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THE ANT LARVAE OF THE MYRMICINE TRIBE PHEIDOLOGETINI¹

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In the *Genera Insectorum* Emery included the genera *Lophomyrmex*, *Trigonogaster*, *Pheidologeton*, *Aneleus*, *Oligomyrmex*, *Erebomyrma*, *Carebara* and *Paedalgus* in the tribe Pheidologetini. Wheeler placed these genera in the Solenopsidini but admitted (1922, p. 659) that the latter tribe was "very unsatisfactorily defined." We have followed Emery.

The tribe Pheidologetini comprises about a hundred species, most of which are Paleotropical. The tribe is noted for the large size of the queens. In *C. vidua*, for example, the volume ratio of queen to worker is several thousand to one. *Pheidologeton* is a genus of harvesters, with a polymorphic worker caste ranging from minute minimae through a graded series to gigantic soldiers with enormous heads. The other genera are suspected of having relations with termites, though just what sort of relations has never been proved. At least they nest in termitaria. *Aneleus* and *Oligomyrmex* have the worker caste strongly dimorphic — large headed soldier and small worker. In *Lophomyrmex*, *Trigonogaster*, *Erebomyrma*, *Carebara* and *Paedalgus* the worker caste is monomorphic and minute.

In this article we have described the larvae of 13 species in seven genera. These larvae do not constitute a homogeneous group. They are nevertheless better defined

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as a group than are the larvae of the Solenopsidini (either in the sense of Emery or in the sense of Wheeler) to the extent that at least a few minor characters are common to all the known genera. The subtribes, however, are homogeneous and easily differentiated. Within each subtribe the genera are not easily distinguished.

Tribe PHEIDOLOGETINI Emery

Body hairs moderately numerous and uniformly distributed. Anchor-tipped hairs absent. Antennae small. Head hairs few. Labrum short and broad (breadth $2\times$ to $3\times$ length). Ratio of head width to mandible length = 3.0 to 4.0; average 3.5. Ratio of mandible length to mandible width (at base) = 1.4 to 2.4; average 1.7. Surface of maxillae without spinules. Anterior surface of labium spinulose.

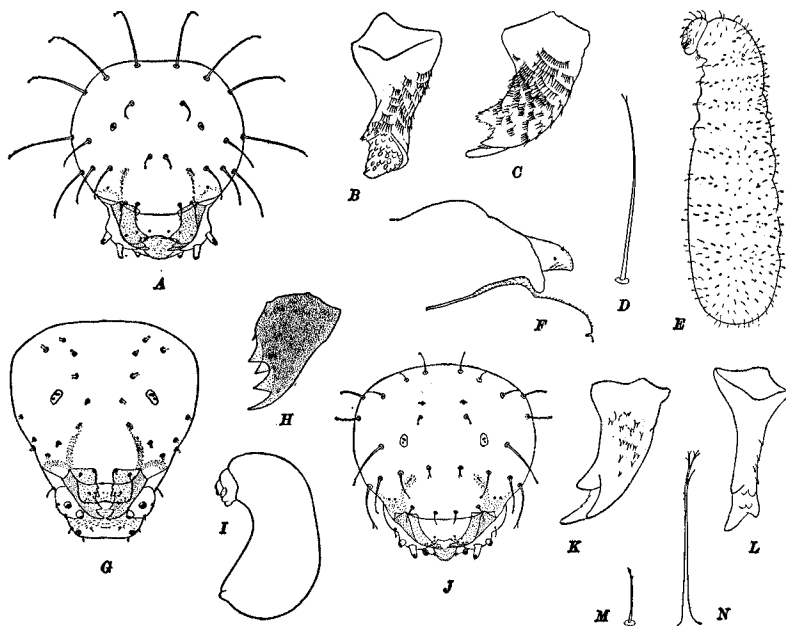
Subtribe LOPHOMYRMICINI Emery

Body hairs all of the same shape: either with the tip denticulate or with the tip bifid. Labrum trilobed, the median lobe projecting posteriorly. Posterior surface of labrum densely spinulose. Mandibles as a whole curved medially; teeth surrounding a denticulate area; anterior surface spinulose. Labium with a median anteroventral projection, which bears the opening of the sericteries at its apex. Labial palp a low knob bearing five sensilla. Hypopharynx spinulose.

Genus *Lophomyrmex* Emery

Thorax rather stout and bent ventrally at right angles; abdomen elongate-ovoidal; diameter greatest at the fourth and fifth abdominal somites; posterior end broadly rounded. Body hairs moderately numerous and short; all with the tip denticulate. Antennae small. Head hairs few, short to moderately long, with the tip denticulate. Labrum small, trilobed, with the median lobe projecting posteriorly; posterior surface densely spinulose. Mandibles slender and thin; curved medially; apical tooth curved medially and posteriorly; a large anterior subapical tooth directed antero-ventrally; a large blunt medial tooth directed postero-ventrally; teeth surrounding a denticulate area; anterior surface with several sharp spinules. Maxillary palp a peg

bearing five sensilla. Labium with a median anteroventral spinulose projection, with the opening of the sericteries at its apex. Labial palp a low knob bearing five sensilla. Hypopharynx with a few oblique rows of minute spinules.



Text figure 1. *Trigonogaster recurvispinosa kemneri* Wheeler, A-F —A, head in anterior view, $\times 85$; B, left mandible in medial view, $\times 247$; C, left mandible in anterior view, $\times 247$; D, body hair, $\times 329$; E, larva in side view, $\times 18$; F, left half of labrum and labium in sagittal view, $\times 165$.

Erebomyrma sp., G-I —G, head in anterior view (with hair bases only), $\times 108$; H, left mandible in anterior view, $\times 247$; I, profile, $\times 18$.

Lophomyrmex quadrispinosus (Jerdon), J-N —J, head in anterior view, $\times 85$; K, left mandible in anterior view, $\times 192$; L, left mandible in medial view, $\times 192$; M and N, two body hairs, $\times 209$.

Lophomyrmex quadrispinosus (Jerdon)

(Text. fig. 1, J-N)

Thorax rather stout and bent ventrally at right angles; abdomen elongate-ovoidal; diameter greatest at the fourth

and fifth abdominal somites; posterior end broadly rounded, anterior end formed from the dorsum of the prothorax. Anus posteroventral. Leg vestiges present. Segmentation indistinct. Integument of ventral surface of thorax and abdominal somites I-III with numerous transverse rows of spinules. Body hairs moderately numerous, short (0.036-0.126 mm), all with denticulate tip; hairs without alveolus and articular membrane except on the prothorax. Head moderately large; cranium transversely subelliptical, breadth $1.25\times$ length. Antennae small, each with three (rarely two) sensilla, each of which bears a spinule. Head hairs few, short to moderately long (0.018-0.072 mm), with denticulate tip. Labrum small, short (width $2\times$ length), trilobed, the median lobe projecting posteriorly; anterior surface of each lateral lobe with three minute hairs and/or sensilla; ventral border of each lateral lobe with three sensilla and several short oblique rows of exceedingly minute spinules; posterior surface of each half with 1-2 isolated and a cluster of 3-4 sensilla; posterior surface spinulose, the spinules minute and in numerous long transverse rows. Mandibles slender and thin; curved medially; apical tooth curved medially and posteriorly; a large anterior subapical tooth directed anteroventrally; a large blunt medial tooth directed posteroventrally; teeth surrounding a denticulate area; anterior surface with several sharp spinules. Maxillae with the apex paraboloidal; palp a peg with one subapical (bearing a spinule) and four apical sensilla; galea a rather tall peg with two apical sensilla. Labium with a median anteroventral projection covered with short rows of minute spinules; palp a low knob with five sensilla (one of which bears a spinule); a minute sensillum between each palp and the opening of the sericteries; the latter a transverse slit on the end of the projection. Hypopharynx with a few oblique rows of minute spinules.

SEXUAL LARVA: Elongate-ovoidal; head small, on the ventral surface near the anterior end. Body naked. Head naked but with minute sensilla. Mandibles with all teeth directed medially. Otherwise similar to worker larva.

Material studied: numerous slightly damaged larvae from Java labelled "*var. opaciceps* Viehmeyer."

Genus TRIGONOGASTER Forel

Long, slender, club-shaped, with only the prothorax bent ventrally to form a very short neck; posterior end broadly round. Body hairs moderately numerous, very short, usually with a short-bifid tip. Antennae minute. Head hairs few, long and with some part of the distal half finely denticulate. Labrum trilobed, with the median lobe projecting posteriorly; posterior surface densely spinulose. Mandibles curved medially; apical tooth round-pointed and curved medially; a large anterior subapical tooth directed anteroventrally; a large blunt medial tooth directed posteroventrally and sometimes covered with spinules; teeth surrounding a denticulate area; anterior surface with many long slender spinules arranged in transverse arcuate rows. Maxillary palp a peg bearing five sensilla. Labium with a median anteroventral spinulose projection, with the opening of the sericteries at its apex; labial palp a low knob bearing five sensilla. Hypopharynx with numerous transverse rows of minute spinules.

Trigonogaster recurvispinosa kemneri Wheeler

(Text fig. 1, A-F)

Long, slender, club-shaped, with only the prothorax bent ventrally to form a very short neck; posterior end broadly rounded. Anus posteroventral. Spiracles small, the mesothoracic larger than the others. Integument with minute spinules on the ventral surface of the thorax. Body hairs moderately numerous, uniformly distributed, very short (0.018-0.108 mm), usually with very short-bifid tip; with alveolus and articular membrane. Head moderately large; cranium transversely subelliptical, slightly broader than long. Antennae minute, each with three sensilla, each of which bears a spinule. Head hairs few, long (0.04-0.105 mm) and with some part of the distal half finely denticulate. Labrum short (breadth $2\times$ length), trilobed, the median lobe projecting posteriorly; anterior surface of each lateral lobe with 2-3 minute hairs and/or sensilla; ventral border of each lateral lobe spinulose and with one isolated and two contiguous sensilla; posterior surface of each half with 3-4 isolated and two contiguous sensilla; posterior surface densely spinulose, the spinules minute and in numerous

long transverse rows. Mandibles curved medially; apical tooth round-pointed and curved medially; a large anterior subapical tooth directed anteroventrally; a large blunt medial tooth directed posteroventrally and sometimes covered with spinules; teeth surrounding a denticulate area; anterior surface with many long slender spinules arranged in transverse arcuate rows. Maxillae with the apex paraboloidal; palp a peg with one subapical (bearing a spinule) and four apical (two bearing each a short spinule) sensilla; galea a tall slender frustum with two apical sensilla. Labium with a median anteroventral projection covered with short rows of minute spinules; palp a low knob with five sensilla (three bearing a spinule each); opening of sericteries a short transverse slit on the end of the projection. Hypopharynx with numerous transverse rows of minute spinules. (Material studied: eight larvae from Java.)

Subtribe PHEIDOLOGETINI Emery

Body hairs of two or three types; those on the dorsal and lateral surfaces deeply bifid, with the branches curling away from each other. Labrum subrectangular, with the ventral corners rounded. Posterior surface of labrum sparsely spinulose or without spinules. Mandibles as a whole not curved medially; the teeth not surrounding a denticulate area; anterior surface without spinules. Labium without a median projection. Labial palp represented by a cluster of four sensilla. Hypopharynx apparently without spinules.

Genus *Pheidologeton* Mayr

Short and stout; prothorax forming a stout neck, which is bent ventrally to a right angle; dorsal profile C-shaped, ventral profile of abdomen nearly straight; diameter greatest at abdominal somites III and IV. Body hairs moderately numerous and short. Of three types (with intergrades): (1) deeply bifid, with the branches curling away from each other and enlarged at the tip, the most abundant type (but absent from the ventral surface); (2) bifid, with the branches acuminate and nearly straight, a few on the ventrolateral surfaces; (3) a few simple hairs on the ventral

surface. Antennae small. Head hairs few, short, simple or with denticulate tip. Labrum subrectangular; posterior surface sparsely spinulose. Mandibles small, short, stout and thick; apex forming a small tooth which is curved medially and posteriorly; with two small medial teeth near the anterior surface. Maxillary palp a low elevation bearing four sensilla; galea a low knob. Labial palp represented by a cluster of four sensilla. *Sexual* (?) *larva* voluminous, plump, turgid, bean-shaped; head exceedingly minute, on the ventral surface near the anterior end; mandibles with the apical tooth vestigial and with only one medial tooth.

Pheidologeton diversus (Jerdon)

(Pl. 6, figs. 8-16)

MATURE WORKER LARVA: Length about 2.1 mm. Short and stout; prothorax forming a stout neck, which is bent ventrally to a right angle; dorsal profile c-shaped, ventral profile of abdomen nearly straight; diameter greatest at abdominal somites III and IV. Anus ventral. Leg vestiges present. Segmentation indistinct. Mesothoracic spiracle a third larger than the metathoracic, the others diminishing slightly toward the posterior end. Integument of dorsal surface of posterior somites sparsely spinulose, the spinules minute and isolated or in very short rows; on the ventral surface of the thorax and abdominal somites I and II they are in longer rows. Body hairs moderately numerous and short. Of three types: (1) deeply bifid, about 0.054 mm, with the branches curling away from each other and enlarged at the tip, the most abundant type, absent from the ventral surface; (2) bifid, 0.024-0.054 mm, with the branches acuminate and nearly straight, a few on the ventrolateral surfaces; (3) simple, about 0.024 mm, a few on the ventral surface; there are intergrades between the several types; a few hairs on the ventral surface have alveolus and articular membrane. Head large; cranium suboctagonal, but with the angles rounded, slightly broader than long. Antennae small, each with three (rarely four) sensilla each bearing a spinule. Head hairs few, short (0.006-0.036 mm), simple or with the tip denticulate. Labrum short and broad (breadth $3\times$ length); subrectangular, with the ventral corners rounded; each half of anterior

surface with 5-6 sensilla; ventral border with a few spinules and two isolated sensilla; posterior surface with 5-6 sensilla and three spinulose areas, a central area of minute spinules arranged in a few scattered short rows and two ventrolateral areas of coarse isolated spinules. Mandibles small, short, stout and thick; apex forming a small tooth which is curved medially and posteriorly; with two small medial teeth near the anterior surface. Maxillae with the apex paraboloidal; palp a low elevation bearing four sensilla; galea a low knob bearing two sensilla. Anterior surface of labium sparsely spinulose, the spinules isolated or in short transverse rows; palp represented by a cluster of four sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit.

YOUNG LARVA: Length about 1.1 mm. Thorax bent ventrally to an acute angle; diameter nearly uniform but greatest at the third and fourth abdominal somites. Head relatively very large. Posterior end forming a knob which is directed posteroventrally. Otherwise as in the mature larva.

Material studied: two dozen larvae from the Philippine Islands.

EXPLANATION OF PLATE 6

Oligomyrmex parvicornis Forel, Figs. 1-7 —1, head in anterior view, $\times 115$; 2, left mandible in anterior view, $\times 303$; 3 and 4, two body hairs, $\times 418$; 5, first instar larva in side view, $\times 39$; 6, young larva in side view, $\times 39$; 7, mature larva in side view, $\times 39$.

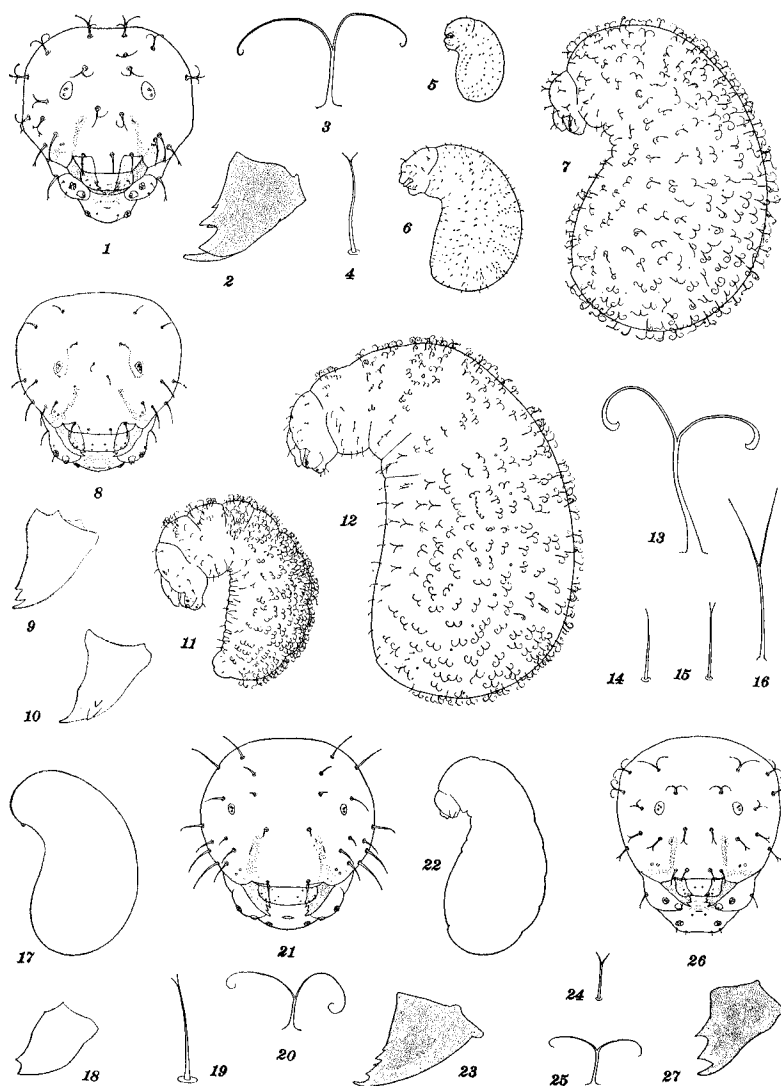
Pheidologeton diversus (Jerdon), Figs. 8-16 —8, head in anterior view, $\times 77$; 9, left mandible in anterior view, $\times 209$; 10, left mandible in medial view, $\times 209$; 11, young larva in side view, $\times 36$; 12, mature larva in side view, $\times 36$; 13-16, four body hairs, $\times 418$.

Pheidologeton affinis (Jerdon), Figs. 17 and 18 —17, profile of sexual (?) larva, $\times 2.7$; 18, left mandible of sexual (?) larva in anterior view, $\times 209$.

Carebara winifredae Wheeler, Figs. 19 and 20, two body hairs, $\times 418$.

Carebara lignata Westwood, Figs. 21-23 —21, head in anterior view, $\times 108$; 22, profile of worker larva, $\times 18$; 23, left mandible in anterior view, $\times 245$.

Paedalgus termitolestes Wheeler, Figs. 24-27 —24 and 25, two body hairs, $\times 329$; 26, head in anterior view, $\times 132$; 27, left mandible in anterior view, $\times 303$.



WHEELER AND WHEELER — MYRMICINE LARVAE

Pheidologeton affinis (Jerdon)

(Pl. 6, figs. 17-18)

SEXUAL (?) LARVA: Length straight from end to end 8 mm; length from head to anus through spiracles about 12 mm. Voluminous, plump and turgid, bean-shaped. Head exceedingly minute, on the ventral surface near the anterior end. Mandibles somewhat smaller; apical tooth vestigial; only one medial tooth. Otherwise similar to *diversus* worker larva. (Material studied: six larvae from Dutch New Guinea; hairs broken off.)

Genus *Oligomyrmex* Mayr

Short and very stout; prothorax forming a short, very stout neck which is bent ventrally to a right angle; dorsal profile C-shaped, ventral sinuate; diameter greatest at abdominal somites IV and V. Body hairs short and moderately numerous. Of two types: (1) deeply bifid, with the branches curling away from each other, the most abundant type, absent from the ventral surface of the thorax; (2) a few on the ventral surface, with short-bifid tip. Head hairs few, short, varying in arrangement and shape. Labrum small and subrectangular; posterior surface sparsely spinulose. Mandibles with a long slender apical tooth which is curved medially; a large subapical tooth on the anterior surface; an acute medial tooth arising from the posterior surface near the middle of the mandible; one or two additional medial teeth may be present. Maxillary and labial palps each represented by a cluster of four sensilla; galea a low knob.

Oligomyrmex parvicornis Forel

(Pl. 6, figs. 1-7)

MATURE WORKER LARVA: Length about 1.5 mm. Short and very stout; prothorax forming a short, very stout neck which is bent ventrally to a right angle; dorsal profile C-shaped, ventral sinuate; diameter greatest at abdominal somites IV-V. Anus ventral, with a posterior lip. Segmentation indistinct. Mesothoracic spiracle a third larger than the metathoracic and first abdominal (which are equal), the others exceedingly minute (one-third the size of the mesothoracic). Integument of midventral surface of thorax

and abdominal somites I and II with a few long transverse rows of spinules. Body hairs moderately numerous, uniformly distributed, short. Of two types: (1) deeply bifid, 0.036-0.054 mm, with the branches curling away from each other, the most abundant type, absent from the ventral surface of the thorax (a few of this type are trifold or have the branches denticulate), without alveolus and articular membrane; (2) a few hairs on the ventral surface, 0.018-0.045 mm, with short-bifid tip, with alveolus and articular membrane. Head large; cranium suboctagonal in anterior view, slightly broader than long. Antennae with three (rarely two) sensilla, each bearing a short spinule. Head hairs few, short (0.018-0.036 mm), varying in arrangement and shape (simple or bifid or trifold or with short-bifid tip or long-branched with a few denticles.) Labrum small, short and broad (breadth $3\times$ length); subrectangular, with the ventral corners rounded; anterior surface with four minute hairs, four sensilla and a few spinules; ventral border spinulose; posterior surface with six isolated sensilla and a few spinules. Mandibles heavily sclerotized; a trifle stout; apex forming a long slender tooth which is curved medially; a large subapical tooth on the anterior surface; an acute medial tooth arising from the posterior surface near the middle of the mandible; one or two additional medial teeth may be present. Maxillae with the apex paraboloidal; palp a cluster of four sensilla, two of which bear each a spinule and two a cap; galea a short knob with two sensilla. Anterior surface of labium sparsely spinulose, the spinules minute and in short rows; palp a cluster of four sensilla, two of which bear each a spinule and two a cap; a minute hair between each palp and the opening of the sericteries; the latter a short transverse slit.

FIRST INSTAR LARVA: Length about 0.27 mm. Body short, stout and subovoidal. Head very large, ventral. Hairs simple, about 0.006 mm long. Integument of dorsal surface with spinules in short transverse rows.

SECOND INSTAR LARVA: Similar to the first instar but with hairs up to 0.009 mm long.

YOUNG LARVA: Length about 0.73 mm. Short and stout with the prothorax curved ventrally to a right angle. Head very large. Body hairs very short (0.006-0.018 mm), most

hairs on the ventral surface straight, with simple or bifid tip; elsewhere varied (simple and straight or flexible, or with bifid tip or deeply bifid). Integument of dorsal surface of abdominal somites VI-X with spinules in short transverse rows; a few minute spinules on the venter of the prothorax.

YOUNG LARVA: Length about 1.1 mm. Similar to mature larva.

Material studied: two dozen larvae from Queensland; courtesy of Dr. W. L. Brown.

Oligomyrmex jacobsoni Forel

Length about 1.36 mm. Body hairs shorter. With a sensillum between each palp and the opening of the sericteries. Otherwise as in *parvicornis*. (Material studied: numerous larvae from Java.)

Oligomyrmex mjobergi Forel

Very similar to *parvicornis*. (Material studied: numerous larvae from Queensland; courtesy of Dr. W. L. Brown.)

Oligomyrmex thoracicus Weber

Weber, 1950, pp. 16-17: "The 6-mm. cell contained worker and female pupae, the latter 3.3 mm. in length, and a few larvae which could have been only female, being 1.8-2.3 mm. long. Early worker pupae were enclosed in the larval skin, the latter being 0.9 mm. long. The female larvae were as plump as those of *Atta*, one 1.8 mm. long having an abdominal diameter of 1.1 mm. and a head capsule of 0.25 mm. situated completely on the ventral side; no hairs were apparent. Worker larval skins on the other hand were covered with short hairs, bifurcate or trifurcate apically."

Oligomyrmex (Aëromyrma) sundaicus Forel

Very similar to *parvicornis*. (Material studied: 18 damaged larvae from Java.)

Genus EREBOMYRMA Wheeler

Short and stout; curved ventrally; posterior end conoidal and directed ventrally. Labrum small and subrectangular; the posterior surface sparsely spinulose. Mandibles with apex forming a long slender acute tooth which is curved medially; anterior surface with two large medial teeth. Maxillary and labial palps each represented by a cluster of four sensilla.

Erebomyrma sp.

(Text fig. 1, G-I)

Length about 2 mm. Short and stout; curved ventrally; posterior end conoidal and directed ventrally; anus at the tip of the conoid, with a conspicuous posterior lip; head ventral near the anterior end. Segmentation indistinct. Dorsal surface of posterior somites sparsely spinulose, the spinules minute and in very short transverse rows; ventral surface of anterior somites with more numerous and longer rows. Head large, subpyriform in anterior view. Each antenna with three sensilla, each of which bears a spinule. Labrum small, subrectangular in anterior view, short and broad (breadth $2.3\times$ the length); anterior surface with four minute hairs, four sensilla and a few spinules; ventral border with six sensilla and a few spinules; posterior surface with four isolated sensilla and a few short rows of minute spinules. Mandibles heavily sclerotized; somewhat stout; apex forming a long slender acute tooth which is curved medially; posterior surface with one large medial tooth; anterior surface with two large medial teeth; medial surface may have a single denticle near the base. Maxillae rather small, lobose; palp a short frustum with four sensilla; galea a short subcone with two sensilla. Anterior surface of labium spinulose, the spinules minute and in short rows; palp represented by a cluster of four sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit. (Material studied: two damaged larvae from Costa Rica; hairs broken off.)

Genus *Carebara* Westwood

Shaped somewhat like a crookneck squash; thorax forming a short, stout neck which is strongly curved ventrally; abdomen somewhat swollen. Body hairs moderately numerous and short. Of two types: (1) deeply bifid, with the branches curled away from each other, the most common type; (2) a few with short-bifid tip, restricted to ventral and ventrolateral surfaces. Antennae small. Head hairs few, short, simple. Labrum small and subrectangular; the posterior surface apparently without spinules. Mandibles small, short and stout; apex forming a short slender tooth;

two small medial teeth arise from the anterior surface and one from the posterior. Maxillary and labial palps each represented by a cluster of four sensilla.

Eidmann (1944, p. 458) characterized the sexual larvae of this genus as gigantic (*riesig*).

Wheeler, 1922, p. 171: The larvae of the sexual forms are "so voluminous that they could not be moved by the workers and are so soft and vulnerable that they would have to be reared in chambers inaccessible to the termites."

Carebara lignata Westwood
(Pl. 6, figs. 21-23)

MATURE WORKER LARVA: Length about 2 mm. Shaped somewhat like a crookneck squash; thorax forming a short, stout neck which is strongly curved ventrally; abdomen somewhat swollen; posterior end round. Anus postero-ventral. Segmentation indistinct. Spiracles uniform in size. Integument of ventral surface of thorax with rather long transverse rows of spinules. Cranium subcircular in anterior view. Antennae small, each with three sensilla, each of which bears a spinule. Head hairs few, short (0.027-0.045 mm), simple, slightly curved. Labrum small, short and broad (breadth $3\times$ length); subrectangular, but with the ventral corners rounded; anterior surface with about 10 sensilla; ventral border with a couple of isolated sensilla and with a few spinules at either side; posterior surface with six sensilla. Mandibles small, short and rather stout; apex forming a short slender tooth; two small medial teeth arise from the anterior surface and one from the posterior. Maxillae with the apex paraboloidal; palp represented by a cluster of four sensilla (two encapsulated and two bearing a spinule each); galea a short frustum bearing two apical sensilla. Anterior surface of labium spinulose, the spinules minute and in very short transverse rows; palp a cluster of four sensilla (two encapsulated and two bearing a spinule each); opening of sericteries a short transverse slit. (Material studied: numerous damaged larvae from Java.)

Carebara winifredae Wheeler
(Pl. 6, figs. 19-20)

MATURE WORKER LARVA: Length about 2 mm. Body hairs

moderately numerous and short. Of two types: (1) about 0.036 mm long, deeply bifid, with the branches curled away from each other, without alveolus and articular membrane, the most common type; (2) a few, 0.027-0.045 mm long, with short-bifid tip, with alveolus and articular membrane, restricted to the ventral surface of the abdomen and to the ventral and ventrolateral surfaces of the thorax. Integument of ventral surface of thorax and abdominal somites I and II with rather long transverse rows of spinules. Labium with an isolated sensillum between each palp and the opening of the sericteries. Otherwise similar to *lignata*. (Material studied: a dozen damaged larvae from British Guiana.)

Genus *Paedalgus* Forel

Abdomen spheroidal; thorax forming a short stout neck which is arched ventrally. Body hairs short and moderately numerous. Of two types: (1) deeply bifid, with the branches curling away from each other, the most abundant type; (2) a few with bifid tip, on the ventral surface. Head hairs few and short, those above the antennal level deeply bifid, those below with bifid tip. Labrum small and subrectangular; posterior surface apparently without spinules. Mandibles short and stout; anterior surface produced into a medial blade which bears two stout medial teeth; posterior surface with one medial tooth. Maxillary and labial palps each represented by a cluster of four sensilla.

Wheeler, 1922, p. 119: "That the salivary glands may be important as exudate organs throughout life is indicated by certain genera of Myrmicinae (e.g., *Paedalgus*), the larvae of which have no exudatoria but greatly developed salivary glands, though the latter are never used for spinning cocoons in the prepupal stage." (Mentioned by Wheeler 1928, p. 233 = 1926, p. 281.)

Paedalgus termitolestes Wheeler

(Pl. 6, figs. 24-27)

Abdomen spheroidal; thorax forming a short stout neck which is arched ventrally; segmentation indistinct (according to W. M. Wheeler). Integument of ventral surface of thorax with rather long transverse rows of minute

spinules. Body hairs moderately numerous, uniformly distributed and short. Of two types: (1) deeply bifid, about 0.036 mm long, with the branches curling away from each other, the most abundant type, without alveolus and articular membrane, absent from the ventral surface; (2) a few on the ventral surface, about 0.018 mm long, nearly straight, with the tip bifid, with alveolus and articular membrane. Cranium transversely subelliptical in anterior view, slightly broader than long. Antennae each with three sensilla, each of which bears a spinule. Head hairs few, short (about 0.027 mm), those dorsal to the antennal level deeply bifid, ventral to the antennal level with bifid tip. Labrum small, short (breadth $2.2 \times$ length); subrectangular, but with the ventral corners rounded; anterior surface with about ten sensilla; posterior surface with about six sensilla. Mandibles short, stout and heavily sclerotized; apex slender and curved medially; anterior surface produced into a medial blade which bears two stout medial teeth; posterior surface with one medial tooth. Maxillae with the apex paraboloidal; palp represented by a cluster of four sensilla (two encapsulated and two bearing a spinule each); galea a short frustum with two apical sensilla. Anterior surface of the labium with a few rows of minute spinules; palp represented by a cluster of four sensilla (two encapsulated and two bearing a spinule each); an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit. (Material studied: a single damaged integument from the Congo.)

Bischoff (1927, pp. 94-95) cited Wheeler (1918) on trophallaxis in this species.

Forel (1922, p. 83 = 1928, Vol. I, pp. 462-463) cited the same.

Wheeler, 1918: "The larva has a singular shape, being almost spherical, with a short neck, small head and minute, bidenticulate mandibles. The delicate integument is studded with very short, stiff hairs, each of which has two recurved branches. The larvae, which are held together in compact masses by the interlocking of these hooked hairs, are fed with liquid food by regurgitation as is evident from the contents of their large spherical stomachs and the very feeble development of their mouthparts. Although, like

other Myrmicinae, they do not spin cocoons but form naked pupae, they nevertheless possess huge salivary glands. Even in the very young larva the salivary receptacle on each side is full of a clear liquid secreted by the large cells of the two branches of the gland. In the nearly full-grown female larva the glands are very voluminous and their lumen and that of the receptacle full of secretion shown as dark, compact masses in the figure, which was, of course, drawn from a specimen hardened and dehydrated in alcohol. As such an amount of saliva would hardly be necessary for digestive purposes and as it is not used in the form of silk by the full-grown larva, it probably serves as a store of food for the nurses. The *Paedalgus* larvae, therefore, would seem to resemble the repletes of honey ants . . . except that the food for the workers is metabolized and stored as saliva by the larva, instead of merely being ingurgitated and stored in the ingluvies, or crop by a certain number of workers. From the fact that other Myrmicine ants, although they spin no cocoons, often have well-developed salivary glands, we may infer that these organs have much the same function as in *Paedalgus*" (pp. 301-302). Fig. 5 on p. 303: A, very young larva in side view showing internal anatomy; B, nearly mature female larva in side view showing salivary glands.

Wheeler, 1922: "They are white, nearly spherical, with short neck, small head, and very feebly developed mouth-parts, indicating that they are fed by the tiny workers with regurgitated liquid food. They are . . . covered uniformly with short, stiff, sparse hairs, each of which has two recurved branches. Even in alcohol, the larvae cling compactly together in masses by means of these hooks. When stained and cleared, the larvae are seen to possess unusually voluminous salivary glands. The youngest individuals, scarcely 0.2 mm. long, have the receptacle full of clear secretion. In older larvae, the secretion after dehydration forms great masses in the receptacles and lumen of the glands. As these organs are not used in spinning a cocoon, it is very probable that the secretion . . . is elaborated and used as a food for the workers (trophallaxis)" (pp. 179-180). Fig. 43 on p. 179 = Wheeler, 1918, Fig. 5.

In this same article Wheeler concluded (pp. 118-119)

from his study of the larvae of *Pachysima* spp. and "*Paedalgus infimus* (*vide infra*) . . . that the young larvae are fed by regurgitation, the older larvae with pellets of crushed insects, and that, especially during their younger stages, the larvae are so assiduously fed and cared for because they furnish liquid exudates, small in quantity, to be sure, but of such a quality as to excite the appetite of their nurses and induce regurgitation. I believe that the salivary glands, as soon as they develop, take on the function of supplying exudates." *Infimus* here must be a lapsus for *termitolestes*, since the only subsequent reference is to Santschi's description (see below) and there is no evidence that Wheeler ever studied the larvae of *infimus*.

Paedalgus infimus (Santschi)

Santschi, 1914, p. 365: "Les larves sont glabres." (Mentioned by Wheeler, 1922, p. 179.)

Wheeler, 1922, p. 118: See last paragraph under *P. termitolestes* above.

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