NOTES ON ANT LARVAE

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Notes on Ant Larvae

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ABSTRACT

The larvae of ten additional species are described, including all instars of *Neivamyrmex opacithorax*; the others are in the genera *Aenictus, Pseudomyrmex, Iridomyrmex* and *Technomyrmex*. Forty references to ant larvae in the literature are cited and several are discussed. Changes in our "Ant Larvae: Review and Synthesis" (1976) and its "Ten-Year Supplement," (1986) which result from our publications in 1987 and 1988, are indicated.

In 1976 we published "Ant Larvae: Review and Synthesis," which we regarded as a summary of our life-time of research. During the following years so many new larvae were added to our collection and so much was published about ant larvae that we decided another general treatment was desireable. So in 1986 we published a "Supplement" to include additions and corrections for our 1976 "Memoir." In the past two years we have described 2 additional genera and 14 additional species and references noted in the literature have increased by 40. Hence this article may be considered as a sort of supplement to the supplement.

MYRMECIINAE

Genus **Myrmecia** Fabricius

Wilson 1971:38. In a table of "Behavior and other Traits of Myrmecia/ Primitive traits." "3. The larvae are fed directly with fresh insect fragments. 4. The larvae are able to crawl short distances unaided." Under advanced traits: "Regurgitation occurs both among adults and between adults and larvae."

Myrmecia gulosa Fabricius

Sisson 1974. Photographs in color of the anterior end of a larva; of the anterior end of a larva being fed an egg by a worker; of a larva being prepared by a worker for spinning a cocoon.

Wilson 1971:39. A diagrammatic view of the inside of the earthen nest of a colony; larvae are shown.

Myrmecia pilosula (F. Smith)

Crossland 1988:483. "Early stages of gregarine spores have been found in the gut wall of field-collected larvae." Heavily infested workers are brown instead of the normal black.

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Genus **Nothomyrmecia** Clark
Nothomyrmecia macrops Clark

Hölldobler and Wilson 1983:497. SEMs showing opening of silk glands on labium.

Taylor 1978:981. "The larvae lack specialized tubercles and have a primitive and generalized structure, sharing many features with *Myrmecia* and with primitive prodoryline and proponerine Ponerinae, although the sensilla on the mouth parts are more abundant."

PONERINAE
~~Tribe Amblyoponini~~
~~Genus Amblyopone Erichson~~
~~Amblyopone silvestrii Wheeler~~

~~See 1988 below~~.

~~Genus Mystrium Roger~~
~~Mystrium mysticum Roger~~

~~See 1988 below~~.

Tribe Ponerini
Hypoponera eduardi (Forel)
and
Ponera pennsylvanica (Buckley)

Escoubas et al. (1987) treat the morphology and behavior of these two species with special reference to the four glutinous tubercles and the care which the workers give the larvae. They do not refer to Wheeler's 1900 discussion of the tubercles and their function together with an excellent drawing of a larva in side view. The drawing was repeated in his ant book (1910). There is no reference to our 1952 description and figures of the larvae of *P. pennsylvanica* nor our account of the stickiness of these dorsal tubercles nor of locomotion in the larvae of *Hypoponera* sp. (p. 634). Our 1964 paper is cited but not correctly, for we did not say that the larvae of these two species "resemble typical ant larvae;" actually the only two species described in that paper were later placed in *Hypoponera* and we have never seen the larva of *H. eduardi.* As is usually the case with SEMs of ant larvae the figures are unsatisfactory. Moreover, the legends are interchanged. Neither legend gives the name of the species. A new bastard term is coined (Greek + English): pseudolegs, and it is applied to the glutinous tubercles which are *dorsal.* But all those errors fade into insignificance when compared to the misspelling of *pennsylvanica*"; it is spelled *pennsylvatica* in the title and throughout the paper; nowhere is it spelled correctly.

CERAPACHYINAE

Brown (1975:13) does not recognize this subfamily, but splits it into three tribes, which he transfers to the subfamily Ponerinae.

"The larvae of Cerapachyini have a particular slender cylindrical form, . . . often compared to that of the army ants, that seems to be optimally suited to the means of their transport, slung longitudinally under the bodies of the workers in the manner of *Eciton, Aenictus, Dorylus* and *Leptogenys,* and some other predatory ants that change their nest sites more or less frequently. This body form is not very persuasive of the phyletic relationship for the very reason of its adaptive nature. The selection of such larval form in ants that lead a nomadic existence is only to be expected, and that expectation is met to varying degrees in several ponerine genera that are not phyletically closely related, such as *Onychomyrmex, Leptogenys* and *Cerapachys.*"

Larval mandibles are discussed on p. 14 and hairs on p. 16.

Genus **Phyracaces** Emery
Phyracaces gilesi Clark

Clark 1923:82. "Long and slender, almost cylindrical, slightly thickened at the anterior end, with thirteen distinct segments behind the head. Head small, slightly broader than long, with vestigial antennae, and short blunt mandibles. Colour dull white; hairs short and bifurcated, except on the head, where they are sparse and not bifurcated."

Phyracaces ruficornis Clark

Clark 1923:87. "Long and slender, with vestigial antennae."

Phyracaces simmonsae Clark

Clark 1923:89. "Long and slender, subcylindrical, slightly thickened to the posterior end, with thirteen distinct segments behind the head, which is short and broad. Hairs short and stout, bifurcated to one-third their length. Colour dull white."

Phyracaces turneri Forel

Hölldobler 1982. Larvae fed on ant larvae *(Pheidole)* which had evidently been stung and paralyzed by the raiders and hence preserved for two months (p. 8). "The larvae and pupae were carried in the manner Brown (1975) predicted, slung longitudinally under the bodies of the workers (Fig 8)" (p. 15).

Genus **Sphinctomyrmex** Mayr
Sphinctomyrmex (=Eusphinctus) imbecilis Forel
[=**fulvidis** (Clark)]

Clark 1923:74. Drawing of two hairs.

Clark 1923:76-77. "Slender, enlarged at the posterior end, with thirteen distinct segments behind the head. Head as broad as long, with vestigial antennae. Mandibles long and indistinctly dentate. Hairs on the dorsal surface of the anterior eight segments bifurcate almost to their base, short and pointed; on the dorsal surface of the posterior three segments these hairs become long and whip-like, gradually decreasing in length to the anterior margin of the ventral surface of the anal segment; the hairs on the ventral surface are trifurcate, and extend to the posterior and lateral surface of the head, where they are much shorter than on the body. Colour, yellowish white.

"Several larvae, freshly emerged from the egg, are clothed with long bristle-like hairs, not bifurcate at their tips; these hairs and few are scattered."

Fig 2 on p. 76 shows three hairs and side-view of a larva. This cannot be the larva of this species; it was probably drawn from prey.

Sphinctomyrmex (=Eusphinctus) occidentalis (Clark)

Clark 1923:74. Drawing of two hairs.

DORYLINAE

CORRECTIONS. Wheeler and Wheeler 1984. Characterization of subfamily on p. 264: change last sentence to read: Mandible vestigial and feebly sclerotized; amblyoponoid or dolichoderoid.

Characterization of genus *Cheliomyrmex:* Change fifth sentence to read "Mandible dolichoderoid."

Under *Labidus.* p. 272, line 2: Add "and Fig 3a and c."

Genus **Aenictus** Shuckard
Aenictus gracilis Emery

YOUNG LARVA. Length (through spiracles) 2.2 mm. Similar to mature worker larva (1984:265) except as follows. Lacks terminal knob. Body hairs about half as numerous. Of one type: 0.025 - 0.063 mm long, slightly curved, unbranched, smooth. Head hairs shorter (0.01 - 0.04 mm long). Labrum bilobed and narrowed dorsally; each lobe with 2 isolated sensilla on anterior surface; ventral surface with rows of spinules and 4 contiguous sensilla in the midventral groove. Maxillary galea represented by 2 contiguous sensilla. (Material studied: 6 larvae from the Philippines.)

Genus **Neivamyrmex** Borgmeier

In our 1984 revision of doryline larvae we included no description of the immature stages of this genus. We have since discovered that we have adequate material for a complete series for one species.

Neivamyrmex opacithorax (Emery)

Figures 1 - 6

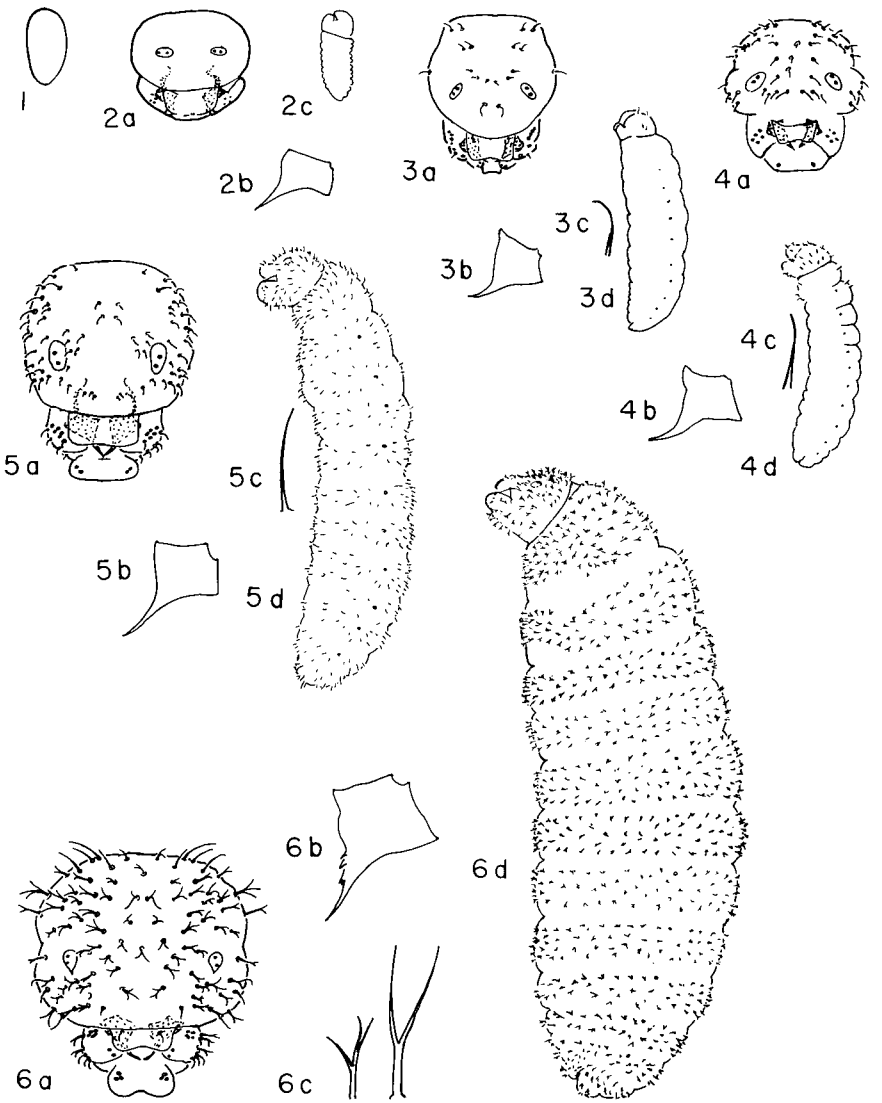
EGG: 0.2 - 0.23 x 0.35 - 0.45 mm.

FIRST INSTAR LARVA. — Length (through spiracles) 0.4 - 0.67 mm (average 0.53 mm). Body straight; narrowed posteriorly. Anus terminal. Segmentation distinct. Head on anterior end; greater in diameter than the body which tapers to posterior end. Spiracles about 0.001 mm in diameter. Integument coarsely spinulose (except the midventer of all somites), the spinules isolated. No body hairs. Cranium transversely subelliptical. [Antennae not visible.] Head hairs none, but probably represented by about 6 sensilla 0.003 mm long. Labrum feebly bilobed; with 4 sensilla in the middle but no spinules. Mandible subtriangular in anterior view, base broad, tapering rapidly to a sharp-pointed apex. Maxilla appearing adnate; palp represented by 5 sensilla in a raised cluster; galea represented by 2 sensilla. Labium short and broad; palp represented by a cluster of sensilla.

SECOND INSTAR LARVA. — Length (through spiracles) 0.82 - 1.08 mm. Similar to first instar larva except as follows. Head diameter less than that of prothorax; body nearly straight; diameter decreasing rapidly from AV to posterior end. Anus ventral. Spiracles about 0.003 mm in diameter. Integument coarsely spinulose except on intersegmental areas. Cranium with bulging genae. Antennae on lower half of cranium, with 2 sensilla each. Head hairs about 14; 0.006 - 0.013 mm long; unbranched. Labrum with 6 sensilla in medial notch. Entire mandible moderately sclerotized. Maxilla swollen laterally; galea with 2 sensilla on slightly sclerotized base. Anterior surface of labrum with minute spinules in a few short rows.

THIRD INSTAR LARVA — Length (through spiracles) 0.84 - 1.26 mm. Similar to second instar larva except as follows. Body slightly curved ventrally. Anus posteroventral. Integument with spinules coarse and in short transverse rows on thorax, isolated and fewer posteriorly. Body hairs 0.006 - 0.018 mm long, unbranched, about 12 on T1, fewer on T2. Antennae at midlength of cranium, small, with 2 sensilla each. Head hairs about 0.003 - 0.025 mm long, unbranched, about 52. Entire mandible moderately sclerotized. Apex of maxilla paraboloidal and directed medially; palp with 5 sensilla on a slightly sclerotized base. Opening of sericteries a short transverse slit.

FOURTH INSTAR LARVA. — Length (through spiracles) 2 - 3.4 mm. Spiracles on T2 0.025 mm in diameter decreasing to 0.005 mm on AVIII. Integument spinulose, the spinules minute and isolated or in short rows. Body



FIGURES 1 - 6. *Neivamyrmex opacithorax*. 1. EGG, x27. 2. FIRST INSTAR. a, Head in anterior view; b, left mandible in anterior view; c, larva in side view. 3. SECOND INSTAR. a, Head in anterior view; b, left mandible in anterior view; c, body hair; d, larva in side view. 4. THIRD INSTAR. a, Head in anterior view; b, left mandible in anterior view; c, body hair; d, larva in side view. 5. FOURTH INSTAR. a, Head in anterior view; b, left mandible in anterior view; c, body hair; d, larva in side view. 6. FIFTH INSTAR (= MATURE LARVA). a, Head in anterior view; b, left mandible in anterior view; c, 2 body hairs; d, larva in side view. (Heads, x61; mandibles, x200; body hairs, x508; larva in side view, x27.)

hairs 0.006 - 0.03 mm long, unbranched, uniformly distributed, sparse. Head hairs 0.013 - 0.038 mm long, unbranched, numerous (about 70).

FIFTH INSTAR (MATURE) LARVA. — Length (through spiracles) 2 - 3.4 mm. Spiracles on T2 0.025 mm in diameter, 0.005 mm on AVIII. Integument spinulose, the spinules minute and isolated or in short rows. Body hairs 0.016 - 0.056 mm long, 2- to 4-branched (rarely 5-branched). Cranium subtrapezoidal, with slightly bulging genae. Antenna subovoidal, with 3 sensilla. Head hairs 0.025 - 0.06 mm long, 2- to 3-branched. Labrum bilobed, anterior surface of each lobe with about 6 sensilla; ventral surface with 4 lateral and 6 medial sensilla; posterior surface with a few short rows of ridges (or spinules?). Mandible amblyoponoid; moderately sclerotized; medial surface with a few denticles. Maxilla bulging anteriorly, palp a slightly raised irregular knob with 5 sensilla; galea a small cone with 2 apical sensilla.

Material studied: numerous larvae from Florida, courtesy of J.C. Trager, and from Texas, courtesy of J.F. Watkins.

Genus **Nomamyrmex** Borgmeier

Borgmeier 1955:136. "Larve. — Annaehernd cylindrisch. Haare einfach. Tegument spinulose. Mandibeln laenglich, spitz, ohne Zaehne am innenrand. (Ich untersuchte eine Arbeiterlarve von *hartigi*)." [Larva. — Nearly cylindrical. Hairs simple. Integument spinulose. Mandibles elongate, sharp, without teeth on the inner border. (I examined a worker larva of *hartigi*.)]

LEPTANILLINAE

The females and workers of the leptanillines show an undoubted relationship with the Dorylinae and were originally in that subfamily as a separate tribe. The alleged males were so peculiar that they could not be affiliated with any other ant taxon; so perhaps they were placed in the genus *Leptanilla* by default.

Baroni-Urbani (1977:428) stated that larval characters were the best justification for the elevation of the former doryline tribe Leptanillini to subfamily status. (Original in Italian quoted in our 1986:696). Now that Masuko (MS) has taken males from a colony, we would say that both males and larvae are strange enough to warrant subfamily status.

Genus **Leptanilla** Emery
Leptanilla swani Wheeler

Addition to our (1965:30) description of the labrum: "lateral borders with a fringe of long slender spinules, which project posteriorly."

PSEUDOMYRMECINAE

Genus **Pseudomyrmex** Lund

Pseudomyrmex malignus Wheeler

Figure 8

Length (through spiracles) 3.8 - 4.5 mm. Similar to *Ps. alliodorae* (1956:379) except as follows: On the ventrolateral surfaces of each thoracic swelling there is an area which appears sieve-like (most prominent on T1). Entire integument with additional minute spinules, isolated or in short rows. Body hairs: (1) 0.006 - 0.019 mm long; (2) 0.012 - 0.07 mm long, longest of dorsum of T2; (3) about 0.2 mm long, 4 in a row on AI-AIV, AVII, AVIII and 6 in a row on AV and AVI. Head hairs less numerous, 0.007 - 0.033 mm long. Mandible pristomyrmecoid; apex and medial surfaces heavily sclerotized; apex blunt-pointed; with 4 medial teeth decreasing in size basally; anterior and medial surfaces with rather coarse spinules isolated or in short subtransverse rows. (Material studied: 4 larvae from Guyana, courtesy of J.T. Longino.)

Pseudomyrmex mexicanus Lund

Petralia and Vinson 1979: Venter — description and SEM.

Pseudomyrmex pallidus F. Smith

Petralia and Vinson 1979: Venter — description and SEM.

Pseudomyrmex triplarina (Weddell)

Figure 7

Anterior half of a mature worker larva in sagittal section. This is similar to our drawing on Plate II, Fig 6 on p. 383 in our 1956, but this shows food in the trophothylax. Photograph by J.T. Longino and Tracy McLellan.

MYRMICINAE

Tribe Pheidolini

Genus **Aphaenogaster** Mayr

Aphaenogaster senilis Mayr and **A. subterranea** Latreille

Agbogba 1986:217. These ants "employ special means for feeding their larvae, depending on the size of the prey to which they are presented and on the size of the larvae. Large and medium-size larvae are placed by the workers upon large-size preys, on which they feed unaided, whereas small larvae are fed with pieces of prey as among many other ants."

This method of feeding the larvae of *Aphaenogaster* was reported many years ago by Wheeler (1910) and by us (1953).

DOLICHODERINAE

Genus **Dolichoderus** Lund

Torossian 1971: The mite *Pediculoides ventricosus* is parasitic upon the brood. It can destroy the entire brood of a colony, but it is not a serious enemy because of its rarity.

Genus **Iridomyrmex** Mayr

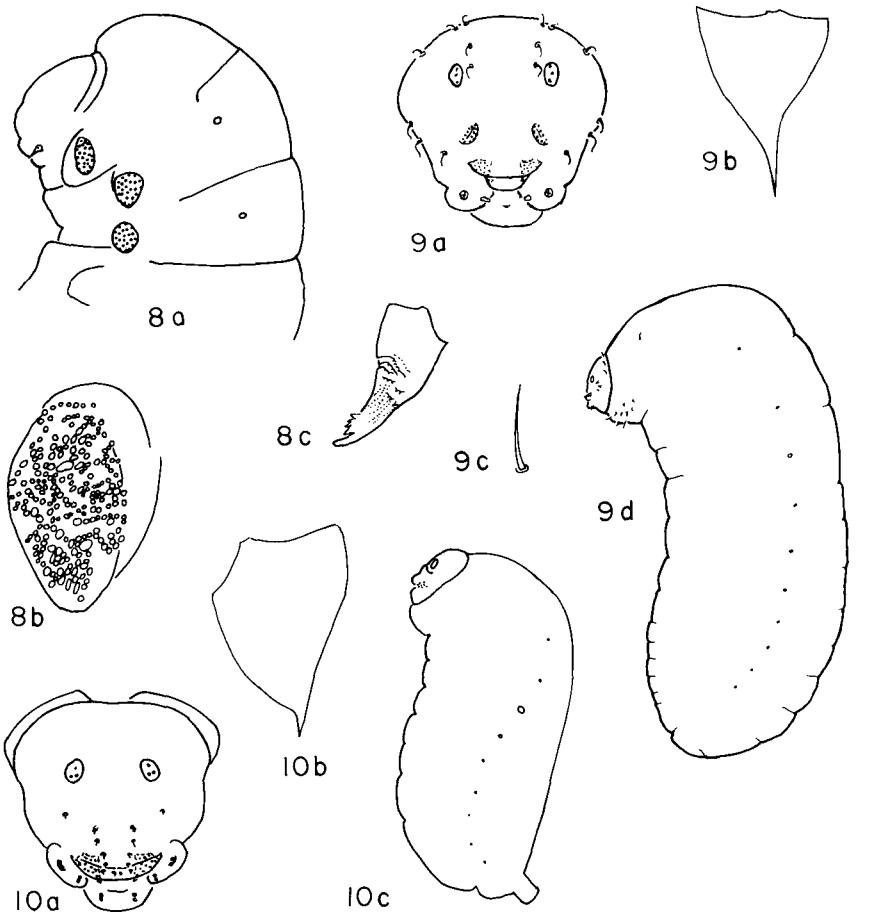
It is strange that after half a century of study of hundreds of species of ant larvae we have never before had good material for the Argentine ant.

Iridomyrmex humilis (Mayr)

Figure 9

Length (through spiracles) about 4.4 mm. Dolichoderoid, anterior end broadly rounded, posterior end narrowly so. Gonopod vestiges on AVIII and AIX: leg and wing vestiges present. Spiracles minute (about 0.006 mm) except larger on AI (about 0.013 mm). Integument with transverse rows of minute spinules. Body hairs few, largely confined to venter of T1; short (0.025 - 0.05 mm long); unbranched, smooth, slightly curved, slender. Cranium transversely subelliptical. Mouth parts small. Antennae rather large; above midlength of cranium; each a boss with 3 minute sensilla. Head hairs few (about 16) unbranched, slightly curved, about 0.038 mm long. Labrum small; feebly bilobed; each lobe with 3 sensilla near ventral border of anterior surface; posterior surface with rather numerous subtransverse rows of minute spinules and with a few isolated sensilla medially. Mandible feebly sclerotized, dolichoderoid, broad-based, narrowed abruptly to a straight slender apical tooth. Maxilla with apex paraboloidal, appearing adnate; palp

FIGURE 7. *Pseudomyrmex triplarina.* Anterior portion of mature worker larva in sagittal section. Photomicrograph, courtesy of J.T. Longino and Tracy McLellan.



FIGURES 8 — 10. 8. *Pseudomyrmex malignus*. a, Anterior portion of larva in side view showing 3 "sieve areas," x25; b, "sieve area" on prothorax, x152; c, left mandible in anterior view, x130. 9. *Iridomyrmex humilis*. a, Head in anterior view, x76; b, left mandible in anterior view, x400; c, body hair, x200; d, larva in side view, x21. 10. *Technomyrmex* sp. a, Head in anterior view, x76; b, left mandible in anterior view, x323; c, larva in side view, x36.

represented by an elevation with 5 (4 apical and 1 lateral) sensilla; galea a short frustum with 2 apical sensilla. Labial palp represented by a cluster of sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit. (Material studied: 9 larvae from California, courtesy of R.R. Snelling.)

Iridomyrmex purpureus (F. Smith)

Dodd 1912. The caterpillars of *Cyclotorna monocentra* feed on the larvae of this ant.

Genus **Forelius** Emery
Forelius pruinosus (Roger)

Duffield 1981: Second and third instars of the larvae of *Microdon fuscipennis* (Syrphidae) feed on the larvae of this ant.

Petralia and Vinson 1979. Venter — description and SEM.

Genus **Tapinoma** Foerster
Tapinoma erraticum Latreille

Hinton 1951:156. The larvae of *Maculinea alcon* F. [Lepidoptera: Lycaenidae] prey upon the larvae of this ant.

Genus **Technomyrmex** Mayr
Technomyrmex sp.
Figure 10

YOUNG LARVA. — Length (through spiracles) about 1.7 mm. With a posterodorsal knob; T1 with a midventral swelling. Leg vestiges present. Spiracles on T2, T3 and AI-AVI; none seen on AVII-AVIII. Entire integument (except apex of knob) covered with spinules in short transverse rows on T1, T2, but isolated dorsally; decreasing anteriorly. Body hairs none. Head hairs very few (about 10); very short (about 0.006 mm). Labrum short and crescentic; anterior surface with 5 sensilla; ventral surface with few minute spinules; posterior surface spinulose, the spinules minute and arranged in rows, the rows concentric with ventral border of labrum. Maxilla bulging slightly, feebly differentiated, appearing adnate; apex paraboloidal and directed medially; palp a cluster of 5 sensilla on a slight irregular elevation; galea represented by 2 isolated sensilla. Labium short, spinulose, the spinules in short rows; palp a slight elevation with contiguous sensilla; opening of sericteries a short transverse slit. (Material studied: several larvae from South Africa, courtesy of R.E. Gregg.)

Technomyrmex bicolor textor Forel

Hölldobler and Wilson 1983:491. These authors doubt that this ant larva produces silk for the construction of the nest.

FORMICINAE

Tribe Formicini

Genus **Cataglyphis** Foerster
Cataglyphis cursor (Fonscolombe)

Isingrini 1987. In experiments workers were able to distinguish between larvae of their own colony and larvae from another colony. The former received "more licking and transportation."

Genus **Lasius** Fabricius
Lasius spp.

Kaiser 1986: The nematode *Pheromermis villosa* Kaiser is a parasitoid of adult sexuals of *L. flavus* (Fabricius) and *L. niger* (Linnaeus). The larvae are infected "orally by means of oligochaetes," but development of the parasitoid begins with pupation.

Genus **Formica** Linnaeus

Dlusskii 1967. Five instars. Drawings on p. 11: head (inaccurate); very young larva; internal anatomy.

Formica spp.

Garnett et al. 1985:617. "*Microdon* larvae appeared to feed exclusively upon cocoon occupants."

Tribe Plagiolepidini
Genus **Anoplolepis** Santschi
Anoplolepis custodiens (F. Smith)

Henning 1987:264. The larvae of the lycaenid butterfly *Thestor dicksoni* Riley and *T. bastus* Wallengren feed on the ant brood.

Tribe Brachymyrmecini
Genus **Paratrechina** Motschulsky
Paratrechina flaviceps (F. Smith)

Ichinose 1987. Four instars and sexual larvae are described. "Larvae of all instars and adult workers are found throughout the year" in Japan.

Tribe Camponotini
Genus **Camponotus** Mayr
Camponotus aethiops Latreille

Suzzoni et al. 1987. The five instars of the larval stage may be recognized by the diameter of the spiracles.

Camponotus floridanus (Buckley)

Schauff and Boucek 1987. The new eulophid *Alachua floridensis* is parasitoid on this ant.

Camponotus sebosus [?]

Henning 1987:262. The larvae of the lycaenid butterfly *Lepidochrysops ignota* (Trimen) feed on the larvae and pupae.

Camponotus spp.

Garnett et al. 1985:617. "*Microdon* larvae appeared to feed exclusively upon cocoon occupants: larvae, prepupae or pupae."

Mintzer 1985: The duration of egg, larval and pupal stages in *C. laevigatus, C. modoc, C. planatus* and *C. vicinus.*

CHANGES IN OUR 1976 MEMOIR

(The pages indicated refer to pages in the Memoir.)

HISTORY (p. 1). — Add: Forel certainly had a low opinion of ant larvae: "La larve des fourmis supérieures n'est plus guère qu'un sac avalant ce qu'on lui dégorge, puis digérant et croissant." (1921:129.) [="The larva of the higher ants is scarcely more than a receptacle for swallowing what is regurgitated into it, digesting it, and growing." (1928 I:123 - 124)].

PROFILES (p. 8). — Move *Chelaner* from PHEIDOLOID to POGONOMYRMECOID.

BODY HAIRS (p. 21). — Lanham (1979) has considered the possible phylogenetic significance of complex hairs in bees and ants. "If both larval and adult stages are taken into account, then ants and bees are the only major groups of aculeate Hymenoptera in which complex hairs are abundant." But bees are characterized by branched hairs in the adult; they are rare in the larvae. Most ant larvae have branched hairs, but among the adults they are found in the genus *Triglyphothirx* and one species in *Acanthomyops.* We have never seen larvae of the latter and the larvae of our species of *Triglyphothrix* are immature.

Our rejection of Lanham's hypotheses is based on the facts that the Hymenoptera undergo complete metamorphosis, which means that the entire larval integument with all its hairs is shed at pupation, while the adult integument is constructed from histolysed tissues. Adult hairs are generally quite different from larval. The fact that there may be a few exceptions among ants proves nothing to us. It would be easy to account for these hypothetically without postulating a continuity through metamorphosis.

Finally, we find support for our rejection in a statement by Van Emden (1957:94). "[F]ew direct connections between the characters of larvae and typical pupae have been proved."

MANDIBLE SHAPE (p. 39). — Change definition of "2. Camponotoid" to: Subtrianguar; base broad, its width at least ⅔ its length; apex forming a small short tooth; no medial teeth; medial border erose.

LARVAE OF THE SUBFAMILIES (p. 55.) — Under 9. SOLENOPSIDINI add *Chelaner* to pogonomyrmecoid.

KEYS (p. 72). — Under PROFILE 1 add "*Chelaner* in Solenpsidini" after 10a. On p. 74 under PROFILE 2 delete "*Chelaner* in Solenopsidini" from 9a.

MATERIAL STUDIED (p. 99). MYRMICINAE

17. Cataulacini

Change *Cataulacus horridus* F. Smith to *C. insularis* F. Smith and *C. taprobanae* F. Smith to *C. catuvolcus* Bolton.

CHANGES IN OUR 10-YEAR SUPPLEMENT (1986)

Page 685: — In the key under 3b change "separate" to "paper."

LITERATURE (p. 685). — Change 632 to 657.

MATERIAL STUDIED (p. 699). — Add the following species to the appropriate taxa or make the changes indicated.

PONERINAE

7. Ponerini

Cryptopone testacea Motschulsky
Leptogenys bohlsi Emery, *castanea* Mayr
Simopelta sp., sp., sp.

PSEUDOMYRMECINAE

Pseudomyrmex: *spinicola* Emery; change 4 to 3 unidentified species.

MYRMICINAE

13. Leptothoracini

Rogeria scandens (Mann)

18. Cephalotini

Procryptocerus scabriusculus Emery
Zacryptocerus christopherseni (Forel)

FORMICINAE

12. Camponotini

Notostigma carazzi (Emery)

METHODS (p. 685). — Dr. Diana Wheeler presented us with a photomicrograph of the head of a larva of *Pogonomyrmex badius* (Fig 11). It is in side view — almost. How does one know it is only "almost"? If he can answer that question, then he understands the anatomy. We offer this photograph "to lend an air of verisimilitude" to the hundreds of drawings of ant larvae that we have published.

CARE (p. 695). — Moffett (1988:358) observed that in *Pheidologeton diversus* "minor larvae were in large piles, with pupae and clumps of eggs and

microlarvae interspersed among them; larger (non-minor) larvae and pupae were often clumped together but not clearly separated from the minor brood."

LARVAL CLASSIFICATION vs. ADULT CLASSIFICATION (p. 696). — Francoeur and Loiselle (1988:68): — "G.C. and J. Wheeler (1955; 1976) characterized the *Nesomyrmex* larvae as pogonomyrmecoid like those of *Leptothorax* (s.s.). They are either pheidoloid or crematogastroid in the other subgenera of *Leptothorax* (s. l.). These differences offer unused clues to clarify generic limits and establish higher taxonomic units."

FIGURE 11. *Pogonomyrmex badius*. Head in side view, X214. Photomicrograph, courtesy of Diana E. Wheeler.

IMPORTANCE OF LARVAE (p. 696). — Vander Meer and Morel (1988) support the hypothesis that "brood phermones do not exist." They also confirm the principle that ant larvae contribute an essential part of adult nutrition.

FOURTH USE: — The queens of some species cut holes in the integument of larvae and feed upon the exuding haemolymph (1988a:23).

TAXONOMIC BIBLIOGRAPHY OF OUR PUBLICATIONS ON ANT LARVAE (p. 697)

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