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Notes On Ant Larvae 1989-1991

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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 hereafter.

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 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.

Pierce 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 *Amblyopone* and *Mystrium* should have been deleted.

Subfamily Myrmeciinae

Body profile myrmecioid. Body hairs short and moderately abundant. Head hairs smooth and unbranched. Mandible large, pogonomyrmecoid. 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 MYRMECIA Fabricius

Body profile myrmecioid. Body hairs short; moderately numerous, uniformly distributed, unbranched, smooth or more or less denticulate, rarely uncinat. 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-

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 myrmecoid. 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, moderate-sized. Mandible large, pogonomyrmecoid. Maxilla coarsely spinulose. Labium with a dorsal transverse welt, which is densely beset with coarse spinules. Hyopharynx with a few minute spinules.

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

Genus *MYSTRIMUM* Roger

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

Tribe Platythyreini

Genus *PLATYTHYREA* Roger

Platythyrea lamellosa Roger

Wheeler and Wheeler 1989b:51. Description.

Platythyrea schultzi Forel

Wheeler and Wheeler 1989b:51. Description.

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 analagous (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

Proceratium 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

Wheeler and Wheeler 1989b:52. Correction in characterization.

Genus *PLECTROCTENA* F. Smith

Plectroctena conjugata Santschi

Wheeler and Wheeler 1989b:52. Description.

Genus *PONERA* Latreille

Ponera coarctata Latreille

Picquet 1958:22, Figs. 24-27.

Genus *SIMOPELTA* Mayr

Wheeler and Wheeler 1989b:52. Characterization.

Genus *STREBLOGNATHUS* Mayr

Wheeler and Wheeler 1989b:53. Characterization.

Streblognathus aethiopicus (F. Smith)

Wheeler and Wheeler 1989b:53. Characterization.

Subfamily Cerapachyinae

Genus *CERAPACHYS* F. Smith*Cerapachys turneri* Forel

Hölldobler 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 anteroventral projection from the prothorax of the larva.

Wheeler and Wheeler 1988:185-189. Description of young larvae.

Subfamily Pseudomyrmecinae

Genus *TETRAPONERA* 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 uncinat 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

Hölldobler 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)

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

Aphaenogaster gibbosa Latreille

Picquet 1958:25, Figs. 32-35.

Aphaenogaster subterranea Latreille

Picquet 1958:24, Figs. 28-31.

Hölldobler and Wilson 1990:68, Fig 3-2. A good photograph of larvae placed on food by workers.

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 Blepharidattini
Genus *BLEPHARIDATTA* Wheeler

Blepharidatta brasiliensis Wheeler
Wheeler and Wheeler 1991:134-135. Description.

Subfamily Dolichoderinae
Genus *IRIDOMYRMEX* Mayr

Iridomyrmex humilis Mayr
Wheeler and Wheeler 1989a:465. Description.

Genus *TAPINOMA* Foerster

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

Genus *TECHNOMYRMEX* Mayr

Technomyrmex sp.
Wheeler and Wheeler 1989a:467. Description of young larva.

Subfamily Formicinae
Tribe Formicini
Genus *FORMICA* Linnaeus
Hölldobler 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 ligniperdus Larteille
Picquet 1958:12, Figs. 9-12.

Camponotus modoc Wheeler
Hansen and Akre 1985: Figs. 19 and 35. Photographs of larvae.

Camponotus vagans Scopoli
Picquet 1958:13, Figs. 13-15.

Genus *POLYRHACHIS* F. Smith
Hölldobler 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*, *Trigonogaster*.

ADD

pogonomyrmecoid--Formicinae: *Anoplolepis*, *Dendromyrmex*.

phaidoloid--Myrmicinae: *Leptothorax* (*Mychothorax* and *Nesomyrmex*). Formicinae: *Gesomyrmex*.

attoid--Myrmicinae: *Blepharidatta*, *Myrmecaria*.

myrmecioid--Ponerinae: *Ponera*.

aphaenogastroid--Myrmicinae: *Adelomyrmex*, *Megalomyrmex*.

leptanilloid--Ponerinae: *Cryptopone*, *Myopopone*. Myrmicinae: *Trigonogaster*.

oecophylloid--Cerapachyinae: *Simopone*. Formicinae: *Acropyga*.

HAIRS (1976:34)

ADD

G. Short, stout, with narrow base and wider top, which has a flat pebbly surface. Known only in *Platythyrea lamellosa*; see our 1989b: Fig. 1.

MANDIBLE SHAPES (1976:39)

DELETE

5. amblyoponoid--Cerapachyinae: *Lioponera*, *Phyracaces*.

6. pristomyrmecoid--Myrmicinae: *Mascomischoides*.

10. attoid--Myrmicinae: *Sericomyrmex*.

ADD

1. ectatommoid--Myrmicinae: *Acanthomyrmex*, *Macromischoides*. Formicinae: *Proformica*.

3. dolichoderoid--Cerapachyinae: *Lioponera*.

5. amblyoponoid--Myrmicinae: *Blepharidatta*, *Sericomyrmex*, *Trachymyrmex*.

7. pheidoloid--Myrmicinae: *Macromischoides*.

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 Memoir (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 scutellaris*, *C. stadelmanni*, *C. striatula*, *Formica japonica*, *Messor rubra*, *Monomorium minimum*, *M. pharaonis* (workers and queen), *Myrmica ruginodis*, *Tetramorium caespitum*.

3 or 4 instars: *Oecophylla longinoda*, *Pheidole pallidula*.

4 instars: *Acromyrmex octospinosus*, *Brachyponera chinensis*, *Formica polystena*, *Paratrechina flavipes*, *Pheidole bicarinata*, *Polyrhachis lamellidens*, *Solenopsis invicta*, *Zacryptocerus minutus*.

5 instars: *Acantholepis frauenfeldi*, *Amblyopone silvestrii*, *Camponotus aethiops*, *Eciton burchelli*, *E. hamatum*, *Neivamyrmex opacithorax*, *Polyrhachis armata*, *P. bihamata*, *P. mulleri*, *P. scissa*, *P. ypsilon*, *Veromessor pergandei*.

6 instars: *Camponotus aethiops* queen.

CARE (1976:82)

Hölldobler and Wilson 1990:168. A good paragraph on feeding.

TAXONOMIC BIBLIOGRAPHY OF OUR PUBLICATIONS ON ANT LARVAE (1976:93, 1986:697 and 1989a:672)

Eight subfamilies 1989. Notes on ant larvae. Trans. Amer. Ent. Soc. 115:457-473.

Ponerinae. 1989. Notes on ant larvae: Ponerinae. J. New York Ent. Soc. 97:50-55.

Leptanillinae. 1988. The larva of *Leptanilla japonica*, with notes on the genus. Psyche 93:185-189.

Formicinae. 1990. Larvae of the formicine ant genus *Polyrhachis*. Trans. Amer. Ent. Soc. 116:753-767.

Myrmicinae. 1991. The larva of *Blepharidatta*. J. New York Ent. Soc. 99:132-137.

MATERIAL STUDIED (1976:96 and 1986:698)

ADD

Ponerinae

2. Plaththyreini. *Platythyrea: lamellosa* Roger, *schultzi* Forel.

7. Ponerini. *Plectroctena conjugata* Santschi. *Streblognathus aethiopicus* (F. Smith).

Pseudomyrmecinae

Pseudomyrmex malignus Wheeler.

Myrmecinae

11. Myrmecini. *Acanthomyrmex: ferox* Emery, *notabilis* F. Smith.

13. Leptothoracini. *Lachnomyrmex scrobiculator* Wheeler. *Leptothorax: diversipilosus* Smith, *longispinosus* Roger, *quebecensis* (Francoeur), *wheeleri* Smith. *Rogeria: belti* Mann, *blanda* F. Smith.

15. Tetramoriini. *Tetramorium: blochmani* Forel, *lobulicornis* Forel.

21. Blepharidattini. *Blepharidatta brasiliensis* Wheeler.

Dolichoderinae

3. Tapinomini. *Iridomyrmex humilis* (Mayr).

Formicinae

12. Camponotini. *Polyrhachis*, 11 species.

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

Syrphidae: *Trichopsomyia* brood parasitoid on *Polyrhachis*. *Microdon*--many genera.

Order Hymenoptera

Eucharitidae: Add *Pheidoloxenus*. Add to hosts: *Ectatomma*, *Messor*.

Formicidae: *Phyracaces turneri* feeds upon larvae of *Pheidole*.

IMPORTANCE OF LARVAE (1986:696)

Hölldobler 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."

Hölldobler and Wilson 1990:164-168. Brood care and larval reciprocation.

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Hansen, L. D., and R. D. Akre. 1985. Biology of carpenter ants in Washington state. *Melandria* 43:1-62.

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