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OVOVIVIPARITY IN THE BLATTELLID COCKROACH, *SYMPLOCE BIMACULATA* (GERSTAECKER) (DICTYOPTERA: BLATTARIA: BLATTELLIDAE)

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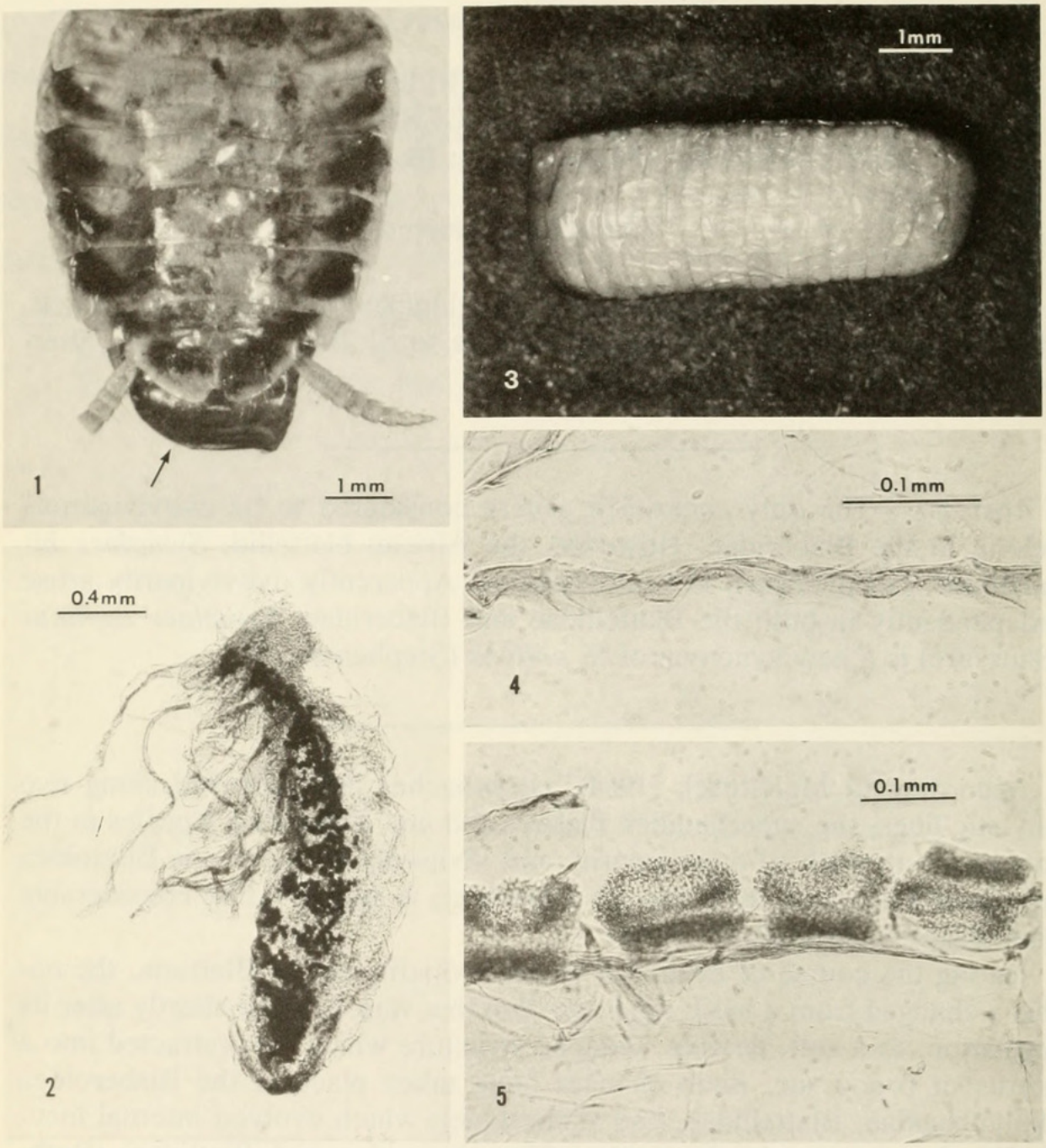
Abstract.—The only cockroach genera considered to be ovoviviparous belong to the Blaberidae. However, the African blattellid, *Symploce bimaculata* (Gerstaecker), is ovoviviparous. Apparently ovoviviparity arose independently in both the Blattellidae and Blaberidae. *Symploce capitata* (Saussure) is a new synonym of *S. pallens* (Stephens).

According to McKittrick (1964), cockroaches have evolved along two phyletic lines, the superfamilies Blaberoidea and Blattoidea. Species in the former group evolved ovoviviparity and viviparity, whereas the Blattoidea remained oviparous. McKittrick's hypothesis is supported by considerable biological evidence (Roth, 1970).

During the course of evolution of ovoviviparity in the Blattaria, the oötheca changed from a hard, rigid egg case that was dropped shortly after its formation, to a soft, flexible, reduced structure which was retracted into a uterus or brood sac. Such changes have taken place in the Blaberoidea (Polyphagidae, Blattellidae, and Blaberidae), which evolved internal incubation, but not in the Blattoidea (Cryptocercidae and Blattidae) (Roth, 1968a, 1971).

Because species of *Blattella* carry their oöthecae externally for about the entire embryogenetic period, Roth and Willis (1958) suggested that the *Blattella* type of oviposition behavior is an intermediate stage between oviparous and ovoviviparous forms. Two other blattellid genera, *Chorisia* and *Onycholobus* have similar oöthecae and oviposition behavior (Roth, 1968a, 1971). After studying the ovarioles of various species of Blattaria, I (Roth, 1968b, 1970) suggested two possible pathways within the Blattellidae that led to ovoviviparity in the Blaberidae. At that time, the available evidence indicated that only the Blaberidae are ovoviviparous or viviparous [only *Diploptera punctata* (Eschscholtz) is known to be viviparous, but presumably the other species of *Diploptera* are also].



Figs. 1–5. *Symploce bimaculata*. 1, Abdomen (dorsal) of a pregnant female showing the end of the öotheca (arrow) protruding slightly beyond the supraanal plate. 2, Embryo removed from an oötheca that was carried internally in the brood sac. 3, Oötheca removed from the uterus. 4, Part of the keel region of an oötheca showing the absence of respiratory tubules and calcium oxalate crystals. 5, Spongy bodies in the keel region of the oötheca. Figures 2, 4, and 5 are chitin preparations.

Recently while working on a taxonomic revision of the blattellid genera *Blattella* and *Symploce*, I found several female specimens of the African *Symploce bimaculata* (Gerstaecker) that had oöthecae internally in a uterus (Fig. 1). The egg cases occupy practically the entire abdominal cavity, as they do in pregnant blaberids. Shelford (1910) stated that the oötheca of *S.*

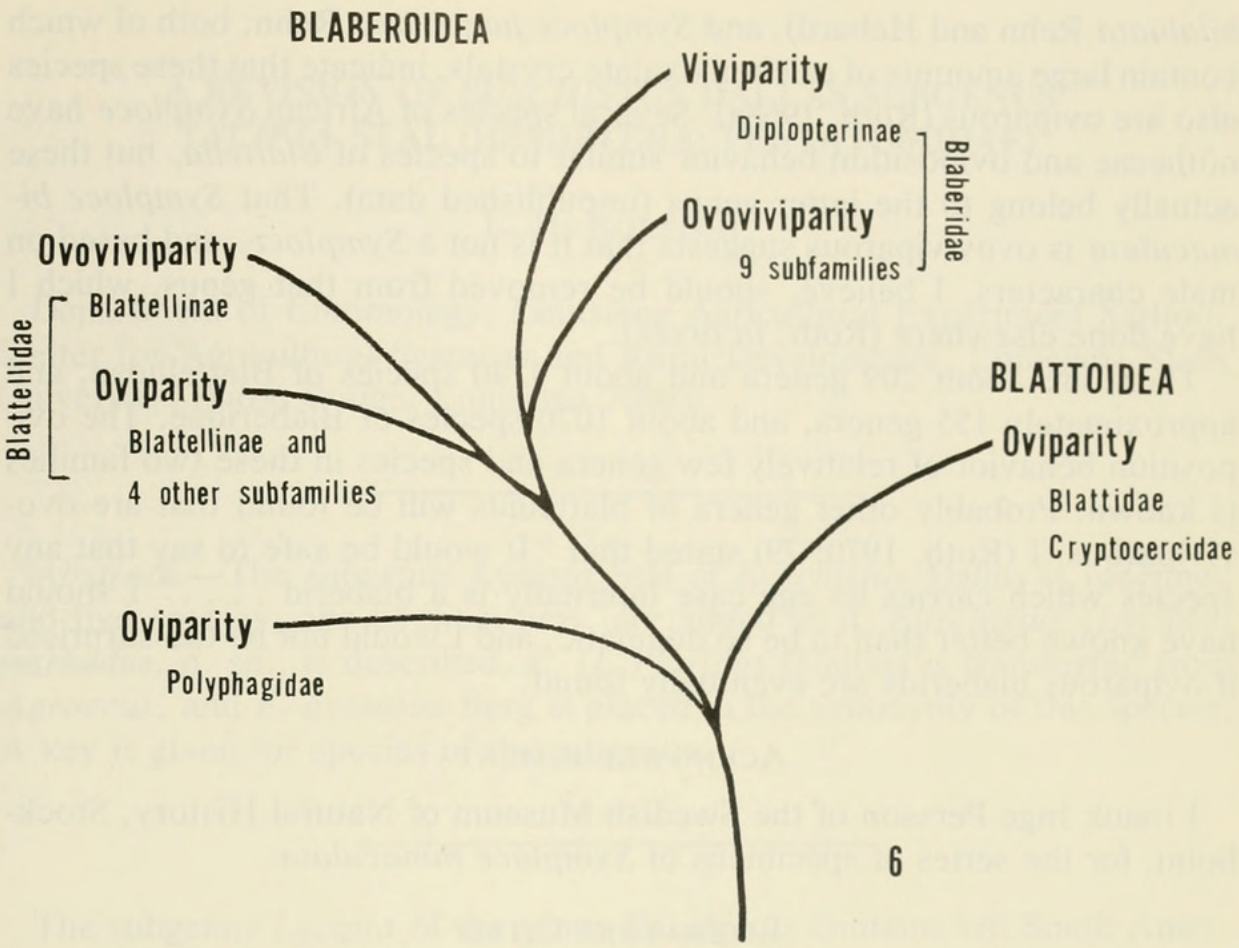


Fig. 6. Phylogenetic tree of the Blattaria (abbreviated and modified from McKittrick, 1964), showing the evolution of ovoviviparity and viviparity.

bimaculata is similar to that of *Blattella germanica* (L.), but he did not indicate that it is carried internally.

Two of the oöthecae of *bimaculata* contained 38 and 40 eggs, which, in the latter, contained developing embryos (Fig. 2). Superficially the oötheca resembles that of species of *Blattella* but is more transparent throughout (Fig. 3; however, the portion near the end of the female's body is slightly darker than the remainder of the egg case), and its keel is further reduced and lacks respiratory tubules (Fig. 4). The spongy bodies in the interior of the seam (Fig. 5) are still present and are similar to those of *Blattella germanica* (Lawson, 1951). Calcium oxalate crystals are completely absent from the walls of the egg case. The oöthecae of various species of *Blattella* may have a few calcium oxalate crystals, or none at all (Roth, 1968a). That *Symploce bimaculata* incubates its eggs internally shows that ovoviviparity actually has evolved independently in at least two families of the Blaberoidea, the Blattellidae and Blaberidae (Fig. 6).

Symploce pallens (Stephens) [=*Symploce capitata* (Saussure), **new synonymy**] is oviparous and deposits its oötheca shortly after its formation. The hard, rigid oöthecae of *Symploce ruficollis* (F.) (reported as *Symploce*

bilabiata Rehn and Hebard), and *Symploce jamaicana* Rehn, both of which contain large amounts of calcium oxalate crystals, indicate that these species also are oviparous (Roth, 1968a). Several species of African *Symploce* have oöthecae and oviposition behavior similar to species of *Blattella,* but these actually belong to the latter genus (unpublished data). That *Symploce bimaculata* is ovoviviparous suggests that it is not a *Symploce,* and based on male characters, I believe, should be removed from that genus, which I have done elsewhere (Roth, *in press*).

There are about 209 genera and about 1740 species of Blattellidae, and approximately 155 genera, and about 1020 species of Blaberidae, The oviposition behavior of relatively few genera and species in these two families is known. Probably other genera of blattellids will be found that are ovoviviparous. I (Roth, 1970: 79) stated that "It would be safe to say that any species which carries its egg case internally is a blaberid . . . ." I should have known better than to be so dogmatic, and I would not be too surprised if oviparous blaberids are eventually found.

Acknowledgment

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