

ENTOMOPHAGOUS PARASITISM AMONG THE BEETLES

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A small number of beetles may be properly described as entomophagous parasites. Regardless of the fact that they belong to widely diverse taxonomic groups, all, so far as known, have assumed the same type of relation to their hosts. They do not deposit their eggs directly upon the future host, as is done by the parasitic true flies and the ichneumon wasps. The first or primary larval instar resembles a silverfish. It retains its facilities for running about rapidly, and has the responsibility of finding its host or food supply. If successful, the larva begins feeding on the host and subsequently has two or more instars, in each of which its body becomes increasingly bulky and the legs grow correspondingly smaller and weaker. Both these changes obviously result from the availability of an ample supply of food. The fullgrown larva then transforms to an adult in or near the habitat of the host. A few examples of this relationship are given herewith, the development of all, so far as known, possessing the features just described.

1. *Carabidae*. The larva of the bombardier beetle, *Brachinus janthinipennis* has been reared from the pupae of *Dineutes assimilis*, a whirligig beetle, and at least two species of *Lebia* are known to parasitize the larvae or pupae of certain leaf beetles. *Pelecium sulcatum*, related to the Carabidae, is reported from South America as attacking parasitically, soft millipedes, a beetle pupa, and a leaf beetle larva.

2. *Cucujidae*. *Catogenus rufus* lives upon the pupae of long-horned beetles or the pupae of their braconid parasite, *Bracon dorsatus*. *Scalidia* spp. are said to be parasitic upon bark-boring beetles.

3. *Bothrideridae*. It is believed that *Bothrideres geminatus* passes its larval stage as an internal parasite of various long-horned beetles, including *Saperda candida*.

4. *Staphylinidae*. The species of the Aleocharinae, as far as known, enter the puparia of the muscoid flies and devour the pupae.

5. *Rhipiphoridae*. The larvae of wasps and bees are the hosts of these beetles in all known cases.

6. *Meloidae*. The adult blister beetles eat the foliage of plants and lay their eggs on or in the soil. The hosts of their larvae are either the egg masses of the common grasshoppers or the eggs and the food stored by parent bees for their young. The primary larva of the first type runs over the ground to find the eggs of the locusts, whereas the second kind climb upon a bee and are thus transported to the bee's cell. No less than 45 species of this family have been recorded as living at the expense of locust egg masses, and at least 21 first eat the bee's egg, then consume the store of nectar and pollen intended for the larvae of the bee.