tropics, however, soil moisture may be so high that optimal conditions cannot be found; hence an airspace between body and substrate might be beneficial. At any rate, the Ponerinae are largely tropical.

2. Defense. Probably the greatest menace to a ponerine larva is her sister larvae. It is easy to believe that some of the hairy tubercles afford protection against cannibalism.

3. Attachment to ceilings. This is certainly probable in the case of the glutinous dorsal doorknobs; at least attachment can be readily observed in artificial formicaries. It would keep the larvae off the damp floors. (See 1 above.)

4. Trophallaxis. It has been suggested by W. M. Wheeler and others that tubercles may be exudate organs, which secrete onto their surfaces substances of which the workers are so fond that they tend the larvae for the "selfish" purpose of getting these exudates.

Tubercles such as we have been considering have been found among ant larvae in only 20 genera, all of which are in the higher Ponerinae. It is true that protuberances do occur elsewhere. A single caudal knob is found in *Platythyrea* (Ponerinae), in *Rhopalomastix* and *Acromyrmex* among the Myrmicinae, and in 4 dolichoderine genera (*Dorymyrmex, Engramma, Tapinoma, Technomyrmex*); there is a single middorsal row of tubercles in *Iridomyrmex itoi* (Dolichoderinae); lateral projections have been reported in *Crematogaster* (Myrmicinae). But none of these protuberances bears any resemblance to the ponerine tubercles.

In general a larva bears tubercles of only 1 kind, but 2 distinct kinds are found in 6 genera (*Anochetus, Belonopelta, Cryptopone, Euponera, Odontomachus* and *Ponera*). The number of tubercles per larva seems to be a generic characteristic, although it does vary within narrow limits among the species of a genus and even among individuals of the same species. The minimum number is 10 (*Bothroponera sublaevis*) and the maximum about 400 (*Centromyrmex*). The arrangement of tubercles usually follows a simple but definite pattern of longitudinal and transverse rows. No tubercles have been found on the midventral surface.

We have endeavored to classify and name the various shapes of ponerine tubercles and to illustrate each shape with a synthetic drawing; see Appendix C and Fig. 19. Only fully developed tubercles have been considered. One finds atypical tubercles on every larva, but they are obviously underdeveloped representatives of the typical form.

HETEROGENEITY

We have discussed at length (1960) the heterogeneity of the Myrmicinae—both adults and larvae. The adults of the Ponerinae are less heterogeneous than those of the Myrmicinae. Can the same be said of their larvae? To attempt an answer we have devised a simple index of heterogeneity: the ratio of the number of genera studied to the number of types of body profile (or mandible shape); this gives the average number of genera per type; the lower the index number, the greater the heterogeneity. (See appendices.)

Our computations follow:

Myrmicinae: 57 genera/22 profile types = 2.6 genera per type

Myrmicinae: 68 genera/30 mandible shapes = 2.3 genera per type

Ponerinae: 26 genera/8 profile types = 3.3 genera per type

Ponerinae: 33 genera/20 mandible shapes = 1.7 genera per type

We conclude therefore that both subfamilies are more heterogeneous in mandible shape than in body profile, the Ponerinae being more so by far. The Myrmicinae are more heterogeneous than the Ponerinae in profile, while the Ponerinae are the more heterogeneous in mandible shape.

APPENDIX A. GENERALIZED BODY PROFILES[5]

(Fig. 17)

GROUP A

1. Myrmeciiform. Not differentiated into neck and body; elongate and rather slender; diameter diminishing gradually from the fifth abdominal somite to the anterior end; anterior half strongly curved. Genus: *Myrmecia.* (*Myopopone* may belong here, but we cannot be sure because our material is damaged.)

GROUP B

Shaped somewhat like a crookneck squash; thorax forming a distinct neck, whose diameter is notably less than that of the abdomen and which is strongly bent or curved ventrally; first abdominal somite transitional to the remainder of the abdomen, which is stout or swollen.

1. **Paraponeriform.** Neck short and stout; body elongate, stouter, straight and subcylindrical. Genera: *Paranomopone, Paraponera.*

2. **Ectatommiform.** Neck long and slender; head small; abdomen ovoidal; anus subterminal. Genera: *Amblyopone, Ectatomma, Gnamptogenys, Rhytidoponera.*

3. **Pachycondyliform.** Neck long and slender; head large; abdomen subovoidal, but with the ventral profile nearly straight; anus ventral. [Except for *Stigmatomma,* all larvae of this type have tubercles (not shown on the profile).] Genera: *Anochetus, Centromyrmex, Diacamma, Dinoponera, Euponera* Type I, *Leptogenys, Neoponera, Odontomachus, Odontoponera, Pachycondyla, Psalidomyrmex, Stigmatomma, Trapeziopelta.*

GROUP C

Thorax curved or bent ventrally but not forming a distinct neck; abdomen only moderately swollen.

1. **Poneriform.** Not constricted at the first abdominal somite; ventral profile of abdomen nearly straight; anus ventral. [Tubercles present but not shown on the profile.] Genera: *Belonopelta, Euponera* Type II, *Ponera.*

2. **Onychomyrmeciform.** Constricted at the first abdominal somite; ventral profile of abdomen convex; anus subterminal. Genera: *Onychomyrmex, Typhlomyrmex.*

[5] The following genera which we have studied are not included here or in the key, because the material we have does not show adequate body profiles (the larvae are immature, the integuments are damaged, or the specimens are semipupae): *Acanthoponera, Bothroponera, Cryptopone, Megaponera, Mystrium, Prionopelta, Simopelta, Thaumatomyrmex.*