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Introduction

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 desirable; so in 1986 we published a "Ten-Year Supplement" to include additions and revisions to our Memoir. In 1987 and 1988 additional material warranted a supplement to the "10-year Supplement" in 1989a. This article is the third supplement to the Memoir.

In the supplement, two genera are characterized, one generic characterization is revised, and references in the literature are increased by 43. Changes in our Memoir (1976) and its supplements (1986, 1989a) are noted.

Family Formicidae

Hölldobler and Wilson 1990. These authors have cited many references to our publications on ant larvae. We cite some of these in appropriate places here and thereafter.

On page 22 is our figure showing our classification of the body profiles of ant larvae (1976: Fig. 3). On page 21 they state: "Ant larvae have been systematically described by Wheeler and Wheeler (1951-1986, syntheses 1976 and 1979), with a supplementary analysis supplied by Picquet (1958)." This implies that Picquet's article supplements our publications, but a casual glance shows that this is incorrect as to its contents, while Picquet's article was published in 1958, and a supplement is something added later.

Picquet 1958. The larvae of 18 species are described and figured. The author's conclusions drawn from this study were expressed by a key to the species studied based solely upon the head. The 44 drawings of the whole head are in anterior (full-face) view and of the mouth parts enlarged. The drawings are quite good except that the diameters of the hairs are greatly exaggerated.

Fierce 1987. This author has written a thorough review of the relations between ants and lycaenid larvae, but unfortunately has not named many of the ant species involved. The larvae of several lycaenid species feed on ant brood.

Wheeler and Wheeler 1989a. The printer failed to heed many of the corrections we made on the galley proof although our manuscript had been corrected. This was especially true of Literature Cited. Therefore, we have prepared corrected copies of this part, which we will be glad to mail upon request. In addition the references on page 458 to \textit{Amblyopone} and \textit{Myrmix} should have been deleted.

Subfamily Myrmeciinae

Body profile myrmecoid. Body hairs short and moderately abundant. Head hairs smooth and unbranched. Mandible large, pogonotomaecoid. Labium with dorsal transverse welt, which is densely beset with coarse spinules; palp a slight elevation bearing 5-7 sensilla; opening of sericteries wide and salient.

Genus \textit{MYRMECIA} Fabricius

Body profile myrmecoid. Body hairs short; moderately numerous, uniformly distributed, unbranched, smooth or more or less denticulate, rarely uncinate. Head subpyriform in anterior view. Head hairs few, unbranched, smooth or denticulate. Labrum small, short, and bilobed, posterior surface with large isolated spinules and sensilla of various sizes. Mandible large, pogono-

\textsuperscript{1}George C. Wheeler died on February 19, 1991.
myrmecoid and heavily sclerotized; basal half usually bearing isolated spinules. Maxilla and labium spinulose with many large isolated spinules.

*Myrmecia* sp.

Hölldobler and Wilson 1990:347, Fig. 8-48. Photograph of larvae.

Genus *NOTHOMYRMECIA* Clark

Body profile myrmecioid. Body hairs short, moderately abundant and unbranched; of 2 types: (1) rather stout, slightly curved and with minute denticles near the apex, on all somites; (2) shorter, sharply bent and denticulate, on venter of anterior somites. Head subcircular in anterior view. Head hairs moderately numerous and moderately long, smooth and unbranched. Labrum short, moderately sized. Mandible large, pagonomyrmecoid. Maxilla coarsely spinulose. Labium with a dorsal transverse welt, which is densely beset with coarse spinules. Hyopharynx with a few minute spinules.

*Notomyrmecia macrops* Clark

Hölldobler and Wilson (1990:165, Fig.3-19). A photograph of living larvae.

Subfamily Ponerinae

Tribe Amblyoponini

Genus *AMBLYOPONE* Dalla Torre

_Amblyopone silvestri* Wheeler

Masuko 1986. Queens cut holes in the integument of mature or nearly mature larvae and feed upon the exuding larval hemolymph.

Masuko 1990. The external anatomy of five instars is described and illustrated by SEM.

Wheeler and Wheeler 1989b:458. Headings and references should have been deleted by printer.

Genus *MYSTRIUM* Roger

Wheeler and Wheeler 1989a:458. Headings and references should have been deleted by the printer.

Tribe Platythyreini

Genus *PLATYTHYREA* Roger

*Platythyrea lamellosa* Roger


Genus *PROBOLOMYRMEX* Mayr

_Probolomyrmex angusticeps* M. R. Smith

Taylor 1965:348. Description of mature larvae based on pharate pupa with figures on p. 348. Taylor said: "The *Probolomyrmex* larva is distinguished from those of all other known ponerine ants by the shape of the body and the unique posterodorsal suspensory organ, which is analogous (but clearly not homologous) with the dorsal 'door-knob' tubercles found in some genera of the tribe Ponerini (see G. C. and J. Wheeler, 1952, 1964)."

But we have to challenge the above: body shape is the one character that cannot be determined from the prepupa.

Hölldobler and Wilson 1990:348. "Workers... carry the larvae by the [posterodorsal] tubercles. They also attach the larvae to the roof of the nest with the apparently adhesive outer surface of the knob-like endings."

Tribe Proceratiini

Genus *PROCERATIUM* Roger

_Procercatium watasei, P. itoi, P. japonicum*

Masuko 1986. Queens cut holes in the integument of worker larvae and feed on the exuding hemolymph.

Tribe Ponerini

Genus *HYPOPONERA* Santschi


Genus *PECTROCTENA* F. Smith

_Pectroctena conjugata* Santschi


Genus *PONERA* Latreille

_Ponera coarctata* Latreille


Genus *SIMOPELTA* Mayr

Genus **STREBLOGNATHUS** Mayr


**Streblognathus aethiopicus** (F. Smith)


Subfamily Cerapachyinae
Genus **CERAPACHYS** F. Smith

**Cerapachys tumen** Forel

Holldobler and Wilson 1990:569. Workers of species in this group store, after stinging, the living larvae of *Pheidole*.

Subfamily Dorylinae
Genus **NEIVAMYRMEX** Borgmeier

**Neivamyrmex pilosus** (F. Smith)

Akre and Torgerson 1968. The staphylinid beetle *Diploeciton nevermanni* Reichensperger is predaceous on the ant brood.

Subfamily Leptanillinae
Genus **LEPTANILLA** Emery

**Leptanilla japonica** Baroni-Urbani

Masuko 1987. Unique among ant larvae is a pair of hemolymph feeding pores. Through these the queen feeds on the hemolymph of the larvae. Masuko also found that when a worker moves a larva it grasps with its posterior mouth parts the peculiar anteroveltral projection from the prothorax of the larva.


Subfamily Pseudomyrmecinae
Genus **TETRAPONEHA** F. Smith

**REVISED CHARACTERIZATION.** Body profile crematogastroid. Trophothylax well developed. Body hairs numerous. Of 3 types: (1) minute to short, unbranched, smooth, on all somites; (2) moderately long, 2-10 on dorsal and lateral surfaces of most somites; (3) long, with sinuous shaft and uncinate tip, several in a row across dorsum of each thoracic and several abdominal somites. Head subquadrangular. Antennae minute. Head hairs numerous, short, unbranched, smooth. Mouth parts small. Mandible tetraponeroid.

**Tetraponera** (≡*Pachysima*) *latifrons* Emery

Holldobler and Wilson 1990:166, Figs. 3-20. Repeat Wheeler 1918, Fig. 9 and our 1956, Text Fig. 5.

Subfamily Myrmicinae
Tribe Myrmicini
Genus **MYRMICA** Latreille

**Myrmica laevinodis** Nylander

Picquet 1958:30, Figs. 38-42.

**Myrmica ruginodis** Nylander

Picquet 1958:31, Fig. 43.

Tribe Pheidolini
Genus **APHAENOGASTER** Mayr

**Aphaenogaster cockerelli** (E. André)

Holldobler and Wilson 1990:239, Fig. 7-21. Photograph of larvae.

**Aphaenogaster gibbosa** Latreille

Picquet 1958:25, Figs. 32-35.

**Aphaenogaster subterranea** Latreille


Genus **PHEIDOLE** Westwood

**Pheidole bicornis** Forel

Letourneau 1990. Larvae of a clerid beetle *Phyllobaenus* sp. feed upon the *Pheidole* brood.

Tribe Solenopsidini
Genus **SOLENOPSIS** Westwood

**Solenopsis fugax** Latreille

Picquet 1958:26, Fig 36.

Tribe Tetramoriini
Genus **TETRAMORIUM** Mayr
Tetramorium caespitum Linnaeus  
Picquet 1958:28, Fig. 37.

Tribe Blepharidattilli  
Genus BLEPHARIDATTILIA Wheeler

Blepharidatta brasiliensis Wheeler  

Subfamily Dolichoderinae  
Genus IRIDOMYRMEX Mayr

Iridomyrmex humilis Mayr  

Genus TAPINOMA Foelsler

Tapinoma erraticum Latreille  
Picquet 1958:32, Fig. 44.

Genus TECHNOMYRMEX Mayr

Technomyrmex sp.  

Subfamily Formicinae  
Tribe Formcini

Genus FORMICA Linnaeus  
Holldobler and Wilson 1990:484. The apterous females of the phorid flies Aenigmatias lay eggs on host larvae (Formica).

Formica fusca Linnaeus  
Picquet 1958:9, Fig. 6.

Formica rufa Linnaeus  
Picquet 1958:4, Figs.1-5.

Genus LASIUS (Fabricius)

Lasius brunneus Latreille  
Picquet 1958:18, Figs. 18-19.

Lasius emarginatus Olivier  
Picquet 1958:19, Figs. 20-22.

Lasius flavus Fabricius  
Picquet 1958:20, Fig. 23.

Lasius niger Linnaeus  
Picquet 1958:16, Fig. 17.

Tribe Camponotini  
Genus CAMPONOTUS Mayr

Camponotus aethiops Latreille  
Picquet 1958:10, Figs. 7-8.

Camponotus floridanus (Buckley)  
Davis and Jouvenaz 1990. Another eucharitid, Obeza floridana (Ashmead), is parasitoid on this species.

Camponotus lateralis Olivier  
Picquet 1958:15, Fig. 16.

Camponotus liguidopbus Latreille  
Picquet 1958:12, Figs. 9-12.

Camponotus modoc Wheeler  

Camponotus vagans Scopoli  

Genus POLYRHACHIS F. Smith  
Holldobler and Wilson 1990:485. A syrphid fly Trichopsomyia is a parasitoid on the brood.  
Wheeler and Wheeler 1990:753-767. The larvae of 11 species are described.

Polyrhachis arachne Emery and P. hodgsoni Forel  
Dorow and Maschwitz (1990: 77-78). The colony is housed in a "pavilion" constructed of silk secreted by the larvae, which are manipulated by the workers. The underside of a bamboo leaf contributes the ceiling of the pavilion, which houses the nest. This ceiling is covered with a thin layer of silk. "The brood was fixed longitudinally to this layer with a few threads of silk." Fig. 2 shows a weaving larva of P. hodgsoni.

CHANGES IN OUR 1976 MEMOIR (and in our 10-year supplement [1986] and in our 1989a:457-473)

GEOGRAPHICAL DISTRIBUTION (1976:2)  
ADD AFRICA--Natal, Zimbabwe; SOUTH AMERICA--Guyana
BODY SHAPES (1976:8)
DELETE
From pogonomyrmecoid Ponerinae: Cryptopone, Ponera. Myrmicinae: Leptothorax (Mychothorax and Nesomyrmex), Formicinae: Gesomyrmex, Plagiolepis.
From pheidoloid--Myrmicinae: Megalomyrmex, Trigonomastyx.
ADD
pogonomyrmecoid--Formicinae: Anoplolepis, Dendromyrmex.
apheanogastroid--Myrmicinae: Adelomyrmex, Megalomyrmex.

HAIRS (1976:34)
ADD
G. Short, stout, with narrow base and wider top, which has a flat pebbly surface. Known only in Platthyrea lamellosa; see our 1989b: Fig. 1.

MANDIBLE SHAPES (1976:39)
DELETE
5. amblyoponoid--Cerapachyinae: Lioponera, Phyracaces.
6. pristomyrmecoid--Myrmicinae: Masaromischoides.
10. attoid--Myrmicinae: Sericomyrmex.
ADD
3. dolichoderoid--Cerapachyinae: Lioponera.
5. amblyoponoid--Myrmicinae: Blepharidatta, Sericomyrmex, Truchyomyrmex.
7. pheidoloid--Myrmicinae: Macronischoides.

LIFE CYCLE (1976:80; 1986:694)
When we describe immature larvae we do not like to call them instars unless certain conditions are fulfilled, an egg ready to hatch will reveal the characters of the first instar; a first instar ready to moult will contain a fully formed second instar; etc.; etc.; until we find a semipupa (~prepupa) which will have all the characters of the last instar except body shape. But such favorable specimens are rarely found; hence we like to get a large number of larvae from the same nest.

In our Mémoire (1976:81) we mentioned the number of instars reported in the literature. In our 10-year Supplement (1986:695) we brought it up to date. Hölldobler and Wilson (1990:170) have updated it again citing authorities. Masuko (1990) gives in a table the number of instars in 25 species and a 26th is cited in a postscript. After adding our recent contributions (1987) for Veromessor pergandei, (1989b) for Neivamyrmex opacithorax and (1991) for Blepharidatta the whole list of reported instars looks like this:

3 instars: Cataglyphis cursor, Crematogaster scuetellaris, C. stadelmanni, C. striatula, Formica japonica, Myrmeleontinae, Myrmica ruginodis, Tetramorium caespitum.
3 or 4 instars: Oecophylla longinoda, Pheidole pallidula.
4 instars: Acromyrmex octospinesa, Drachyponera chinesis, Formica polyctena, Paratrechina flavipes, Pheidole bicarinata, Polyrrachis lamellidens, Solenopsis invicta, Zonocerus cerina.
6 instars: Camponotus aethiops queens.

CARE (1976:82)

TAXONOMIC BIBLIOGRAPHY OF OUR PUBLICATIONS ON ANT LARVAE (1976:93, 1986:672 and 1989a:672)
MATERIAL STUDIED (1976:96 and 1986:698)

ADD

Ponerinae


Streblognathus aethopicus (F. Smith).

Pseudomyrmecinae

Pseudomyrmex malignus Wheeler.

Myrmicinae


Dolichoderinae

3. Tapinomiini. Irudomyrmex humilis (Mayr).

Formicinae


Change

Cerapachyinae

Change all Phyracaces to Cerapachys.

Delete

9. Solenopsidini. Delete all references to the genus Vollenhovia.

ENEMIES OF ANT LARVAE (1976:102)

Order Diptera


Order Hymenoptera


Formicidae: Phyracaces turneri feeds upon larvae of Pheidole.

IMPORTANCE OF LARVAE (1986:696)

Holldobler and Wilson 1990:392. "According to Davison (1982), colonies of Monomorium (=Chelaner) in arid New South Wales are sensitive to fluctuations in the supply of seeds on which they depend. In times of scarcity the number of larvae declines. Because the adult workers depend on larval secretions for food (the larvae consume and metabolize the raw seeds for the colony), the worker population also declines."


Literature Cited


Masuko, Keiichi. 1990. The instars of the ant *Amblyopone silvestri*. Sociobiology 17:221-244.


