The Ant Larvae of the Subfamily Ponerinae—Part I

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The Ant Larvae of the Subfamily Ponerinae — Part I[1]

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Tribe MYRMECIINI Emery

Genus MYRMECIA Fabricius

Not differentiated into neck and body; elongate, terete and rather slender; diameter diminishing gradually from the fifth abdominal somite to the anterior end; anterior half strongly curved. Body hairs short, simply, slightly curved. Head very small; cranium subcircular in anterior view. Head hairs very few, simple, minute, irregularly scattered. Labrum small and short; posterior surface with spinules of various sizes irregularly arranged and with sensilla of various sizes not clustered near the middle. Mandibles stout and subtriangular; heavily sclerotized; arcuate posteriorly with coarse spinules (not in rows) on the basal half and longitudinal striae on the apical half; apical tooth stout and straight. Galea a truncate cone. Labial palp a low rounded elevation.

Clark, 1925, p. 60: "Although the adult Bull-ant is really a honey-eater, the larvae must have an insect diet or they will eat one another when close together." (Quoted by Wheeler, 1933, p. 22.)

Girault (1915, p. 236) recorded the eucharid *Chalcuroides versicolor* Girault as "parasitic on *Myrmecia* sp." Presumably the larva was parasitoid on the ant larva.

Wheeler, 1910, p. 233: "Smooth, slender larvae, with a rather dense covering of hairs."

Myrmecia gulosa Fabricius.—Plate I, figs. 1-7. Elongate, terete and rather slender. Posterior half definitely the stouter, slightly surved ventrally. Anterior half slender and strongly curved ventrally. Diameter greatest at the fifth and sixth abdominal somites; gradually diminishing forward. Posterior end rounded. Anus subterminal. Leg vestiges moderately large. Segmentation distinct; 10 somites differentiated. Body hairs simple, slightly curved, relatively short (0.06-0.2 mm), uniformly distributed and moderately abundant. Integument spinulose on the ventral surface of pro- and mesothorax. Head very small, subpyriform in anterior view; cranium subcircular, with numerous minute sensilla irregularly scattered over the surface. Head hairs very few, minute (0.03 mm long) and scattered. Antennae mounted on low bulges; small, with three sensilla each. Labrum small and short; breadth twice the length; strongly bilobed due to a wide median incision of the free edge; anterior surface with a few sensilla; posterior surface with several sensilla and

1 Discussion, key and bibliography will follow at the end of Part II.

spinules of various sizes and arranged in various patterns. Mandibles stout, heavily sclerotized throughout, subtriangular in anterior view, arcuate posteriorly; two stout teeth on the medial border and a stout apical tooth; anterior surface with spinules on the basal half and longitudinal striae on the apical half; posterior surface with longitudinal striae on the apical half. Maxillae lobose, round-pointed, with the apical half spinulose; a few hairs (0.04 mm long) on the posterior surface; palp a truncate cone with one apical and two lateral sensilla; galea a truncate cone with a single apical sensillum. Labium subhemispherical; anterior surface spinulose; posterior surface with several hairs (0.04 mm long); palp a low rounded elevation bearing three sensilla; opening of sericteries a conspicuous transverse slit. Hypopharynx coarsely spinulose. (Material studied: several larvae from New South Wales.)

Brues, 1919: Adult eucharids (*Psilogaster fasciiventris* Brues) bred from a cocoon of *M. gulosa*. (Referred to by Wheeler, 1928, p. 42.) Presumably the larvae had been parasitoid on the ant larvae.

Wheeler, G. C., 1938, p. 141: "A larva . . . has short (0.045 mm) transverse lines (slits?)" on the meso- and metathorax. These are provisionally termed "wing rudiments."

Myrmecia sanguinea F. Smith.—Body and head hairs a little longer; maxillary palp and galea longer and slenderer; otherwise very similar to *gulosa*. (Material studied: fragments of three larvae from New South Wales.)

Wheeler, 1918: "It is milk-white, has the form of a vegetable marrow, with all the segments distinct, except those at the extreme posterior end of the body, the anterior segments are very slender and curved and the head is very small. The body is rather uniformly clothed with short, rapidly tapering bristle-like hairs. Under a higher magnification the head is seen to have a projecting bilobed clypeus, broad, heavily chitinized, coarsely tridentate mandibles and well-developed maxillae and labium, the former with two pairs of strongly chitinized peg-shaped sensillae, the latter terminating in a broadly elliptical chitinous plate, with a single pair of knob-shaped sensillae and the opening of the salivary duct near the middle of its anterior border. The upper surface of the short, rounded cranium bears a pair of minute antennal rudiments. . . . It is . . . not improbable that the *Myrmecia* larva is fed on whole insects, since the small head and very long mobile neck are very much as in certain solitary wasp larvae (*e.g., Sphecius*), which gnaw a small hole in their prey and then reach into its body cavity and devour its soft parts. The mandibles of the *Myrmecia* larva certainly show that it feeds on insect food" (pp. 296-298). Fig. 1 on p. 297—photograph of two adult larvae of *Myrmecia sanguinea* in side view. Fig. 2 on p. 298—head in dorsal, ventral and lateral views.

Myrmecia forficata Fabricius.—Forel (1890) found adult eucharids (*Eucharis myrmeciae* Cameron) in the cocoons of this bullfrog ant. (Referred to by Brues, 1919, p. 13 and by Wheeler, 1928, p. 41.)

Myrmecia nigriceps Mayr.—"The larvae were feeding on small clusters of

recently killed Camponotus workers, which had been cut in two at the petiole." (Wheeler, 1933, p. 39.)

Myrmecia regularis Crawley.—Wheeler (1932) uses this species as the paradigm of the intermittently claustral method of colony-feeding. As soon as the first larvae hatch the queen leaves her nest from time to time to capture insects with which to feed them.

Wheeler, 1933: "The slender, small-headed and long-necked larvae are fed on pieces of insects or even on entire or nearly entire insects" (p. 26). "Nearly half-grown larvae . . . were sometimes found feeding on fresh pieces of insects, such as caterpillars and the gasters of dealated ant females" (p. 28). "Young larvae feeding on a piece of caterpillar" (Fig. 6 opposite p. 26).

Myrmecia simillima F. Smith.—Wheeler (1933, p. 34) found "a compact cluster of young larvae which were devouring a fresh saw-fly larva."

Myrmecia (*Promyrmecia*) *mandibularis* F. Smith.—"The larvae are fed on insects. In one nest I found a cluster of them devouring a decapitated cricket." (Wheeler, 1933, p. 67.)

Myrmecia (*Promyrmecia*) *pilosula* F. Smith.—"The larvae are fed on pieces of various insects." (Wheeler, 1933, p. 57.)

Tribe AMBLYOPONINI Forel

Genus MYSTRIUM Roger

Body hairs long, simple and flexuous, with the apical half very slender. Cranium broader than long; narrowed ventrally; occipital border broadly rounded. Head hairs none. Spinules on posterior surface of labrum mostly in short transverse arcuate rows, but those near the ventral border are isolated. Mandibles stout, subtriangular and heavily sclerotized; lateral part thick, medial part blade-like; apical tooth stout and nearly straight. Labial palp a low elliptical elevation.

Mystrium camillae Emery.—Plate I, fig. 19-20. Body hairs abundant, long (0.13 mm), flexuous, apical half very slender, uniformly distributed (except on anterior part of prothorax, which is naked but with spinulose integument). Cranium somewhat broader than long; narrowed ventrally; occipital border broadly rounded. Head hairless but with a few scattered sensilla. Antennae of moderate size; three sensilla each. Labrum a little longer than broad; conspicuously bilobed (because of a deep median notch in the free border); 10 sensilla on the anterior surface near the ventral border; several on the posterior near the median; posterior surface spinulose, the spinules minute and grouped in short transverse arcuate rows, except those near the ventral border which are coarse and isolated. Mandibles stout, heavily sclerotized, subtriangular in anterior view; with two stout teeth on the medial border; apical tooth obtuse and round-pointed; medial portion of apical half thin and blade-like, lateral portion much thickened posteriorly; a few longitudinal striae on the anterior surface of the blade-like portion. Maxillae lobose and round-pointed; palp a short paxilla with one finger-like apical sensillum and three short rounded lateral sensilla; galea finger-like, with an apical sensillum.

Labium spinulose; palp an elliptical elevation bearing four sensilla, one of which is a slender paxilla. Opening of sericteries wide and conspicuous. Hypopharynx densely and coarsely spinulose. (Material studied: a single broken larva from the Philippine Islands.)

Genus STIGMATOMMA Roger

Body hairs short to long, simple, slightly curved. Cranium with angulate lateral borders; upper half semicircular in anterior view. No hairs on head. Labrum small, short and broad; posterior surface spinulose, the spinules near the ventral border isolated, the remainder grouped in short transverse arcuate rows. Mandibles stout and subtriangular; medial border deeply furrowed and trough-like, bearing three teeth; also three teeth on the anterior surface; apical tooth curved medially and posteriorly; anterior surface smooth. Labial palp a low rounded elevation.

Cook (1905, p. 38) says that the larvae of this genus have a uniform coat of fine hairs.

Wheeler, 1903, p. 209: "The larva [of *Cerapachys augustae*] is intermediate between that of Eciton and Stigmatomma. It is covered with shorter, less flexuous, and less abundant hairs than the latter and in these particulars resembles the larvae of Eciton."

Wheeler, 1910, p. 233: "Smooth, slender larvae, with a rather dense covering of hairs."

Stigmatomma pallipes (Haldeman).—Plate I, figs. 8-11 and Text fig. 1. Shaped somewhat like a crookneck squash; thorax and first two or three abdominal somites forming a long slender curved flexible neck; the remainder of the abdomen stout and straight. A welt-like ridge along either side of the abdomen, separating the strongly convex dorsum from the less convex venter and continued forward as a series of bosses on the sides of the neck. Posterior end broadly rounded. Anus ventral. Eleven differentiated somites; segmentation conspicuous in the neck; less so elsewhere. Leg vestiges present. Body hairs abundant and uniformly distributed, simple, slightly curved, 0.05-0.2 mm long. Integument of ventral surface spinulose. Head longer than broad. In anterior view the sides of the cranium are angulate while the upper half is semicircular; without hairs but with a few scattered sensilla. Antennae mounted on the ends of oval elevations; small; with three sensilla each. Labrum small, short and broad; bilobed, the ventral border having a narrow and moderately deep notch; seven sensilla on the ventral border of each lobe; numerous sensilla near center of posterior surface; posterior surface spinulose, the spinules near the ventral border isolated, the remainder grouped in short transverse arcuate rows. Mandibles stout, heavily sclerotized, roughly triangular in anterior view; trough-like, with the medial surface deeply grooved lengthwise; the stout apical tooth strongly curved medially and posteriorly; three teeth on the anterior surface and three on the medial border. Maxillae conoidal, with the apex spinulose; palp a short stout peg with four lateral sensilla and one on the apex; galea curved, finger-like, with a single apical sensillum.

Labium large; anterior surface spinulose, the spinules arranged in short transverse rows; palp a rounded boss bearing five sensilla; opening of sericteries wide and conspicuous. Hypopharynx spinulose. (Material studied: numerour larvae from Connecticut, New Hampshire and New York.)

Escherich, 1906, Fig. 30 = 1917, Fig. 36A = Wheeler, 1900, Fig. 8a.

Text fig. 1.—*Stigmatomma pallipes* (Haldeman). Larvae, ×11

Haskins (1928) gives as the life cycle: egg, 40-60 days; larva, 137-233 days; pupa 41-57 days (p. 182). "Trophallaxis forms the bond between adults and larvae but no larvae has been observed to be fed with liquid food. *Pallipes* has been seen to pinch larvae to assist in the exudation of fluids—no doubt the remnant of a primitive Vespine trick. Larvae quickly devour dead members of the brood, but no larva has been observed to actually kill another, or to devour ova. Young larvae have occasionally been accidentally impaled on the sharp mandibles of adults, indicating a significant lack of care on the part of the nurses in their handling of the young" (p. 183).

Wheeler, 1900: "The body is rather slender in alcoholic specimens, and the segments are all quite distinct and clothed rather uniformly and densely with yellowish hairs, which under a high power are seen to taper into very slender flexuous points. The head is somewhat longer than broad and without hairs on its dorsal surface, the labrum is bilobed, the maxillae provided with the usual tactile cones. The outer one of these on either side appears to be bifurcate. The young differs from the mature larva only in having a relatively larger head and a sparser covering of bristles. . . . The larva of *Stigmatomma* . . . does not conform to the Ponerine type but closely resembles, instead, the larvae of certain Myrmicinae, which are also covered with hairs instead of bristly tubercles. . . . The larvae are fed in the very same manner as other Ponerine larvae. . . . A large larva was seen with its head and neck inserted in the two last segments of a beetle larva." When provided with Formica larvae, the Stigmatomma larvae sucked their juices "till they were reduced to shriveled skins" (pp. 61-62). Fig. 8 on page 61 (repeated 1910 as Fig. 38 on p. 72) shows a larva in side view, the head in anterior view and a hair.

Wheeler, 1903, p. 209: The larvae are characterized as "nontuberculate."

Wheeler and Mann, 1914, p. 10: "The larvae . . . are . . . very broad behind and very narrow and curved anteriorly and instead of being tuberculate, have the body covered with dense, soft, erect hairs."

Genus AMBLYOPONE Erichson

Body hairs simple, slender, flexuous. Anus terminal. Cranium subcircular in anterior view. Head practically naked; hairs very few, simple, exceedingly minute. Labrum very small, subrectangular; not bilobed; posterior surface spinulose, the spinules arranged in short transverse arcuate rows. Mandibles elongate and slender; base feebly sclerotized and only slightly dilated, apex strongly sclerotized; apical tooth slightly curved medially and posteriorly; two stout medial teeth; anterior surface with longitudinal grooves. Labial palp a low elliptical elevation.

Amblyopone australis Erichson.—Plate I, figs. 12-18. Shaped somewhat like a crookneck squash; thorax and first two abdominal somites forming a long slender curved flexible neck. The remainder of the abdomen stout. A welt-like ridge along either side of the abdomen, separating the strongly convex dorsum from the less convex venter, and continued forward as a series of bosses on the sides of the neck. Along each dorsal and ventral margin of ridges and bosses are several curious structures (exudatoria?) of various shapes. Posterior end broadly rounded. Anus terminal. Eleven differentiated somites. Leg vestiges present. Spiracles small. Body hairs moderately numerous, uniformly distributed, flexuous, 0.12-0.2 mm long. Integument spinulose (at least on the ventral surface of prothorax). Head small; cranium subcircular in anterior view. Head hairs very few (about 8) and exceedingly minute (0.009 mm). A few sensilla on the surface of the head. Antennae mounted on slight bulges; small; each with three sensilla. Labrum a moderately thick flap, subrectangular, broader than long; a shallow median notch in the free edge, with a median longitudinal groove on the anterior surface leading upward from the notch; on either side of the notch is a boss bearing three sensilla; anterior surface with numerous sensilla near the free border, posterior with a few sensilla near the base; posterior surface spinulose, the spinules grouped in short transverse arcuate rows. Mandibles long and slender; base feebly sclerotized and only slightly dilated; apical two-thirds subcylindrical and strongly sclerotized; tip curved medially and posteriorly; apex sharp-pointed; anterior surface with longitudinal grooves; with two stout teeth on the medial border near its apical third. Maxillae large, lobose, spinulose; spinules on medial surface coarse; fine spinules in short arcuate rows on the anteroventral surface; palp subcylindrical and moderately long; with two apical sensilla and a lateral finger-like projection bearing an apical sensillum; galea large, finger-like, with two apical sensilla. Labium large, prominent and coarsely spinulose; palp a low elliptical elevation bearing three sensilla, one of which is on the tip of a finger-like projection; opening of sericteries conspicuous. (Material studied: fifteen larvae from New South Wales and Tasmania.)

Wheeler, 1933, p. 75: "The larvae are fed with bisected or entire insects, as the following observations show: . . . devouring an Elaterid beetle nearly an inch long, which the workers had brought in and cut in two at the junction of the prothorax and mesothorax. Two of the larvae had thrust their small, narrow heads and slender necks deeply into the small opening at the anterior end of

the mesothorax in order to reach the soft tissues at the only vulnerable point of the heavily armored prey."

Amblyopone cephalotes F. Smith.—Very similar to *australis*. The mandible as a whole is stouter; its apical tooth is stouter and blunter. (Material studied: 4 larvae from New Zealand.)

Tribe PARAPONERINI Emery

Genus PARAPONERA F. Smith

Neck stout and strongly curved; body stouter, elongate, straight and subcylindrical. Spiracles minute. Body hairs simple and slightly curved; mostly short, a few minute. Midventral surface naked. Head practically naked; with several exceedingly minute simple hairs. Cranium subtrapezoidal in anterior view. Labrum very small; posterior surface spinulose, with the spinules isolated and not arranged in any pattern. Mandibles stout and subtriangular, with the lateral part thick and the medial part blade-like; apical tooth stout and straight; anterior surface with reticulated striae on the base. Maxillary and labial palps each with five apical sensilla, one of which is a paxilla.

Paraponera clavata (Fabricius).—Plate II, figs. 1-9. Thorax and first abdominal somite forming a rather stout but strongly curved neck. The remainder of the abdomen stouter, elongate, straight and subcylindrical. Lateral longitudinal welts broad, low and inconspicuous. Posterior end round-pointed. Anus ventral. Thirteen differentiated somites. Leg vestiges present. Spiracles minute. Body hairs abundant and uniformly distributed, except on the midventral surface, which is naked; simple and slightly curved; short (0.2-0.3 mm); numerous longer (0.4 mm) hairs on the ventral surface and a few scattered elsewhere; a few minute (0.07 mm) hairs irregularly distributed. Integument of ventral surface beset with minute spinules arranged in short arcuate rows. Head small; cranium subtrapezoidal in anterior view, narrower below; with numerous small sensilla and several minute hairs scattered over the surface. Antennae surmounting a low convexity; small; three sensilla each. Labrum small, short and thick; breadth twice the length; free border broadly notched and bearing eight low rounded projections, each with one to three sensilla; anterior surface roughened with irregular bosses and bearing numerous sensilla and several minute hairs; posterior surface spinulose and bearing numerous sensilla; the spinules not arranged in any definite pattern. Mandibles stout and very heavily sclerotized, subtriangular in anterior view; anterior surface of basal half roughened with grooves in an irregularly reticulate pattern; lateral part of distal half thick, curving medially and terminating in a strong blunt apical tooth; medial part blade-like and bearing two stout blunt subapical teeth. Maxillae conoidal; apex densely beset with long slender spinules; palp a subcylindrical peg bearing on its flat apex five sensilla, one of which is peg-like; galea finger-like, with two apical sensilla. Labium large and subhemispherical; applied to the end of an inflated gula; anterior surface densely spinulose; palp a subcylindrical peg bearing five apical sensilla, one of which is peg-like; opening of sericteries wide and salient.

Hypopharynx spinulose. (Material studied: nine larvae from British Guiana.)

Young larva.—Hairs less abundant.

Wheeler (1928) discusses a case of Mermis parasitism in Paraponera and infers that the Mermis larva must enter the ant larva.

Wheeler, G. C., 1938, p. 141: no wing rudiments.

Zahl, 1939: "The larvae are glistening blue-white, helpless creatures capable of very limited movement" (p. 170). Zahl suspects (p. 179) that the larvae (presumably because of exudates) are necessary for or at least highly conducive to the welfare of the captive colony.

Tribe PLATYTHYREINI Emery

Genus PLATYTHYREA Roger

Abdomen with its dorsal profile strongly convex and its ventral nearly straight and serrate; terminal somite forming a stout blunt tail, which is directed ventrally at right angles to the long axis of the abdomen; anus ventral, on the anterior base of the tail; ventral surface of abdomen furnished with seven pairs of tubercles and three transverse ridges. Body and head practically naked, with only a very few scattered minute simple hairs. Cranium subhexagonal. Antennae slender elongate lobose adnate elevations. Labrum small; spinules on posterior surface isolated near the ventral border but elsewhere grouped in short transverse arcuate rows. Mandibles elongate, narrow, heavily sclerotized; base only slightly dilated; arcuate ventrally; apical tooth short, blunt and curved medially; medial border serrate with several denticles; anterior surface without spinules.

Wheeler (1910) describes the larvae of this genus as naked on page 73 and on page 233 as "smooth, thickset larvae, with short, sparse hairs and peculiar unpaired tubercles on the midventral surface of some of the abdominal segments."

Platythyrea inermis Forel.—Plate II, figs. 10-18. Thorax and first abdominal somite forming a slender, somewhat curved neck; the remainder of the abdomen stout, with its dorsal profile strongly convex and its ventral profile serrate and nearly straight. Lateral longitudinal welts feebly developed. Diameter greatest at the sixth abdominal somite and diminishing rapidly to the posterior end. Terminal somite forming a sort of stout, blunt tail, which is directed ventrally at right angles to the long axis of the abdomen; anus ventral, on the anterior base of this tail. A pair of tubercles (exudatoria?) on the midventral surface of each abdominal somite, except the first and the last; two transverse ridges on the midventral surface of the seventh abdominal somite and one on the ninth. Twelve differentiated somites. Leg vestiges present. Spiracles small. Body hairs very few, uniformly scattered, simple, minute (about 0.018 mm long). Integument for the most part densely spinulose, the spinules about 0.005 mm long and arranged in transverse rows; those on the mesothorax grading into papillae (0.003 mm) which cover the prothorax and the anterior portions of the mesothorax. Cranium subhexagonal

in anterior view; about as broad as long; occipital border slightly curved. Head naked except for a few sensilla and a very few exceedingly minute (about 0.005 mm long) hairs. Antennae slender elongate lobose adnate elevations narrowed dorsally to a slender ridge which extends obliquely almost to the center of the occipital border; each with three sensilla. Mouth parts large and prominent. Labrum small; breadth at the base one and a half times the length; narrowed ventrally; ventral border with a median lobe and several large sensilla; anterior surface with several sensilla; posterior surface densely spinulose and bearing a few sensilla; spinules on ventral third are isolated but the remainder are grouped in short transverse arcuate rows. Mandibles long, narrow and heavily sclerotized; slightly arcuate posteriorly; not greatly enlarged at the base; with a short blunt apical tooth which is curved medially; distal half of medial border serrate with several denticles. Maxillae paraboloidal; with a patch of spinules at the middle of the anterior surface and another on the apex; palp a rather stout peg with one apical and three lateral sensilla; galea a rather stout finger-like projection bearing a single apical sensillum. Labium large and prominent; anterior surface spinulose; palp a rather stout peg with two apical and three lateral sensilla; opening of sericteries conspicuous. Hypopharynx spinulose. (Material studied: nine larvae from the Philippine Islands.)

Platythyrea meinerti Forel.—Mann (1916, Pl. 7, fig. 53) figures a full-grown larva in side view.

Platythyrea punctata (F. Smith).—Wheeler, 1905, p. 81: "There are no pointed tubercles covering the body as in many other Ponerinae . . . and the hairs are much shorter and sparser. . . . There is a prominent rounded protuberance on the midventral surface of the fifth, and another on the corresponding region of the sixth abdominal segment. The latter protuberance is covered with yellow spinules. The head of the larva is unusually small, with rather feeble mandibles." The figure on page 81 shows the head and the abdomen in ventral view and the entire larva in side view.

Tribe ECTATOMMINI Emery

Wheeler, 1920, p. 48: ". . . the Ectatommiine Ponerinae . . . have elaborate but coarser stridulatory surfaces on the mandibles, so that the larva may be able to produce a variety of sounds and therefore apprise the nurses of more than one need or craving."

Genus PARANAMOPONE Wheeler

Paranamopone relicta Wheeler.—Wheeler, 1915: "The larva is rather slender, pure white and covered with delicate white hairs, which are short and rather dense, especially on the dorsal surface, and interspersed with fewer, longer and more flexuous hairs. The head is rounded, sparsely hairy and bears a pair of well-developed, tridentate mandibles" (p. 119). Wheeler figures a "nearly full grown larva" and the "head of same from above" (Pl. VIII, figs. 7 and 8).

Genus PRIONOPELTA Mayr

Body elongate, terete, moderately slender, slightly curved ventrally. Body hairs simple; grouped in bands around the middle of the somites leaving the intersomitic grooves and adjacent areas conspicuously naked; mostly short, simple and slightly curved, the longer hairs whip-like and restricted to the middle of the somites. Head hairs few, simple, slightly curved, moderately long. Antennae subhemispherical. Labrum short, broad, subrectangular, not bilobed; medial half of posterior surface spinulose, with the spinules in transverse rows. Mandibles elongate and very slender; base only slightly dilated; feebly sclerotized; apical tooth small and slightly curved medially; medial teeth small and acute; anterior surface smooth. Maxillary palp shaped like a bootee; with a spinule-bearing sensillum on the outer edge, a curved finger-like sensillum projecting upward from the "toe" and three spinule-bearing mammillate sensilla decorating the "top." Labial palp a low rounded elevation.

Prionopelta punctulata Mayr.—Plate II, figs. 19-24. Elongate, moderately slender, terete, slightly curved ventrally. Diameter greatest at the fifth abdominal somite; decreasing gradually to the anterior end (*i.e.* no distinct neck) and more abruptly to the posterior end, which is round-pointed. Anus subterminal. Ten differentiated somites. Spiracles minute. Body hairs simple, moderately abundant, grouped in bands around the middle of the somites, leaving the intersomitic grooves and adjacent areas conspicuously naked; length 0.045-0.144 mm; the longer hairs whip-like, restricted to the middle of the somites; shorter hairs slightly curved, not whip-like. Integument with a few spinules on the midventral surface of the thorax. Head large; cranium subcircular in anterior view. Head hairs few, simple, slightly curved, about 0.055 mm long. Antennae small, subhemispherical, each bearing three sensilla. Labrum subrectangular but with the ventral corners rounded and the ventral border feebly concave; short and broad, the breadth twice the length; numerous sensilla on the ventral edge and adjacent part of anterior surface; medial half of posterior surface densely spinulose, with the spinules in transverse rows; a medial cluster of sensilla on the posterior surface near the ventral border. Mandibles feebly sclerotized; elongate and very slender; subcylindrical; base only slightly dilated; apical tooth small, moderately sharp, slightly curved medially; two delicate sharp denticles on the medial border. Maxillae large and lobose; distal surface spinulose; palp shaped like a bootee, with a spinule-bearing sensillum on the outer edge, a curved finger-like sensillum projecting upward from the "toe," and three spinule-bearing mammillate sensilla decorating the "top"; galea a slender finger-like projection with a single apical sensillum. Labium large, protruding, transversely subelliptical; anterior surface spinulose, the spinules arranged in short arcuate rows; palp a low rounded elevation bearing four sensilla, one of which is finger-like; opening of sericteries a wide conspicuous shelf projecting downward. (Material studied: five larvae and two semipupae from Colombia.)

Genus TYPHLOMYRMEX Mayr

Densely and uniformly covered with a mat of branching (mostly trifid) hairs. Head with a few large bifid hairs. Cranium transversely subelliptical. Antennae cylindrical; with three sensilla, each of which bears a long stout spine. Labrum large and thick, subtrapezoidal, with the ventral border feebly incised at the middle; posterior surface spinulose, the spinules minute but becoming longer toward the ventral border and arranged in definite rows which radiate from the dorsolateral angles; rows continuous on basal half of labrum but broken into short components on the ventral half; no spinules near the ventral border. Mandibles with the basal 2/5 greatly inflated and feebly sclerotized; distal 3/5 straight, very slender, strongly sclerotized; apical tooth slender, sharp-pointed, curved medially and posteriorly; medial teeth small and acute; basal half of anterior surface with longitudinal rows of minute spinules.

Typhlomyrmex robustus Emery.—Plate III, fig. 9-12. Shaped somewhat like a crookneck squash; thorax and first two abdominal somites forming a slender neck; remainder of abdomen swollen. Densely and uniformly covered with a mat of branching hairs averaging about 0.1 mm long; hairs typically trifid (rarely bifid or four-branched). Cranium subelliptical in anterior view; short, the breadth 1½ times the length; front bulging. Head hairs few; relatively large; length 0.035-0.07 mm; number and location variable. Each antenna mounted on a small elevation; small, slender, relatively long, subcylindrical; bearing three apical sensilla, each surmounted by a long stout spinule. Labrum large and thick; subtrapezoidal, narrower below; breadth (at base) twice the length; ventral border broadly but feebly incised at the middle; a few sensilla on the anterior surface and six on the ventral border; posterior surface spinulose, the spinules minute but increasing in length toward the ventral border and arranged in definite rows which radiate from the dorsolateral angles, the rows continuous on the basal half but breaking distally into short arcuate components; no spinules near the ventral border; posterior surface with a medial cluster of small sesnsilla on the lower half. Mandibles large; basal two-fifths greatly inflated and feebly sclerotized, its anterior surface with numerous radiating rows of minute spinules; distal three-fifths straight, very slender, somewhat flattened and strongly sclerotized; apical tooth slender, sharp-pointed, curved medially and posteriorly; two small acute teeth on the medial border. Maxillae paraboloidal; palp a stout peg bearing three apical and one lateral sensilla; galea a slender finger-like projection bearing a single apical sensillum. Labium very large, subhemispherical, applied to the end of a greatly inflated gula; anterior surface spinulose; palp a stout peg bearing several sensilla; opening of sericteries conspicuous. (Material studied: one damaged immature larva and a head; collected by Dr. W. M. Mann in Honduras.)

Genus STICTOPONERA Mayr

Anus terminal. Body with a dense coat of branched (mostly four-branched) hairs, through which project a few longer bifid and simple hairs;

the simple hairs stiff, nearly straight and most abundant at the posterior end. Head hairs few, short, simple, slightly curved. Cranium subhexagonal in anterior view. Antennae minute, paxilliform; with three sensilla, each of which bears a stout moderately long spine. Mouth parts large and conspicuous. Labrum large, subtrapezoidal; ventral border feebly incised at the middle; posterior surface spinulose, the spinules all minute but becoming longer toward the ventral border and arranged in definite rows which radiate from the dorsolateral angles; rows continuous on basal half of labrum but broken into short arcuate components on the ventral half; no spinules near the ventral border. Mandibles large, long and narrow; moderately sclerotized; base slightly dilated; lateral border thickened, medial bladelike; apex slightly curved medially and posteriorly; apical tooth stout, round-pointed; medial teeth small, acute; basal 2/3 of anterior surface beset with numerous spinules arranged in longitudinal rows; spinules mostly minute but along and near the lateral border of the medial half they are exceedingly long.

Stictoponera sp.—Plate III, figs. 1-8. Shaped somewhat like a crookneck squash; thorax and first two abdominal somites forming a slender curved neck; remainder of abdomen swollen and nearly straight. Posterior end round-pointed. Anus terminal. Eleven differentiated somites. Body with a dense coat (about 0.08 mm thick) of many-branched hairs (mostly four-branched), about 0.1 mm long, through which project a few bifid and simple hairs about 0.14 mm long; simple hairs stiff, nearly straight and most abundant at the posterior end. Integumental spinules restricted to the ventral surface of the thorax. Head small and elongate; mouth parts very large and conspicuous; cranium subhexagonal and somewhat broader than long. Head hairs few, short (0.02-0.07 mm), simple, slightly curved; arrangement various and often asymmetrical; only two hairs on clypeus. Antennae minute; each situated on the enlarged end of an elongate rounded ridge; a stout peg, slightly constricted at the base and bearing three apical sensilla, each of which is surmounted by a stout and moderately long spine. Labrum subtrapezoidal, narrowed ventrally; ventral border feebly incised at the middle; numerous sensilla on and near the ventral border; posterior surface with a cluster of minute sensilla near the center; posterior surface spinulose, the spinules all minute but becoming longer toward the ventral border, and arranged in definite rows which radiate from the dorsolateral angles; rows continuous on basal half of labrum but broken into short arcuate components on the ventral half; no spinules near the ventral border. Mandibles large; long and narrow; moderately sclerotized; basal half slightly dilated; apical half rather stout, its lateral border thickened, its medial border blade-like; apex slightly curved medially and posteriorly; apical tooth stout, round-pointed; two small acute subapical teeth on the medial border; basal 2/3 of anterior surface beset with numerous spinules arranged in longitudinal rows; spinules mostly minute but along and near the lateral border of the middle half they are exceedingly long. Maxillae large; apex paraboloidal; anterior surface with minute spinules arranged in short rows; palp a large peg bearing two terminal and two lateral sensilla; galea a large finger-like projection bearing two apical sensilla. Labium large, subhemispherical, applied to the end of a greatly inflated gula; anterior surface thickly beset with coarse

spinules; palp a short stout peg, bearing one lateral and four apical sensilla; opening of sericteries prominent. (Material studied: six larvae labelled "Kalabit Country N. Borneo 3000 ft. E. Mjöberg"; probably a new species.)

Stictoponera sp.—Hairs more abundant and longer; otherwise similar to the larvae from Kalabit. [Material studied: six larvae labelled "Pajan Borneo E. Mjöberg"; probably *S. coxalis* (Roger).]

Genus HOLCOPONERA Mayr

Neck rather stout. Body hairs branched, mostly trifid. Head hairs short, simple or bifid. Antennae minute paraboloidal prominences bearing three sensilla, on each of which is mounted a long stout spine. Mouth parts large and conspicuous. Labrum large; subparabolic in anterior view; ventral border feebly incised at the middle; posterior surface spinulose, the spinules all minute but becoming longer toward the ventral border, and arranged in definite rows which radiate from the dorsolateral angles; rows continuous on the basal half but broken into short arcuate components on the ventral half; no spinules near the ventral border. Mandibles large, moderately sclerotized; dilated at base; apical half slender; apical tooth long, slender, acute, slightly curved medially and posteriorly; medial teeth small and acute; basal ⅔ of anterior surface beset with numerous spinules; spinules on basal third minute, those on the middle third extremely long and slender, giving the rows a comb-like appearance.

Holcoponera striatula Mayr.—Plate III, figs. 13-17. Thorax and first abdominal somite forming a rather stout neck, which is curved ventrally. The remainder of the abdomen stouter, straight and subcylindrical. Lateral longitudinal welts broad, low and inconspicuous. Posterior end rounded. Anus subterminal. Seven or eight differentiated somites. Leg vestiges present. Spiracles minute. Body hairs abundant and uniformly distributed, except for the naked areas adjacent to the intersomitic furrows; dendritic, mostly three-branched, a few bifid, many four- or five-branched; averaging about 0.1 mm long. Head small. Cranium subtrapezoidal (in anterior view) but with the occipital border broadly rounded; much narrowed ventrally. Mouth parts large and prominent. Head hairs few and uniformly distributed; simple or bifid; slightly curved; short (0.027-0.053 mm). Antennae small situated on the ends of elliptical elevations; each a minute paraboloidal protuberance bearing on its apex three sensilla; from each sensillum projects a slender conical spine which is nearly as long as the antenna itself. Labrum a little broader than long; narrowed ventrally; ventral border rounded at the corners and feebly incised at the middle; a few sensilla on the ventral border and adjacent portion of anterior surface; posterior surface with a cluster of sensilla near the center; posterior surface spinulose, the spinules all minute but becoming longer toward the ventral border, and arranged in definite rows which radiate from the dorsolateral angles; rows continuous on basal half but broken into short arcuate components on the ventral half; no spinules near the ventral border. Mandibles rather long and moderately sclerotized; dilated at the base;

apical half slender and bearing two small acute teeth on the medial border; apical tooth long, slender, acute, slightly curved medially and posteriorly; basal two-thirds of anterior surface beset with numerous spinules arranged in longitudinal rows; the spinules on the basal third minute, those on the middle third extremely long and slender and giving the rows a comb-like appearance. Maxillae paraboloidal; apical half spinulose; palp a slender cone bearing one apical and two lateral sensilla; galea only slightly longer than palp, finger-like and bearing a single sensillum on the apex. Labium large and inflated; subhemispherical; anterior surface beset with coarse spinules arranged in transverse arcuate rows; palp a subconical paxilla bearing one apical and two lateral sensilla; opening of setricteries wide and conspicuous. (Material studied: five larvae from Costa Rica.)

Holcoponera brasiliensis Emery.—Similar to *striatula*. (Material studied: three larvae from Brazil.)

Holcoponera rustica wheeleri Santschi.—Similar to *striatula*. (Material studied: eight larvae from Costa Rica.)

Holcoponera striatula angustipleura Forel.—Eidmann, 1936, p. 33: "Die Larven sind schwach gekrümmt und ringsum dicht behaart."

Holcoponera strigata (Norton).—Wheeler, 1903, p. 209: "These larvae are nontuberculate . . . but covered with long, multifurcate, somewhat flexuous hairs."

Genus CHALCOPONERA Emery

Body hairs short; of five types (including simple and branched). Head hairs few, short, simple, slightly curved. Cranium subhexagonal in anterior view. Antennae minute, peg-like; each bearing on its apex three long stout spines. Mouth parts large. Labrum large, subrectangular, bilobed; posterior surface spinulose, the spinule minute but becoming longer toward the ventral border, and arranged in definite rows which radiate from the dorsolateral angles; rows continuous on the basal half but broken into short arcuate components on the ventral half. Mandibles rather stout, subtriangular in anterior view; moderately sclerotized; basal half greatly inflated; apical half thin and narrow, bearing two rather stout medial teeth and terminating in a long slender apical tooth which is curved medially and posteriorly; most of anterior surface beset with minute spinules arranged in longitudinal rows; no combs.

Chalcoponera impressa (Mayr).—Plate IV, figs. 1-8. Shaped somewhat like a crookneck squash; thorax and first abdominal somite forming a slender curved neck; remainder of abdomen stout and straight; posterior end rounded. Anus subterminal. Spiracles minute. Body hairs short, moderately abundant, uniformly distributed; of five sorts—(a) short (0.16 mm) rather stout, with the tips frayed; (b) bifid, with simple branches, about 0.26 mm long; (c) unbranched and whip-like, with short stout base and long tenuous lash, about 0.45 mm long; (d) bifid with short stiff base and very long flexuous branches, about 0.45 mm long; (e) trifid but otherwise like (d). Head small with large and prominent mouth parts; cranium subhexagonal in anterior view,

bulging at the middle of each side, the occipital border somewhat rounded. Head hairs few, simple, slightly curved, shorter than body hairs but quite varied in length (0.04-0.12 mm), uniformly scattered. Antennae minute pegs mounted on rounded eminences; each bearing three apical sensilla; each sensillum bearing a long stout spine. Labrum rather large; subrectangular, breadth one and a half times the width; ventral border rounded at the corners, incised at the middle and furnished with numerous large sensilla; posterior surface spinulose, the spinules minute but becoming longer toward the ventral border, and arranged in definite rows which radiate from the dorsolateral angles; rows continuous on basal half but broken into short arcuate components on the ventral half; a cluster of small sensilla on the posterior surface near the center. Mandibles rather stout, subtriangular in anterior view; moderately sclerotized; basal half greatly inflated; apical half thin and narrow, bearing two rather stout medial teeth and terminating in a long slender apical tooth which is curved medially and posteriorly; most of anterior surface beset with minute spinules arranged in rows which radiate from the middle of the dorsal border. Maxillae with the anterior surface sparsely spinulose; palp an elongate cone bearing one lateral and two apical sensilla; galea a finger-like projection bearing a single apical sensillum. Labium very large; anterior surface densely spinulose, the spinules arranged in transverse rows; palp a short stout peg bearing one apical and four lateral sensilla; opening of sericteries wide and conspicuous. Hypopharynx spinulose. (Material studied: three larvae from Queensland.)

Chalcoponera metallica (F. Smith).—Similar to *impressa*. (Material studied: three larvae from Queensland.)

Chalcoponera metallica cristulata Forel.—Brues (1934, p. 204) has described the adult of *Tricoryna chalcoponerae* collected with this ant in New South Wales. From what is known of the life histories of other eucharids, one may infer that the wasp larvae are parasitoids in the ant larvae.

Genus RHYTIDOPONERA Mayr

Body hairs of three types: (a) simple and slightly curved, (b) simple and flagelliform, but mostly (c) bifid. Head hairs several, short, simple, slightly curved. Cranium subelliptical in anterior view. Antennae minute, paraboloidal; each with three moderately long spines on the apex. Labrum bilobed; posterior surface spinulose, the spinules minute but becoming longer toward the ventral border; spinules arranged in definite rows which radiate from the dorsolateral angles; rows continuous on the basal half of the labrum but broken into short arcuate components on the ventral half; on and near the ventral border the spinules are isolated. Mandibles feebly sclerotized; basal half greatly inflated; distal half narrow, of two parts—(1) a large thin obtuse medial tooth and (2) an elongate slender lateral part which terminates in a long slender apical tooth and which has an elongate acute tooth adnate to its medial face; most of anterior surface spinulose, the spinules minute and arranged in longitudinal rows; no combs.

Rhytidoponera cristata Mayr.—Plate III, figs. 19-22. Shaped somewhat like a crookneck squash; thorax and first abdominal somite forming a long slender curved neck; remainder of abdomen stout and nearly straight. A welt-like ridge along either side of the abdomen, separating the strongly convex dorsum from the less convex venter. Along the dorsal and ventral margins of the welts are several curious structures (exudatoria?) of various shapes. Posteriorly end broadly rounded. Anus terminal. Leg vestiges elliptical, rather large. Nine differentiated somites. Body hairs moderately abundant and uniformly distributed; of three types—(a) bifid, 0.2-0.3 mm long, the most abundant type, (b) simple, flagelliform, base short and moderately stout, flagellum extremely long and fine, total length about 0.5 mm, limited to the ventral surface, and (c) simple, rather stout, slightly curved, 0.25-0.35 mm long, near the posterior end. Integument spinulose; the spinules exceedingly minute and arranged in transverse rows. Cranium subelliptical in anterior view; slightly broader than long. Head hairs few, irregularly scattered, simple, slightly curved, shorter than body hairs but quite varied in length (0.06-0.19 mm). Antennae minute paraboloidal projection mounted on slight rounded elevations; each bearing three apical sensilla, each of which is surmounted by a stout spinule. Labrum as broad as long, bilobed due to a wide deep median incision of the ventral border; numerous large sensilla on the ventral border and on the anterior surface near that border; numerous smaller sensilla on the posterior surface near the center and near the ventral border; posterior surface spinulose, the spinules minute but becoming longer toward the ventral border; spinules arranged in definite rows which radiate from the dorsolateral angles; rows continuous on the basal half of the labrum but broken into short arcuate components on the ventral half; on and near the ventral border the spinules are isolated. Mandibles feebly sclerotized; basal half greatly inflated; distal half narrow, of two parts—(1) a large thin obtuse medial tooth and (2) an elongate slender lateral part which terminates in a long slender straight round-pointed apical tooth and which has an elongate acute tooth adnate to its medial face; anterior surface of mandibles spinulose, the spinules minute and arranged in longitudinal rows. Maxillae spinulose, the spinules minute, some finer and grouped in short rows, others coarser and isolated; palp a stout truncate cone with five sensilla, four of which bear each a slender paxilla; galea a longer slenderer truncate cone with two apical sensilla, each bearing a slender paxilla. Labium large and protruding; anterior surface densely spinulose, the spinules mostly coarse and isolated; palp a short cylindrical projection, with four sensilla each bearing a slender paxilla; opening of sericteries wide and conspicuous. Hypopharynx spinulose. the spinules slender and grouped in arcuate rows. (Material studied: three larvae from New South Wales.)

Wheeler and Bailey (1920) published a photomicrograph (Pl. III, fig. 19) of the mouthparts of this larva and the following comment (p. 269): "The trophorhinium may be discerned as an arcuate system of extremely fine, parallel ridges extending across the space between the bases of the mandibles. It will be noticed also that the upper surfaces of the latter are very finely and

regularly imbricated. . . . When the mandibles are opened or closed, their imbricated surfaces would naturally rub against the dorsal plate of the trophorhinium, and in forms with large mandibles, like *Rhytidoponera* the latter must overlap more or less when opening and closing and thus also rub against one another. Not improbably, therefore, the rough surfaces of the mandibles may reinforce the triturating and sifting functions of the trophorhinium."

Rhytidoponera convexa Mayr.—Apical tooth of mandibles slightly curved medially, slenderer and noticeably shorter. Otherwise similar to *cristata*. (Material studied: two larvae from Queensland.)

Rhytidoponera froggatti Forel—Plate III, fig. 18. Apical tooth of mandibles is strongly curved medially and all teeth are sharper; galea slenderer. Otherwise similar to *cristata*. (Material studied: two larvae from the Solomon Islands.)

Genus EMERYELLA Forel

Body hairs of four types (a) mostly short, stout, slightly curved or sinuous with several minute lateral branches; (b) a few short trifid, with the branches fine and flexuous; (c) a few bifid, longer, with the branches long, fine and flexuous; (d) a few simple, stout and longer. Head hairs few, simple, slightly curved, fine, short. Cranium subhexagonal in anterior view. Mouth parts large and prominent. Antennae minute, cylindrical, bearing three stout moderately long spinules on the distal end. Labrum large, strongly narrowed ventrally, bilobed; posterior surface spinulose, the spinules minute but becoming longer toward the ventral border; spinules arranged in definite rows which radiate from the dorsolateral angles; rows continuous on the basal half of the labrum but broken into short arcuate components on the ventral half; on and near the ventral border the spinules are isolated. Mandibles large, elongate and rather narrow; basal half moderately dilated; apical half, slender, its lateral border thickened, its medial border blade-like; apical tooth curved medially, round-pointed; proximal tooth on medial border obtuse, distal round-pointed; basal $\frac{2}{3}$ of anterior surface beset with numerous spinules arranged in longitudinal rows; most spinules very minute but along and near the lateral border of the middle third a few isolated spinules are exceedingly long.

Emeryella schmitti Forel.—Plate IV, figs. 9-14. Shaped somewhat like a crookneck squash; thorax and first two abdominal somites forming a slender curved neck; remainder of abdomen straight and swollen. Posterior end rounded. Body hairs moderately abundant and uniformly distributed; of four types—(a) about 0.17 mm long, numerous, stout, slightly curved, with several short acute lateral branches, (b) a few trifid, about 0.17 mm long, with the branches fine and flexuous, (c) a few bifid, about 0.23 mm long, with long fine flexuous branches, and (d) a few simple, stout, about 0.25 mm long. Cranium subhexagonal in anterior view; breadth one and one-half times the length; mouth parts large and conspicuous. Head hairs few, scat-

tered, simple, slightly curved, fine and short (about 0.05 mm long). Antennae minute, each a short cylinder bearing three stout apical spinules. Labrum large; wider (at base) than long; narrowed ventrally; ventral border narrowly incised at the middle; numerous sensilla on the ventral border and on both surfaces near that border; posterior surface spinulose, the spinules minute but becoming longer toward the ventral border; spinules arranged in definite rows which radiate from the dorsolateral angles; rows continuous on basal half of labrum but broken into short arcuate components on the ventral half; on and near the ventral border the spinules are isolated. Mandibles large, elongate and rather narrow; moderately sclerotized; basal half moderately dilated; apical half slender, its lateral border thickened, its medial border blade-like; two subapical teeth on the medial border, the proximal blunt-pointed and the distal round-pointed; apical tooth curved medially, round-pointed; basal two-thirds of anterior surface beset with numerous spinules arranged in longitudinal rows; spinules mostly very minute but along and near the lateral border of the middle third a few isolated spinules are exceedingly long. Maxillae with the anterior surface sparsely spinulose; palp a short subconical projection bearing three sensilla—apical, subapical and lateral; galea a finger-like projection bearing two apical sensilla. Labium with the anteroventral surface densely spinulose; palp a short subconical projection bearing five sensilla—one apical, two subapical, one lateral and one basal; opening of sericteries wide and conspicuous. Hypopharynx densely spinulose. (Material studied: a single larvae from Haiti; only the head is in good condition.)

Wheeler and Mann, 1914, p. 10: "The larvae . . . are peculiar, . . . resembling the larvae of *Stigmatomma pallipes* . . . in being very broad behind and very narrow and curved anteriorly and instead of being tuberculate, have the body covered with dense, soft, erect hairs." Fig. 3 (p. 10) shows the larva in side view.

Genus ECTATOMMA F. Smith

Cook, 1905, p. 38: "The larvae, like those of *Stigmatomma*, have a uniform coat of fine hairs."

Girault (1915, p. 228) states that *Tricoryna ectatommae* Girault was "taken from nest of ant, Ectatomma." Presumably the eucharid larva was parasitoid on the ant larva.

Wheeler, 1904, p. 767: "The larva of *Ectatomma* is much more primitive in its characters than that of many other Ponerinae, whereas the larva of *Odontomachus* is much like that of the typical genus *Ponera*."

Wheeler, 1910, p. 233: "Smooth, slender larvae, with a rather dense covering of hairs."

Subgenus ECTATOMMA F. Smith

Swollen posterior part of abdomen elongate and subellipsoidal. Neck short, body hairs long and whip-like, the basal 3/5 stiff and bearing numerous denticles along its sides, the distal 2/5 finely attenuate and lash-like. Head

hairs few, moderately long, rather stout, slightly curved, roughened with several minute denticles along the sides. Cranium suboctagonal in anterior view. Mouth parts moderately large. Antennae small; each a truncate cone bearing on its apex three stout spinules, two short and one long. Labrum large, subrectangular, feebly incised at the middle of the ventral border; posterior surface spinulose, the spinules minute but increasing in length toward the ventral border and arranged in definite rows which radiate from the dorsolateral angles, the rows continuous on the basal 2/3 but broken distally into short arcuate components; isolated spinules on and near the ventral border. Mandibles large and rather stout; base broad and feebly sclerotized; apex narrow and strongly sclerotized; apical tooth long and slender, curved medially and posteriorly; subapical teeth acute, the distal much the larger. Most of the anterior surface beset with spinules arranged in longitudinal rows. Maxillae with the lateral surface concave.

Ectatomma tuberculatum (Olivier).—Plate IV, figs. 15-26. Shaped somewhat like a crookneck squash; thorax and first abdominal somite forming a short slender curved neck (longer and more slender in younger larvae); rest of abdomen elongate, swollen, straight, subellipsoidal. Posterior end rounded. Anus subterminal. Leg vestiges present. Ten differentiated somites. Body hairs abundant and long (0.3 to 0.5 mm); arranged around the somites in distinct bands which are separated by naked intersomitic zones; whip-like, the basal 3/5 stiff and bearing numerous denticles along its sides, the distal 2/5 finely attenuate and flexuous. Integument spinulose; spinules exceedingly minute (about 0.0018 mm); a few in rather regular transverse rows, but mostly arranged irregularly. Cranium suboctagonal in anterior view but with corners broadly rounded. Mouth parts moderately large. Head hairs few, moderately long (0.10-0.15 mm), rather stout, slightly curved, roughened with several minute denticles along the sides. Antennae minute; mounted on low rounded elevations; each antenna a low truncate cone with three apical sensilla; two sensilla bear each a short stout spine, the third a stout curved spine twice as long. Labrum large, subrectangular, a fourth broader than long; moderately incised at the middle of the ventral border; a few sensilla on and near the ventral border; posterior surface with a cluster of minute sensilla near the middle; posterior surface spinulose, the spinules minute but increasing in length toward the ventral border and arranged in definite rows which radiate from the dorsolateral angles, the rows continuous on the basal $\frac{2}{3}$ but broken distally into short arcuate components; isolated spinules on and near the ventral border. Mandibles large and rather stout; subtriangular in anterior view; base broad and feebly sclerotized; apex narrow and strongly sclerotized; apical tooth long and slender, curved medially and posteriorly; two acute subapical teeth on the medial border, the distal much larger than the proximal; most of anterior surface beset with spinules arranged in longitudinal rows. Maxillae with the apex conoidal and spinulose, the spinules minute and arranged in short longitudinal rows; lateral surface concave; palp a stout peg with four sensilla (one apical, one subapical, two lateral); galea

a stout finger-shaped projection bearing two apical sensilla. Labium subhemispherical, applied to the end of an inflated gula; anterior surface thickly beset with coarse spinules, those near the midline grouped in short arcuate rows, those at the sides isolated; palp a short peg with four sensilla. Hypopharynx densely furnished with both fine and coarse spinules. (Material studied: numerous larvae from Costa Rica and Panama.)

Text fig. 2—*Ectatomma* (*Gnamptogenys*) *tortuolosum* (F. Smith). A larva infested with two phorid maggots, ×9.

Cook, 1905: "It does not appear that the keleps have the art of regurgitating food for their larvae or for each other, but they have, instead, the curious habit of opening their mandibles wide and lapping up drops of nectar, moistened sugar, or honey on their mouth parts. The liquid is thus carried into the nest and dispensed to the other members of the community, old and young" (p. 17). "Workers occasionally lay eggs" which are "at once fed to the larvae" (p. 18). "Two larvae of unusual size were raised, one of which emerged as a normal winged queen. . . . The time required for the development of a queen is about three months, the larval and pupal stages being about one and one-half times as long as those of the workers" (p. 22). "The extent to which the keleps normally depend upon nectar has not been adequately learned as yet. It may be that they use it largely, if not exclusively, for feeding the very young larvae, since these do not seem to be regularly fed with animal food, captured insects always being given, as far as observed, to the large larvae. Colonies fed exclusively on sugar or honey have raised larvae to nearly the full size, but these seldom, if ever, pupate normally, and in some of the captive colonies very few pupae have survived to emerge as adults" (p. 42). The workers construct over the larvae which are ready to pupate "a cell of earth, if no other materials are at hand, but prefer pieces of old cocoons if these are obtainable" (p. 43). "The brood cells of the kelep are built over the larva as it lies on the floor" (p. 44). "The kelep larvae are not so completely helpless as those of bees and true ants, being provided with mouth parts adapted for eating out the soft interior tissues of insects, and long, flexible necks to enable them to reach inside and clean out the sections of boll weevils laid by the workers carefully on the fat stomachs of their baby sisters. Two such, lying side by side, each provided with a weevil's front leg to nibble, was the ludicrous sight observed in the nest of one of the captive colonies in Texas. Mrs. Cook has noted another instance of feeding which well illustrates the extent to which the social organization has developed in this respect. A worker seized a termite as soon as it was dropped into the nest and held it in its jaws for fully five minutes, the termite vigorously protesting with its anten-

nae. After it was dead, or at least motionless, the kelep took it below where other workers assisted in feeding it to a large larva. It was very hard to get the termite properly placed; time and again it fell from where it had been put, and was turned over and twisted in all sorts of ways in the effort to bring it into a position so that the larva might take hold of its head. The larva meanwhile moved its own head back and forth, evidently trying to get hold on its own account, and a little larva nearby did secure a hold on the other end of the termite, so that the keleps had to move both larva and termite in their further efforts to give the latter to the large larva. The little larva was almost as large as the termite. Finally the matter was arranged, the termite lying across the two larvae, which remained peacefully side by side, the big one eating at the head, the little one at the tail. A worker had to take the head of the big larva between his jaws and fore legs and put it in contact with the termite, and then stood over it as though to see that the larva did its duty. The weight of the small larva kept pulling the termite off the body of the large larva before it had become firmly attached, so a worker stayed by and kept pulling the termite back in position. Finally the large larva got to work in earnest, and the faithful nurse left to help another kelep with another termite" (p. 46).

Weber (1946, p. 5) refers to Cook's account as follows: "The slender larvae 'have long flexible necks which enable them to reach inside and clean out the sections of boll weevils laid by the workers carefully on the fat stomachs of their baby sisters.' The workers covered the larvae with dirt when the latter were ready to pupate, pupation in colonies introduced into Texas taking one and one-half hours."

Cook also reported (p. 15) the emergence of a few specimens of *Isomerala coronata* Westwood from captive colonies. (Referred to by Wheeler, 1907, p. 17.) Presumably the eucharid larvae were parasitoid on the ant larvae. In this connection it is interesting to note that a larva of *tuberculatum* collected in Panama (Changuinola District, August 3, 1924, G. C. Wheeler, No. 169) has a planidium attached to the ventral surface at the junction of head and prothorax. The anterior end of the planidium is directed toward the posterior end of the host. The planidium is 0.1 mm long (exclusive of caudal spines), while the ant larva is about 5 mm long. The attachment to the host was so secure that it resisted boiling in potassium hydroxide solution.

Wheeler (1928a, p. 166; 1928b, p. 205; 1930) discussed mermithegates of this ant and inferred that the nematode larvae (Mermis) had been parasitic in the ant larvae.

Ectatomma quadridens (Fabricius).—Similar to *tuberculatum*. (Material studied: three larvae from Brazil.)

Mann, 1916, Fig. 54 on Pl. 7: larva in profile. (Copied by Gallardo, 1918, Fig. 6 on p. 35.)

Ectatomma ruidum Roger.—Similar to *tuberculatum*. (Material studied: four larvae from Panama Canal Zone.)

Weber, 1946, p. 12: The larvae in an observation nest "rasped the integument of the callow of everything removable. The lower mouth parts were used with the aid of the sharp mandibles above. One larva pierced a femur and, when fluid exuded, the clear liquid was drawn into the mouth, presumably by capillarity. . . . Two other larvae were feeding steadily on a termite, one larva being on its side, the other resting on its dorsal surface. . . . Larvae had also apparently been feeding on sugar. . . . The long hairs of the larvae were clearly of service in keeping them off the wet floor. The larvae were seen to progress slowly forward by an undulating motion and could also raise the anterior half of the body in the air at times. . . . Three larvae had their heads inside the carcass of a fly given them the previous day." Larva in profile, Fig. 3 on p. 15.

Ectatomma edentatum Roger.—Emery (1901, p. 431) describes a larva about 6 mm long:—"È una larva di tipo ponerino, con i quattro primi segmenti dopo il capo sottili, costituenti un collo, al quale segue il resto del corpo rigonfiato che costituisce un addome voluminoso. Tutta la superficie del corpo e ricoperta di numerosi peli semplici, assottigliati all'estremità, come quelli della larva di *Dorylus;* questi peli sono di lunghezza ineguale, ma tutti della medesima struttura. Nessun vestigio di tubercoli o punte o spine. Il colore della larva conservata nello spirito è bigio brunastro, come sono al solito le larve mature di Ponerine prima di avere filato il bozzolo. Il capo della larva è poco meno lungo del segmento seguente dal quale è separato per mezzo di una strozzatura pronunziata che accenna ad una notevole mobilità. Le parti boccali sono robuste. Il labbro superiore bruno è inciso nel mezzo, con due paia di papille e altrettanti brevi peli conici, vicino all'incisura. Le mandibole molto scure sono forti e tridentate. Le mascelle e il labbro inferiore sono come nelle altre ponerine. Sul capo, si vedono molti peli semplici e un paio di minute papille sormontate ciascuna da due minuti peli. Io ritengo che siano rudimenti di antenne. (Pl. II: fig. 10, larva in side view; fig. 11, head in side view; fig. 12, head in anterior view; fig. 13, mandible; fig. 14, antenna.)

Subgenus PONERACANTHA Emery

Swollen posterior part of abdomen subovoidal. Neck long. Prothorax nearly naked. Body hairs rather short, varying in shape between two extremes: at one extreme—slender, slightly curved, with several small slender acute lateral branches; at the other—stout, somewhat flattened, with numerous longer branches, which are occasionally bifid. Head hairs few, simple, minute. Antennae, a pair of minute truncate cones, each bearing three short stout apical spines. Labrum large; slightly broader at the base than long; ventral corners strongly rounded; a conspicuous incision at the middle of the ventral border; posterior surface spinulose, the spinules minute but increasing in length toward the ventral border and arranged in definite rows which radiate from the dorsolateral angles, the rows continuous on the basal two-thirds but broken into short arcuate components on the distal third. Mandibles large, elongate, rather narrow; basal half moderately dilated; distal half with its lateral border

thickened and its medial border blade-like; apical tooth long, slender, round-pointed; medial teeth small and acute; basal three-fourths of anterior surface beset with numerous spinules arranged in longitudinal rows; spinules mostly minute but along and near the lateral border a few isolated spinules are exceedingly long. Labial spinules coarse and isolated.

Ectatomma (*Poneracantha*) *bispinosum* Emery.—Plate V. figs. 1-5. Shaped somewhat like a crookneck squash; thorax and first two abdominal somites forming a long slender curved neck; remainder of abdomen swollen and subovoidal. Posterior end rounded. Anus subterminal. Leg vestiges present. Body hairs moderately abundant and uniformly distributed (except for the prothorax which is nearly naked); short (length 0.21-0.25 mm); varying in shape between two extremes; at one extreme—slender, slightly curved, with several small slender acute lateral branches; at the other— stout, somewhat flattened, with numerous longer branches, which are occasionally bifid. Integument spinulose, the spinules minute and arranged in transverse rows. Head pear-shaped; cranium as broad as long; mouth parts moderately large. Head hairs few, scattered, simple, minute (0.023 mm). Antennae minute; each mounted on the ventral end of an elongate low narrow rounded ridge; each a rather stout truncate cone bearing three short stout apical spines. Labrum large; slightly broader (at base) than long; ventral corners broadly rounded; a conspicuous incision at the middle of the ventral border; several sensilla on and near the ventral border; a cluster of small sensilla near the center of the posterior surface; posterior surface spinulose, the spinules all minute but increasing in length toward the ventral border and arranged in definite rows which radiate from the dorsolateral angles, the rows continuous on the basal two thirds but broken into short arcuate components on the distal third. Mandibles large, elongate and rather narrow; moderately sclerotized; basal half moderately dilated; distal half with its lateral border thickened and its medial border thin and blade-like; apical tooth long, slender, round-pointed, curved medially and posteriorly; two small acute subapical teeth on the medial border; basal three fourths of anterior surface beset with numerous spinules arranged in longitudinal rows; spinules mostly minute but along and near the lateral border a few isolated spinules are exceedingly long. Maxillae spinulose; palp peg-like, with four or five sensilla; galea finger-like, with one or two apical sensilla. Labium with the anterior surface densely spinulose, the spinules long, coarse, sharp and isolated; palp a short peg with four or five sensilla; opening of sericteries conspicuous. Hypopharynx beset with slender delicate spinules arranged in short arcuate rows. (Material studied: four larvae from Panama.)

Subgenus PARECTATOMMA Emery

Plate V, figs. 13-16. Resembles Poneracantha except in the following characters:— Body hairs of two main types: (1) sinuate, with three to eight minute acuminate lateral branches, 0.18-0.21 mm long; (2) furcate, about 0.16 mm long, with two to four (mostly four) long branches; there are also

intergrades between these types. Antennae slender elongate cylinders, each bearing three short stout spines on the distal end. Labial spinules fine and grouped in short arcuate rows. (Material studied: eight larvae of *E.* (*P.*) sp. from Barro Colorado Island, Panama Canal Zone; collected by G. C. Wheeler, July 21, 1924, No. 254.)

Subgenus GNAMPTOGENYS Roger

Plate V, figs. 6-12. Resembles Poneracantha except in the following characters:—Neck short; swollen posterior part of abdomen subellipsoidal and straight (as in the subgenus Ectatomma). Body hairs of four types (with intergrades): (1) simple, nearly straight, about 0.16 mm long; (2) sinuate, about 0.18 mm long, with a few minute acuminate lateral branches; (3) straight or slightly curved, 0.14-0.17 mm long, with longer slender lateral branches; (4) bifurcate, 0.1-0.28 mm long, the most abundant type. Prothorax with numerous hairs. Head small. Labrum with the sides more nearly parallel; median incision in ventral border slightly deeper. Mandibles with the apical tooth slenderer and more curved; medial teeth slightly larger. (Material studied: numerous larvae of *E.* (*Gn.*) *tortuolosum* (F. Smith) and one of *E.* (*Gn.*) *mordax* (F. Smith) from British Guiana.)

The larvae of *tortuolosum* are labelled "Kartabo, B. G. VII-14-1920 No. 69" and were evidently collected by Dr. W. M. Wheeler. They are particularly interesting because eight out of fifteen larvae contain parasitoid maggots. Six contain one maggot each and two contain two maggots each (Text fig. 2). The spiracles of the maggots are applied to breathing holes made through the integument of the host. Apparently these holes may be located on any part of the ant larva except the head and first two thoracic somites. One of these holes (in a cleaned and stained integument) is elliptical and measures 0.035 x 0.070 mm; its rim is raised, rounded, heavily sclerotized and 0.026-0.053 mm wide. Four additional ant larvae have one or two such holes through the integument but contain no evident parasitoids. Five semipupae removed from cocoons show no evidence of infestation. Mr. Willis W. Wirth of the United States National Museum has kindly examined the maggots and written as follows: "These appear to me to belong to the family Phoridae, but possess several modifications for parasitic habit which makes this determination less sure. There are two small elevations at the posterior end which correspond well in shape and position to those on which the posterior spiracles are usually borne in Phoridae. But in these larvae the spiracles seem to have migrated along a very slender sclerite alongside the large ventral anal plate, to occupy a position about halfway up on the abdomen. In the un-dissected ant larva, these spiracles can plainly be seen to protrude outside the body of the ant."

Tribe PROCERATIINI Emery
Genus PROCERATIUM Roger

Short and stout; with a stout curved neck and a short round-pointed tail, which are both bent ventrally so that head and tail are pointed toward each

other; remainder of body stout and subcylindrical. Body surface thickly beset with large hemispheroidal bosses. Head and body practically naked; hairs very few, widely scattered and exceedingly minute. Head moderately large; its surface roughened with several low bosses which in turn have their surfaces tuberculate. Antennae large, not projecting. Mouth parts very large. Labrum considerably broader than long, narrowed at the base; lateral borders sinuate; ventral border slightly concave; not spinulose. Mandibles small and feebly sclerotized; acuminate; no medial teeth; no spinules. Maxillae very large; with only a few minute spinules; palp represented by a few scattered sensilla. Labium large; with only a few minute spinules; opening of sericteries consisting of a pair of truncate cones separated by an angular projection.

Proceratium croceum (Roger).—Plate V, figs. 20-27. Short and stout; thorax and first abdominal somite forming a very stout neck which is bent ventrally at right angles to the main axis and then posteriorly; terminal somite forming a small ellipsoidal tail which is pointed downward and forward at an angle of about 45° to the main axis; remainder of abdomen subcylindrical. Anus at base of tail on ventral side. Body surface thickly beset with large hemispheroidal bosses, which are arranged for the most part in longitudinal rows. Segmentation indistinct. Body practically naked; body hairs simple, very few, exceedingly minute (0.009 mm long); occurring only on bosses; not more than three to a boss. Dorsal and ventral bosses at anterior end have the integument roughened by coarse spinules which are not arranged in any distinct pattern; the three posterior dorsal bosses, however, have fine spinules arranged in short arcuate rows; intermediate bosses have intergrading spinules; lateral bosses and the integument between bosses lack spinules. Head moderately large; mouth parts very large; cranium subpentagonal in anterior view; middle of posterior border subangulate; surface roughened with several low bosses, each of which in turn has its surface roughened with several small tubercles. Head practically naked; a very few, simple, exceedingly minute (about 0.007 mm long), widely scattered hairs. Antennae a pair of large low rounded elevations, each with three sensilla. Labrum a thick flap; breadth 1½ times the length; narrowed at the base, widest near the ventral border, which is slightly concave; lateral borders sinuate; several sensilla on both surfaces near the ventral border; no spinules. Mandibles small and feebly sclerotized; subtriangular in anterior view; narrow, acuminate, sharp-pointed; no medial teeth; no spinulose surfaces. Maxillae very large and lobose; medial face with a small patch of minute spinules; palp represented by a few scattered sensilla; galea a finger-shaped projection with two apical sensilla. Labium large; a small patch of minute spinules near the center of the anterior surface; palp a low elevation bearing three sensilla; opening of sericteries wide and salient, consisting of two divergent truncate cones separated by a median angular projection. (Material studied: a single damaged specimen from Virginia.)

Young Larva.—Length 0.7 mm. Plump; strongly curved ventrally, so that the mouth and anus are closely approximated; dorsal profile very long

and C-shaped; ventral very short; ventral surface of abdomen broad, convex and protruding at the center; body very broad due to a distinct flange on either side extending from the first through the eighth abdominal somites; each flange is about one eighth of the total width. Terminal somite forming a broad rounded tail, which is pointed forward. Body naked. Integument thickly beset with minute spinules, except on the lateral flanges, which are smooth. Head naked and smooth; cranium subhexagonal in anterior view. (Material studied: several specimens from Mississippi.)

Half-grown Larva.—Length 1.25 mm. Plump; still curved ventrally but with the middle of the body somewhat straightened; ends farther apart but still pointed toward each other; lateral flanges deeper, narrower and broken into incipient bosses by intersomitic furrows; bosses have developed on the thorax and on the ventral surface of the abdomen. Body naked. Integument densely spinulose except on the sides. Head naked; rudiments of a few bosses have appeared. (Material studied: a single specimen from Virginia.)

The following notes are based upon observations made in an artificial formicary in this laboratory in July, 1931; the living larvae and workers of *P. croceum* were collected in Mississippi and sent to us through the courtesy of Dr. M. R. Smith: The larvae (all immature) were sluggish but moved actively upon tactile stimulation. When disturbed the head and tail were repeatedly approximated and separated. The broad and somewhat flattened ventral surface served as a table for food. The tail aided in holding the food. When a larva was offered the viscera of a mealworm, they were seized by approximation of head and tail. The mouth parts were applied to the food; bubbles passed into the body rhythmically at intervals as short as two seconds. The mandibles moved but served no apparent function. The larvae were translucent—almost transparent—and colorless except for many small white lumps beneath the integument; these might have been clumps of urate crystals.

Several of the living larvae referred to above were infested with tarsonemid mites, which were identified by Dr. H. E. Ewing of the United State National Museum as *Pigmephorus* sp.

Haskins, 1930, pp. 123-124: "The larvae, when hatched, are left on the egg packet for three or four days, and during this period are not differentiated by the nurses from unhatched ova. The larvae are short and thick set, with large heads, and are noticeably inactive. They show no tendency to devour unhatched eggs, and during the first week of life give no indication of hunger, nor are they, as far as could be observed, fed. When about a week old, the larvae are removed from the unhatched eggs, and are then placed on whatever food may chance to have been brought into the brood chamber. Even at this stage they show none of the activity usual to Ponerine larvae, but attach themselves to their victims and remain in this position for days, feeding extremely slowly. While feeding they are eagerly licked for exudates, and some indication has been seen of a tendency to pinch them to hasten the flow. When full-fed they drop from their victims, more after the fashion of the larvae of

solitary wasps than of ants, and are then allowed to lie singly on the chamber floor. Growth, under artificial conditions at least, is extremely slow. The larvae have never been seen to move, their complete immobility reminding one strongly of the behavior of many Myrmicine larvae, and contrasting strangely with their thoroughly entomophagous habits. No verifiable case has been seen by the writer in which any attempt was made by a nurse to feed the larvae by regurgitation, although the mouth and the first thoracic segments of the larvae were often assiduously licked, perhaps to obtain a minute quantity of saliva present with the exudates.

"When disturbed, the brood nurses eagerly seize both eggs and larvae and hurry away with them. When undisturbed, however, they showed an increasing tendency to neglect the larvae more and more as the latter grew older, and in every case the young when two or three months old were no longer placed on the insect material brought into the nest to be devoured by the adults. The young made no attempt to help themselves, but shriveled and soon perished, when they were either thrown away or devoured by the nurses."

Proceratium crassicorne Emery.—Plate V, figs. 17-19. The profile of this larva seems at first glance to be quite different from that of *croceum,* but we suspect that the difference is artificial, *i.e.*, the result of preservation, and that the profile of *croceum* is the more natural.

The larvae of the two species are essentially alike, but since the specimen of *crassicorne* is in better condition than that of *croceum,* we append a few details better shown in the former: The bosses range in diameter from 0.04 to 0.17 mm in diameter; those on the dorsal surface are transversely elongate (*i.e.*, subelliptical in dorsal outline); no bosses along the middorsal line. On the ventral side the prothorax forms one large boss; the midventral surface of abdominal somites II-VII is raised into rounded transverse ridges which are subelliptical in ventral outline. The bosses are distributed as follows: prothorax, 13; mesothorax, 12; metathorax, 12; abdomen I, 12; II, 14; III, 16; IV, 12; V, 12; VI, 12; VII, 8; VIII, 4; IX, 2; X, 2. Integument of dorsal and ventral bosses spinulose; dorsal bosses with coarse isolated scattered spinules about 0.007 mm long, which grade posteriorly into short arcuate rows (up to 0.0018 mm long) of finer and shorter (about 0.002 mm long) spinules on the last three somites; ventral bosses with coarse isolated scattered spinules; lateral bosses practically smooth; integument adjacent to bosses with short arcuate rows of spinules (except on abdominal somites IV, V and VI, where such spinules are lacking). (Material studied: a single specimen from Alabama.) (To be concluded)

EXPLANATION OF PLATES

PLATE I. *Myrmecia gulosa* Fabricius, Figs. 1-7.—1, larva in side view, x2.8; 2, two body hairs, ×115; 3, right mandible in anterior view, ×67; 4, head and thoracic segments showing leg and wing vestiges in ventral view (hairs omitted), ×7; 5, mesothoracic legs in ventral view, ×44; 6, head in anterior view, ×33; 7, labrum in posterior view, ×74.

Stigmatomma pallipes (Haldeman), Figs. 8-11.—8, head in anterior view, ×95; 9, two body hairs, ×185; 10, larva in side view, ×21; 11, left mandible in anterior view, ×185.

Amblyopone australis Erichson, Figs. 12-18.—12, right mandible in anterior view, ×93; 13, larva in side view, ×10; 14, head in anterior view, ×56; 15, body hair, ×113; 16-18, three structures found on the borders of the welt, ×90.

Mystrium camillae Emery, Figs. 19-20.—19, left mandible in anterior view, ×117; 20, left mandible in posterior view (shaded to show thickness), ×117.

PLATE II. *Paraponera clavata* Fabricius, Figs. 1-9.—1, head in anterior view, ×25; 2, labrum in posterior view, ×57; 3, larva in side view, ×3; 4, left maxilla in anterior view, ×57; 5, palp of left maxilla in anterior view, ×185; 6, right mandible in anterior view, ×57; 7, right mandible in posterior view (shaded to show thickness), ×57; 8, spinules on ventral surfaces of prothorax, ×235; 9, body hair, ×45.

Plat'ythyrea inermis Forel, Figs. 10-18.—10, larva in side view, ×17; 11, body hair, ×133; 12, midventral surface of abdomen, ×17; 13, right antenna in anterior view, ×117; 14, papillae on prothorax in profile, ×433; 15, spinules on abdominal integument in profile, ×433; 16, head in anterior view, ×95; 17, spinules on hypopharynx in anterior view, ×433; 18, right mandible in anterior view, ×148.

Prionopelta punctulata Mayr, Figs. 19-24.—19, head in anterior view, ×111; 20, right mandible in anterior view, ×191; 21, left maxillary palp in anterior view, ×470; 22, left antenna in side view, ×236; 23, larva in side view, ×25; 24, two body hairs, ×236.

PLATE III. *Typhlomyrmex robustus* Emery, Figs. 9-12.—9. head in anterior view, ×95; 10, right mandible in anterior view, ×235; 11, head in side view, ×95; 12, body hair, ×185.

Stictoponera sp. [from Kalabit], Figs. 1-8.—1, head in anterior view, ×95; 2, antenna and base in anterior view, ×593; 3, 4, 6, 8, four body hairs, ×212; 5, larva in side view, ×12; 7, left mandible in anterior view, ×185.

Holcoponera striatula Mayr, Figs. 13-17.—13, head in anterior view, ×97; 14, left mandible in anterior view, ×167; 15, left antenna in anterior view, ×697; 16, two body hairs, ×167; 17, outline of body in side view (hairs omitted), ×12.

Rhyidoponera froggatti Forel, Fig. 18.—Outline of body in side view (hairs omitted), ×6.

Rhytidoponera cristata Mayr, Figs. 19-22.—19, three body hairs, ×44; 20, left antenna in anterior view, ×340; 21, right mandible in anterior view, ×95; 22, head in anterior view, ×39.

PLATE IV *Chalcoponera impressa* (Mayr), Figs. 1-8.—1, left antenna and base in anterior view, ×185; 2, right mandible in anterior view, ×100; 3, head in anterior view, ×57; 4-8, five body hairs, ×57.

Emeryella schmitti Forel, Figs. 9-14.—9, head in anterior view, ×57; 10, 11, 13, 14, four body hairs, ×72; 12, left mandible in anterior view, ×72.

Ectatomma (*E.*) *tuberculatum* (Olivier), Figs. 15-26.—15, right antenna and base in anterior view, ×210; 16, head in anterior view, ×55; 17, body hair, ×107; 18, larva in side view, ×8; 19, head in posterior view showing attached planidium, ×55; 20, labrum in posterior view (right half only), ×95; 21, spinules of integument arranged in irregular pattern, ×185; 22, spinules of integument arranged in short rows, ×185; 23, labrum and hypopharynx in anterior view (left half only), ×95; 24, left mandible in anterior view, ×82; 25, left maxilla in anterior view, ×95; 26, midventral surface of meso- and metathorax showing leg vestiges and alveoli of hairs, ×44.

PLATE V. *Ectatomma* (*Poneracantha*) *bispinosum* Emery, Figs. 1-5.—1, head in anterior view, ×55; 2, right antenna in anterior view, ×235; 3, right mandible in anterior view, ×95; 4-5, two body hairs, ×95.

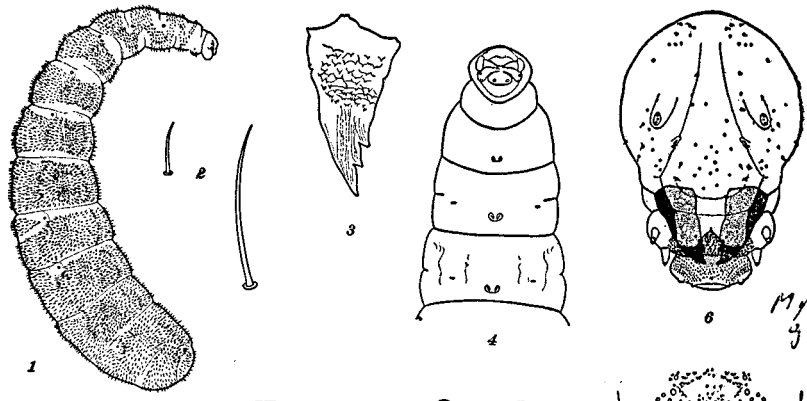
Ectatomma (*Parectatomma*) sp., Figs. 13-16.—13, right antenna in anterior view, ×235; 14, profile of larva, ×6; 15-16, two body hairs, ×95.

Ectatomma (*Gnamptogenys*) *tortuolosum* (F. Smith), Figs. 6-12.—6-7 and 9-12, six body hairs, ×95; 8, profile of larva, ×6.

Proceratium crassicorne Emery, Figs. 17-19.—17, abdominal segment II in dorsal view, ×23; 18, abdominal segment IV to end of body in ventral view, ×23; 19, larva in side view, ×23.

Proceratium croceum (Roger), Figs. 20-27.—20, head in anterior view, ×59; 21, a dorsal boss in side view, ×167; 22, right mandible in anterior view, ×89; 3, body hair, ×370; 24, very young larva in ventral view, ×23; 25, very young larva in side view, ×23; 26, half grown larva in side view, ×23; 27, mature larva in side view, ×23.

PLATE I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Myrmecia gulosa


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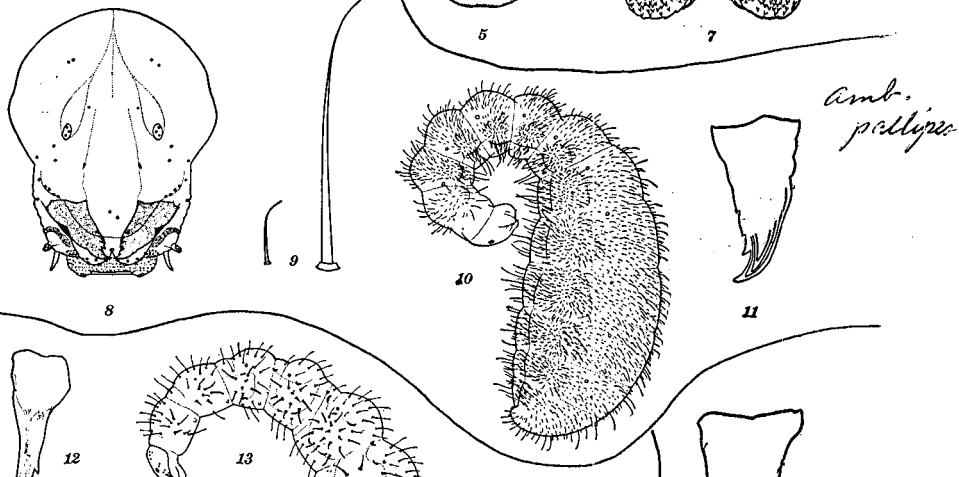
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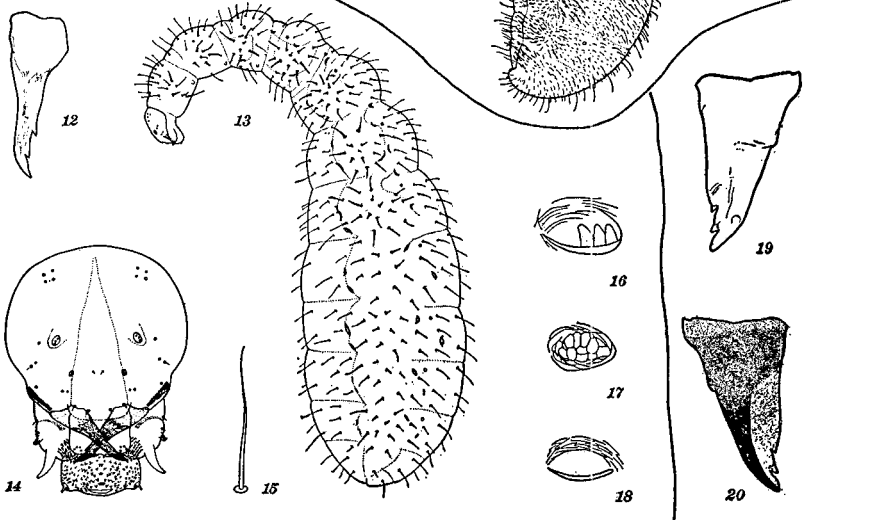
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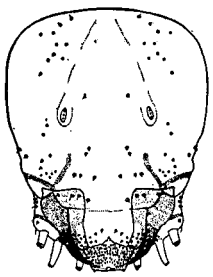
Amblyopone australis
Myrmecia camillae

Paraponera clavata

PLATE II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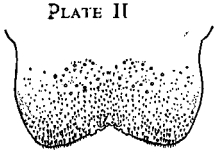
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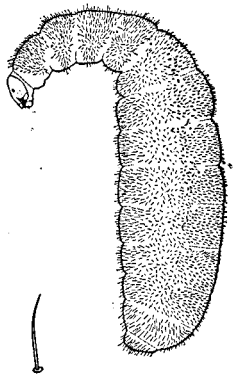
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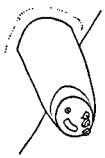
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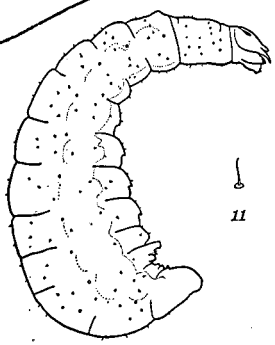
Platythyrea inermis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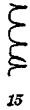
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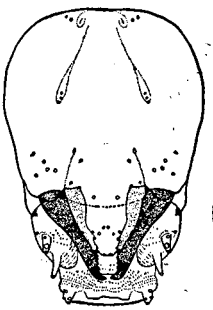
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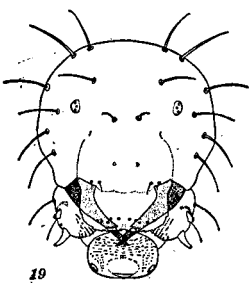
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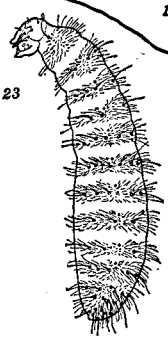
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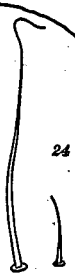
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Prionopelta punctulata [?]

Stictoponera.
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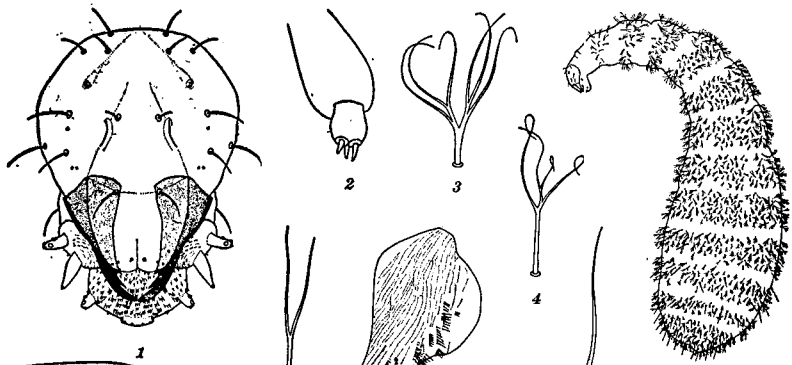
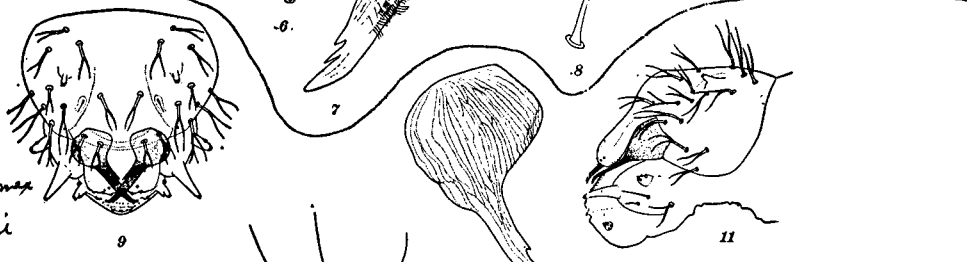
Kalabit Country,
N. Borneo

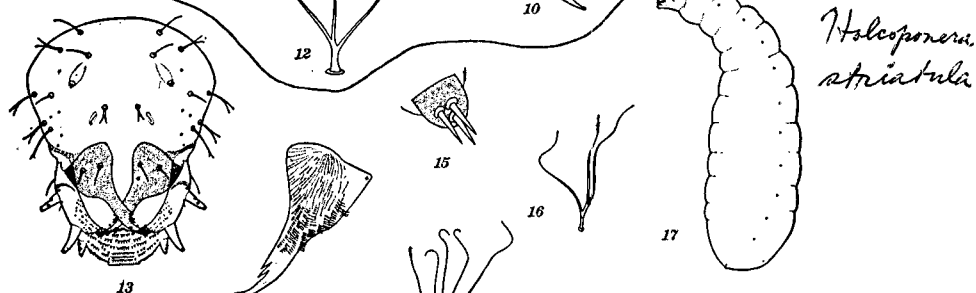
PLATE III

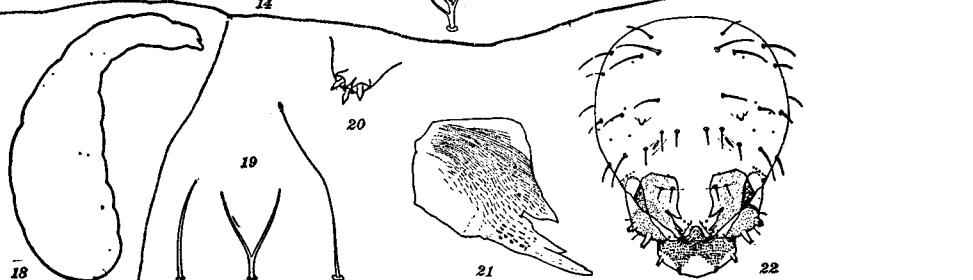


Typhlomyrmex rogenhoferi



Holcoponera striatula

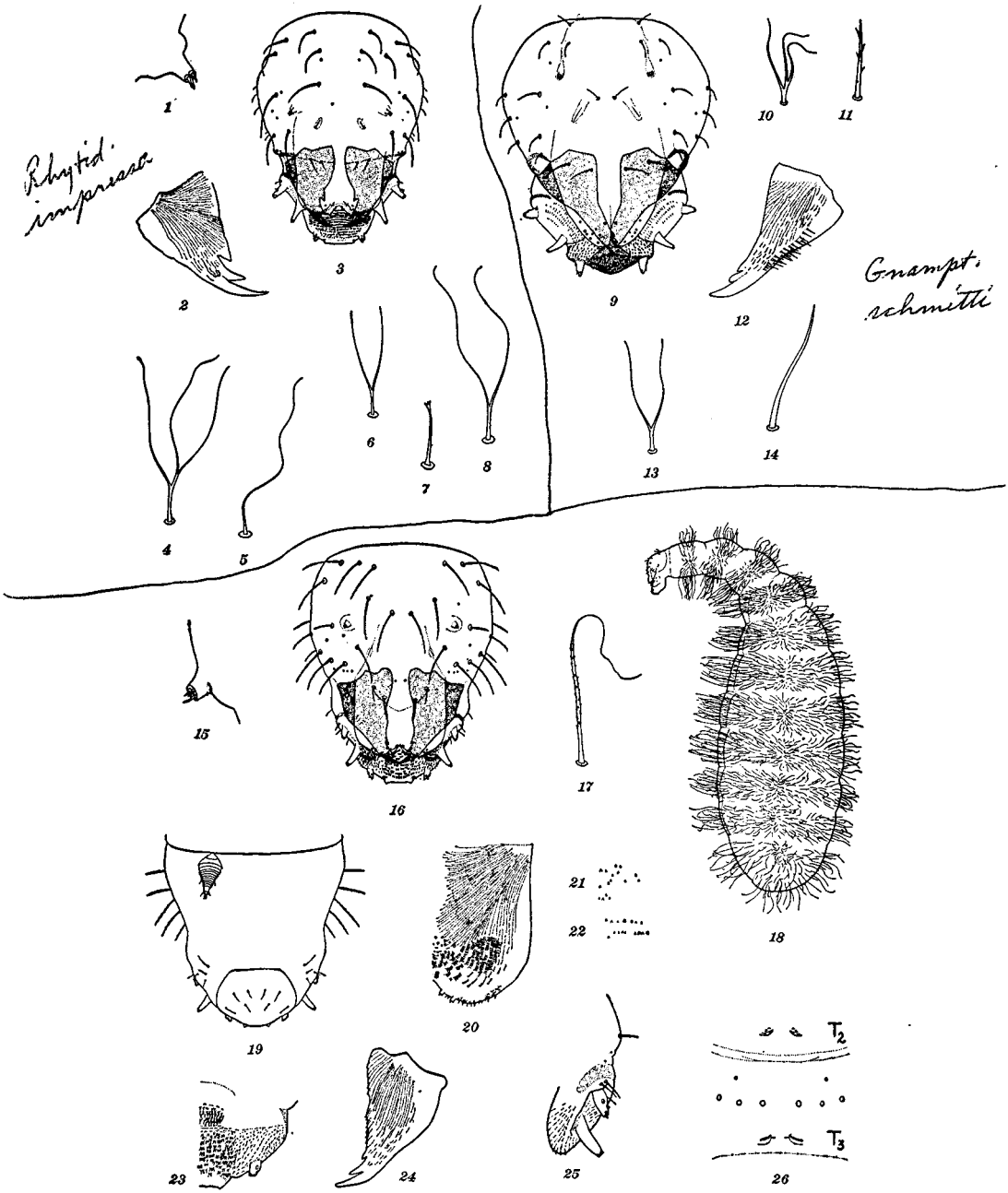




Rhytidoponera araneoides

Rhytidoponera cristata Mayr

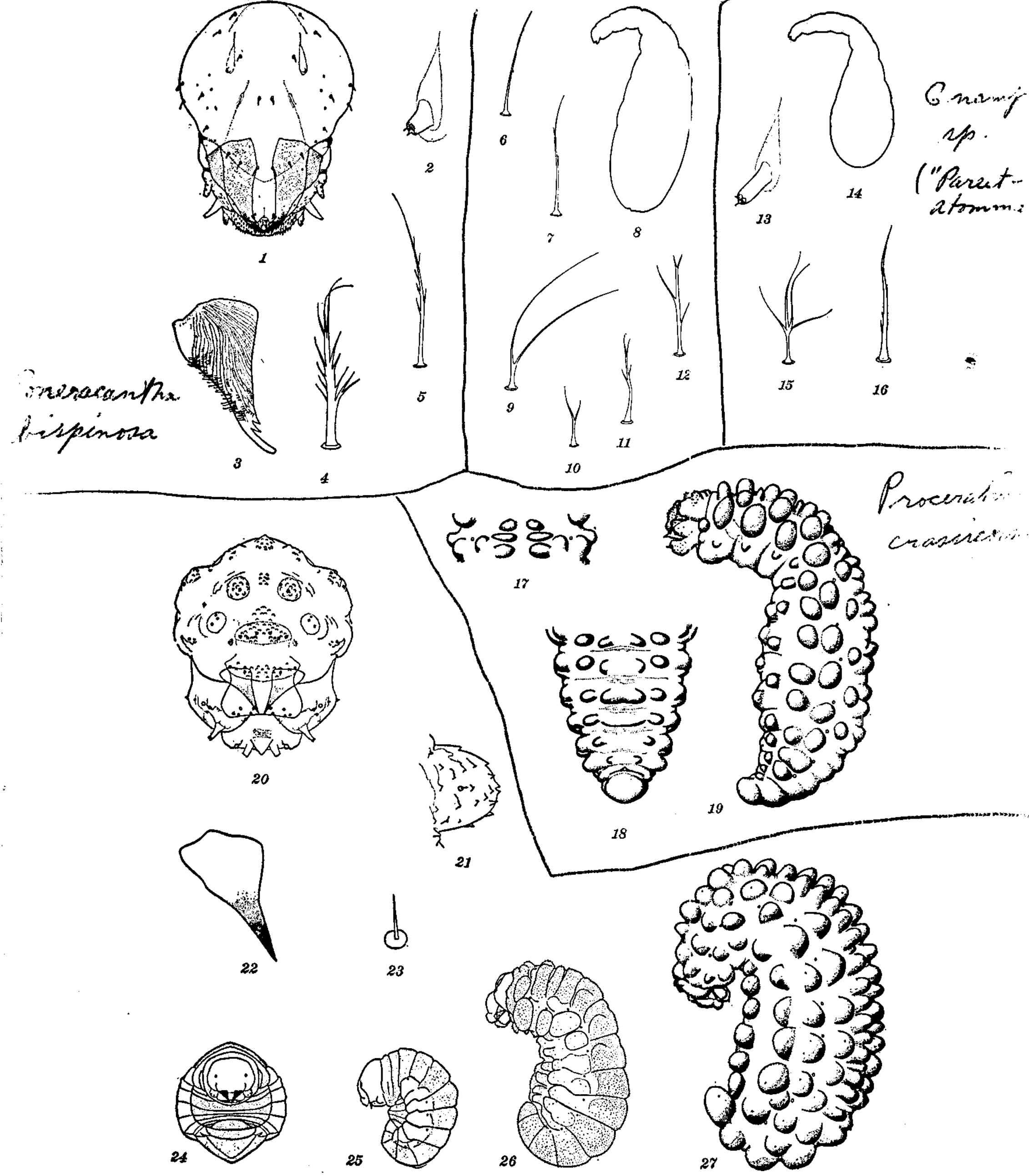
PLATE IV



Ectatomma tuberculatum

Gnamptogenys tortuolosum 144

PLATE V



Proceratium croceum