

A MORPHOLOGICAL BASIS OF PARASITIZATION STRATEGIES OF CHALCID  
WASPS (HYMENOPTERA: CHALCIDOIDEA) INFESTING SOFT SCALE INSECTS  
(HEMIPTERA: COCCOIDEA: COCCIDAE).

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A study was undertaken of the morphological and biological adaptations of chalcid wasps for the synchronisation of their life-cycles with that of the host, so as to provide optimal conditions for parasitization under temperate conditions. This revealed two strategies by the adult wasp for overcoming the period when a suitable host stage is absent. These are referred to here as the “surviving” strategy and the “evasion” strategy. These two strategies are shown by two structural features of the adult wasp:

I. *Body size*. Adult wasps with a “surviving” strategy are robust, with a long adult life, thus reflecting a trend towards body enlargement and increased longevity (e.g., *Microterys* spp). The alternative “evasion” strategy is to be very small; here, the adult life cycle is very short and the wasp survives in the pre-imaginal stages of its host (e.g., *Pseudorhopus testaceus* (Ratzeburg)).

II. *Structure of ovipositor and abdomen*. For the group with the “surviving” strategy and a large body size, there are three types of ovipositor associated with particular abdominal structures:

A. An unexerted ovipositor of moderate length, with an oval abdomen, rounded at the apex. The ovipositor of these parasitoids is only used to pierce the thin integument of their hosts (e.g., *Microterys hortulanus* Erdös and *Coccophagus lycimnia* (Walker)).

B. A long ovipositor, with long basal parts (i.e. gonopophysis and gonocoxites) but with short exerted parts (gonostyles) associated with a long abdomen, conical at apex. This is common in species with ectoparasitic predatory larvae, where the female parasitoid pierces the host body causing paralysis and then lays its egg on the ventral surface of the host (e.g., *Microterys sylvius* (Dalman) and *M. lunatus* (Dalman)).

C. The ovipositor is long due to the presence of long external parts, i.e. long gonopophysis and gonostyles. The parasites attack hosts defended by thick layers of wax or a layer of fine wax threads (e.g., *Microterys indicus* Subba Rao, *Sauleria dlabolai* Hoffer and *Mesaphycus taigae* Sugonjaev).

In the group with the “evasion” strategy and small body size, the ovipositor is very small and short, situated at the apex of the abdomen. Here, the females lay their eggs into 1<sup>st</sup>-instar nymphs of their hosts and the resulting larvae do not disturb the growth and metamorphosis of the host, the adult wasps emerging from the adult scale (e.g., *Pseudorhopus testaceus* and *Encyrtus infidus* (Rossi)).