thin-textured, the distal pair oblanceolate ±10–13 mm wide; Sa. da Mantiqueira, especially on Mt. Itatiaia. 104b. var. *heterandra* (p. 328).
 3. Two antepetalous abaxial stamens elongate and fertile, the centric one between them much smaller and sterile; glands between all but distal pair of lfts; lfts notably coriaceous, the blade of the distal pair oblong-obovate 13–22 mm wide; Sa. dos Orgãos. 104d. var. *friburgensis* (p. 329).

- 104a.** *Senna organensis* (Harms) Irwin & Barneby var. **organensis**. *Cassia organensis* Glaziou ex Harms, 1924, l.c., sens. str.—“Brasilien: Rio de Janeiro, Serra dos Orgaos (Glaziou n. 3942).”—Holotypus, †B = F Neg. 1721; neoholotypus, *Glaziou* 3942, P!—*Cassia organensis* Glaziou, Bull. Soc. Bot. Fr. **53**, Mém. **3**: 167. 1906, nom. nud.

Glands between all pairs of lfts; lfts 4–8 pairs, the distal pair 12–30 mm, the margin revolute; upper face of lfts simply penniveined or almost veinless, reticulation obscure or 0; filaments of 3 abaxial stamens 2–2.7 mm, the anthers 3.2–4 mm; ovary strigulose; style ± 1 mm.—Collections: 10.

Open rocky places in cool woodland or montane campo, 1200–2600 m, local on the Atlantic slope of s.-e. Brazil, from Sa. de Caparaó on the Minas Gerais–Espírito Santo border s.-e. to Sa. dos Orgãos in Rio de Janeiro.—Fl. I–IV.

- 104b.** *Senna organensis* (Harms) var. **heterandra** Irwin & Barneby, var. nov., quoad folia cum var. *organensi* congrua sed ab ea staminibus fertilibus eximie dimorphis, abaxialibus tribus mediana simul longe superantibus ac iis longioribus, antheris suis 5–7 (nec 3.2–4) mm longis diversa.—BRAZIL. Rio de Janeiro (?): Baum in Wäldchen, 1800 m, 2.I.1896 (fl), *Ule* 3708.—Holotypus, HBG = NY Neg. 9686.

Lvs of var. *organensis*, but a gland between proximal pair of lfts only; stamens strongly heteromorphic, the filaments of 4 median stamens ± 2.5 mm, of 3 abaxial ones 4.5–5.5 mm, the anthers of 4 median stamens 3.8–4.5 mm, of 3 abaxial ones 5–7 mm.—Collections: 3.

Woodland at 1800 m, known certainly only from Mt. Itatiaia in w. Rio de Janeiro.

The typus and two other known collections of var. *heterandra* are in flower only, but resemble var. *organensis* at so many points that we have little doubt as to their affinity. For the present the more highly differentiated androecium appears adequately distinctive.

- 104c.** *Senna organensis* (Harms) var. **extratropica** Irwin & Barneby, var. nov., a var. *Jorganensi* foliolis minus numerosis 3–5 (nec 4–8)-jugis utrinque reticulatis, glandula singula inter imum foliolorum par ovarioque glabro, ulterius ab aliis speciei varietatibus omnibus patria procul remota diversa.—BRAZIL. Paraná: matinha nebular, 1700 m, Sa. Ibitiraquire (Abrigo 1), mun. Campina Grande, 22.I.1970 (fl), *G. Hatschbach* 23394.—Holotypus, MBM; isotypi, NY, US.—Sa. Marumbi, Pico Gigante, mun. Morretes, 2.II.1947 (fl) & 11.V.1947 (fr), *O. Curial* 724.—Paratypes, NY, US.

Gland between proximal pair of lfts only; lfts 3–5 pairs, the distal pair 1.8–3.5 cm, the margin revolute; both faces of lfts loosely reticulate, the tertiary veinlets prominent; androecium of var. *organensis*; gynoecium glabrous.—Collections: 6.

Subalpine campo and margins of cloud forest, 1150–1700 m, on and e. of the crest of Sa. do Mar in mun. Campina Grande, Morretes and Guaratuba, Paraná.—Fl. IX–II.

This variety, fully disjunct from the rest of the species, is distinguished from var. *organensis*, of which it has essentially the flower and fruit, by the combi-

nation of relatively few, reticulate leaflets, a solitary petiolar gland, and glabrous ovary.

- 104d. *Senna organensis* (Harms) var. *friburgensis* Irwin & Barneby, var. nov., a var. *heterandra*, quacum filamentis abaxialibus antepetalis elongatis (± 5.5 mm longis) congruit, glandulis inter omnia nisi ultimum foliolorum paria, foliolis coriaceis latis (ultimo cujusque folii 13–22 nec 10–13 mm lato) necnon stamine abaxiali centrico sterili certe diversa, a sympatrica var. *organensi* androecii forma et magnitudine, foliolorum textura stipulisque oblanceolatis 2–7 mm latis distantior.—BRAZIL. Rio de Janeiro: Felsen der Pedra do Conico bei Neufreiburg [=Novo Friburgo], 14.IV.1895 (fl), *E. Ule* 3670, HBG = NY Neg. 9687.**

Petioles stout 0.6–2.5 cm; glands between all pairs of lflets; stipules oblanceolate 10–15 \times 2–7 mm; lflets 4–5 pairs accrescent upward, coriaceous, ventrally glossy, pallid dorsally, reticulate on both faces, the basally semicordate plane-margined blades up to 26–50 \times 13–22 mm; fl and strigulose ovary of var. *heterandra*, but the centric abaxial (antesepalous) stamen much smaller than its 2 neighbors, sterile.—Collections: 2.

Cliffs of the Organ Mountains, probably on the higher treeless morros, known only from Novo Friburgo and Teresópolis, Rio de Janeiro.—Fl. II–IV.

This remarkable plant seems clearly related to *S. organensis* sens. lat. but differs in the heteromorphic stamens and strongly graduated plane-margined leaflets at once coriaceous in texture and reticulate on both faces. The constancy and significance of the differential characters listed in our key to varieties need confirmation from new collections, and the status of the variety is contingent on the morphology of the as yet unknown pod and seeds.

- 105. *Senna pneumatica* Irwin & Barneby, sp. nov., ut videtur *S. organensi* (Harms) proxime affinis, imprimis ab ea leguminis longioris pro rata angustioris 6–10 \times 0.8–1.1 (nec 3–6.5 \times 1.1–1.7) cm valvulis elevatim reticulatis necnon seminibus opacis ad hilum corneis, ulterius a var. *organensi* (in monte Caparaó subsympatrica) glandula petiolari solitaria (nec inter omnia paria) petiolisque brevioribus 0.8–1.7 (nec 1.5–3) cm longis diversa.—MINAS GERAIS/ESPIRITO SANTO: Sa. do Caparaó, 2200 m, 30.IX.1941 (fl, fr), *A. C. Brade* 17052.—Holotypus, RB 45970; isotypus, NY.**

Slender erect shrubs ± 1 m, the angulately ribbed stems naked after 1 season, densely leafy and paniculately branched distally, the lf-stalks and margins of lflets thinly subappressed-pilosulous with mostly straight lustrous hairs up to 0.3–0.6 mm, the foliage subbicolored, the (dry) lflets brownish-green, a little paler beneath, the few-fl'd axillary racemes immersed in lvs.

Stipules thinly herbaceous, early dry caducous, lance-acuminate or ovate-elliptic acute ± 5 –7 \times 1.2–3.5 mm.

Lvs 3–6.5 cm; petiole including livid pulvinus 8–17 mm, at middle 0.4–0.6 mm diam, shallowly sulcate; rachis 1.5–3.5 cm; gland between proximal pair stipitate, in profile 1.5–3 mm tall, the ovoid-acuminate body 0.5–0.9 mm diam, commonly sigmoidally incurved; pulvinules 0.8–1.2 mm; lflets 5–9 pairs, a trifle accrescent upward, broadly oblanceolate or oblong-obovate obtuse, minutely mucronulate

(6–)10–16 \times (2.5–)3–5.5 mm, 2.4–3 times as long as wide, at slightly asymmetric base cuneate or rounded on both sides, the margin plane, the centric midrib immersed above, carinate beneath, the (4–)5–7 pairs of camptodrome secondary veins visible only beneath, there discolored but not prominulous.

Peduncles 2–2.5 cm; racemes \pm 2–12-fl'd, the axis \pm 0.5–2 cm; bracts (caducous, little known) resembling stipules in shape and size; pedicels (4–)8–18 mm; fl-buds plumply oblong-obovoid glabrous; sepals livid except for pallid membranous margins, broadly elliptic obtuse, little graduated, the inner ones \pm 4.5–5.5 mm; petals glabrous, yellow fading pale with dark venation, of subequal length, the banner cuneately flabellate, the rest broadly oblanceolate or obovate beyond the claw, the longest \pm 7.5–8.5 mm; androecium glabrous, the filaments of 4 median stamens 1.5–2 mm, of 3 abaxial ones \pm 3 mm, the anthers of 4 median stamens nearly straight 2.6–3.2 mm, of 3 abaxial ones slightly incurved 3.7–4 mm, all abruptly truncate at apex; ovary loosely pilosulous; style dilated, at apex \pm 0.2 mm diam; ovules \pm 10.

Pod obliquely ascending, the stipe 4–5 mm, the narrowly oblong body (4.5–)6–10 \times 0.8–1.1 cm, plano-compressed, keeled by the slender cordlike sutures, the chartaceous brown valves scarcely elevated over seeds, sharply transversely venulose-reticulate, the intraseminal septa 0.2–0.4 mm wide, 4–7 mm apart; seeds compressed-obovoid or oblong-obovoid \pm 6.5–7.2 \times 3.4–4 mm, the testa dull castaneous, corneously thickened around hilum, exareolate.—Collection: 1.

Habitat not recorded, to be expected in stony campo or about outcrops near 2200 m, known only from upper slopes of Sa. do Caparaó on the Minas Gerais–Espírito Santo boundary.—Fl. IX–X(–?).

This still poorly known senna is certainly related to *S. organensis*, which it resembles in habit, form of stipule, foliage, perianth and androecium, at the same time differing, so far as we can tell at present, in the absolutely and proportionately longer, sharply reticulate-venulose pod and in the dull seed-testa corneously thickened around the hilum. It is more easily and directly separable from var. *organensis*, which occurs at the same elevations on Sa. do Caparaó, in the single gland on the leaf-stalk and in the plane-margined leaflets. However solitary glands and plane leaflet-margins are encountered in some distantly allopatric varieties of *S. organensis* sens. lat. and we depend for specific distinctions on the pod and seed.

- 106. *Senna cruckshanksii* (Hooker) Irwin & Barneby, comb. nov. *Cassia cruckshanksii* Hooker & Arnott ex Hooker, Bot. Miscell. 3(2): 210. 1829.—“Valparaiso, Bridges; Mr. Cruckshanks . . . raised from seeds sent to the Edinburgh Botanical Garden by Mr. Cruckshanks . . .”—Holotypus not found at E, GL, or K, perhaps none preserved, but the protologue decisive.**

Cassia stipulacea var. (β) *tenuistipula* Bertero ex Vogel, Syn. Gen. Cass. 29. 1837.—“[Bertero] n. 895! Unio it[ineraria] pl. exsicc.”—Holotypus, collected near Quillota, prov. Valparaiso, IX–X. 1829 (fl), Hb. Lucae (KIEL, non vis.); isotypi, BM, K, NY!

Cassia campanae Philippi, Anal. Univ. Chile 84: 439. 1893.—“In celeberrimo monte Campana de Quillota . . . invenit orn. Augustus Borchers.”—Holotypus to be sought at SGO; isotypus, dated 15.XI.1884 (fl), BM! = NY Neg. 10540.—*C. confusa* var. *campanae* (Philippi) Reiche, Anal. Univ. Chile 98: 302 & Fl. Chile 2: 39. 1897.

Cassia cruckshanksii sensu Clos in Gay, 1854, p. 242; Bentham, 1871, p. 539 (“*Cruikshanksii*”).

Closely resembling *S. stipulacea* in habit, fl and pod, the foliage however,

varying from dark olivaceous to notably glaucous, the pubescence inconspicuous, the lfts glabrous facially and sometimes also marginally.

Stipules submembranous linear-ligulate or -attenuate $4-10 \times 0.3-1.5$ mm, caducous.

Lvs 6–13 cm; petiole slender, (0.4–)0.6–1 mm diam; rachis 2.5–6.5 cm; glands between proximal pair only or between lower 2–3 pairs, $1.5-3.3 \times 0.4-0.6$ mm; lfts (3–)4–5 pairs, in outline oblong or obovate obtuse or emarginate $14-43 \times 8-20$ mm, 2–3 times as long as wide, when relatively broad becoming inequilateral at base, the slender midrib immersed (but not depressed-sulcate), giving rise to 6–8 pairs of fine camptodrome secondary veins, these immersed or faintly prominent above, discolored but not raised beneath.

Inflorescence and individual fl of *S. stipulacea* except for narrow deciduous bracts, these subulate or lanceolate $1.5-4.5 \times 0.4-0.9$ mm; pedicels 14–29 mm; sepals 4.5–6.5 mm; longer petals 8–10.5 mm; androecium of *S. stipulacea* var. *anglorum*; ovary thinly strigulose or glabrous; style $1.8-2.2 \times 0.15-0.2$ mm, incurved at apex; ovules 9–11.

Stipe of (little known) pod 4.5–5 mm, the plano-compressed body $\pm 5-6 \times 1.4-1.6$ cm, the papery, transversely venulose valves shallowly expressed over seeds, the septa subobsolete; seeds (not seen fully ripe) apparently like those of *S. stipulacea*.—Collections: 7.

Wooded hillsides near 500 m, apparently local in the coast range of centr. Chile, in the states of Aconcagua (precise locality not recorded) and Valparaíso (Quillota; Limache; Cerro Campana).—Fl. IX–XII.

The scanty material that has contributed to our description of *S. cruckshanksii* is variable in amplitude and coloration of the foliage and consequently heterogeneous in superficial aspect. The type-series of *Cassia stipulacea* var. *tenuistipula* has mostly oblong leaflets, dark olive green above; Meyer 9703 has broadly obovate glaucous leaflets; and an isotypus of *C. campanae* has leaflets of intermediate size and shape, colored as those of var. *tenuistipula*. As all these originated on or near the foothills of Cerro Campana and have identically similar flower and stipules, we cannot doubt that the differences in foliage are due to site, exposure, or season. If our definition of the species is correct, *S. cruckshanksii* emerges as very closely related to *S. stipulacea*, a kinship expressed in an essential likeness of flowers, pods and seeds; but differs conspicuously in the narrow stipules and floral bracts and in the prevailing oblong-obovate rather than ovate-lanceolate outline of the leaflets. In the pod, except that the stipe (as known from only one collection) is longer, and in ovule number *S. cruckshanksii* does not differ from vicariant *S. stipulacea* var. *anglorum*; but the faint penninerved venation of the leaflets is more like that of more distantly allopatric var. *stipulacea*.

107. *Senna mandoni* (Bentham) Irwin & Barneby, comb. nov. *Cassia mandoni* Bentham, Trans. Linn. Soc. London 27: 540. 1871.—“Bolivia near Sorata, prov. Larecaja, Mandon, n. 751bis.”—Lectoholotypus, collected in valley of R. Challasuyo, VIII–IX.1858 (fl, fr), BM! isotypi, K (hb. Hook., fl absque fr) = NY Neg. 1560, P!

Cassia subelliptica Rusby, Bull. N.Y. Bot. Gard. 8: 94. 1912.—“[Bolivia:] Sorata, 7500 ft., Sept. 1, 1901 ([R. S. Williams] No. 2383).”—Holotypus, NY! isotypi, BM, K!

Cassia cookii Killip & Macbride ex Macbride, Field Mus., Bot. 13(Fl. Peru), pt. 3(1): 160. 1943.—“Cuzco: San Miguel, Urubamba Valley, Cook & Gilbert 1747 . . .”—Holotypus, US! classtypus (fragm), F!

Shrubs 2–3 m with gray or castaneous striate or finely canaliculate older branches, glabrous throughout or the pulvinules and dorsal face of lfts and some axes of inflorescence charged with fine or random subappressed-incurved hairs to 0.3–0.7 mm and the ovary often thinly pilosulous, the foliage strongly bicolored, the firmly membranous lfts dull dark green above, pallid and often glaucescent beneath, the racemes mostly subtended by fully developed lvs and at first lateral immersed, at length becoming \pm paniculate, the panicle sometimes shortly exerted.

Stipules erect or spreading, thinly herbaceous, symmetrically linear-lanceolate or lance-acuminate plane $3.5\text{--}6 \times 0.7\text{--}1.7$ mm, early deciduous.

Lvs at least sometimes heteromorphic, those of vigorous main stems (lacking from most spms) longer and ampler than the rest, those of flowering branchlets mostly 4–14 (the lower up to 22) cm; petiole including strongly wrinkled pulvinus (1.7–)2–4.5(–5.5) cm, at middle 0.6–1.1(–1.9) mm diam, narrowly grooved ventrally; rachis 0.7–4(–5.5) cm; pulvinules 0.9–2.2(–2.5) mm; glands (often eaten) between all pairs or all but the distal pair stipitate or sessile, in profile 1.4–3.5 mm tall, the fusiform acute or obtuse head 0.4–0.8 mm diam; lfts (2–)3–5 pairs, accrescent distally, elliptic-oblong, elliptic or obovate, obtuse mucronulate or minutely emarginate, the distal pair mostly (1.8–)2–6 \times (0.7–)0.8–1.7 (or in some lower lvs up to 1.5–3.8) cm, 2–4.2(–4.5) times as long as wide, all at base rounded or semicordate on proximal and cuneate on distal side, the often discolored margin plane (incipiently revolute if dried when young), the venation of upper face immersed, the straight midrib cariniform beneath, there giving rise to 6–10(–13) pairs of fine, weakly prominulous or fully immersed but discolored secondary venules, subsequent venulation 0.

Racemes loosely 8–35(–60)-fld, the nodding buds usually elevated a little above level of open fls, the axis together with short peduncle becoming (2.5–)4–17 cm; bracts resembling stipules in texture, lanceolate or narrowly lance-ovate $2.5\text{--}5 \times 0.4\text{--}1$ mm, caducous; mature pedicels 13–33 mm; young fl-buds plumply obovoid glabrous; sepals submembranous fuscous-purplish with narrow hyaline margin, obovate or oblong-obovate obtuse, not much graduated, the 2 outer ones 4–6 mm, the longest inner one 6.5–8 mm; petals yellow drying brownish-yellow, delicately dark-veined, glabrous, the vexillary one broadest obovate-flabellate emarginate, the rest oblong-obovate obtuse, the longest 9.5–14.5 mm; androecium glabrous, the 3 staminodes dilated paddle-shaped, the filaments of 4 median stamens 1–1.6 mm, of 2 latero-abaxial ones dilated (3.5–)4–7.5 mm, of the centric abaxial one 1.3–3 mm, the anthers of 4 median stamens 3.2–4.5 mm, of 2 latero-abaxial ones $4.7\text{--}6.5 \times 1.3\text{--}1.6$ mm, of the centric abaxial one depauperate $3.3\text{--}4.5 \times 0.6\text{--}0.8$ mm, all obliquely truncate, the orifice a little produced into a narrow apron, the orifice divided by slender septum; ovary thinly pilosulous proximally or subglabrous; style 2.5–3 mm, abruptly incurved at tip through at least 300°, not or scarcely dilated, at apex 0.2–0.3 mm diam, the orifice terminal glabrous; ovules 12–25.

Pod obliquely pendulous, the stipe 3.5–5 mm, the narrowly oblong plano-compressed body $3.5\text{--}8 \times 1.2\text{--}1.6$ cm, bicarinate ventrally, simply carinate dorsally, the papery brownish, delicately venulose valves only slightly raised over the seeds, the seed-locules 3–4.5 mm long; seeds (little known) obovoid, $4.4\text{--}6.3 \times 2.5\text{--}3.9$ mm, plump or moderately compressed parallel to the valves, obscurely pinched at hilum, the testa brown lustrous, either smooth or coarsely pitted, exareolate.—Collections: 11.

Rocky hillsides and thickets along streams, 1600–2800 m, apparently local and

seldom collected, e. scarp of the Bolivian altiplano on the sources of ríos Beni and Mamoré in La Paz (prov. Larecaja), Cochabamba (head of río Ayopaya) and Santa Cruz (prov. Valle), Bolivia, n. to the upper Urubamba valley in Cuzco, Peru.—Fl. V–XI.

A senna notable for the relatively few, dorsally glaucescent leaflets and glands between all or all but the distal pair. In these features it differs from vicariant or sympatric forms of *S. birostris* or from *S. aymara*, both of which have or can have similar perianths and androecia, but a less abruptly incurved style. The perhaps related *S.* (ser. *Coluteoideae*) *cajamarcae*, distantly allopatric in northern Peru, adjoining Ecuador, and western Panama, has similar foliage but broad floral bracts and a narrower, strongly turgid, pluriovulate pod. *Senna mandoni* is presently known from four small and well separated areas, three in Bolivia and one in Cuzco, Peru; whether it occurs in intermediate stations remains to be seen. The Peruvian populations (*C. cookii*) have relatively small leaflets pubescent dorsally, in this but apparently in no other respect differing from the Bolivian ones. The plants from Sorata (including typi of *S. mandoni* and *S. subelliptica*) have slightly larger flowers and more heteromorphic leaves than those from Santa Cruz. The seeds of the latter are plump and smooth, while those of the Sorata plant are unknown unless *Bang* 1985 (NY, sine loc.) is from that region. The seed of *Bang* 1985 has a deeply and densely pitted testa, the significance of which, if any, cannot be evaluated at present.

A poor specimen in young flower from Siberia, Cochabamba (*Cárdenas* 5574, K) is suggestive of *S. mandoni* in habit and coloration of foliage, but differs in the deltately subacute leaflets yellowish-strigulose along the midrib dorsally and minutely ciliolate. Its identity remains doubtful.

108. ***Senna praeterita*** Irwin & Barneby, sp. nov., *S. mandoni* et *S. cruckshanksii* ut videtur affinis, ab illa, quoad folia, antherarum formam ovulorumque numerum congrua, praesertim floribus minoribus (petalo maximo ± 7.5 nec 9.5–14 mm longo) styloque abbreviato vix incurvo (nec hamato), ab hac foliolis exacte 3 (nec 4–5)-jugis margine tenui planis, antheris breviter infra apicem constrictis necnon ovulis ± 16 (nec 9–11), ulterius ab ambabus patria distantissima certe diversa.—PERU: Amazonas: Sesuya, Chachapoyas, anno 1840, *Andrew Mathews* 3276.—Holotypus, K (hb. Hook.) = NY Neg. 10631; isotypus, BM.

Shrubs of unknown stature, with terete striate, at length purplish and fissured hornotinous branchlets, except for rudimentary puberulence of stem and pulvinules and for sparingly ciliolate bracts glabrous throughout, the foliage bicolored, the lfts dull green above, pallid glaucescent beneath, the inflorescence a terminal subcorymbose, shortly exserted panicle of racemes.

Stipules linear-lanceolate $\pm 4\text{--}6 \times 0.5\text{--}0.7$ mm, caducous.

Lvs 6–9.5 cm; petiole including dilated pulvinus 1.8–3 cm, narrowly sulcate ventrally; rachis 2–3 cm; gland between the proximal and sometimes also the second pair of lfts, including its short stipe 2–2.6 mm tall, the narrowly oblong-ellipsoid body 0.4–0.7 mm diam; lfts exactly 3 pairs, strongly accrescent distally, the distal pair broadly elliptic emarginate $2.7\text{--}4.2 \times 1.2\text{--}2.1$ cm, 1.8–2.3 times as long as wide, at very oblique base semicordate on proximal and cuneate on distal side, the membranous margin plane, the slender centric midrib immersed above, finely prominulous beneath, the 7–9 pairs of secondary veins either weakly raised or immersed and discolored, tertiary venulation imperceptible.

Peduncles from distal axils 3.5–5 cm; racemes loosely 6–18-fld, the expanded

fls raised to level of nodding glabrous globose buds, the axis by late anthesis $\pm 1-3$ cm; bracts submembranous, narrowly lanceolate $3.5-5 \times 0.5-0.8$ mm, persistent into anthesis, then deciduous; pedicels (fertile) becoming ± 2 cm; sepals submembranous, fuscous broadly pallid-margined, moderately graduated, the outermost ovate $\pm 3.5-4.5$ mm, the innermost obovate $\pm 5-6$ mm; corolla zygomorphic, the petals glabrous, yellow drying whitish dark-veined, all obovate or the vexillary one obcordate, of subequal length, ± 7.5 mm; androecium glabrous, the obtusely quadrate staminodes $1-1.4$ mm diam, the filaments of 4 median stamens $1.2-1.5$ mm, of 2 exterior abaxial ones 2.5 mm, of the centric abaxial one ± 2 mm, the anthers brown, the 4 median $3-3.3 \times 0.9-1$ mm, little incurved, the 3 abaxial lunately incurved $4.5-5.5 \times 1.1-1.2$ mm, all gently constricted 0.5 mm below apex and thence a trifle expanded into the subhorizontally truncate orifice, this divided by a slender septum; ovary glabrous; style slightly incurved, $1.2-1.5 \times 0.15-0.2$ mm, the minute stigmatic orifice looking upward; ovules 16.—Collection: 1.

Habitat not recorded, to be expected in thickets or woodland margins, known only from the type-locality in Amazonas, Peru.—Season of bloom unknown.

The type-collection of *S. praeterita* was examined by Benthams who passed it over with the remark, in annotation, that it resembled *Cassia bicapsularis* but differed in its bracts and in its small flowers. It was incautiously reidentified by a recent student as *C. pendula* var. *pendula*. The low ovule-number, 16 in one flower examined, prefigures a plano-compressed pod of a type seen in the habitually similar *S. mandoni*, and is incompatible with any close kindred of *S. bicapsularis* or *S. pendula*. We suppose *S. praeterita* to be related to *S. mandoni*, from which it differs (at anthesis) in the smaller flower and especially in the short, very slightly incurved and not distally hooked style. At anthesis *S. praeterita* is suggestive of *S. cruckshanksii*, but the strictly plane leaflets, apparently stabilized at exactly three pairs, the apically constricted anthers and the rather more numerous (16, not 9–11) ovules are differential characters which we confidently expect will be reinforced by comparison of the pods. The fundamentally different dispersal and (presumably) ecology of *S. praeterita*, on a source of the Amazon in equatorial latitudes (near 6°S), and *S. cruckshanksii*, in the Mediterranean climate of central Chile, preclude any chance of them proving conspecific.

109. *Senna stipulacea* (Aiton) Irwin & Barneby, comb. nov. *Cassia stipulacea* Aiton, Hort. Kew. 2: 52. 1789.—Typus sub. var. *stipulacea* infra indicatur.

Cassia opaca N. Graham, Edinburgh New Philosoph. J. 4: 173. 1828.—“We received a plant from Raith this season, it having been raised by Mr. Ferguson’s Gardener from South American seeds, communicated by Professor Leslie in 1825.”—No typus seen, but the description, especially of the stipules, strongly suggesting *S. stipulacea* sens. lat., the precise variety indeterminable.—Equated with *C. stipulacea* by Benthams, 1871, p. 538, who cited the name ex Vogel (1837, p. 42), having been misled by Vogel’s erroneous reference to vol. 2 (not 4) of the Edinburgh Journal into thinking *C. opaca* unpublished by Graham.

Amplly leafy shrubs of bushy habit, at anthesis $1-3.5$ m, the young stems, lf-stalks and axes of inflorescence remotely, sparsely, or sometimes densely pilosulous with pale lustrous spreading or procumbent hairs to $\pm 0.3-0.9$ mm, the malodorous foliage either membranous dark green or firmer and pallidly olivaceous, the lflets bicolored, paler beneath, their revolute margins ciliolate but their faces either both glabrous or the ventral one puberulent along the depressed midrib and the dorsal one sometimes remotely pilosulous, the racemes axillary

to and shorter than developed lvs, all lateral or finally crowded into a small leafy-bracteate panicle.

Stipules erect foliaceous, resembling lfts in texture and venation, in outline rhombic, ovate- or obovate-cuneate, or broadly elliptic-oblongate (3–) 5–17(–19) × (2–) 4–10(–13) mm, 1.1–2.2 times as long as wide, acuminate or abruptly acuminate at apex, at base broadly or narrowly cuneate, deciduous before the lf.

Lvs (6–) 7–17 cm; petiole including discolored but little-swollen pulvinus (10–) 12–35 mm, at middle (0.6–) 0.7–1.4 mm diam, the ventral sulcus usually narrow or closed, sometimes open and shallow; rachis 4–12 cm; glands 1(–2) between proximal and often 1 between second (third) pair of lfts, stipitate or sessile, in profile 1–2.8 mm tall, the lance ellipsoid or plumply ovoid-acuminate, straight or porrectly clawlike head 0.4–0.9 (rarely vermiform and only 0.1–0.2 mm diam; pulvinules 1–2(–2.6) mm; lfts 4–8(–9, commonly 5–7) pairs, ± decrescent proximally but the longest pair either terminal or subterminal, all in outline subsymmetrically ovate, lanceolate or lance-elliptic obtuse or obtusely acuminate (2–) 2.5–5(–5.5) × (0.8–) 0.9–2.2 cm, 2–3(–3.7) times as long as wide, at base subequilaterally rounded or broadly cuneate, the slender midrib sulcate ventrally, cariniform dorsally, giving rise to 6–12 pairs of camptodrome secondary veins, these variably branched and variably prominulous (see key to vars.).

Racemes loosely 6–25-fld, the several simultaneously expanded fls not or just raised to level of unopened buds, the axis with peduncle together becoming 6–13(–16) cm; bracts thinly herbaceous, rhombic-elliptic, elliptic-oblongate, ovate-acuminate or obovate-cuneate, at apex commonly short-acuminate, (4.5–) 5–9(–10) × (1.8–) 2–5(–6) cm, deciduous well before, at, or soon after anthesis; pedicels 1–2(–2.3) cm; fl-buds subglobose glabrous or almost so; sepals petaloid, yellow or the outermost brown-tinged, obovate or oblong-obovate little graduated, (4.5–) 5–7 mm; petals glabrous deep yellow or orange, subheteromorphic, the vexillary one broadly obovate-flabellate emarginate, the 2 lateral similar but obtuse, the 2 abaxial obovate-oblongate, the longest petal 8–11.5 mm; androecium glabrous, the conspicuous obcordate staminodes 2–3 × 1.3–1.8 mm, the filaments of 4 median stamens 1.2–3 mm, of 2 latero-abaxial ones 2–5 mm, of the centric abaxial one 1.8–3 mm, the anthers of 4 median stamens 2.6–3.5 mm, of 2 latero-abaxial ones (3–) 3.3–4 mm, of the centric abaxial one ± 2.3–3.3 mm but as wide as its neighbors, all biporose at apex; ovary thinly pilosulous or subglabrous; style 1.2–2.5 mm filiform, at very apex abruptly incurved and 0.1–0.15 mm diam; ovules 5–12.

Pod obliquely pendulous, the stipe (1.5–) 2–3.5 mm, the broadly oblong, strongly compressed body 2.5–5 × 1.1–1.8 cm, except when some ovules abort abruptly truncate-rounded at both ends, the stiffly papery brownish, finely intricately venulose valves early glabrate, weakly mounded over the seeds, the septa almost obsolete; seeds plumply oblong-obovoid a little compressed parallel to the valves 6.5–9 × 4.5–6.6 mm, the atrocastaneous lustrous testa smooth or microscopically pitted, exareolate.

The mayu, a shrubby senna of the Pacific foothills and coast range of central Chile, is readily recognized in its region by the dilated stipules, equivalently enlarged floral bracts and broad short planocompressed pod. Among sympatric sennas *S. cruckshanksii* alone has a similar pod, but commonplace narrow bracts and stipules. We readily adopt Bentham's concept of *S. stipulacea*, as expressed by specimens so annotated at Kew, but find that the species consists of two races clearly differentiated by morphology and dispersal, separable as follows:

Key to Varieties of *S. stipulacea*

1. Secondary venation of lfts immersed on upper face, on lower face simply or almost simply penniveined, tertiary venulation subobsolete; ovules 8–12; Ñuble to Valdivia, $\pm 36\text{--}40^\circ\text{S}$.
109a. var. *stipulacea* (p. 336).
1. Secondary venation of lfts prominulous on both faces and giving rise to delicately raised tertiary connecting or reticular venulation; ovules 5–7; Valparaíso and Coquimbo, lat. 34° n.-ward.
109b. var. *anglorum* (p. 336).

109a. *Senna stipulacea* (Aiton) Irwin & Barneby var. *stipulacea*. *Cassia stipulacea* Aiton, 1789, l.c., sens. str.—“*Nat. of Chili. Introd.* 1786, by Mons. Thouin.”—Described from plants cultivated at K, of which no spm was found at BM. Probably progeny of Dombey’s ‘*Cassia brevisiliqua*’ (nom. nud.), P, NY! of which ripe pods in herb. Lamarck. (P) are dated 1786, hence = ‘*Cassia reflexa*’ (nom. nud.) or *mayu* encountered by Ruiz, Pavón & Dombey during III–IV. 1782 in the environs of Concepción (cf. Dahlgren, *Field Mus. Bot.* 21: 128. 1940) and = *C. foetida* Ruiz & Pavón ex G. Don, which see following.

Pseudo-Acacia foliis mucronatis flore luteo vulgo Maju Feuillée, *J. Observ. Phys.* 3 (=Hist. Pl. Médic.): 56, t. 42. 1725 & transl. germanice Huth, *Beschr. Arzen. Pfl.* 2: 78, t. 42. 1757.

Cassia stipulacea Willdenow, *Enum. pl. hort. bot. Berol., Suppl.* 23. 1813.—No locality mentioned.—Holotypus, a leafy branchlet cultivated at Berlin from stock derived from Bonpland and known to be of Chilean origin, presumably descended from that grown by Thouin, q.v. supra, B-WILLD 7978!

Cassia foetida Ruiz & Pavón ex G. Don, *Gen. Hist. Dichl. Pl.* 2: 443. 1832.—“. . . (Ruiz et Pav. in herb. Lamb.) . . . Native of Chili.”—Holotypus, BM (pl. fruct)! = NY Neg. 157; presumed isotypi, BM (ex hb. Pavon., pl. flor.), FI (hb. Webb.), NY (ex hb. Dombey., fl, fr), MA (hb. Pavon. 14/9), P (ex hb. Dombey.; cf. supra sub *S. stipulacea*).

Cassia stipulacea sensu Vogel, 1837, p. 29, exclus. var.; Clos in Gay, 1854, p. 241, majore ex parte; Bentham, 1871, p. 538, ex parte; Reiche, 1897, p. 35, ex parte.

Cassia foetida sensu Clos in Gay, 1854, p. 242; Reiche, 1897, p. 35.

Cassia frondosa sensu Clos in Gay, 1854, p. 239; Reiche, 1897, p. 36 (incl. *C. pencana* Philippi, nom. nud.); non *C. frondosa* Ait. quae = *Senna angustisiliqua* (Lamarck) Irwin & Barneby.

Characters as given in key; filaments of 2 long abaxial stamens 3–5 mm, of the centric abaxial one 2.5–3 mm; style 2–2.5 mm.—Collections: 13.

Brushy hillsides and thickets, 5–1000 m, scattered along the coast range of s. centr. Chile from Valdivia n. to Ñuble, there extending e. into the foothills of the Cordillera.—Fl. X–III(–?).—*Mayu* (*mayo*), *palo negro*.

An attractive shrub, small-flowered but highly floriferous, the trunk attaining a diameter (according to Clos) of one to three inches. Father Feuillée, whose early description was overlooked by Linnaeus, found it used in decoction, at Concepción, as a fleabane and was the first to record the vernacular name *mayu*, heard in the same region by Ruiz, Pavón & Dombey.

109b. *Senna stipulacea* (Aiton) var. *anglorum* Irwin & Barneby, var. nov., a var. *stipulacea* foliolis utrinque laxe reticulatim venulosis (nec supra eveniis, infra simpliciter penninerviis) ovulisque paullo minus numerosis plerumque 5–7 (nec 8–12) diversa.—CHILE. Valparaíso: Valparaíso, anno 1832, *Cuming* 708.—Holotypus, K (hb. Hook.); isotypus, BM.

(?)*Cassia myrtifolia* Philippi ex Reiche, *Fl. Chile* 2: 36. 1897.—“Provincia de Valparaíso.”—Typus to be sought at SGO; the locality and the description of oval-orbicular stipules to 1 cm long suggest var. *anglorum*.

Cassia stipulacea sensu Hooker, *Bot. Miscell.* 3(2): 210. 1829, max. ex parte (exclus. pl. e Concepción); Clos in Gay, 1854, p. 241, ex parte; Bentham, 1871, p. 538, ex parte; Turrill, *Curtis’s Bot. Mag.* 172(4): t. 345. 1859.

Characters as given in key; filaments of abaxial stamens a little shorter, of 2 longer ones 2–2.5 mm, of the centric one 1.8–2 mm; style 1.2–2 mm.—Collections: 10.

Wooded ravines and moist thickets along and near the coast of central Chile, mostly below 500 m, known only from the provinces of Valparaíso and Coquimbo.—Fl. VIII–XII(–?).

The northern form of the mayu was collected so frequently by the earlier botanists in Chile, by Gay, Pöppig, Bertero, Cuming, Macrae, Bridges and Matthews, that it tended to eclipse the original *C. stipulacea* of Pavón both in herbaria and in the literature. While variable in pubescence, the foliage tends to be of a darker green than that of var. *stipulacea*; it is perhaps of thinner texture when fresh. The portrait in Curtis's Botanical Magazine cited above is an excellent likeness. At the time this was written up by Turrill the source of the model was unknown, but according to a letter filed with a cultivated specimen at Kew it was grown from seed collected by G. W. Robinson in Reñaca valley 10–12 miles north of Valparaíso.

110. *Senna birostris* (Vogel) Irwin & Barneby, comb. nov. *Cassia birostris* Dombey ex Vogel, Syn. Gen. Cass. 44 & Linnaea 11: 685, descr. ampliata. 1837.—Typus infra sub var. *birostri* indicatur.

Bushy shrubs at anthesis 0.4–3(–4) m, exceptionally arborescent to 6 m, with castaneous or atropurpureous annotinous branchlets, variable in pubescence (as described for each var.) from subglabrous to densely pilosulous, the subconcolorous or bicolored foliage dull olivaceous, the lfts veinless above, costate and sometimes also finely penninerved beneath, the racemes mostly axillary to and shorter than a fully developed lf, either all lateral to branchlets or crowded into a terminal panicle.

Stipules submembranous or thinly herbaceous, if greenish then soon dry and brownish, mostly linear-lanceolate or -attenuate and 2.5–11 × 0.2–1.2 mm, less commonly broader and firmer, up to 1–1.5 mm wide, then suboblique at base and incipiently replicate marginally, in any case deciduous before the lf.

Lvs mostly (4–)5–15(–21) cm (some low on lateral branchlets, or in the panicle, shorter and simpler, but not further noticed); petiole including little swollen pulvinus 6–27(–35) mm, at middle (0.4–)0.5–1.2(–1.6) mm diam, obtusely 3-ribbed dorsolaterally, shallowly open-sulcate ventrally; rachis (2.5–)3–10.5 cm; petiolar gland (much eaten) between or above proximal, sometimes displaced to between second pair of lfts, stipitate, in profile (1–)1.3–3(–3.4) mm tall, the slenderly ellipsoid acute or thicker claviform subobtuse head (0.1–)0.2–0.8 mm diam, rarely a second gland between the second (third) pair; pulvinules 0.3–2.2 mm; lfts (5–)6–14(–16) pairs, slightly decrescent toward base or toward both ends but otherwise of subequal length, in outline varying from narrowly lanceolate, lance-oblong or elliptic either acute mucronulate or obtuse acuminate to ovate or ovate-oblong acute obtuse or subemarginate, the longest (6–)7–30(–32) × (2–)3–12 mm, (1.5–)1.7–5 times as long as wide, at base inequilaterally cuneate or obliquely rounded, the margins plane, the centric midrib depressed or immersed above, cariniform beneath, all subsequent venation fully immersed on both faces or 4–7(–9) pairs of faint discolored but not or scarcely prominulous, often imperfectly camptodrome secondary venules visible beneath.

Racemes loosely (4–)7–35(–40)-fld, the axis and peduncle together becoming (2–)2.5–14 cm, the open fls usually raised ± to level of the nodding buds, but these sometimes (var. *birostris* only) racemosely disposed above them; bracts

submembranous, lance- or elliptic-attenuate (2-)2.5-8 \times 0.6-1.4(-2) mm, deciduous by or long before anthesis; pedicels (12-)14-26(-29) mm; fl-buds subglobose, glabrous or pilosulous; sepals submembranous pallid or yellowish and toward middle commonly fuscous or purplish, obovate-suborbicular or oblong-obovate, not much or strongly graduated, the 2 outer ones 2.5-7 mm, the longest inner one 4.3-10.5 mm; petals yellow (whitening or not when dried, dark-venulose) glabrous, subhomomorphic or the vexillary one broader than the rest and emarginate, the lateral and abaxial pairs obovate or oblong-obovate beyond short claw, up to (6-)7-14 \times 3-10 mm; androecium glabrous, the filaments of 4 median stamens 1.5-2.5(-2.8) mm, of 2 latero-abaxial ones 2.2-11 mm, of the centric abaxial one (1.8-)2-7 mm, the anthers of the 4 median stamens 2.4-4.8 mm, of the 3 abaxial ones usually subequal (3.5-)4-7.5(-7.8) mm, but the centric abaxial stamen rarely (var. *totorae*) staminodal or lacking, the fertile anthers all subobliquely truncate, the orifice divided by a weak, sometimes obsolescent septum; ovary pilosulous overall, or only laterally, sometimes only residually, rarely glabrous; style (0.8-)1.3-2.7(-3.4) mm, at gently incurved apex 0.15-0.3 mm diam, the stigmatic cavity terminal; ovules (8-)10-22(-28).

Pod obliquely pendulous, the stipe 2-8 mm, the straight or somewhat decurved, laterally compressed body 3.5-9.5 \times 0.6-1.3(-1.5) cm, the stiffly papery, green then brownish, finely venulose glabrate valves variably turgescient over the seeds, the seed-locules 3-5 mm long, as wide as the pod's cavity; seeds broadly or narrowly but always plumply obovoid or oblong-obovoid, little compressed, \pm 4-5.6 \times 2.7-3.2 mm, the castaneous or atrocastaneous testa lustrous, smooth or rarely pitted.

Accumulated evidence has done nothing to strengthen the weak contrasts brought out by Bentham (1871) between *Cassia hookerana*, *C. arequipensis* and *C. birostris*, or by Macbride (1943) between the last two and *C. helveola*, which was from the first suspected of being no more than a "very pubescent form of one of the too closely allied species of the group." While they differ ideally, one from the next, in vesture, or in differentiation of the sepals, or in size and asymmetry of the androecium, or in ovule number, or in length, width and stipe of the pod, the character states are so subject to independent fluctuation that morphological discontinuities have become blurred or bridged. The species just mentioned, together with two entities hitherto undescribed, appear to form a replacement series distributed successively, mostly above 2000 m, along the Andean cordillera between latitude 33°S and the Equator, a series most realistically treated under one specific heading. Features characteristic of *S. birostris* in this wide sense are: narrow caducous stipules; \pm 6-14 pairs of leaflets veinless on the upper face; relatively small flowers (longest petal 7-14 mm); fertile anthers subsymmetrically truncate at apex; a pod variably stipitate and variably turgescient when ripe; and plump seeds lacking an areole. However, the complex specific concept that has been built up by accretion has incorporated so much variation that *S. birostris* sens. lat. cannot be separated from all relatives in a neat phrase. As a consequence we emphasize below only the diagnostic features of the constituent elements within the framework of their ecology and dispersal.

The earliest specific epithet applicable to a member of this complex is *hookeriana*, mandatory in *Cassia* but unfortunately preoccupied in *Senna*. Next in seniority are the coeval *birostris* and *arequipensis*. We have chosen to maintain the former because of its longer history and aptly descriptive form.

Key to the Varieties of *S. birostris*

1. Anthers of 3 abaxial stamens all fertile, of \pm equal length (4–7.8 mm) and girth even though the centric one is raised on a shorter filament than its neighbors; style 1.2–2.7(–3.4) mm.
2. Lfts glabrous on upper, often nearly so on lower face, the margins and the midrib on dorsal face ciliolate; widespread along the Andes from Ecuador to Argentina.
3. Plants of Peru s.-ward from 7°S, Bolivia and Argentina; filaments of longer abaxial stamens 3–11 mm; pod (0.75–)0.8–1.3(–1.5) cm wide.
4. Range extending from s. Bolivia (Potosí, Tarija) to San Luis in Argentina; lfts thick-textured glabrous minutely ciliolate; stipe of pod 2–4.5 mm.
 - 110a. var. *hookeriana* (p. 339).
4. Range extending from n.-w. Bolivia through the Peruvian Andean plateau to Ancash and along its Pacific slope from Arequipa to La Libertad; lfts thin-textured if glabrous, often pubescent dorsally; stipe of pod 4.5–8.5 mm.
5. Sepals glabrous dorsally, not much graduated, the 2 outer (4.5–)5–7 mm, the longest inner one 6.5–8.5 mm; lfts subglabrous dorsally, only the midrib remotely ciliolate; Pacific slope of Peruvian Andes at 370–2000 m between La Libertad and Arequipa.
 - 110f. var. *birostris* (p. 344).
5. Sepals either pubescent dorsally or some of them smaller, in either case well graduated; e. slope of Andes at \pm 2200–3500 m between n.-w. Bolivia and La Libertad, Peru, there and in Ancash passing the crest to the Pacific slope.
6. Sepals densely pilosulous dorsally, the inner ones relatively large, the longest 7–10.5 mm; Pasco, Huánuco, Ancash and La Libertad.
 - 110e. var. *helveola* (p. 343).
6. Sepals glabrous or thinly pilosulous dorsally, shorter, the longest inner one 4.5–6.5 mm; Huancavelica and Cuzco, Peru and n.-w. Bolivia.
 - 110c. var. *huancavensis* (p. 341).
3. Plants of Ecuador; filaments of 3 abaxial stamens 2–3 mm; pod 0.6–0.7 cm wide.
 - 110g. var. *campiana* (p. 345).
2. Lfts pilosulous on both faces and small (the longest 7–17 mm); Pacific slope of Andes from s.-w. Peru (Arequipa) to n. Chile (Tarapacá).
 - 110d. var. *arequipensis* (p. 342).
1. Anthers of 2 lateral abaxial stamens fertile and 2.4–3.5 mm long, that of the centric one much smaller and sterile or the stamen absent; style 0.8–1 mm; e. edge of Bolivian altiplano in Cochabamba and Potosí.
 - 110b. var. *totorae* (p. 340).

110a. *Senna birostris* (Vogel) var. *hookeriana* (Hooker) Irwin & Barneby, stat. nov. *Cassia hookeriana* Gillies ex Hooker, Bot. Miscell. 3(2): 210. 1829.—“[Argentina:] El Cerro del Morro (Prov. of San Luis), Dr. Gillies.”—Holotypus, K (hb. Hook.)! = NY Neg. 1566; isotypus, FI (hb. Webb.)!—Non *Senna hookeriana* Batka, Bot. Zeit. 21: 264. 1863.

Cassia hookeriana sensu Vogel, 1837, p. 37; Bentham, 1871, p. 539; Burkart, 1952, p. 166; Dimitri & Rial Alberti, 1954, fig. 5; Bravo, 1981, p. 268, fig. 4, 5 (M–P).

Low bushy shrubs 0.5–2 m, with atropurpureous older branchlets, appearing glabrous but the very young stems, lf-stalks and margin of lfts thinly strigulose-pilosulous with straight subappressed or incurved hairs up to 0.2–0.45 mm, the lfts glabrous on both faces, dull olivaceous but paler beneath, the racemes either lateral or crowded into a corymbiform panicle; stipules linear-lanceolate or lance-attenuate $3.5\text{--}6.5 \times 0.2\text{--}0.7$, early caducous; lvs (4–)5–12 cm; lfts (5–)6–11 pairs, narrowly lanceolate, lance-oblong or -elliptic, acute mucronulate or obtuse acuminate, less often ovate acute, up to $1\text{--}2.7(3) \times (0.2\text{--})0.3\text{--}0.8(1)$ cm, (2.2–)2.5–5 times as long as wide, the venation except for dorsally prominulous midrib fully immersed or 4–6(–7) pairs of faint discolored but not prominulous secondary veins visible beneath; racemes 4–15(–19)-fld; sepals little graduated, the 2 outer $\pm 4\text{--}6$ mm, the longest inner one 5–8 mm; petals (7.5–)8–12.5 mm;

filaments of 2 latero-abaxial stamens 3–7 mm, of the centric abaxial one 2–4 mm, the anthers of all 3 subequal, (3.5–)4–6 mm; ovary pilosulous laterally, the sutures glabrous; style 1.3–2.4 mm; ovules 8–20(–28); stipe of pod 2–4.5 mm, the body 3.5–7 × 0.75–1 cm, the seminal locules (2.5–)3–5 mm long. Collections: 26.

Dry mountain slopes, gravel washes, often near rock outcrops or among boulders, 2100–3700 m, locally plentiful along the e. slope and altiplano of the Andes from s. Bolivia (Potosí, Tarija) to Tucumán and La Rioja, Argentina, thence s.-e. to the pre-Andean ranges of Sas. de San Luis, del Morro and de Córdoba (Sa. Grande) in San Luis and Córdoba.—Fl. XII–III.

Bravo (1981, l.c.) records the use in Argentina of leaves, flowers and seeds of var. *hookerana* as purgatives and of the roasted seeds as surrogate coffee. She cites numerous vernacular names.

110b. *Senna birostris* (Vogel) var. *totorae* Irwin & Barneby, var. nov., androecii reducti antheris abaxialibus parvis, 2 lateralibus ±3.5–4.5 mm tantum longis filamentis ±2.5–3.5 mm tantum longo elevatis, centrica minuta cassa vel omnino deficienti a caeteris speciei formis abstans, legumine brevistipitato cum var. *hookerana* congruens sed ab ea, praeter androecium peculiare, stylo abbreviato 0.8–1 (nec 1.3–4 mm) longo diversa.—BOLIVIA. Cochabamba: Santa Cruz to Cochabamba, km 305, roadside bank at 7000 ft, 18.II.1965 (fl, fr jun), *Badcock 544*.—Holotypus, K = NY Neg. 10477.

Bushy shrubs 1–4 m, the young branchlets, lf-stalks and axes of inflorescence strigulose-pilosulous with pallid or lutescent hairs ±0.2–0.4 mm, the dull olivaceous lflets glabrous above, slightly paler beneath, ciliolate; stipules linear or narrowly lanceolate 3–6.5 × 0.5–0.8 mm; lvs (4–)5–13 cm; petiolar gland at or just above proximal pair; lflets 6–9 pairs, on pulvinules (0.7–)1–2.2 mm, in outline oblong-elliptic, -ovate, or elliptic-obovate, the longest 14–30 × (5–)6–12 mm, 2–3.4 times as long as wide, veinless above, the dorsally prominent midrib giving rise to 6–9 pairs of fine discolored but immersed secondaries; racemes (7–)10–40-fl; sepals well graduated, the outer 2.5–3(–4) mm, the inner 4.3–5.5(–6) mm; petals 6–11.5 mm; filament of 2 latero-abaxial stamens 2.3–3.5 mm, their anther 3.5–4.6 mm, the centric abaxial stamen 0 or staminodal, the sterile linear anther ±2–2.5 mm; ovary pilosulous; style 0.8–1 mm; ovules 15–18; stipe of pod 2.5–3 mm, the body ±4 × 0.9 cm.—Collections: 7.—Fig. 26.

Rocky hillsides, sometimes colonial on road-cuttings, 2000–2800 m, locally frequent on Cordillera de Cochabamba and extending s. to the head of Río Pilcomayo, e. margin of Bolivian Altiplano in Cochabamba and Potosí (lat. 17°20'–19°30'S).—Fl. IX–III(–V).

Within its species var. *totorae* stands alone in the obsolescence or full suppression of the centric abaxial stamen, in the small size of all six fertile anthers, and in the abbreviated style, and it is these features of the corolla which alone distinguish it from all of var. *hookerana*. From Peruvian var. *huancavensis* it differs further in the fewer (6–9, not 10–14) pairs of leaflets, the glabrate flower-buds, shorter inner sepals (4.3–6, not 7.5–10.5 mm) and in the shorter, short-stipitate pod. Habitally similar but less closely related *S. aymara*, actually or nearly sympatric with var. *totorae* in Cordillera de Cochabamba, may be separated at anthesis by the broader stipules, sepals of subequal length and the presence of three fertile abaxial stamens, and when in fruit by the sharply defined areole on each face of the seeds.

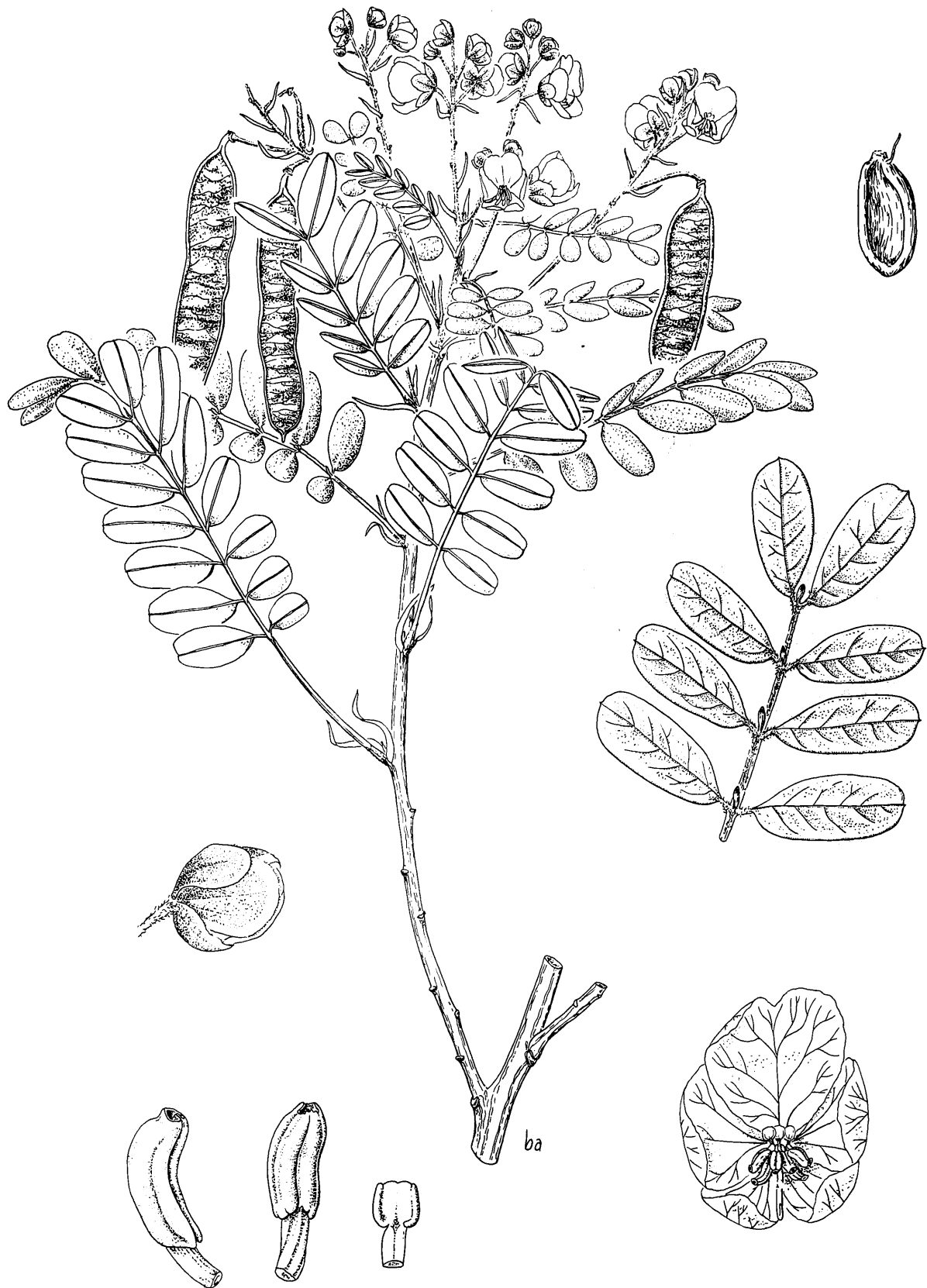


Fig. 26. *Senna birostris* var. *totorae* I. & B. Habit $\times \frac{1}{2}$; upper leaf-stalk showing petiolar glands $\times 1$; bud + flower $\times 2$; detached stamens $\times 4$ (Maguire 44480).

110c. *Senna birostris* (Vogel) var. *huancavensis* (Macbride) Irwin & Barneby, comb. nov. *Cassia helveola* var. *huancavensis* Macbride, Field Mus. Bot. 13, part 3(1): 167. 1943.—“PERU. Huancavelica: Montaro Valley, Weberbauer 7608 . . .” Holotypus, collected near La Mejorada, prov. Tayacaja, 21.III.26 (fl jun), F! = F Neg. 53097; isotypus, K!

Senna birostris "var. *controversa*" Irwin & Barneby, in sched., nom. nud.

Morphologically and geographically intermediate between var. *totorae* and var. *helveola*, resembling the former in habit (but sometimes arborescent to 6 m) and in pubescence, and the latter in the androecium; lfts 8–12 pairs, ciliate on margins and midrib beneath, otherwise glabrous, the longer ones $13\text{--}21 \times 5\text{--}8$ mm, all veinless on upper face, delicately penniveined beneath, the 5–7 pairs of camp-todrome secondary veins immersed discolored; sepals well graduated, glabrous or almost so dorsally, the outer ones 2.5–4.3 mm, the inner 4.5–6.5 mm; petals up to 7–12.5 mm; filaments of 2 latero-abaxial stamens 3–6 mm, of the centric abaxial one 2.5–4.5 mm, the anthers of 2 latero-abaxial stamens 4–5.5 mm, of the centric one 3.5–4.8 mm; style 1.4–2.2 mm; ovules 20–28; stipe of pod ± 5 mm, the linear body 11.5×0.9 cm, the seed locules 3.5–4 mm long.—Collections: 5.

Thickets in the monte formation, 2650–3500 m, on the sources of ríos Montaro, Urubamba, Madre de Dios and Beni in s.-e. Peru (Huancavelica, Cuzco) and adjoining Bolivia (La Paz).—Fl. III–IV.

The var. *huancavensis* occupies the geographic gap between var. *totorae* to the south and var. *helveola* to the northwest, differing from the former in the presence of a seventh functional stamen, a longer style, and a much longer pod; and from the latter in the shorter, externally glabrous or glabrescent calyx. The first collection of the variety, the widely distributed *Mandon 751* which contains distracting fruiting fragments of the only superficially similar *S. aymara*, was cited by Bentham (1871, p. 540) as *Cassia versicolor* and has corrupted subsequent accounts of that species. During our preliminary studies of *Senna* we interpreted this Bolivian plant as undescribed, and unfortunately have annotated a number of sheets in various herbaria as "var. *controversa*."

110d. *Senna birostris* (Vogel) var. *arequipensis* (Vogel) Irwin & Barneby, stat. nov. *Cassia arequipensis* Vogel, Syn. Gen. Cass. 43. 1837.—"In Peru (v.s.s.fr. comm. a cel. Meyen)."—Holotypus, collected at Arequipa IV.1831 by F. J. F. Meyen, †B = F Neg. 1648; no isotypus found.

Cassia tarapacana Philippi, Cat. Praevius Pl. Itin. ad Tarapacá in Anal. Mus. Nac. Chile, seg. secc., Bot. 1891: 20. 1891.—"[CHILE: Tarapacá:] Inter Tarapacá oppidum et flumen Camarones crescit."—Holotypus, not seen; isotypi, †B = F Neg. 1648, K!

Cassia arequipensis sensu Bentham, 1871, p. 539.

Bushy shrubs 0.5–1.5 m, pilosulous throughout with spreading-incurved gray hairs 0.2–0.4(–0.5) mm, the pallid olivaceous thick-textured lfts subconcolorous, equally pubescent on both faces, the racemes forming a subcorymbose panicle; stipules linear-attenuate, linear or setiform $2.5\text{--}7.5 \times 0.2\text{--}0.5$ mm; lvs (4.5–)5.5–10 cm; petiolar gland either between or more often above first pair of lfts, sometimes displaced to the second pair; lfts 9–12(–14) pairs, on pulvinules 0.3–0.8(–1) mm, in outline oblong-ovate- or obovate-elliptic, the longest (6–)7–13(–17) \times 3–6 mm, 1.5–2.6(–3) times as long wide, veinless except for dorsally prominulous midrib; racemes (5–)7–20(–25)-fld; sepals not strongly graduated, fuscous or purplish except for pallid margins, elliptic-obovate, the outer glabrous or dorsally puberulent 4.5–6(–7) mm, the inner glabrous 5.5–7.5(–8.5) mm; petals up to $11.5\text{--}14 \times 6\text{--}10$ mm; filaments of 2 latero-abaxial stamens 5–9 mm, of the centric abaxial one 2.5–4 mm, the anthers of the lateral ones (4.5–)5–6.8 mm, of the centric one plump but slightly shorter, $4\text{--}5 \times 1\text{--}1.2$ mm; ovary densely white-strigulose; style 2–2.7(–3.4) mm; ovules 8–16; stipe of pod 4–8 mm, the linear-oblong straight body $4.5\text{--}9.5 \times 0.8\text{--}1.3(–1.5)$ cm, the seminal locules 5–5.5 mm long.—Collections: 14.

Dry rocky hillsides, banks of ravines, sometimes colonial along watercourses in alluvial gravels, ascending into the puno formation, 2200–3900 m, locally plentiful on the w. slope of the Andes in s. Peru (Arequipa, presumably also Moquegua and Tacna) and adjoining Chile (n. Tarapacá).—Fl. irregularly through the year.

The var. *arequipensis* is distinguished technically from other varieties of *S. birostris* by the gray pilosulous vesture of the leaflets, which are at the same time relatively small, thick-textured, apparently veinless except for the dorsally prominent midrib, and borne on short pulvinules (0.3–0.8, rarely–1 mm), often appearing sessile against the rachis. It is obviously very closely related to the glabrate and less xeromorphic var. *birostris*, vicariant northward, mostly at lower elevations, along the Peruvian coast as far as La Libertad. This has a calyx of essentially the same size and proportions, the same long-stalked abaxial anthers, and the same (nearly always) broad and (always) long-stipitate pod; but green, thin-textured leaflets visibly penniveined dorsally. The also similar var. *helveola* of the central Peruvian Andes has, with the same pod and androecium, ventrally glabrous, dorsally penniveined leaflets and strongly graduated sepals hairy on the back. The type-collection of *Cassia tarapacana* agrees in every detail with some flowering specimens of var. *arequipensis* from Arequipa.

- 110e. *Senna birostris* (Vogel) var. *helveola* (Macbride) Irwin & Barneby, stat. nov. *Cassia helveola* Macbride, Field Mus., Bot. 8(2): 91. 1930.—“Peru: Yanahuanca, Dept. of Huánuco [really Dept. of Pasco, prov. Daniel Carrión], June 16–22, 1922, Macbride & Featherstone 1183 . . .”—Holotypus, F! = F Neg. 53096; of 2 paratypes cited, Macbride & Featherstone 2526 is conspecific, but Weberbauer 7608 = var. *huancavensis*.**

Cassia helveola sensu Macbride, Field Mus., Bot. 13, pt. 2(1): 167. 1943, var. exclus.

Shrubs 1.5–3 m, the young branchlets, lf-stalks and inflorescence densely pilosulous or loosely strigulose with sordid or lutescent hairs to 0.2–0.45(–0.6) mm, even the fl-buds silky-pilosulous and the young pod puberulent; stipules 4–6.5 × 0.8–1.5 mm, densely pubescent dorsally; lvs (5–)6–13 cm; lflets (9–)10–14(–16) pairs, ovate-oblong to narrowly oblong-elliptic, the longest 13–26 × 5–8 mm, (1.9–)2–3.6 times as long as wide, glabrous ventrally, densely pilosulous dorsally, the venation as in var. *birostris*; racemes (7–)9–35-fl'd, corymbiform at anthesis; sepals pilosulous dorsally except toward margins, strongly graduated, the outer 3.5–5 mm, the inner 7.5–10.5 mm; petals 11.5–16 mm; filaments of 2 long abaxial stamens 5–8 mm, the anthers as in var. *birostris*; ovary densely pilosulous; style 1.8–2.3 mm; stipe of (little known) pod ±5–7 mm, the broadly linear body ±9 × 1 cm.—Collections: 12.

Rocky and brushy hillsides, river banks and gravels, sometimes on roadside cuttings, 2300–3250 m, locally plentiful in the Andes of n.-centr. Peru, from the sources of Río Huallaga in Pasco and Huánuco n.-e., high on Pacific slope, through Ancash into La Libertad (Otusco).—Fl. I–IV.

Comments on the close relationship within its species and on differential characters of var. *helveola* will be found under the vicariant vars. *arequipensis* and *birostris*. Care must be taken to distinguish it from sympatric and superficially similar *S. versicolor*, different at anthesis in having leaflets paler or brighter green above than beneath (contrary to the rule in *Senna*), in the broader (mostly 1.5–6, not 0.8–1.5 mm), more persistent stipules and in the slightly longer (11.5–16, not

7.5–10.5 mm) petals; and instantly separable when ripe fruit is present by the areolate seed-faces.

110f. *Senna birostris* (Vogel) Irwin & Barneby var. *birostris*. *Cassia birostris* Dombey ex Vogel, 1837, l.c., sens. str.—“Hbt. in Chili: Dombey leg. (. . . Hrb. Kth. . .).”—Holotypus, †B = F Neg. 1657; neoholotypus, collected by Dombey at Chinchina, prov. Huarochirí, dept. Lima, Peru, P! isotypus, *hb. Pavon. s.n.*, MA! presumed isotypus, *Dombey 836*, G!—*Chamaefistula birostris* Dombey ex Macbride, Field Mus. Bot. 13, part 3(1): 158, pro syn. 1943.

Cassia birostris sensu Bentham, 1871, p. 540; Macbride, l.c., exclus. pl. amazonica.

Bushy shrubs at anthesis 4–15 dm, the young stems, lf-stalks and inflorescence thinly strigulose-pilosulous with pale straight or incurved hairs up to 0.2–0.7 mm, the dull olivaceous, relatively thin-textured lfcs glabrous above, either glabrous or remotely pilosulous beneath, the racemes either lateral or corymbose-paniculate but all leafy-bracteate, either early elongating, the open fls then standing well below the racemose buds, or compactly pseudo-corymbose; stipules narrowly linear-attenuate 4–11 × 0.3–0.7 mm; lvs 7–15(–21) cm; petiolar gland either between or shortly above proximal pair; lfcs 7–12 pairs, on pulvinules 0.7–1.4 mm, ovate- or elliptic-oblong and obtuse to deltately subacute or broadly ovate- or obovate-emarginate, the longest 11–24(–32) × 5–11(–12) mm, 1.5–2.7(–3) times as long as wide, veinless above, the dorsally prominent midrib giving rise to 4–6(–7) pairs of fine, immersed and discolored or, toward the pulvinule, subprominulous secondary veins; racemes (5–)7–15(–18)-fld; sepals glabrous or almost so, little graduated, the outer (4.5–)5–7 mm, the inner 6.5–8.5 mm; longer petals 9–13 mm; filaments of 2 latero-abaxial stamens 6–11 mm, of the centric abaxial one 3–7 mm, the anthers of all 3 subequal 5–7.8 × (1–)1.3–1.8 mm; ovary pilosulous; style 1.4–2.2 mm; ovules ±12–14; stipe of pod 4.5–7.5 mm, the body ±6–8 × 1–1.2 cm.—Collections: 17.

Stony clay hills and quebradas in the loma formation, 370–2000(–2250) m, interruptedly frequent along the Pacific slope of the Peruvian Andes from s. Ancash (Huarmey) to w. Arequipa (Caravelí), lat. ±10°–16°S.—Fl. irregularly through the year.

In this variety the androecium of *S. birostris* attains its greatest asymmetry, the long pair of abaxial stamens protruding their relatively massive anthers well beyond the petals, an arresting feature of the flower that must have suggested the epithet. These long stamens are, however, only on the average slightly longer than those of var. *arequipensis*, which see for comment, and var. *helveola*, which replaces var. *birostris* at slightly greater elevations on the Andean plateau to the east and northeast. The latter differs from var. *birostris* principally in the more abundant, often yellowish pubescence of foliage and inflorescence and in the strongly graduated, dorsally pilosulous sepals. The pod of none of these varieties is well known, but the few examples we have appear essentially similar.

Many populations of var. *birostris* differ from other races of the species in the early elongating raceme axis, which carries the developing flower buds well beyond the level of the open flowers; others, however, have more condensed corymbiform racemes normal for the species. The different types of inflorescence are not related to elevation of habitat, for both are known from the foothills below 750 m and from near the altitudinal limit of 1800–2000 meters. Dombey's original *Cassia birostris* was of the condensed, apparently less common type.

- 110g. *Senna birostris* (Vogel) var. *campiana* Irwin & Barneby, var. nov., a var. *huancavensi* et var. *arequipensi*, ambabus habitu pubesque simillimis, imprimis staminum abaxialium filamentis brevibus 2–3 (nec 5–9 usque) mm longis necnon legumine angusto 5–6.5 (nec 9.5–15) mm lato, ulterius ab illa sepalis interioribus brevioribus 5–6.3 (nec 7.5–10.5) mm longis, ab hac foliolis supra glabris (nec utrinque pilosulis), ab ambabus patria remota distincta.—ECUADOR. Azuay: along río Matedero, w. of Cuenca, 3.III.1945 (fl, fr), W. H. Camp 1923.—Holotypus, NY.**

Bushy shrubs 1–2 m, pilosulous with straight ascending or spreading pallid hairs to 0.5–0.8 mm, the lfts glabrous above, the racemes at first axillary and lateral, becoming terminally paniculate; stipules $\pm 4.5\text{--}8 \times 0.8\text{--}1.2$ mm, linear-lance-attenuate; lvs 7–14 cm; lfts 9–14 pairs, ovate- or oblong-elliptic obtuse or subemarginate, the longest $9\text{--}15 \times 3\text{--}7$ mm, 1.9–3.1 times as long as wide; racemes 10–35-flid; sepals graduated, the firm, dorsally puberulent outer ones 3–4 mm, the subpetaloid, finely fuscous-reticulate, dorsally glabrous inner ones up to 5–6.3 mm; petals $8\text{--}10 \times 4\text{--}7$ mm, filaments of 2 latero-abaxial stamens 2.2–3 mm, of the centric abaxial one 1.8–2.5 mm, the anthers of all 3.4–4.5 mm, when dry chocolate-brown paler at tip; ovary white-pilosulous; ovules 16–22; stipe of pod 3–4 mm, the body linear straight $5\text{--}6.5 \times 0.6\text{--}0.7$ cm, the seminal locules 3–3.5 mm long, as wide as the cavity.—Collections: 6.

Dry brushy slopes, 2300–3000 m, known only from the sources of Rio Paute in s. Canar and n.-e. Azuay (lat. $2^{\circ}45'\text{--}3^{\circ}\text{S}$) in the Andes of s.-centr. Ecuador.—Fl. I–IV.

The one flowering collection of var. *campiana* ("Colombia, Lobb s.n., K) known to Bentham was tentatively identified by him with the remotely allopatric *Cassia arequipensis*. This, treated herein as a coordinate variety of *S. birostris*, much resembles var. *campiana* in general aspect, but differs in the denser vesture of the leaflets, in the longer abaxial filaments and consequently exerted anthers, and particularly in the longer-stipitate and much broader pods. In the same characters, vesture excepted, it differs equally from var. *helveola* and var. *birostris*, the forms of *S. birostris* geographically nearest (even though still some 700 kilometers distant southward along the Cordillera) and further from var. *helveola*, the more similar in ecology and vesture, in the short glabrate inner sepals. The general facies and small calyx of var. *campiana* forcibly recall Bolivian var. *totorae*, different in the slightly fewer (6–9, not 9–14) pairs of leaflets, in the abbreviated style, in the loss or reduction to sterility of the central abaxial stamen, in the yet smaller anthers, and in the at least slightly broader, fewer-ovulate pod.

Bxviii. ser. COLUTEOIDEAE (Colladon) Irwin & Barneby

Senna sect. *Chamaefistula* (Colladon) ser. *Coluteoideae* (Colladon) Irwin & Barneby, comb. nov. *Cassia* sect. *Chamaesenna* ser. *Coluteoideae* DeCandolle ex Colladon, Hist. Casses 98. 1816.—Sp. lectotypica: *Cassia coluteoides* Colladon = *Senna pendula* var. *glabrata* (Vogel) Irwin & Barneby.

Cassia sect. *Chamaefistula* DeCandolle ex Colladon, Hist. Casses 87. 1816.—Typus supra sub sect. *Chamaefistula* indicatur.—*Chamaefistula* (Colladon) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832, pro gen., erroneously typified (Britton & Rose, 1930, p. 231) by *Cassia bacillaris* Linnaeus fil., a species specifically excluded from the original concept.—*Cassia* sect. *Senna* subsect. *Chamaefistula* (Colladon) Bentham in Bentham & Hooker, Gen. Pl. 1(2): 572. 1865.

Chamaecassia Link, Handbuch 139. 1831, pro gen.—Generitypus: *Chamaecassia laevigata* (Willdenow) Link = *Senna septemtrionalis* (Viviani) Irwin & Barneby.

Adipera Rafinesque, Sylva Tell. 129. 1838, pro gen.—Generitypus: (Britton & Rose, 1930, p. 239): *Adipera herbertiana* (Lindley) Rafinesque = *Senna* × *floribunda* (Cavanilles) Irwin & Barneby.

Cassia subgen. *Senna* sect. *Chamaefistula* ser. *Corymbosae* Benth in Martius, Fl. Bras. 15(2): 106. 1870 & Trans. Linn. Soc. London 27: 525. 1871.—Sp. lectotypica: *Cassia corymbosa* Lamarck = *Senna corymbosa* (Lamarck) Irwin & Barneby.

Pod either cylindric or laterally compressed but not plano-compressed (ribbon-like), the interseminal septa well developed, often pulpy when fresh, the individual seed-locules either 1-seriate or, when very numerous, displaced into 2 parallel ranks; seeds turned broadside to the interseminal septa, their testa exareolate; androecium functionally either 6- or 7-merous, the centric abaxial anther commonly only \pm half as thick as its 2 neighbors and empty of pollen; style either long or short (1.5–10 mm); ovules mostly 28–152, in *S. itatiaiae* 24–32, *S. lasseigniana* 22–26.—Leaflets 2–11 pairs, but only exceptionally (*S. corymbosa*, *S. tropica*) exactly 2 pairs in all lvs; petiolar gland between proximal and often some distal pairs, in *S. oblongifolia* commonly on petiole below proximal pair.—Spp. 20, tropical and warm temperate N. and S. America.

Our ser. *Coluteoideae* was first precisely defined, as ser. *Corymbosae* of sect. *Chamaefistula*, by Benth (1870, 1871, ll. cc.), whose concept of the group was based primarily on a cylindric or turgid pod, notwithstanding that pods of essentially the same form were encountered in sect. *Chamaesenna* ser. *Pachycarpae*. Time has done nothing to alleviate this difficulty and we have abandoned a primarily carpological classification for *Senna*, historical but manifestly unnatural, and can consequently assemble these series as elements of one section *Chamaefistula*. Emphasis is shifted from the pod's compression, interpreted as a function of ovule-number, ontogeny of the valves and consequent orientation of the seeds, to the antecedent conditions, and a new stress, already foreseen as necessary by Lasseigne in his study (1979) of *Cassia* seeds, is placed on presence or absence of areole. Even so we can discern no substantial discontinuity between groups of species defined as alternatively multi- or pauciovulate or by differently oriented seeds with and without areole. Series *Coluteoideae* is characterized by the syndrome of zygomorphic corolla, a chamaefistula androecium, numerous (mostly over 28 and up to ± 150) ovules, and exareolate seeds turned broadside to the septa, the pod therefore incidentally turgid and the interseminal septa relatively broad. Our small ser. *Stipulaceae*, detached from ser. *Pachycarpae* of Benth and enriched by several species unknown until recently, differs ideally from ser. *Coluteoideae* in the few-ovulate, narrowly septate pod and unmarked seeds turned broadside to the valves; but forms of *S. birostris* having up to 28 ovules and pod-valves considerably elevated over the seeds approach some *Coluteoideae* closely. The homogeneous character of the residual ser. *Pachycarpae*, which accommodates the pauciovulate chamaefistulas with areolate seeds turned broadside to the valves (and an incidentally compressed pod like that of ser. *Stipulaceae*), is marred only by *S. arnottiana*, of which the few (5–14) seeds are contradictorily oriented as in ser. *Coluteoideae*.

Four circles of affinity can be made out within ser. *Coluteoideae*: a) species with relatively small oblong-elliptic or ovate, basally inequilateral and never acuminate, except in *S. cajamarcae* marginally revolute leaflets, exemplified by *S. multiglandulosa* and including *Ss. santanderensis*, *lasseigniana*, *aurantia*, *morongii*, *punoënsis* and *cajamarcae*, this last perhaps as well referred to ser. *Stipulaceae*; b) species with ample, symmetrically ovate- or lance-acuminate leaflets

exemplified by *S. septemtrionalis* and including *Ss. tropica*, *araucarietorum* and *burkartiana*; c) those similar to a) in foliage but the leaflet margin plane, exemplified by the typical species, *S. pendula*, and including *Ss. bicapsularis*, *hilariana*, *corymbosa* (type-species of ser. *Corymbosae* Benth.), *candolleana* and the curious *S. subulata*, outstanding in the series by reason of dilated foliaceous stipules; and d) *S. itatiaiae*, of which the habit, dispersal and ecology suggest close affinity to *S. (Stipulaceae) organensis*, albeit the short sausage-shaped pod and biseriate seeds are technically inseparable from *Coluteoideae*. With the exception of the last named, the species have been arranged so far as possible in a sequence that reflects increase in ovule-number and its consequences for the ripe fruit. We regard the first group, which is essentially Andean in range and most like ser. *Stipulaceae*, as relatively primitive and the two others as derived offshoots, mutually independent.

The North American species of ser. *Coluteoideae* were treated by Britton & Rose (1930) as forming a distinct genus *Adipera* Raf., for which, however, the prior name *Chamaecassia* Link should have been used.

Key to the Species of ser. *Coluteoideae*

1. Lfts ovate- or lance-acuminate from a subequilateral base, broadest below middle, the distal pair ample 4.5–10.5 cm long.
 2. Lfts of larger lvs 5–6 pairs, their pinnate secondary venation engraved into ventral face; style 5–5.5 mm; body of pod ± 10 –14.5 \times 0.5–0.9 cm, the ovules 50+ and the seeds 1-seriate; Andes of Bolivia and Argentina in lat. 17°30'–26°30'S (if s. Peruvian, near 13°S, cf. 123. *S. vargasii*, p. 373). 122. *S. burkartiana* (p. 372).
 2. Lfts 2–4 pairs, their pinnate venation on ventral face either prominulous or immersed but not engraved; style 1.5–4(–4.3) mm; pod commonly either shorter or broader (or both at once) and, if the ovules 50+ the seeds biseriate, if the seeds uniseriate the ovules 28–42.
 3. Species native in Central America and Mexico, widely dispersed in cultivation and naturalized, but rare or absent in s.-e. Brazil; orifice of 2 long abaxial anthers obliquely truncate, its rim a trifle shorter ad- than abaxially, i.e. tilted toward center of fl; ovules 62–80 and seeds 2-seriate. 119. *S. septemtrionalis* (p. 365).
 3. Species endemic to s.-e. Brazil (Rio de Janeiro to Santa Catarina); either the orifice of 2 long anthers tilted away from center of fl or ovules 28–42 and seeds 1-seriate.
 4. Ranging along the coast and foothills from Cabo Frio in Rio de Janeiro to extreme n.-e. Paraná; 2 long anthers at apex prominently 2-umbonate on adaxial side of orifice, this becoming infraterminal and extrorse; ovules 66–96; seeds 2-seriate. 120. *S. tropica* (p. 368).
 4. Ranging inland from crest of Serra do Mar in Paraná and Sta. Catarina; 2 long anthers horizontally truncate, the orifice terminal and looking upward; ovules 28–42; seeds 1-seriate. 121. *S. araucarietorum* (p. 370).
1. Lfts obovate, oblanceolate, elliptic or oblong-elliptic, broadest at or above middle, or less often lanceolate but then either less than 4.5 cm or strongly asymmetric at base (or both), in any case obtuse or obscurely apiculate, not acuminate.
 5. Stipules linear, linear-oblanceolate or elliptic, several times as long as wide; wide-spread.
 6. Blade of stipules firmly herbaceous, tardily deciduous, in outline oblanceolate or elliptic-oblanceolate but replicate upon itself to display its adaxial face; subequatorial and n. Andes, from n. Peru to Venezuela; w. Panama.
 7. Lfts strongly revolute marginally, on dorsal face densely yellow-pilosulous and in addition charged with thickened orange trichomes; secondary pinnate venation of lfts impressed on upper face, strongly prominulous beneath; style abruptly hooked at apex; n.-e. Colombia and w. Venezuela in lat. $\pm 7^\circ$ –9°30'N. 115. *S. santanderensis* (p. 355).
 7. Lfts plane, glabrous except for minutely ciliolate margins; secondary venation scarcely perceptible; style gently incurved distally; s. Ecuador and n. Peru in lat. 4°–7°S; w. Panama. 112. *S. cajamarcae* (p. 350).

6. Blade of stipules thinly herbaceous or membranous plane, usually promptly caducous.
8. Margin of lfts revolute; range primarily upland Andean, one extending to Mexico and extensively cultivated.
9. Upper face of lfts puberulent or pilosulous, glabrous only in centr. Peruvian *S. aurantia*; lfts 2–7 pairs or, if up to 8(–9) pairs, then densely tomentulose dorsally; centric abaxial anther usually as plump or nearly so as its two neighbors.
10. Lfts 4–8(–9) pairs, in larger lvs at least 6 pairs if densely pilose-tomentulose beneath; intertropical highland Andes n.-ward from Bolivia (mostly above 2000 m), one widespread further n. and in cultivation.
11. Pod terete, the seeds 2-seriate. Petiolar gland 1; ovules 35–50; localized in centr. Peru (Junín and Huánuco). 114. *S. aurantia* (p. 354).
11. Pod laterally compressed, the seeds 1-seriate. Either allopatric or glands between several pairs of lfts.
12. Pod mostly $8-12 \times 0.7-0.9(-1)$ cm; ovules 30–50; seeds plumply ovoid 4–5.2 mm long; foliage strongly bicolored, the lower face conspicuously yellowish- or pallid-tomentulose; widespread and common. 116. *S. multiglandulosa* (p. 357).
12. Pod shorter and broader, $5-8 \times 1-1.4$ cm; ovules 22–26; seeds narrowly obovoid 5.5–8.5 mm long; foliage not strongly bicolored, the lower face \pm densely pilose but not tomentulose; Ecuador and n. Peru. 113. *S. lasseigniana* (p. 353).
10. Lfts 2–5, commonly 3 or 4 pairs, subequally pilosulous on both faces; primarily of the outer Andean foothills below 1200 m and the Gran Chaco lowlands in s. Bolivia, n.-w. Argentina and Paraguay (marginally sympatric with the last only in Cochabamba, Bolivia); pod cylindric and seeds 2-seriate. 118. *S. morongii* (p. 364).
9. Upper face of lfts glabrous; lfts 7–11 pairs, finely puberulent beneath; centric abaxial anther sterile, much narrower than its 2 neighbors; s. Peru and n.-w. Bolivia. *S. punoënsis* (p. 362).
8. Margin of lfts plane; almost ubiquitous in tropic and warm temperate N. and S. America, but the few Andean representatives primarily of low elevations, the one exception, *S. bicapsularis*, unique in the abbreviated pedicels (excluding hypanthium at most 5 mm long).
13. Pedicels at and after anthesis (excluding the turbinate hypanthium) relatively long (8–)10+ mm. Pod either cylindric or turgidly compressed and seeds either 1- or 2-seriate.
14. Lfts 2–3 pairs, the distal pair lanceolate or narrowly oblong-elliptic $\pm 3.5-5.5$ times as long as wide; all 3 abaxial anthers fertile and of \pm the same diam; extratropical s.-e. Brazil, Uruguay and n.-e. Argentina, widely cultivated and naturalized elsewhere. Seeds 1-seriate. 128. *S. corymbosa* (p. 397).
14. Lfts of longer lvs 4–8 pairs, usually proportionately wider; centric abaxial anther sterile or obviously ill-developed, less than $\frac{2}{3}$ as plump as its 2 neighbors.
15. Petiolar gland of all or most lvs situated on petiole 0–24 mm above pulvinus, in some random lvs accompanied by 1–2 small lfts; seeds 1-seriate, relatively few, the ovules 32–44; s.-e. Brazil and extreme n.-e. Argentina (Misiones). 124. *S. oblongifolia* (p. 374).
15. Petiolar gland of all lvs situated between proximal (and often succeeding) pair of lfts; both sym- and allopatric, but the sympatric species distinguished by U-shaped, not 2-porose dehiscence of 2 long anthers; seeds either 1- or 2-seriate, but more numerous, the ovules (46–)50–150.
16. Native in the coast range of centr. Chile, cult. elsewhere; orifice of long anthers 2-porose. Seeds 1-seriate. 125. *S. candolleana* (p. 376).
16. Extra-Chilean; pores of 2 long anthers confluent into a U-shaped slit. Seeds either 1- or 2-seriate.
17. Lfts relatively many and small, 5–8 pairs, lance- or narrowly oblong-elliptic, the distal pair 3–6 mm wide and $\pm 3-5$ times as long; extratropical Paraguay to extreme s.-e. Brazil. 127. *S. hilariana* (p. 396).

17. Lfts either fewer or proportionately broader (or both), where vicariant with the preceding the distal pair 9–23 mm wide; widespread over most of tropical N. and S. America and less vigorously into warm temperate regions of both hemispheres. 126. *S. pendula* (p. 378).
13. Pedicels at and after anthesis (excluding the slenderly turbinate or vase-shaped hypanthium) 1–3.5(–5) mm. Circum-Caribbean and Andean, adventive and cultivated elsewhere; pod cylindric; seeds 2-seriate. 129. *S. bicapsularis* (p. 399).
5. Stipules foliaceous or submembranous, strongly dilated, at least half as wide as, sometimes fully as wide or wider than long. Relatively local spp. either of Andean and sub-Andean Argentina or of Mt. Itatiaia in Rio de Janeiro, Brazil.
18. Stipules deflexed, transversely dilated, mostly as wide or wider than long; pod ± 5 –6 mm diam, the seeds 1-seriate or almost so; Argentina. 130. *S. subulata* (p. 403).
18. Stipules erect, ovate, \pm half as wide as long; pod ± 18 mm diam, the seeds fully 2-seriate; Mt. Itatiaia, Rio de Janeiro. 111. *S. itatiaiae* (p. 349).

111. *Senna itatiaiae* Irwin & Barneby, sp. nov., legumine cylindrico seminibusque biseriatis exareolatis ser. *Coluteoideis* manifeste pertinens, sed inter illas stipulis submembranaceis magnis late ovatis basi semicordatis, legumine abbreviato crasso ($\pm 5.5 \times 1.8$ cm) ovulisque paucis (± 24 –32) praestans.—BRAZIL. Rio de Janeiro, mun. de Resende: upper edges of subalpine forest, 2250 m, Mt. Itatiaia on w. edge of planalto at km 12 on road to shelter “Abrigo Rebouças,” 6.XI.1965 (fl), G. & L. Eiten 6669.—Holotypus, NY; isotypus, K.

Arborescent shrubs to ± 2 m, the virgate smooth striate hornotinous branches becoming after first season castaneous lustrous, glabrous throughout except for densely minutely puberulent sepals, the dull olivaceous foliage subconcolorous, the inflorescence of axillary racemes surpassed by foliage.

Stipules thinly herbaceous pale green, obliquely ovate, abruptly acuminate 12 – 17×6.5 – 8 mm, at base subcordately amplexicaul on side opposed to petiole, tardily deciduous.

Lvs 9.5 – 15 cm; petiole including wrinkled pulvinus (2) – 3 – 4.5 cm, at middle ± 0.7 – 1.1 mm diam, rounded dorsally, deeply sulcate ventrally; rachis 3.5 – 7 cm; glands between at least 2 proximal or between all but the distal pair of lfts subsessile ovoid acute or obtuse ± 1.5 – 2×0.5 – 0.9 mm; pulvinules 2 – 2.5 mm; lfts 5 – 6 pairs, a little accrescent distally but the penultimate sometimes longest, all broadly elliptic from asymmetrically rounded base, obtuse but minutely mucronulate at apex, the distal pair (2.6) – 3 – 4.2×1.2 – 2 cm, 2 – 2.5 times as long as wide, the submembranous margins plane or incipiently revolute, the centric midrib immersed above, carinate beneath, the 7 – 9 pairs of camptodrome secondary veins weakly prominulous on both faces, tertiary venulation scarcely perceptible.

Peduncles ± 5 – 7 cm; racemes openly ± 25 – 30 -fld, the axis at mid-anthesis ± 4 – 6 cm; bracts resembling stipules in texture, lance- or the lowest ovate-acuminate 5 – 12×2 – 4 mm, persistent at least into full anthesis; pedicels ± 1.3 – 2.4 cm; fl-buds subglobose densely puberulent; sepals yellowish brown-tinged, obovate obtuse subequal 5.5 – 7 mm; petals glabrous yellow, when dry stramineous brown-veined, all similar in size and shape except the dorsal one a trifle broader, obovate-flabellate short-clawed, ± 9 – 10 mm long; androecium glabrous, the filaments of 4 median anthers 1.5 – 2.4 mm, of 3 abaxial ones 2.5 – 3 mm, the anthers brown, those of 4 median stamens nearly straight 3.7 – 4.3 mm, of 3 abaxial ones lunately incurved 4.5 – 5 mm, all abruptly truncate at apex; ovary glabrous, style $\pm 1.5 \times 0.25$ mm; ovules 24 – 32 .

Pod obliquely geotropic stipitate, the stipe ± 5 mm, the oblong-cylindric body $\pm 5.5 \times 1.8$ cm, abruptly contracted at both ends, the thin indehiscent valves

separating when ripe into a brown almost smooth exocarp and a pallid papery endocarp, the cavity lacking pulp, the membranous interseminal septa complete, ± 3 mm apart; seeds 2-seriate, turned broadside to the septa, plumply compressed-obovoid $\pm 6.5 \times 3.5$ mm, the lustrous brown testa microscopically pitted, exareolate.—Collections: 3.

Disturbed moist forest, in residual thickets and on roadsides, ± 2250 m, known only from the upper slopes of Mt. Itatiaia near $22^{\circ}25'S$ in n.-w. Rio de Janeiro, Brazil.—Fl. XI–II.

A species very distinct in its pallid semicordate stipules and short sausage-shaped pod. Except that the sepals are densely puberulent dorsally, the individual flower is almost that of *S. organensis*, and the relatively few ovules are also suggestive of ser. *Stipulaceae*, to which we provisionally referred the flowering typus. A pod from the type-locality (*V. F. Ferreira 171*, RB) proves, however, to be of the cylindric type characteristic of ser. *Coluteoideae* in which the seeds are doubled up into two fully separated parallel ranks.

Here may be appropriately mentioned sterile specimens (*Glaziou 8417*, C, K, P) of a senna with foliaceous stipules resembling those of *S. itatiaiae* but about as wide as long and up to 2 cm diam. They were collected, according to Glaziou's Liste, on the "rochers du Retiro" at Petrópolis, Rio de Janeiro. The leaves suggest some coarse form of *S. subulata*, but are potentially larger (to 24 cm long) and may have up to eight pairs of leaflets more prominently veined than those of any species with similar stipules. Their identity will remain an intriguing puzzle until flowering specimens can be obtained.

112. *Senna cajamarcae* Irwin & Barneby, sp. nov., habitu *S. mandoni* (Bentham) Irwin & Barneby revocans, imprimis stipulis replicatis bracteisque floralibus firme herbaceis diu persistentibus, stylo parum incurvo, ovulis magis numerosis 30–36 (nec 12–25) necnon legumine turgido subtereti (nec plano-compresso) plane diversa.—PERU. Cajamarca, prov. Chota: ceja de montaña, 2200 m, cerca a Huambos, 14.VIII.1952, *R. Ferreyra 8426*.—Holotypus, NY.

Cassia pendula var. *bracteata* Lasseigne, Iselya 1(1): 9, fig. 2. 1979.—"PERU, CAJAMARCA: entre Porconcillo y Cajamarca, carretera a Bambamarca, 14 November 1971, *Isidro Sanchez Vega 847*."—Holotypus, SI, seen only in photograph (protologue).

Shrubs and treelets ± 1.5 –3 m, with pallid hornotinous and fuscous or almost black older branchlets, appearing glabrous but in fact residually puberulent on lf-stalk, pulvinule and axis of inflorescence (or some of these) and the lflets minutely sparsely ciliolate, the foliage strongly bicolored, the firmly chartaceous lflets above dark dull green with pallid line along midrib, beneath pallid-glaucous overall, the early racemes lateral and scarcely as long as subtending lf, some later ones forming a shortly exserted panicle.

Stipules ascending, firmly herbaceous oblanceolate or elliptic-oblanceolate 4 – 9×1.5 –3 mm, the blade replicate on itself, persistent into and commonly past maturity of associated lf.

Lvs mostly 6–14 cm, some smaller ones high in the inflorescence not further described; petiole including little differentiated pulvinus 1.5–3 cm, at middle 0.6–1 mm diam, subterete, the ventral sulcus narrow or obscure, becoming more evident on rachis, this 2–6.5 cm, its longer interfoliolar segments (8–)10–17 mm; glands (caveat: much eaten) between proximal and commonly between all pairs but the distal one, subsessile ovoid-apiculate, the lowest one in profile 0.9 – 1.7×0.45 –0.7 mm, the distal ones often smaller; pulvinules 1.2–2 mm; lflets

(3-)4-6 pairs, moderately accrescent distally, the distal pair elliptic or lance-elliptic obtuse or minutely emarginate $(19-23-46 \times (7-8-14 \text{ mm})$, 2.6-3.3 times as long as wide, at base asymmetrically rounded or subcordate, the (mature) margin plane, the midrib immersed above, stoutly cariniform beneath, the (7-)8-11 pairs of very slender camptodrome secondary veins barely perceptible on either face or faintly raised beneath, tertiary venulation 0.

Racemes 7-20-fl'd, the 1-2 simultaneously expanded fls raised \pm to level of ascending, obliquely obovoid buds, the axis with peduncle together $(3.5-4-10.5 \text{ cm})$; bracts resembling stipules in texture, green or eventually brunnescent, ovate-acuminate or lanceolate $2-5 \times 1.4-2.4 \text{ mm}$, sometimes revolute but sometimes plane, persistent into or sometimes beyond anthesis of subtended fl; pedicels 10-21 mm; sepals submembranous brown or fuscous, the inner ones narrowly pallid-margined, all ovate or obovate obtuse, moderately graduated, the smallest outer one 4-5.5 the largest inner one 6-10 mm; corolla zygomorphic, the glabrous short-clawed petals yellow drying brownish-yellow brown-veined, the flabellate-obovate vexillar one 8.5-12 mm, the rest nearly as long; androecium glabrous, the blade of 3 staminodes $1.2-1.6 \times 0.8-1.5 \text{ mm}$, the filaments of 4 median stamens 1.1-2.5 mm, of the centric abaxial one 2-2.5 mm, of the 2 long latero-abaxial ones 5.5-8.5 mm, the anthers of 4 median stamens narrowly flask-shaped $3-3.9 \times 0.9-1 \text{ mm}$, of the sterile abaxial one $2.5-4.5 \times 0.5-0.7 \text{ mm}$, of the 2 long ones lunately lanceolate in profile $5.5-8.5 \times 1.1-1.5 \text{ mm}$, the obscurely differentiated, horizontally truncate beak of these $0.4-0.6 \times 0.6-0.7 \text{ mm}$, its orifice divided by slender septum into 2 pores; ovary thinly strigulose-pilosulous; style glabrous linear-attenuate 3.5-4.9 mm, at gently incurved apex 0.2-0.3 mm diam; ovules 30-36.

Pod (little known) obliquely ascending or declined, the stipe 5-6 mm, the fully fertile (often in fact imperfect and variously distorted or malformed) body linear subterete $\pm 5-6.5 \times 0.7-1.2$ ("1.5") cm, the valves firmly chartaceous smooth, brown or castaneous, the seed-locules $\pm 2-2.5 \text{ mm}$ long, as wide as the pod's cavity, apparently thinly pulpy within; seeds transverse, turned with broader faces to the septa, plumply compressed obovoid $4.5-5.5$ ("6.5") $\times 2.5-3.5$ ("4") mm, the testa brown or atrocastaneous lustrous smooth or remotely pitted, ex-areolate.—Collections: 8.—Fig. 27.

Shrub-thickets and disturbed brush-woodland in the monte or ceja de montaña formations, 2200-2850 m, local on and along the Andean divide in s. Ecuador (Loja) and n. Peru (Cajamarca, prov. Chota and Cajamarca), lat. $4^{\circ}-7^{\circ}20'S$; and distantly disjunct, in unrecorded habitats at 1200-1800 m, on w. slope of Cerros Volcán and Horqueta in n.-w. Chiriquí, Panama.—Fl. VII-XII, II-III, perhaps throughout the year.

Senna cajamarcae closely resembles *S. mandoni* in habit of growth and in the strongly bicolored, dorsally glaucescent, almost veinless leaflets, but differs in the more persistent, firmly herbaceous stipules and floral bracts, a less strongly incurved style, and especially in the subterete pod that contains seeds turned with broader faces to the septa and not to the valves. The herbaceous replicate stipules might suggest relationship to *S. versicolor*, certainly almost and perhaps actually sympatric in Cajamarca, but this is obviously different at anthesis in its more numerous (8-13, not 3-6) pairs of leaflets and later on in the plano-compressed pod and the areole on the seed-faces. We see no close connection with *S. pendula*, of which the stipules are membranous and caducous.

The pod of *S. cajamarcae* appears quite variable in girth, and Lasseigne describes the seeds as biseriate, although they are certainly uniseriate in the material studied by us. The typus of *Cassia pendula bracteata*, known to us only through



Fig. 27. *Senna cajamarcae* I. & B. Habit $\times 1$; bract (lower right) $\times 5$; detached stamens + staminode $\times 8$ (Ferreyra 8426).

a photograph, has fully ripe, dehiscent pods at least 12 mm diam, whereas in other specimens from the same general vicinity (e.g. *Reichlen 45*, P) and in our one record from Ecuador (*Wiggins 10949*, NY) it is only 7–8 mm diam. The plants are identical in other respects and surely conspecific in a broad sense; an enquiry on the spot will settle whether the variation is random or reflects a genuinely established racial dichotomy.

Our one Panamanian record with flowers (*Maurice 849*, US) has slightly larger anthers than any yet recorded for Andean *S. cajamarcae*, but is closely similar in all other details ascertainable from a specimen at anthesis. Pods from the same region (*Tyson 5711*; *Correa 1315*, both MO) confirm the identity.

113. *Senna lasseigniana* Irwin & Barneby, nom. & stat. nov. *Cassia santanderensis* var. *parvianthera* Lasseigne, *Iselya* 1(1): 12 ("parviantherus"). 1979.—Typus infra sub var. *lasseigniana* indicatur.

Resembling *S. santanderensis* in habit, but generally smaller-lvd, the lfts puberulent on upper face, variably pilosulous beneath.

Stipules submembranous reflexed lanceolate plane $3.5\text{--}6 \times 1\text{--}2$ mm, deciduous.

Longer lvs 6–11.5 cm; petiole 5–14 mm; rachis 3–7.5 cm; gland ovoid acute $1\text{--}1.8 \times 0.4\text{--}0.8$ mm; lfts 4–7 pairs, the terminal pair elliptic $2.5\text{--}5 \times 0.9\text{--}1.8$ cm, the venation as in *S. santanderensis* but the major camptodrome secondary nerves 5–8 pairs.

Peduncle with axis of raceme 4–6 cm; bracts lanceolate or ovate-acuminulate $3\text{--}6 \times 1\text{--}3.5$ mm; outer sepals 3–4.5 mm, the longest inner one 5–7; longest petal 10–13 mm; filaments of 4 median anthers 2–3, of 3 abaxial ones 3–5 mm (that of centric one a trifle shorter than its neighbors), the anthers of 4 median stamens $3.7\text{--}4 \times 1.1$ mm, of 3 abaxial ones $4.2\text{--}6.3 \times 1\text{--}1.4$ mm, the centric one sometimes a trifle shorter than its neighbors but fertile and of the same diam; style $3.5\text{--}4 \times 0.2$ mm, straight or almost so; ovules 22–26.

Pod of *S. santanderensis*, the body $(4.5\text{--})5\text{--}8 \times (0.9\text{--})1\text{--}1.4$ cm.

This species is coextensive with two varieties of *Cassia santanderensis* recently described by Lasseigne. In its protologue each was compared with *C. santanderensis*, but not directly one with the other, and the resemblance between them in many critical points was consequently underemphasized. While they do indeed resemble *S. santanderensis* in general habit and especially in the pod and the long narrow seeds, they differ collectively in stipules, calyx and androecium, and these differences, supported by the facts of dispersal insofar as known today, seem to us of specific importance. The close relationship of *S. lasseigniana* seems to lie in the direction of the sympatric *S. multiglandulosa* from which it is distinguished principally by the shorter broader pod containing fewer but longer and proportionately narrower seeds. But these differences will require the test of experience as material accumulates, as will the weak contrasts between the two varieties expressed in the key following.

Key to the Varieties of *S. lasseigniana*

1. Lfts 4–5 pairs, the lower face thinly pilosulous and beset between the veins with thickened glandiform trichomes; n. Peru. 113a. var. *lasseigniana* (p. 354).
1. Lfts 5–7 pairs, the lower face densely velutinous-pilosulous both on and between veins with erect lustrous hairs, lacking glandiform trichomes; s. Ecuador. 113b. var. *canarensis* (p. 354).

- 113a. *Senna lasseigniana* Irwin & Barneby var. *lasseigniana*.** *Cassia santanderensis* var. *parvianthera* Lasseigne, 1979, l.c.—“PERU, AMAZONAS: encima de Pomacochas, 17 August 1963, Ramón Ferreyra & C. Acleto 15194.”—Holotypus, NY! isotypus, MO!

Arborescent shrubs, at anthesis 1.5–8 m; otherwise as given in key.—Collections: 5.

Montane rain-forest and thickets in subpáramo, 2200–2900 m, local on both slopes of the Peruvian Andes in lat. 5°40'–7°30'S in Amazonas (Bongará) and Cajamarca (Contumazá).—Fl. IV–IX.

This variety was first collected in 1876–7 by the French traveller Vidal-Sénège (*s.n.*, P) at an unidentified locality “Paramas de Llam..d” where it was recorded as an abundant tree 5–8 m tall.

- 113b. *Senna lasseigniana* Irwin & Barneby var. *canarensis* (Lasseigne) Irwin & Barneby, comb. nov.** *Cassia santanderensis* (Britton & Killip) var. *canarensis* Lasseigne, Iselya 1(1): 11. 1979.—“ECUADOR. CAÑAR: near El Tambo, 5 July 1945, W. H. Camp E-3965. . .”—Holotypus, NY! isotypi, F, K, US!

Shrubs and treelets to 3 m; otherwise as given in the key.—Collections: 1.

Found in a region of dry chaparral scrub and páramo near 2900 m, the microhabitat not recorded, known only from the headwaters of río Naranjal on the w. slope of the Ecuadorean Andes in lat. 2°30'S.—Fl. V–VII(–?).

- 114. *Senna aurantia* (G. Don) Irwin & Barneby, comb. nov.** *Cassia aurantia* Ruiz & Pavón ex G. Don, Gen. Hist. Dichl. Pl. 2: 442. 1832.—“Ruiz et Pav[ón] in herb. Lamb[ertiano] . . . Native of Peru.”—Holotypus, BM! = NY Neg. 165; isotypi, FI, MA (hb. Pavon. 14/15), P!

Cassia dombeyana Vogel, Syn. Gen. Cass. 28. 1837.—“In Peru aut Chili: Dombey leg (v.s.s.fr. in Herb. K[un]th[iano].”—Holotypus, †B = F Neg. 1654! a spm labelled ‘*Cassia comosa* Dombey. Tarma [Peru], *Dombey*,’ P! may be authentic or isotypic.—Equated with *C. aurantia* by Bentham (1871, p. 541), who had seen a *Dombey* spm in hb. Lindley.

Senna barnebyana Lasseigne, Brittonia 33(4): 513. 1981.—“PERU. Huánuco: Ambo, 5 Apr 1923 (fr), J. F. Macbride 3194.”—Holotypus, US (not seen); phototypus, NY!

Low diffuse shrubs sometimes wider than tall, except for glabrous or glabrescent upper face of lflets and dorsally glabrous inner sepals pilosulous throughout with simply incurved or subsinuous hairs ± 0.3 –0.6 mm, the foliage strongly bi-colored, dull olivaceous above, pallid and densely pilosulous beneath, the racemes axillary to distal lvs and shortly exserted.

Stipules spreading-ascending or subreflexed linear-attenuate, marginally revolute 2–5 \times 0.35–0.7 mm, caducous.

Lvs (ignoring some small distal ones) 6–13 cm; petiole including pulvinus 10–22 mm; rachis 3–7 cm; gland between proximal pair of lflets stipitate, in profile including the puberulent stipe 1–2 mm, the lance-ellipsoid body 0.25–0.6 mm diam; pulvinules 1–1.5 mm; lflets (4–)5–7 pairs, a little accrescent distally, oblong or oblong-obovate obtuse, minutely mucronulate, the distal pair 2–4.6 \times 0.6–1.9 cm, 2.3–3.3 times as long as wide, at base inequilaterally rounded or proximally cordate and distally cuneate, the straight midrib with 6–9 pairs of slender camptodrome secondary veins immersed or faintly prominulous above, prominulous beneath, subsequent venation fully immersed or obscure.

Racemes (8–)15–35-fld, the expanded fls raised almost to level of nodding buds,

the peduncle and \pm elongating axis together 7–16 cm; bracts narrowly lanceolate $2.5\text{--}5 \times 0.5\text{--}0.9$ mm caducous; pedicels 16–27 mm; fl-buds globose when young and thinly pilosulous, the outer sepals firm 3–4 mm, the early emerging inner ones obovate-suborbicular glabrous ciliolate subpetaloid 6–8 mm; corolla zygomorphic, the glabrous petals yellow or orange-yellow drying ochroleucous dark-veined, the longest 10–12 mm; androecium glabrous, the trapezoid blade of staminodes $\pm 2 \times 1.2$ mm, the filaments of 4 median stamens ± 1.5 mm, of 2 latero-abaxial ones 4–5 mm, of the centric abaxial one 2.5–3 mm, the anthers of 4 median stamens 3–3.5 mm, of 2 long abaxial ones $5\text{--}6 \times 1\text{--}1.3$ mm, of the centric abaxial one $4\text{--}4.5 \times \pm 0.8$ mm, the 7 fertile anthers obscurely strangulated 0.3–0.5 mm below obliquely truncate apex, the biporose orifice divided by a slender septum; ovary pilosulous; style $2\text{--}3 \times \pm 0.2$ mm, not or scarcely thickened upward, the minute stigmatic orifice introrsely terminal; ovules 33–50.

Pod (little known) $\pm 5\text{--}6.5 \times 0.6\text{--}0.7$ cm, the body subterete, the seeds (not seen fully ripe) 2-seriate exareolate.—Collections: 9.

Stony hillsides and streambeds, 2000–3300 m, locally plentiful on the sources of ríos Huallaga and Perené in s. Huánuco (prov. Huánuco, Ambo) and n.-w. Junín (prov. Junín, Tarma) in centr. Andean Peru.—Fl. I–IV.

While we provisionally maintain *S. aurantia* as a discrete species we find that its claim to specific status is precarious. At anthesis and even in fruit it closely simulates the form of *S. pendula* var. *praeandina* that has been collected several times at 1800 m and lower in the Palca-Chanchamayo valley in northern Junín. This differs technically in having numerous petiolar glands, longer filaments and style, more numerous ovules and truly plane-margined leaflets, but the overall resemblance is disturbing and suggests that *S. aurantia* may be in reality a high-altitude variant of *S. pendula*. It appears related also to the north Peruvian *S. lasseigniana*, which is similar in the revolute leaflet-margin, but is quite different in the compressed pod and fewer, uniseriate seeds. The existence on the Huallaga-Perené divide, within the same elevational limits and, so far as known, in the same habitats as *S. aurantia*, of the grossly similar *S. (Stipulaceae) birostris* var. *huancavensis* introduces the possibility of hybridization between it and outlying populations of *S. pendula* var. *praeandina*, which could conceivably have generated *S. aurantia* or its ancestors. Field observation of these sennas is required.

Senna aurantia was cultivated in early XIX century in the Madrid Botanical Garden under the name “*Cassia prostrata*” and a garden specimen, probably of this stock, was sent to DeCandolle by Lagasca as “*C. procumbens*” (G). There are two collections of *S. aurantia* in the Pavón Herbarium (MA) numbered 14/15 and 14/23 (“*Cassia hirsuta*. Huánuco”) and it was from one of these that the typus of *Cassia dombeyana* must have been acquired by Humboldt and that of *C. aurantia* G. Don by Lambert. A collection specifically attributed to Dombey (P) is an abnormal form in which inhibited sterile branchlets consisting mostly of stipules are found in most leaf-axils, giving rise to the unpublished epithet *comosa*. In modern times Britton & Rose described in manuscript (NY) from *Macbride* 3559 and 3994 a supposedly new species dedicated to the collector, and *Macbride* 3194 from Ambo has recently furnished the type of *S. barnebyana*. We regard all of these Macbride collections as representing *S. aurantia*, which has obviously been and even now remains a challenging puzzle to taxonomists.

115. *Senna santanderensis* (Britton & Killip) Irwin & Barneby, comb. nov. *Adipera santanderensis* Britton & Killip, Ann. N.Y. Acad. Sci. 35: 178. 1936.—“Santander and Norte de Santander, Colombia. Type from

. . . Río Suratá Valley, above Suratá, Santander . . . January 6, 1927, Killip & Smith 16697 . . .”—Holotypus, NY! isotypus, US!—Six paratypes, Killip & Smith 16101, 16886, 18397, 19224, 19518, 20495, all NY, US!—*Cassia santanderensis* (Killip & Smith) Lasseigne, Iselya 1(1): 11. 1979.

Adipera jahnii Britton & Rose ex Pittier, Bol. Soc. Venezol. Ci. Nat. 10(64): 112. 1945.—“Trujillo: Agua de Obispo, 2200 m., flores Septiembre 24, 1929 (Jahn 1171, el tipo de Britton & Rose) . . .”—Holotypus, VEN! isotypus, US! several paratypes, most seen by us, are cited by Lasseigne, 1979, l.c. supra.—*Cassia jahnii* Rose ex Pittier, l.c., pro syn.—Correctly equated by Lasseigne, l.c., with *C. santanderensis*.

Cassia santanderensis var. *santanderensis* sensu Lasseigne, 1979, l.c., sens. str.

Arborescent shrubs and round-headed trees 2–4 m with trunk attaining 25 cm diam, except for the glabrous upper face of lfts pilosulous throughout with straight spreading, spreading-incurved or less often incumbent yellowish hairs up to 0.3–0.6 mm, the lfts in addition charged beneath with many short thickened orange trichomes, the ample foliage bicolored, the lfts when dry dull dark brownish-green above, paler beneath, the inflorescence a panicle of racemes proximally leafy-bracteate and immersed in foliage but often shortly exerted distally.

Stipules spreading-incurved or reflexed, firmly herbaceous, when spread out broadly oblanceolate acute or acuminate (4–)5–8.5 × (2–)2.5–5 mm, but the blade folded backward on itself and thus appearing falcately oblanceolate, deciduous tardily but before the lf.

Lvs (except some high in the panicle) 8–18 cm; petiole including turgid but not much dilated pulvinus 10–26(–37) mm, at middle 0.9–1.8 mm diam, narrowly winged and openly shallowly sulcate ventrally; rachis (2.5–)3.5–9.5 cm, the longer interfoliolar segments (10–)12–21 mm; glands (much eaten) sessile or shortly stipitate between proximal and often some or all distal pairs of lfts, in profile 1.2–2.5 mm tall, the ovoid or lance-ovoid acute body 0.5–1.1 mm diam; pulvinules 1–1.8(–2) mm; lfts 4–6(–7) pairs, strongly accrescent distally, the terminal pair broadly lance- or narrowly ovate-elliptic, obtuse mucronulate or triangular-acute 3–7(–7.5) × 1–1.9 cm, 2.6–3.7 times as long as wide, at strongly asymmetric base cordate always on proximal and sometimes on both sides, the margin strongly revolute, the midrib deeply and 8–13 pairs of camptodrome secondary veins faintly depressed-sulcate above, all sharply elevated beneath, a few weak intercalary secondary veins visible beneath but all tertiary venulation immersed.

Racemes mostly 10–35 (some depauperate distal ones only 4–10)-fld, the 1–3 simultaneously expanded fls raised about to level of spreading-ascending fl-buds, the axis together with stout ascending peduncle becoming (4–)6–16 cm; bracts submembranous ovate- or triangular-acuminate 4–8(–9) × 1.5–4(–5) mm, early papery and usually deciduous before full anthesis; mature pedicels 1.3–2.8 cm; fl-buds obliquely obovoid, thinly pilosulous externally at least at base, the inner subpetaloid sepals glabrate; sepals not strongly graduated, obovate or the inner oblong-obovate, the smallest outer one (5.5–)6–9 mm, the largest inner one (7–)8–10.5 mm; petals glabrous, zygomorphic, the vexillar one broadest emarginate, the abaxial ones narrowest, the longest 11.5–16 mm; staminodes × 1–1.4 mm; filaments of 4 median stamens 1.7–2.8 mm, of the centric abaxial one 2.7–4 mm, of the 2 long latero-abaxial ones dilated 4–6.5 mm, the anthers of 4 median stamens 4.4–6 × 1.2–1.4 mm, obliquely truncate at apex, of the centric sterile abaxial one 5–6 × 0.5–0.7 mm, of the 2 long abaxial ones 6.6–8.5 × 1.5–1.9 mm, lunately lanceolate in outline, bluntly sagittate at base, subhorizontally truncate at apex and 2-porose; ovary densely strigulose-pilosulous; style glabrous linear-

filiform 3–4.5 mm, abruptly hamately incurved just below the terminal stigmatic cavity, there 0.2–0.3 mm diam; ovules 28–46.

Pod obliquely pendulous, the stipe 4.5–6 mm, the broadly linear body 6–14 × 1.1–1.5 cm, at first plano-compressed but the firm green or fuscous, finally brown or nigrescent valves becoming low-convex at maturity, not or only obscurely corrugated, the uniseriate locules 2.5–4 mm long, as wide as the cavity, without pulp; seeds transverse, turned with their broader faces to the septa, plumply narrowly obovoid or claviform moderately compressed, 6–7.5 × 3–3.5 mm, the smooth brown or brown-olivaceous testa lustrous, exareolate.—Collections: 31.

Thickets, open hillsides with relic forest, ascending into subpáramo, n.-ward in cloud-forest, in Cord. de Mérida sometimes also planted around dwellings, (1600–)1900–3200 m, locally plentiful along both slopes of the e. cordillera of the Andes between 7°15' and 9°30'N in n.-e. Colombia (n.-e. Santander and s. Norte de Santander) and n.-w. Venezuela (Táchira, Mérida, Trujillo).—Fl. throughout the year, perhaps most prolifically X–III, the fruits long-persistent.—*Urumaco* (*orumaco*), *brusco*.

Our concept of *S. santanderensis* is equivalent to *Cassia santanderensis* Lasseigne (1979), limited, that is, to the plant of the eastern cordillera northward from about 7°N, and thereby excludes Lasseigne's varieties in the equatorial and southern Andes which appear at once remotely allopatric and specifically distinct. The diagnostic traits of *S. santanderensis* sens. restr. are the firmly herbaceous, backwardly conduplicate stipules, the relatively large leaflets and calyx, the large size of the two long abaxial anthers by comparison with the sterile one between them, and the distally hooked style. The vars. *canarensis* and *parvianthera* Lasseigne differ collectively in their narrow plane thin-textured stipules, small calyx, smaller abaxial anthers all three fertile, and a straight or almost straight style; they constitute together our *S. lasseigniana*, described above.

As Pittier (1945, sub *Adipera jahnii*, l.c.) has pointed out, the vesture of Venezuelan *S. santanderensis* is quite variable, the hairs being most often relatively coarse and erect, but sometimes finer and ascending or forwardly incumbent, but these pubescence types do not appear to be geographically segregated and are interpreted as minor variations. In exposed habitats near 3000 m the trees are sometimes dwarfed and crooked, the leaves smaller than in cloud forest conditions lower down, and the panicle more condensed.

116. *Senna multiglandulosa* (Jacquin) Irwin & Barneby, comb. nov. *Cassia multiglandulosa* Jacquin, Ic. pl. rar. 1(3): 8, t. 72. 1783 & Collectanea 1: 42. 1787.—“. . . semina a Massone accepi, qui in hortis Tenerifae crescentem invenit.”—Holotypus, cult. in hort. schoenbrun., W (hb. Jacq.)!

Cassia tomentosa Linnaeus fil., Suppl. pl. 231. 1781.—“*Habitat* in America meridionali. *Mutis*.”—Holotypus, sent to Linnaeus from Colombia by José Celestino Mutis, LINN 528/23!—*Adipera tomentosa* (Linnaeus fil.) Britton & Rose, N. Amer. Fl. 23(4): 241. 1930.—Non *Senna tomentosa* Batka, Bot. Zeit. 12: 115. 1854, nom. illegit.—*Cassia cana* Schrank ex Steudel, Nomenclator ed. 2, 1: 304, 308. 1840, pro syn.

Cassia lutescens G. Don, Gen. Hist. Dichl. Pl. 2: 442. 1832.—“Native of Peru. *C. pubescens* Ruiz & Pav[ón] in herb. Lamb[ert]”—Holotypus, BM!—Equated with *C. tomentosa* by Bentham, 1871, p. 528.

(?)*Cassia albida* Gómez Ortega, Decades 8: 92. 1800.—“*Habitat* in Nova Hispania. Floret in Hort. Reg. Matrit . . . e seminibus missis e Civitate Puebla de los Angeles per *D. Antonium*

Cal.''—No typus found at MA where, however, *S. multiglandulosa* was cultivated at least as early as 1787 (MA!).—*C. tomentosa* var. [β . *C.*] *albida* (Gómez Ortega) Colladon, Hist. Casses 104. 1816; G. Don, Gen. Hist. Dichl. Pl. 2: 441. 1832.

Cassia wightiana Graham ex Wight & Arnott, Prod. Fl. Pen. Ind. Or. 1: 286. 1834, pro syn.

Cassia tomentosa sensu Colladon, 1816, p. 104, inclus. var. γ (*typica*) & α + var. β ; Schrank, Pl. Rar. hort. Monac. 1(1): t. 1. 1817; Vogel, 1837, p. 22; Lowe, Man. Fl. Madeira 1: 229. 1868; Bentham, 1871, p. 528; Fyson, Fl. Nilgiri & Pulney Hill-tops 1: 126 & 2: t. 92. 1915; Standley, 1922, p. 406; Macbride, 1943, p. 183; McMinin & Maino, Ill. Man. Pac. Coast Trees 247, fig. 278. 1935; Standley & Steyermark, 1946, p. 129; De Wit, 1955, p. 275; Symon, 1966, p. 87; Isely, 1975, p. 130, map 60 (U.S.A., cult.).

Densely leafy shrubs and treelets at anthesis (0.8–)1.5–5(–6) m, with fuscous glabrate older (leafless) branches, elsewhere pilose-tomentulose throughout with fine straight spreading or contorted and \pm matted, pallid or commonly lutescent hairs up to 0.4–0.8(–1) mm, the hornotinous branchlets, lf-stalks, lower face of the firmly chartaceous lflets and the ovary densely so, the upper face of lflets more thinly and shortly so, dull dark green commonly brunnescent when dried, the many axillary racemes either all or mostly lateral and shorter than the subtending lf, or some later ones crowded into a corymbiform, scarcely or shortly exserted panicle.

Stipules erect, thinly herbaceous lance-acuminate 3.5–7 \times 0.6–2 mm, the blade pilose on both faces, but glabrescent at tip, early dry and caducous before maturity of associated lf, lacking from mature spms.

Lvs (6–)8–16(–17.5) cm; petiole including moderately swollen firm pulvinus 3–12(–14) mm, at middle 0.8–1.8(–2) mm diam, shorter than or equaling the first interfoliolar segment of rachis, appearing terete, the very narrow ventral sulcus concealed by vestiture; rachis (3–)4–12 cm, tapering distally, its longest segment (7–)9–18(–20) mm; glands (much eaten) between several proximal or between all pairs of lflets sessile or almost so, the livid or nigrescent glabrous body varying from plumply ovoid-acuminate to slenderly lance-fusiform, that between the proximal pair of lflets 0.8–1.6(–2) \times 0.25–0.7 mm, those between subsequent pairs often decrescent upward, becoming acicular; pulvinules 0.8–1.6 mm; lflets (5–)6–8(–9) pairs, the proximal ones shortest, the rest gradually or scarcely accrescent distally, the longest oblong-, lance- or oblance-elliptic, obtuse apiculate or deltately subacute (2.3–)2.6–4.2(–4.7) \times (0.6–)0.7–1.4(–1.65) cm, (2.6–)2.8–4(–4.2) times as long as wide, at oblique base cordate or broadly rounded proximally, cuneate or less broadly rounded distally, the margin revolute, the midrib impressed above, cariniform beneath, the 5–8(–9) pairs of weak secondary veins finely prominulous beneath but often concealed by vestiture, tertiary venulation 0, the upper face of lflets veinless.

Racemes shortly (3–)4–12(–15)-fld, the 1–2 simultaneously expanded fls elevated to level of ascending subglobose or plumply obovoid pilosulous fl-buds, the axis together with peduncle becoming 2–8(–10) cm; bracts thinly herbaceous ovate or broadly lanceolate acute or acuminate cymbiform 3.5–8(–10) \times 1.8–3.8(–4.4) mm, deciduous long before anthesis; mature pedicels (12–)15–26 mm; sepals moderately graduated, the outermost ovate yellow- or fuscous-tinged, densely pilosulous dorsally 5.5–9 mm, the subpetaloid, marginally glabrate obovate-suborbicular innermost one 8.5–13 mm; petals deep yellow drying dull stramineous brown-veined, dorsally puberulent near claw, the 3 adaxial obovate-flabellate, the vexillar one emarginate, the 2 abaxial ones obovate, as long or a little shorter than the vexillar one, this (12–)13.5–19 mm; androecium glabrous, the blade of 3 staminodes oblong-obovate or spatulate (1.4–)1.7–2.7 \times (1.1–)1.3–2 mm, the filaments of 4 median stamens 2–3.3 mm, those of 2 longer abaxial ones (4.5–)5–7 mm, of the centric abaxial one (3–)3.5–5 mm, the anthers of 4 median

stamens lance-oblong-ellipsoid straight $3.7-5 \times 1.1-1.5$ mm, those of the 2 long abaxial ones lanceolate in outline, shallowly incurved, brown yellow-tipped $6-7.5 \times 1.2-1.7$ mm, that of the centric abaxial one only a trifle shorter or narrower $5.5-7.2 \times 1-1.5$ mm, the 7 fertile anthers all alike tapering into the obliquely truncate tip, there expanded into a pollen-cup $0.3-0.5$ mm long divided by a slender septum; ovary densely white- or yellowish-tomentulose; style glabrous stout scarcely incurved $2.5-4.2(-4.7) \times 0.25-0.4$ mm, after anthesis thickened, laterally compressed proximally, persistent, the oblique stigmatic cavity looking upward and inward; ovules (30-)32-48(-50).

Pod obliquely geotropic or pendulous, the stipe 4-7 mm, the linear compressed but turgid body when fully fertile (7-)8-12(-13.5) $\times 0.7-0.9(-1)$ cm, straight or gently either in- or decurved, the thinly succulent, green, then pale brown, finally nigrescent, when ripe papery and permanently pilosulous valves inconspicuously margined along sutures, becoming wrinkled lengthwise and weakly corrugated over the seeds, only faintly venulose, the dry 1-seriate seed-locules 2-3 mm long, as wide as or a little less wide than the whole cavity; dehiscence very late, chiefly by weathering on the bush; seeds turned with broader face to the septa, plumply obovoid, moderately compressed, in wider profile $4-5.2 \times 2.6-3.7(-4)$ mm, ± 2 mm thick, the testa smooth or minutely pitted overall, lustrous brown or castaneous, exareolate; $2n = 24$.—Collections: 68.

Open sunny places in disturbed forest or scrub-woodland communities, sometimes on lava-flows, rocky riverbanks and outcrops, n.-ward in the pine-oak and oak-liquidambar belt, 2000-3100 (in Peru reportedly to 4150) m, enduring light winter frosts, the original dispersal obscured by cultivation and naturalization in hedges, pastures and road-cuttings, but apparently native both in the Andes and in cordilleran Mexico and Central America: Bolivia (Cochambamba and La Paz) n. through highland Peru and Ecuador to the centr. and e. cordilleras of Colombia (to Cundinamarca and Antioquia); highlands of Guatemala, Chiapas, and of centr. and s. Oaxaca in Mexico; Sa. Madre Oriental from Oaxaca (perhaps not native) and Puebla to e. Guanajuato and s.-e. San Luis Potosí, thence w. through México to n.-e. Michoacán; planted for ornament and locally naturalized in seasonally dry lowlands of tropical America and in temperate s.-w. United States, s. Africa, Macronesia, e. Australia, India, Malaya, Hawaiian Is.—Fl. in Mexico and Guatemala mostly VI-I, in equatorial South America almost throughout the year.—*Parral*, *parrita*, *alcaparillo*, *frijol cimarrón*, *mulato*, *retama* (Mexico); *alcaparito*, *alcaparro chico* (Colombia); *chinchin* (Ecuador).

Senna multiglandulosa is the handsome floriferous shrub or small tree with softly yellowish-tomentulose foliage that in the genus *Cassia* is properly known as *S. tomentosa*. In the context of its group it is morphologically uniform, readily recognized by the syndrome of subsessile leaves consisting of 6-8 pairs of strongly bicolored elliptic leaflets dull green puberulent and veinless above but densely pilose-tomentulose beneath, plane caducous stipules, and a compressed but turgid pod that contains only one row of seeds. The related and habitally similar *S. santanderensis*, which replaces *S. multiglandulosa* in the eastern cordillera of the Andes between Santander, Colombia and Trujillo, Venezuela, differs in the firmly herbaceous replicate stipules, fewer (4-6) pairs of rather larger leaflets glabrous above and charged beneath with many thickened trichomes in addition to the pilosulous vesture, a style abruptly hooked at apex, and a pod 11-15 (not 7-10) mm wide. Near its southern limit in Peru and Bolivia the range of *S. multiglandulosa* overlaps that of *S. punoënsis*, different in more numerous (7-11) pairs of leaflets glabrous above and in details of the androecium, the two long

abaxial anthers being horizontally truncate at apex (not expanded obliquely into a pollen-cup) and the centric abaxial anther being sterile and only about 0.4–0.5 (not 1–1.5) mm diam. In Cochambamba *S. multiglandulosa* comes into contact with *S. morongii*, a species ranging mainly far to the southeast at elevations below 1200 m, and in the past mistaken for a form of *S. multiglandulosa* only because of its similar dense vesture. *Senna morongii* has usually only three or four, rarely five pairs of leaflets, inner sepals only 5–7 (not 8.5–13) mm long, and well over fifty ovules in each ovary, which ripens to a subcylindric (not laterally compressed) pod charged with two parallel rows of seeds.

Standley & Steyermark (1946, l.c.) have drawn attention to the curiously interrupted dispersal of *S. multiglandulosa*, which is locally abundant in southeastern Mexico and Guatemala and again in the Andes southward from central Colombia, but has not been met with in ostensibly suitable habitats in montane Honduras, Costa Rica or Panama. This species is ornamental, a prolific seeder, of easy culture and prone to colonize disturbed habitats, and has moreover been valued in Amerindian folk medicine for its vermifuge and cathartic properties. We hazard the guess that its real home was in equatorial Andes of Ecuador and Peru and that its North American range is secondary, where it may have been introduced in pre-Colombian times. By the year 1824 it appeared to Wight (cf. Wight & Arnott, l.c.) that *S. multiglandulosa* was native in southern India, so completely had it become integrated into the flora of the Nilgiri Hills less than fifty years after it had been first described from plants cultivated on Tenerife and in Vienna. All the close relatives of *S. multiglandulosa* are Andean. The inter-specific hybrid *S. × floribunda*, of highly localized occurrence in Mexico, is apparently begotten of a native species, *S. septemtrionalis* that has encountered *S. multiglandulosa* far from its true home in an artificial environment.

Senna × floribunda (Cavanilles) Irwin & Barneby, stat. nov. *S. multiglandulosa* (Jacquin) × *septemtrionalis* (Zuccagni) Irwin & Barneby. *Cassia floribunda* Cavanilles, Descr. Pl. 132. 1801.—“Crece en la Nueva-España junto a la Puebla de los Angeles [=Puebla, Mexico]: . . . se cultiva en el Jardín botánico.”—Described anew from plants grown in Madrid, but the name technically a legitimate substitute for *C. corymbosa* Gómez Ortega, Decades 10: 124. 1800 (non Lamarck).—“*Habitat* in Nova Hispania ad urbem *Puebla de los Angeles*. *Floret* in Hort. Reg. Matritensi . . . e seminibus missis per *D. Antonium Cal.*”—No typus found at MA (Brenan, 1967, p. 70), but the plants at G-DC! a) sent as *C. floribunda* ex hort. matrit. by Lagasca in 1807 to DeCandolle and b) grown by DeCandolle, one of which provided the model for the illustration in Colladon’s monograph (1817, t. 11) are considered authentic.—*Chamaefistula floribunda* (Cavanilles) G. Don, Gen. Hist. Dichl. Pl. 2: 452. 1832. *Cassia grandiflora* Desfontaines, Cat. Hort. Paris. 302. 1832, nom. in syn.—Spm. authent., cult. in hort. parisiensi, FI (hb. Desf.)!—*C. corymbosa* var. *plurijuga* Benthams, Trans. Linn. Soc. London 27: 526. 1871.

Cassia herbertiana Lindley in Edwards, Bot. Reg. 17: t. 1422. 1831.—“A native of Barbadoes, whence seeds were received by the Hon. and Rev. William Herbert by whom our specimens were communicated . . .”—No specimens preserved (fide Benthams, 1871, p. 527); lectotypus, the cited plate. *Chamaefistula herbertiana* (Lindley) G. Don, op. cit. 1832, p. 452.—*C. floribunda* var. [*‘γ C.*’] *herbertiana* (Lindley) Vogel, Syn. Gen. Cass. 19. 1837.

(?) *Cassia hybrida* Tenore, Cat. R. Orto Bot. Napoli 80. 1845.—Described from a plant grown in the garden of Hôtel des Etrangers at Nice, France, suspected as hybrid *C. floribunda* × *corymbosa* or × *elegans* (our *Senna septemtrionalis*) but coming true from seed.—

Pods "obtenus dans le jardin de l'Hotel des Etrangers à Nice en 1938," G! are ostensibly authentic and the accompanying plant grown at Geneva in IX.1839 appears derived from them.—Equated by Bentham, 1871, p. 527, with *C. laevigata*, but the protologue and cited specimen indicates *S. × floribunda*.

Adipera arsenei Britton & Rose, N. Amer. Fl. 23(4): 242. 1930.—"Fort Guadalupe, Puebla, 2,180 meters altitude, September 30, 1906, Brother G. Arsène!"—Holotypus, US! clastotypus + photo, NY!

Adipera bicolor Britton & Rose, N. Amer. Fl. 23(4): 242. 1930.—"Near Durango City, Durango, 1896, E. Palmer 596a."—Holotypus, presumably from cultivated or naturalized plant, US! clastotypus + photo, NY!

Cassia floribunda sensu Lowe, Man. fl. Madeira 1: 228. 1868.

Habitally similar to *S. septemtrionalis*, but the lfts (at least when young), pedicels and base of ovary finely pilosulous with weak incurved or subappressed hairs up to 0.2–0.7 mm, the inflorescence often corymbose-paniculate and ± exserted from foliage.

Lvs (7–)9–16(–18) cm, the petiole 18–34 mm, the rachis (2.5–)3–8(–9.5) cm, its longest interfoliolar segment 12–25 mm; lfts 4–5 pairs, the distal pair lance- or oblong-elliptic, abruptly acute or acuminate 3–7 × 1–2 cm, 2.5–4(–4.2) times as long as wide, at base inequilateral, rounded or subcordate on proximal and cuneate on distal side, the 8–14 pairs of secondary veins not or scarcely visible above, the tertiary venulation scarcely prominent beneath.

Racemes 4–15(–20)-fld, their axis with peduncle (2–)3.5–12 cm; vexillar petal 14–23 mm; ovary puberulent; ovules 50–64.

Pod like that of *S. septemtrionalis* externally, the body (5–)6–7.5 × 0.7–0.9 cm, terete or somewhat laterally compressed, the seed-locules varying from irregularly 2- to strictly 1-seriate, the orientation of the seeds ± haphazard, some turned with broad faces to the septa, others obliquely to the valves.—Collections: 20.

Open rocky and disturbed habitats, sometimes on pedregal, ±1800–2300 m, primarily with or near the parent spp., but fully fertile and forming independent populations, local around the s. and s.-e. margins of the Mexican Plateau from n.-w. Michoacán to Puebla, n. to s.-e. San Luis Potosí, cultivated in Spain about 1800 and thence diffused in horticulture; reports from Durango, Barbados and elsewhere outside the common range of the parent species are from cultivated or weedy stock.—Fl. in Mexico mostly VI–X.

The two first monographers of *Cassia* sens. lat., Colladon in consultation with his professor A. P. DeCandolle (1816) and Vogel (1837), agreed in recognizing the two species *C. laevigata* and *C. floribunda*, obviously close relatives but seemingly different in outline of leaflets, in pubescence, in incidence of petiolar glands, in architecture of the inflorescence, or in some combination of of these characters. Both species were then known principally from specimens cultivated in Europe; indeed, except for the Mexican type-collection of *C. elegans* H.B.K., there were no exact data about dispersal in the wild state. By 1870–1871 Bentham had evidence that *C. laevigata*, characterized by broadly and subsymmetrically lance- or ovate-acuminate, truly glabrous leaflets, was an American senna widely dispersed as a circumtropical weed; but *C. floribunda*, differing in its oblong-elliptic, basally inequilateral, variably pubescent leaflets and corymbose-paniculate rather than largely lateral racemes, remained a horticultural oddity which Bentham provisionally interpreted as a plurifoliolate variety of *C. corymbosa*. Here the matter rested until De Wit (1955, l.c.) summarily equated *C. floribunda* with *C. laevigata* and, following the dictates of priority, adopted the earlier epithet *floribunda*. Under this name De Wit really described and discussed only

genuine *C. laevigata*, but since his synonymy has become generally accepted the genuine *C. floribunda* has dropped out of sight.

The fact remains that there is a senna distinct from *C. laevigata* that grows wild in Mexico and answers excellently to the plant grown at Madrid in the first decade of the XIX century and independently described by Gómez Ortega as *Cassia corymbosa* (not of Lamarck) and by Cavanilles as *C. floribunda*. It is, however, found only in the common range of *C. laevigata* (=our *Senna septemtrionalis*) and *S. multiglandulosa*, at least sometimes in close association with both. Moreover it is morphologically intermediate in outline and pubescence of the leaflets, in the ovule-number, and in the arrangement of the seeds, which are strictly 2-seriate in *S. septemtrionalis*, strictly 1-seriate in *S. multiglandulosa*, but vary from 1-seriate to irregularly displaced in what we here call *S. × floribunda*. Localities where these three sennas are known to grow close together are on the peripheral foothills of Valle de México (numerous collections), around Zitácuaro and Temascaltepec in Mexico State (*Hinton* 6216, 8278, 13546), and along the San Luis Potosí-Río Verde highway near Santa Catarina (*septemtrionalis*: *Roe & Roe* 2160, *Schubert & Souza* 1919; *multiglandulosa*: *Lasseigne* 4887; *× floribunda*: *Lasseigne* 4886, 4889, *Hill & Funk* 1784). We feel convinced that *Cassia floribunda* is a fertile, self-perpetuating hybrid that probably was synthesized several times as opportunity arose for exchange of pollen between the parent species, features of which it incorporates in varying degree. The typus of *Adipera bicolor*, for example, has the relatively small elliptic, basally asymmetric leaflets of *S. multiglandulosa*, but they are glabrous or almost so. In the typus of *A. arsenei* the leaflets are larger and densely pubescent, in fact resembling those of the original *C. floribunda* which also came from Puebla. Different strains of the hybrid differ in flower-size, the handsome plant known in gardens as *Cassia herbertiana* representing the large-flowered extreme.

117. *Senna punoënsis* Lasseigne, sp. nov., habitu, inflorescentia et legumine *S. multiglandulosae* praesimilis ac manifeste affinis, sed foliis lanceolato-ovatis (nec oblongo-ellipticis) 7–11 (nec 6–8)-jugis superne glabris inferne puberulis (nec lanatis) necnon staminum 2 abaxialium longorum antheris apice horizontaliter (nec oblique) truncatis diversa. PERU. Puno, prov. Sandía: along stream among rocks in open, 3200–3450 m, near Limbani, 14–16.V.1942, *R. D. Metcalfe in Goodspeed* 30491.—Holotypus, UC; isotypus, MO.

Potentially arborescent to 6 m but probably flowering when smaller and only shrubby, the annotinous branches castaneous, the hornotinous, densely leafy ones with lf-stalks and dorsal face of lflets either strigulose with straight subappressed or pilosulous with loosely spreading-ascending hairs up to 0.2–0.45(–0.75) mm, the vesture commonly lutescent, the ample crowded foliage strongly bicolored, the lflets dull olivaceous or dark green and glabrous above, pallid beneath, the axillary racemes equalling or shorter than the subtending lf, forming an immersed or scarcely emergent corymbiform panicle.

Stipules erect submembranous, pallid or brownish, linear-lanceolate 2.5–7.5 × 0.4–1.2 mm, early caducous, absent from mature spms.

Lvs (7–)8–15.5 cm; petiole including discolored but little swollen pulvinus 7–15(–18) mm, not or little longer than the first interfoliolar segment of rachis, at middle 1–1.4 mm diam, the shallow open ventral sulcus narrowly thick-margined; rachis 5.5–10.5 cm, its longer segments 8–14 mm; glands between most pairs or all except the distal pair of lflets, sessile or substipitate 0.8–1.3 mm, the ovoid

obtuse or apiculate body of the proximal one 0.3–0.7 mm diam, that of distal ones sometimes much smaller; pulvinules 1–1.4 mm; lfts 7–11 pairs, basipetally decrescent in the lower $\frac{1}{3}$ of rachis, subequal distally, in outline narrowly ovate or lance-elliptic acute or obtuse mucronulate, the longest $2.2\text{--}3.5 \times 0.5\text{--}1.2$ cm, 3–3.8(–4.5) times as long as wide, at base asymmetrically rounded or proximally cordate, the margin strongly revolute, the midrib cariniform beneath, deeply canaliculate above, the $\pm 8\text{--}10$ pairs of slender camptodrome secondary veins faintly raised above, discolored but scarcely prominulous beneath, tertiary venulation not or scarcely perceptible.

Racemes $\pm 5\text{--}30$ -flowered, the expanded fls elevated nearly or quite to level of the ascending, obtusely obovoid-ellipsoid, proximally puberulent buds, the axis and peduncle together 3–13 cm; bract resembling stipules in shape and texture 3.5–5.5 mm, caducous before anthesis; mature pedicels 23–33 mm; hypanthium broadly obconic; sepals submembranous fuscous with paler margins, well graduated, all obovate obtuse, the outermost 3.5–5.5 mm, the innermost 8–10.5 mm; corolla zygomorphic glabrous, yellow drying brownish-stramineous brown-veined, the obovate-flabellate emarginate vexillary and 2 similar lateral petals 14.5–17 mm, the 2 elliptic-ob lanceolate abaxial ones as long or slightly shorter; androecium glabrous, the blade of staminodes obtusely pentagonal or subquadrate emarginate $1.5 \times 0.8\text{--}1.4$ mm; filaments of 4 median stamens and of the sterile centric abaxial one 3–3.5 mm, those of 2 latero-abaxial ones (3.5–)4–6.5 mm, the anthers brown, those of 4 median stamens straight or nearly so, obliquely truncate $3.5\text{--}4.6 \times \pm 1$ mm, that of the centric sterile one $3\text{--}3.5 \times 0.4\text{--}0.6$ mm, those of the 2 latero-abaxial ones shallowly lunate $5.5\text{--}6.5 \times 1.2\text{--}1.5$ mm, at apex horizontally truncate and essentially beakless, dehiscent by a coarsely U-shaped slit; ovary laterally strigulose or thinly pilosulous; style stoutly linear, gently incurved $2\text{--}3.5 \times 0.3$ mm, the minute stigmatic cavity terminal; ovules 42–47.

Pod declined, the stout stipe 4–7 mm, the linear body $\pm 9\text{--}12 \times 0.8\text{--}0.9$ cm, a little laterally compressed but strongly turgid, the ripe valves stiffly papery brown; seeds uniseriate, turned broadside to the septa, plumply obovoid $\pm 4.5\text{--}5.5 \times 3.5\text{--}4$ mm, the testa lustrous dark brown crackled exareolate.—Collections: 7.

Open rocky slopes and stream banks at $\pm 2200\text{--}2500$ m, apparently local on the sources of ríos Madre de Dios and Mamoré in n.-e. Puno, Peru (prov. Sandía) and Cochabamba, Bolivia (prov. Sacaba).—Fl. VII–X, IV–V, perhaps throughout the year.

This relatively rare and still imperfectly known senna is closely related to *S. multiglandulosa*, which it resembles in habit, inflorescence and pod. The slightly more numerous lance-ovate rather than oblong-elliptic leaflets glabrous above and only thinly puberulent or thinly pilosulous (not lanate) beneath contribute to a subtly individual aspect, and the horizontally truncate long anthers flanking a sterile centric one provide an apparently reliable technical character in the flower. *Senna burkartiana*, which ranges southward along the Andes from Cochabamba, is more easily distinguished by the fewer larger leaflets with secondary venation deeply engraved on the upper face.

This species was independently recognized as undescribed by Dr. Alex Lasseigne, now at Nichols State University, Thibodaux, La., during work on his doctoral thesis, and by us in our general studies of *Senna*. By arrangement with Dr. Lasseigne we are here publishing it as new, but transferring his manuscript epithet to the genus *Senna*.

118. *Senna morongii* (Britton) Irwin & Barneby, comb. nov. *Cassia morongii* Britton, Ann. N.Y. Acad. Sci. 7: 91. 1892.—“[Paraguay–Argentina border:] Pilcomayo River ([*T. Morong*] 1015).”—Holotypus (2 sheets, fl, fr), NY!

Cassia tomentosa var. (β) *paucijuga* O. Kuntze, Rev. Gen. 3(2): 56. 1898.—“Argentina: Cordoba, Ischilin. Bolivia: Cochabamba.”—Lectoholotypus, *Kuntze s.n.* collected at Ischilin, IX.1892 (fl), NY! paratypi, *Kuntze s.n.* collected at Cochabamba, III.1892 (fl jun), NY (2 sheets)!

Cassia rojasiana Hassler, Bull. Herb. Boiss. II, 7(3): 173. 1907.—“[Paraguay:] . . . ad margines silvarum prope Santa Elisa (Chaco septentr.) . . . mens. Mart. [1903] Hassler n. 1797, leg. Rojas.”—Holotypus, G (2 sheets, 1 = F Neg. 28012)! isotypus, NY!

Cassia acinacicarpa Rusby, Bull. N.Y. Bot. Gard. 4(14): 311. 1907.—“[*M. Bang*] 1090 . . . [Bolivia:] Above Cochabamba.”—Holotypus, NY! = NY Neg. 4970; isotypi, NY (2 sheets)!

Cassia cochabambae Herzog in Fedde, Repert. Sp. Nov. 7: 55. 1909.—“Bolivia: Auf trocknen Hügeln um Cochabamba . . . ca. 2700 m, Januar 1908, leg. Herzog.”—Holotypus, †B.—The spms photographed in F Neg. 1674, distributed as phototypus of *C. cochabambae*, are *Herzog s.n.* dated VII.1892 (not I.1908) and *O. Kuntze s.n.*, the latter isotypus of *C. tomentosa* var. *paucijuga*, q.v. supra.

Cassia morongii sensu Burkart, 1952, p. 165, cum syn. omn.

Slender, amply leafy shrubs at anthesis \pm 1–2 m, with terete virgately ascending hornotinous and brown lenticellate older branches, pilosulous or tomentulose throughout with widely spreading straight or incurved or with mostly antrorsely incumbent hairs up to 0.4–1 mm, the foliage dull pale green or commonly softly gray-woolly (the vesture often sordescent when dried), the lflets subequally pubescent on both faces but commonly paler beneath, the shortly pedunculate few-fl'd racemes shorter than the subtending lf, lateral to axillary stems or their secondary branchlets, rarely in age forming a small semi-exserted panicle.

Stipules loosely ascending, narrowly lanceolate or lance-attenuate (1.5–)2–4.5 \times 0.3–0.8 mm, at first herbaceous, quickly dry caducous, often before full expansion of the associated lf, absent from all but young flowering spms.

Lvs (4–)5.5–13(–14.5) cm; petiole (8–)10–22(–24) mm, at middle (0.5–)0.6–1.1 mm diam, strongly pale-margined along the narrow ventral sulcus; rachis (1.2–)1.5–6(–9) cm, the longer interfoliolar segments (8–)10–18(–25) mm; petiolar gland between the proximal pair of lflets sessile or obscurely stipitate, the green or orange head slenderly or plumply ovoid acute or apiculate, in profile 0.7–1.4 \times 0.3–0.7 mm; pulvinules 0.6–1.4 mm; lflets 2–5, in most lvs of any plant 3–4 pairs, accrescent and proportionately narrower distally, the distal pair longest, obliquely lanceolate or lance-elliptic, either acute or obtuse and apiculate, 2.5–6 \times (0.5–)0.6–1.6(–1.8) cm, (2.9–)3–5 times as long as wide, at base rounded or cordate on proximal and cuneate on distal side, the (mature) margin revolute, the upper face of blade veinless or almost so, the midrib prominulous beneath only, there giving rise to 4–7 pairs of slender, weakly camptodrome secondary veins, tertiary venulation invisible and all venation commonly obscured by vesture.

Peduncles slender (5–)8–21(–24) mm; racemes shortly or subumbellately (1–)2–6(–10)-fl'd, the axis becoming 1.5–10(–30) mm and together with peduncle in fruit 1–3.5(–4.5) cm; bracts lance-subulate, early dry caducous from below incipiently elongating pedicel; fl-buds obliquely obovoid-ellipsoid obtuse pilosulous when young, the emergent inner sepals often glabrescent dorsally; hypanthium turbinate \pm 1–1.5 mm; sepals moderately graduated, the outer firm, the shortest 3–4.4 mm, the inner broadly elliptic-obovate, pallidly membranous-margined (4.5–)5–7 mm; corolla zygomorphic, the yellow petals drying paler yellow or stramineous, delicately dark-veined, glabrous or puberulent at the short claw,

the vexillar one obovate-emarginate, its 2 neighbors obovate obtuse, the 2 abaxial ones elliptic or lance-elliptic, often a trifle longer than the anterior ones, the longest 7–11(–11.5) mm; androecium glabrous or puberulent about the filaments, functionally 7-merous, the oblong or rhombic, basally cordate blade of the staminodes 1–1.3 mm wide, the filaments of 4 median stamens 0.5–1.6 mm, of the centric abaxial one 2–4 mm, of 2 latero-abaxial ones dilated 3.5–6 mm, the anthers brownish yellow-tipped, of 4 median stamens straight $3.5\text{--}4.5 \times 0.7\text{--}1.2$ mm, of the centric abaxial one $4\text{--}6 \times 0.7\text{--}1$ mm, of the long pair lunately incurved $5\text{--}6.8 \times 1\text{--}1.2$ mm, all anthers slightly constricted 0.4–0.6 mm below apex, those of 4 median stamens there obliquely, of the rest horizontally truncate, the latter dehiscent by a broadly U-shaped pore, the orifice of the 4 median often divided by a persistent septum; ovary pilosulous, usually densely and loosely so; style glabrous or proximally puberulent, incurved from ovary thence straight, linear slightly dilated upward $(1.8\text{--})2\text{--}3.3(\text{--}3.5) \times 0.2\text{--}0.3(\text{--}0.4)$ mm, the minute stigmatic cavity looking upward; ovules (52–)56–86.

Pod stiffly obliquely geotropic (sometimes apparently ascending from geotropic branches), the stipe 4–6 mm, the cylindric or subtetragonally compressed, straight or gently incurved body $6\text{--}8.5 \times (0.5\text{--})0.6\text{--}0.9(\text{--}1.1)$ cm, abruptly contracted at both ends, sometimes obscurely sulcate along one or both of the broadly margined sutures, the pilosulous green valves in age brunnescent or stramineous and stiffly papery, not or scarcely pulpy internally, the individual, completely enclosed seed-cavities 2–2.8 mm long, occupying \pm half the width of the pod; seeds transverse, stacked in 2 parallel or very shallowly interdigitating rows, each turned with broad faces to the septa, in outline obliquely obovate $(2.9\text{--})3.3\text{--}4.6 \times (2\text{--})2.7\text{--}3$ mm, the testa fuscous or brownish-olivaceous smooth and highly lustrous, exareolate.—Collections: 47.

Rocky hillsides, thickets, riverbanks and beds of intermittent streams, mostly extratropical and ranging between 350 and 1200 m along the Andean piedmont in n.-w. Argentina from Jujuy s. to centr. Cordoba and n. San Luis, thence extending e.- and downward to 100 m, mostly along rivers, over Gran Chaco to the Paraguay Valley in s. Paraguay and adjacent Argentina (Corrientes); apparently isolated near 2000–2700 m on the headwaters of the Río Grande in Cochabamba, Bolivia.—Fl. XI–V(–VIII), the long-persistent pods often coeval with fls.—*Pito*, *p. canuto*; *algarrobo de los caranchos*; *sen*, the lvs purgative.

Senna morongii is easily distinguished from kindred species with cylindric pod and biseriate seeds by the relatively few, most commonly 3–4 pairs of leaflets veinless on the upper face and pilosulous-tomentulose on both. The vesture varies in length, attitude and concentration of hairs, but we cannot recognize any geographic pattern to it. The synonymy, worked out by Burkart (1952), is accountable to duplication of effort rather than critical differentiation.

119. *Senna septemtrionalis* (Viviani) Irwin & Barneby, comb. nov. *Cassia septemtrionalis* Viviani, Elench. pl. hort. bot. J. Car. Dinegro 14. 1802.—Described from plants cultivated at Genoa and acquired “ex hort. Tic. et Flor[entino]”; no typus known to survive, but the description full and decisive.

Cassia septentrionalis Zuccagni, “Cent. 69. 1806,” preprinted in Roemer, Collectanea 1: 141. 1809.—“Semina hujus Plantae in viridario Casertae prope Neapolin cultae, benigne communicavit D. Andreas Graefer, ejus viridarii custos.”—Described from plants grown at Florence, where represented by a spm in hb. Micheli., here designated lectotypus, FI!—A potential isotypus labelled “*C. settentrionalis*,” G-DC!

- Cassia laevigata* Willdenow, Enum. pl. hort. Berol. 441. 1809.—Described from a plant cultivated at Berlin, of unknown provenance.—Holotypus, B-WILLD 7952!—*Chamaecassia laevigata* (Willdenow) Link, Handbuch 2: 139. 1831. *Chamaefistula laevigata* (Willdenow) G. Don, Gen. Hist. Dichl. Pl. 2: 452. 1832. *Adipera laevigata* (Willdenow) Britton & Rose in Britton & Wilson, Sci. Surv. Porto Rico & Virgin Is. 5(3): 371. 1924.
- Cassia elegans* Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(qu): 342. 1824. “Crescit prope Mexico, alt. 1170 hex.”—Holotypus, labelled ‘*Cassia elegans*. n. 4138. Mexico,’ P-HBK!—*C. floribunda* var. [“β. C.”] *elegans* (Humboldt, Bonpland & Kunth) Vogel, Syn. Gen. Cass. 19. 1837.
- Senna aurata* Roxburgh, Fl. Indica 2: 342. 1832.—“. . . native to the countries and islands to the eastward of the Bay of Bengal.”—Described from plants cultivated at Calcutta, of which no sample (fide Bentham) was preserved. Referred to *C. laevigata* by Bentham, 1871, p. 527, and the protologue fully consistent with this interpretation.
- Cassia vernicosa* Clos in Gay, Hist. Chile, Flora 2: 244. 1854.—“. . . se cria en Rancagua y otros varios puntos de las provincias centrales.”—Holotypus, Bertero 148, P!—Equated by Bentham, l.c., with *C. laevigata*.
- Cassia septentrionalis* Sessé & Mociño, Pl. Nov. Hisp. 60. 1893.—“Habitat Mexici, ubi *Sinensis Genista* nuncupatur.”—Holotypus, Hb. S. & M. 1143, MA! = F Neg. 44438, surmised to be the plant figured by Colladon (1816, t. 4) as *C. laevigata*, this based on a drawing made in Mexico by an artist of the Royal Expedition to New Spain and loaned to DeCandolle by Mociño; cf. Colladon, op. cit., avant-propos.
- Cassia laevigata* sensu Colladon, 1816, p. 88, t. 4; Vogel 1837, p. 19; Lowe, Man. fl. Madeira 1: 227. 1868; Bentham, 1870, p. 108, exclus. var.; 1871, p. 527, major. ex parte; Fyson, Fl. Nilgiri & Pulney Hill-tops 1: 125 & 2: t. 91. 1915; Rock, Leg. Pl. Hawaii 85, pl. 34. 1920; Fawcett & Rendle, 1920, p. 103; Standley, 1922, p. 407 (note on medicinal use and pre-Linnaean history); Dimitri & Rial Alberti, 1941, p. 18, fig. 6; Standley & Steyermark, 1946, p. 118; Schery, 1951, p. 67; Steyaert, 1952, p. 511; Isely, 1975, p. 104, map 43 (U.S.A. cult.); Sánchez, Fl. Valle de México 204. 1968.
- Adipera laevigata* sensu Britton & Rose, 1930, p. 240, exclus. syn. *C. herbertiana*; Britton & Killip, 1936, p. 177.
- Cassia floribunda* sensu De Wit, 1955, p. 245; Symon, 1966, p. 86, map 9 (Australia); Brenan, 1967, p. 70; Adams, 1972, p. 324; non *S. × floribunda* nob.

Amplly leafy shrubs and treelets of rapid growth and precocious maturity, at anthesis 1–5(–6.5) m, with smooth terete green, commonly fistular hornotinous and purplish-castaneous or fuscous older (leafless) branches, except for residually puberulent pulvinules glabrous throughout, the chartaceous, rich green, moderately or weakly malodorous foliage subconcolorous or pallid beneath, the racemes either all lateral and surpassed by their subtending lf or some ultimately crowded into a terminal immersed or scarcely exerted corymbose panicle.

Stipules erect submembranous pallid, narrowly lanceolate or lance-acuminate 3–7 × (0.5–)0.7–1.5 mm, caducous before maturity of associated lf, lacking from mature fl and all fr spms.

Lvs 8–25 cm; petiole including discolored, when dry wrinkled pulvinus (2.2–)2.5–6.5(–7.5) cm, at middle 0.8–1.8 mm diam, openly shallowly sulcate ventrally; rachis (2–)3–9.5(–10) cm, its longest interfoliolar segment (1.1–)1.5–3.7 cm; glands (much eaten) between all pairs or all but the distal pair of lfcs, commonly diminished distally, sessile or shortly stiptitate, the proximal one in profile (1.1–)1.3–2 mm tall, its lance- or ovate-apiculate or oblong-elliptic head 0.4–0.85(–1.1) mm diam; pulvinules wrinkled 1.2–2.7 mm; lfcs 3–4(–5) pairs, ac-crescent distally, often drooping from rachis (emphatically so at night or when wilted), the distal pair broadly ovate- or lance-acuminate or -caudate (3.5–)4.5–10.5 × (1.1–)1.4–3.5 cm, (2.1–)2.3–3.5(–4.7) times as long as wide, sub-equilaterally rounded or cuneate at base, the margin plane or incipiently revolute near the pulvinule, the centric midrib immersed or almost so above, pallid and cariniform beneath, the (11–)12–17 pairs of camptodrome (commonly with many intercalary) secondary veins always prominulous beneath, sometimes also less sharply so above, a sinuous open tertiary venulation raised beneath only, sometimes fully immersed.

Racemes (3–)4–10(–13)-fld, the expanded fls raised to level of the obliquely obovoid fl-buds, the axis together with peduncle becoming (1.5–)2.5–8 cm; bracts submembranous pallid, linear, lanceolate or subulate (1.5–)2–4.5 × 0.4–1 mm, caducous as pedicel begins to elongate; mature pedicels (12–)15–25 mm; sepals either yellowish-green- or reddish-brown-tinged or sometimes bright yellow petaloid, well graduated, the outermost relatively firm ovate-elliptic 4–6.5 mm, the submembranous innermost one oblong-obovate or suborbicular 6.5–10 mm; petals bright yellow drying stramineous brown-veined, all short-clawed glabrous, the amply obovate or obovate-flabellate vexillar one ± deeply emarginate, the rest all obovate obtuse or the 2 abaxial ones narrower, all 5 of subequal length or the vexillar sometimes largest, the longest petal (12–)13–16 mm; blade of staminodes obovate or suborbicular (1.7–)2–2.6 × 1.4–2.5 mm; filaments of 4 median stamens 1.3–2.2 mm, of the centric abaxial one 2–4 mm, of the 2 long latero-abaxial ones dilated ribbonlike (7–)7.5–10.5 mm, the anthers of 4 median stamens oblong-flask-shaped, including the short dilated, obliquely truncate beak 3.6–4.5 × 1.2–1.5 mm, that of the centric abaxial stamen 4.5–5.5 × 1–1.5 mm, either distinctly or scarcely narrower than its 2 long neighbors, these lunately lanceolate, yellow or brown yellow-tipped 5.5–7.5 × (1.1–)1.3–1.8 mm, obscurely constricted 0.4–0.6 mm below the horizontally truncate apex, the orifice 0.6–1 mm wide, the rim 2-umbonate on the adaxial side, dilated abaxially into a small pollen-cup beyond the twin pores of the locules; ovary glabrous; style stoutly linear (2.6–)3–4(–4.3) mm, often a trifle dilated distally, not or scarcely incurved and just below apex 0.3–0.45 mm diam, often persistent into maturity of pod, the stigmatic orifice minutely ciliolate; ovules 62–80.

Pod obliquely ascending on stiff pedicel, the stipe 2.5–5 mm, the straight or obscurely incurved, cylindric or obtusely subquadrangular body when fully fertile 6–9.5(–10.5) × 0.8–1.1 (if strongly flattened in press becoming –1.3 cm wide), the smooth green or anthocyanic valves becoming pale brown, fuscous or ultimately black, paler-margined along the sutures, when fully ripe papery and faintly corrugated over the seeds, the moderately pulpy cavity divided into 2 parallel rows of locules, these when fertile becoming 1.7–2.6 mm long, occupying the breadth but only half the thickness of the cavity; seeds turned with broader faces to the septa, plumply compressed-obovoid (3.6–)3.8–4.9 × (2.7–)2.9–4 mm, ± emphatically pinched at hilum, the olive-drab or brown testa smooth or sometimes microscopically pitted, commonly lustrous but sometimes dull, exareolate; $n = 14$.—Collections: 93.

Originally a shrub or treelet of sunny microhabitats in cool or moist oak, oak-pine and mixed pine-liquidambar forest, secondarily a prolific shrubby weed of old pastures, abandoned orchards, waysides and other disturbed or ruderal places, for over 200 years cultivated for ornament and since pre-Columbian times for folk medicine, the primary range of dispersal thereby modified and lost to view, but apparently truly native in Mexico at ±1000–1950 m along or near the crest and Gulf Slope of Sa. Madre Oriental from s.-e. San Luis Potosí to n. Oaxaca and Veracruz, and from the highlands of w. and s. Oaxaca and Chiapas s.-e. through montane Guatemala, Honduras and Nicaragua just into Costa Rica, in Mexico extending w. at scattered points along the Transverse Volcanic Range into Michoacán; naturalized since XVIII century on Jamaica and apparently more recently in hill country of centr. Puerto Rico and centr. Dominican Republic, reported (but surely only weedy or cultivated) from Martinique, Barbados and Gulf of Panama; collected infrequently and without data as to status but improbably wild in upland Colombia, Pacific Peru, the Federal District in Brazil, and from gardens in Argentina and Chile; long established in tropical Africa, India,

Sri Lanka, Malay Peninsula, in Java and Sumatra (where it has acquired several vernacular names listed by De Wit, l.c. sub *C. floribunda*), in e. Australia and on some Pacific islands including Fiji and Hawaii; widespread in tropical and subtropical horticulture and under glass northward.—Fl. in tropical N. America mostly V–XI, but erratically on through the dry winter months, the long-persistent pods often contemporaneous with new fls, releasing their seeds by decay and weathering.—*Retama* (Mexico); *frijolillo*, *moco* (Guatemala); *hedionda macho* (Pto. Rico); *arsenic-bush*, *Dooley weed*, *laburnum* (Australia).

Senna septemtrionalis is the widespread circumtropical weedy senna with ovate-acuminate, basally equilateral glabrous leaflets and cylindric multiovulate pods that was long known as *Cassia laevigata* but since 1955 has usurped the epithet *floribunda* properly reserved for its hybrid progeny with *S. multiglandulosa*. Within a decade of its publication the basionym *Cassia septemtrionalis* was recognized by Colladon, and therefore by DeCandolle, as a prior synonym of *C. laevigata* Willd. and deliberately passed over as inappropriate in meaning, but this does not constitute a valid objection either by present rule or past convention. Zuccagni's choice of the epithet *northern* indeed makes little sense unless, as seems probable, he had it from Sessé & Mociño, who already had a *Cassia septemtrionalis* described in manuscript although only posthumously published many years later (see synonymy above). From the viewpoint of the Valley of Mexico a local senna might well appear relatively northern, the bulk of the genus being tropical or subtropical in dispersal. But this is by the way; the correct epithet is implicit in the synonymy given by Bentham (1871, p. 527).

Our concept of *S. septemtrionalis* is somewhat more narrowly defined than Bentham's of *Cassia laevigata*. We consider genuine *S. septemtrionalis* to be native only in the northern hemisphere and probably only in highland Mexico and Central America; and we interpret the habitally similar southeast Brazilian sennas as the distinct species *S. tropica* and *S. araucarietorum*, which see for differential comment.

The spelling *septemtrionalis*, although much rarer than *septrionalis*, is a variant encountered in classical antiquity and there is no reason to think that it was used other than intentionally by Viviani.

- 120. *Senna tropica* (Vellozo) Irwin & Barneby, comb. nov. *Cassia tropica* Vellozo, Fl. Flum. 166. 1825 & Ic. 4: t. 64, 1835.—“*Habitat* campis fruticetisve Regii Praedii S. Crucis [=w. Guanabara, Brazil].”—Lectoholotypus, the cited plate.—Doubtfully equated by Vogel (1837, p. 20), and firmly but incorrectly so by Bentham (1871, p. 527), with *C. laevigata* (=our *S. septemtrionalis*).**

Cassia loefgreniana Hoehne, Rev. Mus. Paulista 10: 660, t. 7. 1918.—“Museu Paulista: n. 2445 (fructificado), Löfgren et Edwall, Campos da Bocaina, 18/IV/94 e 3450 (florado), Löfgren, S. Francisco dos Campos, 24/XII/96 . . .”—Lectotypus, A. Löfgren 13212 = Herbario da Comissão Geog. e Geol. de S. Paulo 3450, not seen; isotypus, NY!

Shrubs and treelets at anthesis 1–3(–?) m, with green striate hornotinous and fuscous or atrocastaneous older leafless branchlets, resembling in habit and foliage *S. septemtrionalis*, glabrous except for residually puberulent pulvinules and sometimes remotely ciliolate lflets, the thin-textured foliage when dry dull brownish- or yellowish-olivaceous bicolored, paler beneath, some early racemes axillary and lateral, much surpassed by the associated lf, but most of them crowded into a subterminal leafy-bracteate corymbose panicle not or scarcely raised above the foliage.

Stipules erect submembranous pallid or pale green lanceolate or oblanceolate $3-15 \times 0.6-2$ mm, caducous before maturity of associated lf, the lower ones scarcely known, all lacking from mature spms.

Lvs (7.5-)9.5-21 cm; petiole including wrinkled pulvinus 3-6.5 cm, at middle 0.6-1.2 mm diam, angulately ribbed dorso-laterally, openly shallowly sulcate ventrally; rachis (1.2-)1.5-7 cm, its longest (or only) interfoliolar segment 1.2-3.7 cm; glands between all pairs or all but the distal pair of lflets stipitate, in profile 1-2.5 mm tall, the ovoid acute or obtuse or lance-fusiform body 0.4-0.9 mm diam; lflets 2-4 pairs, only exceptionally in all lvs exactly 2, commonly either 2-3 or 3-4 pairs, accrescent distally, the distal pair broadly lance- or ovate-acuminate (4-)5-10.5 \times (1.1-)1.3-3 cm, 3.1-4.7 times as long as wide, at base subequilaterally rounded or cuneate, the margin narrowly pallid-margined plane, the midrib cariniform beneath, immersed or depressed above, the (9-)11-19 pairs of fine camptodrome with random intercalary secondary veins prominulous on both faces of mature blades, more strongly so beneath, an elaborate reticular venation always prominulous beneath, often so above; the proximal pairs of lflets shorter and proportionately broad, mostly ovate and abruptly acuminate.

Racemes shortly densely (5-)8-24-fld, the axis together with peduncle 2.5-7 cm, either shorter or a little longer than the subtending petiole; bracts pallid lance-subulate 1.2-2.8 \times 0.3-0.6 mm, caducous before elongation of pedicel, this becoming at and after anthesis 12-22 mm; fl-buds plumply obovoid, except for minutely ciliolate sepals glabrous; sepals subpetaloid yellow commonly green- or fuscous-tinged, the outermost ovate or ovate-oblong (3.5-)4-5.5 mm, the innermost obovate or suborbicular 7-9 mm; petals of *S. corymbosa*, the emarginate vexillar one 10-14 mm; androecium glabrous, the blade of staminodes transversely reniform-obcordate 1.1-1.4 \times 1.6-2 mm, the filaments of 4 median stamens 0.8-1.2 mm, of the sterile centric abaxial one 1.5-2 mm, of the 2 long abaxial ones dilated ribbonlike (5.5-)7-11 mm, the anthers of 4 median stamens plumply flaskshaped, including beak 3.2-4.5 \times 1.1-1.6 mm, strangled 0.6-0.9 mm short of apex and then expanded to the obliquely truncate apex 0.7-1.1 mm diam, the orifice dehiscent by U-shaped slit, the sterile abaxial anther 3.5-5 \times 0.5-0.7 mm, the anthers of 2 long stamens lunately lanceolate in outline, including the beak (4.7-)5.2-7.4 \times 1.2-1.5 mm, the beak itself 0.5-1 mm, its abaxial side prolonged into a bi-umbonate protuberance projecting 0.3-0.6 mm beyond the infraterminal orifice, this 2-porose; ovary glabrous or rarely puberulent at base; style gently incurved 1.5-3.7 mm, commonly somewhat swollen distally and 0.2-0.5 mm diam shortly below the minute stigmatic cavity; ovules (66-)74-96.

Pod obliquely geotropic, the stipe 3-5 mm, the body cylindroid or obscurely obtusely quadrangular (5-)6-9 \times ± 1 cm, the seeds biseriate.—Collections: 41.

Thickets, disturbed woodland, rocky, sparsely wooded hillsides, sometimes surviving in hedges, below 600 m, local along the Atlantic foothills of s.-e. Brazil, from s.-w. Espírito Santo s.-w. through Rio de Janeiro and e. S. Paulo just into extreme n.-e. Paraná (rio Pardo), weakly n. into s.-centr. Minas Gerais (Sa. do Cipó).—Fl. almost throughout the year.

Senna tropica is deceptively similar to *S. septemtrionalis*, that is to *Cassia laevigata* of Benthams revision or *C. floribunda* of some modern authors, in which it has lain concealed. It differs in its thinner-textured, more prominently and closely reticulate leaflets and most importantly in the structure of the two long anthers. In *S. septemtrionalis* the orifice of these anthers is either symmetrically truncate or, if obliquely so, then cut back from the abaxial to the adaxial side in the manner common in *Senna*, its posterior rim forming a diminutive

scoop or pollen-cup. In *S. tropica* the slant of the orifice is reversed, its adaxial rim being produced in the form of a bluntly bi-umbonate nose, the biporose orifice itself becoming infraterminal, suggesting the underhung mouth of a shark or dog-fish. As already noted, *S. septemtrionalis*, although encountered at scattered points in Andean Colombia and Peru and collected once in Brazil's Federal District, is believed to be native only in cool montane Mexico and Central America, over 5000 km distant from the southeast Brazilian, lowland range of *S. tropica*. This discontinuity is of a pattern with that displayed by varieties of *Senna hirsuta*, of which endemic forms are sympatric with *S. septemtrionalis* and *S. tropica* in, respectively, Central America and Brazil; but these are linked by a series of forms intermediate at once in morphology and dispersal. In this revision we recognize as only varietally distinct *S. pendula* var. *advena* (= *Cassia indecora*), of which the principal differential character is a slightly modified beak to the long anthers. In these circumstances it will appear illogical to maintain *S. tropica* in the rank of species. Evaluated, however, in the context of its immediate relatives and neighbors *S. araucarietorum*, *S. hilariana* and *S. corymbosa*, which constitute a replacement series of vicariant small species extending from Rio de Janeiro to Paraguay and the Plate River in Argentina, *S. tropica* emerges as no less distinct than its peers. A devaluation in rank, evenhandedly applied to the group, would envelop all of them in a clumsy and unrealistic *S. corymbosa*. As pointed out in the diagnosis, *S. araucarietorum*, the immediate southern neighbor of *S. tropica*, is readily distinguished from it by the syndrome of leaves and symmetrically truncate anthers of *S. septemtrionalis* with the relatively few, uniseriate seeds of *S. corymbosa*.

121. *Senna araucarietorum* Irwin & Barneby, sp. nov., inter *S. corymbosam* et *S. septentrionalem* quasi ambivalens, ab ea, quoad legumen angustum, ovula pauca (28–42) necnon semina 1-seriata praesimili, foliis amplissimis foliolisque ambitu late ovato-acuminatis (distalium lamina 20–35 nec 5–12 mm lata), ab hac, quoad folia, ergo habitu toto comparabili, foliolis plerumque 2–3 (nec 3–5)-jugis, leguminè angusto 6–7.5 (nec 8–11) mm diam, seminibusque 1-seriatis dimidio minus numerosis (± 30 –40, nec 50–80) partrique distantissime remota abstans, praeterea ab austrobrasiliensi etiamsi vicarianti *S. tropica*, quoad folia praesimili, iisdem notulis simul antheris fertilibus subsymmetricè truncatis (nec apice prominule 2-umbonatis, ore ergo infraterminali) diversa.—BRAZIL. Santa Catarina: Fazenda da Laranja, Bom Jardim, mun. São Joaquim, 1400 m, 13.XII.1958, Reitz & Klein 7872.—Holotypus, NY; isotypi, BR, US!

Amplly leafy shrubs with terete green subfistular hornotinous branchlets at anthesis 1–3 m (not known to be arborescent), in general aspect resembling *S. septemtrionalis*, glabrous except for minutely puberulent pulvinules, ovary, or sometimes remotely ciliolate lflets or sepals, the thin-textured foliage bicolored, when dry rich dark green and sublustrous above, paler dull beneath, the short racemes of small fls lateral and much surpassed by the subtending lf, not known to form a terminal panicle.

Stipules erect submembranous pallid or greenish, narrowly lance-acuminate or linear acute 2.5 – 6×0.6 – 1 mm, caducous before maturity of the associated lf, lacking from many spms.

Lvs 12–30 cm; petiole including wrinkled discolored pulvinus (3.5–)4.5–9 cm, at middle 0.9–1.6 mm diam, openly shallowly sulcate ventrally; rachis (2.5–)4–9

cm, the longest interfoliolar segment (2.2–)2.5–4.5 cm; gland between all pairs or all but the distal pair of lfts, subsessile or shortly stipitate, the proximal one 1.5–2 mm tall, the plumply ovoid apiculate or lance-fusiform body 0.6–1 mm diam, the more distal glands either similar or smaller; pulvinules 2–3 mm, when dry livid and wrinkled; lfts 2–3(–4) pairs, accrescent distally, the distal pair narrowly ovate-to broadly lance-acuminate (5.5–)6–12 × 2–3.5 cm, (2.5–)2.6–3.6 times as long as wide, at base subequilaterally rounded or cuneate, the pallid membranous margin plane, the midrib beneath pallid cariniform, above immersed or nearly so, the 12–18 pairs of slender camptodrome secondary veins with slender tertiary and reticular venules all ± prominulous on both faces but more sharply so beneath.

Racemes shortly, at first subumbellately 6–13-fld, the axis together with slender peduncle 2.5–6 cm, shorter than or rarely equalling the associated petiole; bracts subulate 1.5–4.5 mm, like stipules in shape and texture, early caducous; mature fl and fr pedicels 7–15 mm; sepals yellowish or fuscous-tinged, well graduated, the ovate outermost one 3–3.5 mm, the obovate cucullate innermost one 5.5–9 mm; petals essentially of *S. septemtrionalis*, the vexillar one 11–14 mm; androecium glabrous, the blade of staminodes obovate 1–1.3 × 1 mm, the filaments of 4 median stamens 1–2 mm, of the centric abaxial one 2–2.5 mm, of the 2 latero-abaxial ones (4.5–)5–7.5 mm, the anthers brownish, of 4 median stamens lance-oblong 3.2–4 × 0.8–1.2 mm, of the centric abaxial one 4–4.8 × 0.6–1 (either obviously sterile or substantially narrower than its neighbors), those of 2 long stamens lunately lanceolate from obtuse base 4.8–5.6 × 1.1–1.5 mm, obscurely strangulate 0.4–0.5 mm below the symmetrically truncate orifice, there 0.7–0.8 mm diam, dehiscent by U-shaped slit; ovary minutely puberulent laterally; style 2.8–3.4 × 0.25–0.4 mm, slightly incurved distally; ovules 28–42.

Pod obliquely geotropic, the stipe 3–4.5 mm, the linear straight subcylindric but when fresh apparently slightly compressed body 7–10.5 × 0.5–0.75 cm, the smooth green, when ripe papery brunnescent or fuscous valves narrowly margined along the sutures, the 1-seriate seed-locules not or scarcely pulpy, occupying the width of the pod's cavity, 1.6–2.4 mm long; seeds turned with broader faces to the septa, plumply compressed-obovoid or -spheroid 3.8–4.8 × 2.8–4.2 mm, the smooth brown testa highly lustrous, exareolate.—Collections: 16.

Thickets, clearings and margins of secondary woodland, often associated with Paraná pine, ±800–1400 m, hill-country w. of the coastal serra in Paraná and Santa Catarina, Brazil, and adjacent Misiones, Argentina, occupying a range interposed between those of *S. hilariana* and *S. corymbosa* to the s.-w. and that of *S. tropica* to the n.-e.—Fl. mostly X–III, perhaps throughout the year.

This somewhat cryptic species, along with related *S. tropica*, has been mistaken in herbaria for *Cassia laevigata* (=our *Senna septemtrionalis*) which may possibly occur in its range as a weed, although native in remotely distant Mexico and Central America. *Senna araucarietorum* resembles *S. septemtrionalis* in its ample leaves and in the ovate-acuminate outline of its leaflets, but these are on average fewer, only 2–3 rather than 3–5 pairs, and the pod is quite different, resembling that of *S. corymbosa* in its slender girth and in the single stack of no more than 42, commonly less than 40 (as opposed to 50–80 biseriate) seeds housed in pulpless locules. The range of *S. araucarietorum* lies to the west of the Atlantic divide southwestward from the head of Rio Iguaçu in northeastern Paraná. Northeastward from this point, but always on the Atlantic slope, it is replaced by the habitally similar *S. tropica* which differs like *S. septemtrionalis* in the multi-ovulate fruit and biseriate seeds, but can be separated instantly at anthesis by the peculiar development of the umbos at the tip of the long anthers.

122. *Senna burkartiana* (Villa Carenzo) Irwin & Barneby, comb. nov. *Cassia burkartiana* Villa Carenzo, Lilloa 31: 252, 253 (fig.). 1962.—“[Argentina.] Tucumán, departamento Burruyacu, cerro Medina 1.600 m de altitud, 20.I.1962, leg. Villa C[arenzo], Legname y Cuezco 1723.”—Holotypus, LIL, not seen, but the protologue decisive.

Amplly leafy shrubs and treelets at anthesis 1–4 m, with stout terete, at length lenticellate hornotinous branches, variable in pubescence, either the lf-stalks, margin and dorsal midrib and often one, rarely both faces of lflets minutely pilosulous with incurved yellowish hairs ± 0.1 –0.3 mm, the lflet-margin in addition ciliolate with some ascending hairs to 0.5 mm, or the lflets dorsally pilose-tomentose or simply thinly pilose with weak flexuous hairs to 0.5–1 mm, the firm subchartaceous foliage bicolored, the lflets dull dark olivaceous above, pallid and conspicuously dark-venulose beneath, the early racemes axillary to and shorter than fully developed lvs, some later ones forming a shortly exerted corymbose panicle.

Stipules early dry caducous (hence little known), the few seen lance-acuminate ± 5 –9 \times 0.6–1 mm, the blade perhaps sometimes reflexed and revolute.

Lvs (below inflorescence, rapidly diminished distally) 12–22 cm; petiole including little dilated pulvinus (2–)2.5–6 cm, at middle 1–1.6 mm diam, rounded or obtusely carinate dorsally, very shallowly, sometimes obscurely sulcate ventrally; rachis 6–10.5 cm, its longer interfoliolar segments 1.6–3 cm; glands between proximal and sometimes the second (third) pair of lflets stipitate, in profile 1.2–3.4 mm tall, the stout stipe densely puberulent, the conic-ovoid or depressed-conic glabrous head 0.7–1.2 mm diam; pulvinules 1–3 mm; lflets commonly (4–)5–6, less often 3–5 pairs, accrescent distally, narrowly ovate- or lance-acuminate, the longest (distal or penultimate) pair 4.5–8 \times 1.1–2.6 cm, 2.7–4.1 times as long as wide, mucronulate at attenuate tip, at base only a little inequilateral, cuneate or rounded on both sides, the margin strongly revolute, the midrib and ± 11 –16 pairs of camptodrome with random intercalary secondary veins deeply engraved on upper face, sharply prominulous beneath, the connecting tertiary and reticular venules only faintly raised beneath or merely discolored.

Racemes shortly 7–30-fl'd, the 2 or more simultaneously expanded fls raised about to level of the obliquely ascending obovoid-ellipsoid puberulent or glabrate fl-buds, the axis becoming 1–4.5 cm and together with the peduncle 2.5–9 cm; bracts lance- or rhombic-acuminate 5–7 \times 1–3 mm, early dry caducous, the lowest sometimes assuming the form of a diminished lf and the raceme then appearing sessile; sepals submembranous obovate-elliptic brownish or the glabrate inner ones pinkish-tinged and pallid-margined, the smaller outermost one 3.5–6.5 mm, the largest inner one 7.5–10 mm; corolla zygomorphic, the glabrous petals yellow drying pale yellow brown-veined, all sessile or very short-clawed, the vexillar one largest, oblong-obovate-obcordate 14–18 \times 9–12 mm, the rest a little shorter and the 2 abaxial a little narrower, oblong-obovate obtuse; androecium glabrous, functionally 7-merous; staminodes obtusely pentagonal ± 1.5 mm diam; filaments of 4 median stamens 1.4–2 mm, of the centric abaxial sterile one 2–2.5 mm, of the 2 long abaxial ones 11–12.5 mm dilated ribbonlike, the anthers of 4 median stamens 4.4–5.2 \times 1–1.3 mm, obliquely truncate, of the sterile abaxial one 4.5–5 \times 0.7–0.8 mm, of the 2 long abaxial ones lunately lanceolate from obtusely sagittate base 6.2–8.5 \times 1.5–1.9 mm, subhorizontally truncate, the 6 fertile ones 2-porose; ovary loosely pilosulous; style glabrous linear-filiform 5–5.5 \times 0.2–0.3 mm, rather strongly incurved at apex, the stigmatic cavity introrse; ovules 54–64.

Pod pendulous from spreading-ascending pedicel, the stipe 5–6 mm, the linear-vermiform subterete or slightly laterally compressed, straight or gently incurved body when fully fertile $10\text{--}14.5 \times 0.5\text{--}0.9$ cm (but often partly sterile and irregularly strangled or withered, the firm green valves early brunescent or finally blackish, the seed-locules without pulp 2–2.5 mm long, arranged in one series the length of the cavity; seeds obliquely descending, turned broadside to the septa, plumply obovoid $4\text{--}4.5 \times 2.8\text{--}3$ mm, the castaneous testa smooth, highly lustrous, exareolate.—Collections: 7.

Dry brushy hillsides and stony riverbanks, in disturbed sites sometimes surviving in hedgerows, 1600(s.-ward)–3000 m, scattered along the e. slope of the Andes in lat. $17^{\circ}30'\text{--}26^{\circ}30'\text{S}$, from the s. face of Cordillera de Cochabamba in Bolivia s. to Sa. de Medina in n. Tucumán, Argentina.—Fl. IX–II(–V), the old fruit sometimes contemporary with young fls.—*Motucho* (Cochabamba); *taquillo* (Salta).

This species seems closely related to the common and widespread, often cultivated *S. septemtrionalis*, of which it has the general habit, the relatively ample, broadly lance- or ovate-acuminate leaflets and the showy subcorymbose racemes of flower. It differs decisively, however, in the ventrally engraved venulation of the leaflets and in the narrow pendulous vermiform pod that contains only one row of seeds.

No two collections of *S. burkartiana* are quite alike in pubescence, which varies from sordid gray to yellow, from sparse to dense, and from strigulose or minutely pilosulous to loosely pilose-tomentulose. The variation appears random, at least in relation to dispersal, except that the longer, looser vesture is found chiefly near the Argentine-Bolivian boundary, the sparser and shorter types to the north and south. We have in most cases no correlation between vesture and characters of the fruit, and it is too early to say whether there are discrete taxonomic units to be defined within the species.

Fruiting specimens of what appears to be a yellow-villosulous form of *S. burkartiana* were most unexpectedly collected in Chiriquí, Panama, in 1977 by W. G. D'Arcy (above Bajo Chorro, 24.III, fr). They were taken from a cultivated tree 5 m tall. Flowers are needed for certain identification of this interesting plant.

123. *Senna vargasii* (Schery) Irwin & Barneby, comb. nov. *Cassia vargasii* Schery, Ann. Mo. Bot. Gard. 37: 401. 1950.—“PERU: CUZCO: Prov. Urubamba, Machupicchu, Feb., 1938, *C. Vargas* C. 985.”—Holotypus, MO! = NY Neg. 10620.

Doubtless shrubby but of unrecorded stature, the annotinous branchlets, foliage and inflorescence densely pilosulous with rather coarse spreading lutescent hairs $\pm 0.4\text{--}0.6$ mm, the foliage bicolored, the ample submembranous lflets above dull olivaceous and only thinly pubescent, beneath especially along the veins densely so and pallid, the early racemes axillary to and shorter than lvs, later ones perhaps forming an exserted panicle.

Stipules reflexed, thinly herbaceous, ovate $\pm 6\text{--}7.5 \times 3$ mm, persistent into full development of associated lf, then apparently deciduous.

Lvs up to 19 cm, the stout petiole $\pm 2\text{--}2.5 \times 0.2$ cm; rachis 8–10.5 cm, its longer interfoliolar segments $\pm 2\text{--}2.5$ cm; gland between proximal pair of lflets sessile ovoid-acuminate $\pm 1.5 \times 0.8\text{--}1$ mm, and smaller glands between 2–3 succeeding pairs; lflets 5–6 pairs, strongly accrescent distally, the distal pair subsymmetrically elliptic acuminulate $\pm 6\text{--}7 \times 2.2$ cm, the shorter middle and proximal

pairs ovate, the margin of all revolute, the midrib with ± 10 – 12 pairs of camptodrome secondary veins deeply impressed on upper and prominent on lower face, tertiary venulation imperceptible above, obscure beneath.

Peduncles stout ± 7 cm; young racemes shortly densely ± 10 – 15 -fld, the expanded fls raised to level of the subglabrous buds, the axis apparently little elongating (but not seen mature); bracts submembranous ovate ± 6 – 6.5×2.5 – 3 mm, persistent at least into full anthesis; pedicels ± 26 mm; sepals submembranous brownish obovate or oblong-obovate obtuse, strongly graduated, the outermost ± 6 mm, the innermost ± 11 mm; corolla zygomorphic, the flabellate-emarginate vexillar petal 15×17 mm, the 2 lateral petals almost as long and likewise subsessile, the 2 abaxial petals short-clawed and slightly shorter; blade of 3 adaxial staminodes broadly ovate ± 2.5 – 2 mm; 7 anthers thin-textured brownish glabrous, the 4 median $\pm 5 \times 1$ mm, obliquely truncate, the filaments of 2 latero-abaxial stamens ± 6 mm, their lunately linear horizontally truncate anther 7.5×1.3 mm, the centric abaxial stamen substerile, its anther $\pm 6 \times 0.8$ mm, the orifice of all 1-porose by confluence; ovary densely appressed-pilosulous; style linear almost straight glabrous $\pm 4.5 \times 0.2$ mm, its minute stigmatic cavity obliquely terminal; ovules ± 35 .

Pod unknown.—Collection: 1.

Habitat not recorded, but to be sought on rocky hillsides or stream banks of Cordillera de Vilcabamba in Cuzco, Peru, known at present only from the Urubamba valley near Machupicchu.—Fl. II–IV(?).

Senna vargasii is certainly a distinct species, but its affinities will remain unknown until more can be learned about it. The type-collection, consisting of a branchlet at the earliest phase of anthesis, suggests the more pubescent forms of *S. burkartiana* from Cochabamba, Bolivia, but differs in the reflexed and dilated stipules. Schery thought it related to *S. multiglandulosa* (*Cassia tomentosa*) and *S. santanderensis*, and we agree that its affinities lie probably with this group of ser. *Coluteoideae*, with which *S. vargasii* agrees in the relatively low ovule-number, prefiguring a laterally compressed rather than terete pod.

- 124. *Senna oblongifolia* (Vogel) Irwin & Barneby, comb. nov. *Cassia oblongifolia* Vogel, Syn. Gen. Cass. 23 & Linnaea 11: 666, descr. ampliata. 1837.—“In Brasilia: Sellow leg.; Luschnath leg. pr. R[io de] Jan[eiro] . . . Specimina Selloviana in Montevideo lecta sunt.”—Holotypus, the element providing the principal (but not the fruiting) character, *Sellow s.n.*, †B = F Neg. 1716! neoholotypus, former isotypus, numbered 1838/IV, W! isotypus, LE! paratypus, *Luschnath s.n.*, 1834, e monte Corcovado, BR!**

Potentially arborescent shrubs with smooth terete or finely channelled, densely leafy hornotinous branchlets, at anthesis (1–)2–4(–5) m, variable in pubescence, often glabrous except for puberulent new branchlets and axes of inflorescence and the lfts glabrous except for a tuft of hairs dorsally in the distal basal angle of midrib, but the annotinous stems sometimes softly pilosulous with spreading hairs up to 0.4–0.7 mm, or the lfts strigulose (exceptionally pilosulous) beneath or (rarely) on both faces and ciliate, sometimes in addition erratically ciliate with weak straight hairs up to 0.8–1.5 mm, the foliage conspicuously bicolored, bright green or (dry) brownish-olivaceous and scarcely lustrous above, pallid dull beneath, the numerous racemes at first axillary to and surpassed by lvs, the later ones sometimes at length forming a subcorymbiform but scarcely exerted panicle.

Stipules erect or subfalcately erect lanceolate, linear-lanceolate or narrowly lance-ovate (2.5–)3–7(–9) × 0.4–1.2 mm, at first thinly herbaceous, early dry caducous, lacking from fruiting spms.

Lvs (6–)7–20(–22) cm; petiole including firmly dilated pulvinus 1.5–4.7 cm, at middle (0.5–)0.6–1 mm diam, shallowly open-sulcate ventrally; petiolar gland variable in site and form, inserted either next above the pulvinus or more commonly on petiole proper at points 3–24(–30) mm distant from the lf-axil, sometimes accompanied by 1 or inserted between 2 small lfts, either sessile or shortly stipitate, in profile 0.8–2.1 mm tall, the squatly ovoid obtuse, conic-ovoid acute or lance-fusiform head 0.4–1.1(–1.4) mm diam; rachis (2–)2.5–9(–12) cm; pulvinules 0.8–1.7(–2) mm; lfts commonly (3–)4–8, in some populations 7–10 pairs, accrescent distally, the distal pair elliptic, elliptic-ob lanceolate or narrowly oblong-obovate obtuse or emarginate (2.3–)2.8–6 × (0.7–)0.9–1.8 cm, (2.4–)2.6–4(–4.3) times as long as wide, the shorter proximal ones proportionately wider, the pallid margin incipiently revolute near the pulvinule, the centric midrib immersed or almost so above, cariniform beneath, the (in larger lfts) 8–14 pairs of camptodrome secondary veins finely sharply prominulous on both faces, a loose tertiary venulation likewise raised on both faces or that beneath developing a close sharp reticulum of veinlets.

Racemes (5–)10–45-fld, the usually several simultaneously expanded fls raised to or almost to level of the ascending buds, the axis including slender peduncle becoming (2–)3–10(–12) cm; bracts lanceolate or subulate 1.5–6 mm caducous; pedicels (12–)15–28 mm, at anthesis very slender, narrowly ascending, much thickened in fruit; young fl-buds obovoid-ellipsoid obtuse, toward anthesis becoming half-ovoid, externally either glabrous or proximally pilosulous, less often softly pilosulous overall; sepals strongly graduated, obovate-elliptic obtuse, the outermost usually fuscous-tinged, 3–5(–5.5) mm, the innermost broadly membranous-margined 5.5–8.5 mm; petals glabrous yellow drying whitish brown-veined, the vexillar one broadest obcordate, the 2 abaxial ones obovate-ob lanceolate, all of ± equal length or the abaxial a trifle longer, the longest petal 11–14.5 mm; androecium glabrous, the staminodes (1.1–)1.3–1.6 mm wide, the filaments of 4 median stamens 1.2–2 mm, of 2 long abaxial ones dilated ribbon-like (3–)4.5–7(–8) mm, of the centric abaxial one 1.5–3.5 mm, the anthers of 4 median stamens 3.5–4.7 × 0.7–1 mm, of the 2 long abaxial ones (5–)5.4–7.2 × 1–1.3 mm, of the centric abaxial one (often sterile) 4–5.5 × 0.6–0.9 mm, all anthers shortly sagittate at base, the 5 shorter ones slightly constricted subapically and obliquely truncate, the 2 long ones lunately incurved, not or obscurely constricted and subhorizontally truncate, 2-porose; ovary strigulose, sometimes thinly so; style (1.3–)1.5–2.7(–3) mm glabrous, slightly incurved distally and ±0.2 mm diam just below the minute terminal stigmatic orifice; ovules 32–44.

Pod ascending arched outward, in profile linear, the stout stipe 2–3 mm, the body 6–9 × 0.8–1(–1.1) cm, a little compressed but the ripe valves convexly turgid, firm, faintly corrugated by impression between seeds, broadly thick-margined lengthwise parallel to the sutures, at first green or red-tinged, later stramineous brown or blackish, the 1-seriate seed-locules 1.5–3 mm long, as wide as the cavity, separated by broad membranous septa, lacking pulp around the seeds; seeds turned with broad faces to the septa, compressed but plump, in outline oblong-obovate, broadly obovate or almost round, 3.7–5.7 × 2.7–4.7 mm, the broad faces indistinctly grooved vertically, the lustrously castaneous testa smooth or micro-punctate, lacking waxy exoderm, exareolate.—Collections: 36.

Moist stony campo, disturbed woodland, thickets and rocky streambanks, 600–1300 m, local in s.-e. Brazil s.-ward from lat. ±21°S and immediately adjacent

Argentina, in Brazil from s. Minas Gerais (Sa. de Mantiqueira and vicinity of Caldas) to Rio de Janeiro and Guanabara (Sa. dos Orgãos and morros about Rio), apparently not recorded from São Paulo, and from interior Paraná s.-w. to the valleys of rios Uruguai and Jacuí in lat. 30°S in n.-w. and e.-centr. Rio Grande do Sul; an old report (Vogel, l.c.) from s. Uruguay requires confirmation.—Fl. primarily X–II, intermittently through the year.

A variable species of somewhat controversial relationships, referred by Vogel and Benthams to sect. *Oncolobium*, by Vogel because of the pod's structure and by Benthams because of the infrafoliolar petiolar glands, but different from all tropical and South American *Oncolobia* in the truncate unappendaged long anthers and from all *Oncolobia* tropical or not in the lustrous seeds lacking both waxy exoderm and facial areoles. The combination of turgid pod and unmarked seed-coat prompted Lasseigne (1979, p. 68) to transfer *Cassia oblongifolia* to ser. *Corymbosae* where, however, it remains somewhat anomalous by reason of the petiolar glands. Over much of its range *S. oblongifolia* is actually or potentially sympatric with *S. organensis* and varieties of *S. neglecta*. The former is readily distinguished by its strictly intrafoliolar glands, little graduated sepals, three sub-homomorphic abaxial stamens, and most decisively by the plano-compressed 8–14 (not turgid 32–44)-ovulate pod. The glands of *S. neglecta* are variably situated on the petiole like those of *S. oblongifolia*, but the inflorescence is a narrow exserted panicle of racemes subtended by vestigial leaf-stalks, the style is abruptly dilated and incurved at tip, while the pod, although containing about the same number of ovules, becomes plano-compressed at maturity and substantially longer, its seed-locules therefore long enough to accommodate seeds with their broad faces toward the valves, not toward the interseminal septa.

The known populations of *S. oblongifolia* are diverse in vesture of stems and foliage. On morros around Rio de Janeiro (Corcovado, Pico de Tijuca) the plants are almost glabrous except that the usually 4–6 pairs of leaflets bear a tuft of hairs dorsally in one basal angle of the midrib and when mature become finely intricately reticulate. Elsewhere the young stems and inflorescence are variably strigulose-pilosulous and the leaflets, either 4–7 or less often 7–10 pairs, can be ciliate on margin and midrib, or pubescent on the back, or exceptionally softly hairy on both faces, and their mature reticulation may or may not be sharply raised. There is, however, a notable absence of either mutual or geographic correlations between these variable features.

- 125. *Senna candolleana* (Vogel) Irwin & Barneby, comb. nov.** *Cassia candolleana* Vogel, Syn. Gen. Cass. 42. 1837, a legitimate substitute for *C. flexuosa* Bertero ex A. DeCandolle in A. P. & A. DeCandolle, Septième Notice sur les Pl. Rares 34, pl. 6. 1836 (non *C. flexuosa* L., 1753).—“... découverte au Chili, par l'infortuné Bertero . . .”—Described from plants cultivated at Geneva from seeds (probably *Bertero* 897, G) sent by Bertero under the name *Cassia flexuosa*.—Holotypus, cult. VII.32, G!—*Cassia bicapsularis* var. *chilensis* Benthams, Trans. Linn. Soc. London 27: 526. 1871.—*C. quebracho* Steudel, Nomenclator Bot. ed. 2, 1: 304, 307, pro syn. 1840.

Cassia foliis Pseudo-Acaciae Feuillée, J. Observ. Phys. 3: (=Hist. Pl. Médic.): 14, pl. 9. 1725, e descr.

Cassia frondosa var. β Hooker & Arnott in Hooker, Bot. Miscell. 3(2): 210. 1829.—“Coquimbo, Messrs. Lay & Collie; Bridges.”—Spm. authent., K!

Cassia obtusa Clos in Gay, Fl. Chil. 2: 235. 1854.—“... en los lugares áridos de las provincias setentrionales [de Chile].”—Holotypus, Gay s.n., P!—Equated with *C. bicapsularis* var.

chilensis by Bentham, 1871, p. 526; known to Reiche 1897, p. 41 from Coquimbo and Valparaíso.

Cassia emarginata Clos in Gay, Fl. Chil. 2: 237. 1854.—“... en sitios marítimos... comun en las provincias de Colchagua, Valparaíso y Aconcagua.”—Holotypus, Gay 233 e “maritimis,” Topocalma, prov. Colchagua, II.1831 (fl, fr), P!—*C. closiana* Philippi, Anal. Univ. Chile 84: 438. 1893, a legitimate substitute, non *C. emarginata* L., 1753.—Equated by Bentham, 1871, l.c. with *C. bicapsularis* var. *chilensis*.

Bushy shrubs and small trees at anthesis 2–5 m, with smooth green, obtusely angulate, densely leafy hornotinous branchlets, appearing glabrous but the young stems (often), the pulvinules of lfts and the raceme-axis with pedicels finely strigulose-pilosulous with gray hairs up to 0.2–0.4 mm, the foliage subconcolorous, the racemes all axillary to developed lvs but sometimes crowded toward apex of branchlets to form a small immersed or barely exerted panicle.

Stipules erect herbaceous linear-oblongate or linear-attenuate 6–14 × 0.6–1.4 mm, entire or rarely toothed on side further from petiole, deciduous before the lf.

Lvs 7.5–14 cm; petiole including swollen but firm pulvinus 1.5–2.7 cm, at middle 0.7–1.3 mm diam, obtusely 3-ribbed dorso-laterally, narrowly sulcate ventrally; rachis 3.5–8.5 cm, the longer interfoliolar segments 9–17 mm; gland between proximal pair sessile or stoutly short-stipitate, in profile 1.4–2.3 mm tall, the ovoid or oblong-ovoid obtuse or subacute (much eaten) body 0.4–0.7 mm diam; pulvinules 1.6–2.7 mm; lfts 4–7 pairs, moderately accrescent distally (the penultimate pair sometimes longest), in outline oblong or oblong-obovate emarginate, less often broadly obovate emarginate, the longest pair (2.3–)2.8–4.5 × 0.9–1.7 cm, (2–)2.4–3.1 times as long as wide, at strongly asymmetric base rounded or subcordate on proximal and cuneately decurrent on distal side, the margin plane, the centric midrib immersed or almost so above, cariniform beneath, the 6–9 pairs of major camptodrome and intercalary secondary veins with tertiary connecting and reticular venules all ± raised on both sides, strongly so beneath.

Racemes rather densely 15–30-fld, the commonly several simultaneously expanded fls raised nearly to level of the erect buds, the axis together with peduncle becoming ± 6–9 cm; bracts subulate or linear-lanceolate 2–5 mm caducous; pedicels at and after anthesis 1.7–2.7 cm; fl-buds subsymmetrically obovoid, glabrous or puberulent at base; sepals subpetaloid yellowish, finely veined, obovate obtuse, strongly graduated, the outermost 4.5–6.5 mm, the longest inner one 7.5–11.5 mm; petals (of *Coluteoideae*) glabrous golden-yellow drying pale yellow or stramineous brown-veined, the longest 12–17 mm; androecium glabrous, the staminodes 1–1.3 mm wide, the filaments of 4 median stamens 1.4–2.4 mm, of 2 latero-abaxial ones dilated 7.5–10.5 mm, of the sterile centric abaxial one ± 4 mm, the anthers of 4 median stamens 4–5 × 1.1–1.3 mm, almost straight, of 2 long abaxial ones lunately lanceolate in profile 5.5–6 × 1.3–1.5 mm, of the centric abaxial one 4–6.5 × 0.5–0.9 mm, the 6 fertile anthers obscurely strangulate just below apex, there truncate and 2-porose; ovary strigulose; style glabrous 2–2.5 mm, slightly incurved and tapering distally, 0.15–0.2 mm diam at the terminal minute stigmatic cavity.

Pod erratically ascending or obliquely declined, the stout stipe 3–4 mm, the body linear in outline, commonly a little decurved 6–9.5 × 0.6–0.7 cm, when fully mature terete or strongly turgid, the sutures little prominent often irregularly undulate, the thick green convex, ultimately coriaceous brown or blackish valves corrugated by shallow depressions at each interseminal septum, externally veinless, the septa usually broad and complete, the pulpless seed-locules 2.5–4 mm

long; seeds transverse uniseriate, turned with broader face to the septa, plumply obovoid or oblong-obovoid $4.2\text{--}5.3 \times (2.6\text{--})2.8\text{--}3.6$ mm, the smooth testa dark brown around the periphery, paler on the faces, the pale patch sometimes differentiated into a shadowy areole, when fully ripe either dull or lustrous, lacking a waxy exocarp.—Collections: 16.

Thickets and open hillsides, 5–800 m, locally plentiful in the coastal cordillera of Mediterranean Chile, in the provinces of Coquimbo, Valparaiso and Santiago.—Fl. almost throughout the year.—*Quebracho*, the wood notably hard and durable, the fl-buds sometimes used like capers preserved in vinegar.

Bentham was perplexed by carpological variation within his polymorphic macrospecies *Cassia bicapsularis* and interpreted the quebracho of coastal Chile as a variety characterized by a narrow pod with uniseriate seeds combined with relatively small firm, prominently venulose leaflets. These features can in fact be almost exactly matched in some local, distantly allopatric forms of our *S. pendula*, in particular in the brachystylous *S. pendula* var. *ambigua* of coastal southeastern Brazil. However, the orifice of the long anthers in all forms of *S. pendula* takes the form of a U-shaped aperture divided by a septum that remains attached only to its adaxial rim; whereas in *S. candolleana* the orifice remains biporose, the septum being permanently attached to both rims. This small feature, in conjunction with a remotely allopatric range, serves to liberate *S. candolleana* from the orbit of *S. pendula* sens. lat. but does not, of course, obscure the manifest relationship between them. The segregation of *S. candolleana* usefully reduces the all too protean compass of variation encountered in *S. pendula*.

On the coast of Coquimbo *S. candolleana* enters the range of *S. cumingii* sens. lat. which may be similar at anthesis but is very different in the compressed pod and in orientation of the areolate seeds. The flower of *S. cumingii* var. *coquimbensis*, which most closely resembles *S. candolleana* in broad outline and texture of leaflets, differs in the elongated style.

126. ***Senna pendula*** (Willdenow) Irwin & Barneby, comb. nov. *Cassia pendula* Humboldt & Bonpland ex Willdenow, Enum. Pl. Hort. Berol. 440. 1809.—Typus infra sub var. *pendula* indicatur.

Diffuse or awkwardly assurgent shrubs 1–4 m, in brush-woodland, savanna and margin of gallery forest arborescent to 7 m, in close competition sarmentose and reportedly reaching (in Pacific Ecuador) 20 m, the older trunks brown or castaneous lenticellate, the pliantly virgate, commonly \pm geotropic, simple or randomly branched annotinous stems terete striate, green or anthocyanic, the whole plant varying from fully glabrous to pilosulous with incumbent or spreading straight hairs (described in greater detail under vars.) but the lfts almost always glabrous above, the foliage bicolored, dull bright green or olivaceous above, paler and sometimes glaucescent beneath, the inflorescence a \pm exserted simple or branched thyriform panicle of racemes.

Stipules caducous before maturity of associated lf, consequently little known, absent from most fl and all fr spms, submembranous pallid linear-lanceolate or -oblanceolate 1.5–9 mm.

Lvs (depauperate ones in inflorescence ignored) 5–13 cm; petiole including moderately swollen, when dry wrinkled and often discolored pulvinus 1.5–4(–5) cm, at middle 0.4–1.1 mm diam, shallowly, most often openly sulcate ventrally; rachis 1–6(–7) cm, its longer interfoliolar segments (5–)6–21 mm; glands always between proximal pair of lflets, sometimes also between the second pair, or between all but the distal pair, sessile or shortly stipitate, in profile 0.7–2.5(–2.8)

mm, the livid or greenish body varying from oblong- or lance-ellipsoid to oblong-obovoid, ovoid, obovoid or globose and in any case either obtuse, acute or apiculate, (0.25–)0.4–1.2 mm diam; pulvinules 1–2.7 mm; lfts (2–)3–6(–7), in most populations 4–5 or exactly 4 or 5, only locally 6–7 pairs, accrescent distally, the proximal pairs shorter and proportionately broader than the distal, these from variably asymmetric base varying in outline from broadly to narrowly obovate, oblong-elliptic or broadly oblanceolate, (1.8–)2.2–5.5(–6.5) × (0.75–)0.85–2(–2.4) cm, (1.7–)1.8–3.5(–3.9) times as long as wide (in local Peruvian var. *scandens* ovate-elliptic), at apex broadly rounded, obtuse mucronulate-apiculate, or shallowly emarginate, the translucent pallid or orange margin plane or incipiently revolute toward the pulvinule, the midrib with (5–)6–12(–13) pairs of camptodrome (+ random intercalary) secondary veins prominulous either on both faces or beneath only, the tertiary venulation variable, sometimes faint, open and irregular, sometimes forming a sharply raised, fine and regular reticulum.

Racemes (2–)4–27(–35, exceptionally –50)-fld, the peduncle (from geotropic branches appearing recurved) with raceme-axis together becoming (2–)3–18(–33) cm, the ascending buds either corymbose or racemose in praefloration; bracts membranous pallid or pallid-margined lance-subulate 1–4 mm, caducous as the pedicel begins to elongate; pedicels at and after full anthesis 8–33(–37) mm; hypanthium turbinate 1–2.2 mm; fl-buds obliquely obovoid obtuse, commonly glabrous, sometimes densely minutely puberulent; sepals almost always membranous subhyaline-margined, exceptionally (in w. Brazil) subcarnosulous and wrinkled when dry, varying from yellowish to fuscous or reddish-castaneous, moderately or well graduated, the outermost ovate or lance-elliptic 3–9.5(–10) mm, the amply obovate or elliptic-suborbicular innermost one mostly 7–15.5 (in n.-w. Argentina 5.5–6) mm; corolla zygomorphic, the subsessile glabrous petals golden- or orange-yellow fading pale yellow or stramineous dark-veined, the vexillar one broadly obovate-flabellate emarginate or deeply notched, its 2 neighbors ovate or obovate obtuse, the 2 abaxial ones ovate- or oblong-elliptic, either a trifle longer or shorter than the rest, the longest petal (11–)12–26 mm; androecium glabrous, the yellow blade of the 3 staminodes varying from linear-oblanceolate to rhombic-orbicular, quadrate, trapeziform (broader upward), pandurate, inversely deltate, or broadly cuneiform 1.2–4.5 × 0.8–3(–3.5) mm; filaments of 4 median stamens 1.4–3(–4) mm, of the centric abaxial one 1.6–6(–7) mm, of the 2 long latero-abaxial ones dilated and (6.5–)7–20 mm, the 4 smooth or papillate, almost straight median anthers slenderly or plumply flask-shaped, including beak 3.5–7 × 0.7–2 mm, the body constricted 0.3–1.4 mm below apex and thence dilated into an obliquely truncate orifice in profile 0.7–1.5 mm wide; centric abaxial anther sterile or almost so, variably intermediate in length between the 4 median and the long abaxial ones, the body narrower than all of them, often only the beak dilated; 2 long abaxial anthers either brown yellow-tipped or uniformly yellow, lunately lanceolate from shortly sagittate base, including the beak (4.5–)5.5–11(–14) × 0.9–2.2 mm, slightly or strongly constricted 0.3–1.2 mm, in var. *advena* 1.1–2 mm below the symmetrically truncate apex into a broadly drum-shaped or more slender tubular beak at orifice 0.5–1.2 mm diam; dehiscence of fertile anthers by coarsely U-shaped slit; ovary glabrous, strigulose or densely pilosulous, the vesture white or less commonly lutescent; style linear-filiform or slightly dilated and up to 0.5 mm diam just below the minute stigmatic orifice, 1.5–10 mm long, either gently incurved distally or (when short) more abruptly hooked; ovules (48–)50–152.

Pod obliquely geotropic or pendulous, the stipe 2–5(–6) mm (caveat: pods sterile at base may appear long-stipitate), the cylindric, sometimes gently obcom-

pressed-cylindric, less often laterally compressed but turgid, exceptionally (cf. var. *tenuifolia*) moniliform body when fully fertile (7–)8–18 (in var. *tenuifolia* –29) \times 0.9–1.5(–1.6) cm, straight, gently curved or, when (as often) semisterile or bruchid-infested, variably distorted, the smooth green or fuscous, glabrous or early glabrate, rarely thinly pilosulous valves becoming pale brown and papery, the meso- and exocarp separating only when fully ripe and dry, the broadly margined sutures never prominulous, tardily if at all dehiscent; seeds commonly 2-seriate, locally (in s.-e. Brazil and n.-e. Argentina) 1-seriate, in either case turned with broad faces to the transverse septa, plumply obliquely obovoid 4.1–6(–6.6) \times (2.8–)3–4.3 \times \pm 2 mm, embedded in copious or scanty pulp, the brown, sooty or castaneous testa either smooth lustrous or microscopically granular dull, exareolate.

The limits of *S. pendula* as set in the foregoing description have no exact precedent. Our species is approximately equivalent to the residue of Benthams heterogeneous *Cassia bicapsularis* if this is purged of *Senna bicapsularis* sens. str., described below (no. 129) and of its var. *chilensis*, our *S. candolleana*, but is materially expanded in directions that could not be foreseen by Benthams in 1871. Its boundaries are more nearly coextensive with those assigned by Lasseigne (ined.) to *Cassia pendula*, but are expanded to include *Cassia indecora* (*C. bicapsularis* var. *canescens* Benth.) and contracted to exclude *C. pendula* var. *bracteata* Lasseigne, which is our *S. cajamarcae*. The species differs from the closely related and habitally similar *S. bicapsularis* sens. str. in its much longer pedicels and shorter hypanthium; from *S. candolleana* in the U-shaped (not discretely 2-porose) dehiscence of the fertile anthers; and from *S. cajamarcae* in the caducous stipules and bracts and in relatively numerous (\pm 50–150, not 30–36) ovules with consequently many-seeded pod. In the Andes of Bolivia and southern Peru care must be taken to distinguish *S. mandoni*, easily mistaken at anthesis for some brevistylous form of *S. pendula* but different in the yet fewer (12–25) ovules and ultimately in the thin-textured, strongly compressed, internally pulpless fruit.

Among American sennas *S. pendula* is second only to *S. pallida* for multiplicity of subtle floral modifications, and far surpasses it in vastness of range, which extends continuously, except where interrupted by high mountains or closed forest, from latitude 27°N in northwestern Mexico to 27°S in northern Argentina. The centers of differentiation are, however, rather different, *S. pallida* being most diverse in southern Mexico and thence crossing the Equator only into northern Peru, whereas *S. pendula* is racially most complex in southeastern Brazil and on the Amazonian slope of the Andes, becoming more homogeneous, though no less populous in number of individual plants, in the Carib-Mexican region. The collections of *S. pendula* that have accumulated since Benthams revision of *Cassia* are heterogeneous in vesture of foliage, in venulation of the leaflets, in size of calyx and corolla, in form of the three staminodes, in length of the two long filaments and relative proportion of these to their anther, in length of style, and in number of ovules which, as they become more numerous and more crowded following fertilization, are displaced into two parallel ranks. In the bee-pollinated flower of *Senna* the staminodal flag standing erect behind the four short median stamens and the reciprocal positions at anthesis of the long stamens and the stigma are elements crucial to fecundation of the ovary. Theoretically one might expect rapid selection of particular floral patterns tailored to fit the needs of particular pollinators, certain to be different in the extremely diverse climates to which *S. pendula* sens. lat. has become adapted. This indeed is what we have

found to be the case, strong geographic correlation with floral morphology emerging when the now extensive material of the species is examined in close detail. As elsewhere in the genus, we have found the density, quality and distribution of vestiture to vary in so random and capricious a way as to become an impediment to a sound classification; but all the other variable features listed above contribute something to our understanding of adaptive radiation in this complex group of sennas.

Key to Varieties of *S. pendula*

1. Lfts obovate or oblanceolate, rarely elliptic-oblanceolate, broadest above (exceptionally near) the middle; range of the whole sp.
 2. Style at and after anthesis 1.5–5 mm and the 2 long abaxial filaments 6–11 mm.
 3. Plants of Mexico, West Indies, Central America and of South America n. and w. of the Orinoco-Amazon forests.
 4. Long anthers, including beak, if any, (5.5–)6–14 mm; widespread, but not on Puerto Rico.
 5. Beak of 2 long anthers (1–)1.2–2 mm, the dilated orifice 0.5–0.9 mm diam, the whole longer than wide; blade of staminodes inversely obtusely deltate, broader than long; circum-Caribbean to w. Mexico, s. to centr. Colombia.
 - 126k. var. *advena* (p. 389).
 5. Beak of long anthers 0.3–1 mm, shorter than or at least not longer than diam of orifice, the whole commonly drum-shaped, sometimes scarcely differentiated from the body; blade of staminodes as long or longer than wide; Mexico, Cuba, n.-w. Venezuela.
 - 126m. var. *ovalifolia* (p. 391).
 4. Long anthers, including obscure beak, ± 4.5 mm; Puerto Rico.
 - 126n. var. *stahlui* (p. 392).
 3. Plants of the Orinoco valley in Venezuela, of the Amazonian Hylaea, of the Paraguai basin, and of coastal s.-e. Brazil.
 6. Lfts intricately and finely reticulate on lower face; restinga of coastal Rio de Janeiro and São Paulo, Brazil (if brought hither by plants of Paraguai valley s.-ward from Mato Grosso cf. 126o. var. *paludicola*); seeds 1-seriate.
 - 126d. var. *ambigua* (p. 385).
 6. Lfts penniveined on lower face, the raised tertiary venulation, if present, weak and erratic, not forming a close, sharply defined reticulum; allopatric; seeds 2-seriate.
 7. Style only 1.5–3 mm; Amazonia s.-ward.
 8. Sepals membranous; blade of staminodes linear-oblong or -oblanceolate, $3\text{--}4.3 \times 1\text{--}1.8$ mm, 2–3 times as long as wide; 2 long anthers (6.2–)7–12 mm.
 9. Plants of Paraguai valley downstream from the Pantanal in w. Mato Grosso, Brazil to n.-e. Argentina; longest interior sepal 7.5–11 mm and petiolar gland at first pair of lfts only.
 - 126o. var. *paludicola* (p. 393).
 9. Plants of the Amazon basin in Brazil and Peru; either longest sepal 13–15 mm or petiolar glands several.
 10. Longest petal 18–22 mm; longest sepal 13–15 mm; gland between first pair of lfts only.
 - 126p. var. *tenuifolia* (p. 394).
 10. Longest petal ± 15 mm; longest sepal 10–11 mm; known only imperfectly from e. Maynas and adj. Amazonas, Peru and from upper Rio Branco in Terr. do Roraima, Brazil.
 - 126q. var. *q* (p. 395).
 8. Sepals carnosulous (finely wrinkled when dry); blade of staminodes bluntly rhombic in outline, ± 1.5 mm diam; long anthers ± 5.5 mm; upper Purús valley in Amazonas, Brazil.
 - 126r. var. *r* (p. 395).
 7. Style ± 4.5 mm; middle Orinoco valley in Apure and Guárico, Venezuela and presumably adjacent Colombia.
 - 126l. var. *meticola* (p. 391).
 2. Style 5–10 mm and filaments of 2 long stamens (10–)11–20 mm.
 11. Plants of Mexico, Central America, West Indies, Venezuela, Colombia and Pacific Ecuador.
 12. Beak of 2 long abaxial anthers as long or longer than diam of orifice.

13. Blade of staminodes trapeziform (broadest distally); beak of 2 long abaxial anthers 0.7–1.2 mm; local in Belize and immediately adjoining Guatemala and Mexico. 126j. var. *hemirostrata* (p. 389).
13. Blade of staminodes inversely deltate; beak of 2 long anthers (1–)1.2–2 mm, at orifice 0.5–0.9 mm; widespread in range indicated at choice 11 above. 126k. var. *advena* (p. 389).
12. Beak of 2 long abaxial anthers drum-shaped, broader than long; style 6.5–10 mm and long abaxial filaments 15–20 mm; Colombia (if brought higher by plants of s.-w. Venezuelan lowlands with style and filaments barely within limits of variation indicated at choice 2 above, cf. 126l, var. *meticola*. 126i. var. *pendula* (p. 388).
11. Plants of Brazil, Peru and s. through Bolivia to Paraguay and n. Argentina.
14. Adult lfis sharply and closely reticulate beneath or on both faces; Brazilian Planalto s.-ward from near 13°S in Bahia and Goiás to n.-e. Argentina, in Brazil extending locally to the coast in Paraná and Sta. Catarina.
15. Pod subcylindric, the seeds 2-seriate; common and widespread between 13° and 26°S, but not coastal. 126a. var. *glabrata* (p. 382).
15. Pod turgid but laterally compressed, the seeds 1-seriate; either coastal in s.-e. Brazil or of n.-e. Argentina.
16. Staminodes narrowly oblanceolate, \pm twice as long as wide; ovules \pm 48–52; coastal s.-e. Brazil (Paraná and Sta. Catarina). 126b. var. *recondita* (p. 384).
16. Staminodes rhomboidal, scarcely longer than wide; ovules 58–98; Misiones and adjoining Corrientes, Argentina. 126c. var. *missionum* (p. 384).
14. Lfis not sharply reticulate on either face, the tertiary venulation faint or erratic or immersed.
17. Anther of 2 long abaxial stamens 5.5–8 mm, obviously shorter than its filament; widespread.
18. Distribution in the e. foothills and interior valleys of the Andes from centr. Peru to n.-w. Argentina; petiolar glands between all but the distal pair of lfis; blade of staminodes either shorter than 2 mm or narrower than 1.6 mm (or both).
19. Longest sepal 8–11 mm and longest petal 14–18(–20) mm; filament of 2 long abaxial stamens 12–18 mm; blade of staminodes oblong 3–4.5 mm; Peru, Bolivia. 126e. var. *praeandina* (p. 385).
19. Longest sepal 5.5–6 mm and longest petal 10.5–13 mm; filament of 2 long stamens 8–10 mm; blade of staminodes rhombic-suborbicular 1.2–1.5 mm; n.-w. Argentina. 126f. var. *eriocarpa* (p. 386).
18. Distribution along rivers of n.-e. Brazil in Pará, Maranhão and e.-ward; petiolar glands at proximal and rarely the second pair of lfis; blade of staminodes amply trapeziform 2.7–4 \times 2–2.5 mm. 126g. var. *indistincta* (p. 387).
17. Anther of 2 long abaxial stamens 13–14 mm, as long or a trifle longer than its filament; local in n.-e. Minas Gerais and Paraíba, Brazil. 126h. var. *dolichandra* (p. 387).
1. Lfis ovate or ovate-elliptic, broadest well below middle; local in Amazonian Peru (San Martín). 126s. var. *scandens* (p. 395).

126a. *Senna pendula* (Willdenow) var. *glabrata* (Vogel) Irwin & Barneby, comb. nov. *Cassia indecora* var. [δ] *glabrata* Vogel, Syn. Gen. Cass. 19. 1837, in statu illegit. (subordinated to a species containing an earlier proposal).—“In Brasilia: Sellow legit pr. Ypanema [São Paulo].”—Holotypus, \dagger B; neotypus, presumed isotypus, K!

Cassia dormiens Vellozo, Fl. Flum. 159. 1825 & Ic. 4: t. 67. 1835.—Lectotypus, the cited plate which shows the large fl and biseriate seeds of the var!

Cassia coluteoides Colladon, Hist. Casses 102, t. 12. 1816.—“. . . culta in hortis . . . v.v. sine fl. in h[orto] m[eo] et s.c. in herbario d. Bouchet.”—Lectotypus, an old cult. spm dating back to DeCandolle’s years at Montpellier, the stock acquired from Lisbon, MPU!

Cassia crassisejala Benthams, Linnaea 22: 527. 1849.—“. . . [in Brasiliae provincia Minarum generalium imprimis prope Caldas collegerat clar. A. Regnell.] II.76”—Holotypus, *Regnell*

76 of collection II, K (hb. Benth.)!—Reduced by Bentham, 1870, p. 106 and 1871, p. 525, to *C. bicapsularis*, sens. lat.

Cassia bicapsularis (typical) sensu Bentham, 1870, p. 107, majori ex parte; Burkart in Parodi, Encicl. Argentina Agric. y Jard. 1: 465, fig. 464C (optima!). 1959.

Diffuse or assurgent shrubs, in cerrado commonly 1–3 m, at margin of gallery forest sarmentose to 5 m, commonly glabrous throughout but the hornotinous stems and lf-stalks sometimes pilosulous and the lflets then, or independently, pilosulous dorsally in distal basal angle of midrib, rarely dorsally pilosulous overall; petiolar gland between proximal, occasionally also the second (–fourth) pair of lflets, these usually 4–6, in many populations 4–5, in some 6–7 pairs, the distal pair mostly $2.5\text{--}5.5\text{--}(6.5) \times 0.9\text{--}2.3$ cm, their secondary camptodrome veins 7–12 pairs, the intervenium intricately reticulate; longest sepal (9–)10–14.5(–15.5) mm; longest petal (16–)18–26 mm; blade of staminodes typically rhombic-orbicular to subquadrate and $1.5\text{--}2.7\text{--}(3) \times (1\text{--})1.4\text{--}2.2$ mm, rarely (n.-ward, transient to var. *indistincta*) oblong-pandurate and $3.6\text{--}4 \times 1.6\text{--}3$ mm; 2 long filaments 13–18.5 mm, their anther (7–)7.5–10 $\times 1.5\text{--}2.2$ mm, its beak 0.6–1 mm; style 5–8 mm; ovules mostly 70–96, locally up to 132; pod subcylindric $\pm 9\text{--}16 \times (0.9\text{--})1\text{--}1.6$ cm; seeds 2-seriate.—Collections: 103.—Fig. 10 (androecium), 12 (pod, seed).

Cerrado, disturbed cerradão, margin of gallery forest and about granite or sandstone outcrops, mostly 450–1100 m but ascending to campo rupestre at 1320 and locally in Sa. do Espinhaço (Sa. da Piedade) to 2000 m, becoming weedy along roadsides and in disturbed woodland, common and widespread over the Brazilian Planalto from centr. Mato Grosso to s.-centr. Bahia, s. to interior Paraná and s.-centr. Paraguay, reappearing locally on restinga and at margin of wet forest in coastal s. Bahia; cultivated in warm temperate United States and locally naturalized in s. peninsular Florida and the Bahamas (Great Abaco).—Fl. in S. America (XI–)I–VI(–VII), the pods maturing slowly and long persisting.—*Fedegoso*, *cassia* (Brazil) and *pito-muvero* (Paraguay), but these used generically for various sennas; *caquera* (reported by Vellozo for this or a closely allied form) is not confirmed by any modern collector.

This is the handsome large-flowered, longistylous senna that in southeastern Brazil has passed, along with assorted kindred described hereafter, as typical *Cassia bicapsularis*, a mistake traceable back to Bentham (1870, p. 106–107); and that latterly formed a substantial part of *C. pendula* var. *pendula* sensu Lasseigne (ined.). The original *Cassia pendula* is here regarded as a small entity endemic to the eastern cordillera in Colombia at points distant over 2500 km to the northwest of var. *glabrata*, from which it differs in the simpler, non-reticulate venulation of the leaflets and in the broadly cuneiform or inversely deltate staminodes. Except that it may possibly be cultivated on the Atlantic slope in Rio or Guanabara, var. *glabrata* is not found along the coast of southeastern Brazil where it is replaced by the closely related, respectively longi- and brevistyled vars. *recondita* and *ambigua*, and equally different from it in the compressed pod and uniseriate seeds. A pod entirely similar in compression is the principal diagnostic character also of longistylous var. *missionum*, which replaces var. *pendula* vicariantly along the lower Paraguay river in Misiones, Argentina.

Beyond the intravarietal variation accounted for in our description it should be mentioned that the populations found in wet coastal forest climax and adjoining restinga along the coast of Bahia tend to have relatively ample and thin-textured but nonetheless finely reticulate leaflets. The earliest collection of this form (*Luschnath in Martius* 715) contributed to the protologue of *C. bicapsularis* var. *tenuifolia*, which lectotypification permits us to preserve for a quite different Amazonian variety of the species.

- 126b. *Senna pendula* (Willdenow) var. *recondita* Irwin & Barneby, var. nov., ad anthesin vix nisi ovulis minus numerosis $\pm 48-52$ (nec 70+) a var. *glabrata* distinguenda sed ulterius vero floribus ut videtur paullo minoribus, staminodiorum lamina spatulato-oblongata, certiusque fructifera legumine de latere compresso turgido (nec cylindrico) seminibusque 1-seriatis diversa, a var. *ambigua*, legumine necnon patria submaritima arcte comparabili, praesertim stylo elongato (6.5–8 nec 3–4.5 mm) abstans.—BRAZIL. Santa Catarina: Praia Braba, Itajaí, 15.VII.1953 (fr), *Reitz & Klein 603*.—Holotypus, NY; isotypi, NY, US.**

Shrubs $\pm 1-2$ m, the young branchlets minutely incurved-puberulent, the lfts glabrous except for a dorsal tuft of hairs in anterior basal angle of midrib; petiolar gland between proximal pair only; lfts 4–5 pairs, the distal pair (2–)2.3–3.4 \times (0.9–)1.1–1.6 cm, their secondary camptodrome veins 7–9 pairs, the lower face intricately closely reticulate as in var. *glabrata*; longest sepal 7–10 mm; longest petal 15–18 mm; blade of staminodes spatulate-oblongate $\pm 2-2.5 \times 1-1.3$ mm; long filaments 14–16 mm, their anther 7.6–9 \times 1.6–1.7 mm, its beak 0.5–0.7 mm; style 6.5–8 mm; ovules 48–52; body of pod 10–17 \times 1–1.2 cm, laterally compressed but turgid, the seed-locules 1-seriate.—Collections: 6.

Disturbed brush-woodland and restinga below 30 m, along the immediate coast of Santa Catarina and adjacent Paraná in lat. $\pm 25^{\circ}40'-27^{\circ}15'S$.—Fl. III–V.

The epithet *recondita* has been chosen for this maritime variety to emphasize the often cryptic difference between it and var. *glabrata*, from which it can be distinguished reliably at anthesis only by a count of ovules. Despite this very close phenetic resemblance, we find the compressed pod and uniseriate seeds distinctive enough in season. The variety is also closely related to the ecologically similar var. *ambigua* from the coast of Rio de Janeiro, which combines the compressed pod of var. *recondita* with a brevistylous flower; and to the longistylous var. *missionum* of northeastern Argentina, which see for further comment.

- 126c *Senna pendula* (Willdenow) var. *missionum* Irwin & Barneby, var. nov., var. *glabratae* quoad foliola dorso reticulata stylumque elongatum ($\pm 5-6$ mm) praesimilis, sed legumine maturo de latere compresso turgido (nec subcylindrico) seminibusque 1- (nec 2-) seriatis abstans.—ARGENTINA. Misiones. Depto. Candelaria: Loreto, 27.VII.1944 (fr), *J. E. Montes 138*.—Holotypus, NY.**

Essentially like var. *glabrata* in all respects except the pod, the dorsally reticulate lfts glabrous or almost so; petiolar gland between proximal pair only; lfts (3–)4–5 pairs, the distal pair obovate or elliptic, rarely broadly oblongate (2.2–)2.5–5 \times (0.9–)1–2 cm, 1.9–3 times as long as wide; longest sepal 7.5–11.5(–13.5) mm; longest petal 14–17(–20) mm; blade of staminodes obovate-quadrate 1.5–2.5 \times 1.2–1.7 mm; long filaments (11–)12–15(–16.5) mm, their anther 6.6–8.3 \times 1.2–1.8 mm, its beak 0.5–0.8 mm; style (4.5–)5–6 mm; ovules 58–86(–98); body of pod $\pm 11-12.5 \times 1.3-1.5$ cm as viewed in profile, laterally compressed, the seeds 1-seriate.—Collections: 10.

Thickets and gallery-margins, 200–330 m, local in s.-w. Misiones, in the departments of Cainguas, San Ignacio, Candelaria and Posadas, and extreme n.-e. Corrientes (Sto. Tomás), Argentina.—Fl. I–V.—*Pitomovelo (pitomohebo), sen del monte, aurin*.

The var. *missionum* is intermediate between var. *glabrata*, vicariant northward

mostly above the tropic line, which has similar staminodes but a cylindric pod enclosing biseriate seeds, and the local coastal Brazilian var. *recondita*, which has a similar pod but oblanceolate staminodes, a slightly longer style (6.5–8, not 4.5–6 mm) and only about 50, not 58 to about 90 ovules. At anthesis var. *missionum* is more easily and substantially separated from var. *paludicola*, its vicariant neighbor to the north- and southwest, by the greater length of style (4.5–6, not 1.5–2.5 mm) and long filaments (11–16.5, not 6.5–9 mm), and in fruit, as from var. *glabrata*, by the lateral compression of the pod.

- 126d. *Senna pendula* (Willendow) var. *ambigua* Irwin & Barneby, var. nov., foliolis dorso intricatim reticulatis cum var. *glabrata* et var. *recondita* congruens, ab ambabus stylo cum filamentis 2 latero-abaxialibus brevioribus (illo 3–4 nec 4.5–8 mm, his 6.5–10 nec 13–18.5 mm longis), ulterius a var. *glabrata* ovulis minus numerosis (50–64, nec 70–130) seminibusque 1-seriatis, ulterius a var. *recondita* (etiam littorali sed extratropica) staminodiorum lamina angulatim spatulata nec oblanceolata diversa.—BRAZIL. sine loc., but doubtless from the littoral of Rio de Janeiro or Guanabara, *Martius Herb. Brasil.* 129.—Holotypus, NY; isotypi, K, NY, P!

Cassia bicapsularis sensu Benth. 1870, p. 106, minore ex parte.

Like relatively small-fl. var. *glabrata*, the stems and lf-stalks incurved-puberulent, the lflets pilosulous dorsally in anterior basal angle of midrib but otherwise glabrous, at least beneath intricately reticulate-venulose; petiolar glands 1–3; lflets 3–5 pairs, the distal pair $1.8\text{--}3.3 \times 0.9\text{--}1.8$ cm; longest sepal 8–13 mm; longest petal (13–)14–17 mm; blade of staminodes $1.6\text{--}2.3 \times 1.7\text{--}2.1$ mm; 2 long filaments 6.5–10 mm, their anther 6–7.7 mm, its beak 0.5–0.7 mm; style 3–4 mm; ovules 50–64; pod (little known) apparently like that of var. *recondita*, perhaps slightly narrower, the seeds 1-seriate.—Collections: 15.

Restinga thickets along the coast of eastern Brazil between Cabo Frio, Rio de Janeiro, and Ubatuba in extreme n.-e. São Paulo; cultivated in subtropical United States and elsewhere.—Fl. IX–X, III–IV, perhaps nearly throughout the year.

The var. *ambigua* stands intermediate both morphologically and geographically between var. *glabrata* and var. *recondita*, although different from both in the brachystylous flower and correspondingly short filaments. The short broad staminodes agree with var. *glabrata*, while the compressed pod, relatively few uniseriate seeds and coastal habitat agree with var. *recondita*.

- 126e. *Senna pendula* (Willdenow) var. *praeandina* Irwin & Barneby, var. nov., grandiflora longistyla, foliolis membranaceis haud reticulato-nervulosis, glandulis petiolaribus inter omnia praeter distale paria foliolorum sitis, staminodiorum lamina anguste oblonga necnon partria subandina peruviano-boliviana, a var. *eriocarpa* caeterius simili praesertim floribus majoribus staminodiorumque lamina duplo longiori recognita.—PERU. Huánuco. Pachitea, dto. Honoria: Bosque Nacional de Iparia, en el caserio Miel de Abejas, 6.VI.1967 (fl), *José Schunke V.* 2043.—Holotypus, NY.

Cassia bicapsularis sensu Macbride, 1943, p. 157, ex parte.

Diffuse or scandent, at anthesis 1–5.5 m, usually densely gray- or yellow-pilosulous, the lflets dorsally over the whole face, rarely glabrate except for patch

in anterior basal angle of midrib; petiolar glands between all pairs of lfts except the distal one; lfts 4–6 pairs, the distal pair $(2.2-2.5-4.7 \times (0.8-0.9-2.1 \text{ cm})$, the secondary venation fully immersed or faintly delicately raised on one or both faces; longest sepal 8–11(–13.5) mm; longest petal 14–18(–20) mm; blade of staminodes oblong, $3-4.5 \times 0.8-1.5(-1.9) \text{ mm}$; long filaments 12–17(–18) mm, their anther $6-7.5(-8) \times 1.3-1.9(-2) \text{ mm}$, its beak $0.5-0.8 \times 1 \text{ mm}$; ovules 88–108; body of pod $7-11 \times 0.9-1.2 \text{ cm}$, subcylindric, the seeds 2-seriate.—Collections: 24.

Openings in dense wet forest, riverbanks and clearings, mostly 150–500, in centr. Peru (on Río Chanchamayo in Junín) to 1800 and in Bolivia rarely (Coripata) up to 1600 m, scattered along the e. foot and lower intermontane valleys of the Andes between 8° and 19°S, from the upper Huallaga and middle Ucuyali rivers in San Martín and s. Loreto in Peru s.-e. to the headwaters of Río Mamoré in Bolivia, e. feebly across Sa. de Divisor to the head of Rio Juruá in Acre and the Guaporé valley in Rondônia, Brazil.—Fl. IV–VIII.—*Retama-huasca* (Peru).

With var. *praeandina* we embark on the description of the more numerous varieties of *S. pendula* in which the leaflets are obviously pinnately veined but only weakly, sinuously or indefinitely reticulate. In this context the syndrome of relatively large, longistylous flowers, glands between all but the distal pair of leaflets and the elongately oblong staminodes is distinctive. The flask-shaped short anthers, which are abruptly strangulated below the dilated, broad-headed beak, are visually distinctive also, but difficult to describe in differential terms. In the known populations of var. *praeandina* in Peru and adjoining Brazil the plants are for the most part densely pilosulous, often with yellowish hairs, but the Bolivian ones are more glabrous, in this respect resembling the southwardly vicariant Argentine var. *eriocarpa*, which see next below.

126f. *Senna pendula* (Willendow) var. *eriocarpa* (Grisebach) Irwin & Barneby, comb. nov. *Cassia bicapsularis* var. *eriocarpa* Grisebach, Pl. Lorentz, 81. 1874.—“[Lorentz] 246 . . . Tucuman . . . inter Yerba buena et Siambon.”—Holotypus not seen; presumed isotypus (Lasseigne, l.c. infra), Lorentz & Hieronymus 1041, F!—*Cassia pendula* var. *eriocarpa* (Grisebach) Lasseigne, Iselya 1(1): 9. 1979.

Weak shrubs up to 3(–?) m, the submembranous lfts glabrous above, pilosulous beneath only along midrib and in its anterior basal angle with loose straightish hairs to 0.5–1 mm; petiolar glands (much eaten) at all but the distal pair of lfts; lfts (3–)4–5 pairs, the distal pair $2.5-4.5 \times 1.2-2.4 \text{ cm}$, their secondary camptodrome veins 7–9 pairs, the tertiary reticulation 0 above, faint and irregular beneath; longest sepal 5.5–6 mm; longest petal 11–13 mm; blade of staminodes $1.2-1.5 \times \pm 1.2 \text{ mm}$; long filaments 8.5–10 mm, their anther $5.5-6.5 \times 1.1 \text{ mm}$, its beak $0.4-0.6 \times 0.7-0.9 \text{ mm}$; ovary densely pilose-tomentulose, the glabrous style 5.5–6 mm; ovules 74–88; body of pod $\pm 7-8 \times 1-1.2 \text{ cm}$, terete, the seeds biseriate.—Collections: 8.

Habitat little known, but to be expected in thickets and on riverbanks or shores, reaching 1200 m in Salta, scattered along the foothills of the Argentine Andes from Salta to Tucumán.—Fl. XII–III.

The var. *eriocarpa* was originally picked out for description from the mass of variants of the *Senna bicapsularis-pendula* complex because of its densely woolly ovary, but this can be matched elsewhere in *S. pendula* sens. lat. and we maintain the variety for other reasons. It seems closely allied to var. *praeandina*, which

replaces it in the more humid Andean foothills in Bolivia and Peru; both have petiolar glands between all but the distal pair of leaflets and longistylous flowers. The perianth of var. *eriocarpa*, is, however, substantially smaller and the little obtusely pentagonal staminode blades are scarcely half as long. The range of the variety stands apart from that of all other forms of *S. pendula*. The only sympatric near relative is *S. subulata*, readily distinguished by the dilated foliaceous stipules.

- 126g. *Senna pendula* (Willdenow) var. *indistincta* Irwin & Barneby, var. nov., a var. *glabrata* cum qua flore magno longistylis congruet imprimis foliolis membranaceis penninerviis sed haud reticulatis, staminodiorumque lamina majuscula trapeziformi $3-4 \times 2-2.5$ mm diversa.—BRAZIL. Pará: Breu Branco, Tucuruí, Rio Tocantins, 10.V.1978 (fl), *M. G. Silva* & *R. Bahia* 3472.—Holotypus, NY; isotypus (n.v.), MG.**

Weakly frutescent, at anthesis 1.5–2.5 m, the membranous foliage either glabrous or the lflets thinly pilosulous dorsally with fine straight hairs up to 0.4–0.7 mm; petiolar glands between the proximal sometimes also the second pair of lflets; lflets (3–)4–6 pairs, the distal pair cuneate-oblongate or -obovate $2.5-3.5 \times 1-1.5(-1.7)$ cm, the secondary camptodrome veins (5–)6–8 pairs, the tertiary venulation weak, irregular or fully immersed; longest sepal 9.5–14 mm; longest petal 18–24 mm; blade of staminodes trapeziform, broadest at the subundulately truncate apex, $(2.7-)3-4 \times 2-2.5$ mm; long filaments 12–18 mm, their anther $5.5-8 \times 1.3-1.8$ mm; ovary glabrous or laterally strigulose; style 5–8 mm; ovules 52–107; pod of var. *glabrata*.—Collections: 9.

Disturbed and cut-over forest, creek margins and riverbanks, both on varzea and terra firme, below 200 m, locally plentiful in the lower Tocantins basin and s. margins of the Amazon estuary in Pará and adjacent Maranhão, lat. $\pm 1^{\circ}-7^{\circ}\text{S}$; one record from Pernambuco (Tapera), perhaps introduced from further w.—Fl. III–VIII.

The var. *indistincta* is a somewhat nebulously defined entity in which the large longistylous flower of var. *glabrata* is combined with the membranous penninerved (non-reticulate) leaflets common to the brevistylous Amazonian varieties of the species. Dilated trapeziform staminodes are characteristic of var. *indistincta*, but these are known also from a few populations of var. *glabrata* in n.-e. Mato Grosso and the sources of the Tocantins in the Federal District, and are therefore not truly diagnostic. It is the coincidence with dispersal of a distinctive character-syndrome, but not with any one unique character, that enables us to recognize in var. *indistincta* another regional expression of the plastic *S. pendula*.

- 126h. *Senna pendula* (Willdenow) var. *dolichandra* Irwin & Barneby, var. nov., ab omnibus speciei formis hucusque notis staminum duorum latero-abaxialium anthera maxima 13–14 (nec 6–10) mm longa filamentis subaequilongis diversa, caeteris cum var. *indistincta* conveniens.—BRAZIL. Minas Gerais: Pedra Azul, caminho do aeroporto, 20.IV.1964 (fl), *Z. A. Trinta* 801 = *E. Fromm* 1877.—Holotypus, NY; isotypi, BRADE, NY.**

Shrubs of unknown stature, not perceptibly different from var. *indistincta* except in the androecium, this unique in *S. pendula*, the 2 long filaments 11–12 mm, their linear-lanceolate anther $13-14 \times 1.1-1.5$ mm, its beak $0.5-0.6 \times 1$ mm; ovules ± 100 ; pod unknown.—Collections: 2.

Habitat not recorded, but to be expected in weedy thickets or at edge of woodland below 400 m, known only from the type-locality in the lower Jequetinhonha valley in n.-e. Minas Gerais and from an unrecorded locality in Paraíba (*Coêlho de Moraes* 2183, NY)—Fl. IV–VI.

The present variety has everything in common with var. *indistincta* except for the two extraordinary latero-abaxial anthers which attain or slightly surpass in length their own long filament. In no other form of *S. pendula* have we encountered long anthers over 11 mm in length and these are commonly raised on a filament longer than themselves, always so if 8 mm long or more, the relative proportion between filament and anther being therefore highly individual in this case. The two known collections of var. *dolichandra* are so nearly identical morphologically that we cannot doubt they are genetically related and not merely sports of independent origin. There is no ready explanation, however, for the improbable distance, not less than 600 km, between the two localities. Further collecting may show one of our two records to be weedy or incorrectly labelled, or intermediate stations may turn up in Bahia; but for the present one cannot do more than guess.

126i. *Senna pendula* (Willdenow) Irwin & Barneby var. *pendula*. *Cassia pendula* Humboldt & Bonpland ex Willdenow, 1809, l.c., sens. str.—“*Habitat in America meridionali*” or, more exactly, fide Kunth in H.B.K., Nov. Gen. & Sp. 6(qu): 343. 1824, “. . . in Nova Granata, prope Guaduas [Cundinamarca, Colombia], alt. 590 hex . . .”—Holotypus, collected by Humboldt & Bonpland in VII.1801, B-WILLD 7948! isotypi, P-HBK!, Bonpland 1754, P!—*Chamaefistula pendula* (Willdenow) G. Don, Gen. Hist. Dichl. Pl. 2: 452. 1832.

Adipera bicapsularis sensu Britton & Killip, 1936, p. 177, ex parte, quoad syn.

Arborescent at maturity but precociously flowering, at anthesis 1–7(–10) m, the foliage glabrous or the lflets sometimes weakly barbate dorsally in anterior angle of midrib; petiolar gland between proximal pair of lflets only; lflets 4–5(–6) pairs, the distal pair narrowly or broadly obovate 21–46 × 9–19 mm, the secondary campitodrome veins 6–8 pairs, tertiary venulation faint and irregular or 0; longest sepal 11–14.5 mm; longest petal 16–19 mm; long filaments 15–20 mm, their anther 8–9.2 × 1.4–1.8 mm, its beak 0.8–1.1 × 0.8–1 mm; blade of staminodes inversely deltate ±2 × 2.2–3 mm; ovary glabrous; style 6.5–10 mm; ovules 80–104; pod not seen mature, but seeds evidently 2-seriate.—Collections: 6.

Riverbanks, thickets along streams, sometimes weedy on roadsides, 525–1250 m, apparently local in the cordilleras of n. and centr. Colombia, from Santa Marta s. to Antioquia and Cundinamarca.—Fl. VI–XII.

In its large flower, greatly elongated latero-abaxial filaments and long style var. *pendula* closely resembles the much commoner but distantly allopatric var. *glabrata*, from which it is weakly but consistently differentiated by the absence of sharp reticular venulation of the leaflets and by the broadly deltate blade of the staminodes. The var. *hemirostrata* is at least as close in proportions of flower parts and leaf-venulation, but is separable technically by the beaklike attenuation of the long anthers and physically by its habitat remotely distant in the Maya Mountains region of Belize and Guatemala. The discontinuities in range between these three intimately related forms are far from unprecedented. Examples from Cassieae are *Chamaecrista desvauxii* var. *langsдорffii* (Vogel) Irwin & Barneby, almost ubiquitous over the Brazilian Planalto, which reappears locally in the

eastern cordillera of Colombia; or *Chamaecrista desvauxii* (Colladon) Killip and *Ch. zygophylloides* (Taubert) Irwin & Barneby which survive in the Maya Mountain region as remnants of formerly widespread savanna floras.

- 126j. *Senna pendula* (Willdenow) var. *hemirostrata* (Lasseigne) Irwin & Barneby, comb. nov. *Cassia pendula* var. *hemirostrata* Lasseigne, Iselya 1(1): 10, fig. 3. 1979.—“BELIZE. Road to St. Johns, Belize [City], 5 March 1922, O. F. Cook & R. D. Morris 18.”—Holotypus, US! phototypus, NY!**

Diffuse or semiscandent to 4 m, the lfts glabrous except for a residual pilosity in anterior basal angle of midrib beneath; petiolar glands between proximal and often also between second pair of lfts; lfts (3–)4 pairs, the distal pair obovate 16–34 × 9–17 mm, the secondary veins 6–8 pairs, tertiary venulation faint and irregular or immersed; longest sepal 8–10.5 mm; longest petal 12–15 mm; blade of staminodes subquadrate 2.7–3.2 × 2.2–2.5 mm; 2 long filaments 11–14.5 mm, their anther 8–9 × 1.2–1.5 mm, its beak 0.7–1.2 × 0.6–0.8 mm, almost always a trifle longer than diameter at orifice; ovary glabrous, style 5–6.5 mm; ovules 88–108; body of pod (little known) 11–19 × ±1.2 cm, the seeds biseriate.—Collections: 8.

Riverbanks, disturbed forest and roadsides, below 150 m, local in the Maya Mts. and vicinity, in Belize, adjoining Guatemala (Petén) and Mexico (Tabasco).—Fl. X–III.

The var. *hemirostrata* closely resembles var. *ovalifolia*, from which it differs in the distinctly rostrate long anthers borne on longer filaments (11–14.5, not 7–10 mm) and in the appropriately longer style (±6.5, not 3–5 mm). The more directly vicariant var. *advena*, with a yet longer and more sharply defined anther-beak (1.2–2, not 0.7–1.2 mm) is also similar in most points, but has obdeltate rather than quadrate staminodes. Distantly allopatric var. *pendula* has the staminodes of var. *advena* combined with a substantially larger flower, longer style and longer abaxial filaments. In its small range var. *hemirostrata* is, so far as known, the only representative of its species.

- 126k. *Senna pendula* (Willdenow) var. *advena* (Vogel) Irwin & Barneby, comb. nov. *Cassia indecora* var. [“*β. C.*”] *advena* Willdenow ex Vogel, Syn. Gen. Cass. 18. 1837, in statu illegit.—“W[illd.] Hrb. 7958 . . . In Lusitania quasi spontanea.”—Holotypus, comm. *Hoffmannsegg*, B-WILLD 7958!**

Cassia indecora Kunth in Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(qu): 344. 1824.—“Crescit prope Caracas, alt. 460 hex.”—Holotypus, collected I.1800, labelled “n. 1177. Caracas,” P-HBK! isotypus, B-WILLD 7943!—*Chamaefistula indecora* (Humboldt, Bonpland & Kunth) G. Don, Gen. Hist. Dichl. Pl. 2: 452. 1832. *Cassia bicapsularis* var. [*β*] *indecora* (Humboldt, Bonpland & Kunth) Benth in Martius, Fl. Bras. 15(2): 107. 1870; Urban, Symb. Antill. 2: 268. 1900, pro comb. nov., nom. illegit. *C. bicapsularis* var. *pubescens* Benth, Trans. Linn. Soc. London 27: 545. 1871, nom. superfl. *Adipera indecora* (Humboldt, Bonpland & Kunth) Britton & Rose, N. Amer. Fl. 23(4): 239. 1930.

Cassia medellinensis Posada, Adansonia 10: 187. 1872.—Described from Medellín, Colombia.—Holotypus, labelled: “. . . à Medellín, 1500 m . . . 1868 . . . Donné par M. André Posada,” P!

Cassia manzanilloana Rose, Contrib. U.S. Nat. Herb. 1: 325. 1895.—“Colima [Mexico], January 9 to February 6, 1891. No. 1161.”—Holotypus, *E. Palmer 1161*, US! isotypi, NY (2 sheets)!—Equated incorrectly by Standley, 1922, p. 407, with *C. bicapsularis*, correctly so by Britton & Rose, 1930, p. 239, with *Adipera indecora*.

Adipera arborea Britton & Killip, Ann. N.Y. Acad. Sci. 35: 177. 1936.—“Mesa de los Santos

. . . Santander, Colombia, December 12, 1926, Killip & Smith 15180. . .”—Holotypus, NY!

Cassia indecora sensu Vogel, 1837, p. 18, ex parte, quoad vars. α & β ; Standley & Steyermark, 1946, p. 118. *Adipera indecora* sensu Britton & Killip, 1936, p. 177.

Cassia bicapsularis var. *pubescens* sensu Schery, 1951, p. 75.

Diffuse, weakly erect or leaning, vinelike and potentially arborescent shrubs at anthesis (0.7–)1.5–5(–7) m, commonly but not always more densely pubescent than other vars. of *S. pendula*, the stems and lf-stalks pilosulous with straight spreading or loosely incumbent hairs up to 0.2–0.5 mm or less, often glabrescent or fully glabrous, the dorsal face of lflets commonly pilosulous overall with ascending straight or sinuous hairs up to 0.3–1 mm, but the vestiture sometimes confined to midrib or its anterior basal angle, the ventral face usually glabrous, rarely remotely pilosulous; petiolar gland between proximal pair and sometimes also the next pair of lflets, these 4–5 pairs, obovate or obovate-cuneate, the distal pair (20–)24–44(–50) \times 10–18(–20) mm, the secondary camptodrome veins (5–)6–8(–9) pairs, the tertiary venulation immersed or on dorsal face weak and irregular; longest sepal 9.5–11.5(–13) mm; longest petal 12–15(–16) mm; blade of staminodes inversely deltate 1.2–2(–2.5) \times 1.9–2.7(–3.5) mm, usually wider than, rarely as wide as long; 2 long filaments (6.5–)7–11.5 mm, their anther (beak included) 6.5–8(–10) \times 1.1–1.5(–1.6) mm, constricted (1–)1.2–2 mm below apex into a tubular beak at orifice 0.5–0.8(–0.9) mm diam; ovary pilosulous, often densely so; style 4.8–6.5(–7) mm; ovules 80–122; body of pod cylindric or almost so 8–15 \times 1–1.2 cm, the seeds 2-seriate.—Collections: 69.

Disturbed woodland, thickets, forest margins and riverbanks, in either dry stony or rich, seasonally wet soils, becoming weedy along highways and garden fences, ascending from near sea level in w. Mexico, the Greater Antilles and the Magdalena valley in Colombia to 900 m in Guatemala, to 1950 m in Colombia and to 2150 m in Venezuela, interruptedly widespread and locally common along the Pacific slope from near 23°N in Sinaloa, Mexico to Panama; in submontane and lowland valleys of Colombia from Cauca to Norte de Santander, thence e. discontinuously through s.-e. and n.-centr. Venezuela to the Orinoco Delta and Trinidad; Hispaniola and e. Cuba (Oriente); formerly adventive in s.-w. Europe; cultivated in Hawaiian Is.—Fl. in Mexico and Central America IX–III, in Antilles XI–IV, in S. America primarily IX–VI, erratically through the year.—*Moco de chompipe* (Guatemala); *brusca de Pascua* (Dominican Rep.); *urumaco* (Venezuela).

Although *Cassia indecora*, our *S. pendula* var. *advena*, has been described as more densely pubescent than its close relatives, this is only an approximation to the truth, the vestiture being quite variable, that of the leaflets sometimes reduced to a tuft of hairs dorsally. There is in actuality only one feature unique to var. *advena*, the emphatic and abrupt constriction of the long anthers into a beak as long or longer than the diameter of its orifice. This beak is, however, variable in development and at its shortest (± 1 mm) is only by a fraction either proportionately or actually longer than the beak in var. *hemirostrata*. As compared with var. *ovalifolia*, which replaces it northward on both the Pacific and the Gulf slopes in Mexico, var. *advena* differs further, but only slightly, in the usually longer style (± 5 –8, not 3–5 mm) and in the transversely dilated, therefore obdeltate rather than trapeziform blade of the staminodes. There is no obvious way to distinguish fruiting specimens. The range of var. *advena* fits neatly into the gap between those of var. *ovalifolia* northward, of var. *hemirostrata* in the Belize-Petén region, and of the Andean longistylous varieties of *S. pendula* to the south;

it is just what would be expected of one unit in a replacement series but highly improbable for a sibling species independent of the rest. We readily follow unpublished annotations of Lasseigne in reducing *Adipera arborea* to synonymy, for the size of corolla, the shape of petiolar glands and the stature of the plants which figured as diagnostic in the protologue have all proved ineffective and nothing to replace them has been found.

- 126l. *Senna pendula* (Willdenow) var. *meticola* Irwin & Barneby, var. nov., var. *pendulae* adspectu simillima sed stylo 4.5–5 (nec 6.5–10) mm longo, filamentis 2 latero-abaxialibus 6–10 (nec 15–20) mm longis, a var. *ovalifolia* imprimis staminum 2 longiorum antheris crassis 1.5–1.8 (nec 0.9–1.3) mm diam ore grosse dilatatis diversa.—VENEZUELA. Apure: e. outskirts of Puerto Paez, on río Orinoco at mouth of río Meta, 17.XII.1955 (fl), J. J. Wurdack & J. V. Monachino 39964.—Holotypus, NY; isotypus, US.

Shrubs at anthesis 1.5–3 m, appearing glabrous, the lfts truly so on both faces, the stems thinly puberulent; petiolar gland between first pair of lfts only; lfts (3–)4 pairs, the distal pair broadly oblanceolate or cuneate-obovate 21–31 × 10–14 mm, the camptodrome secondary veins ± 7 –9 pairs, tertiary venulation faint or 0; longest sepal 9–11.5 mm; longest petal 15–17 mm; filaments of 2 long abaxial stamens 6–8 mm, their anther including beak 7.7–9 × 1.5–1.8 mm, its beak ± 1 mm long, strongly constricted proximally and distally dilated into an orifice ± 1 mm diam; style 4.5–5 mm; ovary thinly puberulent; ovules 110–120; pod unknown, but presumably subterete and the seeds 2-seriate.—Collections: 3.

Wet savannas and riverbanks in lowlands of the middle Orinoco valley, 50–90 m, apparently local on the lower ríos Meta and Guárico in Apure and Guárico, Venezuela.—Fl. IX–II, probably later.

With its style of moderate length (± 5 mm) and two long abaxial filaments (6–8 mm) about equalling their anther, var. *meticola* stands intermediate between var. *pendula*, vicariant westward in Colombia, mostly in the highlands, and the brachystylous, hylaeen varieties of the Amazon Basin, all of which have styles only 2–3 mm long. The variety *meticola* occupies an area of minor endemism from which no other form of *S. pendula* is known. In cooler submontane climates in western and northern Venezuela *S. pendula* is represented by the habitally similar var. *ovalifolia* and var. *advena*; the latter is quickly distinguished by its slenderly beaked long anthers and the former by a syndrome of 2–3 (not one) petiolar glands and more slender abaxial anthers (± 1.3 , not 1.5–1.8 mm diam) not dilated at the orifice.

- 126m. *Senna pendula* (Willdenow) var. *ovalifolia* Irwin & Barneby, nom. nov. *Cassia ovalifolia* Martens & Galeotti, Bull. Acad. Roy. Bruxelles 10(9): 305 = Enum. pl. Mex. 9(4): 1843.—“Coll. H. Gal[eotti] No. 3260 . . . Habite les endroits humides de la colonie allemande de Mirador [Veracruz], à 3,000 pieds.”—Holotypus, BR! isotypus, K!—*Adipera ovalifolia* (Martens & Galeotti) Britton & Rose, N. Amer. Fl. 23(4): 241. 1930.—Unjustly equated by Bentham 1871, p. 525, with *Cassia bicapsularis* var. *pubescens* (=our *Senna pendula* var. *advena*).—Non *C. ovalifolia* Mart. ex Colla, 1834.

Cassia botteriana Bentham, Trans. Linn. Soc. London 27: 541. 1871.—“Mexico, on Mount Orizaba, Botteri, n. 784; between San Blas and Tepic, Coulter; near San José del Oro, Karwinski.”—Lectotypus (Britton & Rose, 1930, p. 267, nec p. 241): Botteri 784 e mte.

Orizaba, K (hb. Hook., plant at left of sheet only)! = NY Neg. 1416.—*Peiranisia botteriana* (Benth.) Britton & Rose, N. Amer. Fl. 23(4): 267. 1930.
Adipera submontana Britton & Rose, N. Amer. Fl. 23(4): 241. 1930.—“Zacupam, Veracruz, February, 1924, C. A. Purpus 109.”—Holotypus, US, isotypus, NY, ex parte, plant at left of sheet, the other representing *S. septemtrionalis*.—*Cassia submontana* (Britton & Rose) Lundell, Phytologia 1: 215. 1937.
Cassia bicapsularis sensu Standley, 1922, p. 407, ex parte; Isely, 1975, p. 74–76, ex parte (cult.).

Precociously flowering, at first diffuse, when crowded leaning or vinelike, in age arborescent shrubs fertile at 1–6.5 m, the lfsts glabrous or facially glabrous but ciliolate, or dorsally either barbellate in the further basal angle of midrib or thinly pilosulous overall; petiolar glands at first and rarely also at the second pair of lfsts, these 3–5 (in most lvs of most plants exactly 4) pairs, the distal pair obovate or elliptic-obovate obtuse (apiculate) 18–40(–45) × (9–)10–20 mm, the secondary veins on each side of midrib 5–8(–9), tertiary venulation obscure or weak and irregular; longest sepal 7.5–9.5(–10) mm; longest petal 11.5–14(–16) mm; blade of staminodes quadrate, short-oblong or trapeziform (broadest at undulately truncate apex) 2.1–2.6(–3.2) × 1.5–2.4 mm; 2 long abaxial filaments 7–10 mm, their anther slenderly lanceolate 6–7.8 × 0.9–1.2(–1.3) mm, the obscurely differentiated beak ±0.3–0.4 mm; ovary commonly pilosulous, rarely glabrate; style (2.7–)3.2–5 mm; ovules 66–108; body of pod subcylindric 10–15.5 × 1.1–1.5 cm, appearing broader when flattened in press.—Collections: 52.

Thickets, hedges, waste places, forest openings or clearings, shores, sometimes coming out onto dunes or barrier beaches, near sea level up to 1320 m in Veracruz and up to 1300–1700 m in Venezuela, locally abundant on the e. slope and piedmont of Sa. Madre Oriental and adjoining Gulf coastal plain from near 24°N in Tamaulipas s. to s. Veracruz and Tabasco, n. (probably adventively) to the lower Rio Grande valley in extreme s. Texas and s. to the Pacific slope between w. Oaxaca and Istmo de Tehuantepec; reappearing disjunctly on the Pacific coastal plain between 23° and 27°N in Sinaloa and s. Sonora, and remotely so at 1300 m upwards in mountains of n.-w. Venezuela (Falcón and Lara); established but dubiously native in w. Cuba (Las Villas, La Habana, Pinar del Río) and sparingly escaped from cultivation in s. peninsular Florida.—Fl. in e. Mexico, Cuba and Venezuela (VI–)VII–XII(–I), in w. Mexico III–V, VIII–XII, perhaps irregularly through the year as seasonal rains permit.—*Caca de gato*; *cachimbo* (Veracruz).

Since Bentham's reduction of *Cassia ovalifolia* to *C. bicapsularis* this easily recognized, primarily Mexican variety of *S. pendula* has been lost sight of and in the last revision (Lasseigne, adnot. ined.) has still been submerged in a polymorphic var. *pendula* sens. lat. The syndrome of relatively small, brachystylous flower and slender, almost beakless long anthers readily distinguishes it from other North American forms of its species. The focus of abundance of var. *ovalifolia* is on the Gulf slope and coastal plain in Tamaulipas and Veracruz, but we interpret the disjunct occurrence on Pacific slope in Sinaloa as probably natural, following a well recognized pattern of dispersal. It is otherwise with the Cuban material, all of which is from the neighborhood of towns and very probably cultivated or naturalized. The montane northern Venezuelan populations, apparently truly native but remotely disjunct from the main range, cannot be distinguished morphologically; we suspect nevertheless that they represent an independently evolved variant of the *pendula* stock, very close to the lowland Venezuelan var. *meticola*, which see for comment.

126n. *Senna pendula* (Willdenow) var. *stahlii* (Urban) Irwin & Barneby, stat. nov.
Cassia stahlii Urban, Symb. Antill. 1: 316. 1899.—“Hab. in Portorico

in sylvis montanis inter Guayama et Guamani, prope Cayey juxta flumen Morillos, prope Aybonito ad La Lima, m. Sept., Oct. flor., Dec. fruct.: Sintenis n. 2138, 2520, 2724, 3074, Stahl n. 205."—Syntypomnes †B; lectoneotypus, *Sintenis* 2138, collected 21.X.1885 (fl), GH! paratypi, *Sintenis* 3074, M, MO, NY!—*Adipera stahlii* (Urban) Britton & Rose ex Britton & Wilson, Sci. Surv. Porto Rico & Virgin Is. 5(3): 370. 1924.

Adipera stahlii sensu Britton & Rose, 1930, p. 240.

In stature, foliage, vesture and pod closely resembling var. *ovalifolia*, but the petiolar glands more numerous, 2, 3 or 4, between all or all but the distal pair of lfts; pedicels proportionately elongate, 25–33 mm; fls small, the innermost sepal ± 7 mm, the longest petal 11.5–14 mm; 2 long filaments ± 6 mm, their anther 4.5×1 mm; style 1.8–2.2 mm, hooked at apex; ovules ± 74 .—Collections: 9.

Open hillsides and thickets along streams, up to 600 m, local in hill country on and near the north–south divide in e.-centr. Puerto Rico (about Aibonito and Sa. de Cayey).—Fl. VIII–XII.

At the fruiting stage this geographically isolated variety of *S. pendula* can hardly be distinguished from var. *ovalifolia* except by the more numerous petiolar glands, situated between all or all but the distal pair of leaflets, and by the elongate pedicels (25+, not 11–23 mm). It differs from this, however, as from all other forms of its species, in the very short abaxial stamens coinciding with an abbreviated style hooked at tip. The only senna native to Puerto Rico that closely resembles var. *stahlii* in general habit, foliage and terete pod is *S. bicapsularis*, distinguishable at all seasons by the short pedicels, even in fruit not over 5 mm long.

Cassia stahlii commemorates Augustin Stahl (1842–1917), physician and naturalist of German-Dutch descent, botanically active in Puerto Rico in 1883–1889.

1260. *Senna pendula* (Willdenow) var. *paludicola* Irwin & Barneby, var. nov., a vicinis var. *glabrata* et var. *missionum*, caterius similibus, imprimis stylo brevissimo 1.5–2.5 (nec 5–8) mm longo apice abrupte hamato simulac filamentis 2 longioribus 6.5–9 (nec 13–18.5) mm longis, staminodiorumque lamina anguste oblanceolato-oblonga (nec subquadrate-trapeziformi) abstans.—ARGENTINA. Corrientes, dep. Empedrado: along Arroyo Ahomá, Estancia 'Las Tres Marías,' 20.IV.1972 (fl), *Troels Myndel Pedersen* 10165.—Holotypus, NY.

Cassia bicapsularis fma. *pilosa* Chodat & Hassler, Bull. Herb. Boissier II, 4: 691. 1904.—". . . in sabulosis insulae Choco-y pr. Concepcion [Paraguay], Sept., n. 7361."—Holotypus, G! isotypus, NY!

Shrubs 1.4–4 m, glabrous throughout or the stems remotely puberulent and the lfts barbellate dorsally in the further basal angle of midrib; petiolar gland between proximal pair of lfts only; lfts (3–)4(–5) pairs, the distal pair broadly or narrowly obovate (2–)2.5–4(–4.5) \times (0.75)0.85–1.4(–1.9) cm, the secondary camptodrome veins 8–12 on each side of midrib, the tertiary venulation either sharply prominent dorsally or subimmersed; innermost sepal 7.5–11 mm; longest petal (13–)15–20 mm; blade of staminodes oblong slightly dilated upward 3–4.3 \times 1.1–1.8 mm; filaments of 2 long abaxial stamens 10–17 mm, their anther 6.2–8.5 \times 1.5–2 mm, tapering into the truncate apex; ovary glabrous or thinly pilosulous; style 1.5–2.5 mm, abruptly hooked at apex; ovules 76–104; body of pod cylindric 10–18 \times 0.9–1.4 cm, the seeds biseriate.—Collections: 17.

Thickets, woodland margins, shores of temporary lakes or ponds, riverbanks and low swampy grasslands below 250 m, widespread and locally common in the Paraguay valley between 19° and 30°S, from the Pantanal in w. Mato Grosso, Brazil and the lower Pilcomayo valley in Paraguay s. to Corrientes and adjoining Santa Fe, Argentina, extending across Corrientes to the Uruguay River, therefore to be expected in w. Rio Grande do Sul, Brazil and possibly extreme n. Uruguay; one record from wet savanna on río Yacuma near 14°S in Beni, Bolivia.—Fl. (XII)–II–VI.

In our key to the varieties of *S. pendula* we have stressed a difference between intricately, sharply reticulate and penniveined but only weakly, indefinitely reticulate leaflets. As a general rule this criterion is practical and easily applied, but the tertiary and subsequent venulation in var. *paludicola* is variable and sometimes difficult to classify. In context of its dispersal, however, var. *paludicola* is instantly recognized by the short hooked style and proportionately short abaxial filaments, the immediately vicariant or narrowly overlapping vars. *missionum* and *glabrata* being conspicuously longistylous and different in outline of the staminodes. A close match for its androecium is found in the maritime allopatric var. *ambigua*, but this has the staminodes of var. *glabrata* and a relatively few-ovulate, laterally compressed pod with uniseriate seeds. The also closely related var. *tenuifolia*, distantly allopatric in the Hylaeon forest, has almost the same androecial apparatus but differs in the thinly membranous foliage, an ampler calyx and an extraordinarily drawn out pod mostly 2–3 (not 1–2) dm long. The var. *paludicola* has been treated in Argentine literature as part of a polymorphic *Cassia bicapsularis* and referred by Lasseigne (in adnot.) to a broadly conceived *C. pendula*.

126p. *Senna pendula* (Willdenow) var. *tenuifolia* (Benth) Irwin & Barneby, comb. nov. *Cassia bicapsularis* var. (γ) *tenuifolia* Benth in Martius, Fl. Bras. 15(2): 107. 1870.—“... prope Ilheus: Luschnath (Mart. Herb. Fl. Bras. n. 715.); ad fl Amazonum: Spruce n. 1701. (distributa sub nomine *C. biflorae* aff.).”—Lectoholotypus, collected at Manaquirí-gapó near mouth of R. Solimões, Amazonas, Brazil, VI.51 (fl), Spruce 1701, K (hb. Hook.)! isotypi, K (hb. Benth.), M! paratypus, Martius Hb. 715, BR! = *S. pendula* var. *glabrata*.

Weakly shrubs, potentially vinelike or arborescent, at anthesis 2–7 m, the trunks sometimes deeply immersed by floodwaters; petiolar gland 1; lfts membranous (2–)3–4(–5) pairs, the distal pair elliptic or broadly oblanceolate 2.7–5 \times 1–2 cm, the camptodrome secondary veins \pm 10–13 pairs, tertiary venulation weak erratic, the blade thinly pilosulous dorsally with straight ascending hairs up to 0.6–1 mm, or the vesture confined to anterior basal angle of midrib, or lacking; longest sepal 13–15 mm; longest petal 18–24 mm; blade of staminodes narrowly oblong-oblanceolate 3.4–4.5 \times 1–1.3 mm; 2 long abaxial filaments 10.5–12 mm, their anther 9–11 \times 1.5–2 mm, the drum-shaped beak very short or scarcely differentiated; ovary thinly pilosulous or glabrous; style 2.5–3 mm; ovules 100–152; body of pod 19–29 \times \pm 1 cm, unknown when quite mature, when green either terete or deeply constricted between seeds, the septa then much narrower than the locules, and the pod resembling a double row of beads.—Collections: 10.

Flooded river banks and margins of várzea forest below 250 m, discontinuously widespread in Brazilian Amazonia, along the Great River from the mouth of the Jarí in Pará upstream nearly to the Peruvian border in Amazonas, s. through the

Araguaia–Tocantins and Madeira–Guaporé basins into n. Goiás and Rondônia.—Fl. IV–VIII.

The characters listed in our diagnosis, namely a solitary petiolar gland, an ample perianth, an abaxial pair of filaments hardly longer than their stout brown anther, elongate and narrow staminodes, a short style and an extremely long pod form a distinctive syndrome coinciding with a riparian habitat in high Amazonian forest. Length of pod requires confirmation for populations from which we have only flowering material, but this has a consistently high number of ovules appropriate to an elongate fruit. The pod of *Krukoff 4525* from Tefé, though not fully ripe, is clearly of the cylindric type common in *S. pendula*, which has interseminal septa extending (in double file) across the width of the cavity and this, so far as known, is the pod to be expected normally in var. *amazonum*. With some hesitation we include in the variety two collections from the upper Madeira–Guaporé basin (*Prance 5303*; *Black 15157*, both NY) and one from the Araguaia basin in northern Goiás (*Pires & Santos 16669*, NY) in which the septa fail to develop normally, with the consequence that the valves become deeply constricted between seeds and the whole pod doubly moniliform. Whether this pod is pathogenic or belongs to a distinct race we cannot determine.

In our key to the varieties of *S. pendula* we have incidentally characterized two shadowy sennas which have many morphological characters in common with var. *tenuifolia* and share its riparian habitat in Amazonia but which are so poorly known that we pass over them with brief notice but no formal description:

126q. *Senna pendula* (Willdenow) var. q., known to us through *J. Revilla 504* and *788* (both NY) from río Ampiyacu in Maynas and through *Kujikat 287* (MO) from río Cenepa in Amazonas, Peru and through *Prance et al. 10733* (NY) from Rio Uraricoeira, Terr. do Roraima, Brazil, resembles var. *tenuifolia* in general habit, short style and oblanceolate staminodes, but differs in having several petiolar glands, a smaller perianth (longest petal 13–15 mm) and slender long anthers (± 1.3 , not 1.6–2 mm diam). More material is needed.

126r. *Senna pendula* (Willdenow) var. r., known to us only through *Prance et al. 13490* from Rio Purús opposite Lábrea, Amazonas, Brazil, is similar to the last in gross facies, but has an extremely massive gland between the first pair of leaflets, little pentagonal staminodes $\pm 1.5 \times 1$ mm and carnosulous sepals encountered nowhere else in *S. pendula* sens. lat.

126s. *Senna pendula* (Willdenow) var. scandens (Bentham) Irwin & Barneby, comb. nov. *Cassia laevigata* (?) var. *scandens* Bentham in Martius, Fl. Bras. 15(2): 109. 1870.—“... prope Tarapoto Peruviae: Spruce n. 3925.”—Holotypus, collected VII.55 (fl), K (hb. Benth.)! isotypi, K (hb. Hook.), W!—*Cassia floribunda* var. *scandens* (Bentham) Las-seigne, Iselya 1(1): 8. 1979.

Weak sarmentose shrubs up to 3(–?) m, the membranous lfts puberulent along midrib above, thinly pilosulous beneath with straight ascending hairs up to ± 0.6 –0.8 mm; a gland between all pairs of lfts or all but the distal one; lfts 3 or 4 pairs, ovate or lance-ovate from inequilateral base, the distal pair ± 3.5 –5.5 \times 1.5–2 cm, the secondary camptodrome veins ± 8 –10 on each side of midrib, tertiary venulation faint and irregular; longest sepal 8–11.5 mm; longest petal 13–

15 mm; blade of staminodes trapeziform $\pm 2.5\text{--}3.5 \times 2$ mm; 2 long abaxial filaments 10–11.5 mm, their anther $8\text{--}9 \times 1\text{--}1.3$ mm, its beak weakly differentiated; ovary glabrous; style $\pm 4\text{--}5.5$ mm; ovules (1 count) ± 88 ; body of pod (scarcely known) apparently only 7–9 cm long subterete, the seeds 2-seriate.—Collections: 4.

Forest margins, shores and steep grassy slopes along rivers, 200–1100 m, apparently local, known only from the valleys of Río Huallaga and its tributary Río Mayo in San Martín (prov. Moyobamba, Lamas and San Martín), Peru.—Fl. VI–VII, and to be expected at other seasons.

The var. *scandens* was subordinated with doubt by Benthham and definitively by Lasseigne to the species treated herein as *Senna septemtrionalis*. This species was thought at the time to be native both in North and South America, so that the budding off of a local variant in trans-Andean Peru occasioned little surprise. We have developed the contrary view that *S. septemtrionalis* is only adventive in equatorial latitudes and native only in Mexico and Central America, and consider a direct genetic connection between it and var. *scandens* highly improbable. Morphologically var. *scandens* resembles the Hylaeae forms of *S. pendula* in everything but outline of the leaflets, which are broader below, not above the middle. They are, however, asymmetric at base as in *S. pendula*, not subequilateral as in *S. septemtrionalis*, while the small known range of dispersal fits into that of *S. pendula* sens. lat. like a chip missing from a mosaic. We suspect that var. *scandens* is most closely related to var. *praeandina* which replaces it in the same environment immediately to the southward. Together with the ovate leaflets, unknown otherwise in *S. pendula*, the trapeziform staminodes and relatively few-ovulate and short pod form a strong differential syndrome.

127. *Senna hilariana* (Benthham) Irwin & Barneby, comb. nov. *Cassia hilariana* Benthham in Martius, Fl. Bras. 15(1): 108. 1870.—“*Habitat in prov. Rio Grande do Sul: St. Hilaire 1717.*”—Holotypus, P! isotypi (2), P!

Cassia hilariana sensu Benthham, 1871, p. 527.

Small densely leafy shrubs and subshrubs at anthesis $\pm 0.6\text{--}2$ m, glabrous throughout, with virgately erect simple or few-branched pale green or stramineous, finely ribbed hornotinous stems, the dull pale olivaceous foliage subconcolorous, the many axillary few-fl'd racemes forming a narrow leafy thyriform panicle.

Stipules caducous before maturity of lf, absent from most spms, so far as known submembranous, narrowly linear-lanceolate 1.5–5 mm.

Lvs mostly narrowly ascending and distally recurved (3.5–)4.5–10 cm; petiole including the commonly discolored, little dilated pulvinus (2–)5–25 mm, at middle 0.4–0.8 mm diam, prominently ribbed dorso-laterally, deeply narrowly sulcate ventrally; rachis (1.8–)2.5–6.5 cm, its longer interfoliolar segments (4–)5–12 mm; gland between proximal pair of lflets sessile or almost so, in profile stoutly lanceolate or narrowly ovate acute or obtuse, often curved outward, $1\text{--}1.8 \times 0.35\text{--}0.7$ mm; pulvinules 0.7–1.4 mm; lflets 5–8 pairs, moderately accrescent distally, ascending at narrow angle from rachis and forwardly imbricate when pressed, the distal pair lance- or narrowly oblong-elliptic acute mucronulate $12\text{--}27 \times (2.5\text{--})3\text{--}6$ mm, 3.2–4.8 times as long as wide, at base asymmetrically rounded-subcordate on both sides or cuneate on distal one, the pallid translucent margin plane, the midrib and 6–10 pairs of major camptodrome with random intercalary secondary veins and connecting, loosely reticular venules all prominent beneath, immersed

or almost so above, the proximal lfts at once shorter and proportionately broader, becoming ovate acute.

Racemes shortly loosely (3-)5-9(-11)-fld, the axis together with peduncle becoming 2.5-4 cm; bracts narrowly lance-subulate 2-4 mm, early caducous; pedicels 13-19 mm; hypanthium narrowly turbinate 0.9-1.4 mm; sepals not strongly graduated in length but much so in outline, the outermost lance-elliptic or ovate 4.5-6 mm, the inner broadly ovate-obovate 7-9 mm, all submembranous, brownish with pallid subhyaline margin; petals short-clawed, the vexillar one flabellate-obcordate 11-12.5 mm, the rest obovate or elliptic-obovate a trifle shorter; blade of staminodes pentagonal or obcordate-quadrate $1.5-2 \times 1.4-2$ mm; filaments of 4 median stamens 1-1.3 mm, of the centric sterile abaxial one 2-2.5 mm, of the 2 long abaxial ones 5.5-6.5 mm, the anthers of 4 median stamens flask-shaped $3.4-3.8 \times 0.8-1.2$ mm, stragulate 0.5-1 mm below apex and thence abruptly dilated to oblique orifice 0.7-1 mm diam, the anther of the centric abaxial stamen $4.5-5 \times 0.7-1$ mm, those of 2 long abaxial ones brown yellow-tipped, lunately lanceolate $6-7 \times 1.2-1.5$ mm, the drum-shaped, horizontally truncate beak $0.4-0.7 \times 0.7-0.9$ mm, the fertile anthers all dehiscent by U-shaped slit; ovary glabrous; style gently incurved from ovary thence nearly straight $1.8-3.7 \times 0.2-0.3$ mm; ovules 46-56.

Pod seen only in immature state $\pm 7-8 \times 0.6$ cm, apparently quite like that of *S. corymbosa*.—Collections: 9.

Campo, 200-800 m, local on the forks of lower Paraná and middle Uruguay valleys from s.-e. Paraguay e. to w. Santa Catarina and n.-w. Rio Grande do Sul, Brazil, to be sought and expected in intervening Misiones, Argentina.—Fl. I-III.

The affinities of *S. hilariana* are neatly expressed by its range of dispersal which lies precisely between those of *S. corymbosa* southward and varieties of *S. pendula* to the immediate north and west. It is clearly related to both, but has acquired a certain individuality of facies by reason of its more numerous (5-8 pairs) of smaller, narrower leaflets and its crowded, narrowly thyrsoide-paniculate inflorescence composed of few-flowered racemes.

128. *Senna corymbosa* (Lamarck) Irwin & Barneby, comb. nov. *Cassia corymbosa* Lamarck, Encycl. Méth., Bot. 1: 644. 1785.—“... croît dans les environs de Buenos Aires . . . cultivée au Jardin du Roi . . . M. Thouin nous en a fait voir les fruits rapportés par M. Commerson.”—Holotypus, cultivated at Paris from seeds collected by Commerson on Bougainville’s voyage, P-LA! isotypus, P (hb. Poiret.)!—*Chamaefistula corymbosa* (Lamarck) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832. *Cassia falcata* Dumont du Courset, Bot. Cult. ed. 2, 6: 35. 1811, nom. superfl. & homonym. poster. *Adipera corymbosa* (Lamarck) Britton & Rose, N. Amer. Fl. 23(4): 242. 1930.

Cassia crassifolia Gómez Ortega, Decades 10: 122. 1800.—“Habitat passim per cantae Provinciam in Peruvia. Floret in Hort. Reg. Matrit. e seminibus missis per D. Tafalla.”—Lectotypus, cult. at MA 1802-1808, MA! possible isotypus, “misit Lagasca, 1807,” G-DC!—Redescribed by Cavanilles, Descr. Pl. 130. 1801.—“... es natural de la provincia de Canta en el Peru . . .”—Early and correctly equated with *C. corymbosa* by DeCandolle, 1825, p. 491.

Cassia corymbosa sensu Sims in Curtis, Bot. Mag. 17: t. 633. 1803; Jacquin, Fragm. Bot. t. 101, fig. 1. 1809; Duhamel, Traité Arbres & Arbustes ed. 2, 6: t. 32. 1815; Colladon, 1816, p. 88; Vogel, 1837, p. 19; Bentham, 1870, p. 107, exclus. pl. Mandon. boliv.; 1871, p. 526, exclus. var; Henslow, Belgique Hort. 31: 315. 1881 (sleep movement of lvs, studied by Darwin); Boelcke, Darwiniana 7(2): 304, t. IX, fig. c (seed). 1946; Burkart, 1952, p. 166; Dimitri &

Rial Alberti, 1954, p. 20, fig. 7 (optima!); Lombardo, Fl. Arb. Uruguay ed. 2, 65, fig. 59. 1964; Burkart in Cabrera, Fl. prov. Buenos Aires 3: 449–450, fig. 140. 1967; Isely, 1975, p. 76, map 24 (s.-e. U.S.A.); Graf, Exotica ed. 9, 1036. 1978.

Erect or, with age and opportunity, sarmentose slender shrubs and treelets at anthesis 0.8–4 m, with terete, finely ribbed greenish-stramineous hornotinous and fuscous-castaneous or nigrescent older (leafless) branches, except for often residually pubescent pulvinules, exceptionally for puberulent sepals and nearly always for strigulose-pilosulous ovary glabrous throughout, the foliage dull pale olivaceous concolorous or almost so, the few-fl'd racemes at first axillary to and not or scarcely longer than the subtending lf, some later ones often forming a terminal, shortly exserted corymbose panicle.

Stipules submembranous, narrowly linear-lanceolate $2-5 \times 0.2-0.6(-0.7)$ mm, pale green turning stramineous and dry, caducous before maturity of associated lf, absent from most mature fl and all fr spms.

Lvs 5.5–9.5 cm; petiole slender, including moderately dilated pallid or discolored pulvinus (13–)15–28 mm, at middle 0.35–0.6(–0.7) mm diam, bluntly 3-ribbed laterally and dorsally, narrowly sulcate ventrally; rachis 6–27 mm, the longer (or only) interfoliolar segment 6–15 mm; gland between proximal pair of lf's stipitate 1.3–2 mm, the ovoid or lance-ellipsoid apiculate or obtuse head 0.25–0.6 mm diam, a depauperate gland sometimes between second (but not the distal) pair; pulvinules (0.8–)1–2.2 mm; lf's commonly 3 or 2–3, rarely in all lvs exactly 2 pairs, accrescent distally, the distal pair lanceolate, lance- or narrowly oblong-elliptic obtuse mucronulate or apiculate, less often subemarginate or deltately subacute $25-47(-60) \times (4.5-)5-12(-14)$ mm, (3.3–)3.5–5.6(–6.5) times as long as wide, at oblique base varying with increasing breadth from cuneate to rounded, the (mature) margin plane, the midrib and 9–14 pairs of camptodrome (with random intercalary) secondary veins immersed or feebly prominulous on upper face, sharply prominulous beneath, the tertiary venules usually invisible above, always raised beneath, forming a loose reticulum.

Racemes 4–15(–18)-fl'd, the 1 or more expanded fl's raised to or beyond level of ascending, obliquely obovoid buds, the axis together with peduncle becoming (1.5–)2–6(–7) cm; bracts submembranous pallid, narrowly lance-subulate $1-4 \times 0.25-0.6$ mm, caducous as pedicel begins to elongate; mature pedicels (13–)15–23 mm; hypanthium (not always externally differentiated) vase-shaped (1–)1.2–2 mm; sepals submembranous brownish pale-margined, ovate or elliptic-obovate obtuse not strongly graduated, the outermost 4–6 mm, the largest inner one 6–8.5 mm; petals glabrous short-clawed yellow drying brownish-yellow or stramineous brown-veined, the vexillar one either broadly obovate obtuse or flabellate-obovate emarginate, the rest alike obovate or the 2 abaxial ones narrower and often a trifle longer, nidulating the long stamens, the longest petal (8–)9–14 (–16) mm; androecium glabrous, the blade of 3 staminodes elliptic-obovate or oblong-oblancheolate $1.5-2 \times 0.7-1.2$ mm, the filaments of 4 median stamens 1.8–2.7 mm, of the centric abaxial one (2.5)3.5–6 mm, of the long abaxial pair (5.5–)6.5–9 mm, the anthers of 4 median stamens including obliquely truncate beak $3.6-4.8 \times 0.8-1.2$ mm, of the long abaxial pair lunately lanceolate from obtuse base including beak $5.2-6.5 \times (1-)1.1-1.4$ mm, the beak itself 0.5–0.8 mm long, at orifice 0.7–1 mm diam, 2-umbonate adaxially and produced abaxially into a short pollen-cup divided by a slender vertical septum, the centric abaxial anther scarcely narrower than its neighbors, fertile; ovary thinly strigulose or pilosulous laterally, the sutures glabrous, or glabrous overall; style gently incurved and often a trifle dilated distally (2–)2.2–3 $\times 0.2-0.3(-0.4)$ mm, the stigma obliquely introrse; ovules 34–50.

Pod essentially pendulous, the stipe 3–5 mm, the fully fertilized body cylindric or obscurely quadrangular-compressed, straight or a trifle incurved 7.5–12 × 0.6–0.9(–1) cm (in fact often sterile toward base or at random intervals upward, becoming at maturity shorter or variably misshapen), the smooth green glabrous or early glabrate valves becoming papery brownish-stramineous or castaneous, separating into 2 layers, the endocarp thinly pulpy, the uniseriate seed-locules occupying the full width of the cavity and 2–3 mm long; seeds transverse, turned with broader faces to the septa, plumply obovoid or oblong-ellipsoid 4.5–5.3 × 3–3.6 mm, the testa dull brown or lustrous castaneous, exareolate; $n = 14$.—Collections: 42.

Thickets, brushy stream and river banks below 150 m, native along the lower Paraná and Uruguay rivers, in the Mesopotamia of n.-e. Argentina and adjoining Uruguay s.-ward from 28°S in Corrientes to the Plate estuary, thence n. and s. along the coast into Rio Grande do Sul, Brazil and as far as Miramar in Buenos Aires; foothill streambeds and disturbed places up to 450(–?) m in Tucumán and Córdoba, Argentina, long since established and appearing native; widely naturalized in the Gulf States of s.-e. United States (cf. Isely, l.c.); cultivated and casually escaping in waste places and hedges in warm temperate w. Europe and South Africa, and grown in many botanical gardens (under protection n.-ward) in both Old and New worlds.—Fl. in Argentina and Uruguay XI–V.—*Rama negra*; *sén de campo* (used as purgative in folk medicine).

Since its introduction to Europe by Philibert Commerson two centuries ago *S. corymbosa* has been in continuous cultivation. A handsome, free-flowering shrub easily propagated either by seed or cuttings, it has been widely dispersed among botanical gardens in tropical and warm temperate countries and in places has become extensively naturalized. In southern United States it is known to endure short periods of light frost without damage, and could be more widely used as an ornamental, its late-summer floral display being especially welcome. The primitive range of *S. corymbosa*, unknowable in sure detail, is likely to have been Argentine Mesopotamia, southern Uruguay, the Plate estuary and the neighboring Atlantic shore and coastal lowlands. The populations in Tucumán and Córdoba, like most of the few known ones in Rio Grande do Sul, are probably secondary.

The close relationship of *S. corymbosa* is to *S. pendula* and *S. hilariana*, vicariant northward, which differ collectively in the more numerous leaflets, in the first case broader and in the second smaller. An apparently constant diagnostic feature in the flower of *S. corymbosa* is the fertile abaxial anther which, though borne on a somewhat shorter filament, is as long and almost or quite as plump as its fellows on either side, not etiolated and empty of pollen as in kindred species.

129. *Senna bicapsularis* (Linnaeus) Roxburgh, Fl. Ind. ed. 2, 2: 342. 1832. *Cassia bicapsularis* Linnaeus, Sp. Pl. 376. 1753.—Typus infra sub var. *bicapsulari* indicatur.

Weakly arborescent shrubs, when free-standing either diffuse or bushy, in brush-woodland, hedges or forest margins sarmentose and the long terete striate hornotinous branches horizontal or obliquely pendulous (the heliotropic peduncles then appearing retroarcuate), the old stems lenticellate, glabrous throughout or the young stems and pulvinules thinly pillosulous with fine random incurved hairs up to 0.1–0.3 mm, the thick-textured, mildly malodorous foliage dull oliveaceous subconcolorous, the axillary racemes either all lateral to primary leafy

stems, or to short secondary branchlets, or subterminally paniculate and in any case either shorter than the subtending lf or well exerted.

Stipules submembranous, narrowly lance-subulate $1-3.5 \times 0.3-0.7$ mm, early reflexed caducous, often thrown off before maturity of the associated lf, absent from many spms.

Lvs (2.5-)3-8(-9) cm; petiole including sensitive, when dry wrinkled and often discolored pulvinus (1-)1.3-2.7(-3.2) cm, at middle 0.4-0.8 mm diam, 3-ribbed dorso-laterally, deeply narrow-sulcate ventrally; rachis (4-)10-28(-35) mm, its longer interfoliolar segments (4-)6-12(-14) mm; gland between proximal pair of lfts either stipitate and plumply claviform or sessile and ovoid, obtuse or conic-subacute, in profile $0.9-2.1 \times 0.35-0.8$ mm, the head green or yellowish; lfts 2-4, mostly 3-4 or 2-3, exceptionally in (almost) all lvs only 2 pairs, accrescent distally, in sleep forwardly imbricate and the distal pair tilted backward from tip of rachis, all broadly, rarely narrowly obovate, obtuse, subemarginate or seldom deltately apiculate, the distal pair $15-40 \times (6.5-)9-26$ mm, 1.25-2.8(-3) times as long as wide, at inequilateral base cuneate or on proximal side semicordate, the translucent margin plane, the slender midrib with 4-8 pairs of major camptodrome secondary veins and open tertiary reticulum all either prominulous on both faces or (sub)immersed ventrally.

Racemes loosely (3-)6-25(-30)-fld, the buds elevated well above the 1-few simultaneously expanded fls, the axis including peduncle becoming (3-)4-14(-18) cm; bracts membranous, narrowly lance-subulate 0.7-2 mm, caducous from young fl-buds; pedicels (excluding hypanthium) 1-3.5(-5) mm, the fertile ones much thickened in fruit and \pm clearly differentiated from hypanthium by a collar or sulcus; fl-buds obliquely obovoid obtuse glabrous; hypanthium at anthesis vase-shaped, often narrowly so, 1.5-3.5 mm long, (2-)1 mm longer to 1(-2.5) mm shorter than pedicel; sepals submembranous yellowish-green or red-brown, oblong-elliptic or -obovate obtuse, moderately graduated, the smallest outer one (4.5-)5-8 mm, the longest inner one (6.5-)7-11.5 mm; corolla zygomorphic, the petals yellow drying stramineous delicately brown-veined, all cuneate at base and scarcely clawed, the vexillar one broadest, obovate truncate-emarginate, the rest oblong-oblongeolate or -obovate obtuse, the 2 abaxial ones usually a trifle longer than the rest, the longest petals (10-)11-15(-16) mm; androecium glabrous, functionally 6-merous, the 3 adaxial staminodes broadly cuneiform 1.6-2.1 mm wide at their shallowly emarginate apex, the filaments of 4 median stamens 0.7-1.2 mm, of the centric abaxial one 2-3 mm, of the 2 latero-abaxial ones dilated ribbonlike (5-)5.3-8.4 mm, the anthers of 4 median stamens linear-oblong nearly straight $3.5-5.1 \times 0.8-1.3$ mm, of the 2 latero-abaxial ones lunately incurved from obtusely short-sagittate base (5.3-)5.8-8.6(-9.5) $\times 1-1.4(-1.5)$ mm, of the centric abaxial stamen $5.5-8 \times 0.6-0.8$ mm, all anthers constricted at a point 0.5-0.9 below symmetrically or subobliquely truncate apex where dehiscent by a single coarsely U-shaped pore interrupted by a subulate \pm porrect imperfect septum; ovary glabrous; style filiform 2.3-4 mm hooked apically, just below the minute terminal semi-introrse stigmatic cavity 0.15-0.3 mm diam; ovules $\pm 70-130$.

Pod erratically geotropic, long persisting on sometimes defoliate stems into a second season, the stipe 3-6 mm, the cylindric straight or slightly incurved body when fully fertile $9-16(-17) \times (0.9-)1-1.4$ (when flattened in press up to 1.6) cm, the green or anthocyanic smooth glabrous valves brunnescent or livid in age except for a paler sutural margin, when ripe firmly papery, tardily dehiscent along the ventral suture; seeds transverse, turned with broader faces to the complete membranous septa, stacked along the pod in two parallel and separate or shallowly interdigitating files, the individual seed-locules 2-3.5 mm long occupying

only \pm half the pod's cavity, each lined with fetid sweetish pulp; seeds plumply compressed-obovoid or semi-obovoid (sometimes distorted by crowding) $3.9-5.1(-5.5) \times 2.9-4(-4.3) \times \pm 2$ mm, the brown testa usually smooth and lustrous sometimes minutely granular, exareolate.

Senna bicapsularis of this account is equivalent to *Cassia bicapsularis* of De Wit (1955), Brenan (1967) and Lasseigne (1980, dissert. ined.) and to *Adipera bicapsularis* Britton & Rose (1930, excluding the synonym *Cassia coluteoides* which = *S. pendula*); following these precedents we abandon Bentham's comprehensive definition that was stretched to include the species treated above as *S. pendula* and *S. candolleana*. Like our predecessors, we stress the short pedicels as the most distinctive feature of *S. bicapsularis* sens. str., but must point out that the pedicel as described hitherto is actually, like that of *S. (ser. Senna) alexandrina*, not a simple stalk but actually compounded of a true pedicel and a downwardly attenuate hypanthium which may be either slightly longer or shorter than it. Thus the true pedicel is, by comparison with that of related species, even shorter than has been supposed. The composite structure of the flower-stalk is especially apparent in unfertilized flowers, which disjoint at the plane of junction, and again in the thickened fruiting flower-stalk, where the discontinuity is marked externally at first by a more or less emphatic swelling and later (often but not always) by an incised scar.

Intraspecific variation in *S. bicapsularis*, other than such as is readily attributable to age and environment, is marked only in western South America. Along the Pacific slope of the Andes between southernmost Ecuador and southern Peru there appear to be both truly native and adventive populations of the species, the latter inseparable from their Caribbean kindred, the autochthonous ones differing in their mostly or entirely 4-foliolate leaves. Following Macbride (1943) in this, but not all details of his account, we recognize a var. *augusti*.

Key to the Varieties of *S. bicapsularis*

1. Lfts of mature lvs (disregarding depauperate ones of paniculate inflorescences) mostly or entirely 3-4 pairs, 4-foliolate lvs few or absent; range of the species, but in Ecuador, Peru and Chile only about coastal cities, presumed adventive. 129a. var. *bicapsularis* (p. 401).
1. Lfts of all lvs exactly 2 pairs (random 3-jugate lfts obviously exceptional); native at low and middle elevations along the Pacific slope of the Andes from extreme s. Ecuador to s. Peru. 129b. var. *augusti* (p. 403).

129a. *Senna bicapsularis* (Linnaeus) Roxburgh var. *bicapsularis*. *Cassia bicapsularis* Linnaeus, 1753, l.c., sens. str.—“*Habitat in India.*”—Lectoholotypus (De Wit, 1955, p. 236, accepted as syntypus by Brenan, 1967, p. 71 and by Isely, 1975, p. 198), LINN 528/10!—First described by Linnaeus from sterile plants grown in Clifford's garden (Hort. Cliff. 159, *Cassia* no. 11. 1737) from seed thought to be from Ceylon [“in Zeylona, ut fertur”], but the synonym of Plumier quoted in the protologue, derived from a West Indian plant, provided the critical character of the pod and the descriptive epithet.—*Cathartocarpus bicapsularis* (Linnaeus) W. Hamilton, Prod. Pl. Ind. Occ. 38. 1825. *Adipera bicapsularis* (Linnaeus) Britton & Rose ex Britton & Wilson, Sci. Surv. Porto Rico 5(3): 370. 1924.

Cassia emarginata Linnaeus, Sp. Pl. 376. 1753.—“*Habitat in Caribaeis.*”—First described by Linnaeus in Hort. Cliffort. 159. 1738 as *Cassia foliolis trium parium aequalibus ovatis emarginatis rotundatis* and there equated with *C. minor fruticosa hexaphylla sennae foliis* Sloane, Voy. Jam. 2: 44, t. 180, fig. 1, 2, 3, 4. 1725.—“This grows in the Plain or Low-lands of

- Jamaica* as well as all the *Caribes*."—No cult. spm. survives either in LINN or in Herb. Clifort., BM.—Lectotypus, (Fawcett & Rendle, 1920, p. 108, by implication), the protologue of *C. minor fruticosa* etc. Sloane, l.c.!, cited by Linnaeus in 1738 and 1753.—Typotypus, *Sloane Herb.* vol. 6, fol. 28, BM!—Fawcett & Rendle, l.c., distinguished between the plant and the associated pod and seeds, citing only the plant itself, therefore presumably only the figure 1 of Sloane's tab. 180, as typical of *Cassia emarginata*. In our opinion the plant and the detached parts, both as preserved in Sloane's herbarium and as faithfully depicted in the cited table, are conspecific and represent *C. bicapsularis* L. Sloane's description of his *C. minor fruticosa* etc. categorically excludes Bentham's misinterpreted *C. emarginata*, the species herein described as *Senna atomaria*.—*Isandrina arborescens* Rafinesque, *Sylva Tell.* 126. 1838, nom. illegit. *I. emarginata* (Linnaeus) Britton & Rose ex Britton & Wilson, *Sci. Surv. Porto Rico & Virgin Is.* 5(3): 374. 1924, quoad nom. sol., exclus. descr.
- Cassia limensis* Lamarck, *Encycl. Méth.* 1: 643. 1785.—". . . cultivé au Jardin du Roi [Paris], et a été trouvée par M. Dombey dans les environs de Lima [Peru]."—Holotypus, P-LA! The wild plant, from Huaura, Prov. Chancay, dept. Lima, is represented by *Dombey* 832, P! and *Herb. Ruiz & Pavón* 14/17, MA!—Correctly equated with *C. bicapsularis* by Vogel, 1837, p. 18, a synonymy not since questioned.
- Cassia sennoides* Jacquin, *Collectanea* 1: 74 & Ic. Rar. 1: 8, t. 70. 1780–1786.—". . . semina hujus Cassiae . . . mihi transmissa fuerunt, una cum aliis ex India Orientali allata."—Holotypus, cult. in hort. bot. vindob., W (hb. Jacqu.)!—Equated with *C. bicapsularis* by Vogel, 1837, l.c.
- Cassia berteri* Colla, *Hort. Ripul.* 30, t. 24. 1824.—"E seminibus a Bertero e Guadalupa [Ile Guadeloupe, Lesser Antilles] missis an: 1817 enata . . . laete floruit Majo 1823 [at Rivoli, w. of Torino, n. Italy]."—No typus found at G; equated with *C. bicapsularis* by Bentham, 1871, p. 525, and certainly, from protologue and geographic origin, conspecific.—*C. bicapsularis* var. (β) *aristata* DeCandolle, *Prod.* 2: 495. 1825 (nov). *C. collae* G. Don, *Gen. Hist. Dichl. Pl.* 2: 442. 1832, a superfluous substitute, the supposed obstacle, *C. berteriana* DC., different in form.
- Cassia inflata* Sprengel, *Syst. Veg.* 2: 336. 1825 (Jan–Mai).—"Ad fl. *Magdalenae*. Bertero."—Holotypus not known to survive; isotypus, *Bertero s.n.*, misit Balbis, 1822, G-DC!—Equated with *C. bicapsularis* by DeCandolle, 1825, p. 495 and by Vogel, 1837, l.c., a synonymy emphatically confirmed by Bentham, 1871, p. 525.—*Chamaefistula inflata* (Sprengel) G. Don, *Gen. Hist. Dichl. Pl.* 2: 451. 1832.
- Cassia bicapsularis* var. (γ) *quadrijuga* DeCandolle, *Prod.* 2: 495. 1825 (nov).—"v. s. in herb. Balb[is.]."—No locality given; no typus found at G or G-DC.
- Adipera spiciflora* Pittier, *Bol. Soc. Venezol. Ci. Nat.* 10: 113. 1945.—"Cerca de El Rosario en la orilla de la carretera de Valera a Timotes [prov. Trujillo, Venezuela] . . . Enero 16, 1929 (Pittier 13159, tipo) . . ."—Holotypus, VEN! = NY Neg. 6335; isotypi, A, NY!—Paratypes cited in the protologue (*Pittier* 12641, *Tamayo* 1711, *Jahn* 666) are conspecific!—*Cassia spiciflora* Pittier, l.c., pro syn.
- Cassia foliis trijugatis* . . . P. Miller, *Fig. Pl.* 1: t. 82, fig. a, b (nec fig. c, quae *S. pentagoniam* illustrat). 1760.
- Cassia bicapsularis* sensu Jacquin, *Fragm. Bot.* 46, t. 58 (optima!). 1809; Colladon, 1816, p. 100; Vogel, 1837, p. 18, inclus. var. β ; Bentham, 1871, p. 525, ex parte, quoad var. typicam sed exclus. syn. *C. pendula* (= *S. pendula* nob.), *C. glandulifera* Reinwardt (= *C. divaricata* Nees & Blume; cf. De Wit, 1955, p. 237), *C. alcaparillo* (= var. *augusti*, sequ.) *C. dormiens* (= *S. pendula* nob.), *C. crassisejala* (= *S. pendula* nob.) & *C. chrysoloma* (= *S. pendula* nob.); Britton, *Fl. Bermud.* 172. 1918; Adams, 1972, p. 324.
- Adipera bicapsularis* sensu Britton & Rose, 1930, p. 240.

Lfts (2–)3–4 pairs.—Collections: 115.

Thickets, riverbanks, beaches, riparian forest, persisting in hedges, plantations and disturbed brush-woodland, mostly between sea level and 650 m but ascending in n.-w. Venezuela to 1000–2000 m, long cultivated, readily escaping and weedy, and consequently of uncertain aboriginal range but apparently native on Jamaica and around the s. and e. periphery of the Caribbean Basin from e. Puerto Rico through the Virgin, Leeward and Windward Is. to Trinidad, thence w. across n. Venezuela and adjacent Dutch Antilles to the lower Magdalene valley in Colombia and to centr. Panama, extending feebly s. in Venezuela to Cordillera de Mérida, the lower Orinoco valley in Guárico and Altiplanicie de Nuria in n.-e. Bolívar;

locally established in S. America about ports and coastal cities, as on the Demerara estuary in Guyana, about Cayenne, French Guiana, at Esmeraldas and Guayaquil in Ecuador, Chiclayo and Lima in Peru, and Arica, Chile; adventive n.-ward in Guatemala, w. Cuba, the Caicos and Turk Is. (status equivocal, possibly native), s. peninsular Florida and Bermuda. Early taken to tropical Africa, Mauritius, s. India and Sri Lanka, Indomalaya and New Caledonia, where either transiently or permanently established outside cultivation, reported from elsewhere in Old World tropics, at least sometimes mistakenly for *S. pendula*. Cultivated in Europe, under glass n.-ward and unprotected in Mediterranean gardens, from early XVIII century onward.—Fl. in the Americas primarily following rains, but in favorable circumstances throughout the year, the pods long persistent and often contemporary with fls.—*Christmas-bush* (Bermuda); *velamuerto*, *sen del pais* (Pto. Rico); *styver-bush* (Virgin Is.); *sou maqué*, *sousmarqué* (French Antilles); *black-dog-bush* (St. Kitts); *money-bush* (Trinidad); *feuille-d'argent* (French Guiana); *chiquichique* (Venezuela, in wide use); *bombito*, *platanito* (Colombia); *chilifruta* (Peru).

- 129b. *Senna bicapsularis* (Linnaeus) var. *augusti* (Harms) Irwin & Barneby, comb. nov. *Cassia augusti* Harms in Fedde, Repert. Sp. Nov. 18: 93. 1922.—“Peru: . . . zwischen 13° und 14° s. Br., über dem Hafen Pisco, unter Pampano, 1000 m, . . . (A. Weberbauer no. 5368—Mai 1910 . . .).”—Holotypus, †B = F Neg. 1653; no isotypus found.—*C. bicapsularis* var. *augusti* (Harms) Macbride, Field Mus., Bot. 13(Fl. Peru), part 3(1): 157. 1943.**

Cassia alcaparillo Humboldt, Bonpland & Kunth, Nov. Gen. & Sp. 6(qu. ed.): 355. 1824.—“Crescit in Peruviae calidis, prope Olleros [dept. Piura, prov. Ayabaca], alt. 750 hex.”—Holotypus, collected in VIII.1801, labelled ‘n. 3493, Ayavaca, Olleros,’ P-HBK! isotypi, B (hb. Willd. 7939), P!

Lvs all or almost all 4-foliolate.—Collections: 11.

Riverbanks, streambeds, open hillsides and disturbed brush-woodland (monte), (40–)250–2000 m, locally plentiful along the Pacific slope of the Andes from s. Ecuador (Loja) to s. Peru (Arequipa), within lat. 4°–16°S.—Fl. VII–XII, perhaps intermittently throughout the year.—*Alcaparillo*.

- 130. *Senna subulata* (Grisebach) Irwin & Barneby, comb. nov. *Cassia subulata* Grisebach, Pl. Lorenz. 82. 1874.—“[Lorentz No.] 250 . . . Catamarca, frequens in collibus pr. Yakutula.”—No typus examined, but the protologue definitive. *Lorentz* 658 from the type-locality, †B, surviving as F Neg. 1751, was perhaps an isotypus.**

Cassia subulata sensu Burkart, 1952, p. 165.

Slender floriferous bushy shrubs at anthesis 1–3 m with pliantly virgate, often geotropic annotinous branchlets, either glabrous throughout, or the lf-stalks and lower face of lflets minutely strigulose, or the whole plant, including upper face of lflets, villosulous with fine loose wavy hairs up to 0.7–1.2 mm, the foliage bicolored, the thin-textured lflets dull dark green or olivaceous above, pallid beneath, the early racemes axillary to and about as long as ordinary foliage lvs, the lvs at distal nodes abruptly reduced or repressed, the racemes from these axils forming an open, far exserted panicle.

Stipules early deflexed foliaceous, asymmetrically transversely dilated becoming obliquely reniform but the midrib produced into a subulate point, the lobe

further from petiole broader and amplexicaul, the whole blade (point included) $5-12 \times 5-33$ mm, persistent into or past maturity of the associated lf.

Lvs 7-19 cm; petiole including firm, laterally dilated pulvinus (2-)2.5-4 cm, at middle (0.5-)0.6-1.1 mm diam, subterete except for narrow ventral sulcus; rachis 3.5-11 cm, its longer interfoliolar segments 1-2.2 cm; gland between proximal (and rarely the second) pair of lflets stipitate, in profile 1.5-3 mm, the lance-ellipsoid or fusiform obtuse or acute head 0.35-0.9 mm diam; pulvinules 1-2.2 mm; lflets (3-)4-6 pairs, accrescent distally, the distal pair narrowly obovate or broadly elliptic-oblongate obtuse or subemarginate, minutely mucronulate $2.7-5 \times 1-1.9$ cm, (2.1-)2.3-3.1 times as long as wide, at base asymmetrically cuneate or on proximal side rounded-subcordate, the membranous translucent margin plane, the midrib immersed above, cariniform beneath, the 7-10(-11) pairs of slender camptodrome secondary veins often faintly raised on both faces, sometimes immersed but discolored, tertiary venulation imperceptible or erratic, the proximal pairs of lflets proportionately broader and fewer-veined.

Racemes loosely (7-)15-50-fl'd, the ascending glabrous or subglabrous obovoid-ellipsoid buds at first racemosely elevated beyond the expanded fls, the axis together with peduncle becoming 5-21 cm; bracts submembranous greenish or livid lance-acuminate 2.5-6 mm, deciduous before full anthesis; pedicels slender, at maturity 10-22 mm; sepals ovate or obovate obtuse submembranous brown-tinged or -speckled, the inner ones broadly hyaline-margined, the set well graduated, the outermost 3-6 mm, the innermost 6.5-11 mm; corolla zygomorphic, the glabrous petals yellow drying stramineous delicately dark-veined, all subsessile, the 3 adaxial broadly obovate or elliptic-obovate, the 2 abaxial narrower and a trifle longer (12-)13-18 mm, nidulating the long stamens; androecium glabrous, the filaments of 4 median stamens 1.1-2.5 mm, of 3 abaxial ones 4-8.5 mm (that of centric stamen often a little shorter than its neighbors), the 7 fertile anthers thin-walled brownish, those of 4 median stamens almost straight $3.7-4.6 \times 0.9-1.1$ mm, at apex obliquely truncate 2-porose, those of 3 abaxial stamens lunately lanceolate in profile $4.2-6 \times 1.1-1.4$ mm, abruptly contracted at apex and 1-porose; ovary strigulose or pilosulous; style stoutly linear, gently incurved $2-3.5 \times 0.3-0.4$ mm, the stigmatic cavity obliquely terminal; ovules 36-60.

Pod geotropic from pliantly bending central axis, the stipe $\pm 5-6$ mm, the cylindric straight or slightly curved body $5.5-6.5 \times \pm 0.5-0.6$ cm, abruptly apiculate by persistent style-base, the valves at first smooth lustrous, becoming dull brownish-stramineous papery, indehiscent; seeds stacked in 2 slightly interdigitating files, not seen fully ripe.—Collections: 14.

Open hillsides and canyon floors near 1200-1700 m in the foothills of the Argentine Andes and detached ranges to the e., from Salta s. through Catamarca, Tucumán and e. La Rioja to the sierras of Córdoba and San Luis, lat. $\pm 25-33^\circ\text{S}$.

The foliaceous, obliquely reniform stipules abruptly contracted into an eccentric point (to which the epithet refers) are the obvious hallmark of *S. subulata*, which otherwise superficially resembles *S. pendula* sens. lat. except that at full anthesis the upper leaves tend to be reduced or absent and a panicle of flowers is consequently exerted. At close quarters the thin-textured anthers, of which the three abaxial ones are all alike and fertile, recall the androecium of *S. (Stipulaceae) organensis* and *birostris*, but the number and orientation of the seeds are typical of ser. *Coluteoideae*. The species varies greatly in pubescence of the foliage, which may be fully glabrous or villosulous throughout; however we find this variation geographically random and taxonomically insignificant.

COLUTEOIDEAE IMPERFECTE NOTAE

Cassia bracteosa Lasseigne, Iselya 1(1): 8, fig. 1. 1979.—“ARGENTINA. SALTA: Santa Victoria [3340 m], 3 April 1940, Meyer & Bianchini 31540.”—Holotypus (not seen), F.

We are unable to evaluate or place in due context this apparently distinct senna, the typus of which was not available during the course of our study. The protologue stresses the following diagnostic characters: persistent linear stipules; glands between all but the uppermost pairs of leaflets; broad persistent floral bracts (10–14 × 4–6 mm); long anthers only ± 4 mm and style only 1 mm long. The exareolate seeds stacked in two rows along a terete pod appear characteristic of ser. *Coluteoideae* but the bracts are not matched elsewhere in the series. The type-locality is in the northwestern corner of Salta, on the eastern scarp of the Andes just below the Bolivian frontier.

Bxix. ser. BASIGLANDULOSAE (Colladon) Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Basiglandulosae** (Colladon) Irwin & Barneby, comb. nov. *Cassia* sect. *Chamaesenna* ser. *Basiglandulosae* DeCandolle ex Colladon, Hist. Casses 107. 1816, spp. pauc. exclus.—Sp. lectotypica: *C. occidentalis* Linnaeus \equiv **Senna occidentalis** (Linnaeus) Link.—*Cassia* sect. *Chamaesenna* ser. *Coluteoideae* ****Basiglandulosae* [descriptive, not epithetic] (Colladon) DeCandolle, Prod. 2: 497. 1825.

Cassia sect. *Chamaefistula* subsect. *Oncolobium* Vogel, Syn. Gen. Cass. 10 (in conspectu definita), 21. 1837.—Sp. lectotypica (Bentham, 1871, p. 530): *C. occidentalis* Linnaeus \equiv **Senna occidentalis** (Linnaeus) Link.—*C.* subgen. *Senna* sect. *Oncolobium* (Vogel) Bentham, in Martius, Fl. Bras. 15(2): 110. 1870 & Trans. Linn. Soc. London 27: 530. 1871.

Ditremexa Rafinesque, Sylva Tellur. 127. 1838.—Sp. lectotypica (Britton & Wilson, Sci. Surv. Porto Rico & Virgin Is. 5(3): 371. 1824): *D. occidentalis* (Linnaeus) Britton & Rose \equiv *Cassia occidentalis* Linnaeus \equiv **Senna occidentalis** (Linnaeus) Link.

Ditremexa sensu Britton & Rose, 1930, pp. 255–258; Britton & Killip, 1936, p. 180.

Cassia sect. *Oncolobium* sensu Symon, 1966, pp. 76, 87–92.

Corolla zygomorphic; sepals either moderately or little graduated; androecium functionally 6-merous, the 3 adaxial members staminodal, the centric abaxial one imperfect, sterile or rudimentary (at largest only half as thick as its neighbors), the 4 median short-stalked anthers nearly straight, obliquely truncate 2-porose, the 2 longer, long-stalked abaxial ones either lunately lanceolate in profile or lanceolate and subapically strangulated, at apex prolonged on the abaxial side beyond the 2-porose orifice into a thickened linguiform appendage; style angulately grooved ventrally, distally incurved or hamate, the enlarged ciliolate stigmatic cavity retrorse or latero-introrse; ovules 20–108; pod ascending or erect (but when elongate often recurved distally, or randomly geotropic by its own weight), in outline linear, when ripe plano-compressed, turgidly compressed or (when both long and narrow) subtetragonal, the valves when ripe papery and differentiated into a slightly depressed darker median and 2 paler marginal bands, slightly sulcate at each interseminal septum; seeds either transverse or obliquely basipetal, 1-seriate or (*S. sophora*) crowded into 2 parallel but \pm interdigitating files, mostly compressed parallel to the valves but when constricted by the locule sometimes laterally compressed and drum-shaped, in either case lying with areolate face to the valves, less often rotated on their funicle and areolate toward the septa.—Shrubs and herbs, commonly with blackish roots and malodorous

foliage; stipules thinly herbaceous, narrow, sometimes obscurely dilated-subamplexicaul at base, caducous; petiolar gland usually situated on or at base of petiole, below the proximal pair of lflets, but occasionally (in some forms of *S. mexicana*) between the proximal pair; lflets 3–8, in *S. mexicana* var. *berteriana* up to 16 pairs; inflorescence of axillary, in the more widespread weedy spp. depauperately few-fl'd racemes, these all lateral and immersed in foliage or, following reduction distally of lvs to rudimentary lf-stalks, becoming corymbose- or narrowly thyriform-paniculate.—Spp. 13, several pluri-racial, several weedy, most highly diversified in the West Indies, s.-e. tropical and subtropical South America, and Australia, 10 native and 9 endemic to the New World, 3 of the latter extending n. into warm temperate e. or arid s.-w. United States, 2 (*S. occidentalis*, *S. hirsuta*, originally Neotropical) now circumtropical, 1 (*S. sophora*, originally Paletropical) adventive in the Americas, 2 endemic to Australia-Malesia.

The ser. *Basiglandulosae* that emerged from the first systematic study of *Cassia* sens. lat. (Colladon, 1816) survives here in only slightly modified form. It was originally defined, and with few reservations can still be defined, by the infrafoliolar situation of the petiolar gland, which may be either truly basal and juxtaposed to the pulvinus or displaced up to half way between the pulvinus and the first pair of leaflets. However, the obliquely appendaged long anthers and a style variously dilated upward to an enlarged, retrorse or latero-introrse stigmatic cavity are the characters which we now regard as definitive. This shift in emphasis permits the inclusion in ser. *Basiglandulosae* of *S. mexicana* sens. lat., in which the petiolar gland may be either between or below the proximal pair of leaflets, but requires the exclusion of *S. marilandica* and *S. hebecarpa* which, while congruent in the gland, differ substantially in the style and anthers. We also exclude from the series *S. oblongifolia*, equivocally referred by Bentham to the equivalent sect. *Oncolobium*. As shown by Lasseigne (1979a, p. 71, fig. 38; 1979b, p. 151, fig. 34) this species has the exareolate seed and symmetrically truncate long anthers of ser. *Corymbosae* and will be found described under that series.

The apparently displaced petiolar gland, which acquired overstated importance in the taxonomy of *Senna* before much was known about the pod or about fine details of floral morphology, can be interpreted in two ways: either the gland itself has shifted downward from its usual site between the first pair of leaflets; or these leaflets have been suppressed, leaving the gland naked. Bentham drew attention to the fact that the gland in *C. oblongifolia* and *C. bahamensis* (our *Senna mexicana* var. *chapmanii*) may be either naked or accompanied by a leaflet on one or both sides, which points to the second alternative as the more likely. If this is truly the case, the leaves of *S. occidentalis* and close kindred, in which the gland is always strictly basal, are really in a technical sense sessile, the apparent petiole representing the first interfoliolar segment of the rachis.

Insight into the orientation of the seeds can be derived from study of the fruits of ser. *Basiglandulosae*. Vogel was the first to remark, of his heterogeneous subsect. *Oncolobium*, that seeds in one and the same pod might vary from transverse at and below the middle to vertical in some distal locules. Within the series as defined herein there are seeds transverse and broadside to the valves, seeds transverse and broadside to the interseminal septa, seeds uniseriate and (*S. sophora*) biseriate, and seeds rotated through 45–50 degrees on their vertical axis, externally observable by position of the areole. In every case the seed's orientation can be attributed to accommodation of the swelling ovule to space available as it matures and is determined by number of ovules modified by inherent growth-potential of the pod's valves. The several resolutions of mutually opposed forces

within the maturing pod are made manifest in compression and orientation of the ripened seed. Parallel resolutions have occurred in remotely related sections and series of *Senna* and a classification based primarily upon them would run counter to all other evidence of relationship between species.

Key to Species of ser. *Basiglandulosae*

1. Plants of subtropical Florida and West Indies (including Bermuda), one (monocarpic) extending n. into centr. and e. United States.
2. Lfts of larger lvs linear or narrowly lance-attenuate 1–4 mm wide, 7–70 times as long as wide; rare and local in e. Cuba and Haiti.
3. Larger lfts narrowly lance-attenuate up to 2–4 mm wide, 7–14 times as long as wide; fl-buds ascending pilosulous; sepals well graduated, the outer 4–5 mm, the inner 6.5–9 mm; style incurved through $\pm 45^\circ$, the stigmatic cavity latero-introrse. 132. *S. collicola* (p. 412).
3. Larger lfts narrowly linear or linear-attenuate 1–2.5 mm wide, 25–70 times as long as wide; fl-buds nodding glabrous; sepals little graduated 8–10 mm; style incurved through $\pm 180^\circ$, the stigmatic cavity directed backward toward the floral receptacle; Cuba (Oriente). 133. *S. stenophylla* (p. 413).
2. Lfts of larger lvs lance- or ovate-acuminate or oblong-elliptic (4–)5–40 mm wide, 1.8–7 times as long as wide; spp. widespread in the range indicated.
4. Stems and lvs hirsute with straight spreading-ascending lustrous setae up to 1–2.5 mm; var. *hirsuta* of: 138. *S. hirsuta* (p. 425).
4. Stems and lvs puberulous, pilosulous or glabrate, the longest hairs not over 0.6(–0.8) mm.
5. Plant at anthesis:
 6. Distal pair of lfts oblong- or obovate-elliptic, broadest near middle; petiolar gland situated above the pulvinus, obtuse.
 7. Petiolar gland at once sessile and situated most often on the petiole proper, occasionally between proximal pair of lfts; widespread from s. Florida through Bahamas and Greater Antilles but in Cuba coastal only. 134. *S. mexicana* (p. 414).
 7. Petiolar gland at once stipitate phalloid and situated between proximal pair of lfts; rare taxa of mountainous e. Cuba (Oriente).
 8. Petiole 7–20 mm; margin of lfts thickened into a raised, minutely crimped rim; var. *shaferi* of: 134. *S. mexicana* (p. 417).
 8. Petiole 16–43 mm; margin of lfts not thickened but strongly revolute. 135. *S. benitoënsis* (p. 418).
 6. Distal pair of lfts lance- or ovate-acuminate, broadest below middle; gland basal if obtuse, acute if situated on petiole above pulvinus.
 9. Petiolar glands slenderly ovate or lance-attenuate in profile, acute or subacute, including stipe (not always present) $1.7\text{--}3.5 \times 0.4\text{--}1$ mm; racemes mostly 5–30-fl. 131. *S. ligustrina* (p. 409).
 9. Petiolar glands (sessile or almost so) obovoid, depressed-hemispherical or globose, obtuse, 0.5–1.5 mm diam; racemes 1–5-fl.
 10. Style only moderately dilated or incurved at tip, the introrsely lateral stigmatic cavity elliptic-oblongate in outline, its margins explanate and barbellate along the sides, minutely porrect at tip; peduncles 1–5 mm. 140. *S. occidentalis* (p. 436).
 10. Style strongly dilated at tip and incurved through $\pm 180^\circ$, the terminal stigmatic cavity round and directed backward toward the floral receptacle; peduncles 6–23 mm. 141. *S. sophera* (p. 440).
5. Plant in fruit:
 11. Pod subterete, \pm as wide between sutures as between middle of valves; seeds 2-seriate lengthwise, each turned with its broad areolate faces to the septa. 141. *S. sophera* (p. 440).
 11. Pod compressed or plano-compressed, much wider between sutures than between middle of valves; seeds strictly 1-seriate, but variably oriented within their locule.
 12. All (or almost all) seeds turned with broad areolate faces to the septa; peduncles not over 5 mm nor over 5-fl. 140. *S. occidentalis* (p. 436).
 12. All seeds lying with broad faces toward the valves; peduncles usually longer, or fls more numerous, or both.

13. Lfts 3–16 pairs, the distal pair lance-oblong, oblong- or ovate-elliptic, broadest near middle, obtuse or very broadly shortly acuminate; ovules 20–40; return to choices 7/7, 8/8 between *S. mexicana* and *S. benitoënsis*.
13. Lfts 4–8 pairs, the distal pair lanceolate to lance- or ovate-acuminate, broadest toward base; ovules (36–)40–56.
 131. *S. ligustrina* (p. 409).
1. Plants of continental North and South America s.-ward from s.-w. United States (w. Texas to s. Arizona).
14. N.-ward from the Amazon River and the equatorial Andes:
 15. Stems and lvs hirsute with straight spreading-ascending lustrous setae up to 1–2.5 mm; vars. *hirsuta* and *hirta* of:
 138. *S. hirsuta* (p. 433).
 15. Stems and lvs puberulous, pilosulous or glabrate, the longest hairs not over 0.6 mm.
 16. Floral bracts less than 5 mm; pod at once narrow and elongate, 13–23 × 0.3–0.45 cm, arched outward (the seminiferous suture convex); var. *glaberrima* of:
 138. *S. hirsuta* (p. 432).
 16. Floral bracts (5–)6–18 mm; pod (5–)6–13 × 0.65–1 cm, straight or a little incurved (the ventral suture concave).
 17. Peduncles 1–4.5(–7) mm, 1–5-fld, the whole axis including peduncle not over 1 cm; style only moderately dilated or incurved at tip, the introrsely lateral stigmatic cavity elliptic-oblongate in outline, its margins explanate and barbellate along the sides, minutely porrect at tip; ovules 40–60; pod strongly compressed; seeds 1-seriate.
 140. *S. occidentalis* (p. 436).
 17. Peduncles (5–)6–23 mm, 1–5-fld, the axis of more vigorous or of all racemes including peduncle over 1 cm; style dilated and strongly recurved at tip, the terminal round stigmatic cavity directed backward toward the floral receptacle; ovules 62–84; pod subterete; seeds 2-seriate.
 141. *S. sophera* (p. 440).
14. S.-ward from Amazon River:
 18. Plant at anthesis:
 19. Floral bracts (5–)6–16 mm; return to choice 17/17 between ubiquitous weedy *S. occidentalis* and rare introduced *S. sophera*.
 19. Floral bracts at most 5(–6) mm and except in local extratropical *S. scabriuscula* not over 4.5 mm.
 20. Distal pair of lfts elliptic to oblong- or obovate-elliptic or oblanceolate, broadest near or above middle; s.-e. Brazil and Paraguay only.
 21. Petioles 1.6–3(–3.5) cm; lfts 4–5(–6) pairs; posterior lip of beak of 2 long anthers 0.3–0.6 mm.
 137. *S. neglecta* (p. 421).
 21. Petioles 3.5–9 cm; lfts (5–)6–8(–9) pairs; posterior lip of anther-beaks linguiform-thickened 0.8–1.1 mm.
 136. *S. cernua* (p. 419).
 20. Distal pair of lfts lance- or ovate-acuminate, broadest below middle; widespread within and far beyond range of the last.
 22. Beak of long anthers 1.2–1.5 mm, its thickened posterior lip 0.7–1 mm; petals 8–15 mm; ovules 50–108; widespread n.-ward from Paraguay; vars. of:
 138. *S. hirsuta* (p. 425).
 22. Beak of long anthers 1.7–2.5 mm, its posterior lip 1.2–2 mm; petals 14.5–20 mm; ovules 46–60; s. Paraguay, n. Argentina and Uruguay, lat. 25°–35°S.
 139. *S. scabriuscula* (p. 435).
 18. Plant in fruit:
 23. Seeds biseriate along the cavity of the subterete pod; rare introduced sp.
 141. *S. sophera* (p. 440).
 23. Seeds uniseriate along cavity of the compressed-quadrangular or plano-compressed pod; widespread native spp.
 24. Vesture of foliage pilose-setose, some hairs at least 1 mm; vars. of:
 138. *S. hirsuta* (p. 425).
 24. Vesture of foliage pilosulous-strigulose or almost 0, the hairs all less than 1 mm.
 25. Pod at once very narrow and much elongate, 15–28 × 0.3–0.55 cm.
 26. Lfts ovate-acuminate, broadest below middle, in most lvs 3–6 pairs; vars. of:
 138. *S. hirsuta* (p. 425).
 26. Lfts elliptic or oblong-elliptic, broadest near middle, in most lvs 6–8 pairs.
 136. *S. cernua* (p. 419).

25. Pod either shorter or broader, either less than 15 cm long or over 5.5 mm wide.
27. Pod 7–14 mm wide and its seeds lying with broad areolate faces toward the valves.
28. Lfts broadest near or beyond middle; Atlantic slope of Brazil s.-ward from s.-e. Bahia. 137. *S. neglecta* (p. 421).
28. Lfts ovate-acuminate broadest below middle; local in centr. Minas Gerais, Brazil; var. *acuminata* of: 138. *S. hirsuta* (p. 431).
27. Pod either 4–5.5 mm wide or, if broader, the seeds turned to present their broad faces to the interseminal septa.
29. Racemes mostly 8–35-fl'd; pod at once narrow (4–5.5 mm), strongly curved outward, and spirally twisted; extreme n.-e. Argentina and adjacent Brazil; var. *streptocarpa* of: 138. *S. hirsuta* (p. 429).
29. Racemes 1–8-fl'd; pod at once wider (5.5–9.5 mm) and straight to gently incurved, not twisted; seeds (or most of them) turned to face the interseminal septa.
30. Petiole 2.5–5 cm; ubiquitous n. of Capricorn, extending weakly s. of the tropic line into n.-e. Argentina. 140. *S. occidentalis* (p. 436).
30. Petiole of most lvs only 0.6–2.1 cm; local in s. Paraguay, n.-e. Argentina and adjoining Uruguay, wholly extratropical. 139. *S. scabriuscula* (p. 435).

131. *Senna ligustrina* (Linnaeus) Irwin & Barneby, comb. nov. *Cassia ligustrina* Linnaeus, Sp. Pl. 378. 1753.—“*Habitat in Virginia, Bahama.*”—Described from plants grown at Hartekamp and later at Uppsala and on illustrations provided by Dillenius and Martyn. Lectoholotypus, Herb. Clifffort., *Cassia* No. 7 *ex parte*, BM!, one of 4 sheets (annotated as *Senna ligustrina* by Barneby, 1980) filed under the common title *Senna occidentalis odore opii virosi Orobi pannonici foliis mucronatis glabris* (the others represent holotypic *Cassia occidentalis* and *Senna marilandica*).—The lectotypus proposed by Fawcett & Rendle, Fl. Jam. 4: 105. 1920, by implication, LINN 528/25!, = *Senna sophera*; the habitat “Virginia,” taken from Gronovius, Fl. Virg. 47 = *S. marilandica*.

Cassia bahamensis P. Miller, Gard. Dict. ed. 8, *Cassia* no. 9. 1798.—“... grows naturally in the Bahama Islands, from whence I received the seeds.”—Holotypus, “*Cassia Bahamensis pinnis foliorum mucronatis . . .*,” BM! = BH Neg. 5771.—Equated by Martyn in Miller, Dict. ed. 9, *Cassia* no. 24, with *C. ligustrina*.—Non *C. bahamensis* sensu Benth, 1871, p. 541, quae = *Senna mexicana* var. *chapmanii*.

Cassia ligustrina var. *jaegeriana* Urban, Symb. Antill. 5: 360. 1908.—“Hab. in Haiti in montibus Le grand fond de Port-au-Prince dictis . . . 1000 m alt., m. Dec. fl. et fr.: *Jaeger n. 36.*”—Holotypus, †B; presumed isotypus, *Jaeger s.n.* ex Haiti, NY!—Equated by Britton & Rose, 1930, p. 257, with *Ditremexa confusa*, q.v. infra.

Cassia ligustrina var. *eggersiana* Urban, Symb. Antill. 5: 360. 1908.—“Hab. in Santo Domingo in monte Barrero [$\pm 19^\circ\text{N}$, $17^\circ 40'\text{W}$ in prov. La Vega] 330 m alt., m. Majo flor . . . : *Eggers n. 2063.*”—Holotypus, †B; no isotypus found.—Equated by Britton & Rose, 1930, p. 257, with *Ditremexa confusa*, q.v. sequ.

Ditremexa confusa Britton ex Britton & Rose, N. Amer. Fl. 23(4): 257. 1930.—“Type from between Higüey [Higüey] and Gato, Santo Domingo, December 6, 1909, *N. Taylor 430.*”—Holotypus, NY!

Peirania turquinae Britton ex Britton & Rose, N. Amer. Fl. 23(4): 267. 1930.—“... First and Main Peaks, Pico Turquino, Oriente, [Cuba,] October 12–14, 1924, *G. C. Bucher 78.*”—Holotypus, NY! isotypus, US 1222792!—*Cassia turquinae* (Britton & Rose) León, Contrib. Ocas. Mus. Hist. Nat. Colegio “De La Salle” 9: 12. 1950.

Senna Americana ligustri folio Plumier ex Tournefort, Inst. Rei Herb. 618. 1700, primary source of epithet *ligustrina*.

Cassia Bahamensis pinnis foliorum mucronatis, angustis . . . Martyn, Pl. Rar. 21. 1728.—Described from plants grown from seed sent by Mark Catesby from the Bahamas, more precisely, acc. Dillenius, Hort. Eltham. t. 259 (legum. exclus.) 1732, from New Providence.—

This is the ancestor, via Miller, Dict. ed. 1, *Cassia* no. 5. 1731 and successive editions, of *C. bahamensis* Miller (q.v. supra).

Cassia (no. 8) *foliolis septem parium lanceolatis* . . . Linnaeus, Hort. Cliff. 159. 1757, equated by Linnaeus with the plants of Plumier and Dillenius mentioned in 2 preceding paragraphs, described from plants grown at Hartekamp doubtless from the stock introduced by Catesby; hence direct ancestor of *C. ligustrina* Linnaeus (q.v. supra).

Cassia ligustrina sensu Edwards, Bot. Reg. 2: pl. 109. 1816; Curtis, Bot. Mag. 43: pl. 1829. 1816; Colladon, 1816, p. 111; Vogel, 1837, p. 32 (exclus. syn. Willdenov.); Bentham, 1871, p. 534; Britton, Fl. Bermuda 171 + fig. 1918.

Ditremexa ligustrina sensu Britton & Rose, 1930, p. 258.

Amplly leafy, precociously maturing but potentially frutescent herbs from black roots, at anthesis (4–)6–20(“–30”) dm, at first 1-stemmed becoming bushy with 1–several slender leafless trunks, the hornotinous branchlets densely leafy, the whole appearing glabrous but young stems, lf-stalks, lft-margins and axis of inflorescence loosely strigulose, pilosulous or rarely hirsutulous with pale subappressed, incurved or spreading hairs up to (0.2–)0.3–0.6(–0.7) mm, the weakly ill-scented foliage subconcolorous or paler beneath, the faces of lfts often glabrous except for a puberulent line along midrib above and scattered minute thickened trichomes beneath, rarely either or both faces pilosulous overall, the racemes mostly crowded in axils of upper lvs or of vestigial lf-stalks to form a short but not or only shortly exerted subcorymbose panicle.

Stipules erect, thinly herbaceous, early pallid then dry caducous (lacking from all but vigorous young stems), lanceolate, lance-oblong or narrowly ovate acute (2–)3–6(–7) × 1–2.2 mm, at base often obliquely dilated and obtusely amplexicaul-auriculate on side further from petiole.

Primary cauline lvs 1–2.2(–2.7) dm (occasional shorter ones in the panicle or on lateral spurs not further mentioned); petiole including often discolored but not much dilated pulvinus (1.7–)2–4.5(–6) cm, at middle 0.7–1.7(–1.9) mm diam, obtusely ribbed dorso-laterally, openly shallow-sulcate ventrally; gland most commonly inserted either next to pulvinus or below middle of petiole at a point up to 11(–13) mm distant from it, but in some lvs between the proximal pair of lfts, in either case either stipitate or sessile, in profile 1.7–3(–3.5) mm tall, the slenderly ovate or lance-attenuate acute or subacute, erect or incurved body 0.4–1 mm diam, similar glands sometimes between the distal or between this and the penultimate 2–3 pairs of lfts; rachis 5–13(–15) cm, the longer interfoliolar segments (8–)10–26(–35) mm; pulvinules 1.3–2.3 mm; lfts (4–)5–8 pairs, ± accrescent distally but the penultimate pair often longest, the longer lfts obliquely lanceolate, lance-acuminate, or ovate and more abruptly and shortly acuminate 3–7 × 0.6–2(–2.2) cm, (2.5–)2.7–7 times as long as wide, at base on proximal side varying from broadly cuneate to shallowly cordate, cuneate on distal side, the margins weakly revolute or distally plane, the straight midrib impressed-canaliculate above, sharply cariniform beneath, the pinnate venulation of 8–15 pairs of camptodrome secondary nerves either fully immersed or faintly raised on one or both faces, tertiary venulation almost or quite invisible.

Peduncles narrowly ascending (1.1–)1.6–4.5(–6.5) cm; racemes rather densely (3–)5–30-fld, the glabrous buds ± obliquely ascending, the expanded fls subcorymbose, the axis including peduncle becoming (1.5–)2–8.5(–10) cm; bracts submembranous pallid or yellowish, rarely firm castaneous-fuscos, lanceolate, lance-oblong, -elliptic or ovate, commonly 2.5–6 × 1–2.5, sometimes to 10 × 4 mm, early caducous; mature pedicels (1–)1.3–2.3(–2.6) cm; sepals greenish, yellow or fuscous, obovate not strongly graduated, the membranous-margined outer ones up to 5–7.5 mm, the thinner-textured inner ones up to 6.5–8.5(–9) mm; petals glabrous, yellow drying whitish or ochroleucous brown-veined, of ± equal length

but the emarginate banner widest, the lateral and abaxial petals obovate beyond short claw, the longest petal 12–15 mm; androecium glabrous, the staminodes 1.3–1.6 mm wide, the filaments of 4 median stamens 1.5–2.6 mm, of 2 larger abaxial ones 4.8–6.3 mm, of the centric abaxial one 3–4 mm, the anthers of 4 median stamens including shallowly obliquely 2-lipped beak 3.6–5 mm, that of the sterile centric abaxial one 1.8–5 × 0.4–0.7 mm, those of 2 long abaxial ones, measured to obscure infraterminal constriction, (4–)4.2–5.8 × 1.3–1.8 mm, their beak (0.8–)0.9–1.2 mm, its thickened abaxial lip projecting (0.4–)0.5–0.7 mm beyond orifice; ovary strigulose, thinly pilosulous or minutely scaberulous laterally, the sutures often glabrous, the pubescence early sparse or evanescent; style ±2.5–3 mm, abruptly thickened distally and incurved through ±140–300°, at the introrsely directed barbellate stigmatic cavity (0.4–)0.45–0.6 mm diam; ovules (36–)40–52(–56).

Pod ascending, gently curved outward, the stipe 1.5–2.5 mm, the linear plano-compressed body (7–)9–14 × (0.5–)0.6–0.85 cm, the papery valves brown or purplish-castaneous paler-margined, scarcely venulose, a little elevated over and depressed between each successive pair of seeds, the membranous interseminal septa 1.5–3.3(–4) mm apart, the seed-locules wider than long; seeds obliquely transverse, varying in outline (sometimes in one pod) from broadly obovate to oblong-elliptic, 2.7–4.5 × 1.7–2.8 mm, plump but compressed usually parallel to the valves, rarely (in narrow locules) a little rotated on their long axis and incipiently compressed parallel to the septa, the smooth dull or sublustrous testa olivaceous or smoke-gray usually paler around the blackish areole and fuscous at the periphery, the obovate or elliptic areole (1.8–)2.2–3.3 × 1.1–2 mm.—Collections: 80.

Open woodlands, thickets, hammocks (Florida), coppice (Bahamas), often in seasonally wet ground, coming out into pastures, roadsides, coastal sands and coral reefs, from near sea level up to 1500 m in Jamaica and 1200 m in Hispaniola, locally plentiful in peninsular Florida s.-ward from 28°30'N (Isely, 1975, map 46), the Bahamas n.-w. from Exuma Sound, Cuba (all provinces), Jamaica, Cayman Is. and Hispaniola; Isla Colón, Panama (Bocas del Toro, ?native); cultivated and locally naturalized in Puerto Rico and Bermuda; the report (Britton & Millspaugh, Bahama Fl. 167) from Guyana requires verification.—Fl. intermittently through the year, most prolifically VIII–IV, the pods often long persistent after fall of seeds.—*Privet senna*; *frijolillo*; *brusca*.

Senna ligustrina is variable in pubescence and width of lfts, but we have not found any significant correlation between these features or between either of them and dispersal. The leaflets are commonly glabrous on both faces or glabrous above and charged beneath with minute thickened glandiform trichomes. A notable exception is *Liogier 14166* from Sa. de Batoruco in southwestern Dominican Republic, which is hirsutulous throughout with vertical hairs, and intermediate states of vestiture are not infrequent. The populations from the central highlands of Dominican Republic have relatively broad leaflets (*D. confusa*), but not or hardly broader than some in Florida. The typus of *Peiranisia turquinae*, inexplicably referred by Britton to a different genus from *Ditremexa ligustrina*, consists of branch-tips bearing only small upper leaves. It is unusual in the species as a whole because of its large dark-colored and thick-textured floral bracts, but we can find no supporting difference. More complete plants collected later by León on the slopes of Pico Turquino (nos. 10743, 10950) were both recognized by Britton himself as *Dit. ligustrina*. *Peiranisia turquinae* appears distinct only in the context of the wrong genus.

132. *Senna collicola* Irwin & Barneby, sp. nov., *S. ligustrinae* proxima, sed foliolis angustissime lanceolato-acuminatis basin versus 2–4 (nec 6–20) mm latis, alabastris pilosulis (nec glabris) styloque apicem versus leviter tantum per $\pm 45^\circ$ incurvo (nec abrupte per $140\text{--}300^\circ$ hamatim recurvo) diversa.—HAITI. Département de l'Ouest: Guimbi Galata, Mornes des Commissaires, 21.VI.1942 (fl jun), L. R. Holdridge 1279.—Holotypus, NY; isotypi, BM, MO!

Slender shrubs up to ± 1 m, the prominently lenticellate leafless annotinous stems branched distally, the densely leafy young stems, lf-stalks and inflorescence pilosulous with incurved-spreading whitish hairs up to 0.6 mm, the ciliate lfts facially glabrous except for a minutely puberulent line along costa above, the foliage bicolored, when dry brownish-olivaceous above, paler beneath, the few-fld, shortly pedunculate racemes crowded in upper lf-axils and forming a small immersed panicle.

Stipules erect, thinly herbaceous, narrowly lanceolate $\pm 4\text{--}6 \times 1\text{--}1.5$ mm, at base obscurely cordate on side further from petiole, early deciduous.

Lvs 7–14 cm; petiole including little swollen pulvinus 3–25 mm, at middle 0.5–0.8 mm diam, carinate dorsally, very narrowly and shallowly sulcate ventrally; rachis 4–7.5 cm; gland near base of lf-stalk, contiguous or almost so to pulvinus, sometimes accompanied by a pair of small lfts, sometimes up to ± 2 cm distant from proximal pair, in either case stipitate incurved-erect, in profile 2–3 mm tall, the slenderly lanceolate-acute body 0.3–0.5 mm diam, often similar but more slender glands between 1–3 distal pairs of lfts; pulvinules ± 1 mm; lfts 6–8 pairs, the proximal smallest, the rest slightly or scarcely accrescent, the longer ones narrowly subobliquely lance-attenuate $2\text{--}3.5 \times 0.2\text{--}0.4$ cm, $\pm 7\text{--}14$ times as long as wide, the margins strongly revolute, the midrib sulcate ventrally, cariniform dorsally, the $\pm 6\text{--}7$ pairs of obscurely camptodrome secondary veins faintly raised dorsally on proximal half of blade, invisible distally and on ventral face.

Peduncles 3–17 mm; racemes very shortly subcorymbosely 3–5-fld, the axis up to 6 mm; bracts thinly herbaceous lanceolate $5.5\text{--}7 \times 1.7\text{--}2.3$ mm, persistent into anthesis; pedicels at anthesis $\pm 13\text{--}15$ mm; fl-buds ascending, densely shortly pilosulous; sepals firm, fuscous except for pallid margin, well graduated, the suborbicular outer ones 4–5 mm, the elliptic-obovate inner ones 6.5–9 mm; petals glabrous orange-yellow drying whitish brown-veined, in shape like those of *S. ligustrina*, the longest 10–12 mm; androecium glabrous, the staminodes ± 1.4 mm wide, the filaments of 4 median stamens 1.5 mm, of 2 long abaxial ones dilated 3.5–4.5 mm, the anthers of 4 median stamens 4.5 mm, obliquely truncate 2-pore, those of 2 long abaxial ones lunately incurved 5.5×1.3 mm, scarcely constricted subapically, brownish yellow-tipped, the pollen-cup only 0.4 mm long, the centric abaxial stamen rudimentary; ovary pilosulous laterally; style ± 2.5 mm, at apex moderately thickened 0.4 mm diam, incurved only through $\pm 45^\circ$, the lateral stigmatic cavity longer than wide.

Pod incompletely known from year-old fragments, apparently much like that of *S. ligustrina* and *S. stenophylla*, the papery valves ± 6 mm wide; seed unknown.—Collection: 1.

Habitat not recorded, known only from the type-locality near 1800 m in the mountains of Département de l'Ouest, Haiti.—Fl. VI–VII(–?).

The evidently rare and local *S. collicola* appears, like the related Cuban *S. stenophylla*, to be derived from relatively widespread *S. ligustrina*. All three have the same slender pointed petiolar gland which varies in position, sometimes from leaf to leaf on one plant, from genuinely basal (contiguous to the pulvinus) to

interfoliolar. The flowers and pods, so far as known, are essentially uniform, but the foliage and consequently the general facies of the plants is markedly different, the larger leaflets of *S. ligustrina* being 2.5–7 times (in Hispaniola less than 7 times), those of *S. collicola* 7–14 times, and those of *S. stenophylla* 25–70 times longer than wide. *Senna collicola* stands alone in its pilosulous sepals and in the less pronounced curvature of the style which determines the lateral rather than retrorse orientation of the stigmatic cavity.

133. *Senna stenophylla* (Bentham) Irwin & Barneby, comb. nov. *Cassia stenophylla* Bentham, Trans. Linn. Soc. London 27: 535. 1871—"Cuba, Wright, n. 1601."—Lectoholotypus, *Wright 1601 ex parte*, collected 18.X (flor) at 'Farallones Potrero San Andre[s],' K (hb. Hook.)! = NY Neg. 1427; paratypus, *Wright 1601 ex parte* (fr), K (hb. Hook.)! = NY Neg. 1428.—*Cassia decipiens* sensu Grisebach, Mem. Amer. Acad. II, 8: 179. 1860 (non Desvaux)—"in rupibus ad Nouvelle Sophie, Nov. . . . Wright 1601.—*Leoncassia stenophylla* (Bentham) Britton ex Britton & Rose, N. Amer. Fl. 23(4): 268. 1930.

Erect 1–few-stemmed, basally suffrutescent, simple or distally branching herb ± 0.8 –1.2 m, appearing and sometimes truly glabrous, but the sharply angulate young stems and terminal branchlets often remotely minutely strigulose with appressed hairs to 0.15–0.35 mm, the abundant but very narrow grasslike foliage sublustrously olivaceous, paler beneath, the racemes all lateral, axillary to and surpassed by lvs, or some late ones crowded into a small leafy, scarcely exerted panicle.

Stipules erect, resembling lflets in herbaceous texture and revolute margins, linear-lanceolate 4–11 \times 0.6–1 mm, sometimes a trifle dilated at base on side further from petiole, deciduous before the lf.

Lvs 8–19 cm; petiole including little-swollen pulvinus 9–24 mm, at middle 0.5–0.8 mm diam, bluntly keeled dorsally, narrowly thick-margined and openly shallow-sulcate ventrally; rachis 3.5–10 cm, the interfoliolar segments (8–)10–19 mm; gland inserted on petiole (2–)3–7 mm distant from pulvinus, ascending stipitate, in profile (1.5–)2–3.3 mm tall, the narrowly ovoid or lance-ovoid acute or subobtuse body 0.3–0.8 mm diam, and similar but smaller glands often between the ultimate and penultimate pairs of lflets; pulvinules 0.5–1.2 mm; lflets 5–8 pairs, accrescent distally, all linear to linear-lanceolate-attenuate, the distal pair 30–70 \times 0.7–2.5 mm, (25–)30–70 times as long as wide, the margins recurved or strongly revolute, the midrib impressed-canaliculate above, cariniform beneath, an obscure secondary venulation visible only beneath.

Peduncles (1.7–)2.5–4.5 cm; racemes rather densely (4–)7–25-fl'd, the axis becoming (3–)5–35 mm; bracts (little known) submembranous linear-lanceolate 4–7 mm, deciduous before anthesis; mature pedicels 2–3 cm; fl-buds nodding glabrous; fls at anthesis little known, apparently little different from those of *S. ligustrina*, the oblong-obovate subequal sepals ± 8 –10 mm, the petals to ± 13 mm; androecium glabrous, the 3 staminodes 1.3–1.5 mm wide, the filaments of 4 median stamens ± 1.5 mm, of 2 large abaxial ones dilated ± 6 mm, of the sterile centric abaxial one ± 3 mm, the anthers of 4 median stamens including their very short, obliquely 2-lipped beak ± 4 mm, those of 2 abaxial ones brown, measured from sagittate base to subterminal constriction ± 5 –6 \times 1.5 mm, their beak ± 1 mm, its thickened abaxial lip ± 0.6 –0.7 mm, the anther of the centric stamen sterile $\pm 3 \times 0.6$ mm; ovary minutely puberulent, early glabrate; style ± 2 mm, shaped like that of *S. neglecta* or *S. mexicana*, at incurved apex 0.4–0.5 mm diam; ovules 34–44.

Pod ascending, the stipe 2–3 mm, the straight or gently outwardly arched body narrowly linear plano-compressed $11\text{--}15 \times 0.46\text{--}0.6$ cm, the thinly papery, purpurascens, when ripe brown valves narrowly pallid-margined, shallowly depressed between seeds, the interseminal septa 2.5–4 mm apart, the seed-locules mostly a little broader than long but some (especially distally) a little longer than broad; seeds (little known) broadly obovoid, compressed parallel to valves $\pm 3.5 \times 3$ mm, pinched at hilum, the smooth dull brown-olivaceous testa girdled by a dark line, the elliptic-obovate areole $2.2\text{--}2.5 \times 1\text{--}1.3$ mm.—Collections: 7.

Dry brushy hillsides and open woodland, 5–200 m, local along the coastal foothills of Sa. Maestra, Oriente, Cuba.—Fl. IX–III, the old pods sometimes long persisting.

One of several singular Cassieae endemic to eastern Cuba, *S. stenophylla* is readily recognized by the extremely narrow grasslike leaflets. The petiolar glands and the morphology of the flower, especially of the recurved style, closely resemble those of *S. ligustrina*, of which it may well be a local derivative.

134. *Senna mexicana* (Jacquin) Irwin & Barneby, comb. nov. *Cassia mexicana* Jacquin, Pl. Rar. Hort. Caes. Schoenbrun. 2: 41, t. 203. 1797.—Typus infra sub var. *mexicana* indicatur.

Shrubs, at anthesis commonly 0.5–3, rarely arborescent to 5(“–8”) m, varying from almost glabrous except for remotely puberulent young branchlets and lf-stalks to pilosulous throughout with forwardly incumbent, spreading or subappressed hairs up to 0.15–0.5(–0.8) mm usually mixed with some minute thickened or verrucular (granular), pallid or discolored trichomes, the foliage either concolorous or moderately bicolored, then dull yellowish-olivaceous above, olivaceous beneath, the lflets varying from equably pubescent on both faces or beneath only to glabrous (when sometimes dorsally verruculose) or glabrous except for a tuft of hairs in basal dorsal angle of midrib, when densely pubescent often \pm distinctly papillate, the inflorescence of axillary racemes commonly at first shorter than lvs but distally, by reduction of foliage, forming a thyrsoid or corymbiform panicle.

Stipules thinly herbaceous, early dry caducous, lance-elliptic, lance- or ovate-acuminate $1.3\text{--}6 \times 0.3\text{--}1$ mm.

Lvs 3–20 cm, varying in size and number of lflets as described under the varieties, the lflets of larger lvs (2–)3–16 pairs; petiole, measured from stem to petiolar gland, (4–)6–23(–30) mm, at middle 0.4–1.4 mm diam, like the rachis trigonously 3-ribbed and openly shallow-sulcate ventrally; gland either between proximal pair of lflets or, these lacking or caducous, on lf-stalk $\pm \frac{1}{2}$ -way between pulvinus and proximal pair, sessile or subsessile (in var. *shaferi* distinctly stipitate), the reddish-brown body plumply or slenderly ovoid-globose obtuse 0.3–1.3(–1.5) mm diam, nigrescent when dry; pulvinules 0.7–2 mm; lflets at least slightly, often markedly accrescent and proportionately narrower distally, the distal pair obliquely lance-oblong, oblong- or ovate-elliptic, or ovate, $12\text{--}54 \times (3.5\text{--})4\text{--}20$ mm, at apex abruptly deltate-acute to broadly short-acuminate or obtusely rounded mucronulate, at base asymmetric, rounded or cordate on proximal and cuneate to obscurely rounded on distal side, the lower lflets when shorter proportionately broader, the midrib immersed or depressed above, cariniform beneath, the (3–)4–11 pairs of camptodrome secondary veins either immersed or faintly prominulous above, immersed or sometimes sharply prominulous beneath, a tertiary venulation 0 or raised dorsally only.

Racemes (2–)3–16-fld, the axis together with short peduncle becoming 0.5–7.5

cm; bracts lanceolate, resembling stipules, 1.2–3.5 mm, caducous; pedicels at maturity 7–23(–26) mm; fl-buds obliquely obovoid or subglobose, glabrous, puberulent or densely pilosulous, sometimes also minutely verruculose; sepals greenish or brownish with pallid membranous margins, moderately graduated, in outline obovate, oblong-obovate or broadly oblanceolate, the inner ones 5.5–8 mm; petals yellow glabrous, drying stamineous or whitish dark-veined; banner obovate-obcordate, the rest obovate or oblanceolate from short claw, the 3 adaxial either a trifle longer or shorter than the 2 abaxial, the longest 9–14 mm; androecium glabrous, functionally 6-merous, zygomorphic, the 3 adaxial members staminodal, the central abaxial one rudimentary sterile, the filaments of 4 median stamens 0.8–2.2 mm, of 2 latero-abaxial ones dilated, ribbonlike 4.8–6.5 mm, the anthers of 4 median stamens commonly yellowish, nearly straight (3.3–)3.5–5.2 mm, obliquely truncate 2-porose, those of 2 fertile abaxial ones lunately incurved, commonly brown (often yellow-tipped), (4.6–)5–6.5 mm, sagittate at base, dehiscent by 2 pores into a half-circular pollen-cup; ovary pilosulous or strigulose, rarely subglabrous; style 2–3 mm, at tip hamately incurved and dilated, at the ciliolate-barbellate stigma 0.3–0.5 mm diam.

Pod ascending or erratically pendulous, the stipe 1–4 mm, the linear compressed but turgid body (5–)6–11 × 0.45–0.9 cm, straight or commonly gently decurved, the stiffly papery valves shallowly convex over the seeds, depressed between them (often more deeply so between every second seed on each face), the interseminal septa up to 0.4–1 mm wide, standing 2–3.5 mm apart; seeds obovoid or oblong-ellipsoid, moderately compressed, 2.8–4.5 × 1.7–2.5(–2.7) mm, pinched laterally at the hilum, the dull or moderately lustrous, brownish-olivaceous testa crackled, the linear-oblong or oval-elliptic areole 1.2–2.4 × 0.5–1.1(–1.3) mm.

Cassia chapmanii (= *C. bahamensis* sensu Benth, non Miller), its var. *latifolia* Benth., *C. shaferi* B. & R., *C. mexicana* Jacqu. (including *C. clarendonensis* Britt.) and its var. *moustiquensis* Urb. form a replacement series extending from southern Florida through the Bahamas and Caicos islands to Hispaniola and the north coast of Cuba, with an outlying station on Jamaica. The flowers, except for some variation in pubescence of the sepals, their androecia, and the pods and seeds of all are essentially identical in form, and the tangible differences are in the foliage alone, the leaflets, relatively few and long northward, becoming progressively smaller, or more numerous, or both, to the south and east, a trend loosely correlated with shortening of the raceme-axis and narrowing of the pod. We find them so closely related as to be best treated collectively as forming a megaspecies consisting of five geographical races, with contiguous but well differentiated ranges of dispersal. The closely related *S. benitoënsis* (q.v.) of eastern Cuba should perhaps also be included but is still too poorly known.

Key to the Varieties of *S. mexicana*

1. Larger lvs 7–20 cm; lflets (8–)9–16 pairs. Pod 4.5–6 mm wide; Hispaniola and Jamaica.
134a. var. *berteriana* (p. 416).
1. Larger lvs 3–12.5(–14) cm, if over 9 cm the lflets not over 7 pairs; lflets (2–)3–7(–8) pairs.
Hispaniola, Cuba, Bahamas and Florida.
2. Margin of lflets not thickened; petiolar gland sessile or almost so; range as just given.
3. Lflets 5–7(–8) pairs, those of distal pair 13–28 × 4–10 mm; peduncle with raceme-axis together 1–3.5 cm; pod 4.5–6 mm wide; Hispaniola.
134b. var. *mexicana* (p. 416).
3. Lflets (2–)3–6, of most lvs exactly 4 or 5 pairs, those of distal pair 24–54 × 7–20 mm; peduncle with raceme-axis together (1–)1.5–7.5 cm; pod 5.5–8(–9) mm wide; Cuba, Bahamas, Florida.

4. Lfts relatively narrow, the distal pair prevailingly lance-elliptic, (24-)30-54 × ±7-15 mm, ±3-4.5 times as long as wide; Cuba, n.-w. Bahamas, Florida.
134e. var. *chapmanii* (p. 417).
4. Lfts relatively broad, the distal pair mostly ovate-oblong (22-)24-40 × 12-20 mm, 1.8-2.4 times as long as wide; s.-e. Bahamas, Caicos and Turks Is.
134d. var. *latifolia* (p. 417).
2. Margin of lfts thickened as a raised rim; petiolar gland stipitate, phalloid. Pod ±8 mm wide; Cuba (Oriente).
134c. var. *shaferi* (p. 417).

134a. *Senna mexicana* (Jacquin) var. *berteriana* (DeCandolle) Irwin & Barneby, stat. nov. *Cassia berteriana* Balbis ex DeCandolle, Prod. 2: 496. 1825.—“ . . . in Sancto-Domingo. Bertero . . . (v.s. in herb. Balb.).”—Holotypus, *Bertero 1420*, seen only as fragments (2 lvs) in G-DC and in form of a calque made at G in 1925 by Hochreutiner and sent to N. L. Britton with fragmentary clastotypus, NY!—Wrongly equated by Bentham, 1871, p. 543, with *C. biflora*, and by Britton & Rose, 1930, p. 265, with *Peirania angustisiliqua*.

Cassia clarendonensis Britton, Bull. Torr. Club 42: 389. 1915.—“Inverness, Clarendon, Jamaica, [Wm] Harris 11693.”—Holotypus, collected 22.XI.1913, NY! isotypi, F, NY, US!—*Peirania clarendonensis* (Britton) Britton & Rose, N. Amer. Fl. 23(4): 264, 1930.

Cassia berteriana sensu Urban, Symb. Antill. 5: 360. 1908.

Peirania angustisiliqua sensu Britton & Rose, 1930, p. 265; non *Cassia angustisiliqua* Lamk.

Cassia clarendonensis sensu Adams, 1972, p. 325.

Pilosulous at least on young branchlets and ventral angles of lf-stalk, the lfts pubescent on both faces, beneath only, or subglabrous ciliolate; lvs 7-20 cm; petiole (measured to petiolar gland) 4-17(-19) mm; gland either between proximal pair or on lf-stalk between pulvinus and first pair, sessile or subsessile, squatly or slenderly ovoid or subglobose 0.6-1.5 × 0.5-1.3(-1.5) mm; lfts (8-)10-16 pairs, the distal pair 12-23(-25) × (3.5-)4.5-7.5(-8.5) mm, the shorter proximal pairs to (4.5-)6-10 mm wide; body of pod (6-)7-11 × 0.45-0.6 cm.—Collections: 18.

Thickets and roadsides, sometimes weedy, often calciphile, sea level up to ±600 m, scattered along the s. coast of Hispaniola from La Altagracia, Dominican Republic, to Département du Sud, Haiti, thence n. to lowlands of centr. Département de l'Ouest; s.-centr. Jamaica (Clarendon Pa., Middlesex).—Fl. (IX-)X-IV.

Pilosulous and glabrate phases of var. *berteriana* appear neatly segregated geographically, the former being known only from southeastern Dominican Republic (D. F. and La Altagracia) and from Jamaica, all known intervening populations being of a less hairy type. We can find no substantial difference between the Jamaican and east Dominican plants.

134b. *Senna mexicana* (Jacquin) Irwin & Barneby var. *mexicana*. *Cassia mexicana* Jacquin, l.c., 1797, sens. str.—“Crescit in Mexico.”—Described from a plant cultivated under glass at Vienna, preserved as *C. mexicana* in hb. Jacquin., W! = NY Neg. 10490.—*Adipera mexicana* (Jacquin) Britton & Rose, N. Amer. Fl. 23(4): 241. 1930, quoad basionym, exclus. syn. *C. foetidissima* R. & P.

Cassia mexicana Jacquin var. *moustiquensis* Urban, Arkiv Bot. 22A(8): 33. 1929.—“ . . . prope Port-de-Paix ad viam inter Haut-Moustique et Bas-Moustique, cr. 300 m . . . [Ekman] n. H 3671.”—Holotypus, S! = NY Neg. 10486.

Cassia mexicana sensu Bentham quoad pl. Berterianam, caet. exclus.

Shrubs 1-2 m, more commonly pilosulous than glabrescent, when pilosulous the lfts conspicuously papillate; lvs 3-10(-13) cm; petiole (8-)10-23 (in cultivation

–35) mm; gland of var. *berteriana*; lfts 5–7(–8) pairs, the distal pair 13–28 × 4–10 mm, the shorter proximal pairs up to 5–10 mm wide, the margins plane, not thickened; fl and pod of var. *berteriana*.—Collections: 10.

Thickets and stony slopes in pine forest, 300–1300 m, local in interior hill-country of Hispaniola: sources of Río Yaque del Norte in Santiago and La Vega and on Sa. Bahoruco in Barahona, Dominican Republic, w. into Haiti (dpts. de l'Ouest and Nord-Ouest).—Fl. IV, IX–XI.

The plant cultivated by Jacquin at Schoenbrunn closely matches in all essential details wild ones from the central cordillera of Dominican Republic, differing only in having rather more drawn-out foliage and longer petioles, as might be expected in the artificial conditions of a conservatory. The var. *moustiquensis* represents the less common glabrate form, with hairless sepals and upper face of leaflets.

- 134c. *Senna mexicana* Jacquin var. *shaferi* (Britton & Wilson) Irwin & Barneby, stat. nov. *Cassia shaferi* Britton & Wilson, Bull. Torr. Club 43: 459. 1916.—“ . . . near the base of Loma Mensura, Oriente [Cuba] (*Shafer 3770*) . . . ”—Holotypus, collected in pineland near 680 m, 1–3.II.1910, NY! paratypus, *Shafer 3803*, NY!—*Peirania shaferi* (Britton & Wilson) Britton & Rose, N. Amer. Fl. 23(4): 263. 1930.**

Habit and general appearance of var. *mexicana*, the lfts glabrous above, thinly pilosulous or glabrate beneath; petiolar gland stipitate, in profile 1.5–2.4 mm, the claviform-obovoid head 0.3–0.7 mm diam; lfts of var. *mexicana* except for thickened, minutely crimped margin, the distal pair up to 3 × 1.1 cm; pod ±8 mm wide.—Collections: 5.

Pine forest, on limestone or serpentine, ±500–700 m, known only from Sa. de Nipe, Oriente, Cuba.—Fl. II, V, VII, the principal season not known.

- 134d. *Senna mexicana* Jacquin var. *latifolia* (Bentham) Irwin & Barneby, comb. nov. *Cassia bahamensis* (?) var. *latifolia* Bentham, Trans. Linn. Soc. London 27: 541. 1871.—“Bahamas, *Swainson* . . . ”—Holotypus, K (hb. Hook.)! = NY Neg. 10478.**

Cassia pallens Dryander ex Bentham, l.c., pro syn., the name taken from Dryander's manuscript on a sheet at BM!

In all respects like var. *chapmanii* except for proportionately (and for the most part absolutely) broader lfts, the distal pair (22–)24–40 × (11–)12–20(–23) mm, 1.8–2.4 times as long as wide.—Collections: 11.

In coppice and along strand behind barrier beaches, below 10 m, s.-e. Bahama Is. (Crooked and Long Is., Rum Cay) and the Caicos and Turks archipelago.—Fl. throughout the year except when drought-inhibited.

The var. *latifolia* was reduced by Britton & Rose to their *Peirania bahamensis*, but is readily distinguished by the broad leaflets and is now known to be geographically segregated.

- 134e. *Senna mexicana* Jacquin var. *chapmanii* (Isely) Irwin & Barneby, stat. nov. *Cassia chapmanii* Isely, Mem. N.Y. Bot. Gard. 25: 199, 73, map 22. 1975.—“ . . . J. K. Small 3983. Florida [Monroe Co.], Big Pine Key . . . November 17, 1912.”—Holotypus, NY!**

Cassia bahamensis sensu Bentham, 1871, p. 541 & auct. sequ. fere omnium annum 1976 usque; Robertson & Lee, 1976, p. 37, fig. 5, a–j. *Peirania bahamensis* sensu Britton & Rose, 1930, p. 266, exclus. basionym. *C. bahamensi* Mill.

Shrubs 0.8–2.5(–3) m, perhaps (Isely, l.c.) rarely arborescent to 8 m, appearing glabrous but the firmly membranous or subcoriaceous lflets bearing dorsally in the distal basal angle of midrib a tuft of incurved-ascending hairs up to 0.2–0.5 mm and ventrally or on both faces a few random minute orange or livid trichomes, their margins sometimes remotely ciliolate; lvs (5–)6–12.5(–14) cm; petiole, measured to gland, (4–)7–21(–24) mm; gland either between or (in some distal lvs) below first pair, sessile or almost so, hemispherical or globose or broadly ovoid, very obtuse, in profile (0.6–)0.8–1.5 mm, nearly as broad or broader; lflets (2–)3–6 but of most lvs exactly 4 or 5 pairs, the distal pair obliquely lanceolate, lance-elliptic, or narrowly ovate, (24–)30–54 × (6.5–)7–15(–16) mm, (2.7–)3–4.5(–4.8) times as long as wide; body of pod (5–)6–10(–12) × (0.5–)0.55–0.8(–0.9) cm.—Collections: 68.

Pine savanna, sandy or rocky strand, and coppice on coral limestones, below 15 m, locally plentiful and becoming weedy in disturbed brush, s. peninsular Florida and the Keys in Dade and Monroe cos., s.-e. through the Bahamas from Bimini I. to Great Ragged, Long I. and San Salvador (Watling's); scattered along the n. coast of Cuba from Archipélago de Camaguey to Bahía de Banes in Oriente ($\pm 75^{\circ}30'$ – $78^{\circ}W$).—Fl. abundantly IX–IV, intermittently throughout the year.

In the protologue Isely described seven stamens as fertile, but the central anterior one is, in our experience, consistently sterile as in other varieties of *S. mexicana*.

The variety was first encountered, in the Bahamas, in 1732 by Samuel Dale (BM).

- 135. *Senna benitoënsis*** (Britton & Wilson) Irwin & Barneby, comb. nov. *Cassia benitoënsis* Britton & Wilson, Mem. Torr. Bot. Club **16**: 66. 1920.—“Along rocky stream, vicinity of Camp San Benito, Oriente, Cuba ([J. A.] Shafer 4072.”—Holotypus, collected 24.II.1910 (fr), NY!—*Peirania benitoënsis* (Britton & Wilson) Britton & Rose, N. Amer. Fl. **23**(4): 262. 1930.

Shrubs 1–3 m, appearing glabrous but the ananous branchlets, lf-stalks and strongly revolute margin of lflets thinly strigulose with forwardly appressed or incurved hairs 0.15–0.35 mm, the foliage subconcolorous, the lflets lustrous especially above, the inflorescence of racemes axillary to distal lvs, not or scarcely exerted.

Stipules erect, thinly herbaceous, narrowly lance-acuminate or linear-attenuate 6–10 × 1–1.5 mm, plane or subrevolute, deciduous.

Lvs (disregarding small distal ones) 7–16 cm; petiole including livid pulvinus 16–43 mm, at middle 0.7–1.2 mm diam, 3-ribbed dorso-laterally, openly narrow-sulcate ventrally; rachis ± 4 –9 cm; gland erect between proximal pair, stipitate, in profile slenderly claviform or phalloid, 1.4–3.4 mm tall, the stipe glabrous, the obtuse black head 0.45–0.6 mm diam; lflets (4–)5–7 pairs, accrescent and proportionately narrower upward, the distal pair oblong-elliptic or obovate obtuse mucronulate 20–34 × 8–11 mm, 2–3.3 times as long as wide, at strongly asymmetric base cordate on proximal and cuneate on distal side, the straight midrib depressed above, cariniform beneath, the 6–10 pairs of fine camptodrome secondary veins either immersed or subprominulous above, sharply raised beneath and there giving rise to a weak open tertiary venulation.

Racemes shortly 6–12-fld, the axis with short peduncle together becoming 1.5–4 cm; pedicels 2–3 cm; buds glabrous; fls (including androecium and style) of *S.*

mexicana, the longer sepals ± 7 mm and longer petals ± 13 mm; ovary minutely puberulent or glabrate; ovules 20–28.

Stipe of pod 2–3 mm, the linear ribbonlike straight or gently decurved body 9–15.5 \times 0.55–0.75 cm, the papery brownish-nigrescent valves scarcely elevated over seeds, the interseminal septa 0.3–0.6 mm wide, standing 4–5.5 mm apart; seeds subquadrate, moderately compressed 4–4.2 \times 3–4.2 mm, pinched at the hilum, the testa in color like that of *S. mexicana*, but the areole broadly oval 2.6–3.1 \times 1.9–2.3 mm.—Collections: 5.

Habitat scarcely known, reported from woodland and rocky stream-banks, very likely on serpentine, the type from near 900 m, local in the mountains of n.-e. Oriente (Sas. de Nipe and de Moa; Cuchillas de Toar), Cuba.—Fl. XII–IV.

The relationship of *S. benitoënsis* to *S. mexicana*, and especially to its var. *shaferi* which shares the phalloid stipitate gland and is sympatric on Sa. de Nipe, is obvious and close, and will need reassessment when fieldwork in the biologically complex highlands of Oriente is again possible. For the present the longer leaves, the glossy leaflets with revolute but not thickened or crimped margins, the narrower pod and, in particular, the broadly quadrate seeds with ample oval pleurogram appear adequately distinctive. The stipitate gland distinguishes *S. benitoënsis* handily from all other forms of *S. mexicana*, which is in any case represented in Cuba only by var. *shaferi* and the coastal var. *chapmanii*.

The type-locality, Camp San Benito, was situated, according to Shafer's field-book (NY), near the head of río Yamanigüey, apparently on the north slope of the massif Cuchillas de Toar.

136. *Senna cernua* (Balbis) Irwin & Barneby, comb. nov. *Cassia cernua* Balbis, Cat. Stirp. Hort. Bot. Taur. ad annum mdcccxiii 22. 1813 (jan).—"Colitur in olla . . . Semina hujusce plantae accepi a D. Armano sub nomine *Cassiae ex America meridionali*."—No holotypus seen, but authentic vouchers survive: misit Balbis, BM (hb. Shuttleworth. ex hb. Roemer.); sent to Schreber from Torino by Balbis, and to Fischer from Montpellier by Delile, both LE (NY Negs. 10497, 10498; in hb. Desfont., FI (hb. Webb.)!—Improperly reduced by Colladon, 1816 and by DeCandolle, 1825, ll. cc. infra, with the slightly posterior *C. sulcata*.

Cassia sulcata DeCandolle, Cat. pl. hort. Monspel. 90. 1813 (feb–mar).—"Ab hortis Italicis recepi sed patriam ignoro."—Holotypus, "ex hort. meo, 5.XIII.1812," G-DC! presumed isotypus, acquired by Fischer from Delile, LE! subsequently cult. at Montpellier, IX.1822, MPU!

Cassia macrocarpa Micheli, Mém. Soc. Phys. Genève 28(7): 43, pl. 16. 1883.—"[Paraguay]: Caaguazu in campis, Mart., [Balansa] n. 1404."—Holotypus, collected 7.III.1876 (fl, fr jun), G! isotypus, P!

Cassia sulcata sensu Colladon, 1816, p. 110, t. 6; DeCandolle, 1825, p. 498; Bentham, 1870, p. 112; 1871, p. 531; Glaziov, 1905, p. 160.

Cassia leptocarpa sensu Chodat & Hassler, 1904, p. 692, quoad no. 7050; non Bentham.

Cassia sophera sensu Glaziov, 1905, p. 160, quoad no. suum 13748; non Linnaeus.

Coarse, amply leafy, softly woody subshrubs 0.8–1.6 m, with sulcate, obtusely angulate, distally flexuous annotinous stems, except for always glabrous upper face of lfts strigulose-pilosulous throughout with appressed straight or subappressed incurved or wavy hairs up to 0.25–0.6 mm, the ill-scented foliage strongly bicolored, yellowish-green above, pallid or bluish-green (and when young often subsericeous) beneath, the short racemes either all axillary to and much

surpassed by fully developed lvs or some distal ones forming a narrow thyriform panicle.

Stipules erect, thinly herbaceous, brown or reddish-tinged, lanceolate or lance-acuminate $3-7 \times 0.4-1.2$ mm, very early dry caducous, absent from many flowering and most fruiting spms.

Major lvs (below and sometimes through part or most of inflorescence) 15-29 cm; petiole including \pm wrinkled and discolored pulvinus (2.5-)3.5-9 cm, at middle (0.8-)1-2.4 mm diam, rounded dorsally, thick-margined and openly shallowly sulcate ventrally; gland contiguous to pulvinus, sessile or almost so, globose or plumply ovoid obtuse or inversely pyriform $1-2.5 \times 0.9-2.2$ mm, either a little longer or a little shorter than its diam, exceptionally a second gland between proximal pair of lfts; rachis (6.5-)8-17 cm; lfts (5-)6-8(-9) pairs, moderately or markedly accrescent upward but the distal pair sometimes a little shorter than the penultimate, the longest pair oblong- to obovate-elliptic or broadly oblanceolate obtuse, deltately subacute or rarely acuminate, often mucronulate, (2.8-)3.3-6(-7) \times (1.1-)1.3-2.6 cm, 2.1-3.2 times as long as wide, the translucent orange margin plane except at inequilaterally cuneate or rounded base where incipiently revolute, the straight centric midrib immersed above, cariniform beneath, the 8-12 pairs of slender camptodrome (and random intercalary) secondary veins finely prominulous above, more sharply so beneath, the tertiary venulation fully immersed or faint and irregular.

Peduncles 8-26(-30) mm; racemes (3-)5-12(-17), exceptionally -25)-fld, the axis together with peduncle becoming (1-)1.5-5(-7) cm; bracts ovate or lanceolate $2-4.5 \times 0.8-1.5$ mm, early dry castaneous, caducous from first elongation of pedicel; mature pedicels 15-25 mm; fl-buds nodding obovoid or subglobose, strigulose-pilosulous or sometimes glabrescent distally; sepals obovate obtuse, the firm outer ones commonly brownish-tinged 5-7.5(-8) mm, the inner subpetaloid glabrescent, palmately veined from base, the longest 7.5-11 mm; petals withering in afternoon of first day, glabrous, rich yellow drying ochroleucous or whitish brown-veined, the vexillar one flabellate-obcordate, the 2 lateral obovate obtuse, the 2 abaxial ones narrowly obovate or oblanceolate, the longest petal 14.5-20 mm; androecium glabrous, functionally 7-merous, the spatulate-obcordate staminodes 1.7-2.4 mm wide, the filaments of 4 median stamens 1.4-2.1 mm, of 2 latero-abaxial ones dilated 7-9.5 mm, of the centric abaxial one 2.5-4 mm, the 4 median anthers including their short, obliquely dilated beak 4.6-6.2 mm, the sterile abaxial one $3.5-5.5 \times 0.8-1.4$ mm, the 2 large brown abaxial ones $5.6-7.7 \times 2-2.6$ mm measured from sagittate base to strangulated base of beak, the beak itself 1.3-1.7 mm, the thickened linguiform pollen-cup prolonged 0.8-1.1 mm beyond the opposed umbos; ovary densely strigulose-pilosulous, commonly canescent; style grooved ventrally 2.5-3.6 mm, abruptly incurved and thickened distally, there 0.6-0.8 mm diam, the introrse stigmatic cavity barbellate; ovules (60-)76-94.

Pod ascending or erect, straight or curved outward (and sometimes sigmoidally twisted), narrowly linear $19-28 \times 0.3-0.45$ cm, in compression and texture of valves exactly like that of *S. hirsuta* var. *hirta*, the seminal locules 2.2-4 mm long, thus either longer or shorter than wide; seeds oriented and compressed so as to fit their locule, either plumply ovoid compressed parallel to valves or drum-shaped compressed parallel to septa, their wider faces $2.5-3.1 \times 2-2.6$ mm, the testa as in *S. hirsuta*, the areole elliptic $1.3-1.5 \times 0.7-1$ mm.—Collections: 54.

Campo and cerrado, but now commonly seen only in disturbed brush-woodland, along roads, in pastures (where shunned by cattle), and in ruderal or waste

places, mostly 300–800 m but in Sa. do Espinhaço ascending to 1500 (on Sa. da Piedade to 1800) m, locally abundant in scattered colonies around the s.-e. margins of the Brazilian Planalto from centr. Minas Gerais (Sa. do Cabral and Diamantina) to interior montane Rio de Janeiro (Petrópolis), e. São Paulo and n.-e. Paraná; collected in early times, but not recently, in s. Goiás near 16°S (Jaraguá; Luziânia); apparently native but disjunct in s.-e. Paraguay (Río Apa; Valenzuela; Caaguazú), to be sought in s.-w. Mato Grosso.—Fl. (X–)XI–IV.

Senna cernua is readily distinguished from allied *Basiglandulosae* by the long-petioled leaves and relatively numerous (about 6–8) pairs of oblong- or obovate-elliptic leaflets, these combined with the extremely long and narrow pod of *S. hirsuta* var. *hirta*. A rather coarse, ill-scented plant, weedy in nature, it flourishes in cultivation with the minimum of attention, becoming an attractive object when in advanced anthesis, as the leaves then become abruptly reduced in size and the racemes are gathered into erect, exserted thyrses.

Since the days of DeCandolle and Colladon this species has been known consistently as *Cassia sulcata*, but the eclipsed epithet *cernua* must be restored under the present Code. It seems virtually certain, although not specifically stated, that DeCandolle received the seeds of his *C. sulcata* from the Turin botanic garden, where Balbis was growing the same thing as *C. cernua*. We surmise that the stock grown in Italian gardens, and thence disseminated to Montpellier and Schönbrunn, may have been raised from seed brought from Brazil by Raddi.

137. *Senna neglecta* (Vogel) Irwin & Barneby, comb. nov. *Cassia neglecta* Vogel, *Linnaea* 10(5): 594. 1836.—Typus infra sub var. *neglecta* indicatur.

Weakly woody shrubs of straggling or bushy habit, malodorous when bruised, variably pubescent with loosely incurved or erect hairs up to 0.3–0.7 mm (the vesture more fully described under the vars.), the dull olivaceous bicolored leaflets either glabrous or puberulent above, densely pilose or glabrescent beneath, the inflorescence a rather dense, commonly narrow panicle of racemes often leafy-bracteate proximally but always, at least distally and often wholly, exserted from foliage.

Stipules erect or patent, thinly herbaceous very early dry caducous, absent from many spms, in outline lanceolate, linear-lanceolate or lance-acuminate 2.5–10 × 0.4–2 mm.

Lvs below (and often some at base of) panicle (6.5–)8–16(–17) cm; petiole including dilated but texturally little differentiated pulvinus 1.6–3(–3.5) cm, at middle 0.7–1.4 mm diam, bluntly carinate dorsally, grooved along either side of keel, openly shallow-sulcate ventrally; rachis 2.5–6.5 cm; petiolar gland 1 sessile at or up to 4–10 mm distant from the pulvinus, 2–12 mm distant from stem, obtusely mounded, inversely pyriform, globose or depressed-globose, usually as wide or wider than tall, in profile 0.6–2 mm tall, 1–2.5 mm diam, blackish and wrinkled when dry; lfts 4–5(–6) pairs, moderately or strongly accrescent distally, the ultimate pair subobliquely elliptic, obovate- or oblong-elliptic (3–)3.5–7.5(–9) × (1–)1.2–2.4(–2.6) cm, 2.2–3.8(–4) times as long as wide, at apex either broadly or narrowly triangular-acute or (when relatively broad) obtuse-mucronulate, at base rounded or subcordate on proximal and cuneate on distal side, the margin commonly but not always revolute, the straight or slightly incurved midrib immersed or shallowly depressed on upper face, cariniform beneath, the 8–14(–16) pairs of major camptrodome (and random intercalary) secondary veins usually finely prominulous on upper and sharply so on lower face, the weak or sharply defined tertiary and quaternary venulation equally variable;

short proximal lfts proportionately broader, the lowest pair often ovate; lvs in inflorescence mostly reduced to depauperate stalk with abortive blade but scarcely diminished gland.

Racemes rather densely 7–30(–35)-fld, the expanded fls raised to or slightly beyond the nodding, obliquely ovoid or oblong-obovoid obtuse fl-buds, the axis including short peduncle becoming (1.5–)2.5–9.5 cm; bracts very early caducous, ovate or lance-acuminate 1.2–3.5 mm; mature pedicels 1–2.6 cm; sepals little graduated, the outer greenish or fuscous with paler margins, the inner subpetaloid, all oblong or obovate obtuse, the longest 5–11 mm; petals glabrous bright yellow, when dry tardily whitening and brown-veined, of \pm equal length, the vexillary one obovate or obovate- to cuneate-flabellate 4.5–8 mm wide, the rest more narrowly obovate or oblanceolate 2.5–5.5 mm wide, the longest 9–19 mm, the abaxial pair almost always oblanceolate, one of them nidulating the pistil; androecium glabrous, the 3 staminodes 0.9–1.3 mm wide, the filaments of 4 median stamens 1.2–2.3 mm, of 2 long abaxial ones 5–7 mm, of the centric abaxial one 1.5–3.5 mm, the anthers of 4 median stamens $3.1\text{--}5 \times 0.8\text{--}1.2$ mm, of 2 long abaxial ones $(4.2\text{--})4.5\text{--}6(\text{--}7) \times 1.2\text{--}1.5$ mm, of the centric abaxial one sterile linear $1.5\text{--}5 \times 0.2\text{--}0.5$ mm, the fertile anthers all constricted distally and then obliquely dilated, the orifice of the long ones produced on abaxial side beyond the two pores into a pollen-cup 0.3–0.6 mm; ovary strigulose, pilosulous or rarely glabrate; style 3–5.5 mm, sulcate on the inner side, abruptly thickened and strongly incurved at apex, there 0.3–0.5 mm diam, the introrse stigmatic cavity pilosulous and apparently often viscid; ovules 32–48.

Pod erratically spreading-pendulous, the true stipe 2–5 mm cuneately expanded into the linear plano-compressed body, this $(6.5\text{--})8\text{--}19 \times 0.75\text{--}1.4$ cm, stoutly carinate by the sutures, the papery greenish, later brown paler-margined valves scarcely raised over the seeds, early glabrate, faintly or prominulously venulose; seeds (poorly known) oblong, moderately compressed parallel to the valves, $4.5\text{--}7 \times 2\text{--}3.5$ mm, the ochraceous- or castaneous-brown, scarcely lustrous or dull testa either smooth or pitted, the areole $2.6\text{--}4.5 \times 1\text{--}1.5$ mm.—Fig. 1 (petiolar nectary).

In characters of foliage *S. neglecta* stands intermediate between *S. cernua* and *S. hirsuta*, combining the essentially oblong-elliptic or oblanceolate leaflet-outline of the former with the relatively few (4–5) pairs of the latter. Furthermore the anterior lip of the pore of the long anthers is intermediate in length. Its range is largely extratropical and lies mostly to the east and south of these kindred species; where it extends north of the tropic line it is almost confined to the Atlantic slope and is substantially sympatric only with *S. hirsuta* var. *streptocarpa*. Some forms of *S. neglecta* closely simulate the paucifoliolate varieties of Caribbean *S. mexicana*, and such is the degree of internal variation in both these species that differential characters consistently applicable to all individuals of each are hard to find. Generally speaking, *S. mexicana*, when agreeing with *S. neglecta* in leaflet number, has smaller leaflets, a narrower pod containing smaller seeds (about 3–4.5, not 4.5–7 mm long) marked with smaller areoles 1.2–2.4, not 2.6–4.5 mm long), and a rather shorter style (2–3, not 3–5.5 mm long). The petiolar gland of *S. neglecta* is situated either next to the pulvinus, like that of *S. hirsuta*, or on the petiole up to 1 cm distant from it, when it simulates that of *S. mexicana*. All of these four species form a complex series of mostly vicariant *Basiglandulosae* in which a few variable features appear in various combinations almost throughout the American tropics. Interrelationships in the group are often perplexing and more than one rational taxonomic scheme could be contrived to express them.

Key to the Varieties of *S. neglecta*

1. Fls small, the longer sepals 5–7.5(–8) mm, the longest petal 9–13 mm.
 2. Lower face of lflets pilosulous overall, the upper face nearly always puberulent, exceptionally glabrate, the margin in any case revolute; s.-e. Brazil, s.-ward from Paraná, and apparently locally disjunct in s. Espírito Santo; stipules 2.5–4.5 mm.

137a. var. *neglecta* (p. 423).
 2. Lower face of lflets pilosulous only in distal basal angle of midrib, the upper face glabrous, the margin plane; local in Rio de Janeiro (Sa. dos Orgãos) and Minas Gerais (Sa. da Caraça); stipules 5–9 mm.

137c. var. *oligophylla* (p. 424).
1. Fls larger, the longer sepals 8.5–11 mm, the longest petal 14–19 mm.
 3. Lower face of lflets pilosulous overall; pod \pm 8–10 mm wide; n.-e. Minas Gerais and s.-e. Bahia.

137b. var. *grandiflora* (p. 423).
 3. Lower face of lflets pilosulous only in distal basal angle of midrib; pod \pm 14 mm wide; s. Espírito Santo (Furno Grande).

137d. var. *furnicola* (p. 425).

137a. *Senna neglecta* (Vogel) Irwin & Barneby var. *neglecta*. *Cassia neglecta* Vogel, 1836, l.c., sens. strict.—“... in Expeditione Speculatoria Romanzoffiana . . . Brasilia,” the data expanded in Syn. Gen. Cass. 32. 1837.—“... in Ins. St. Catharinae . . .”—Holotypus, collected by Adelbert von Chamisso on Kotozebue’s exploration on the *Rurik* at or near the present Florianópolis, Santa Catarina, XII.1815 (fl, fr), †B; neoholotypus, former isotypus, LE! = NY Neg. 10489.

Cassia neglecta sensu Benthham, 1870, p. 111, exclus. pl. Selloana atque var. *acuminata* quae sunt prima *S. oblongifolia* Vog. secunda *S. hirsuta* var. *acuminata*.

Lfts 4–5 pairs, at apex broadly to narrowly triangular-acute or obtuse mucronulate, softly pilosulous beneath with loosely incurved hairs up to 0.3–0.7 mm, above minutely puberulent or exceptionally glabrous, the margin revolute; tertiary venulation of upper face weak or immersed; fl-buds pilosulous; sepals up to 5–7.5(–8) mm; longer petals 9–13 mm; pod 8–13 \times 0.75–1 cm; seeds \pm 4.5–5 \times 2–3 mm, the areole \pm 3 \times 1 mm.—Collections: 31.—Fig. 11 (androecium).

Disturbed woodland, hedges and waste places, ascending from the coastal lowlands up to 1200 m on the Ribeyra-Igacú divide, scattered along the seaward slope of Serra do Mar and the uplands adjacent to the west between 25° and 31°S in e. Paraná, Sta. Catarina and Rio Grande do Sul, Brazil; apparently isolated within the Tropics on the lower slopes of Sa. do Caparaó near 20°30’S on the boundary between Minas Gerais and Espírito Santo; an old report from Argentina (Tucumán) is based probably on mislabelled spms.—Fl. I–IV(–V).

The main, extratropical range of var. *neglecta* appears very natural and continuous, and we feel confident that Benthham’s record from Argentina, which has not been confirmed and is not quoted by Burkart (1952), is based on a mislabelled specimen. This plant of Tweedie (K) is indeed ticketed ‘Tucumán,’ but the collector was in coastal Santa Catarina and Rio Grande do Sul in 1832 and may well have encountered *S. neglecta* in this region. The single record from Sa. de Caparaó (Irwin 2807, K, NY) is disconcerting; for phytogeographic regions one would expect there var. *furnicola* found on the heights of neighboring Furno Grande, but the plant has the pubescence, venation, small flower and relatively narrow pod of genuine var. *neglecta*. The population may, however, be an element of the long-recognized relictual flora of the Serra.

137b. *Senna neglecta* (Vogel) var. *grandiflora* Irwin & Barneby, var. nov., a var. *neglecta* praesertim florum manifeste majorum sepalis 8.5–11 (nec 5–8) mm petalisque 14–19 (nec 9–13) mm usque longis, foliolisque utrinque (nec dorso tantum) venulosis diversa.—BRAZIL. Minas Gerais: ao

lado da Rodovia BR-4, km 777 [=Jequetinonha valley in n.-w. Minas], 27.VI.1968 (fl, fr), *R. P. Belém* 3769.—Holotypus, NY; isotypi, CEPEC, K, R, US.

Lfts elliptic-obovate or broadly oblanceolate, obtuse mucronulate, densely or thinly pilosulous beneath with incumbent hairs ± 0.3 – 0.5 mm, glabrous above, the margin revolute, the tertiary venulation of either face subequally prominulous; fl-buds either densely yellowish-pilosulous or subglabrous; sepals up to 8.5–11 mm; longer petals 14–19 mm; pod (little known) $\pm 18 \times 0.85$ cm; ripe seeds not seen.—Collections: 4.

Habitat not recorded, but sometimes (typus) associated with limestone outcrops, apparently local on the Atlantic slope of the Brazilian Planalto between the valleys of rios Jequetinonha and Mucuri in the s.-e. lobe of Bahia and adjoining Minas Gerais (lat. $\pm 16^\circ$ – $17^\circ 30'$ S).—Fl. V–VII.

Clearly distinguished from var. *neglecta* by the more ample perianth, although the androecium is not proportionately increased. Our two collections from Minas Gerais are alike in having densely pilosulous, almost velvety sepals, whereas in our one from Bahia (Monte Pascoal near Pto. Seguro, *Lanna & Castellanos* 1520/2626, CEPEC, NY) the sepals are almost glabrous. The pod of the latter, possibly distinct form, may provide a basis for segregation.

137c. *Senna neglecta* (Vogel) var. *oligophylla* (Benth) Irwin & Barneby, comb. nov. *Cassia oblongifolia* var. *oligophylla* Benth in Martius, Fl. Bras. 15(2): 111. 1870.—“... loco Brasiliae non indicato: Martius; in Serra dos Orgãos prov. Rio de Janeiro: Gardner n. 5701.”—Lectotypus, *Gardner* 5701, K (hb. Benth.)! isotypus, K (hb. Hook.)! = NY Neg. 1452; paratypus, *Martius* 727, M!

Lfts 4–5 pairs, elliptic or obovate- or oblong-elliptic, obtuse mucronulate, pubescent only dorsally in the distal basal angle of midrib, the margin plane, the tertiary and quaternary venulation sharply prominulous on both faces; fl-buds thinly puberulent; perianth and androecium of var. *neglecta*; pod (little known) $\pm (6.5 \text{ by abortion of ovules}) 10 \times 0.9$ – 1 cm; testa of seed smooth.—Collections: 17.

Openings in wet forest associated with rock outcrops, cliffs and talus, $\pm (700) 1100$ – 1850 m, known certainly only from Sa. dos Orgãos and vicinity in state of Rio de Janeiro and Sas. da Caraça and Ibitipoca in s.-centr. Minas Gerais (to be sought elsewhere in Sa. da Mantiqueira).—Fl. I–V(–?).

This highly localized variety has essentially the flower and pod of var. *neglecta* but differs in the more sharply reticulate, more obtuse leaflets glabrous except for a dorsal tuft of hairs in the forward basal angle of the midrib. The stipules, known at present from too few examples, appear to be longer and the plane-margined leaflets tend to be more abruptly accrescent distally. Benth misinterpreted the two flowering specimens available to him in 1870 as representing a form of *S. oblongifolia*, often superficially similar in habit and foliage but radically different in having anthers horizontally truncate (not asymmetrically produced at apex into a pollen-cup), in the erect style, in the turgid (not plano-compressed) pod, and in the facially unmarked seeds. The sometimes disturbingly similar and moreover sympatric *S. organensis*, which has the same tuft of hairs on lower face of the leaflets, has petiolar glands between, not below the leaflets, a pod similarly compressed but only 8–14 (not at least 30)-ovulate, and again unmarked seeds.

- 137d. *Senna neglecta* (Vogel) var. *furnicola* Irwin & Barneby, var. nov., inter var. *oligophyllum* et var. *grandifloram* quasi ambigens, ab illa, quoad foliolorum pubem simili, floribus magnis foliolisque margine subrevolutis, ab hac, quoad florum magnitudinem aequali, foliolorum pube, ab ambabus imprimis legumine latissimo ± 14 (nec 7.5–10) mm lato diversa.—BRAZIL. Espírito Santo: Forno Grande, município de Castelo, 12.V.1949 (fl, fr), A. C. Brade 19776.—Holotypus, NY; isotypus (“14776”), MO!**

Lfts 4 pairs, elliptic-obovate, glabrous except for tuft of hairs in distal basal angle or along distal side of midrib on dorsal face only, the margin revolute; tertiary venulation of both faces prominulous; fl-buds remotely pilosulous glabrescent; longer sepals ± 8.5 mm; longer petals 15–16 mm; pod $\pm 15 \times 1.4$ cm, the valves coarsely venulose; seeds $\pm 7 \times 3$ mm, the areole $4.5\text{--}4.8 \times 1.4\text{--}1.6$ mm.—Collections: 1.

On flagstone rock near 1200 m, known only from the mountain Forno Grande near 20°30'S, 41°07'W in s. Espírito Santo, Brazil.—Fl. (III?)–VI.

Reluctant as we are to describe single specimens, we cannot otherwise dispose of this striking variant of *S. neglecta*, so different from all others in the broad pod. In other respects it seems intermediate between var. *grandiflora*, vicariant northward, with which it agrees in the relatively large flowers, and var. *oligophylla*, vicariant southwestward, which is similar in pubescence of the leaflets. From the last and from the population of var. *neglecta* seemingly isolated on neighboring Sa. de Caparaó it is handily distinguished by the large flower.

- 138. *Senna hirsuta* (Linnaeus) Irwin & Barneby, *Phytologia* 44(7): 499. 1979. *Cassia hirsuta* Linnaeus, *Sp. Pl.* 378. 1753.—Typus infra sub var. *hirsuta* indicatur.**

Coarse erect or diffuse, simple or several-stemmed, amply leafy malodorous herbs becoming softly woody in age, at anthesis (3–)5–20(–24) dm, highly diverse in pubescence, that of stems, lfts and pods independently varying from lustrously spreading-hirsute to pilosulous or incurved-puberulent, rarely minute and almost 0, the longest hairs 0.15–2.3(–2.8) mm, when over 1 mm mostly erect, sometimes septate, when shorter incurved or subappressed, in either case mixed with (or almost replaced by) minute thickened yellowish or reddish trichomes, the relatively thin-textured lfts not or not strongly bicolored, dull dark or yellowish-olivaceous on both faces, the inflorescence a narrow thyse of usually few-fl'd, often pseudo-umbellate, but sometimes up to ± 35 -fl'd and then densely fl'd racemes, the proximal ones almost always subtended and greatly surpassed by fully developed lvs and the distal ones subtended by vestigial lvs consisting of rudimentary lf-stalk with scarcely diminished gland, the distal ones forming a \pm continuous panicle.

Stipules erect or falcately incurved to erect, thinly herbaceous, linear-oblong, -attenuate or linear-elliptic-acuminate $3\text{--}12 \times (0.2\text{--})0.4\text{--}1.6$ mm, deciduous before the lf, absent from most fruiting spms.

Lvs below (and at base of) inflorescence 8–28(–33) cm; petiole including shrunk-en pulvinus (1.2–)1.5–6.5 cm, at middle 1.1–2.8 mm diam, bluntly 3-ribbed dorsally, narrowly thick-margined and openly shallowly sulcate ventrally; gland at base of petiole proper (contiguous to pulvinus), ascending at narrow angle to petiole, sessile or commonly very shortly stipitate, in profile (0.8–)1–2.5 mm tall, the slenderly or plumply ovoid, ellipsoid, fusiform, claviform or globose body

0.4–1.7 mm diam, when both broad and stipitate then \pm dorsoventrally compressed or phalloid, a similar gland exceptionally between proximal pair of lfts; rachis (3–)4.5–12(–16) cm, the terminal appendage either dry setiform or fleshy-thickened subuliform; pulvinules 1.3–3.5 mm, moderately turgid, when dry either green or nigrescent; lfts 3–7(–8) pairs, strongly accrescent distally, the distal pair subsymmetrically ovate-, rhombic-ovate-, lance- or lance-elliptic-acuminate or -caudate (3–)3.5–10.5 \times 0.8–4 cm, (1.7–)2–6 times as long as wide, at base inequilaterally rounded or cuneate, the margins plane or incipiently revolute toward the pulvinule, the centric midrib and 7–16 pairs of fine camptodrome (with random intercalary) secondary veins nearly always immersed above, prominulous beneath, the faint tertiary venulation commonly visible (either faintly raised or merely discolored) beneath only, in one variety prominulous on both faces.

Peduncles (0–)1–30 mm; racemes commonly (n. of the Equator almost always) 2–8-, in Argentina and s.-w. Brazil commonly to 15–43-fl'd, the expanded fls raised to or above level of nodding buds, the axis becoming 0–8 cm; bracts lanceolate or linear-attenuate 1.5–4.5 \times 0.25–1.2 mm, caducous as the pedicel begins to elongate; mature pedicels 9–25 mm; fl-buds plumply obovoid-globose becoming asymmetrically obovoid obtuse, when young usually \pm pubescent but sometimes glabrous; sepals submembranous yellowish, greenish or brownish \pm strongly graduated, obovate or the inner ones oblance-obovate, the smallest outer one 4–7 mm, the longest inner one 6.5–10 mm; petals glabrous, yellow drying stramineous or whitish brown-veined, of subequal length but the flabellate or broadly obovate emarginate vexillar one broadest, the rest obovate or oblanceolate, the longest 8–15 mm; androecium (except for random puberulence of long anthers) glabrous, functionally 7-merous, the paddle-shaped staminodes 1.1–2 mm wide, the filaments of 4 median stamens 1.3–2.3 mm, of 2 latero-abaxial ones membranous-dilated at middle, 4–7 mm, of the centric abaxial one 2–3.5 mm, the body of 4 median anthers including short oblique beak 3.8–5.4 mm, that of the 2 long abaxial ones, measured from sagittate base to constriction below beak, 3.8–5.4 \times 1.4–2.4 mm, the beak itself 1.2–1.5 mm, very asymmetrically dilated on exterior side into a thickened tongue-shaped, internally 2-grooved pollen-cup 0.7–1 mm long, the centric one similar but scarcely half as long or wide and sterile, the fertile anthers commonly brown yellow-beaked, sometimes yellow throughout; ovary densely white-hirsute, short-pilosulous, or minutely strigulose; style (1.8–)2–3.5 mm, openly sulcate ventrally, at apex dilated, strongly incurved through 90–180° and 0.5–0.8 mm diam, the crateriform stigmatic cavity introrsely directed, its margin barbellate; ovules 50–108.

Pods 1–5 per raceme, stiffly ascending at narrow angles but when elongate outwardly recurved through up to $\frac{3}{4}$ -circle (in one var. also spirally twisted through 1–2 turns), in outline narrowly linear to linear-vermiform 10–28 \times (0.25–)0.3–0.65(–0.7) cm, when fully ripe laterally compressed-tetragonal, the broad ventral suture 3-keeled, the valves green ripening brown and papery, faintly or shallowly depressed between seeds, the seed-locules separated by broad complete hyaline septa, (1–)1.2–3.5(–4.5) mm long, as wide as the pod's cavity, in consequence either longer or shorter than wide, the distal ones usually longer than the rest; seeds either transverse or obliquely basipetal, when not crowded plumply obovoid compressed parallel to the valves, when crowded becoming drum-shaped or variably rhomboidally distorted, the larger ones (1.8–)2–3.4(–3.8) in var. *acuminata* to 4.5 \times 1.5–2.6 mm, the smooth testa dull brown, fawn, chocolate-brown or brownish-olivaceous, encircled in the plane of the hilum by a darker line, the areole on either the broad or narrow faces or even displaced

across the angle between these, in outline elliptic or subcircular $(0.55-0.7-2.4 \times (0.3-0.4-1 \text{ mm})$.

The material of *Cassia hirsuta* and its close relatives available for Bentham's scrutiny a century ago could at the time be reasonably interpreted as representing two species, a *C. hirsuta* sens. str. defined by a relatively broad but not necessarily short pod combined with hirsute vesture and a *C. leptocarpa* defined by a narrow but only potentially longer pod combined with vesture varying from hirsute to pilosulous or obsolescent. In view of the essentially identical habit of growth, flower structure and seeds, Bentham's distinction between pods 1-1½ and 2-3 lines wide was at best finely drawn and in the light of our much more extensive collections has faded into a continuum of variation. Britton & Rose (1923, p. 255, in key to *Ditremexa*) characterized the pod of *D. hirsuta* as both shorter and wider than that of *D. leptocarpa*, but perplexingly allowed in the description of the latter's fruit a range in length of 7 to 30 cm, fully encompassing the 8-20 cm range assigned to *D. hirsuta*. Correlations in the *S. hirsuta* complex between length and width of pod, and between the pod's proportions and the vesture of foliage, ovary, or both, are so low that no combination of these features serves as specifically diagnostic.

Study of the pod of *S. hirsuta* sens. lat. has brought to light some unexpected facts. The 60-96 ovules within the relatively broad and short pod of var. *hirsuta* sens. str. are not significantly less numerous than the 60-108 recorded from the long narrow pod of the so-called *leptocarpa* type. With increase in number, the individual seed-locules become shorter and broader because more crowded along the pod's long axis, and the seed, accommodating itself to its confining cell and to pressure from its neighbors, becomes distorted from the apparently primitive, obliquely basipetal orientation and from compression parallel to the valves to a strictly transverse orientation and compression parallel to the interseminal septa. Thus drum-shaped seeds crowded into narrow stalls, as described by Brenan (1967, p. 80) for adventive African *C. hirsuta*, bear their areoles not on the broad faces but on the narrow rim. While two extreme forms of seed are strikingly different at first view, there are intermediate and irregular configurations where the areole is displaced to an angle between two faces; and furthermore two types of seed may be found in one pod, the compressed ovoid one at random points along the pod where neighboring ovules fail to develop and also very frequently in elongated locules toward the apex of even the shortest pods. The same variation was noticed by Bentham (1871, p. 532) in *Cassia occidentalis*. It appears that the differences in proportions of the pod and in orientation and compression of the seed can be traced to one cause, a slight modification in the ontogeny of the pod's valves.

While vesture has proved ineffective as a specific criterion, within *S. hirsuta* it is very definitely correlated with dispersal and with a few minor morphological features, and is therefore useful taxonomically at the varietal level. A thin puberulence often confined to the lower face of the leaflets characterizes a xeromorphic Mexican var. *glaberrima* and the original *Cassia leptocarpa*, which emerges as an independent variety highly localized in southeastern Brazil. A hirsute vesture of long, coarse, straight and shining hairs is proper to typical var. *hirsuta* and to what we here call var. *hirta*, partially equivalent to Bentham's *C. leptocarpa* var. *hirsuta* (deceptively homonymous but heterotypic). A softer pilosulous vesture of shorter, mostly incurved or subappressed hairs marks the South American, largely extratropical vars. *puberula* and *streptocarpa*, in which survive, either facultatively or constantly, what we suppose to be a relatively

primitive multiflorous raceme. Our six varieties of *S. hirsuta* are for the most part genuinely allopatric and vicariant. The species as a whole is, like *C. occidentalis*, prevailingly weedy even where native, and we suspect that random records of a variety from phytogeographically improbable stations and, indeed, some continuous or semi-continuous extensions of range are due to human interference. It is generally conceded that *S. hirsuta* is an American weed in Africa and Southeast Asia, but it is widespread there and has proved its ability to spread over great distances in ruderal habitats. Thus we have no real gauge by which to assess the extent to which any form of *S. hirsuta* is genuinely autochthonous except as a particular phase of it conforms to known patterns of geographical dispersal.

The varieties of *S. hirsuta* are serially ordered below to conform with the hypothesis that obsolescent vestiture, coarse hirsute vestiture, an abbreviated, few-flowered, pseudo-umbellate raceme and a condensed pod with densely crowded seeds are derived or specialized features, and that the more primitive forms of the species are those found today in the Paraguai-Uruguai basin, near or astride the Tropic of Capricorn between southern Bolivia and Rio Grande do Sul in Brazil. It follows that var. *streptocarpa*, which closely resembles the vicariant *S. neglecta*, is placed first and var. *hirsuta* last. Generally speaking the varieties with more numerous derived features are dispersed correspondingly further north or northwest from the presumed focus of speciation for the section in southern Brazil.

Key to the Varieties of *S. hirsuta*

1. Lfts pubescent on both faces and cili(ol)ate, the longer hairs 0.4–2.8 mm.
2. Vesture of lfts strigulose or softly pilosulous, the hairs when loose commonly incumbent or incurved, less often straight and spreading, in any case not highly lustrous nor more than 0.4–0.7 mm long; S. America in lat. 17–30°S.
3. Pod both arched outward and spirally twisted, commonly sigmoid when flattened in press; racemes mostly 8–35-fl'd; fls small, the longer inner sepals 5–7 mm, the longest petal 8–13.5 mm; n.-e. Argentina (Misiones) and adjoining Brazil (Rio Grande do Sul).
138a. var. *streptocarpa* (p. 429).
3. Pod simply arched outward, not twisted; racemes in Bolivia and Paraguay 2–8-, in Argentina and e. Brazil (centr. Minas Gerais) to 6–14-fl'd; fls larger, the longer inner sepals 7–10 mm, the longest petal 12–16 mm; s.-centr. Bolivia and n.-w. Argentina (Salta, Tucumán, Santiago del Estero) to Paraguay, disjunct in s.-e. Brazil (Minas Gerais); adventive in Philippine Is.
4. Pod 15–25 × 0.3–0.5(–0.55) cm; ovules 66–82; range as just given except Brazil.
138b. var. *puberula* (p. 429).
4. Pod 15 × 0.7 cm; ovules ±54; centr. Minas Gerais, apparently very local.
138c. var. *acuminata* (p. 431).
2. Vesture of lfts hirsute, the hairs straight, spreading or ascending, highly lustrous, the longest 0.6–2.8 mm; equatorial S. America n.-w. and n. to tropical Mexico and W. Indies, s. infrequently and interruptedly in Brazil and Bolivia to ±17°S.
5. Pod slender, usually elongate and curved out- or both out- and downward, (14–)15–27 × 0.25–0.45(–0.5) cm; Mexico and w. Cuba s.-e. through Central America to n. Colombia, thence s. along the Andes to n.-w. Bolivia, in S. America essentially cordilleran.
138f. var. *hirta* (p. 433).
5. Pod stouter, shorter and straight, 11–15 × (0.4–)0.45–0.65 cm; n. S. America from Colombia to the Guianas, s.-e. in Brazil to Maranhão and (disjunctly) s.-centr. Goiás, n. to the Greater and Lesser Antilles; widespread as a weed in Old World Tropics.
138g. var. *hirsuta* (p. 434).
1. Lfts on upper face glabrous or very minutely puberulent, elsewhere thinly puberulent or strigulose, the longest hairs 0.2–0.4 mm; either s.-e. Brazil or Mexico and s.-w. United States.
6. Venation of both faces of lfts finely prominulous, the blades openly reticulate; s.-e. Brazil (local in Rio de Janeiro and adjoining Minas Gerais).
138d. var. *leptocarpa* (p. 431).

6. Venation of upper face of lflets immersed, of lower face faintly penniveined, tertiary venulation 0 or merely discolored, prominulous on neither face.

138e. var. *glaberrima* (p. 432).

- 138a. *Senna hirsuta* (Linnaeus)) var. *streptocarpa* Irwin & Barneby, var. nov., var. *puberulae* proxima, speciem suam intra imprimis foliolis dorso dense molliter pilosulis (nec hirsutis), racemis plurifloris, necnon legumine spiraliter torto insignis.—ARGENTINA. Misiones, dep. San Ignacio: Pastoreo, 10.IV.1956, *José E. Montes 14875*.—Holotypus, NY (2 sheets).**

Cassia leptocarpa sensu Burkart, 1952, p. 165, in clave; non Bentham.

Except for glabrescent pod softly pubescent throughout with procumbent or ascending and antrorsely incurved hairs up to 0.25–0.7 mm (occasional random ciliae longer), the lflets at least when young densely gray-pilosulous beneath, finely puberulent above; petioles 12–35 mm; rachis (4–)4.5–9 cm; gland globose or squatly ovoid 1–1.7 mm diam; lflets (4–)5–6(–7) pairs, the distal pair ovate- or broadly lance-acuminate 4.5–8 × 1.6–2.8 cm, 2.5–3.4 times as long as wide; peduncles 6–30 mm; racemes (except for some depauperate early and late ones) 8–35(–43)-fld, the axis including peduncle becoming (1.5–)2.5–8(–10) cm; longer sepals 5–7 mm; longer petals 8–13.5 mm; ovules 50–68; pod 10.5–16 × 0.4–0.55 mm, strongly arched outward and spirally twisted through 1–2 turns.—Collections: 16.

Campo thickets, matorral, fallow fields, sometimes colonial along roads or in pastures ±70–350 m, locally plentiful in extreme n.-e. Argentina (Misiones) and adjoining Brazil (n. and centr. Rio Grande do Sul), there extending e. into the middle Jacuí valley.—Fl. XI–III(–IV).

In his account of *Cassia* in Argentina, Burkart (1952, l.c.) carefully distinguished two hairy, narrow-fruited sennas of sect. *Oncolobium*, one entering the northwest of the country from Bolivia and Paraguay, the other weedy in Misiones and adjoining Brazil. The plant of the Chaco and of the Andean foothills in Salta and Tucumán, equivalent to our *S. hirsuta* var. *puberula*, was referred by Burkart to *C. hirsuta* sens. lat. whereas that of the middle Paraná-Uruguai valleys, evidently the same as our var. *streptocarpa*, was misidentified as *C. leptocarpa*, although very different in detail from the glabrescent plant from Rio de Janeiro to which the name properly belongs. The var. *streptocarpa* has long been known in herbaria and variously referred either to *C. neglecta*, from which it differs in the ovate-acuminate rather than oblong-elliptic leaflets and the much narrower pod (4–5.5, not 7.5–14 mm wide) or, following Burkart, to *C. leptocarpa*, or to *C. pubescens* Jacqu., which we interpret as synonymous with *S. hirsuta* var. *puberula* described immediately following. The dense but soft pubescence of the foliage, the well-furnished racemes of small flowers, and the long narrow glabrescent pod that tends to fall into a sigmoid figure when pressed are the features by which var. *streptocarpa* may be recognized. The figure of *Cassia leptocarpa* given by Dimitri & Rial Alberti (1954, p. 25) may well be this.

- 138b. *Senna hirsuta* (Linnaeus) var. *puberula* Irwin & Barneby, stat. et nom. nov. *Cassia occidentalis* fma. *ovato-lanceolata* Chodat & Hassler, Bull. Herb. Boissier II, 4: 692. 1904.—“[Paraguay:] . . . pr. Tobaty, Dec. [Hassler] n. 3598.”—Holotypus, G! isotypus, W!**

Cassia pubescens Jacquin, Fragm. bot. 46, t. 57. 1809.—“Patria ignoratur.”—Lectoholotypus, ex hort. bot. Schoenbrun., W (hb. Jacquin)! = F Neg. 32085.

Cassia longisiliqua Blanco, Fl. Filip. 338. 1837.—“[Islas Filipinas, probably Luzon:] . . . en todas partes en las orillas de los caminos.”—No *typus* survives, but the description and discussion decisive.—*C. sulcata* Blanco, Fl. Filip. ed. 2, 236. 1845, substituted for the preceding, a posterior homonym of *C. longisiliqua* Linnaeus, but itself also a posterior homonym of *C. sulcata* DC.—Inexactly equated by Merrill, Bur. Sci. Publ. 12: 173. 1918, with *C. hirsuta* Linnaeus.

Cassia leptocarpa var. *hirsuta* sensu Benth. 1870, p. 112, quoad pl. boliv., non var. *hirsuta* sens. restr. quae = *S. hirsuta* var. *hirta*; De Wit, 1955, p. 251, quoad pl. philippin.

Cassia hirsuta sensu Chodat & Hassler, 1904, l.c.; Merrill, Philipp. J. Sci. Bot. 5: 50. 1910 Enum. Philipp. Fl. 2: 263. 1923; Burkart, 1952, p. 165.

Cassia pubescens sensu Chodat & Hassler, 1904, l.c.

Strigulose or incurved-pilosulous with hairs to 0.4–0.7 mm (random ciliae sometimes to 0.9 mm), the lfts pubescent on both faces; petiole (2–)2.5–5 cm; rachis 5.5–12(–15.5) cm; gland ovoid, taller than wide; lfts 4–6(–7) pairs, the distal pair broadly ovate- to lance-acuminate 4.5–8 × 1.3–3 cm, (1.9–)2.3–4.3 times as long as wide; peduncles 2–12 mm; racemes 2–14-fl'd, the axis including peduncle becoming (4–)6–30 mm; longer sepals 7–10 mm; petals up to 12–16 mm; ovules ±66–82; pod 15–25 × 0.3–0.5(–0.55) cm, simply curved outward, the valves either strigulose or hirsutulous.—Collections: 21.

Disturbed semideciduous or moist evergreen woodland, campo thickets, fields and waste places, mostly 200–550 m but ascending in Bolivia (Cochabamba), perhaps only adventively, to 2000 m, locally frequent along the Andean piedmont and adjoining plains from the headwaters of Rio Mamoré in s.-centr. Bolivia to those of Rios Salado and Dulce in Tucumán and adjoining Santiago del Estero, n.-w. Argentina, thence e. across the Gran Chaco to the Brazilian frontier in Paraguay, to be expected in extreme s. Mato Grosso.—Fl. XII–V.—*Taperiguá* (Argentina).

The var. *puberula* stands intermediate, both morphologically and geographically, between vars. *hirta* and *streptocarpa*, having the simply arched (not twisted) pod and, often but not always, the few-flowered raceme of the former, but a short pilosulous or shorter strigulose, not lustrous hirsute vestiture resembling that of the latter. An early collection from Bolivia (Santa Cruz, d'Orbigny) contributed to Benth. 1870's concept of a *Cassia leptocarpa* var. *hirsuta*; it has passed in northwestern Argentina as genuine *C. hirsuta*; and Chodat & Hassler identified Paraguayan collections of it as either *C. hirsuta*, or *C. pubescens*, or a form of *C. occidentalis*, from which we here derive our varietal name. The variety's perplexed history has arisen from the basic problem of distinguishing between *C. hirsuta* and *C. leptocarpa* at the specific level.

It is possible that var. *puberula* as here defined consists of two taxonomically discrete elements, one of the Andean piedmont and northwestern periphery of the Gran Chaco, the other confined or almost so to Paraguay. The Argentine plants have mostly 5–14-flowered racemes, the Paraguayan ones depauperate 2–5-flowered racemes like var. *hirta*, but there are already exceptions to this rule and we have yet to learn about the situation in central Gran Chaco, from which no material is at present available.

The synonymy of var. *puberula* goes back to surprisingly early days. We confidently refer here *C. pubescens* Jacqu., of which Benth. and subsequent botanists have had only hazy or erroneous notions, but we are at a loss to explain how it came into cultivation in Europe before the much commoner and more readily accessible var. *hirta*. Its early arrival in the Philippines, where Blanco saw it fully established as a roadside weed before 1837, is equally intriguing; one might have expected in its place var. *hirta* or even var. *glaberrima* as stowaways

on the Acapulco-Manila trade route. In Mexico it was collected first by Sessé & Mociño (no. 1142, MA).

- 138c. *Senna hirsuta* (Linnaeus) var. *acuminata* (Benth.) Irwin & Barneby, comb. nov. *Cassia neglecta* var. *acuminata* Benth. in Martius, Fl. Bras. 15(2): 111. 1870.—“ . . . ad Lagoa Santa prov. Minas Geraës: Warming.”—Lectoholotypus, *Warming* 228, collected 2.IX.1864 (fr). C! = NY Neg. 10474; paratypus, *Warming* 234, collected V.1865 (fl). C! = NY Neg. 10475; both annotated by Benth. himself.**

Habit and foliage of var. *puberula*, pilosulous throughout with fine spreading-ascending hairs up to 0.6 mm; racemes 5–12-fl'd, the axis with peduncle becoming 1.5–3.5 cm; pod $\pm 15 \times 0.7$ cm, ± 54 -ovulate, the seed-locules ± 3 mm long, as wide as the cavity; seeds (1 seen) obliquely transverse, $\pm 4.5 \times 2.5$ mm, the excentric areole $\pm 2.2 \times 0.9$ mm.—Collections: 2.

Habitat not recorded, to be expected in campo cerrado, apparently rare, known only from the type-collections from the upper Rio Velhas valley in centr. Minas Gerais.—Fl. V–VI.

The poorly known var. *acuminata* was subordinated by Benth. to *Cassia neglecta*, no doubt because of its relatively broad pod. Its foliage, flower, and particularly its androecium agree better with those of *S. hirsuta* sens. lat., in our expanded concept of which it is accommodated without strain. From our very scanty sample var. *acuminata* appears closely related to var. *puberula*, distantly allopatric in Paraguay and westward, differing in the broad pod which is, however, scarcely wider than the widest known in var. *hirsuta*. The only other form of *S. hirsuta* recorded from Minas Gerais is var. *leptocarpa*, quite different in the glabrate venulose leaflets and extremely narrow and greatly elongate pod less than 5 mm diameter.

- 138d. *Senna hirsuta* (Linnaeus) var. *leptocarpa* (Benth.) Irwin & Barneby, stat. nov. *Cassia leptocarpa* Benth., Linnaea 22: 528. 1849.—“Ad Zapative [=Sepitiba, Edo. Guanabara] legit Pohl et prope Rio de Janeiro, Luschnath.”—Lectoholotypus, *Pohl s.n.*, K (hb. Benth.)! = NY Neg. 1454; isotypus, *Pohl* 5654, W!**

Appearing glabrous but the lfts finely strigulose beneath with appressed hairs to 0.2–0.4 mm, either glabrous or micropuberulent above, loosely finely reticulate on both faces, often with a yellowish-green cast when dry; petiole 3–9 cm; rachis 7.5–14.5 mm; gland ovoid or conic-ovoid, as long as or a little longer than wide; peduncles 1–2.5 cm; racemes 7–20-fl'd, the axis including peduncle becoming 3–7.5 cm; inner sepals 5.5–7 mm; longer petals 12–14 mm; ovules ± 70 –80; pod $16\text{--}27 \times \pm 0.4\text{--}0.45$ cm, sparsely minutely strigulose, evenly arched outward.—Collections: 10.

Disturbed woodlands, 100–660 m, apparently uncommon, known only from Rio de Janeiro, Guanabara and s. Minas Gerais, Brazil.—Fl. I–III.

As here defined, var. *leptocarpa* is readily separated from all other forms of *S. hirsuta* by the openly reticulate, not simply penniveined or simply costate leaflets, and from other varieties native in the same latitudes by the glabrate stems and foliage. We return, at varietal level and in a new context, to Benth.'s original concept of *Cassia leptocarpa*, then as now known only from a small sector of southeastern Brazil within a 200 km radius of Rio de Janeiro; and reject

his later circumscriptions (1870, 1871), stretched to accommodate, as *C. leptocarpa* var. *hirsuta*, the Mexican, Central American and western South American sennas in which the same narrow, elongated pod coincides with pilosulous or hirsute foliage (our vars. *puberula* and *hirta*). Also repudiated is the corrupt concept of Britton & Rose (1930, p. 256, sub *Ditremexa*) who, by a process of drift, had come to identify *C. leptocarpa* primarily with the hirsute North American var. *hirta*.

- 138e. *Senna hirsuta* (Linnaeus) var. *glaberrima* (M. E. Jones) Irwin & Barneby, Phytologia 44(7): 499. 1979. *Cassia leptocarpa* var. *glaberrima* M. E. Jones, Contrib. W. Bot. 12: 7. 1908.—“Huachuca, Catalina, and Santa Rita Mts., Arizona, Aug. 1903.”—Lectoholotypus, *Jones s.n.*, 22.VIII.1903 (fl, fr) from Santa Rita Mts., POM! paratypus, *Jones s.n.*, 18.VIII.1903 (fl) from Sabino Canyon, Catalina Mts., POM!—*Ditremexa glaberrima* (M. E. Jones) Britton & Rose, N. Amer. Fl. 23(4): 256. 1930.**

Cassia gooddingii A. Nelson, Amer. J. Bot. 23: 268. 1936.—“. . . secured by Mr. Leslie N. Goodding: No. 289 . . . Huachuca Flats, Arizona, August 2, 1909; no. 2431, Miller Canyon, Arizona, August 23, 1907 . . .”—Holotypus, *Goodding 289*, WYO (not seen); isotypus, NY! paratypus, *Goodding 2431*, NY!—Equated with *C. leptocarpa* var. *glaberrima* by Kearney & Peebles, 1942, p. 424.

Cassia leptocarpa sensu Bentham, 1871, p. 531, quoad *Wright 1032*, non alibi; Wootton & Standley, Contrib. U.S. Nat. Herb. 19: 334. 1915.

Cassia leptocarpa var. *glaberrima* sensu Kearney & Peebles, Ariz. Fl. 405. 1951.

Pubescence inconspicuous, sparse or distally almost 0, of appressed or subappressed hairs up to 0.15–0.35(–0.4) mm, the lflets varying from glabrous minutely ciliolate to puberulent on both faces, the foliage commonly smaller, brighter green and of firmer texture than that of var. *hirta*, the fl-buds either glabrous or puberulent; petioles (1.5–)2–5 cm; rachis (4–)5–13 cm; gland either sessile or shortly stipitate, up to 1.3 mm diam, and a second gland rarely present between the first pair of lflets; lflets 4–7(–8) pairs, of most larger lvs at least 5 pairs, less strongly graduated than in var. *hirta*, ovate- or lance-acuminate, the longest (3–)3.5–6.5(–8) × 0.8–2.2(–3.2) cm, (2.6–)3–6 times as long as wide; peduncles (5–)8–24 mm; racemes mostly 4–10-fl'd, the axis together with peduncle becoming 1–3 cm; fls of var. *hirta*; ovules 60–78; pod (12–)15–23 × (0.25–)0.3–0.45 cm, simply arched outward, the valves minutely or remotely strigulose-puberulent, rarely glabrous.—Collections: 43.

Washes, riverbeds, mesquite thickets, secondary brush-woodland, n.-ward often with *Larrea* and on the central plateau ascending into the arid grasslands, now commonest in degraded, ruderal or roadside habitats, mostly between 700 and 2100 m but occasional on the Gulf and Pacific coastal plains as low as 70 m, interruptedly widespread over interior Mexico from the n. slope of the Transverse Volcanic range n.-ward on the w. slope to n.-e. Sonora, on the e. slope to s. Tamaulipas and n.-w. Chihuahua, thence around the sources of the Gila river in s. Arizona and extreme s.-w. New Mexico; occasional, perhaps only adventive, further s. in Mexico, to Morelos and (disjunctly) the valley of Oaxaca.—Fl. VII–XI.

The var. *glaberrima* was known to Bentham only in the form of *Wright 1032* from northern Sonora, which he pronounced closely similar to the original *C. leptocarpa* from Rio de Janeiro. This is certainly true so far as habit, sparse strigulose pubescence and relatively many-flowered racemes are concerned, but

var. *glaberrima* has since emerged as a certainly native, xeromorphic and largely extra-tropical derivative of *S. hirsuta* var. *hirta*, separable from the rest of its species by the generally small, slightly more numerous, thicker-textured, yellowish-green leaflets in which all venation but the midrib is immersed. In the Gila Basin and on the Mexican Plateau proper var. *glaberrima* is a well-marked entity, but in the moister hotter conditions of the Volcanic belt the foliage becomes more ample, the hairs a little longer, and the variety fades insensibly southward into var. *hirta*. Along the Zacatecas–Durango border near 2000 m altitude an extensive local population is distinguished by the presence of a second petiolar gland between the proximal pair of leaflets.

- 138f. *Senna hirsuta* (Linnaeus) var. *hirta* Irwin & Barneby, comb. & nom. nov. *Cassia leptocarpa* var. *hirsuta* Benth. Trans. Linn. Soc. London 27: 531. 1871.—“... most ... of the northern and western specimens belonging to the hirsute variety,” these specified in Martius, Fl. Bras. 15(2): 112. 1870: “legerunt Brotero in monte Orizaba, Oersted in Costa Rica et D’Orbigny in Bolivia.”—Lectoholotypus, *Oersted s.n.* e. Costa Rica, K (hb. Benth.)! = NY Neg. 1415; paratypus orbignyanus = *S. hirsuta* var. *puberula*, q.v.—Non *S. hirsuta* var. *hirsuta*.

Cassia pubigera Lagasca, Gen. & Sp. Pl. Nov. 14. 1816.—“Hab. in Guayaquil—... Semina communicavit D. Tafalla.”—Described from a plant grown at Madrid, of which no specimen is known to survive. Equated by Benth. 1871, p. 534, with *C. hirsuta*, but probably better referred to *S. hirsuta* var. *hirta*, the only senna of its type collected subsequently in Guayas, Ecuador.

Cassia leptocarpa sensu auct. centr.-amer., non Benth. sens. str.; *Ditremexa leptocarpa* sensu Britton & Rose, 1930, p. 256, max. ex parte, exclus. basionym.

Hirsute-hirsutulous up to the pod with straight erect or loosely ascending lustrous hairs up to 0.6–2.3(–2.8), the lfts pubescent (even though only thinly so) on both faces, the vesture of the pod varying from hirsute like the foliage and stems to subappressed-pilosulous or strigulose; petioles (1.2–)1.5–6.5 cm; rachis (3–)4.5–12(–16) cm; lfts 3–5(–6) pairs, the distal pair ovate-, rhombic-ovate- or lance-elliptic-acuminate or -caudate 4.5–10.5 × (1.4–)1.6–4 cm, (1.7–)2.1–4(–4.3) times as long as wide; peduncles (0–)1–12(–18) mm; racemes 2–8-fld, the axis becoming 0–21 mm; longer sepals 6.5–9.5(–10) mm; longer petals (10–)11–15 mm; ovules (58–)62–108; pod (14–)15–27 × 0.25–0.45(–0.5) cm, simply, often strongly arched outward.—Collections: 111.

Openings in tropical brush-woodland and along stream-banks and beaches, now everywhere commonest in secondary and ruderal habitats, becoming abundant in over-grazed pasture, along roads and fences, in fallow fields and about towns and farmyards, ascending from the tropical lowlands to ±1400–1600 m in Mexico, Central America, Ecuador and Bolivia, discontinuously widespread in Mexico from the Gulf slope in San Luis Potosí and the periphery of Balsas Depression to Yucatán and Chiapas, rarely n.-w. to the Lerma valley in Michoacán and to Sa. Surutato (near 26°N) in Sinaloa; w. Cuba (Matanzas, La Habana, Pinar del Río), perhaps only weedy; scattered through Central America from Guatemala to Panama; thence s. through the Magdalena and Cauca valleys in Colombia to montane and coastal Ecuador, and s.-e. along the Amazon slope of the Andes to Bolivia (Beni, La Paz, Cochabamba), there reaching 17°30'S and passing into var. *puberula*; occasional in ruderal or roadside habitats in s.-e. Brazil (coastal Bahia, s. Goiás, e. São Paulo).—Fl. in N. Amer. primarily VIII–II, in S. Amer. III–VIII,

but especially in the lowlands sporadically or even continuously through the year.—*Mano de muerto* (s. Mexico); *disiplinilla* (Puebla); *zalche* (Yucatán); *viche* (Sinaloa); *pico de pájaro* (Costa Rica).

The var. *hirta* is the form of *S. hirsuta* most widely dispersed in the Americas, that commonly referred to northward from Panama as *Cassia leptocarpa* or, with greater precision, *C. leptocarpa hirsuta*. Judging from its erratic dispersal in the tierra caliente, we suppose that its natural range must have been cordilleran, probably in both hemispheres, because there are perceptible but minor pubescence-phases proper to each; but its weedy proclivities preclude anything but conjecture about its geographic origins. Morphologically var. *hirta* stands between var. *hirsuta*, with which its range overlaps only in northern Colombia and adjoining Panama, and var. *puberula*, vicariant southward from near 17°S in Bolivia. The longer narrower pod alone distinguishes it from var. *hirsuta*, and the vesture of straight shining hairs from var. *puberula*.

- 138g. *Senna hirsuta* (Linnaeus) Irwin & Barneby var. *hirta*. *Cassia hirsuta* Linnaeus, Sp. Pl. 378. 1753, sens. str.—“Habitat in America.”—Holotypus (Brenan, 1967, p. 80), a plant cultivated at Hartekamp and described by Linnaeus, Hort. Cliff. 159. 1737 = Herb. Cliffort., *Cassia* No. 4 (lvs only), BM!—*Ditremexa hirsuta* (Linnaeus) Britton & Rose ex Britton & Wilson, Sci. Surv. Porto Rico & Virgin Is. 5(3): 372. 1924.**

Cassia venenifera Rodschied, Medizin. und Chirurg. Bemerk. holländ. Kolonie Rio Essequibo 43. 1796.—Described from plants observed near the mouth of Essequibo River, Guyana; no typus survives at GOETT.—Equated with *C. hirsuta* by Bentham, 1871, p. 534.

Cassia caracasana Jacquin, Pl. Rar. 3: 11, t. 270. 1798.—“Crescit ad Caracas . . . In caldario [horti schoebrunnensis] colitur . . .”—No typus seen, to be sought at W, but the description and plate decisive for the species, the place of origin and description of pod for the var.—Equated with *C. hirsuta* by Vogel, 1837, p. 32, and by Bentham, 1871, p. 534.

Cassia tomentosa Wallich ex Arnott in Wight & Arnott, Prod. Fl. Pen. Ind. Or. 1: 286. 1834, nom. nud.—The plant (Wallich Cat. 5304) equated with *C. hirsuta* by Bentham, 1871, p. 534.

Cassia hirsuta sensu Colladon, 1816, p. 108; Vogel, 1837, p. 32; Bentham, 1870, p. 114, t. 34, fig. 1; 1871, p. 534; Schery, 1951, fig. 124 (“*C. leptocarpa hirsuta*”); De Wit, 1955, p. 250 (with summary bibliography); Symon, 1966, p. 88; Brenan, 1967, p. 80.

Ditremexa hirsuta sensu Britton & Rose, 1830, p. 256.

Except for the pod in all respects like var. *hirta*, technically indistinguishable at anthesis; ovules 60–96; pod 11–15 × (0.4–)0.45–0.65 cm, slightly or moderately curved outward, the valves densely permanently bristly-hirsutulous with ascending hairs.—Collections: 59.

Forest margins, thickets, shores, disturbed and regenerating scrub-woodlands, becoming a vigorously aggressive weed along roads, in pastures, orchards, and in rural and urban waste places, over most of its range confined to the lowlands but ascending to 1000–1900 m in Andean Colombia and Venezuela and to 900 m on the Brazilian Planalto, discontinuously widespread around the n. and n.-e. edges of South America, from Panama (Bocas del Toro and Darién) e. and s.-e. across Venezuela and the Guianas to the middle Tocantins and Parnaíba valleys in Maranhão, Brazil, n. through Trinidad and some Windward Is. (St. Vincent, Martinique, Guadeloupe) to Puerto Rico; Jamaica (probably only naturalized); introduced in cocoa plantations in Bahia, along highways in s.-e. Goiás, in e. Bolivia, and to be expected elsewhere in the lowland Neotropics. Long naturalized in the wet tropics of the Old World (Africa, India, Sri Lanka, Malaysia, New

Caledonia, Queensland).—Fl. in the Neotropics nearly throughout the year.—*Frijolillo de monte* (Panama); *aytera cimarrona* (Venezuela); *erva de bicho* (Maranhão).

139. *Senna scabriuscula* (Vogel) Irwin & Barneby, stat. nov. *Cassia occidentalis* var. (γ ?) *scabriuscula* Vogel, Syn. Gen. Cass. 21. 1837.—“In Brasilia: Sellow lëg.”—Holotypus presumably \dagger B; neoholotypus, *Sellow s.n.*, K! = NY Neg. 1456.

Cassia neglecta var. *entreriana* Grisebach, Abhandl. K. Ges. Wiss. Göttingen 24 [=Symb. Fl. Argent.]: 116. 1879.—“655 . . . E[nterrios]: Entrerios, in arenosis pr. Concordia ubique.”—Holotypus, P. G. Lorentz N.E. 739, collected 13.II.1876. GOETT! isotypi, CORD (seen by Burkart, 1972, l.c. infra), W!—*C. occidentalis* var. *entreriana* (Grisebach) Burkart, Darwiniana 17: 594. 1972.

Coarse leafy herbs from blackish roots, commonly appearing glabrous, but the obtusely angulate stems distally and all axes of inflorescence at least thinly strigulose-pilosulous with subappressed or incurved-ascending hairs up to 0.2–0.4(–0.5) mm, the stems sometimes in addition randomly pilose with fine lustrous setae up to 0.7–3 mm, the lfts usually scabrid beneath with minute scattered thickened trichomes and rarely also finely pilosulous, above glabrous or exceptionally puberulent, always coarsely ascending-ciliolate, the narrow terminal thyrses of few-fl'd racemes either entirely exserted or leafy-bracteate proximally.

Stipules erect submembranous green or purplish triangular- or broadly lance-acuminate $\pm 2\text{--}5 \times 1\text{--}2$ mm, very early caducous, absent from many spms.

Lvs 8–25 cm; petiole including discolored pulvinus mostly (3–)6–21 mm, or where the small proximal pair of lfts lacks becoming longer (to 3 cm), at middle 0.8–1.8 mm diam, deeply openly grooved ventrally; rachis (4.5–)5–12.5 cm, its subulate terminal appendage glandular-thickened at base on ventral side; gland contiguous to pulvinus, sessile or obscurely stipitate, squatly ovoid or subglobose $1.2\text{--}2 \times (0.7\text{--})1\text{--}1.5$ mm; lfts 5–7(–8) pairs, accrescent distally, the distal pair lance- or narrowly ovate-acuminate obtuse mucronulate or acute $3.5\text{--}7.5 \times (0.7\text{--})0.85\text{--}1.5$ cm, (3–)4–6.3 times longer than wide, the midrib immersed above, cariniform beneath, the 9–15 pairs of camptodrome with weak intercalary secondary veins beneath firmly sharply prominulous, above prominulous only near costa, thence immersed, the tertiary venulation invisible above, faintly discolored but not or scarcely raised beneath.

Peduncles 3–10 mm; racemes short, often subumbellately (1–)2–6(–8)-fl'd, the axis including peduncle becoming (3–)7–12(–16) mm; bracts ovate-acuminate or lance-caudate $2.5\text{--}6 \times 1.2\text{--}2$ mm, caducous from below young fl-buds; mature pedicels 14–22 mm; fl-buds nodding, glabrous beyond hypanthium; sepals submembranous pallid, fuscous- or purple-tinged, obovate or oblong-obovate obtuse, the outermost 5–8 mm, the longest inner one 8.5–12 mm; petals deep yellow drying whitish brown-veined, of \pm equal length, the 3 abaxial obovate obtuse or flabellate-obcordate, the 2 abaxial oblanceolate, the longest petal (13–)14.5–20 mm; androecium glabrous, the spatulate staminodes 1.4–1.8 mm wide, the filaments of 4 median stamens 1.6–2.5(–3.5) mm, of 2 large abaxial ones 5.5–9 mm, of the sterile centric abaxial one 3–4 mm, the yellow anthers of 4 median stamens including the oblique, shortly 2-lipped beak (4–)4.3–6.2 mm, the castaneous or chocolate-brown anthers of the 2 latero-abaxial ones measured to base of beak $5\text{--}7 \times (1.6\text{--})1.9\text{--}2.3$ mm, their yellow beak 1.7–2.5 mm, its thickened tongue-like abaxial lip 1.2–2 mm, the anther of the centric abaxial stamen linear-oblanceolate

2.5–4 × 0.4–0.6 mm; ovary densely strigulose-pilosulous; style 3.8–5 mm, abruptly thickened and retrocurved at apex, there 0.45–0.7 mm diam, the stigmatic cavity introrse; ovules 46–60.

Pod straight erect or gently incurved-ascending 10–15 × (0.55–)0.6–0.9 cm, essentially as that of *S. occidentalis*, the locules mostly 1.6–2.5 (some up to 3.5) mm long, always wider than long; seeds turned to present their areolate broader faces to the septa, broadly compressed-obovoid 3.9–5 × (2.5–)2.9–4 mm, the dull olivaceous testa microscopically papillate, the obovate or elliptic areole 2.2–3.2 × 1–1.8 mm.—Collections: 21.

Sandy campo and derived riparian and ruderal habitats below 300 m, locally plentiful in the lower Paraná and Uruguai valleys between 25° and 35°S latitude, in s. Paraguay, n.-e. Argentina (s.-e. Chaco, e. Sta. Fe, Corrientes, Entre Ríos) and adjoining Uruguay, originally described from “Brazil,” and to be looked for in w. Rio Grande do Sul; disjunctly (?) w. up Río Pilcomayo to 450 m in s.-e. Tarija, Bolivia.—Fl. X–III(–IV).

Senna scabriuscula occurs in two pubescence forms: in the commoner of these the leaflets are glabrous except for stiffly ciliolate margins and scattered thickened trichomes on the dorsal face, while the stems are either glabrate or thinly pilose with long shining bristles; in the other the leaflets are pilosulous on one or both faces but the stems lack setae. These two forms, which are sympatric near Concordia, type-locality of *Cassia neglecta* var. *entreriana*, have the same pod, which is essentially that of *S. occidentalis*, gently incurved and 46–60-ovulate, and we agree with Burkart (1972, l.c.) that the close affinity of the species lies in the direction of *S. occidentalis* and not of *S. neglecta*, with which Grisebach, who knew only the pubescent phase, associated it. Burkart earlier (1952, p. 164, in key) contrasted the annual root, 4–6 pairs of relatively broad leaflets and mostly axillary racemes of *Cassia occidentalis* with the perennial root, 5–7 pairs of narrower leaflets and thyrsiform inflorescence of *C. neglecta* var. *entreriana*, but these comparisons are effective only in the narrow context of the Argentine flora. We find, however, that *S. scabriuscula* differs further and more significantly from *S. occidentalis* in the narrow stipules and floral bracts, in the abbreviated petioles, in the generally (but not absolutely) longer sepals, in the broader staminodes and very stout long-beaked abaxial anthers, and most importantly in the style, which is thickened and incurved like that of *S. hirsuta* sens. lat. The ranges of fully extratropical *S. scabriuscula* and the largely intertropical *S. occidentalis* and *S. hirsuta* all overlap in southern Paraguay and it seems possible that the present species has arisen through hybridization, inheriting its involute stigma and unstabilized tendency to hairiness from *S. hirsuta* var. *puberula* and its pod and seeds from *S. occidentalis*. Whatever its origin, however, *S. scabriuscula* appears now to be an independently self-reproductive entity most appropriately treated at the level of species.

140. *Senna occidentalis* (Linnaeus) Link, Handb. 2: 140. 1831. *Cassia occidentalis* Linnaeus, Sp. Pl. 377. 1753.—“*Habitat in Jamaica.*”—First described (Hort. Cliff. 159. 1738) from a plant cultivated at Hartekamp near Leiden; lectoholotypus (Brenan, 1967, pl. 78), BM (hb. Clifford.)! The spm. LINN 528.13, indicated as typus by De Wit, 1955, p. 256 and accepted as such by Symon, 1966, p. 88, was acquired by Linnaeus only in 1758 with the herbarium of P. Browne.—*Senna occidentalis* (Linnaeus) Roxburgh, Fl. Ind. 2: 343. 1832, pro comb. nov. *Ditremexa*

occidentalis (Linnaeus) Britton & Rose ex Britton & Wilson, Sci. Surv. Porto Rico & Virgin Is. 5(3): 372. 1924.

- Cassia falcata* Linnaeus, Sp. Pl. 377. 1753.—“*Habitat in America.*”—Described, like the last, from a plant cultivated in Clifford’s garden near Leiden; a fragmentary spm consisting of lvs only, LINN 528.12 may be authentic.—Equated by Bentham, 1871, p. 532, with *C. occidentalis*.
- Cassia planisiliqua* Linnaeus, Sp. Pl. 377. 1753.—“*Habitat in America calidiore* [more precisely, fide Lamarck, Encycl. Méth. 1(2): 645. 1785, on the island of Guadeloupe].”—Based entirely on *Cassia siliquis planis* Plumier, Cat. Pl. 18. 1703, illustrated in Burman, Pl. Amer. Fasc. 4: t. 77. 1756, which = typus! *Cassia plumieri* DeCandolle, Prod. 2: 506. 1825, based on “*C. planisiliqua* Lamarck, non Linnaeus,” but as shown by Colladon, 1816, reiterated by Bentham, and confirmed above, these are homotypic, the epithet *plumieri* therefore redundant.—Equated with *C. occidentalis* by Edwards, Bot. Reg. 1: t. 83. 1815; Bentham, 1871, p. 532, with pungent comment.
- Cassia caroliniana* Walter, Fl. Carol. 135. 1788.—Carolina, without further particulars.—Lacking in hb. Walter., BM (1980!).—Reduced to *C. occidentalis* by Elliott, Sketchb. 471. 1823; DeCandolle, 1825, p. 497; Bentham, 1871, p. 532.
- Cassia foetida* Persoon, Syn. 1: 457. 1805, nom. alternativum illegit.
- (?) *Cassia occidentalis* var. (β) *aristata* Colladon, Hist. Casses 108. 1816.—“... in Sto. Domingo et Guadalupa, Badier.”—No collection of Badier found at G or P. The only label in hb. G-DC giving locality Guadeloupe is now not associated with a spm. The plant nearest this label represents *S. hirsuta* var. *hirta*, but is Cuban (*A. de la Olla s.n.*).
- Cassia macradena* Colladon, Hist. Casses 132. 1816.—“*Hab. in Brasilia.*”—Based entirely on “*Cassia foliis 4-jugis . . . glandula orbiculari ad basin petiolorum magna*” Vandelli in Roemer, Script. 104. 1796, this probably based on a plant (not found in hb. Micheli., FI) collected by Raddi.—Possibly = *S. hirsuta* var. *leptocarpa*, common around Rio de Janeiro.
- Cassia ciliata* Rafinesque, Fl. Ludov. 100. 1817.—Described at second-hand from plants observed by Robin in Louisiana; equated with *C. occidentalis* by Merrill, Index Rafin. 143. 1949.
- Cassia obliquifolia* Schrank, Denkschrift. Bot. Ges. Regensburg 2(1): 40. 1822.—“*Brasilien.*”—No typus known to exist, but plausibly equated with *C. occidentalis* by Bentham, 1871, p. 532, the description fully consonant with this interpretation.
- Paomirioba* Piso ex Marcgravius, Hist. Rer. Nat. Brasiliae 1: 9. 1648.
- Senna occidentalis*, *odore opii virosi, orobi Pannonici foliis . . .* Commelijn, Hort. Med. Amstel. 1: 51, t. 1697.—A slide of the original colored drawing (AMD) is at NY!—Sloane, Hist. Jam. 2: 48, t. 175, fig. 3, 4. 1725.
- Cassia occidentalis* sensu Edwards, Bot. Reg. 1: t. 83, 1815; Colladon, 1816, p. 107; DeCandolle, 1825, p. 497; Vogel, 1837, p. 21, exclus. var. γ ; Audubon, Birds Amer., elephant folio 1: t. 35. 1827; Bentham, 1870, p. 112; 1871, p. 532, exclus. syn. *C. longisiliqua*; Cook & Collins, Contrib. U.S. Nat. Herb. 8(2): 108. 1903; Urban, Fl. Portoric. 273. 1905; Britton, Bahama Fl. 166. 1920; Fawcett & Rendle, 1920, p. 104; Rock, Leg. Pl. Hawaii 87, t. 36. 1920; Standley, 1920, p. 404; Pio Correa, Dicc. Pl. Ut. Bras. 3: 56 + fig. 1931. St. John & Hosaka, Univ. Hawaii. Res. Publ. 6: 88. 1932; Boelcke, Darwiniana 7(2): 305, t. IX, fig. e (seed). 1946; Schery, 1951, p. 64, fig. 125 (pod shown reflexed); Burkart, 1952, p. 164; Steyaert, 1952, p. 513; Dimitri & Rial Alberti, 1954, p. 22, fig. 8; De Wit, 1955, p. 256; Turner, 1959, p. 75, map 34 (Texas); Gleason, 1963, p. 384 + fig.; Wilbur, Leg. Pl. N. Carol. 22, fig. 5. 1963; Symon, 1966, p. 87; Brenan, 1967, p. 78, fig. 14 (optima); Adams, 1972, p. 326; Agnew, Upland Kenya Wild Fls. 234. 1974; Isely, 1975, p. 116, map 51 (U.S.A.); Walker, Fl. Okinawa 545. 1976; Fl. Taiwan 3: 201, p. 536. 1977; Malick & Krishna, 1978, fig. 4 (seed).
- Cassia planisiliqua* sensu Urban, Repert. Sp. Nov., Beih. 5: 52. 1920.
- Ditremexa occidentalis* sensu Britton & Rose, 1930, p. 256, exclus. syn. *C. frutescens*, *C. lineata*, *C. longisiliqua*; Degener, Fl. Hawaii, s.p., issued 24.XII.1934.

Coarse, amply leafy foetid herbs from black, yellow-tipped roots, in temperate or seasonally dry climates truly annual, perishing with onset of cold or dry weather, but under warm moist or tropical conditions either monocarpic of indefinite duration or softly fruticose and of 2–3 years duration, finally many-stemmed and bushy, at anthesis (0.5–)1.5–22 (but most often \pm 4–12) dm, appearing glabrous and the obtusely angled or sulcate stems truly or almost so, the axis of inflorescence thinly strigulose-pilosulous, the thin-textured, when dry dull olivaceous lfts

glabrous above, ciliolate with forwardly ascending stiff hairs up to 0.25–0.5 mm, beneath charged with scattered minute thickened trichomes, the inflorescence composed of subsessile or shortly pedunculate few-fl'd racemes axillary proximally to fully developed lvs, these distally \pm abruptly reduced to a rudimentary lf-stalk with undiminished petiolar gland, the uppermost racemes forming a shortly exerted narrow thyse.

Stipules loosely erect, thinly herbaceous often livid-tinged or purple-dotted, broadly triangular- to lance-acuminate (3–)4.5–11(–13) \times (1.5–)2–4.5(–5) cm, at oblique base, either on side further from petiole or (when broad) on both sides, rounded and bluntly auriculate-amplexicaul, early dry caducous.

Major lvs (except in rare starveling plants) 11–24(–26) cm; petiole with swollen or little differentiated, sometimes discolored pulvinus 2.5–5(–5.5) cm, at middle 0.8–2 mm diam, bluntly 3-costate dorso-laterally, thickly obtusely margined and openly grooved ventrally; gland contiguous to pulvinus sessile or almost so, plumply ovoid, hemispherical, depressed-hemispherical or subglobose, in profile 0.7–1.8 \times (0.6–)0.8–2.2 mm, varying from a little longer to a little shorter than diam, always obtuse, when fresh livid-reddish, nigrescent and wrinkled when dry, sometimes a second gland near the first, but none between lf's; rachis (4–)6–14 cm, its subulate or hornlike terminal appendage thickened and livid proximally; pulvinules discolored (1.7–)2–4 mm; lf's (3–)4–6, of most plants exactly 4 or 5 pairs, accrescent distally, the proportionately broad proximal pair much the shortest, the distal pair broadly lance- or ovate- (exceptionally obovate)-acuminate 4.5–9.5(–10) \times (1.2–)1.4–3.5(–3.8) cm, (2.1–)2.4–4(–5) times longer than wide, at inequilateral base cordately decurrent on pulvinule on proximal or on both sides, the midrib immersed or scarcely raised above, cariniform beneath, the 9–15 pairs of major camptodrome and random intercalary secondary veins finely prominulous above, more sharply so beneath, the tertiary venulation invisible on both faces or discolored but scarcely raised beneath.

Peduncles (1–)1.5–4.5(–7) mm; racemes very shortly or subumbellately (1–)2–5-fl'd, the axis becoming 0–5 mm, the whole axis including peduncle not over 1 cm; bracts thinly herbaceous early dry brown caducous, lance (oblance)-acuminate (5–)6–16(–18) \times (0.8–)1.8–4.5 mm; mature pedicels 8–17(–21) mm; fl-buds nodding glabrous (puberulent at base), plumply obovoid; sepals submembranous pallid or commonly pinkish- or fuscous-tinged, moderately graduated, obovate or oblong-obovate, the outer (5–)5.5–7.5 mm, the longest inner one (6.5–)7–10 mm; petals glabrous, yellow drying whitish brown-veined, the vexillar one usually obcordate, the 2 lateral ones obovate, the 2 abaxial ones oblanceolate, all of equal length or either the anterior or posterior ones longer, the longest petal 12–16(–17) mm; androecium glabrous, the 3 staminodes 0.7–1.2 mm wide, the filaments of 4 median stamens 2–3.3 mm, of 2 large abaxial ones dilated and 5–7 mm, of the sterile centric abaxial one 3–4 mm, the anthers of 4 median stamens including the 2-lipped ascending beak 3.2–5.2 mm, those of 2 large abaxial ones, measured from base to constriction beneath the beak, 3.7–5 \times 1.1–1.5 mm, the beak 1.2–1.6 mm, its thickened tonguelike abaxial lobe (0.6–)0.8–1.2 mm, the anther of the centric stamen up to 2 \times 0.6 mm, but often filiform or 0; ovary densely white-strigulose or -pilosulous; style glabrous, keeled laterally and ventrally, (3–)3.2–4.7 mm, a little dilated distally and 0.35–0.5 mm diam toward apex, the introrsely lateral stigmatic cavity elliptic-oblanceolate in ventral view, its margins explanate and barbellate along the sides, minutely porrect at tip; ovules 40–60 (average 51).

Pod normally erect or ascending at narrow angles, sessile or almost so, linear, slightly incurved or less often straight, 8–13(–13.5) \times (0.65)0.7–0.9(–0.95) cm,

plano-compressed when young but \pm distended when ripe, 2-carinate by the sutures, the remotely strigulose valves differentiated lengthwise into marginal bands of green (later stramineous) tissue issuing from the sutures and a central red or livid (later brown) band, this \pm elevated over and depressed between each successive pair of seeds, the seminal cavities separated by complete membranous septa, mostly 1.5–2.5(–3, or the distal one –3.5) mm long; seeds all (or all but 1–few distal ones) turned so as to present their broad areolate faces to the septa, compressed-obovoid or -suborbicular (3.1–)3.4–4.7(–5.1) \times (2.3–)2.9–3.8 mm, the dull olivaceous, fawn-brown or putty-colored, rarely castaneous testa minutely papillate or nearly smooth, the waxy exterior coat cracked in age; $n = 14$, reportedly sometimes = 13 in Old World.—Collections: 311.

Disturbed and waste places in forest, brush, savanna and riparian environments, in arable and pasture land, on roadsides, about farms and villages where sometimes planted for medicine, especially vigorous and abundant in ditches and seasonally moist depressions or on shores, mostly below 500 m but ascending to 1200 m in s. Mexico and on the Brazilian Planalto, now everywhere weedy in the New World, not demonstrably native and perhaps a paleotropical immigrant of long standing, interruptedly widespread almost throughout the American Tropics, but not recorded from the Pacific slope in Peru and absent from much of the Amazonian Hylaea, extending n. around the foothills of the Mexican Plateau into warm temperate Sinaloa and Tamaulipas, thence n.-e. in United States around the Gulf to peninsular Florida and n. in the e. and centr. States to $\pm 36^\circ$ as a self-perpetuating weed, casually further (cf. Iseley, 1975, map 51), in S. America s. to Paraná in Brazil, and to n.-w. and n.-e. Argentina (Salta and Tucumán; Misiones and Corrientes). Also widespread in similar habitats almost throughout tropical Africa, India, Sri Lanka, Indochina, s. China, Malesia, n. Australia, and e. through Micronesia to Hawaiian Is.—Fl. in favorable circumstances throughout the year, in temperate climates in midsummer and fall.—*Coffee senna*; *hediondilla*, *frijolillo*, *cornezuelo*, *brusca*, *bicho* (Mexico and Latin America); *stinking weed*, *pois puant*, *p. p. noir* (West Indies); *martinica* (Cuba); *dandelion*, *styptic weed* (Jamaica); *chilinchile* (Colombia); *potra* (Chocó); *retamilla* (Peru); *mamuri* (Bolivia); *cafetillo*, *cafetón*, *café del campo*, *c. de Bonpland*, *taperibá* (Argentina); *mata pasta*, *fedegoso* (-a), *taratucú*, *paramarioba*, *mata patinho* (Brazil).

With the exception of *S. obtusifolia*, the Coffee Senna is the weedy member of its genus most widespread over tropical lowland and warm temperate America, a coarse ill-scented plant that colonizes roadside ditches, rundown or abandoned farmland, and disturbed places sometimes far from habitations. It is often but needlessly confused with *C. obtusifolia*; at anthesis its basal petiolar gland and leaflets broadest below, not above the middle, and later on the wider shorter pod (mostly 7–9, not 2.5–6 mm broad) distinguish it handily. Its closest relatives are the local Argentine *S. scabriuscula*, mentioned at greater length above, and the equally weedy but more local *S. sophera*, different in its more fruticose stems, smaller and slightly more numerous leaflets, pedunculate racemes and subterete pod dilated when ripe by seeds disposed in two parallel rows. From these and from all other American oncolobiums, however, *S. occidentalis* is definitively separable by the form of the style-tip, as described in our key to the series; and *S. sophera* alone shares the relatively large stipules commonly auriculate-clasping on the side further from the petiole. The ordinarily erect or narrowly ascending pod of *S. occidentalis* varies from straight to gently arched, but if curved at all it is incurved toward vertical, with seminiferous suture concave, not arched outward like that of all other oncolobiums except *S. scabriuscula*.

In spite of its immense range and edaphic adaptability, *S. occidentalis* appears very uniform genetically. Individuals differ much in stature, due to age and accidents of environment, and there is some variation in flower-size, but pubescence, androecium and pod are essentially stable and the species is the most easily defined American member of its group. It is likely that the strains established in southeastern United States and perhaps those in extratropical Argentina have been climatically selected for rapid, obligately monocarpic cycles of growth, but the individual plant so modified in behavior is phenetically identical to the immature phase of its tropical counterpart that has a life expectancy of two or three seasons and a potentially suffruticose maturity.

There is conflict in the literature as to the origin of *S. occidentalis*. Bentham (1871) thought it *probably* derived from America, but some modern authors omit the qualification, though bring no evidence to bear on the question. The species is now a circumtropical ruderal whose dispersal has doubtless been hastened by real or imaginary medicinal virtues, and nothing of substance can be learned from its contemporary range. Historical data are ambiguous. The earliest known record is that of Willem Piso from northeastern Brazil in mid-XVII century, but it was found by Rumpf on Amboina only a few years later and by Plumier in the Antilles about 1690. In the Old World it has acquired so many common names in the tongues of Africa, Indomalaya and the Pacific islands that a familiarity of long standing to the peoples of those countries seems certain. The close relationship of *S. occidentalis* to *S. sophora* which, because its center of high variability is certainly in Asia, is presumed to be originally paleotropical, suggests that the American range of *S. occidentalis* is likewise derived. But if this is really so, the very closely allied *S. scabriuscula*, endemic to northeastern Argentina and adjacent Paraguay and Uruguay, can only be interpreted as a neo-species derived from *S. occidentalis* in post-Colombian times. A close biosystematic study of *S. scabriuscula* might clarify this point. But for the present we can form no firm opinion as to the origin of *S. occidentalis*.

The use of the roasted seeds of *S. occidentalis* as a substitute coffee is established independently on three continents, even though the infusion contains neither caffeine nor allied alkaloids. Medical uses are numerous, infusions of the leaves having tonic, diuretic, stomachic, febrifuge and anthelmintic properties, while analgesic poultices and skin ointments are prepared from stems and foliage. Quisumbing (Medicinal Pl. Philipp. 382–384. 1951) gives a full review of the subject. The plants are generally avoided by stock, and are toxic, sometimes fatally so, to cattle.

Britton & Rose (1930, p. 257, sub *Ditremexa*) called attention to a remarkable lusus of *S. occidentalis*, collected in Florida by Chapman (NY!), in which the blade of all leaves is modified into an ample ovate terminal leaflet. This leaf stands in relation to the ordinary paripinnate one of *Senna* as that of *Poissonia* Baill. stands to the leaf of *Coursetia* DC. We have seen no further instance of this abnormality in the genus.

The Guahibo Indians in Amazonas, Venezuela are reported to use a preparation of the seeds for heart pain, under the name *morrocoy* (Colchester 2012, K). The Madagascan vernacular *natarova*, meaning dies-at-evening, refers to the transient nature of the corolla.

141. *Senna sophora* (Linnaeus) Roxburgh, Fl. Ind. ed. 2, 2: 347 ("sophora") 1832. *Cassia sophora* Linnaeus, Sp. Pl. 379. 1753.—"Habitat in India."—Based directly on *Cassia foliolis decem parium lanceolatis* . . . Linnaeus, Fl. Zeylanica 64. 1747; lectoholotypus (Trimen, J. Linn. Soc.,

Bot. 24: 141. 1887; Fawcett & Rendle, Fl. Jamaica 4: 105. 1920; confirmed by De Wit, 1955, p. 266), BM (hb. Hermann.)!—*Chamaefistula sophera* (Linnaeus) G. Don, Gen. Hist. Dichl. Pl. 2: 452. 1832. *Cassia occidentalis* var. *sophera* (Linnaeus) O. Kuntze, Rev. Gen. 170. 1891. *Ditremexa sophera* (Linnaeus) Britton & Rose ex Britton & Wilson, Sci. Surv. Porto Rico & Virgin Is. 5(3): 372. 1924.

Cassia frutescens Miller, Gard. Dict. ed. 8, *Cassia* no. 2. 1768.—“*Senna spuria Americana frutescens* . . . Houston MSS . . . sent me from Jamaica by the late Dr. Houston.”—Holotypus, collected in Jamaica in 1731, annotated by Houston and by Miller, BM (hb. Mill.)! = BH Neg. 5168.—*Cassia sophera* var. *ligustrinoides* Benthams, Trans. Linn. Soc. London 27: 533, majore ex parte, 1871.

Cassia patula Aiton, Hort. Kew. 2: 51. 1789.—“*Nat. of the West Indies*. Mr. Gilbert Alexander. Introd. [to British Is.] 1778.”—Holotypus, ex hort. kew. 1779, BM!—Equated with the last by Benthams, 1871.

Cassia canca Cavanilles, Descripción Pl. 132. 1802.—“H[ort.] B[ot.] M[atrit.] . . . Es natural de Cumaná [Venezuela]; nació en el Jardín de semillas enviadas por el ciudadano Bompland . . .”—Holotypus, cult. at MA in 1801, MA!—Equated with *C. sophera* by Benthams, 1871, p. 533.

Cassia linearis Michaux, Fl. Bor. Amer. 1: 261. 1803.—“Hab. in Carolina.”—Holotypus, 3 sheets in hb. Michaux., P! not identified as *linearis* but distinguished from genuine *C. occidentalis*, which is represented by a spm “juxta Charleston S. Carolina,” labelled by Michaux as *β serotina*.—Elliott (Sketchbook 472. 1823) observed plants growing in Michaux’s former garden near Charleston and found them to have *terete* pods, the signature of *S. sophera*.—Wrongly equated by Benthams, 1871, p. 532, with *C. occidentalis*.—*Cassia lineata* (sphalm.) Michaux ex Britton & Rose, 1930, p. 256, pro syn.

Cassia geminiflora Schrank, Pl. rar. hort. Monac. 1(3): t. 26. 1819.—Described from plants grown at Munich, of unknown provenance.—No spm found at M in 1980, but the cited figure characteristic.—*C. occidentalis* var. (*β*) *glabra* DeCandolle, Prod. 2: 497. 1825.

Cassia proboscidea Pollard, Bull. Torr. Club 23: 281. 1896.—“Collected by J. F. Waby at Hastings, Barbadoes, April–June, 1895. (No. 24. . .)”—Holotypus, US!—Equated with *Ditremexa sophera* by Britton & Rose, 1930, p. 258.

Cassia sophera sensu Dimitri & Rial Alberti, 1954, fig. 10; Malick & Krishna, 1978, fig. 2 (seed). *Ditremexa sophera* sensu Britton & Rose, 1930, p. 258.

Erect simple, early bushy-branched, precociously flowering, soon frutescent herbs from black roots, at anthesis commonly 5–12 dm but in rich soil or in age up to 2 (perhaps 3) m tall, the softly woody leafless old stems corymbosely branched distally, the whole in habit, pubescence, stipules and petiolar glands resembling at anthesis small-lvd *S. occidentalis*, but the herbage only weakly malodorous, the racemes more strongly pedunculate and their axes commonly glabrous or at most weakly granular-puberulent, decisively different only in the style and pod.

Major lvs 7–18(–21) cm; petiole 1.5–4(–4.7) cm; petiolar gland borne adjacent to pulvinus 0.5–1.2 × 0.6–1.4 mm; rachis 4–11(–12) cm; lfts (3–)4–6(–8) pairs, the distal pair lance- or ovate-acuminate (2–)2.5–6 × (0.7–)0.8–2.1 cm, (2.4–)2.7–4.5(–5) times as long as wide.

Peduncles (5–)6–23 mm; racemes subumbellately 1–4(–5)-fld, the axis 0–4(–5) mm; bracts usually lanceolate or linear-ob lanceolate, abruptly acute, sometimes ovate-acuminate, 5–13 × (1.6–)2–4 mm, the thin-textured blades green or yellowish, when elongate involute over the ascending fl-buds; mature pedicels (8–)9–15(–18) mm; outer sepals 5–6.5 mm, the inner ones 6–8 mm; petals of *S. occidentalis*, but averaging shorter, the longer ones 10–12.5 mm; androecium essentially that of *S. occidentalis*, the staminodes sometimes up to 1.6 mm; ovary strigulose, sometimes only thinly so; style 2–3.5 mm, at apex dilated and strongly incurved, 0.5–0.7 mm diam at the introrsely oriented stigmatic cavity; ovules 62–84.

Pod erect or stiffly ascending subsessile, the ripe body cylindric or (when short) linear-ellipsoid, straight or gently incurved, (5-)6-9.5(-10) \times 0.7-1 cm (when strongly flattened in press apparently up to 1.2 cm diam), the sutures scarcely prominent, the valves broadly pale-margined, dark purple-, when dry black-striped down the middle, not or scarcely elevated over individual seeds, early glabrate, the transverse seed-locules mostly 1.3-2.3 mm long, as wide as the cavity or a few near the pod's apex a little longer; seeds disposed horizontally in two interdigitating series along the length of the pod, each turned to present its broader, areolate faces to the septa, plump but compressed parallel to the septa, in outline broadly or narrowly (when much crowded sometimes irregularly) obovate (2.4-)2.8-4 \times (2-)2.3-3.2(-3.5) mm, the testa smooth or sparsely pitted ochraceous, light-brown or castaneous, dull or sublustrous, crackled in age, the elliptic or obovate-elliptic areole 1.2-2.3 \times 0.7-1.2 mm; $x = 14$ (Irwin & Turner, 1960).—Collections (neotropical only): 63.

Roadsides, old fields, ditches, waste places and rubbish heaps, occurring singly or in thickets, in the Neotropics everywhere weedy, mostly below 600 m but ascending in Mexico and n. Venezuela to ± 1000 m and in the Colombian Andes to 1850 m, discontinuously widespread around the Caribbean from Bahamas and w. Cuba through the Greater and Lesser Antilles to Barbados, Trinidad and across n. Venezuela to centr. Colombia (s. to Nariño), local in Panama (Canal Zone) and Mexico (Veracruz; centr. Oaxaca); coastal Guyana; 1 record from e. Brazil (Bahia).—Fl. intermittently through the year, most prolifically following rains.—*Séné zombi* (Guadeloupe); *brusca* (Venezuela).

Students of *Cassia*, from Bentham (1871, p. 532) onward, have commented repeatedly on the difficulty in distinguishing the obviously related and habitally similar *C. occidentalis* and *C. sophera*, and their perplexity is reflected in the number of misidentified specimens encountered in herbaria. In reality the two species are readily recognized at anthesis by length of peduncles and structure of the style, and later on most decisively by the compression of the pod and disposition of the seeds within it. The differential characters which we consider crucial are set out in dichotomies 12/12 and 19/19 of the key to the series and require no further emphasis. Generally speaking American *S. sophera*, while it flowers as precociously as *S. occidentalis*, is potentially more enduring and becomes genuinely shrubby in age, when its leaflets are on the average smaller. But the habit is seldom evident in the herbarium and there is a wide overlap in size of leaflets which are indistinguishable in outline, vesture or venation.

Our description of *S. sophera* is based exclusively on American material and evades the vexed question of the intraspecific variation and its taxonomic consequences in eastern Asia and Australia. With a single exception of a modern collection from Bahia, neotropical *S. sophera* is essentially uniform. The sessile and subglobose or mounded petiolar gland is truly basal, inserted next to the pulvinus; the leaflets are 4-6 pairs; the flower-buds and usually all axes of inflorescence are glabrous; the petals are small, not over 12.5 mm long; and the pod, unless some ovules abort, is mostly 6.5-9.5 cm long. Nomenclaturally typical *S. sophera* from Sri Lanka and continental India has a more cylindric gland inserted sometimes well above the pulvinus, leaflets up to 10 pairs, sepals more often pubescent than not, and petals up to 15 mm long; but the smoothly cylindroid pod is the same as that of the American plant and we therefore follow tradition in treating them as aspects of one species, though very likely properly distinguishable at varietal level. Variation in Asia encompasses further a large-flowered south Chinese plant called by Bentham *C. sophera* var. *torulosa*, in which the

valves of the ripe pod are corrugately elevated over the seeds. And in Australia, New Caledonia and Fiji the complex is represented by a series of small-fruited relatives, differing among themselves in petiolar gland, vestiture, and number or shape of leaflets, that have been variously treated either as part of *C. sophera* sensu lat. (Bentham, 1871, l.c., Fl. Austral. 2: 283. 1864), as a var. *schinifolia*, or (Symon, 1966, p. 89–91) as allied but distinct species *C. barclayana* and *C. planitiicola*, a controversy which we cannot profitably enter into without access to much more extensive Australasian material of the group. Because we have seen no Asiatic *S. sophera* that matches at every point the American populations of the species we suspect that our circum-Caribbean and Colombian plant may be indigenous (even though now primarily weedy) and varietally distinct from its paleotropical analogues. The exception from Bahia (*Hatschbach 39514*, NY, unfortunately only in young flower) already mentioned has the higher number of leaflets and puberulent sepals commonly encountered in Indian *S. sophera* and may represent a modern introduction independent of the rest.

Until our deliberately limited picture of American *S. sophera* can be integrated with an equivalent body of data from the Old World, the time has not come to reevaluate the long list of synonyms quoted by Bentham (1871, l.c.), the majority of which were based on plants grown in European conservatories, often without record of the original source. We have examined critically only those names based on types known to be American. The only varietal epithet at present potentially available for Neotropical *S. sophera* is *ligustrinoides* Bentham which was, however, based on a mixture of Jamaican *Cassia frutescens* Mill. and Indonesian *C. coromandeliana* Jacqu. and therefore will lack precise application until it is lectotypified.

Bxx. ser. TEMPERATAE Irwin & Barneby

Senna sect. Chamaefistula ser. Temperatae Irwin & Barneby, ser. nov. ab arcte affinis *Basiglandulosae*, quoad glandulam infra foliolorum par infimum insertam congruis, styli filiformis subrecti apice haud incrassati stigmatibus punctiformi antherisque duobus longis apice truncatis vel subbilabiatis exappendiculatis, ulterius habitu herbaceo radiceque gelu hiberno resistenti diversae.—Sp. typica: *S. marilandica* (Linnaeus) Link.

Flower of ser. *Basiglandulosae* except the 2 long abaxial anthers truncate or obscurely 2-labiate at apex, not asymmetrically appendaged beyond the orifice, and the style not dilated distally, its latero-terminal stigmatic cavity punctiform; ovules 10–28; pod obliquely geotropic plano-compressed, the valves in one sp. slightly turgid over the seeds; seeds 1-seriate, horizontally or obliquely transverse, compressed parallel to the valves, areolate.—Tall herbs, the stems dying back annually to the blackish roots; petiolar gland either juxtaposed to the pulvinus or inserted on petiole well below the proximal pair of lfts, these 6–10 pairs; inflorescence thyrsiform, at first leafy-bracteate, later exserted.—Spp. 2, of centr. and e. United States, 1 just entering s. Canada.

Senna marilandica, from which the sibling *S. hebecarpa* had not been extricated at the time of the last broad systematic review of *Cassia* sens. lat., has traditionally been associated with ser. *Basiglandulosae* (or equivalent group) and agrees with it in the infrafoliolar insertion of the petiolar gland. We do not dispute the relationship, but are induced by peculiarities of the flower, supported by the frost-hardy herbaceous habit of growth otherwise foreign to the genus, to refer

this pair of sennas to a coordinate series of sect. *Chamaesenna*. Detached from the plant, neither the flower nor the fruit of the *Temperatae* could be distinguished from those of some *Pachycarpae*, from which habit and position of the gland alone separate them. While the relatively unspecialized floral morphology of ser. *Temperatae* would relate them more closely to the tropical core of sect. *Chamaesenna* than to the florally specialized *Basiglandulosae*, their conquest of the frost-line and consequent assumption of an obligate herbaceous cryptophytic life-form imply a substantial physiological adjustment beyond the normal reach of the genus.

Key to the Species of ser. *Temperatae*

1. Ovules 20–28; pod 8–11 mm wide, its individual seed-locules 3–4 mm long, transversely oblong (wider than long); stems, lf-stalks and ovary thinly strigulose-pilosulous or subglabrous, the hairs not over 0.6 mm; petiolar gland ovoid-globose or squatly fusiform, usually broadest near or below middle; seeds plumply obovoid ± 2.2 –3 mm diam. 142. *S. marilandica* (p. 444).
1. Ovules 10–16; pod 5.5–8 mm wide, its individual locules 5–8 mm long, square or rhombic (\pm as wide as long); stems, lf-stalks and ovary usually (not invariably) pilose-setose with hairs up to 0.8–2 mm; petiolar gland mostly claviform or obovoid, broadest above middle; seeds compressed-obovoid ± 3.5 –4.5 mm diam. 143. *S. hebecarpa* (p. 446).

142. *Senna marilandica* (Linnaeus) Link, Handbuch 2: 140 (“*marylandica*”). 1831, based on *Cassia marilandica* Linnaeus, Sp. Pl. 378. 1753.—“Habitat in Virginia, Marilandia.”—Lectoholotypus (Fernald, Rhodora 39: 410, pl. 480. 1937): LINN 528.27!—*Cassia acuminata* Moench, Meth. 273. 1794 (exclus. descr.), nom. substit. illegit. *C. reflexa* Salisbury, Prod. 326. 1796, nom. substit. illegit. *Senna riparia* Rafinesque, Medical Fl. 1: 94. 1828, nom. substit. provis. *Ditremexa marilandica* (Linnaeus) Britton & Rose, N. Amer. Fl. 23(4): 257. 1930, quoad nom., exclus. descr.

Cassia succedanea Bellardi ex DeCandolle, Prod. 2: 498, pro syn. 1825.

Cassia medsgeri Shafer, Torreya 4: 179, fig. 2 (a–d). 1904.—“PENNSYLVANIA: . . . Westmoreland Co., 1904, O. P. Medsger (type) . . .”—Holotypus, collected in South Huntingdon Township, 12.VIII (fl) & X (fr) 1904, NY!—*Ditremexa medsgeri* (Shafer) Britton & Rose, N. Amer. Fl. 23(4): 257. 1930.—Equated with *C. marilandica* by Fernald, 1937, l.c.

Ditremexa nashii Britton & Rose, N. Amer. Fl. 23(4): 258. 1930.—“Swamp near Eustis, Lake County, Florida, August 16–25, 1894, George V. Nash 1720.”—Holotypus, NY!—Equated with *C. marilandica* by Isely, 1975, pp. 112, 212.

Cassia marilandica sensu Bentham, 1871, p. 534 & auct. antecedent. ex parte, exclus. *S. hebecarpa*; Deam, Fl. Indiana 589, map 1200. 1940; Fernald, 1950, p. 886; Gleason, 1952, p. 384 + fig.; B. L. Turner, 1959, p. 75, map 38; Stevens, Kansas Wild Fls, ed. 2, 263, figs. 438–440. 1961; Gleason & Cronquist, Man. Vasc. Pl. N.-e. U.S. 397. 1963; Wilbur, 1963, p. 25, fig. 7; Radford et al., Man. Vasc. Fl. Carolinas 576 + fig., map. 1964; Rickett, Wild Fls U.S. 2: 320, pl. 116. 1967; Wharton & Barbour, Wildfls Kentucky 211 + fig. 1971; Isely, 1975, p. 110, map 48, p. 205 (where lectotypus erroneously numbered LINN 528.16); McGregor & Barkley, Atlas Great Plains Fl. map 622. 1977.

Cassia medsgeri sensu Britton & Brown, Ill. Fl. ed. 2, 2: 336. 1913; Rydberg, Fl. Prairies Plains N. Amer. 450. 1932.

Coarse, amply leafy perennial herbs, at maturity (6–)7–14(–20) dm, the several-many stems erect and narrowly ascending in clumps from a blackish pluricipital horizontal rootstock, appearing glabrous but the stems distally, lf-stalks, axes of inflorescence and commonly the margins of lflets thinly or remotely pilosulous with subappressed or incurved hairs up to 0.2–0.5(–0.6) mm, the foliage bicolored, the thin-textured lflets dull olivaceous above, paler subglaucescent beneath, the inflorescence a narrow thyrses of racemes proximally subtended by

scarcely diminished lvs, these often abruptly smaller upward and the thyrses then exerted in age.

Stipules ascending or weakly deflexed, thinly herbaceous, narrowly lanceolate $5-9 \times 0.5-1.4$ mm, caducous, absent from mature spms.

Major lvs 12-24(-27) cm; petiole including little modified, sometimes livid pulvinus (2-)3-7(-8) cm, at middle 1.3-2 mm diam, coarsely ribbed dorsally and laterally, openly shallow-sulcate ventrally; gland situated next to pulvinus or on petiole proper distant up to 16(-20) mm from stem, exceptionally between proximal pair of lfts, sessile or substipitate, in outline ovoid, globose, depressed-globose or oblong-fusiform, in profile (1-)1.2-2 \times 0.6-1.7 mm, the body commonly broadest at or below middle; rachis 6.5-16(-17.5) cm; pulvinules 1.6-2.6(-3) mm; lfts (5-)6-9 pairs, accrescent distally but the penultimate sometimes longest, all in outline elliptic, oblong-elliptic or lanceolate acute or obtuse mucronate, the small proximal ones often ovate-elliptic, the longer ones (3-)3.5-6 \times 0.9-2.1(-2.4) cm, 2.5-4(-4.3) times as long as wide, at base rounded or cordate on proximal and cuneate on distal side, the margins plane or incipiently revolute toward the pulvinule, the straight midrib immersed or almost so above, cariniform beneath, the 8-12 pairs of slender camptodrome secondary veins above either faintly prominulous, immersed or finely impressed, beneath finely prominulous, the reticular venules invisible above, commonly discolored dorsally but not raised.

Racemes (3-)5-15(-19)-fld, the axis including peduncle becoming (0.4-)0.7-4(-4.5) cm; bracts membranous-margined, lanceolate or lance-attenuate (2-)2.5-4 mm, caducous; mature pedicels 9-15(-17) mm; fl-buds nodding, glabrous except for minutely ciliolate sepal-margins; sepals moderately graduated, pinkish-brown pallid-margined, ovate or oblong-obovate obtuse, the outer (4-)4.5-5.7 mm, the inner 5.5-7.5(-8.5) mm; petals glabrous, yellow drying whitish brown-veined, of subequal length 8-13(-14) mm, the vexillar one obovate-emarginate, the rest broadly oblanceolate or cuneate-oblanceolate obtuse; androecium glabrous, the staminodes 1.2-1.4 mm wide, the filaments of 4 median stamens 2-3.5 mm, of 2 longer abaxial ones greatly dilated 4-7.5 mm, of the centric abaxial one 2.6-5.5 mm, the anthers livid, those of 4 median stamens 2.6-3.5 mm, almost straight, obscurely 2-lipped, those of 2 long, lunately incurved abaxial ones measured from obtuse base to shortly 2-lipped orifice 4-5 \times 1.3-1.5 mm, the pollen-cup very short and not appendaged ± 0.3 mm, the centric abaxial anther similar but a little shorter and only 0.6-0.75 mm diam; ovary strigulose or pilosulous, the hairs up to 0.2-0.5 mm; style commonly ± 2 , sometimes up to 4 mm, gently incurved but scarcely dilated distally, 0.2-0.4 mm diam at the lateral stigmatic cavity; ovules 20-26(-28).

Pod gently curved out- and downward from ascending pedicel, the stipe 1-2.5 mm, the body linear compressed (6.5-)7-9.5(-11) \times (0.75-)0.8-1.05(-1.1) cm, the valves at first green or reddish, when ripe papery nigrescent glabrate or remotely strigulose, alternately more and less deeply depressed-sulcate at successive interseminal septa, the seed-locules 3-4 mm long, thus oblong and much shorter than wide; seeds perpendicular to the pod's long axis, plumply obovoid or oblong-obovoid compressed parallel to the valves 3.9-5.1 \times 2.2-3 mm, the testa light ocher-brown sometimes castaneous-tinged, dull or sublustrous, crackled, the obovate areole 2.7-3.5 \times 1.3-2 mm; $n = 14$ (Irwin, 1960).—Collections: 64.

Open woodland, alluvia of valley floors, creek-banks, swamps and moist thickets, sometimes colonial in old pastures where shunned by livestock, widespread and locally plentiful over Alleghanian, Ozarkian and mid-western United States

from s.-e. Nebraska to Pennsylvania, s. to n.-e. Texas, Alabama, and through montane and piedmont Carolinas and Georgia to middle Florida.—Fl. VII–IX.

Although the sibling species, *S. marilandica* and *S. hebecarpa*, were both cultivated in western Europe in early XVIII century, they were not recognized as distinct for two hundred years. They are indeed extraordinarily similar in habit and floral structure, and are sometimes even now difficult to distinguish at anthesis, however sharply marked they may become as the pod and seeds develop. Following Fernald's critical analysis of the morphology and nomenclature (1937, l.c.), exaggerated reliance has been placed on the shape of the petiolar gland and on pubescence as differential characters, with the result that some small errors have crept into the record of dispersal. While the gland of *S. hebecarpa* is commonly shortly stipitate and claviform and that of *S. marilandica* is most often sessile and ovoid or mounded, there is much variation in both species and some glands cannot be referred with confidence to either type. The setose cauline vestiture of *S. hebecarpa*, commonly coinciding with a shaggy-pilose ovary, is sometimes very sparse and in southeastern New York and New Jersey is often entirely lacking; flowering plants from this region with glabrous stems and merely strigulose-pilosulous ovaries have been misidentified as *S. marilandica*, the range of which does not extend east of Pennsylvania. In doubtful cases a count of the ovules, 10–16 in *S. hebecarpa* and 20–28 in *S. marilandica*, is decisive. Isely (1975, l.c.) mentions specimens that suggested "limited introgression" between *S. marilandica* and *S. hebecarpa*, but despite their essentially identical flowers and wide (although incomplete) sympatry, we find no evidence to confirm the presence of gene flow between them.

Collectively *S. marilandica* and *S. hebecarpa* represent a specialized offshoot of the genus adapted to temperate summer climate and resistant in the winter-dormant state to zero temperatures. Of the two, *S. marilandica* appears the less advanced or modified, its relatively numerous ovules and more southern (but still entirely extratropical) range suggesting more immediate kinship to tropical antecedents. The differences between the pair in the pod and seeds can be visualized as all contingent on reduced ovule-number in *S. hebecarpa*: in a pod of unaltered length fewer ovules occupy longer cavities and develop into broader, more strongly compressed seeds over which the pod-valves become less convexly elevated. Similar but not identical reciprocal adjustments between more and less crowded seeds are described under *S. hirsuta*. In that species, however, the pod varies greatly in length, and it is length, not ovule-number, that determines the outline of the individual seed-locule and consequently the orientation and compression of the seed itself.

Senna ligustrina, vicariant with *S. marilandica* southward in Florida from about 28°30'N, differs in its slender acute petiolar glands, lance-ovate rather than oblong-elliptic leaflets, corymbose rather than thyrsoid inflorescence, and in its obliquely ascending rather than declined, pluri (36–50, not 20–28)-ovulate pods.

This species was first described by Linnaeus in *Hortus Cliffortianus*, and specimens survive in the Clifford Herbarium (BM) as: *Cassia* No. 8 = *Senna occidentalis foliis ebuli acutis, glabris*; misplaced as one of 4 sheets of *Cassia* No. 7; detached flowers mixed with sterile *Chamaecrista nictitans* as *Cassia* No. 1.

143. *Senna hebecarpa* (Fernald) Irwin & Barneby, comb. nov. *Cassia hebecarpa* Fernald, *Rhodora* 39: 413, pl. 481. 1937.—". . . Newton, Massachusetts, August 6, 1898, W. P. Rich . . ."—Holotypus, GH!

Cassia hebecarpa var. *longipila* E. L. Braun, *Rhodora* 42: 49. 1940.—“ . . . Knott County, Kentucky, July 23, 1937, *Braun* Ky. no. 1633 . . . ”—Holotypus, GH!—Equated with *C. hebecarpa* by Isely, 1975, p. 99.

Senna Mimosae foliis siliqua hirsuta Dillenius, Hort. Eltham. 351, t. 260, fig. 339 (optima!). 1732 & 1774.—Erroneously referred by Linnaeus (1753) to *Cassia marilandica* and not differentiated from it until 1904 (Shafer, l.c. infra).

Cassia marilandica sensu Bentham, 1871 et auct. post-Linnaean. omn. usque ann. 1904, ex parte; sensu Shafer, *Torreyia* 4: 178, fig. 1 (a–d). 1904, where first accurately defined, but under the wrong name; sensu House, *Wild Fls New York* pl. 104. 1918. *Ditremexa marilandica* sensu Britton & Rose, 1930, p. 257, quoad descr., basionym, exclus.

Cassia hebecarpa sensu Fernald, 1950, p. 885; Gleason, 1952, p. 384 + fig.; Wilbur, 1963, p. 25, fig. 6; Rickett, *Wild Fls U.S.* 2: 320, pl. 116. 1967; Isely, 1975, p. 99, map 40.

Closely resembling *S. marilandica* in habit, stature and foliage, different (constantly or potentially) as described following: pubescence of short appressed or incurved hairs lacking, the stems, lf-stalks (especially proximally) and sometimes the axes of inflorescence and fl-buds usually thinly setose with fine straight patent bristles up to 0.8–1.8(–2.2) mm and the ovary commonly shaggy-pilose, but the setae variable in length and density, occasionally 0, the plant then at anthesis simulating *S. marilandica* and reliably distinguished only by ovule-number.

Stipules linear or linear-attenuate $3.5\text{--}9 \times 0.3\text{--}1$ mm, bristly-ciliolate, minutely ciliolate, or glabrous.

Major lvs 13–23 cm; petiole including pulvinus (3–)4–7(–8) cm; gland (exceptionally a pair) situated next to pulvinus or at a point on petiole up to 8(–11) mm distant from stem, most commonly shortly stipitate and either slenderly or plumply claviform obtuse or minutely apiculate, but sometimes sessile obovoid, rarely subcylindroid, in profile $1.2\text{--}3.3 \times 0.6\text{--}1.8$ mm; lflets 6–9(–10) pairs, a little decrescent toward proximal or toward both ends of rachis, elliptic, oblong- or lance-elliptic, rarely elliptic-oblongate or narrowly ovate, $\pm 3\text{--}6 \times 1\text{--}2$ cm, 2.5–3.5 times as long as wide, at apex either obtuse or deltately acute, mucronate.

Racemes up to 25(–37)-fld, the axis including peduncle 1–5.5(–7) cm; pedicels (11–)13–20(–22) mm; perianth on average a trifle smaller than that of *S. marilandica*, the outer sepals 3.7–5 mm, the inner ones 5–7 mm, the longer petals 8–12 mm; androecium and style of *S. marilandica*; ovary commonly shaggy-hirsute with spreading, partly wavy or spirally twisted hairs up to 1–2 mm, but sometimes only shortly strigulose-pilosulous; ovules 10–16(–17).

Body of pod plano-compressed (6–)7–11.5 \times 0.55–0.8 cm, when ripe brunnescent or nigrescent, thinly bristly-hirsute or less often remotely strigulose or glabrate, the papery valves shallowly sulcate at the interseminal septa, these very narrow and 5–8 mm apart, the rhombic or nearly square locules thus about as long as wide; seeds obliquely descending across their locule, in outline broadly ovate or bluntly rhombic, (3.5–)4.3–5.3 \times 3.5–4.5 mm, strongly compressed parallel to the valves, the testa dull ochraceous or fulvous sometimes castaneous- or livid-tinged, crackled when dry, the narrowly or broadly ovate areole 2–3.3 \times (0.9–)1.1–1.7 mm.—Collections: 121.—Fig. 10 (androecium), 14 (pod, seed).

Habitats of *S. marilandica* but said to tolerate lighter, more porous soils, local but widespread over n.-e. and e.-centr. United States, barely entering s. Canada: s. Wisconsin and Illinois to s. Michigan, s. Ontario and New England (n. to Connecticut valley in s. Maine and New Hampshire), s.-e. and s. to e. Tennessee, upland North and South Carolina (and perhaps adjacent Georgia), reaching the Coastal Plain in s.-e. New York (Long I.) and Delaware.—Fl. VII–IX.

Bxxi. ser. GALEOTTIANAE Irwin & Barneby

Senna sect. **Chamaefistula** ser. **Galeottianae** Irwin & Barneby, stat. & nom. nov.
Pterocassia Britton & Rose, N. Amer. Fl. 23(4): 243, pro gen. 1930.—
 Generitypus: *Pt. galeottiana* (Martens) Britton & Rose \equiv **Senna galeottiana** (Martens) Irwin & Barneby.

Corolla zygomorphic, the 2 abaxial petals alike in outline; fertile anthers slenderly lanceolate in outline, the 4 median obliquely truncate, the 3 abaxial asymmetrically produced at the 2-porose orifice in the form of a small pollen-cup; style grooved internally, strongly incurved distally, the stigmatic cavity latero-introrse; ovules 10–15; pod plano-compressed, narrowly winged around both sutures, the flat chartaceous valves separating when ripe both along the ventral suture and along the septal lines between seed-locules into panels hinged along the dorsal suture to allow escape of seeds; seeds transverse, plano-compressed, almost discoid, the faces areolate.—Shrubs and trees; lfts 3–16 pairs; petiolar glands 0.—Spp. 2, of continental Mexico and Baja California.

The two species of the morphologically isolated ser. *Galeottianae* were both known to Bentham (1871), who placed them in sect. *Chamaesenna* ser. *Floridae* next following *C. (Deserticolae) wislizeni* and preceding *C. (Isandrae) emarginata* and kindred. The thin-textured, almost samaroid pod, extraordinary in *Senna* both for form and dehiscence, is the obvious signature of the series and of the equivalent generic segregate *Pterocassia*; but the regularly zygomorphic corolla, the androecium, and the ventrally grooved, distally incurved style are all quite different from anything encountered elsewhere in ser. *Floridae*. In all floral characters ser. *Galeottianae* most closely resembles sect. *Oncolobium* (*Ditremexa* Raf. emend. Britt. & Rose) and it is in this direction, that is to our ser. *Basiglandulosae*, that we must look for genuine relationship. The pod and absence of petiolar glands are enough to exclude the *Galeottianae* from *Oncolobium* itself and entitle them to independent serial status.

Key to the Species of ser. *Galeottianae*

1. Stipules of primary lvs and floral bracts erect, plane; major lvs 4.5–14 cm, their petiole \pm 6–17 mm, their lfts 7–16 (in larger ones nearly always 9) pairs; range of ser. *Galeottianae*.
 144. *S. polyantha* (p. 448).
1. Stipules of primary lvs and floral bracts early reflexed, their blades revolute; larger lvs 2–4.5(–5) cm, their petiole 2–5.5 mm, their lfts 3–8(–9) pairs; local in Tehuacán Desert, s. Puebla and closely adjacent Oaxaca.
 145. *S. galeottiana* (p. 450).

144. *Senna polyantha* (Colladon) Irwin & Barneby, comb. nov. *Cassia polyantha* Colladon, Hist. Casses 112, t. 2. 1816.—“*Cassia* sp. nova. Moc[iño] & Sessé, *pl. mex. ined. ic.* Hab. in Mexico.”—Described from a drawing made by the artists of the Royal Expedition to New Spain, or from a copy of it made at Geneva for A. P. de Candolle.—Lectoholotypus, the protologue, including plate, as cited above!—*Pterocassia polyantha* (Colladon) Britton & Rose, N. Amer. Fl. 23(4): 244. 1930.

Cassia browniana Kunth, Mimoses 135. 1819.—“Crescit prope Guanaxuato Mexicanorum, alt. 1068 hexapodarum.”—Holotypus, collected by Humboldt & Bonpland in IX.1803, labelled ‘n. 4216 Guanajuato,’ P-HBK! isotypi, B (Hb. Willd. 7993), P (hb. Bonpland. 4216)!—Correctly equated with *C. polyantha* by Bentham, 1871, p. 547.

Cassia marginata Sessé & Mociño, Fl. Mex. 100. 1894.—“Habitat in montibus Guanaxuati.”—Holotypus, *Hb. S. & M.* 1191, MA! = F Neg. 44357.—*C. alata* sensu Sessé & Mociño, Pl. Nov. Hisp. 60. 1893, quoad descr., exclus. syn. Linn. & Plum.—This last is identified by

Sessé & Mociño with their Icon. No. 387, very likely the same as mentioned supra under *S. polyantha*.

Cassia goldmani Rose, Contrib. U.S. Nat. Herb. 10(3): 98. 1906.—“[US] 365323, collected by [E. W.] Nelson and [E. A.] Goldman about 5 miles southwest of El Potrero, Lower California, October 31, 1905 (no. 7238).”—Holotypus, US! clastoholotypus + photo, NY!—*Pterocassia goldmanii* (Rose) Britton & Rose, N. Amer. Fl. 23(4): 244. 1930.—Equated with *C. polyantha* by Standley, 1922, p. 409.

Pterocassia rubricaulis Rose ex Britton & Rose, N. Amer. Fl. 23(4): 244. 1930.—“Vicinity of San Luis Tultitlanapa, southern Puebla, July 22, 1908, C. A. Purpus 2657.”—Holotypus, US! clastoholotypus + photo, NY!

Cassia polyantha sensu Bentham, 1871, p. 547; Standley, 1922, p. 409.

Shrubs and slender trees with commonly dense rounded crown of foliage, rough gray trunk and deeply canaliculate, usually red-castaneous hornotinous branchlets, at anthesis 1.5–7 m, the young stems, lf-stalks, dorsal (less often also ventral) face of lf-stalks and axes of inflorescence all commonly softly pilosulous with weak spreading sinuous or straight gray or faintly lutescent hairs up to 0.2–0.45(–0.7) mm, but the vestiture sometimes reduced to rudimentary puberulence of lf-stalk and pedicels, the foliage bicolored, the lf-stalks either dark (when dried brownish-) green or bright yellow-green above, paler beneath, the inflorescence an immersed or shortly exserted subcorymbose panicle of racemes crowded in distal lf-axils, or some racemes subterminal to lateral branchlets.

Stipules caducous (absent from many spms), erect submembranous brown or purplish, lance-acuminate (1.5–)2–6 × 0.7–1.4 mm, the margins not revolute.

Major lvs widely spreading or decurved 4.5–14 cm; petiole including ovoid, often discolored pulvinus (4–)6–17(–19) mm, at middle 0.5–1 mm diam, narrowly margined ventrally, the sulcus almost closed; rachis (2–)2.5–11.5 cm; petiolar gland 0; lf-stalks (5–)7–16(–19) pairs, of subequal length or decrescent proximally, in outline mostly oblong-elliptic, sometimes varying to -oblanceolate, linear-oblong or (when short) oblong-obovate, at apex obtuse-mucronulate or broadly deltate-acuminate, the longest (11–)12–22 × (3.5–)4.5–8 mm, 2.1–3.1 times as long as wide, the margin plane or (young) weakly revolute, the centric midrib immersed above, cariniform beneath, the 6–9 pairs of slender camptodrome (and random intercalary) secondary veins either finely raised or fully immersed on upper face, prominulous or merely discolored beneath, a fine weak tertiary or reticular venation invisible above, raised or discolored beneath.

Racemes closely (7–)10–50-fld, the 1–3 simultaneously expanded fls raised to or a little beyond level of ascending fl-buds, the axis together with peduncle becoming (2.5–)3–6(–9) cm; bracts lance-acuminate 2.5–5.5 × 1–1.8 mm, deciduous before or at latest immediately after anthesis; pedicels 12–24 mm; young fl-buds globose, glabrous or puberulent; sepals firm, fuscous yellow-margined or yellow overall, well graduated, the outer ovate 2.6–4 mm, the more broadly ovate or oblong-obovate inner ones 4.5–6 mm; corolla zygomorphic, the glabrous petals bright yellow drying dull yellow delicately brown-veined, subhomomorphic, oblanceolate, oblong-oblanceolate or ovate-oblong obtuse, the longest (7–)8–11 mm; androecium glabrous, the staminodes 0.5–1.1 mm wide, the filaments of 4 median stamens 1.4–3 mm (the pair further abaxial longer), of the 3 abaxial 3–5 (the centric a trifle shorter than its neighbors), the dark brown anthers slenderly lanceolate in outline from a bluntly sagittate base, those of 4 median stamens 3.4–4.7 × 0.8–1.2 mm, obliquely truncate at apex, of 2 latero-abaxial ones 4.5–6 × 0.8–1.2 mm, of the centric abaxial one 3.7–4.5 × 0.7–0.9 mm, the 3 abaxial gently incurved, the orifice produced on outer side into a blunt lip ±0.3 mm beyond the 2-porose orifice; ovary glabrous or thinly pilosulous at base; style (2.5–)3–4.5 mm, distally incurved through nearly 180°, grooved ventrally, 0.3–0.4 mm diam at the introrsely lateral stigmatic cavity; ovules 10–15.

Pod obliquely ascending or randomly declined, the stout stipe 2–4.5 mm, the broadly linear-oblong plano-compressed, straight or slightly decurved body 7.5–11.5 cm, excluding the sutural wings 1–1.9 cm wide, bicarinate by the prominent sutures, these subundulately cristate all around by a wing 2–4 mm wide, the reddish, when ripe stiffly chartaceous pale brown or subpruinose, almost flat valves separating along the ventral suture and along the lines of interseminal septa into narrowly oblong panels 5.5–9 mm wide and as long as pod's diam, permanently hinged along the dorsal suture to allow egress to the seeds; seeds strongly compressed parallel to valves, broadly obovate-disciform 6.5–8.5 × 4.5–5.5 mm, the testa glossy castaneous smooth or minutely pitted, the areole (sometimes indistinctly differentiated at one end) 1.5–3.3 × 0.5–1 mm.—Collections: 49.

Matorral, drought-deciduous brush-woodland and thickets in grassland, sometimes on pedregal, on barranca terraces, or surviving cultivation along walls and fences, local and discontinuously dispersed at ±1400–2240 m over parts of s.-centr. continental Mexico and (lower and greatly isolated) Baja California: around the s. foothills of the Central Plateau and adjoining Bajío in extreme n. Michoacán, Guanajuato, s. Querétaro and w. Hidalgo; apparently disjunct in centr. and n. Oaxaca and extreme s. Puebla; and in canyons near 500–750 m in desert mountains of middle Baja California Sur (Sa. de la Giganta and vicinity, lat. ±25°45'–26°45'N).—Fl. in continental Mexico V–IX, in Baja California following rains.

This species and closely related *S. galeottiana* are the only Mexican sennas characterized by a syndrome of glandless leaf-stalk, zygomorphic corolla and ventrally grooved style, and are unmistakable as soon as the broad flat, marginally winged pod takes form. The pod itself recalls that of some tropical forest caesalpinoids of which the fruit is wind-dispersed; but it is actually shed from the raceme only reluctantly by weathering, and release of the seeds is accomplished by escape through the independently detached panels of the valves.

Discontinuous dispersal has given rise to incipient racial differentiation in *S. polyantha*, but has not progressed to the point where definable taxonomic entities have emerged. The populations in Oaxaca tend to be more densely pubescent than those north of the Neovolcanic Range, but it is precisely there that the glabrate minor variant described as *Pterocassia rubricaulis* arose. We follow Standley (l.c.) in referring to *S. polyantha* the Baja Californian *Cassia goldmani*, an independently glabrate variant that is remotely allopatric and extratropical in dispersal. Britton & Rose attributed to *Pterocassia goldmani* leaflets narrower than those of *Pt. polyantha* and a glaucous pod. Subsequent collections have erased any difference in shape or width of leaflets between the continental and peninsular populations of the species, and the pod of *C. goldmani* is really not more than faintly pruinose. The leaflets of *C. goldmani* tend to be brighter green and of firmer texture than usual in interior Mexico, but this doubtless reflects the desert habitat. We can find nothing in the flower, pod or seed to distinguish it from genuine *S. polyantha* and speculate that it exists in protected canyons of Sa. de la Giganta as a relic of a once wider dispersal under moister conditions.

145. *Senna galeottiana* (Martens) Irwin & Barneby, comb. nov. *Cassia galeottiana* Martens, Bull. Acad. Roy. Bruxelles 10(2): 305 [=Enum. Synopt. Pl. Phanerog. ab H. Galeotti in reg. Mex. . . . 9: 4]. 1843.—“Se trouve dans les plaines cactifères de Tehuacan de las Granadas, de 5 à 6,000 pieds.”—Holotypus, *Galeotti* 3227, collected VIII.1840, BR! = BH

Neg. 2499; isotypi, BR, K! = NY Neg. 1418.—*Pterocassia galeottiana* (Martens) Britton & Rose, N. Amer. Fl. 23(4): 243. 1930.

Cassia galeottiana sensu Bentham, 1871, p. 547; Standley, 1922, p. 409.

Crooked xeromorphic drought-deciduous shrubs and treelets 2–5 m, closely related to *S. polyantha*, essentially similar in individual flower and pod but the lvs shorter and simpler, the primary ones early deciduous, the rest crowded on short lateral branchlets or fasciculate on brachyblasts, the young growth pilosulous with fine spreading hairs up to 0.2–0.7 mm, the lfts pilosulous on both faces or beneath only, the racemes borne erratically in axils of primary lvs or on brachyblasts, sometimes on defoliate old wood, only rarely forming a panicle terminal to hornotinous long-shoots.

Stipules heteromorphic, those of primary lvs (caducous, lacking from many spms) ovate or lance-acuminate 2.5–5 × 1.5–3 mm, the firm blades revolute, those of brachyblasts subulate 1–2 mm persistent.

Primary lvs 2–4.5(–5) cm, those of brachyblasts mostly 1–2.5 cm, the two sorts not further described independently; petiole including wrinkled pulvinus (1.5–)2–5.5 mm, at middle (0.3–)0.4–0.8 mm diam, narrowly grooved ventrally; rachis (0.4–)1–3.5 cm; gland 0; pulvinules 0.5–0.8(–1.2) mm; lfts (2–)3–8(–9, of some lvs at least 4) pairs, not or scarcely accrescent upward, the larger lfts obovate or oblong-obovate obtuse or emarginate 6–12 × 3–7 mm, 1.5–2.2 times as long as wide, membranous and revolute in flush of youth, firm plane in age, except for always dorsally prominulous midrib appearing veinless, or with 4–6 pairs of camptodrome secondary veins faintly raised on one or both faces.

Racemes densely 10–45(–75)-fld, the axis including peduncle becoming (1–)1.5–6.5(–9) cm; bracts early reflexed, the firm, broadly lance- or ovate-deltate-acuminate blade (2–)2.5–6 × (1.6–)1.8–4 mm, strongly revolute, persistent into, sometimes past anthesis, then deciduous; pedicels 10–34 mm; calyx, perianth, androecium and pistil of *S. polyantha*; ovules 10–15.

Pod essentially that of *S. polyantha* but subsessile, the stipe at most 2 mm long, the body (excluding sutural wings) 5.5–9 × 1.3–1.9 cm, the locules 5.5–7 mm long, as wide as the cavity, the valves often reddish when fresh, turning dark brown or pale tan, dull, faintly venulose, dehiscent as in *S. polyantha*.—Collections: 20.

Thorn forest and thin oakwoods on limestone and metamorphic bedrock, 1200–2000 m, known only from the Tehuacán Desert and vicinity in s.-e. Puebla and immediately adjoining Oaxaca.—Fl. III–VI, the fruits persisting into fall or winter.—*Rompebota*.

The dispersal and what little is known of the ecology of *S. galeottiana* suggest that it is a recent derivative of *S. polyantha*, its abbreviated and proportionately simplified leaves, most of which are fasciculate or closely crowded on brachyblasts, being selectively adapted to the extremely severe conditions of the Tehuacán Desert. In summer 1906 C. A. Purpus made several collections of both species in the region of San Luis Tultitlanapa on the Puebla–Oaxaca border, but unfortunately recorded nothing of their habitats. It must be expected, nevertheless, that where their ranges coincide the two species are separated by altitude, microclimate or bedrock. We have some misgivings about the specific status of *S. galeottiana*, for in the detached flower and the pod it is essentially identical to *S. polyantha*. Its firm green reflexed and revolute floral bracts and similarly modified stipules are, with the diminished foliage and an inflorescence on the average less prolific and more lateral than terminally paniculate, the sum of differential characters perceptible in the herbarium.

C. Sectio ASTROITES Irwin & Barneby

Senna sect. **Astroites** Irwin & Barneby, stat. et nom. nov. *Desmodiocassia* Britton & Rose, N. Amer. Fl. 23(4): 244. 1930, pro gen.—Generitypus: *D. villosa* (P. Miller) Britton & Rose ≡ *Cassia villosa* P. Miller ≡ **Senna villosa** (P. Miller) Irwin & Barneby.

Cassia sect. *Prososperma* ser. *Confertae* Benthām, 1871, p. 536, ex parte, exclus. typ.

Corolla zygomorphic, the 2 abaxial petals alike; sepals subequilong; fertile stamens 7, subisomorphic except the 3 adaxial a trifle longer and more incurved, all anthers slenderly lanceolate in profile, tapering to truncate 1-porose apex, their walls thin-textured, brown-striped laterally; style filiform, gently incurved, the stigmatic cavity minute, obliquely terminal; ovules 8–18; pod undulately moniliform, constricted at interseminal septa, when ripe breaking up into ellipsoid, laterally compressed, longitudinally ridged 1-seeded achenes; seeds basipetal, compressed parallel to valves; areole present.—Subarborescent shrubs, scabrous-tomentulose with stellate hairs; lfts 3–5 pairs; petiolar glands 1–3.—Sp. 1, of tropical s.-e. Mexico and the Cape region of Baja California; naturalized on Bahamas.

Senna villosa has the equilong sepals, the androecium and the seeds of ser. *Brachycarpae*, from which we exclude it because of the lomentiform pod and the stellate vesture, unique in *Senna*. Insofar as it breaks up when ripe into one-seeded achene-like segments the pod resembles that of *S. skinneri* and *S. spinescens*, but the androecia of these are so different that we assume the hedysaroid pod to have evolved by parallel paths. Benthām associated *S. villosa* with *S. uniflora* in a series *Confertae* of sect. *Prososperma*, of which the diagnostic character was basipetal orientation of the seeds, not in our view fundamentally significant. *Senna uniflora* differs from *S. villosa* in its annual life-span, an autogamous flower, a recurved and dilated style, and introrsely porose anthers, while its pod-valves, although impressed between seeds, are continuous throughout and dehisce normally, if sometimes only quite tardily, through the sutures. *Senna villosa* appears so isolated in the genus as to deserve the status of a monotypic section.

- 146. *Senna villosa*** (P. Miller) Irwin & Barneby, comb. nov. *Cassia villosa* P. Miller, Gard. Dict. ed. 8, *Cassia* no. 4. 1768.—“*Senna spuria arborea villosa* . . . siliquis articulatis. Houst[on] MSS . . . sent me from Campechy by the late Dr. Houston . . .”—Holotypus, collected in Campeche in 1730, ticketed successively by Houston and by Miller, BM! = BH Neg. 5166 = NY Neg. 162.—*Desmodiocassia villosa* (P. Miller) Britton & Rose, N. Amer. Fl. 23(4): 244. 1930.

Cassia astroites Chamisso & Schlechtendal, Linnaea 5: 597. 1830.—“H[erb.] W[illd.] no. 7963 (specimen, e Willd., Humboldtianum. Amer. merid. [but certainly Mexican and, not noticed by Kunth, probably not from Humboldt]) . . . Plan del rio [Veracruz, Schiede & Deppe 702].”—Lectoholotypus, WILLD-7963, B! No paratypes (*Schiede & Deppe* 702) found.—*Chamaefistula astroites* (Chamisso & Schlechtendal) G. Don, Gen. Hist. Dichl. Pl. 2: 451. 1832.—Correctly equated with *C. villosa* by Benthām, 1871.

Cassia geniculata G. Don, Gen. Hist. Dichl. Pl. 2: 440. 1832.—“Native of Peru (v.s. in herb. Lamb[ert].).”—Presumed holotypus, labelled ‘Peru’ by Pavón but certainly Mexican and collected probably by Sessé or associates, BM! = NY Neg. 167; isotypus, G!—Correctly equated with *C. villosa* by Benthām, 1871.

Cassia geniculata Sessé & Mociño, Pl. Nov. Hisp. 60. 1894.—“Habitat Metepec [not located by McVaugh, 1977, p. 169; the places of this name in Hidalgo, Puebla and Mexico are all in

tierra templada and thus improbable type-localities].”—Holotypus, sub nom. ined. “*Cassia armillaris* Sessé,” MA (hb. S. & M. 1134, 1162)! both probably isotypi of the preceding.

Cassia articulata Rose, Contrib. U.S. Nat. Herb. 12: 266. 1909.—“Collected by C. A. Purpus at San Pablo, near San José del Cabo, Lower California in 1901 (no. 287, type) and by Nelson and Goldman between Miraflores and San Bernardino [properly Bernardo] ranch in Sierra La Laguna . . . January, 1906 (no. 7419).”—Holotypus, US (no. 470361)! paratypi (*Nelson & Goldman* 7418), NY, US!—Correctly equated with *C. villosa* by Standley, 1922, p. 406.

Cassia stellata M. E. Jones, Extracts from Contrib. W. Bot. 18: 40. 1933.—“No. 27196, Cacachilla mts, L[ower] Cal[ifornia], Oct. 2, 1930 and at Triunfo, No. 27200, Oct. 7.”—Lectoholotypus (Morton, Contrib. U.S. Nat. Herb. 29(3): 100. 1945): *Jones* 27196, POM (no. 191866)! isotypus, NY! paratypus, *Jones* 27200, US!—Correctly equated by Morton, l.c., with *C. villosa*.

Cassia astroites sensu Vogel, 1837, p. 41.

Cassia villosa sensu Bentham, Hook. Icon. 11: t. 1060. 1870 & 1871, p. 536.

Amplly leafy, sometimes arborescent shrubs at anthesis 1–4 m, densely scabrous-tomentulose throughout with thick-stalked gray or lutescent stellate hairs in profile 0.2–0.7(–1.1) mm tall, the thick-textured foliage bicolored, dull dark green above, paler beneath, the inflorescence of racemes either all axillary to cauline lvs or some late ones forming a small, shortly exerted subcorymbose panicle.

Stipules erect, narrowly linear-attenuate or setiform 3.5–6 mm, caducous.

Lvs 6–17 cm; petiole including swollen but not wrinkled pulvinus 1.5–3.5(–4.3) cm, at middle 0.8–1.8 mm diam, rounded dorsally, shallowly narrow-sulcate ventrally; rachis (1.3–)2.5–8 cm; glands (often eaten) between proximal and sometimes 1–2 next succeeding (but not the distal) pairs of lflets, stipitate or subsessile, in profile 1.3–3 mm tall, the stipe and commonly the head also stellate-pubescent, the latter either slenderly or squatly ovoid, acute or obtuse 0.4–1.2(–1.6) mm diam; pulvinules 1–2.5 mm; lflets (2–)3–5, of most lvs either 3 or 4 pairs, accrescent distally, the distal pair lance- or elliptic-acuminate, ovate-elliptic, ovate-acuminate or obliquely ovate and deltately subacute (2–)2.7–8 × (1.8–)1.2–2.7 cm, 2.2–3.8 times as long as wide, at oblique base cordate to rounded on proximal and rounded to cuneate on distal side, the margin revolute, the midrib and (5–)6–9(–10) pairs of incurved-ascending camptodrome secondary nerves immersed above, finely prominent beneath, the tertiary venulation imperceptible.

Peduncles 1–3.5(–5) cm; racemes densely 5–25-fl'd, the axis somewhat elongating, becoming 3–30 mm; bracts subulate-filiform 2–5 mm caducous; pedicels slender 6–13 mm; fl-buds oblong-ellipsoid obtuse, nodding when young; sepals submembranous, densely stellate dorsally except where interior in veneration, of nearly equal length, elliptic-oblong 5–8 mm; petals pale yellow fading whitish brown-veined, glabrous dorsally, subhomomorphic except the 2 abaxial a trifle longer, all obovate-cuneate obtuse or subemarginate, the longest 7.5–10 × 4–6 mm; androecium glabrous or the filaments remotely stellate, functionally 7-merous, the filaments alternately a little longer (oppositisepalous) and shorter 1.6–2.7 mm, the linear-lanceolate anthers brown when dry, not much differentiated, those of 4 median stamens nearly straight 3.1–4 mm truncate, those of 3 abaxial ones a trifle longer, 3.8–5 mm, and more incurved, constricted 0.2–0.4 mm below the somewhat oblique 1-pored orifice; ovary densely stellate-tomentulose; style glabrous, gently incurved 2–2.5 mm, at attenuate apex ±0.2 mm diam; ovules (8–)10–18.

Pod obliquely pendulous, the stipe 2–4 mm, the body in profile undulately moniliform 6–10 × 0.4–0.55 cm, laterally compressed, slenderly carinate by the sutures, constricted between the seeds, the isthmi 1.5–4 mm wide, the seed-locules 5–8 mm long, when ripe separated in the form of achenes, the firmly

papery green, brunnescient valves densely stellate, elevated over each seed as a narrow ridge oriented lengthwise to the pod; seeds basipetally vertical to the long axis of pod, obovoid compressed parallel to valves, $3.7\text{--}4.5 \times 2.6\text{--}3.1$ mm, the testa fawn- or chocolate-brown smooth but not or scarcely lustrous, crackled, the subcentric areole oval $(0.7\text{--})0.8\text{--}1.5 \times (0.5\text{--})0.6\text{--}1$ mm.—Collections: 44.—Fig. 9 (petiolar nectary), 14 (pod, seed).

Scrub thickets and brushy canyon slopes, 10–1600(–1860) m, in continental Mexico (and presumably Bahamas) often calciphile, local, s.-e. Mexico from centr. Veracruz to Yucatán, the headwaters of Río Grande in Chiapas, s.-e. and centr. Oaxaca, and Puebla, in the two latter states entering the Pacific drainage; remotely disjunct in the foothills of the Cape mountains in s. peninsular Baja California; and (perhaps naturalized) on New Providence I. in the Bahamas.—Fl. in continental Mexico VIII–I; on the Cape V–X.

The singular stellate hairs which clothe the stems, foliage, inflorescence and pod of *S. villosa* are composed of a thickened, often yellowish or rufescent stalk bearing on its summit a tuft of fine radiating and ascending whitish filaments. The whole trichome suggests a diminutive sea anemone and is unique in *Senna* to this one species.

The populations of *S. villosa* on the Cape mountains of Baja California differ from those of continental Mexico in the less obviously acuminate leaflets and somewhat less pronounced constriction of the pod valves between seeds, the isthmi being 3–4 (not 1.5–3) mm wide. These slight differences, expectable in the circumstances, are insufficient for taxonomic recognition.

