

Supplementary Studies on Ant
Larvae: Cerapachyinae,
Pseudomyrmecinae and
Myrmicinae

BY GEORGE C. WHEELER

and

JEANETTE WHEELER

Reprinted from *PSYCHE*, Vol. 80, No. 3, September 1973
pages 204-211

WILLIAM L. BROWN

SUPPLEMENTARY STUDIES ON ANT LARVAE:
CERAPACHYINAE, PSEUDOMYRMECINAE
AND MYRMICINAE*

BY GEORGE C. WHEELER AND JEANETTE WHEELER
Laboratory of Desert Biology, Desert Research Institute,
University of Nevada System, Reno 89507

Subsequent to the publication of our first supplement on the ant larvae of the subfamily Cerapachyinae (1964), our first paper on Pseudomyrmecinae (1956) and several supplements on Myrmicinae (1960, 1972, 1973) we have received from other myrmecologists so much additional material that it has now become necessary to publish a supplement.

Genus PHYRACACES Emery

REVISION: The last sentence of our generic characterization (1964: 69) should read: Hypopharynx usually spinulose dorsally.

Phyracaces elegans Wheeler (Fig. 2). Length (through spiracles) about 4.7 mm. Very similar to *Ph. larvatus* (1964: 69) except as follows. Body more slender. A pair of bosses on lateral surfaces of venter of AI-AVI. Spiracles small, AI largest, diameter decreasing posteriorly. Integument densely spinulose, spinules in short to long, subtransverse to arcuate rows. Body hairs less numerous and shorter (0.025-0.05 mm long). Head hairs shorter (0.009-0.019 mm long). Posterior surface of labrum with a ventrally directed medial boss bearing 6 sensilla, about 5 sensilla on each lateral surface. Mandibles with narrower base. No spinules seen on hypopharynx.

YOUNG LARVA: Length (through spiracles) about 2.1 mm. Similar to mature larva above except as follows. Neck curved, abdomen with straight ventral profile and C-shaped dorsal profile. Body hairs shorter (0.01-0.033 mm long). Integument spinulose, spinules minute, isolated laterally and in short rows dorsally and ventrally. Antennae less distinct. Maxillae lacking spinules; galea a slightly raised pair of sensilla. No spinules seen on labium; opening of sericteries a short slit.

VERY YOUNG LARVA: Length (through spiracles) about 1.5 mm. Entire body arcuate ventrally. Otherwise similar to young larva.

Material studied: numerous larvae from New South Wales, courtesy of Rev. B. B. Lowery.

*Manuscript received by the editor September 28, 1973

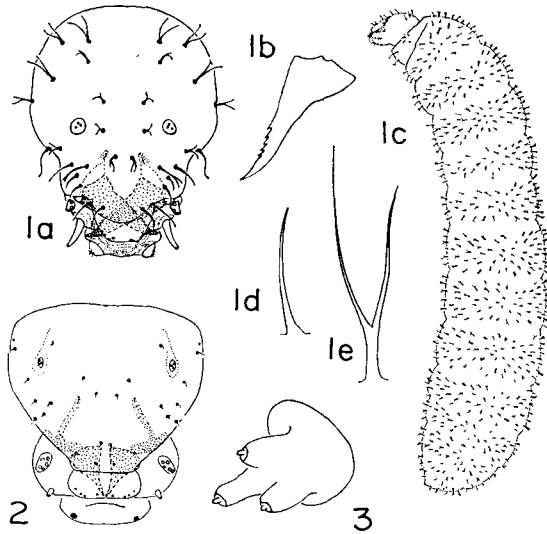


Fig. 1. *Cerapachys (Sycia) australis*: a, head in anterior view, $\times 95$; b, left mandible in anterior view, $\times 314$; c, larva in side view, $\times 22$; d and e, two types of body hairs, $\times 444$. Fig. 2. *Phyracaces elegans*: head in anterior view, $\times 74$. Fig. 3. *Tetraponera natalensis*: left antenna in lateral view, $\times 339$.

Phyracaces ficosus Wheeler. Length (through spiracles) about 4.4 mm. Very similar to *Ph. larvatus* (1964: 69) except in the following details. Spiracles on first abdominal somite slightly larger, remainder small and subequal. Body hairs shorter (0.013-0.063 mm long). Antennae with 2 sensilla each. Head hairs shorter (0.008-0.025 mm long). Galeae digitiform. (Material studied: 14 larvae from New South Wales, courtesy of Rev. B. B. Lowery.)

Genus CERAPACHYS F. Smith

REVISION: Our generic characterization (1964: 67) should be replaced with the following: Leg vestiges small paraboloidal papillae. Body hairs usually simple. Head (including mouth parts) subpyriform in anterior view. Head hairs usually short. Mandibles long, slender and with median border erose. Maxillary palp short; galea long and digitiform.

Cerapachys (Sycia) australis Forel (Fig. 1). Length (through spiracles) about 3.2 mm. Body long and subcylindrical; about 12

differentiated somites; head on anterior end; a small posteriorly projecting boss on AX. Anus ventral. Spiracles small. Entire integument densely spinulose, spinules minute and in short to long straight or arcuate rows. Body hairs short, uniformly distributed and moderately numerous. Of two types: (1) 0.025-0.063 mm long, mostly bifid, sometimes with one or both branches rebranched, on all somites; (2) 0.037-0.05 mm long, simple, a few on each somite. Cranium subhexagonal in anterior view, slightly longer than wide. Antennae large, each a low mound with 3 minute sensilla, each bearing a minute spinule. Head hairs few, 0.025-0.05 mm long, simple or bifid. Labrum subarcuate, about twice as wide as long; anterior surface with 8 sensilla on and near ventral border; posterior surface with about 6 sensilla ventromedially and with a few oblique arcuate rows of minute spinules. Mandibles narrowly subtriangular in anterior view; apex rather long, narrow and heavily sclerotized; medial border with 6-8 small denticles. Maxillae with apex paraboloidal and sparsely spinulose, spinules minute to short and in a few arcuate rows; palp a peg with 4 (2 encapsulated and 2 bearing a spinule each) apical and one lateral sensilla; galea digitiform with 2 apical sensilla, each bearing a minute spinule. Labium subtrapezoidal, widest distally, anterior surface densely spinulose, spinules minute and in numerous short arcuate rows; palp a rounded elevation with 5 (2 encapsulated and 3 bearing a spinule each) sensilla; an isolated sensillum between each palp and opening of sericteries; the latter a slit in a shallow depression on anterior surface. Hypopharynx with minute spinules in long transverse sub-parallel rows. (Material studied: 10 larvae from Queensland, courtesy of Rev. B. B. Lowery.)

SUBFAMILY PSEUDOMYRMECINAE

We have never been able to key the genera of this subfamily. Except for head shape, where the difference in the species of *Pachysima* is greater than that between any two genera, some of the variants of any character in any genus can be found in other genera.

Bernard (1951: 1053) included larval characters in his characterization of the subfamily, which he called family Promyrmicidae.

Sudd (1967: 123) discussed the feeding of the larvae. He stated (erroneously) that the trophothylax was formed by the bases of the rudimentary legs; we have shown (1956: 375, 383) that it is "formed from the depressed ventral surface of the thorax and elaboration of the first and second abdominal somites."

Genus PSEUDOMYRMEX Lund

Janzen (1967: 344). Beltian bodies are cut up by the workers and fed to the larvae.

The following species of *Pseudomyrmex* are compared with *Ps. alliodorae* 1956: 379); only differences are given here.

Pseudomyrmex adustus Borgmeier. Length (through spiracles) about 4.8 mm; straight length about 4.6 mm. Body hairs: (2) 0.05-0.25 mm long, longest of AI-AV; (3) 0.2-0.25 mm long, 2 only on each T1-3 and AI-AIII. Head hairs more numerous and 0.05-0.25 mm long. Posterior surface of labrum with a cluster of 3 sensilla in the middle of each half. (Material studied: 7 larvae from Brazil, courtesy of Dr. K. Lenko.)

Pseudomyrmex belti fulvescens Emery (= *Ps. ferrugineus* F. Smith). Janzen 1967: Description p. 394; feeding of larvae p. 416-417; handling of larvae p. 418. Similar information in Janzen 1966.

Pseudomyrmex elongatus Borgmeier. Length (through spiracles) about 3.8 mm; straight length about 3.6 mm. Body hairs longer: (1) 0.006-0.018 mm long; (2) 0.018-0.2 mm long; (3) 0.175-0.22 mm long, 4 in a row across the dorsum of each T1-3 and AI-AIV. Head hairs more numerous and slightly longer (0.01-0.05 mm long). (Material studied: 15 larvae from Brazil, courtesy of Dr. K. Lenko.)

Pseudomyrmex schuppi Forel. Length (through spiracles) about 5.9 mm; straight length about 5.7 mm. Largest spiracles on AI. Body hairs longer: (1) 0.013-0.025 mm long; (2) 0.038-0.25 mm long; (3) 0.25-0.33 mm long, 4 in a row across the dorsum of each T1-3 and AI-AIII. (Material studied: numerous larvae from Brazil, courtesy of Dr. K. Lenko.)

Pseudomyrmex subtilissimus Emery. Length (through spiracles) about 4.3 mm; straight length about 3.9 mm. Body hairs (1) 0.006-0.018 mm long; (2) 0.018-0.15 mm long; (3) about 0.15 mm long, 4 in a row across the dorsum of each T1-3 and AI-AIV. Head hairs slightly longer (0.025-0.05 mm long). (Material studied: 6 larvae from Brazil, courtesy of Dr. K. Lenko.)

Pseudomyrmex termitarius F. Smith. Length (through spiracles) about 5.1 mm; straight length about 4.7 mm. Body stouter. Body hairs about twice as numerous: (1) 0.013-0.05 mm long; (2) 0.05-0.275 mm long; (3) 0.25-0.35 mm long, 4 in a row across dorsum of each T1-3 and AI-AIV. Head hairs more numerous, longer (0.013-0.05 mm long) and finely denticulate. Labrum with width twice the length, with anterior lobes more prominent and with 2

22011

minute hairs on anterior surface. Mandibles with teeth stouter and blunter; lateral outline less curved; denticles on anterior surface more numerous. Maxillary apex less constricted and with spinules longer and covering a greater portion of the surface. Labium with more numerous spinules. (Material studied: 9 larvae from Brazil, courtesy of Dr. K. Lenko.)

Genus TETRAPONERA F. Smith

Tetraponera natalensis F. Smith (Fig. 3). Length (through spiracles) about 8.2 mm; straight length about 6.2 mm. Similar to *T. aitkeni* (1956: 388) except as follows. Body slightly stouter at AV and AVI. Integument of AIX and AX with minute spinules. Body hairs: (1) 0.008-0.075 mm long; (2) 0.025-0.15 mm long, longest with tip branched or denticulate; (3) 0.175-0.3 mm long, 4 in a row across the dorsum of each T₁₋₃ and AI-AVI. Each antenna represented by 3 individually raised sensilla on a small base. Head hairs longer (0.013-0.11 mm long) and less numerous, with or without alveolus and articular membrane, some with denticles near the tip. Labrum with breadth less than twice length; borders sinuate; anterior surface with 6 sensilla and 2 hairs on each half; posterior surface with 9 sensilla on each half; spinules as in *T. aitkeni*. Anteromedial surface of mandibles with large spinules, which are isolated or in short rows of 2 or 3. Maxillae with rather numerous long spinules in short arcuate rows; palp represented by a cluster of 5 sensilla on a slight elevation. (Material studied: numerous larvae from South Africa, courtesy of Dr. W. L. Brown.)

Genus PACHYSIMA Emery

Pachysima latifrons Emery: Bernard (1951: 1054-1057) described and figured the young (after W. M. Wheeler).

Genus VITICICOLA Wheeler

Viticicola tessmanni (Stitz): Bernard (1951: 1054) described and figured the larva (after W. M. Wheeler).

SUBFAMILY MYRMICINAE

Ettershank (1966: 161, 162): "The larvae of the Formicidae have not been used to any extent in taxonomic studies, although numerous descriptions and figures of scattered genera and species occur in the literature. The only wide-scale comparative larval study

that has been attempted is the series of papers by G. C. Wheeler (later with J. Wheeler), which constitute a fundamental contribution to the subject that will be used for a long time." "Reference to all the publications by the Wheelers on myrmicine ants are contained in a summary article (G. C. and J. Wheeler 1960). In this paper, the authors conclude that three characters are of major importance: body profile, mandible shape, and setal form. They recognize 22 body profiles and 30 mandibular shape categories all of which are explained and illustrated."

Genus MESSOR Forel

Messor capitatus Latreille: Delage (1968a) gave in a table the sizes and abundance of larvae throughout the year. She stated that only small larvae overwinter. She (1968b) discussed larval enzymes and digestion.

Genus PHEIDOLE Westwood

Kempf (1972: 457): *Ph. vallifica* is the host of the eucharitid *Orasema costaricensis* Wheeler and Wheeler.

Genus MELISSOTARSUS Emery

Delage-Darchen (1972a): Hairs few, long, with bifid tips. Crude sketch of a larva on p. 219.

Genus CREMATOGASTER Lund

Delage-Darchen (1972b) found only three larval stages in *C. (Nematocrema) stadelmanni* Mayr. Fig. 1 hairs enlarged; Fig. 2 and 3 larvae of various stages in side view; Fig. 4 head in anterior view. Pilosity is taxonomically worthless because of extreme variation between colonies and even in the same colony.

Genus MONOMORIUM Mayr

Cloudsley-Thompson (1962: 179): The calliphorid flies *Bengalia peuhi* Vil. and *B. minor* Malloch fed on the larvae of *M. salomonis* (Linnaeus) in the central Sudan.

Van Pelt and Van Pelt (1972: 978): Larvae of the syrphid *Microdon baliopterus* Loew fed upon the larvae of *M. minimum* (Buckley).

Genus SOLENOPSIS Westwood

Markin et al. (1972: 1053): Life cycle of *Solenopsis invicta* Buren in an incipient colony: egg 6-8 days, larva 14-15 days, pupa 20-24 days.

Genus TETRAMORIUM Mayr

Tetramorium caespitum (Linnaeus). Donisthorpe (1927: 197): "The larvae were fed with disgorged liquid food as long as they were young and gathered together in groups, but when they grew older and were separated, the workers fed them with solid substances." Many larvae were hung on to the plaster walls of the nest by their anchor-tipped hairs.

LITERATURE CITED

- BERNARD, F.
1951. Super-famille des Formicoidea. *Traité de Zoologie, Tome X, Fasc. II*: 907-1119, 1258-1263, 1272-1275.
- CLOUDSLEY-THOMPSON, J. L.
1962. A note on the association between *Bengalia* spp. (Dipt., Calliphoridae) and ants in the Sudan. *Entomol. Monthly Mag.* 98: 177-179.
- DELAGE, BERNADETTE.
1968a. Recherches sur la fourmis moissonneuses du Bassin Aquitain: écologie et biologie. *Bull. Biol.* 100: 315-367.
1968b. Recherches sur les fourmis moissonneuses du Bassin Aquitain: éthologie. *Physiologie de l'alimentation. Ann. Sci. Nat., Zool. Biol. Anim.* (12)10: 197-265.
1972a. Une fourmi de Côte-d'Ivoire: *Melissotarsus titubans* Del., n. sp. *Insectes Sociaux* 19: 213-226.
1972b. Le polymorphisme larvaire chez les fourmis *Nematocrema* d'Afrique. *Insectes Sociaux* 19: 257-277.
- DONISTHORPE, H. ST. J. K.
1927. *British ants*. Geo. Routledge & Sons, London. 436 pp.
- ETTERSHANK, G.
1966. A generic revision of the world Myrmicinae related to *Solenopsis* and *Pheidologeton*. *Australian J. Zool.* 14: 73-171.
- JANZEN, D. H.
1966. Coevolution of mutualism between ants and acacias in Central America. *Evolution* 20: 249-275.
1967. Interaction of the bull's-horn acacia (*Acacia cornigera* L.) with an ant inhabitant (*Pseudomyrmex ferruginea* F. Smith) in eastern Mexico. *Univ. Kansas Sci. Bull.* 47: 315-558.
- KEMPF, W. W.
1972. A study of some Neotropical ants of genus *Pheidole* Westwood. I. *Studia Entomol.* 15: 449-464.

- MARKIN, G. P., H. L. COLLINS AND J. H. DILLIER.
1972. Colony founding by queens of the red imported fire ant, *Solenopsis invicta*. Ann. Entomol. Soc. Amer. 65: 1053-1058.
- SUDD, J. M.
1967. An introduction to the behavior of ants. St. Martin's Press, New York. 200 pp.
- VAN PELT, A. F., AND S. A. VAN PELT.
1972. *Microdon* (Diptera: Syrphidae) in nests of *Monomorium* in Texas. Ann. Entomol. Soc. Amer. 65: 977-979.
- WHEELER, G. C., AND JEANETTE WHEELER.
1956. The ant larvae of the subfamily Pseudomyrmecinae. Ann. Entomol. Soc. Amer. 49: 374-398.
1960. Supplementary studies on the larvae of the Myrmicinae. Proc. Entomol. Soc. Washington 62: 1-32.
1964. The ant larvae of the subfamily Cerapachyinae: supplement. Proc. Entomol. Soc. Washington 66: 65-71.
1972. Ant larvae of the subfamily Myrmicinae: second supplement on tribes Myrmicini and Pheidolini. J. Georgia Entomol. Soc. 7: 233-246.
1973a. The ant larvae of six tribes: second supplement. J. Georgia Entomol. Soc. 8: 27-39.
1973b. Ant larvae of four tribes: second supplement. Psyche 80: 70-82.
1973c. Ant larvae of the myrmicine tribe Attini: second supplement. Entomol. Soc. Washington. (In press.)
1973d. The ant larvae of the tribes Basicerotini and Dacetini: second supplement. Pan-Pacific Entomol. (In press.)