

**SUPPLEMENTARY STUDIES ON ANT LARVAE: FORMICINAE
(HYMENOPTERA: FORMICIDAE)**

GEORGE C. WHEELER AND JEANETTE WHEELER

3358 NE 58th Avenue, Silver Springs, Florida 32688 and
Adjunct Research Associates, Desert Research Institute,
Reno, Nevada

Abstract.—This article describes the five species of formicine larvae that have accumulated since the publication of our 1982 supplement to our 1976 monograph. The genus *Aphomomyrmex* has not been described previously; the other genera are *Paratrechina* and *Dendromyrmex*. Also included are references to formicine larvae in the literature.

In this article we describe five species of formicine larvae that have accumulated since the publication of our 1982 supplement to our 1976 memoir. Here we give descriptions only. In a future supplement to our 1976 memoir we will prepare keys for the separation of the various taxa.

We have noted recently in the literature a developing problem: the students of caste determination in ants need to be able to distinguish the larval instars. In the past we have rarely secured more than one instar in a sample, but now entomologists are sending us all available sizes of larvae, e.g., *Aphomomyrmex* below.

We also include any references to ant larvae of the subfamily Formicinae which we have found since our 1982 publication.

Tribe Formicini

Genus CATAGLYPHIS Foerster

Cataglyphis cursor (Fonscolombe)

Cagniant, 1980: 3 instars, each described and sketched. Duration of stages given.

Tribe Oecophyllini

Genus OECOPHYLLA F. Smith

Oecophylla longinoda (Latreille)

Hölldobler and Wilson, 1983: SEM's of labium showing opening of silk-glands.

Oecophylla smaragdina (Fabricius)

Hinton, 1951:163. The limpet-like caterpillars of *Liphyra brassolis* Westwood [Lepidoptera: Lycaenidae] feed upon the larvae of this ant: "the caterpillar lowers the edge of its carapace-like upper surface, and the ant larva is then consumed beneath the body. The caterpillars suck their juice out but do not chew them."

Hölldobler and Wilson, 1983: Colored photograph of worker using a larva as a shuttle to spin silk for the nest.

Tribe Brachymyrmecini
Genus APHOMOMYRMEX Emery

Profile pheidoloid but with narrowly rounded posterior end. Praesaepium lacking. Body hairs sparse. Of 2 types: (1) unbranched, smooth, with long flexuous tip; (2) short, unbranched, smooth with frayed tip. Labrum deeply bilobed; without chilo-scleres. Mandible camponotoid but with the apical tooth long, slender and heavily sclerotized.

Aphomomyrmex afer Emery

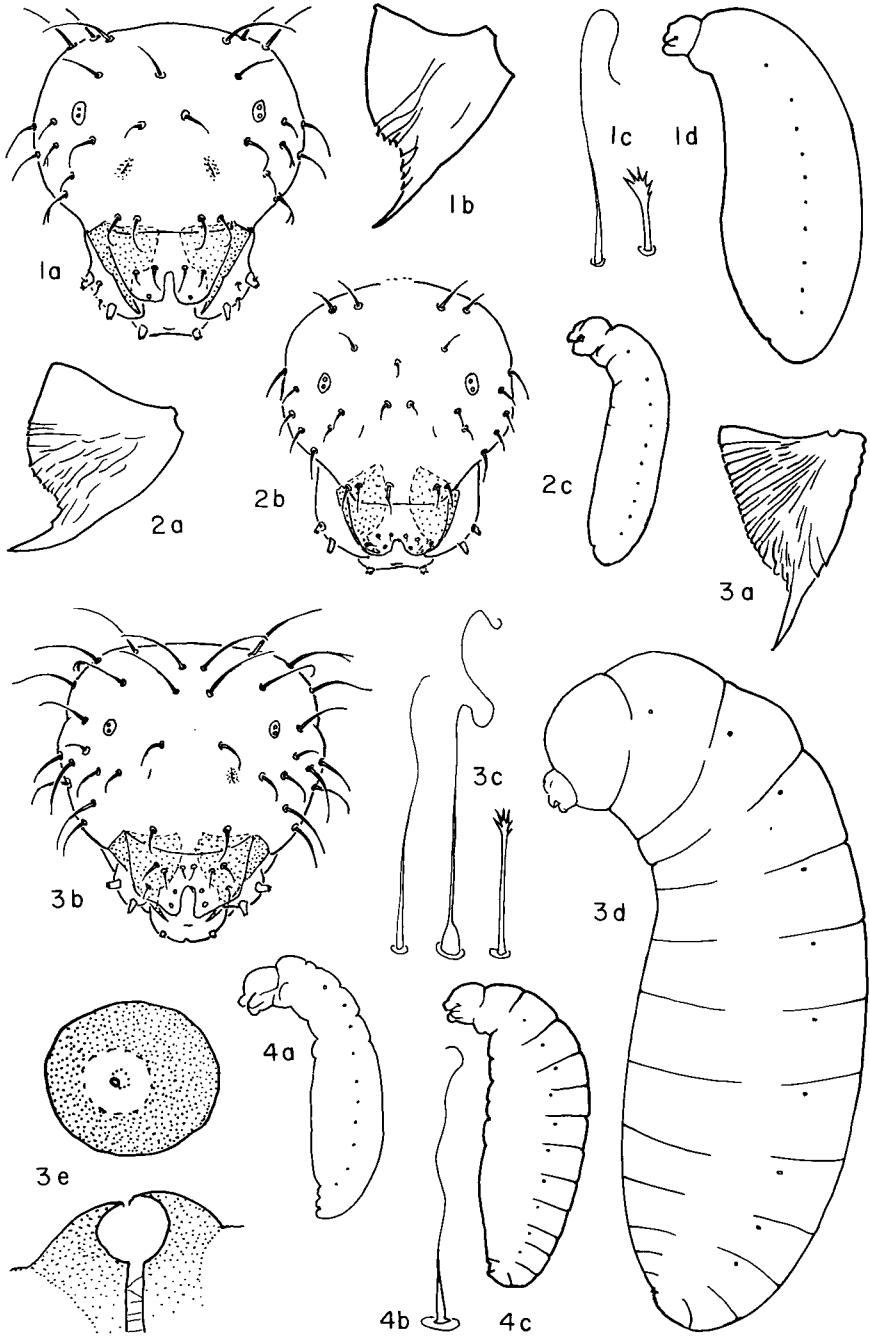
Figs. 1-4

Description. MATURE WORKER LARVA. Length (through spiracles) about 2.6 mm. Profile pheidoloid but with narrowly rounded posterior end. Anus ventral. Spiracles small, decreasing slightly in diameter posteriorly. Body hairs sparse, uniformly distributed. Of 2 types: (1) 0.019-0.063 mm long, unbranched, smooth, with a long flexuous tip, on all somites; (2) about 0.025 mm long, few, with frayed tip, on AVIII-AX. Cranium transversely subelliptical, slightly wider than long. Antennae above midlength of cranium, each with 2 small sensilla. Head hairs few (about 30); 0.05-0.1 mm long, unbranched, smooth, widely scattered. Labrum large, nearly twice as broad as long, narrowed ventrally, deeply bilobed; anterior surface of each lobe with 2 or 3 short hairs and 1 or 2 sensilla; ventral surface spinulose, the spinules minute and in short rows; posterior surface densely spinulose, the spinules minute and in numerous rows radiating from dorsolateral angles and with 4-6 sensilla ventrally. Mandible large; camponotoid but with long slender heavily sclerotized apical tooth; anterior and posterior surfaces with a few longitudinal ridges which terminate on medial border in small projections making medial border erose. Maxilla with apex paraboloidal and with a few minute spinules in arcuate rows; palp a short peg with 5 (4 apical and 1 lateral) sensilla; galea digitiform with 2 apical sensilla. Labium with arcuate rows of minute spinules; palp a short peg with 5 (1 with a large capsule) apical sensilla; an isolated sensillum between each palp and the opening of the sericteries, the latter a short transverse slit. Hypopharynx spinulose, the spinules minute and in numerous short transverse rows.

YOUNG WORKER LARVA. Length (through spiracles) about 2 mm. Thorax curved ventrally, abdomen straight and with a round-pointed posterior end; diameter nearly uniform throughout. Body hairs sparse; 0.024-0.125 mm long, unbranched, smooth, very slender and flexuous, a few on each somite. Head large; cranium subhexagonal, about as broad as long. Antennae small. Head hairs 0.038-0.075 mm

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Figs. 1-4. *Aphomomyrmex afer*. 1. Mature worker larva. a, Head in anterior view, $\times 132$; b, left mandible in anterior view, $\times 278$; c, body hairs, $\times 400$; d, larva in side view, $\times 22$. 2. Young worker larva. a, Left mandible in anterior view, $\times 278$; b, head in anterior view, $\times 132$; c, larva in side view, $\times 22$. 3. Mature sexual larva. a, Left mandible in anterior view, $\times 278$; b, head in anterior view, $\times 132$; c, body hairs, $\times 400$; d, larva in side view, $\times 22$; e, spiracle in surface view (upper) and in optical section (lower), $\times 834$. 4. Young larvae. a, Very young sexual larva, $\times 22$; b, type 2 body hair, $\times 400$; c, young sexual larva, $\times 22$.



long. Mandible with more numerous ridges. Otherwise similar to mature worker larva.

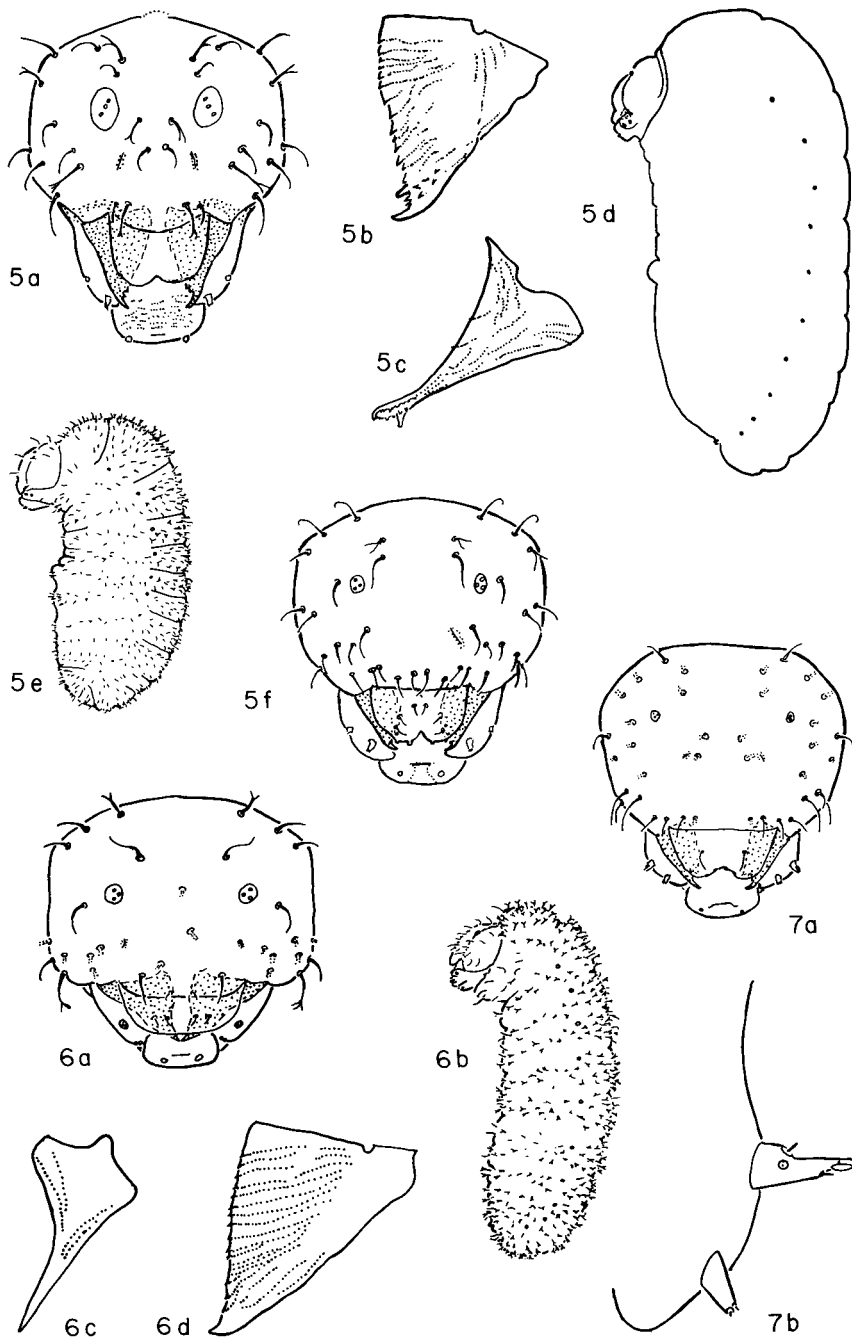
MATURE SEXUAL LARVA. Length (through spiracles) 5.2–5.6 mm. Pogonomyrmecoid but with short stout ventrally curved neck; posterior end rounded. Anus ventral. Spiracles small, nearly uniform in diameter, each opening on a low sclerotized boss. All somites feebly differentiated. Body hairs very sparse. Of 3 types: (1) 0.063–0.139 mm long, on T1–T3 and on dorsum of AI–AIV, unbranched, smooth, flexuous; (2) 0.03–0.168 mm long, with bulbous base and long slender flexuous shaft, a few on venter of AI, increasing in number to AVIII; (3) 0.038–0.075 mm long, stout and with a straight shaft and frayed tip, on AVIII–AX; AX has only type 3. Head small; cranium subhexagonal. Antenna with 2 sensilla, above midlength of cranium. Head hairs moderately numerous (about 40), 0.025–0.125 mm long, unbranched, smooth, slightly curved, a few with bifid tips. Labrum large, deeply bilobed; anterior surface of each lobe with 4–5 short hairs and 2 isolated sensilla; with minute spinules in rows on both sides of notch; posterior surface densely spinulose, the spinules minute and in numerous rows radiating from the dorsolateral angles and with 6 sensilla ventrally. Mandible large; camponotoid but with a long sharp-pointed heavily sclerotized apical tooth; anterior and posterior surfaces with numerous longitudinal ridges. Maxillary apex paraboloidal and with spinules in short arcuate rows; palp paxilliform with 5 [2 apical, 2 lateral (1 with a large cap) and 1 basal] sensilla; galea digitiform with 2 apical sensilla. Labium small, with short rows of minute spinules; palp a short peg with 5 [4 apical (1 with a large cap) and 1 basal] sensilla; an isolated sensillum between each palp and the opening of the sericteries, the latter a transverse slit. Hypopharynx spinulose, the spinules minute and in numerous short transverse sub-parallel rows.

YOUNG SEXUAL LARVA. Length (through spiracles) about 2.4 mm. Anterior end curved ventrally, remainder of body straight; diameter greatest at AII and AIII, diminishing toward either end. Somites feebly differentiated. Integument spinulose, the spinules larger and more numerous posteriorly. Body hairs (1) 0.06–0.138 mm; (2) 0.05–0.075 mm; (3) 0.025–0.075 mm. Head large. Otherwise similar to mature sexual larva.

VERY YOUNG SEXUAL LARVA. Length (through spiracles) about 2 mm. Slender; thorax curved ventrally, remainder of body straight; posterior end narrowly rounded. Integument spinulose. Type 2 body hairs with the base stout but not bulbous. Head large. Apical tooth of mandible somewhat shorter and stouter and slightly curved medially. Otherwise similar to mature sexual larva.

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Figs. 5–7. *Paratrechina*. 5. *P. guatemalensis*. a, Head of mature larva in anterior view, $\times 143$; b, left mandible in anterior view, $\times 400$; c, left mandible in medial view, $\times 400$; d, mature larva in side view, $\times 42$; e, young larva in side view, $\times 42$; f, head of young larva in anterior view, $\times 143$. 6. *P. longicornis*. a, Head of young larva in anterior view, $\times 143$; b, young larva in side view, $\times 42$; c, left mandible of mature larva in lateral view, $\times 400$; d, left mandible of mature larva in anterior view, $\times 400$. 7. *P. wojciki*. a, Head of young larva in anterior view (many hairs broken off), $\times 143$; b, left maxilla of mature larva in anterior view, $\times 400$.



Material studied. 9 larvae from Cameroon—"The Rock," Korup Forest Reserve, Ndain Dist., 8-II-1979, coll. D. McKey, courtesy of R. R. Snelling.

Genus *PARATRECHINA* Motschoulsky
Paratrechina guatemalensis (Forel)

Fig. 5

Description. MATURE LARVA. Length (through spiracles) about 1.8 mm. Profile dolichoderoid (i.e., short, stout, plump, straight, with both ends broadly rounded; anterior end formed from the enlarged dorsum of prothorax; head ventral, near anterior end; no neck; somites indistinct), with a small boss on venter of AIII. Anus posteroventral. Leg vestiges present. Body hairs moderately numerous, uniformly distributed, short (0.019–0.1 mm long); 2- or 3-branched. Head large; cranium subheptagonal in anterior view, breadth 1.4 times length. Antennae just above midlength of cranium, large and with 3 sensilla, each bearing a spinule. Head hairs few (about 36), short. Of 2 types: (1) 0.038–0.06 mm long, unbranched, smooth; (2) about 0.038 mm long, with bifid tip. Labrum bilobed, breadth 1.7 times length; anterior surface of each lobe with 2 minute hairs and numerous closely spaced rows of minute spinules ventrolaterally; ventral surface of each lobe with 2 or 3 isolated sensilla; entire posterior surface spinulose, the spinules minute and in rows radiating from the dorsolateral angles and with 6 isolated sensilla. Mandible moderate-sized; teeth heavily sclerotized; moderately stout, camponotoid (i.e., subtriangular, base broad, apex forming a round-pointed tooth, with 1 subapical tooth); medial surface of apex with 2 rows of denticles one anterior and the other posterior, with the subapical tooth projecting anteriorly; anterior and posterior surfaces with numerous rows of minute spinules. Maxilla appearing adnate; palp paxilliform with 5 (1 with a large capsule) sensilla; galea digitiform with 2 apical sensilla. Labium with numerous arcuate rows of minute spinules; palp a low knob with 5 sensilla; an isolated sensillum between each palp and the opening of the sericteries, the latter a short transverse slit. Hypopharynx spinulose, the spinules minute and in rows radiating from the dorsolateral angles.

YOUNG LARVA. Length (through spiracles) about 1.2 mm. Profile pheidoloid, but anterior end formed from dorsum of T1 and T2. Anus with small anterior and posterior lips. Somites feebly differentiated. Integument spinulose on venter of anterior somites and all surfaces of posterior somites. Body hairs shorter (0.025–0.063 mm long). Antenna medium-sized. Head hairs shorter, all 0.025–0.05 mm long. Galea digitiform. Otherwise as in the mature larva.

Material studied. 5 larvae from Florida—Homestead Air Force Base, Dade Co., 29-XII-1975, coll. G. C. & J. Wheeler.

Paratrechina longicornis (Latreille)

Fig. 6

Description. MATURE LARVA. Length (through spiracles) 1.8–2.1 mm. Profile dolichoderoid, without ventral boss. Body hairs shorter (0.025–0.075 mm long). Head hairs slightly shorter (0.025–0.05 mm long). Labrum without spinules on anterior surface. Mandible camponotoid, without subapical tooth; lateral view of apex thin

and blade-like. Maxillary palp a slight elevation with 5 sensilla; galea represented by 2 contiguous sensilla. Labial palp represented by a cluster of 5 sensilla. Otherwise similar to *P. guatemalensis*.

YOUNG LARVA. Length (through spiracles) about 1.3 mm. Body profile more slender and lacking ventral boss. Galea represented by 2 contiguous sensilla. Otherwise similar to young *P. guatemalensis*.

Material studied. 5 larvae from Florida—Homestead Air Force Base, Dade Co., 29-XII-1975, coll. G. C. & J. Wheeler.

Paratrechina wojciki Trager

Description. MATURE LARVA. Length (through spiracles) about 1.5 mm. Integument of venter of anterior somites with minute spinules. Body hairs (1) 0.013–0.03 mm long, unbranched, smooth, on all somites; (2) 0.019–0.03 mm long, 2-branched (rarely 3-branched), on all somites. Head hairs all unbranched and smooth, 0.024–0.044 mm long. Maxillary palp a tall cone with 2 tall apical sensilla, 1 subapical with a spinule and 2 lateral sensilla with a spinule each; palp a short cone with 2 apical sensilla. Otherwise similar to *P. guatemalensis*.

YOUNG LARVA. Length (through spiracles) about 0.77 mm. Body hairs of 2 types: (1) 0.006–0.036 mm long, unbranched, smooth; (2) 0.012–0.048 mm long, 2-branched, on all somites. Head hairs of 1 type; 0.024–0.036 mm long, unbranched, smooth. Maxillary palp a slender tall cone with 2 tall apical sensilla, 1 subapical with a spinule and 2 lateral with a spinule each; palp shorter, with 2 apical sensilla. Otherwise as in young larva of *P. guatemalensis*.

Material studied. 5 larvae from Florida—Pinelands Trail, Everglades National Park, 30-XII-1975, coll. G. C. & J. Wheeler.

Tribe Camponotini

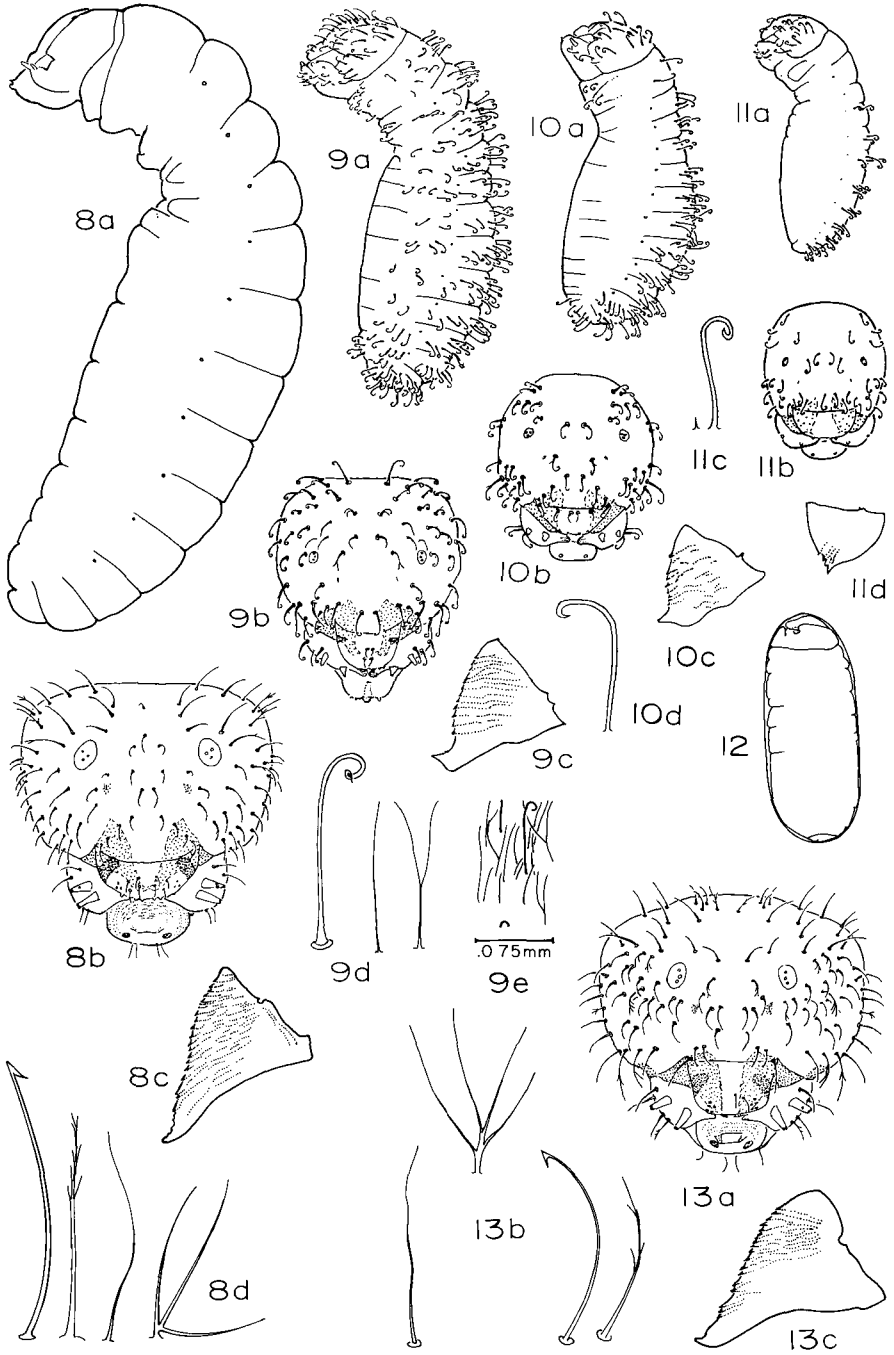
Genus DENDROMYRMEX Emery

Dendromyrmex chartifex (F. Smith)

Figs. 8–13

Description. SUBMATURE LARVA. Length (through spiracles) 3.6–4.3 mm. Profile pogonomyrmecoid; praesaepium present. Anus posteroventral. Spiracles small, decreasing slightly posteriorly. Somites distinct. Integument on venter of anterior somites with spinules in short transverse rows. Body hairs numerous. Of 4 types: (1) 0.05–0.13 mm long, 2- to 4-branched (mostly 2- or 3-branched), evenly distributed; (2) 0.05–0.13 mm long, unbranched, smooth, flexuous, a few on each somite, most numerous on AX; (3) 0.05–0.13 mm long, unbranched, denticulate, a few on each somite; (4) about 0.14 mm long, uncinuate, on dorsum of AI–AVII. Head large; cranium transversely subrectangular. Antennae large; just above midlength of cranium. Head hairs 0.05–0.125 mm long; mostly smooth, a few with a few denticles. Otherwise similar to *D. fabricii* (Wheeler and Wheeler 1953:201).

THIRD INSTAR LARVA. Length (through spiracles) about 2 mm. Thorax stout and curved ventrally, abdomen straight and slightly swollen; posterior end rounded. Anus posteroventral. Spiracles minute. Somites distinct. Spinules on venter of T2–AII, dorsum of AVI–AIX and all surfaces of AX. Body hairs numerous. Of 3 types:



(1) 0.013–0.1 mm long, very fine, unbranched or bifid, smooth, on all somites; (2) 0.013–0.13 mm long, with stout shaft and curled uncinuate tip, on all surfaces of thorax and AVIII–AX, and dorsal and lateral surfaces of AI–AVII; (3) 0.05–0.13 mm long, uncinuate, with tip curled and denticulate shaft, on all surfaces of T1–T3. Head large; cranium subhexagonal, about as broad as long. Antenna small, at mid-length of cranium, with 3 sensilla each bearing a spinule. Head hairs short, moderately numerous. Of 3 types: (1) 0.06–0.08 mm long, uncinuate with curled tip, a few with a few denticles on shaft; (2) about 0.1 mm long, few, bifid; (3) about 0.08 mm long, few, unbranched, smooth. Labrum paraboloidal; chiloscleres feebly developed; anterior surface with 4 hairs and 4 sensilla; ventral surface with 6 projecting sensilla; posterior surface densely spinulose, the spinules minute and in rows radiating from the dorsolateral angles. Mandible camponotoid but with the apex stout, ending in a small short tooth directed medially; feebly sclerotized; stout; anterior and posterior surfaces with moderately numerous rows of minute spinules. Maxilla terminating in a small cone projecting medially and bearing a few rows of spinules; palp paxilliform, with 5 apical sensilla; galea a stout cone with 2 apical sensilla. Labium with a few short transverse rows of minute spinules; palp paxilliform, with 5 apical sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit. Hypopharynx spinulose, the spinules minute and in rows radiating from the dorsolateral angles.

SECOND INSTAR LARVA. Length (through spiracles) about 1.6 mm. Thorax stout and bent ventrally; abdomen straight and slightly swollen. Anus posteroventral. Spiracles minute. Somites feebly differentiated. Entire integument spinulose, the spinules minute and in short rows posteriorly, isolated elsewhere. Body hairs sparse, mostly restricted to dorsal surface; 0.06–0.11 mm long; uncinuate with curled tip. Head large; cranium suboctagonal, slightly broader than long. Antenna small, just above midlength of cranium, with 3 sensilla. Head hairs moderately numerous (60); 0.05–0.09 mm long; uncinuate with curled tip, some with denticles on shaft. Labrum twice as broad as long; chiloscleres lacking; anterior surface with 4 small hairs and 2 sensilla; ventral surface with 4 projecting sensilla; posterior surface densely spinulose, the spinules minute and in rows radiating from the dorsolateral angles, stout, feebly sclerotized, camponotoid with the apical tooth short and with a few rows of minute spinules on anterior and posterior surfaces. Maxilla swollen ventrolaterally; with conical apex directed medially and with a few short rows of spinules; palp

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Figs. 8–13. *Dendromyrmex chartifex*. 8. Submature larva. A, Larva in side view (hairs omitted), $\times 27$; b, head in anterior view, $\times 50$; c, left mandible in anterior view, $\times 133$; d, 4 types of body hairs, $\times 267$. 9. Third instar larva. a, Larva in side view, $\times 27$; b, head in anterior view, $\times 50$; c, left mandible in anterior view, $\times 133$; d, 3 types of body hairs, $\times 267$; e, relation of uncinuate and fine body hairs, $\times 133$. 10. Second instar larva. a, Larva in side view, $\times 27$; b, head in anterior view, $\times 50$; c, left mandible in anterior view, $\times 133$; d, body hair, $\times 267$. 11. First instar larva. a, Larva in side view, $\times 27$; b, head in anterior view, $\times 50$; c, body hairs, $\times 267$; d, left mandible in anterior view, $\times 133$. 12. Egg containing larva, $\times 27$. 13. Sexual larva. a, Head in anterior view, $\times 27$; b, 4 types of body hairs, $\times 267$; c, left mandible in anterior view, $\times 133$.

paxilliform with 5 (4 apical and 1 lateral) sensilla; galea a short frustum with 2 apical sensilla. Labium with a few short rows of minute spinules on anterior surface; palp a short paxilla with 5 apical sensilla; an isolated sensillum between each palp and the opening of the sericteries, the latter a short transverse slit.

FIRST INSTAR LARVA. Length (through spiracles) about 1.2 mm. Thorax stout and bent ventrally, abdomen straight; posterior end round-pointed. Anus ventral. Spiracles minute. Four feebly differentiated somites. Body hairs few. Of 2 types; (1) about 0.088 mm long, uncinete with curled tip, limited to dorsal surface of abdomen, more numerous posteriorly; (2) about 0.006 mm long, 1 on each ventrolateral surface of T1–T3. Head large, of same diameter as T1; bulging anteriorly; cranium subcircular in anterior view. Antenna small, with 3 sensilla; at midlength of cranium. Head hairs moderately numerous (44), 0.038–0.088 mm long, uncinete with curled tip. Labrum trapezoidal; anterior surface with 4 hairs and 4 sensilla; ventral surface with 4 projecting sensilla; posterior surface densely spinulose, the spinules minute and in rows radiating from the dorsolateral angles. Mandible feebly sclerotized, semicircular in anterior view, with a short sharp tooth projecting ventrally; anterior and posterior surfaces with a few short longitudinal rows of minute spinules. Apex of maxilla paraboloidal and with short rows of minute spinules; palp an irregular knob with 5 sensilla; galea a stout frustum with 2 apical sensilla. Labium with a few short transverse rows of minute spinules; palp a slightly raised cluster of 5 sensilla; opening of sericteries a short transverse slit. Hypopharynx spinulose, the spinules minute and in rows radiating from the dorsolateral angles.

EGG (containing 1st instar larvae). Ellipsoidal; 0.9 by 0.4 mm.

SEXUAL (removed from cocoon). Length (through spiracles) 6.7 mm. Body hairs of 4 types: (1) 0.05–0.1 mm long, palmately 2- to 5-branched, a few of longest on each somite; (2) about 0.1 mm long, unbranched, smooth, a few on each somite; (3) about 0.1 mm long, uncinete, on dorsum of AI–AVI; (4) about 0.1 mm long, with a few long denticles, a few on dorsum of thorax. Cranium subheptagonal, broader than long. Head hairs moderately numerous (86). Of 2 types: (1) 0.05–0.125 mm long, unbranched, smooth; (2) about 0.055 mm long, few, 2- or 3-branched. Otherwise similar to submature worker.

Material studied. 7 larvae from Panama—Barro Colorado Island, 20-XI-1982, courtesy of Diana E. Wheeler.

Hölldobler and Wilson, 1983: The larvae are used by the workers to supply silk for reinforcing the carton of the nest-walls.

Genus POLYRHACHIS F. Smith

Hölldobler and Wilson, 1983. Colored photograph of a worker of *P. sp.* (cf. *doddi*) using a larva as a shuttle to weave silk for nest construction. SEM of *P. sp.* labium showing opening of silk glands.

Polyrhachis lamellidens F. Smith

Kôriba, 1963: 4 instars, each described. Duration of stages given. Figure 4 first instar larva.

CAUTION: Hairs have been omitted from most drawings of larvae in side view. In *Aphomomyrmex* they become too fine to be shown accurately at this magnification. In *Paratrechina* 5d most hairs have been broken off. In *Dendromyrmex* 8a they are too numerous.

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