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## A discussion on the location of the anterior and posterior thoracic spiracles on Coccinea

**Abstract** - In the superfamily Coccoidea, the number of thoracic spiracles is reduced to two pairs. On members of most scale insect families, these pairs of spiracles are generally considered to be located either near the anterior margins of the meso- and metathorax or in the intersegmental furrows between the pro- and mesothorax and between the meso- and metathorax. However, on Diaspididae, the anterior pair of spiracles is here considered to have migrated onto the prothorax.

**Key words:** Coccoidea, mesothoracic spiracles, metathoracic spiracles, location.

### INTRODUCTION

Imms (1960) stated that the spiracles on many insects are located in an intersegmental position, particularly on the thorax, on the anterior margin of the segments to which their name generally refers. Deviations from this arrangement have evolved through the migration of the spiracle onto an adjacent segment.

Members of the superfamily Coccoidea have two pairs of thoracic spiracles, which are generally considered to represent those of the meso- and metathorax. Their position on the cephalothorax is the subject of the present discussion.

### DISCUSSION

According to Savage (1914), the mesothoracic and metathoracic spiracles of some scale insects lie just posterior to the ventral intersegmental membranes at the junction of the pro- and mesosternum and of the meso- and metasternum, whilst Ezzat & McConnell (1956), working on the Planococcini, considered that or as located ventrally actually within the intersegmental membranes between these segments. This view was extended to all Pseudococcidae by McKenzie (1967), to the Coccidae by Hammon & Williams (1984) and to the genus *Apiomorpha* (placed in Eriococcidae by Ferris (1957) and Hoy (1963)) by Gullan (1983).

In contrast, the position of thoracic spiracles on Diaspididae is controversial. Zahradnik (1951) considered that the anterior spiracles of adult females were located on the prothorax, while the posterior ones were on the meso- or metathorax; Schmutterer (1959) gave the location of spiracles as on the prothorax and metathorax of adult females; Stoetzel & Davidson (1974) believe that the spiracles of all stages of the Aspidiotini were located on the meso- and metathorax; Howell, Liu and co-workers described the spiracles on first- and second-instar nymphs as apparently being situated on the pro- and metathorax (Howell 1975, 1977, 1981; Howell & Tippins 1977; Liu *et al.*, 1989a, 1989b). Liu *et al.*, (1989b) described the anterior spiracles as on the prothorax and the posterior pair as between the meso- and metathorax on adult females of the genus *Chionaspis*; Foldi (1990) considered on adult female Diaspididae that the anterior spiracles were on the mesothorax and the posterior spiracles on the metathorax, while Podsiadlo (1977, 2000) believed that the anterior spiracles were on the prothorax in the first- and second-instar nymphs of *Quadraspidotus zonatus* (Frauenfeld).

Podsiadlo (2001) considered that all the parasitic stages of diaspidids have the mesothoracic spiracles located on the prothorax, and suggested that the migration of the anterior spiracles onto the prothorax was the result of degeneration of the thoracic muscles in diaspidids following the loss of legs. The migration of the anterior spiracles towards the mouthparts would help to supply the highly active mandibulo-maxillary muscles with oxygen, thus increasing their gaseous exchange.

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