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A REVIEW OF THE ARBOREAL AFROTROPICAL ANT GENUS *AXINIDRIS*

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ABSTRACT

The species of the Afrotropical genus *Axinidris* are here reviewed. The type species is recharacterized following the discovery that the two type specimens have been artificially abraded of almost all pilosity. Thirteen species were recognized by Shattuck (1991) in his revision of the genus. New data extend the ranges of several previously described species and eight new species are described: *A. gabonica* (Gabon), *A. icipe* (Kenya), *A. lignicola* (South Africa), *A. luhya* (Kenya), *A. mlalu* (Central African Republic), *A. namib* (Namibia), *A. okekai* (Kenya) and *A. stageri* (Tanzania). *Technomyrmex hypoclinoides* Santschi is here transferred to *Axinidris* (**new combination**) with *A. parvus* Shattuck as a junior synonym (**new synonymy**). A key is given for the separation of the workers of all known species and the new species are illustrated.

KEY WORDS: Hymenoptera, Formicidae, Dolichoderinae, systematics, *Axinidris*, Afrotropical.

INTRODUCTION

Axinidris is an exclusively Afrotropical genus of arboreal ants, first described by Weber (1941) for a single bizarre Sudanese species, *A. acholli* Weber. The genus was recharacterized by Shattuck (1991), two species were transferred from *Engramma* Forel, 1905 (subsequently treated as a synonym of *Technomyrmex* Mayr, 1872, by Shattuck, 1992), and ten new species were described. An additional eight species are described below and it thus seems likely that the actual diversity of this genus is not yet fully realized, given that most species remain known either from type specimens and/or from only one or two localities.

Species of *Axinidris* appear to nest exclusively within hollow plant stems, both living and dead, and in rotten wood. They are found in forested areas throughout the Afrotropical region, but are most abundant and diverse in the moist equatorial forests. Workers are primarily arboreal foragers, but may occasionally forage in ground litter.

SPECIMENS EXAMINED

The material on which this study is based has come from the following institutional collections:

Alexander Koenig Research Institute and Museum of Zoology, Bonn, Germany (AKRI)
California Academy of Sciences, San Francisco, USA (CASC)
Museum of Comparative Zoology, Harvard University, Cambridge, USA (MCZC)
Natural History Museum of Los Angeles County, Los Angeles, USA (LACM)
Naturhistorisches Museum, Basle, Switzerland (NHMB)
South African Museum, Cape Town, South Africa (SAMC)
The Natural History Museum, London, UK (BMNH)

Voucher specimens of my field work have been placed in most of these institutions, as well as:

International Centre of Insect Physiology and Ecology, Nairobi, Kenya (ICIPE)
National Museum of Kenya, Nairobi, Kenya (NMKC)

MEASUREMENTS AND DEFINITIONS

Measurements of morphological features were made at 50× using a Leitz stereo microscope, with a dual-axis stage micrometer wired to Autometronics digital readouts. Measurements were recorded in thousandths of a millimeter, but are here expressed to the nearest hundredth. Head measurements were made in full-face (frontal) view, as in Shattuck (1991).

The Scanning Electron Microscope (SEM) images were made using a Hitachi S-3000 SEM.

Terms for surface sculpture follow those of Harris (1979). Shattuck (1991) utilized the same terminology and defined the varieties of surface sculpture as follows: colliculate: continuously covered with low, rounded elevations; coriarius: leather-like, with minute cracks; imbricate: appearing similar to shingles on a roof, i.e., slightly overlapping; punctate: with small pits; scabriculous: with fine and regular, short sharp wrinkles and/or projections; strigulate: with numerous short, fine raised lines. To these may be added: smooth: with no apparent surface sculpture other than punctures; rugae: coarse, raised lines or ridges, sometimes parallel, sometimes irregularly anastomosing, forming coarse reticulae or foveae.

Descriptive terminology employed here differs somewhat from that of Shattuck in the following particulars. I consider the ant head to be hypognathous rather than prognathous, so the vertex (see below) is dorsal and the mandibles are ventral. Mesosomal length (ML) is substituted for Shattuck's "alitrunk length or AL". Ocular Index (OI) is an established term in ant systematics and is

substituted for REL (Relative Eye Length). Instead of the morphologically incorrect "occiput" (as noted by Bolton, 1994) employed by Shattuck I use vertex. Appropriate changes are thus necessary for several anagrams used by Shattuck (see below). In the descriptions below, the expression "distance between [propodeal] spines" means the distance across the apices of the spines. Reference to the profile of the medial carina of the propodeum is to its appearance at the summit of the declivity.

Cephalic Index (CI): $(HW/HL)(100)$. Note: This is the conventional definition of CI and expressed as a whole number rather than as a fraction as in Shattuck's revision.

Clypeal Notch Depth (CND): measured from midpoint of a line drawn across ventral-most projecting points of the clypeus to the dorsal-most point of the concavity.

Clypeal Notch Index (CNI): $(CND/CNW)(100)$. Note: This is a modification of Shattuck's method, allowing the expression as a whole, rather than fractional, number.

Clypeal Notch Width (CNW): measured between the ventral-most projecting points of the clypeal notch (contact areas of a line drawn across notch opening).

Eye Length (EL): measured in full face (frontal) view.

Eye Width (EW): measured in full face view.

Head Length (HL): measured in full face view, from uppermost margin of vertex to free margin of clypeus.

Mesosomal Length (ML): measured from anterior-most point of the pronotum (exclusive of neck) to the posterior-most point of the propodeal processes (= AL of Shattuck).

Ocular Index (OI): $(EL/HL)(100)$ (= REL of Shattuck); this is the conventional anagram.

Oculo-vertexal Distance (OVD): Distance between upper eye margin and a line drawn across the dorsal margin of the vertex (= OOD of Shattuck).

Pronotal Width (PNW): maximum width of pronotum in dorsal view. Note: Most of the borrowed types had been returned before I discovered that Shattuck's measurements did not include PNW; in the measurements given below, in such cases I have indicated after PNW n/a (not available).

Propodeal Width (PPW): maximum width of propodeum in dorsal view. (Note: after I had returned most of the type specimens borrowed, I found that Shattuck (1991) had not included this measurement among those that he had made; in such cases PPW is annotated n/a)

Scape Index (SI): $(SL/HW)(100)$ (= ScI of Shattuck); this is the conventional anagram.

Scape Length (SL): maximum length of scape, excluding basal condyle.

SYSTEMATICS

Workers and queens of *Axinidris* may be recognized among the Dolichoderinae by the following suite of characters: clypeus with distinct median notch on free margin; metapleural gland opening large, approximately circular and surrounded by long, stiff straight hairs; propodeum armed with spines or tubercles located near the dorsal margin of the declivitous face, generally short and rounded but may be reduced to mere angles, or more strongly developed as elongate spines that are curved dorsad; propodeal spiracle near dorsal face of propodeum and with at least anterior margin raised on a slight to strong projection, spiracular opening thus directed more or less distad; propodeum usually with elongate median ridge or carina, sometimes sharply elevated and compressed; petiolar node reclinate, narrowly rounded to subacute dorsally, strongly inclined posteriorly; in worker and queen, gaster with only four exposed terga in dorsal view, tergum 5 situated beneath tergum 4. Males are similar to those of *Technomyrmex*, from which they differ in the evenly arched profile of the petiolar node, which is not concealed by the first gastral segment as seen in dorsal view.

KEY TO *AXINIDRIS* WORKERS

- 1 Propodeal ridge cariniform or absent; pronotal dorsum evenly rounded at sides 2
 -- Propodeal ridge compressed and strongly elevated, axiniform (Fig. 11); pronotal dorsum submarginate at side (Sudan; Kenya)..... *acholli* Weber
- 2(1) Pronotum and antennal scape shaft without erect hairs; gastral terga usually without erect hairs 3
 -- Pronotum with at least two erect hairs (caution: one or both, if only two are normally present, may be broken off or lying on the surface); antennal scape shaft and gastral terga with or without erect hairs 10
- 3(2) Medial carina present at least on posterior half of dorsal face & at least slightly elevated at summit of declivity; propodeal spines various, but often more elongate and with surface between them concave in dorsal view 4
 -- Medial carina absent from entire length of dorsal face; propodeal spines triangular in dorsal view and surface between them straight *bidens* Shattuck (part)
- 4(3) Pronotal dorsum conspicuously imbricate and only slightly shiny; mesonotum, mesepisternum and propodeum duller, finely and contiguously punctate; dorsal surfaces with abundant prostrate pubescence; distance between outer margins of propodeal spines subequal to width of propodeum at spiracles 5
 -- Pronotum and mesepisternum smooth and shiny, contrasting sharply with finely and contiguously punctate propodeum; pronotum with scattered prostrate pubescence; distance between outer margins of propodeal spines much less than width of propodeum at spiracles 7
- 5(4) Vertex without erect hairs; gastral terga without erect hairs 6
 -- Vertex with one pair of short erect hairs below dorsal margin; gastral terga 3 and 4 each with several erect hairs (Liberia) *occidentalis* Shattuck
- 6(5) Head longer than broad; head and body dark brown, lower half of clypeus, mandibles, most of scape yellowish red; meso- and metatarsi whitish (Kenya)..... *icipe*, new species
 -- Head broader than long; head and body black, hypostomal area, head below, mandibles and legs reddish black; tarsi dark yellowish red (Kenya) *kakamegensis* Shattuck
- 7(4) Propodeal carina low and right-angular to obtuse in profile (Figs. 17, 18)..... 8
 -- Propodeal carina elevated and acute in profile (Malawi; South Africa) .. *tridens* (Arnold)
- 8(7) At least fourth gastral tergum with at least 2 erect hairs; head and body light to dark brown. 9
 -- Third and fourth gastral terga without erect hairs; head and mesosoma light reddish, petiole and first gastral segment yellowish (Central African Republic) *mlalu*, new species
- 9(8) Hypostomal area without erect or suberect hairs; longest hair on fourth tergum about 0.10mm long and vertex hair about 0.66 x length of that on frontal lobe (Kenya; Cameroun)..... *okekai*, new species
 -- Hypostomal area with several short erect and suberect hairs; longest hair on fourth tergum about 0.06mm long and longest vertexal hairs about 0.60 x length of that on frontal lobe (Namibia)..... *namib*, new species

- 10(2) Propodeum without medial carina and lateral spines virtually absent in dorsal view; pronotum with one pair of long erect hairs and propodeal spines each with similar hair; clypeal notch broad and shallow (CNI less than 75)..... 11
- Propodeum with distinct medial carinae which, at summit of declivity, is usually a low obtuse lobe, less often sharply elevated or dentiform; pilosity various, but usually not as above; clypeal notch relatively narrow, CNI usually over 100, but if as little as 80, then medial carina sharply defined 12
- 11(10) Head and body medium to dark brown; gena distinctly finely imbricate; larger species, HW consistently over 0.50mm (Ghana; Cameroun; Kenya) *bidens* Shattuck (part)
- Head and body light reddish yellow, gaster sometimes slightly darker; gena smooth and shiny, sometimes weakly imbricate; smaller species, HW usually less than 0.50mm, but may range up to 0.52mm (Liberia; Democratic Republic of Congo; Kenya) *hypoclinoides* (Santschi)
- 12(10) Distance between outer margins of propodeal spines, in dorsal view, equal to or exceeding width of propodeum at spiracles; pronotum dull and closely pubescent, surface coarsely imbricate or punctate 13
- Distance between outer margins of propodeal spines, in dorsal view, distinctly less than width of propodeum at spiracles and/or pronotum shiny and sparsely pubescent, surface weakly imbricate..... 14
- 13(12) Erect hairs of head and mesosoma brown, coarse and seta-like; propodeal spines short, no longer than thick in profile (Ghana)..... *nigripes* Shattuck
- Erect hairs of head and mesosoma yellowish and fine, not seta-like; propodeal spines distinctly longer than thick in profile (Kenya)..... *luhya*, new species
- 14(12) Mesonotum either smooth and shiny between several short longitudinal rugae or slightly shiny and coarsely rugulose 15
- Mesonotum moderately shiny, anteriorly finely imbricate, posteriorly duller and densely punctulate 16
- 15(14) Mesonotum smooth and shiny between short longitudinal rugae; head and body light reddish brown (Tanzania) *stageri*, new species
- Mesonotum slightly shiny and coarsely rugulose; head and body dark brown (South Africa) *lignicola*, new species
- 16(14) Scape shaft with fine prostrate pubescence, but no suberect to erect hairs; front of head, exclusive of clypeus, with six hairs (two along each frontal carina and two on upper frons) 17
- Scape shaft with at least one or two short erect hairs in addition to appressed pubescence; front of head, exclusive of clypeus, with two hairs along each frontal carina and four or more on frons 19
- 17(16) Distance between outer margins of propodeal spine apices distinctly less than width of propodeum at level of spiracles; frons and vertex moderately shiny, weakly imbricate and with scattered weak punctures; gaster concolorous with mesosoma..... 18
- Distance between outer margins of propodeal spine apices at least equal to width of propodeum at level of spiracles; frons and vertex weakly shiny, contiguously finely

- punctate and strigulate; mesosoma brown, gaster yellowish red (Ghana)
 *palligastriion* Shattuck
- 18(17) Medial carina broadly rounded in profile; second gastral tergum moderately shiny and
 densely punctate (Republic of Congo)..... *denticulata* (Wheeler)
 -- Medial carina subacute in profile; second gastral tergum shiny between sparse punctures
 (Ghana) *ghanensis* Shattuck
- 19(16) Pronotum with at least two fully erect hairs in addition to humeral pair; frons slightly shiny
 to shiny, varying from finely colliculate to weakly coriarius and scabriculous 20
 -- Pronotum with only two long fully erect hairs, one at each humerus; frons shiny, varying
 from smooth to obscurely coriarius (Gabon) *gabonica*, new species
- 20(19) Scape shaft distinctly with six or more short erect hairs; frons slightly shiny, finely
 colliculate to imbricate..... 21
 -- Scape shaft with only one or two very short erect hairs; frons shiny, weakly coriarius
 (Nigeria) *kinoin* Shattuck
- 21(20) Body color reddish yellow; gaster yellow, similar in color to posterior portion of petiole
 (Ghana) *hylekoites* Shattuck
 -- Entire head and body reddish brown, gaster darker than posterior portion of petiole
 (Cameroun; Ghana; Kenya) *murielae* Shattuck

Axinidris acholli Weber

Figures 1, 11, 21

Axinidris acholli Weber, 1941: 193 (w). **SUDAN**: Imatong Mountains, 4800 and 6200 ft. (N.A. Weber) (MCZC) *examined*. Shattuck, 1991: 109-111; figs. 5-7, 35.

Worker diagnosis. Pronotal disc with 8-10 coarse rugae that more or less diverge behind; mesepisternum with 4 or 5 coarse longitudinal to oblique rugae; medial propodeal carina compressed and conspicuously higher than long and longer dorsally than at base; head and body with abundant long, slender whitish hairs.

Worker measurements (mm) ($n = 12$). HW 0.79-0.90; HL 0.91-1.01; SL 0.79-0.88; EL 0.18-0.23; EW 0.11-0.13; OVD 0.36-0.42; PNW 0.46-0.59; PPW 0.33-0.40; WL 1.08-1.29. **Indices.** CI 85-91; CNI 71-87; OI 23-26; SI 95-103.

Worker description. The worker caste has been adequately described by Shattuck (1991), except for the presence of numerous long flexuous hairs as noted above in the diagnosis.

Queen and male unknown.

SPECIMENS EXAMINED

In addition to the lectotype and lectoparatype, I have collected numerous workers from **KENYA**, Kakamega District, Isecheno, Kakamega Forest (00.24°N 034.85°E), 1550-1600m (LACM), running on vines, except two in litter. All specimens were in dense forest as opposed to being on trees at the edge of a clearing.

DISCUSSION

The bizarrely developed propodeal structures (Figs. 11, 21) are sufficient to separate *A. acholli* from all the known remaining species. Additionally, no other species is known that has such an abundance of long, flexuous white hairs. Only *A. lignicola* and *A. stageri* are almost as hairy, but in both the propodeal structures are much less extreme, the hairs are shorter and straighter, and the antennal scapes are proportionately much shorter.

I had originally regarded the Kenyan specimens as a previously undescribed species. When I examined the two type specimens of *A. acholli*, however, I began to doubt that this was correct. The only difference that I could discern was that the Kenyan specimens were abundantly hairy while the *A. acholli* types were almost completely devoid of hairs. The type specimens, lectotype and lectoparatype, consist of fragments mounted on points. The lectotype head has only a single antenna. The lectoparatype is in even worse condition: the head lacks antennae, the mesosoma is partly broken, and only a single detached hind leg is present. Both specimens appear to be severely abraded, lacking hairs where all other species possess hairs (e.g., the mandibles, clypeus, frontal carinae). Once it was clear that these poor specimens had been artificially denuded, it was obvious that my fresh Kenyan samples were conspecific.

In addition to Sudan and Kenya, I expect that *A. acholli* will also be found in Uganda and the Democratic Republic of Congo, at the very least.

Axinidris bidens Shattuck

Figures 2, 12, 22

Axinidris bidens Shattuck, 1991: 111-112; figs. 8-10, 35 (w). **GHANA:** Tafo (C. Campbell) (BMNH) *examined*.

Worker diagnosis. Pronotal humeri and propodeal spines each with a single long fully erect hair, mesosoma otherwise without erect hairs; antennal scape shaft without erect hairs; medial carina absent and propodeal spines distinct.

Worker measurements (mm) ($n = 12$). HW 0.51-0.62; HL 0.62-0.70; SL 0.42-0.50; EL 0.14-0.19; OVD 0.24-0.29; PNW 0.33-0.38; PPW 0.18-0.26; WL 0.79-0.92. **Indices.** CI 80-89; CNI 50-80; OI 26-34; SI 75-85.

Worker description. The worker caste has been adequately described by Shattuck (1991).

Queen measurements (mm) ($n = 4$). HW 0.62-0.63; HL 0.77-0.81; SL 0.50-0.51; EL 0.21-0.23; OVD 0.29-0.32; PNW 0.51-0.58; PPW 0.37; WL 1.05-1.17. **Indices.** CI 76-82; CNI 80; OI 33-38; SI 80-83.

Queen description. Generally similar to worker but a little larger and with more elongate head; mesosoma fully developed for flight; interocular distance $1.61-1.87 \times$ EL; interocellar distance $3 \times$ diameter of median ocellus; ocellocular distance about $6 \times$ diameter of median ocellus; medial carina absent; sculpture and pilosity similar to those of worker; mesonotum and metanotum each with a single long erect hair on each side; gastral pilosity about as in worker, but appressed pubescence sparser; total length about 2.5mm.

Male unknown.

SPECIMENS EXAMINED

In addition to the three type specimens I have examined samples from the following localities. **CAMEROUN**, Southwest Prov., Big Ngwandi, Rumpi Hills (LACM). **CENTRAL AFRICAN REPUBLIC**, Res. Dzanga-Sangha (CASC). **KENYA**, Kakamega Distr., Buyangu, Isecheno and Kisere, all in Kakamega Forest, 1550-1600m (AKRI, LACM).

DISCUSSION

The samples from Cameroun were collected from living stems of *Leonardoxa africana*. At Isecheno I collected workers running on a fallen tree trunk. One colony collected at Isecheno, on 30 April 2003 from a living stem of *Acanthus eminens* consisted of a single queen and 44 workers in addition to 19 pupae (17 workers). Alate queens were collected from colony samples in Cameroun during the month of November. This species has been collected by Thomas Wagner while fogging *Teclea nobilis*, a common forest tree species. Other fogging samples, collected by W. Freund, included some from *Heinsenia diervillioides*, in addition to *T. nobilis*. These data suggest that *A. bidens*, and probably all species of *Axinidris*, are able to utilize stems or branches of a wide variety of plant species as nesting sites.

Automontage images of this species (as *Axinidris* sp. 3) may be viewed at www.antweb.org.

Axinidris denticulata (Wheeler)

Engramma denticulatum Wheeler, 1922: 205; fig. 51 (w). **DEMOCRATIC REPUBLIC OF CONGO**, between Lukolela and Basoko (H.O. Lang) (MCZC) *examined*.

Axinidris denticulatum: Shattuck, 1991: 112-114; figs. 11-13, 35.

Axinidris denticulata: Bolton, 1995: 77.

Worker diagnosis. Antennal scape without and pronotum with erect hairs; medial carina present and distance between spines less than PPW; mesonotum without rugae; medial carina rounded in profile; gastral tergum 2 densely punctate.

Worker measurements (mm) ($n = 1$). HW 0.71; HL 0.79; SL 0.62; EL 0.19; OVD 0.30; PNW 0.44; PPW 0.37; WL 0.91. **Indices.** CI 90; CNI 153; OI 27; SI 88.

Worker description. The worker caste has been adequately redescribed by Shattuck (1991).

Queen and male unknown.

DISCUSSION

This species is still known only from the three type specimens. Shattuck (1991) selected as lectotype the only specimen that is in fair condition; the two lectoparatypes are so covered with mold that they are nearly worthless for diagnostic purposes.

Axinidris gabonica, new species

Figures 3, 13, 23

Worker diagnosis. Antennal scape with sparse short erect hairs; upper frons and pronotum each with two long erect hairs; gastral terga 3-4 each with one pair of long erect hairs; propodeal spines short and thick; head and body mostly shiny.

Worker measurements (mm) ($n = 3$). HW 0.77-0.83; HL 0.83-0.90; SL 0.72; EL 0.21-0.22; OVD 0.28-0.30; PNW 0.50-0.56; PPW 0.36-0.40; WL 1.01-1.10. **Indices.** CI 91-94; CNI 117-140; OI 25-26; SI 86-93.

Worker description. Head shiny, frons weakly coriarius between sparse distinct punctures, more strongly sculptured on frontal area; gena and malar area shinier and almost smooth. Antennal scape shafts with a few widely spaces fine erect hairs; frons, below vertex, with 1 pair of long erect hairs and a shorter pair near upper end of frontal carinae and a still shorter pair at lower end of carinae; clypeus with about 6 long erect hairs.

Pronotum shiny and nearly smooth between distinct sparse punctures and with a single long erect hair near each humerus (Fig. 13). Mesonotum similar to pronotum, but narrowly contiguously punctate posteriorly. Metanotal spiracles elevated but appressed to base of propodeum, not conspicuous in profile. Mesepisternum largely smooth and shiny anteriorly, becoming duller and contiguously punctate posteriorly. Propodeum slightly shiny, contiguously to subcontiguously punctate; spiracular prominence weak and spiracular opening directed distad; medial carina present on posterior half of dorsal face, absent from declivitous face, slightly elevated at summit of declivity and low and broadly rounded in profile; propodeal spines short and blunt, obtuse in dorsal view with straight outer margins, distance between outer margins of apices distinctly less than distance between spiracles.

Gastral terga shiny, smooth to weakly coriarius; T3-T4 each with a single long erect hair on each side; appressed pubescence sparse.

Head blackish, body dark brown; distal portion of mandible yellowish, with reddish yellow teeth; legs brown, distitarsi yellowish; petiole mostly whitish.

Queen and male unknown.

TYPE MATERIAL

Holotype worker, **GABON**, Prov. Ogoové-Maritime, Réserve des Mons Doudou, 25.2 km 304° NW Doussala (2°13.63'S 10°23.67'E), 660m, 17 March 2000 (S. van Noort), sweeping in coastal lowland rainforest. **Paratypes:** 2 workers, same data as holotype, 2 workers, same except 16 March 2000. Holotype and 2 paratypes in CASC; 1 paratype in LACM.

ETYMOLOGY

The name is derived from that of the country of origin.

DISCUSSION

This species will run to *A. murielae* Shattuck in the key by Shattuck (1991), but is immediately separable by the scarcity of erect hairs on the vertex and frons. The general habitus is similar, but *A. gabonica* is darker, and in both species the punctures of the frons and pronotum are relatively coarse.

Axinidris ghanensis Shattuck

Axinidris ghanensis Shattuck, 1991: 114; fig. 35 (w). **GHANA**, Mampong (P. Room) (BMNH) *examined*.

Worker diagnosis. Antennal scape without and pronotum with erect hairs; medial carina present and subacute in profile; distance between spines less than PPW; gastral tergum 2 shiny and sparsely punctate.

Worker measurements (mm) ($n = 1$). HW 0.76; HL 0.83; SL 0.66; EL 0.21; OVD 0.30; PNW n/a; PPW 0.34; WL 0.98. **Indices.** CI 91; CNI 150; OI 28; SI 86.

Worker description. The worker caste has been adequately described by Shattuck (1991).

Queen and male unknown.

DISCUSSION

This species is known only from the single worker holotype. Nothing is known of its biology, although it is assumed to be arboreal. The most similar species is *A. luhya*, described below, from which it differs as detailed under that species.

Axinidris hylekoites Shattuck

Axinidris hylekoites Shattuck, 1991: 114; figs. 14-16 (w, q). **GHANA**, Tafo (B. Bolton) (BMNH) *examined*.

Worker diagnosis. Head and mesosoma reddish, gaster yellow; scape and pronotum each with 4 or more erect hairs; medial carina present; distance between spines less than PPW.

Worker measurements (mm) ($n = 4$). HW 0.69; HL 0.76-0.79; SL 0.57-0.61; OVD 0.25-0.27; PNW n/a; PPW 0.32-0.33; WL 0.71-0.92. **Indices.** CI 88-91; CNI 77-119; OI 25-28; SI 83-88.

Worker and Queen have been adequately described by Shattuck; the **male** caste remains unknown.

DISCUSSION

This species is known only from the several specimens comprising the type series. They were collected from a nest in a rotten tree branch.

As Shattuck (1991) originally noted it is most similar to *A. murielae* but differs in the lighter body color. The surface sculpture of the head is slightly coarser and the propodeal spines slightly wider; this latter difference is almost certainly sufficiently variable as to be of little value.

Axinidris hypoclinoides (Santschi) **new combination**

Figures 9, 19, 29

Technomyrmex hypoclinoides Santschi, 1919: 89-90; (w). **DEMOCRATIC REPUBLIC OF CONGO** (= Belgian Congo, Avakubi, 6 Jan. (J. Bequaert) (NHMB).

Axinidris parvus Shattuck, 1991: 118; fig. 35 (w). **LIBERIA**, Paiata (= Payeta) (J. Bequaert) (MCZC) *examined*. **NEW SYNONYMY** (B. Bolton, *pers. comm.*).

Worker diagnosis. Antennal scape shaft without erect hairs and pronotum (Fig. 19) with 1 pair of long erect hairs and each propodeal spine with 1 long erect hair; head (excluding clypeus) with 2

pairs of erect hairs; medial propodeal carina absent; first tergum with 2 long erect hairs; gena shiny and finely imbricate; head and body yellow.

Worker measurements (mm) ($n = 10$). HW 0.45-0.52; HL 0.53-0.62; SL 0.38-0.42; EL 0.13-0.17; OVD 0.21-0.27; PNW 0.31-0.35; PPW 0.21-0.26; WL 0.72-0.78. **Indices.** CI 81-88; CNI 67-75; OI 28-32; SI 79-83.

Worker description. The worker has been adequately described by Shattuck (1991).

Queen and male unknown.

SPECIMENS EXAMINED

I have examined the two type specimens of *A. parvus* and others from the following localities. **GABON**, Ogooue Prov., Maritime Res. Mons Doudou (CASC); **KENYA**, Kakamega Forest, Isecheno and Isiukhu (AKRI, LACM).

DISCUSSION

The type of *Technomyrmex hypoclinoides* Santschi was examined by B. Bolton who informed me that it is a senior synonym of *A. parvus*. Both the new combination and new synonymy should be attributed to Mr. Bolton.

The few additional specimens available somewhat amplify the range of size variation, but otherwise are in good agreement with the type specimens and with Shattuck's original description. The presence of a single pair of relatively long erect hairs on the pronotal disc and a single such hair at the apex of each propodeal spine is an unusual feature shared only with *A. bidens*, a larger and darker species. Both species are present in the Kakamega forest of Kenya, but *A. bidens* is encountered much more frequently.

Photomontage images are available at www.antweb.org as *Axinidris* sp. 1.

Axinidris icipe, new species

Figures 4, 14, 24

Worker diagnosis. Antenna scape shaft, pronotal disc and all gastral terga without erect hairs; each frontal carina with a single erect hair and frons with none; medial carina subacute in profile; pronotal disc slightly shiny and distinctly coriarius.

Worker measurements ($n = 10$). HW 0.60-0.68; HL 0.73-0.77; SL 0.44-0.49; EL 0.14-0.17; OVD 0.32-0.33; PNW 0.37-0.42; PPW 0.26-0.28; WL 0.77-0.90. **Indices.** CI 84-90; CNI 60-80; OI 22-28; SI 67-76.

Worker description. Frons slightly shiny, weakly coriarius and densely micropunctate; gena similar but becoming smooth and shiny toward mandible; lower frontal area and clypeus dull and sharply sculptured. Frons and vertex without erect hairs; one erect hair on each frontal carina above level of antennal insertion; clypeus with one pair of long erect hairs; scape shaft without erect hairs.

Mesosomal dorsum (Fig. 14) without erect hairs. Pronotum slightly shiny and sharply coriarius. Mesonotum finely reticulopunctate; mesepisternum and side of propodeum similar but more sparsely punctate and interspaces shinier. Metanotal spiracles low and barely visible in profile.

Spiracular prominence of propodeum low and inconspicuous, spiracular opening directed distad; medial carina present on posterior half of dorsal face, continuing onto declivitous face, carina right-angular to obtuse in profile at summit; spines blunt in dorsal view, distance between their outer apices greater than width of propodeum at spiracles.

Gastral terga shiny between close fine piligerous punctures and without erect hairs.

Head and body dark blackish brown, lower half of clypeus, mandibles, most of scape yellowish red; meso- and metatarsi dirty whitish.

Queen and **male** unknown.

TYPE MATERIAL

Holotype worker and 20 worker **paratypes**, **KENYA**, Kakamega Dist., Isiukhu, Kakamega Forest (0.27°N 34.88°E), January 2003 (W. Freund and C. Schmidt), fogging *Teclea nobilis*. Holotype in LACM; paratypes in AKRI, BMNH, LACM, MCZC, NMKC, and United States National Museum of Natural History (USNM).

ETYMOLOGY

The name is derived from the anagram for the International Centre of Insect Physiology and Ecology, Nairobi; it here used as a noun in apposition.

DISCUSSION

This species may be confused with *A. kakamegensis*, a species still known only from the type specimen. It shares with that species the extreme reduction in erect pilosity; i.e., the lack of erect hairs on the antennal scapes, frons, mesosomal dorsum and gastral terga. It differs from *A. kakamegensis* in the narrow head (longer than broad), the lack of strigulate sculpturing on the frons and malar area, and the lack of erect hairs between the frontal lobes; the clypeus has only a single pair of erect hairs (several present in *A. kakamegensis*). *Axinidris icipe* is also a notably smaller species in which the head width is less than 0.70 mm versus 0.97 mm in the type of *A. kakamegensis*.

Axinidris kakamegensis Shattuck

Axinidris kakamegensis Shattuck, 1991: 115; figs. 17-19, 35 (w). **KENYA**, Kakamega Forest (A.E. Stubbs) (BMNH) *examined*.

Worker diagnosis. Scape and pronotum without erect hairs; head broader than long and vertex without erect hairs; distance between spines greater than PPW.

Worker measurements (mm) ($n = 1$). HW 0.97; HL 0.96; SL 0.69; EL 0.24; OVD 0.37; PNW n/a; PPW 0.40; WL 1.10. **Indices.** CI 102; CNI 161; OI 24; SI 71.

Worker description. The worker has been adequately described by Shattuck (1991).

Queen and **male** unknown.

DISCUSSION

Known only from the worker type specimen from an unspecified locality in the Kakamega Forest.

Axinidris kinoin Shattuck

Axinidris kinoin Shattuck, 1991: 115-116; figs. 20-22, 35 (w). **NIGERIA**, "specific locality not given, probably Gambari Experiment Station (B. Taylor)" (BMNH) *examined*.

Worker diagnosis. Pronotum with erect hairs and scape with 1 or 2 short erect hairs; mesonotum without rugae; medial carina present; distance between spines less than PPW; head and body reddish brown.

Worker measurements (mm) ($n = 2$). HW 0.75-0.76; HL 0.83-0.86; SL 0.68-0.69; EL 0.22; OVD 0.26-0.28; PNW n/a; PPW 0.37-0.38; WL 1.01. **Indices.** CI 88-91; CNI 128-131; OI 29; SI 91.

Worker description. The worker has been adequately described by Shattuck (1991).

Queen and male unknown.

DISCUSSION

This species remains known only from the two type specimens from an unspecified locality in Nigeria, but assumed to be the Gambari Experiment Station (Shattuck, 1991). It is most similar to *A. denticulata* from which it differs as noted in the key.

Axinidris lignicola, new species

Figures 5, 15, 25

Worker diagnosis. Antennal scape shaft without erect hairs and pronotum with 12+ short suberect hairs and 4-6 longer erect hairs; propodeal spines short, dentiform; propodeal dorsum obliquely elevated distad; medial carina strongly elevated, obtuse in profile; first gastral tergum with erect discal hairs and marginal row of suberect hairs.

Worker measurements (mm) ($n = 12$). HW 0.76-0.92; HL 0.83-0.99; SL 0.73-0.81; EL 0.19-0.28; OVD 0.29-0.33; PNW 0.49-0.58; PPW 0.32-0.37; WL 0.95-1.09. **Indices.** CI 88-96; CNI 100-170; OI 24-30; SI 86-100.

Worker description. Front of head smooth to weakly coriarius between fine subcontiguous punctures; gena and malar area distinctly coriarius between well-spaced punctures, many of which are smaller than on frons. Frons with 4-5 pairs of erect hairs, uppermost pair longest; vertex with 1 pair of suberect hairs subequal in length to longest frontal pair. Pubescence short, mostly appressed but some on side of head, especially on malar area, subappressed to reclinate. Shaft of antennal scape with appressed pubescence only.

Pronotum moderately shiny and coriarius between well-separated fine piligerous punctures. Mesonotum irregularly rugulose and moderately shiny. Mesepisternum moderately shiny between short, weak, more or less longitudinal rugae anteriorly, becoming duller and colliculate posteriorly and ventrad. Propodeal dorsum so coarsely rugulose that medial carina is obscured; medial carina at summit of declivity a short, strongly elevated obtuse lobe; spiracle on well developed prominence, opening directed posterolaterad; propodeal spines short and nearly right-angular in dorsal view,

distance between their outer apices less than distance between spiracles. Pronotum (Fig. 15) with 4-5 pairs of short erect hairs; mesonotum and dorsum of propodeum with variable number of suberect to erect hairs of variable length.

Gastral tergum 1 moderately shiny and weakly coriaceous, following segments less shiny and more distinctly sculptured. Terga 1-2 with marginal band of suberect hairs; terga 2-4 with short suberect discal hairs and all segments with abundant coarse subappressed pubescence.

Head and body dark brown; lateral lobes of clypeus and transverse stripe at base of mandibular teeth yellowish.

Queen and **male** unknown.

TYPE MATERIAL

Holotype worker and numerous worker **paratypes**, **SOUTH AFRICA**, Western Cape, Grootvadersbosch (38°59'S 20°49'E), 16 September 1995 (H.G. Robertson), "in centre of dead tree trunk c 2.5cm dia., 1 m above ground", in indigenous forest. Holotype and most paratypes in SAMC; paratypes also in BMNH, CASC, LACM and MCZC.

ETYMOLOGY

Wood-dweller, from L., *lignum* (wood) + L., *colo* (inhabit).

DISCUSSION

In addition to the type series I have seen one worker, also in SAMC, collected by A.J. Prins at the same locality, October 1985 and provided with an unpublished name by Prins and Roux.

The strongly elevated medial carina at the summit of the propodeal declivity, as well as the abundance of suberect to erect pilosity in combination with the lack of erect hairs on the scape shaft, will serve to distinguish this species from all others known to me.

Axinidris luhya, new species

Figures 6, 16, 26

Worker diagnosis. Erect hairs present on pronotal disc but absent from scape shaft; propodeal spines thick and directed posterolaterally, distance between their apices greater than propodeal width; metanotal spiracles prominent in profile and base of propodeum abruptly elevated behind metanotal suture; propodeum dull and contiguously minutely punctate.

Worker measurements (mm) ($n = 12$). HW 0.99-1.04; HL 1.00-1.09; SL 0.69-0.74; EL 0.23-0.28; OVD 0.37-0.42; PNW 0.60-0.68; PPW 0.38-0.46; WL 1.13-1.26. **Indices.** CI 92-100; CNI 12-15; OI 22-28; SI 69-74.

Worker description. Head slightly shiny, with fine strigulate sculpture, interspaces contiguously finely punctate; clypeal disc and malar area with fine longitudinal rugae. Vertex with 0-3 pairs of short stiff hairs; frons with 6-8 widely spaced hairs of variable length in addition to much longer pair along each frontal carina; entire head with abundant short coarse subappressed to appressed pubescence. Shaft of antennal scape without erect or suberect hairs.

Entire mesosoma contiguously punctate and slightly shiny and with abundant coarse subappressed to appressed pubescence; mesepisternum and side of propodeum also with weak irregular longitudinal rugae. Pronotal disc (Fig. 16) with 2-3 pairs of long erect hairs and a variable

number (but fewer than 12) of much shorter erect hairs; 1-3 short erect hairs on each propodeal spine. Mesonotum flat in profile; metanotal spiracles prominent. Propodeum abruptly elevated behind metanotal suture; disc nearly flat; propodeal spiracle on well-developed prominence and spiracular opening directed distad; medial carina low; propodeal spines thick, their apices subacute in profile; spines broad in dorsal view and direct posterolaterally, their outer margins straight and distance between their apices about equal to width of propodeum at spiracles; 4-10 fine erect hairs present, including on spines.

Gastral terga slightly shiny and weakly imbricate, with abundant minute piligerous punctures; terga with close coarse appressed pubescence and discs of two basal segments also usually with scattered short erect hairs; T3-4 with 2-4 longer erect hairs.

Head and body blackish, antennae and legs dark brownish, tarsi reddish brown; yellowish spot on head between eye and antennal socket; mandibles largely reddish, but blackish at base and apex.

Queen and **male** unknown.

TYPE MATERIAL

Holotype worker: **KENYA**, Kakamega Distr., Isecheno, 19 March 2002 (R. R. Snelling, #02-156), on tree trunk. Numerous additional worker **paratypes** from Isecheno, collected by R. R. Snelling, various dates, mostly on trunk of *Solanum mauritiana*. Holotype in LACM; paratypes in AKRI, BMNH, CASC, ICIPE, LACM, MCZC, NMKC, SAMC, and USNM.

ETYMOLOGY

This species is named for the Luhya people who live in the Kakamega area and, in particular, for those at Isecheno who made me feel welcome there; the name is a noun in apposition.

DISCUSSION

Additional specimens (not types) are from Yala and "Colobus Trail", Kakamega Forest, both taken while fogging *Teclea nobilis*, by W. Freund. There is also a single worker collected in GABON: Prov. Ogoové-Maritime, Réserve des Monts Doudou, 24.3 km 307° NW Doussala, 2°13.35'S 10°24;35'E, 370m, 7.iii.2000, S. van Noort (CASC), on vegetation in lowland rainforest.

The erect hairs of the antennal scape are pale, very fine and short, about 0.05mm long, and are widely and irregularly distributed along the length of the shaft. The number varies from 2 to 6, but one specimen was examined that lacked erect hairs on one scape, but had 4 on the other. Also variable is the number of erect hairs on the mesosomal dorsum. Although the pronotum often has but a single pair of long (up to 0.10mm) hairs, the number varies from 0 (2 specimens) to 8 within a nest series. Occasionally, 1 or 2 short erect hairs may be present on the propodeal dorsum in the vicinity of the spiracles; 1 or 2 similar hairs are present on each spine rising above the sometimes suberect pubescence.

This appears to be an eastern sister species to *A. occidentalis*, currently known only from Liberia. The two are similar in size, head shape, mesosomal profile and in most details of sculpture, but *A. luhya* has the mesosoma more coarsely sculptured and there are long erect hairs on both the upper frons (usually) and pronotal disc. In general habitus *A. luhya* might also be confused with *A. ghanensis*, but in that species the distance between the outer margins of the propodeal spines is no greater than that between the spiracles, the pronotum has only a single pair of erect hairs and none are present on the propodeum and on gastral tergum 3.

Axinidris mlalu, new species

Worker diagnosis. Scape shaft, pronotum and gastral terga without erect hairs; distance between apices of propodeal spines less than distance between propodeal spiracles; gastral tergum 1 yellow, segments 2-4 dark brown.

Worker measurements (mm) ($n - 1$). HW 0.74; HL 0.86; SL 0.68; EL 0.21; OVD 0.31; PNW 0.49; PPW 0.36; WL 1.03. **Indices.** CI 87; CNI 100; SI 91; OI 28.

Worker description. Front of head moderately shiny, weakly coriaceous and strigulate between sparse minute punctures; gena shinier and with few strigulae, malar area more strongly coriaceous. Antennal scape without erect hairs; each frontal carina with 1 pair of long erect hairs; upper frons with a single submedian pair of long hairs below vertex margin.

Mesosomal dorsum without erect hairs. Pronotal disc smooth and shiny. Mesonotum shiny, anteriorly smooth, posteriorly sharply punctate. Mesepisternum shiny, with faint longitudinal rugae. Metepisternum densely and relatively coarsely punctate. Propodeum contiguously finely punctate; dorsal face slightly convex in profile; medial carina absent from dorsal face except at summit of declivity, where it is low and broadly rounded; medial carina present on declivitous face; spiracular prominence well-developed, spiracular opening directly obliquely distad; propodeal teeth short and distance between their bases less than distance between spiracles.

Gastral terga shiny and unsculptured except for close fine piligerous punctures; all terga without erect hairs.

Head light brownish with yellowish clypeus and mandibles; mesosoma light brownish, paler on pronotum and sides; gaster dark brown but tergum 1 yellow, concolorous with petiole.

Queen and male unknown.

TYPE MATERIAL

Holotype worker, **CENTRAL AFRICAN REPUBLIC**, Songha-Mbaéré Pref., Parc National Dzanga-Ndoki, "37.9 km 169°S" Lidjombo, 2°22'N 16°10'E, 360m, 20-28 May 2000 (B.L. Fisher, #4128), beating low vegetation, rainforest, in CASC.

ETYMOLOGY

The name is an arbitrary combination to be treated as a noun in apposition.

DISCUSSION

The sharply contrastingly bicolored gaster and lack of erect hairs on both the mesosomal and gastral dorsa are distinctive for this species. Photomontage images are available at www.antweb.org as *Axinidris* sp. 2.

Axinidris murielae Shattuck

Axinidris murielae Shattuck, 1991: 116-117; figs. 23-25, 35 (w, q). **CAMEROON**, Nkoemvon (D. Jackson) (BMNH) *examined*.

Worker diagnosis. Antennal scape with more than 5 and pronotum with 2 erect hairs; pronotum mostly smooth and shiny; medial carina present and obtuse in profile; distance between spines less than PPW; head and body reddish brown.

Worker measurements (mm) ($n = 2$). HW 0.66-0.81; HL 0.76-0.91; SL 0.56-0.66; EL 0.20-0.26; OVD 0.24-0.31; PNW n/a; PPW 0.31-0.46; WL 0.89-1.30. **Indices.** CI 87-89; CNI 90-129; OI 26-34; SI 80-85.

DISCUSSION

Worker and queen have been adequately described by Shattuck (1991); the **male** remains unknown.

The two species *A. gabonica* and *A. murielae* are similar and may ultimately prove to belong to a single somewhat variable species. For the present the two are separable as noted in the key: *A. murielae* has 4-6 erect hairs on the pronotum (only 2 in *A. gabonica*) and numerous erect hairs on the front of the head (only 4 in *A. gabonica*) and also with erect hairs on gastral terga 2-4 (one in *A. gabonica*).

The types of *A. murielae* are from Cameroun; Shattuck (1991) also recorded specimens from Ghana. I have also seen a few specimens from the vicinity of Busumbuli in the Kakamega Forest of Kenya. Both samples were taken by tree fogging, one from *Teclea nobilis* and one from *Heinsenia diervillioides*.

Axinidris namib, new species

Figures 7, 17, 27

Worker diagnosis. Scape shaft and pronotum and gastral terga 1-3 without erect hairs; hypostomal area with erect hairs; mesepisternum with distinct longitudinal rugae; medial carina present on posterior half of dorsal face of propodeum and continued down declivitous face.

Worker measurements (mm) ($n = 1$). HW 0.81; HL 0.86; SL 0.64; EI 0.24; OVD 0.31; PNW 0.51; PPW 0.36; WL 1.03. **Indices.** CI 94; CNI 100; SI 79; OI 30.

Worker description. Frons and vertex moderately shiny, finely longitudinally strigulate between close minute punctures; gena shinier, finely coriarius between sparse shallow punctures; malar area shiny, sharply strigulate and sparsely punctate. Each frontal carina with a single erect hair at lower and upper ends; frons with a pair of very short submedian hairs below summit of vertex; scape shaft without erect hairs; hypostomal area with several short erect hairs on each side.

Dorsum of mesosoma without erect hairs. Pronotal disc moderately shiny and coriarius to strigulate between sparse minute punctures. Mesonotum smooth and shiny anteriorly, posterior three-fourths moderately shiny and with sparse fine longitudinal rugae. Mesepisternum shiny between relatively coarse more or less longitudinal rugae. Propodeal dorsum weakly shiny, contiguously punctate and with irregular short, fine rugae, side (below spiracle) shiny between sparse, short rugae; spiracular prominence distinct, spiracular opening directed obliquely distad; medial carina present on posterior half of dorsal face and on declivitous face, low and broadly rounded in profile at summit of declivity; propodeal spines short and nearly right-angular in dorsal view, distance between their apices less than distance between spiracles.

Gastral terga moderately shiny, coriarius between close minute punctures; terga 1-3 without erect hairs, 4 with one submedian pair near base.

Head and mesosoma reddish brown, mesosomal dorsum slightly darker; gaster darker reddish brown; clypeus and mandibles more yellowish.

Queen and male unknown.

TYPE MATERIAL

Holotype worker, **NAMIBIA** ("S. W. AFRICA"), Keetmans Dist., 1 km W Mata Mata, Welverdiend Farm No. 328 (25°47'S 19°59'E), 19 October 1972 (C.L. Hogue), in LACM.

ETYMOLOGY

The name is derived from that of the country of origin and is here a noun in apposition.

DISCUSSION

The presence of a number of short erect hairs on the hypostomal area is unusual among the species of *Axinidris*, but does occur in several other species (*acholli*, *lignicola*, *stageri*). From *A. acholli*, *A. namib* differs by its much smaller size and the less spectacularly developed medial carina and propodeal spines. Both *A. lignicola* and *A. stageri* possess conspicuous erect pronotal hairs.

Axinidris nigripes Shattuck

Axinidris nigripes Shattuck, 1991: 117-118; fig. 35 (w). **GHANA**, Aburi (P. Room) (BMNH) *examined*.

Worker diagnosis. Scape and pronotum with erect hairs; medial carina present; distance between spines exceeding PPW; hairs of head and mesosoma brown, coarse and seta-like.

Worker measurements (mm) ($n = 1$). HW 0.97; HL 1.06; SL 0.78; EL 0.30; OVD 0.33; PNW n/a; PPW 0.50; WL 1.27. **Indices.** CI 91; CNI 195; OI 31; SI 80.

Worker description. The worker has been adequately described by Shattuck (1991).

Queen and male unknown.

DISCUSSION

This species is similar to both *A. luhya* and *A. palligastriion*. It differs from the latter in its larger size, deeper clypeal notch and differing color pattern, the gaster being darker than the head and mesosoma, the reverse of the pattern in *A. palligastriion*. From *A. luhya*, *A. nigripes* differs by the coarser, darker mesosomal hairs (fine and yellowish in *A. luhya*).

Axinidris occidentalis Shattuck

Axinidris occidentalis Shattuck, 1991: 118; figs. 26-28, 35 (w). **LIBERIA**, Paiata (= Payeta) (J. Bequaert) (MCZC) *examined*.

Worker diagnosis. Scape and pronotum without erect hairs; pronotum weakly shiny, sharply sculptured and densely pubescent; medial carina present; T3-T4 each with several erect hairs.

Worker measurements (mm) ($n = 4$). HW 0.88-0.96; HL 0.88-0.95; SL 0.57-0.65; EL 0.21-0.23; OVD 0.31-0.35; PNW 0.53-0.58; PPW 0.34-0.41; WL 1.02-1.10. **Indices.** CI 99-101; CNI 133-153; OI 23-25; SI 64-69.

Worker description. The worker has been adequately described by Shattuck (1991).

Queen and male unknown.

DISCUSSION

In *A. occidentalis* the pronotum lacks erect hairs, but they are present on gastral terga 3 and 4, and the distance across the propodeal spines is subequal to the propodeal width, a combination of features unique to this western species.

Axinidris okekai, new species

Figures 8, 18, 28

Worker diagnosis. Antennal scape shaft and pronotal disc (Fig. 18) without erect hairs and gastral terga 3-4 each with 2-4 moderately long erect hairs; upper frons with 2 hairs; propodeal spines (dorsal view) short and right-angular, obtuse in profile; base of propodeum convex in profile, medial carina obtusely angulate at declivity; pronotum polished between sparse piligerous punctures.

Worker measurements (mm) ($n = 11$). HW 0.67-0.78; HL 0.73-0.87; SL 0.55-0.67; EL 0.17-0.22; OVD 0.24-0.30; PNW 0.44-0.54; PPW 0.29-0.38; WL 0.85-1.03. **Indices.** CI 85-95; CNI 67-114; OI 25-30; SI 81-91.

Worker description. Frons moderately shiny, with sparse, fine irregular longitudinal strigulae between contiguous minute punctures; vertex shiny between sparse piligerous punctures; gena shiny and weakly imbricate to smooth and malar area closely strigulate. Upper frons with 1 pair of erect hairs, each about as long as maximum width of first funicular segment; frontal area with 1 pair of erect hairs and each frontal carina with 2 pairs. Front of head with sparse, short appressed brownish hairs. Shaft of antennal scape without erect hairs, but with sparse, short appressed brownish hairs.

Pronotal disc polished and shiny between sparse minute piligerous punctures; anterior half of mesonotum similar, posterior half reticulate; mesepisternum shiny and weakly sculptured anteriorly, becoming contiguously, but shallowly, punctate behind; metanotal spiracle prominent in profile, but set so close to base of propodeum that it is not readily visible. Propodeum slightly shiny and contiguously finely punctate; base face convex in profile; spiracular prominence weak, opening directed posterolaterally; medial carina present only at summit of declivity, low and obtusely angulate in profile; propodeal spines short, in dorsal view right-angular and distance between their outer margins much less than width of propodeum at spiracles; spines obtuse to right-angular in profile.

Gastral terga shiny and weakly imbricate between sparse, minute piligerous punctures bearing short, brownish appressed hairs; terga 1-2 without erect hairs, 3-4 each with 2-4 erect hairs.

Head and body dark brownish, mesosoma slightly paler than head; mandibles yellowish at base of teeth.

Queen and male unknown.

TYPE MATERIAL

Holotype and 6 worker **paratypes**: **KENYA**, Kakamega Distr., Isecheno, 21 March 2002 (R. R. Snelling, #02-162), on vines. Additional **paratypes**: 2 workers, Kakamega Forest, 7-11 February 1999 (T. Wagner), ex fogging *Teclea nobilis*; 2 workers, "Colobus Trail", Kakamega Forest, Sept.-Oct. 2001 (W. Freund & C. Schmidt), ex fogging *Heinsenia diernilliodes*. Holotype and several paratypes in LACM; paratypes also in AKRI, BMNH, MCZC and NMKC.

ETYMOLOGY

This species is dedicated to my friend, Wilberforce Okeka of KEEP (Kakamega Environmental Education Programme, Isecheno), who was so helpful during my visits to Kakamega Forest.

DISCUSSION

In addition to the above material, I have seen a single worker that appears to belong to this species: **CAMEROUN**, Mbalmayo, Nov. 1993 (N. Stark; BMNH). It differs from the types in being more reddish, the mandibles largely yellowish; the head and pronotum are less closely sculptured.

The few specimens in the type series are consistent in their features. In stature and color it is most like *A. bidens* but is immediately separable by the lack of erect hairs on the pronotal humeri and propodeal spines.

Axinidris palligastri Shattuck

Axinidris palligastri Shattuck, 1991: 118; figs. 29-31; fig. 35 (w). **GHANA**, Nswam (= Nsawam) (P. Room) (BMNH) *examined*.

Worker diagnosis. Scape without and pronotum with erect hairs; medial carina present; distance between spines equal to PPW; pronotum smooth and shiny; mesonotum without rugae; gaster yellowish red, not concolorous with mesosoma.

Worker measurements (mm) ($n = 5$). HW 0.81-0.85; HL 0.87-0.93; SL 0.61-0.67; EL 0.26-0.30; OVD 0.29-0.32; PNW n/a; PPW 0.42-0.45; WL 1.05-1.16. **Indices.** CI 91-94; CNI 107-134; OI 31-35; SI 72-78.

Worker description. The worker has been adequately described by Shattuck (1991).

Queen and male unknown.

DISCUSSION

Although similar to *A. nigripes*, this species is separable as noted in the discussion of that species. The gaster is distinctly lighter in color than the head and mesosoma, but is not distinctly bicolored as in the otherwise similar *A. mlalu*, a species that lacks erect pronotal hairs (present in *A. palligastri*).

Axinidris stageri, new species

Figures 10, 20, 30

Worker diagnosis. Apex of scape distinctly surpassing vertex margin; scape and pronotum with numerous erect hairs; medial carina profile elevated and acute at apex, continued down propodeal declivity.

Worker measurements (mm) ($n = 3$). HL 0.81-0.89; HW 0.20-0.22; SL 0.68-0.76; EL 0.11-0.13; OVD 0.28-0.34; PNW 0.49-0.58; PPW 0.33-0.38; WL 0.97-1.11. **Indices.** CI 96-98; CNI 5-6; OI 25-26; SI 87-88.

Worker description. Head shiny between dense minute punctures; gena weakly imbricate and with scattered minute punctures; malar area polished and unsculptured. Apex of antennal scape exceeding vertex by more than greatest width of scape. Numerous suberect hairs on head margins in frontal view, especially above eyes; front of head and vertex with numerous short to moderately long suberect and erect hairs; scape shaft with sparse long erect hairs and numerous short suberect hairs.

Pronotal disc shiny and weakly imbricate. Mesonotum shiny, with coarse irregular longitudinal rugae evenly sloping in profile and metanotal spiracle clearly projecting. Mesepisternum shiny, with finer longitudinal rugae. Propodeal dorsum less shiny than pronotum, coarsely imbricate; side shiny and irregularly longitudinally rugose; spiracular tubercle prominent in dorsal view, anterior edge of spiracle moderately elevated so that opening is directed obliquely distad; medial carina sharp, strongly elevated behind and acute in profile, continued ventrad on posterior face; propodeal spines reduced to minute teeth, distance between their apices much less than propodeal width at spiracles. Pronotum (Fig. 20) with 20+ erect hairs; mesonotum and propodeum each with 10+ similar hairs.

Gastral terga subpolished and weakly imbricate; all terga with scattered erect and suberect hairs in addition to sparse appressed pubescence.

Head and body uniformly yellowish red, appendages paler.

Queen and male unknown.

TYPE MATERIAL

Holotype and two **paratype** workers, **TANZANIA**, Bunduki, Uluguru Mts., 6-15 January 1964 (K.E. Stager), all in LACM.

ETYMOLOGY

This species is dedicated to Dr. Kenneth E. Stager, former Curator of Ornithology at the LACM, in appreciation for the many samples of ants that he collected for me in various parts of the world.

DISCUSSION

This species is easily recognized by the abundance of erect pilosity on the body and appendages and by its reddish color. Morphologically it is most similar to *A. tridens*, but the medial carina is higher than in available material of that species. Additionally, *A. tridens* is much less hairy, with no erect hairs on the antennal scapes and the gastral terga.

Axinidris tridens (Arnold)

Engramma tridens Arnold, 1946: 58 (w). **MALAWI**, Mlanje (= Mulanje) (SAMC).

Axinidris tridens: Shattuck, 1991: 119-120.

Worker diagnosis. Antennal scape shaft, pronotum and gastral terga without erect hairs; pronotum densely pubescent; medial carina acute in profile.

Worker measurements (mm) ($n = 2$). HW 0.81-0.88; HL 0.86-0.95; SL 0.72-0.82; OVD 0.33; PNW n/a; PPW 0.31-0.34; WL 1.07. **Indices.** CI 93-94; CNI 64-95; OI 24-28; SI 88-93.

Worker description. The worker has been adequately redescribed by Shattuck (1991).

Queen and male unknown.

DISCUSSION

Shattuck (1991) removed this species from *Engramma* to *Axinidris*. He also reported one worker from St. Lucia Estuary, Natal, SOUTH AFRICA. This is the only specimen known, other than the types.

ACKNOWLEDGEMENTS

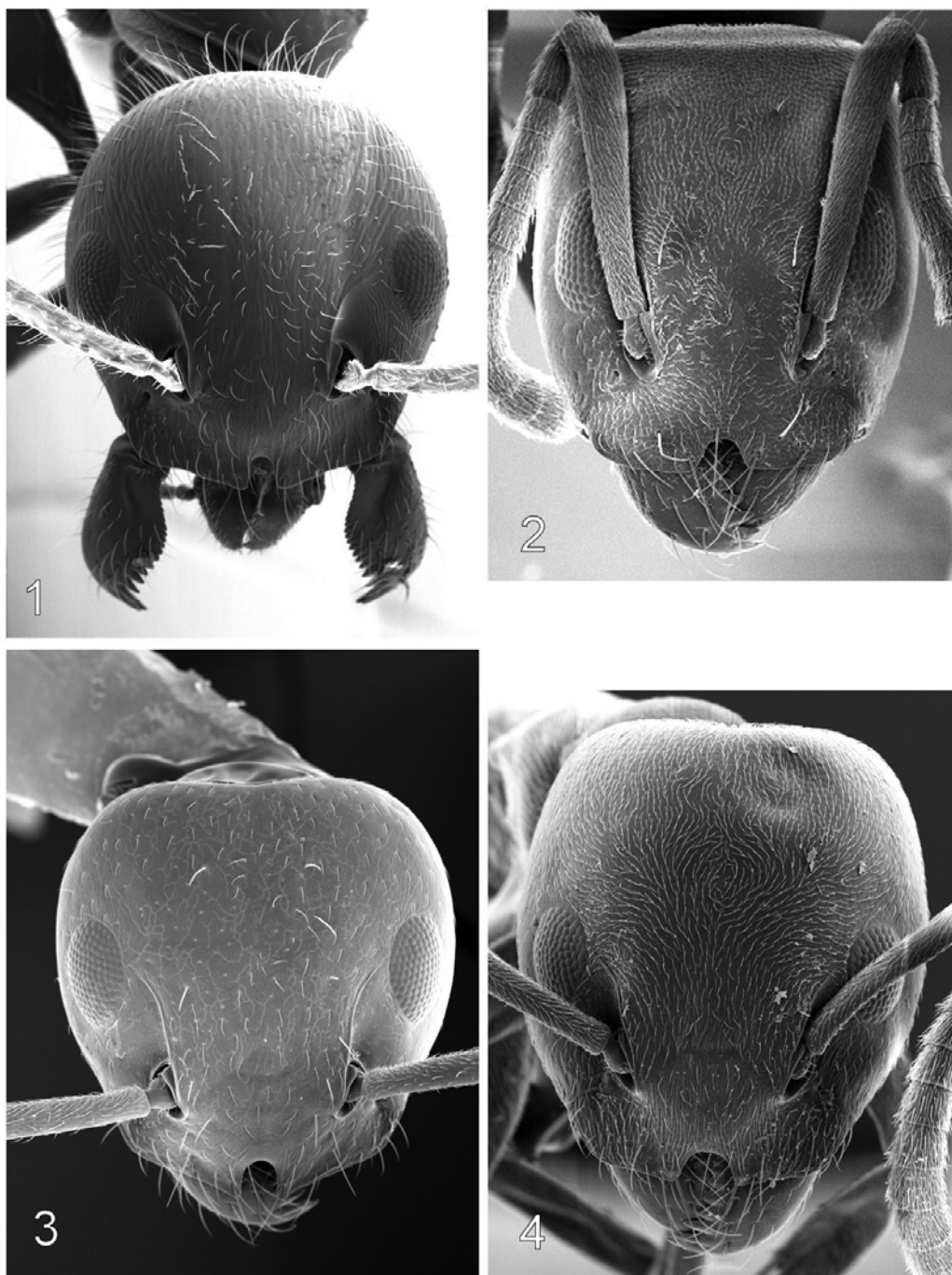
For the loan of specimens in their care, I am deeply indebted to Barry Bolton (BMNH), Stefan Cover (MCZC), Brian Fisher (CASC) and Hamish Robertson (SAMC). My field work in Kenya was facilitated and encouraged by Scott Miller. Hans Herren, Susan Kimani, Nixon Onyimbo and Lucie Rogo, all of ICIPE, greatly aided my field work in Kenya, with further assistance at Isecheno from Wilberforce Okeka, Boniface Omolo, Andrew Chiapya and David Makonjio. Numerous canopy fogging samples from Kakamega Forest that yielded *Axinidris* specimens were contributed by Marcell Peters and Thomas Wagner (AKRI). Thanks are also extended to Giar-Ann Kung for her patient assistance during my sessions with the scanning electron microscope.

DEDICATION

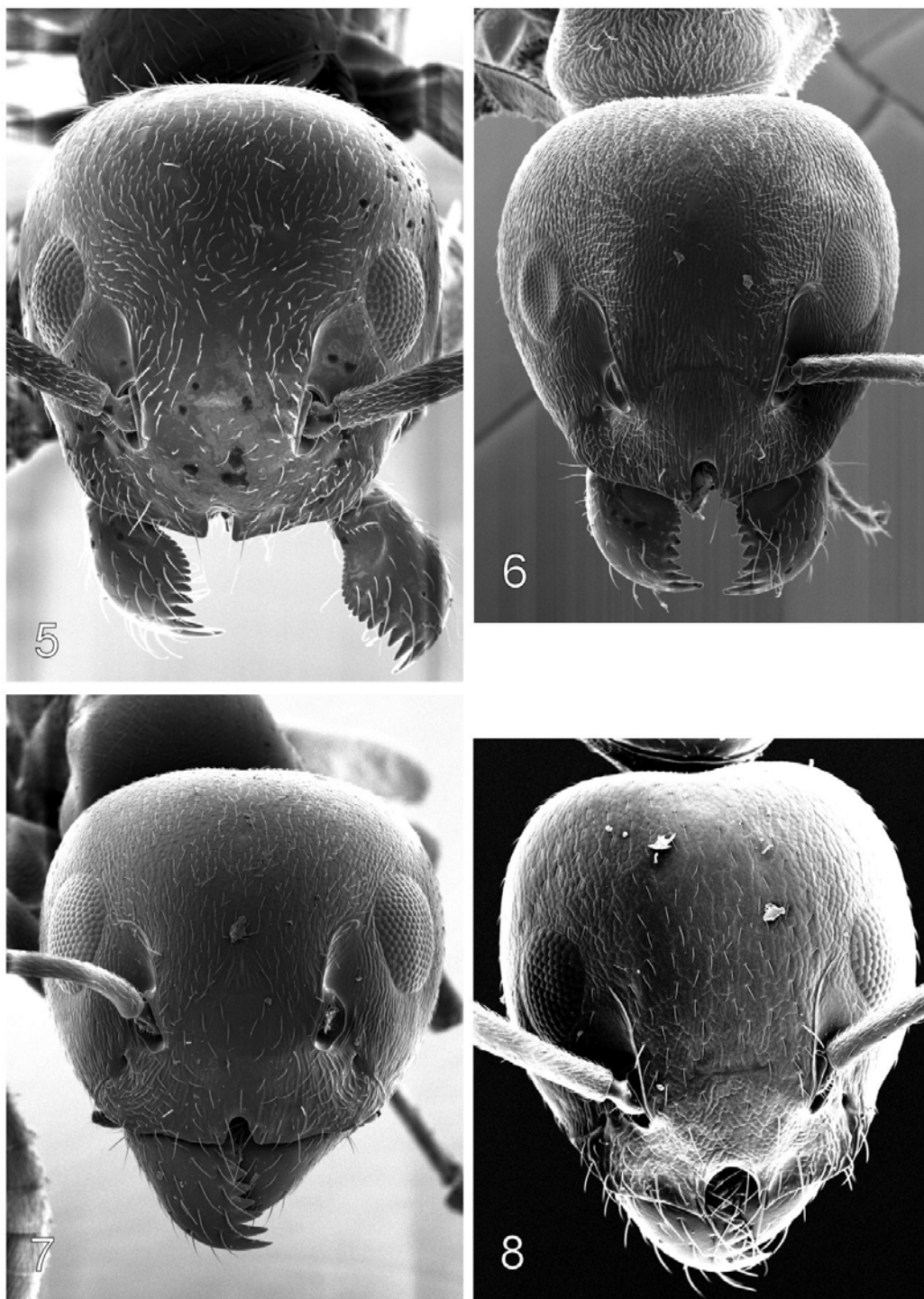
This paper is dedicated to Ed Wilson, not only in recognition of his contributions to ant taxonomy, but also for the advances in understanding the biogeography and ecology of ants and of his many stimulating contributions toward understanding social behavior, from insects to humans.

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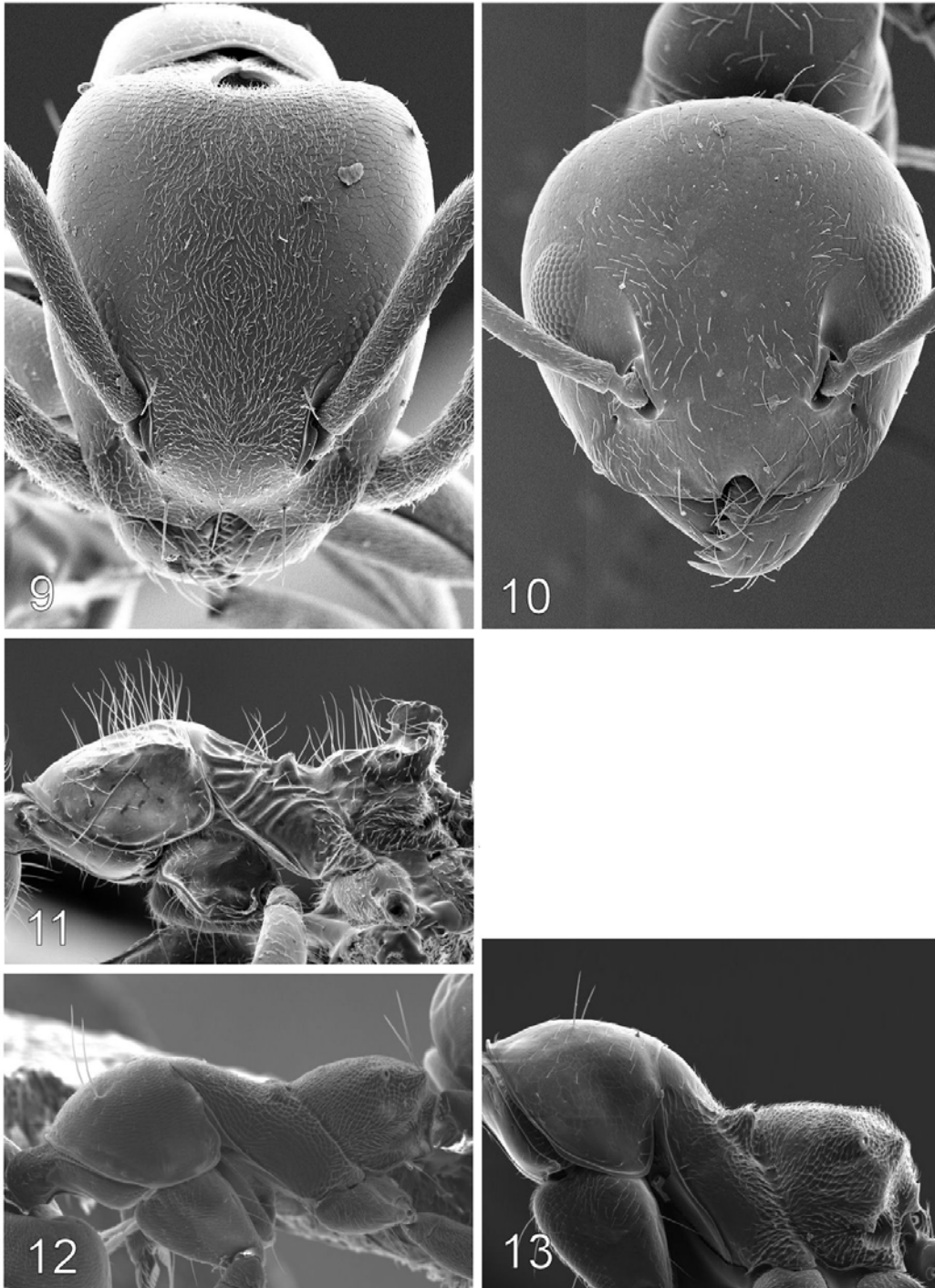
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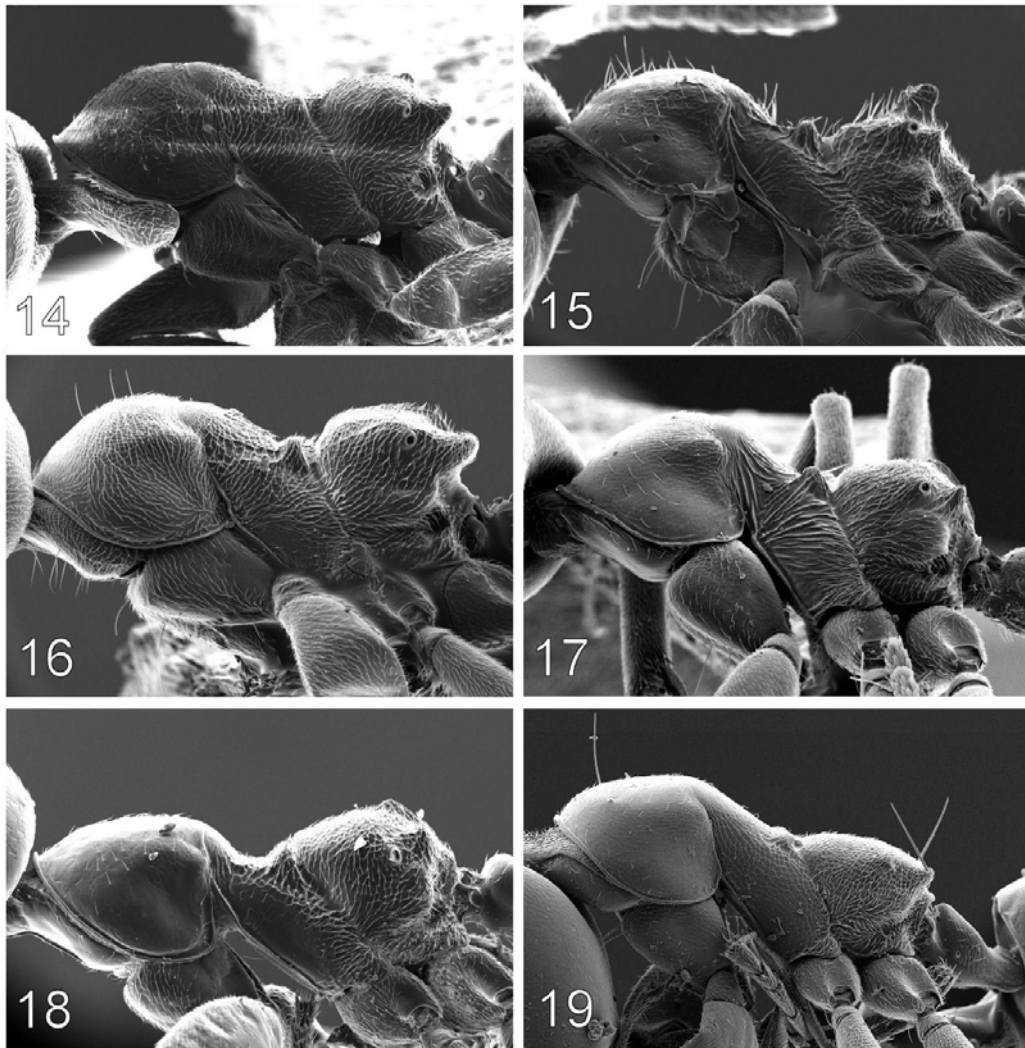
Figures 1-4. Frontal view of head of: 1, *Axinidris acholli*; 2, *A. bidens*; 3, *A. gabonica*; 4, *A. icipe*.



Figures 5-8. Frontal view of head of: 5, *A. lignicola*; 6, *A. luhya*; 7, *A. namib*; 8, *A. okekai*.



Figures 9-10. Frontal view of head of: 9, *A. hypoclinoides*; 10, *A. stageri*. **Figures 11-13.** Lateral view of mesosoma of: 11, *A. acholli*; 12, *A. bidens*; 13, *A. gabonica*.



Figures 14-19. Lateral view of mesosoma of: 14, *A. icipe*; 15, *A. lignicola*; 16, *A. luhya*; 17, *A. namib*; 18, *A. okekai*; 19, *A. hypoclinoides*.

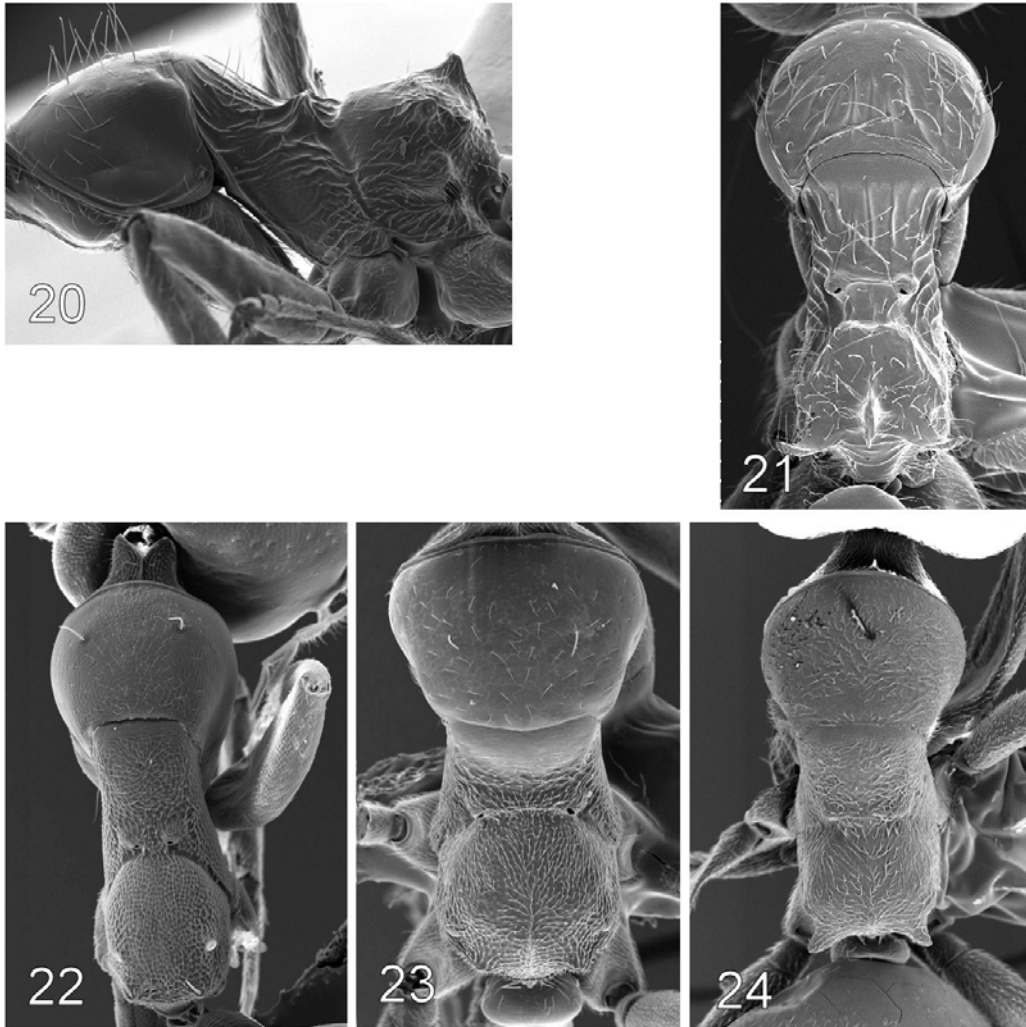
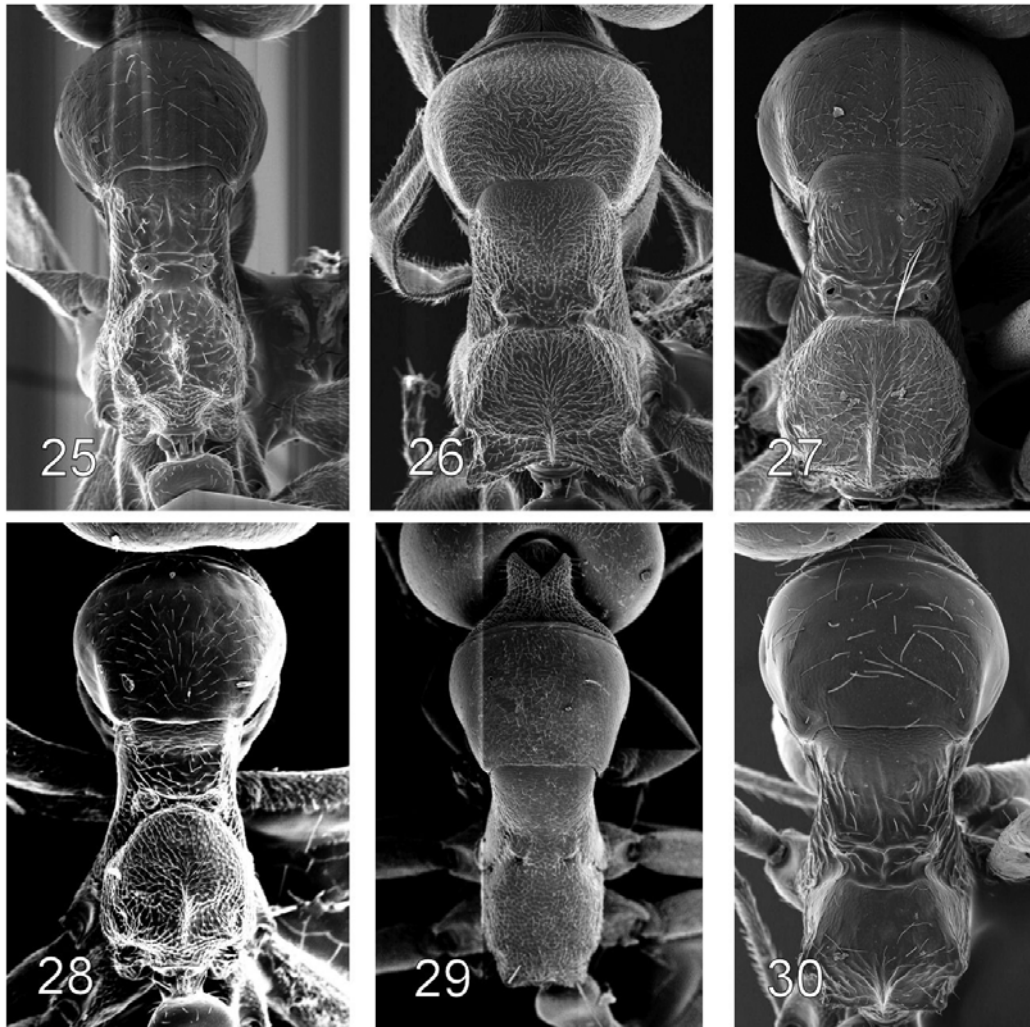


Figure 20. Lateral view of mesosoma of *A. stageri*. **Figures 21-24.** Dorsal view of mesosoma of: 21, *A. acholli*; 22, *A. bidens*; 23, *A. gabonica*; 24, *A. icipe*.



Figures 25-30. Dorsal view of mesosoma of: 25, *A. lignicola*; 26, *A. luhya*; 27, *A. namib*; 28, *A. okekai*; 29, *A. hypoclinoides*; 30, *A. stageri*.