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The Myzolecaniinae (Hemiptera: Coccidae): Old World vs. New World

Abstract - Scale insects of the subfamily Myzolecaniinae (Hemiptera: Coccidae) are of particular interest because of their biology, wide distribution and morphology. Many are agricultural pests, and are known for their symbiotic relations with ants that constantly tend, clean, protect and even transport them in exchange for nutritious honeydew. Many morphological features found in these scale insects are reduced or lost entirely, presumably as a result of this symbiotic relationship. Although members of the Myzolecaniinae share many similarities, those of the New World show unique characteristics not found in the Old World coccids.

Key words: Scale Insects, Myzolecaniinae, Coccidae.

INTRODUCTION

The subfamily Myzolecaniinae was erected by Hodgson (1994) and is composed of 82 species in 17 genera. The included genera are: *Akermes*, *Alecanium*, *Alecanopsis*, *Cribrolecanium*, *Cryptostigma*, *Cyclolecanium*, *Halococcus*, *Houardia*, *Megasaissetia*, *Myzolecanium*, *Neolecanium*, *Paractenochiton*, *Pseudophilippia*, *Richardiella*, *Torarchus*, *Toumeyella* and *Xenolecanium*. The group is currently represented in the New World with 50 species in 7 genera, and in the Old World, including Australia, with 32 species in 10 genera.

The subfamily Myzolecaniinae is considered one of the most derived in the Coccidae, and is characterized by the lack and/or reduction of important diagnostic characters. The Myzolecaniinae are closely associated with ants, particularly those of the genus *Crematogaster*, often inhabiting their domatia and possibly being dispersed by them (Hodgson, 1994). In the New World, ants of the genera *Azteca* and *Myrmelachista* are also found closely associated with these scale insects.

We compared specimens from New and Old World Myzolecaniinae and found morphological differences between the two groups in the adult female and first instar nymphs (crawlers).

MATERIALS AND METHODS

Dry material and slide mounted specimens were borrowed from various institutions (see acknowledgments). Dry specimens were slide mounted and examined using a Zeiss RA phase contrast microscope. Adult females and crawlers of 33 species in 17 genera of Myzolecaniinae were studied. Crawlers were not available for species in the genera *Parachtenochiton* and *Halococcus*.

RESULTS

Morphological differences between adult females and crawlers of New and Old World Myzolecaniinae are listed in Table 1. Differences in the crawler stage of the two geographical groups are most conspicuous. Crawlers of the New World Myzolecaniinae have characteristic 5-segmented antennae, while crawlers of Old World Myzolecaniinae have 6-segmented antennae; the most common number of antennal segments seen in the crawler stage of the Coccoidea. According to Williams and Hodges (1997), the Myzolecaniinae is the only subfamily in the Coccidae known to include crawlers with 5-segmented antennae. Crawlers with 5, or in some cases 7 antennal segments, are also observed in some members of the Asterolecaniidae (5-6),

Table 1 - Differences between New and Old World Myzolecaniinae.

New World Myzolecaniinae	**Old World Myzolecaniinae**
Adult female	**Adult female**
- Presence of large/thick preopercular pores extending anteriorly to anal plates (absent in *Pseudophilippia*)	- Preopercular pores usually absent, small/thin and extending laterad to anal plates when present
- Ventral tubular ducts restricted to vulvar area when present	- Ventral tubular ducts found around submarginal areas and mid-venter (i.e. *Alecanium*, *Alecanopsis, Houardia*)
- Anal plates usually with less than 10 setae	- Anal plates usually with more than 10 setae
- Stigmatic setae usually 3, with median stigmatic setae longest	- Stigmatic setae varying in size and numbers, numerous in some species of *Myzolecanium*
- Absence of clusters of dorsal setae	- Clusters of dorsal body setae common (i.e. *Houardia*, *Richardiella* and *Torarchus*)
Crawler	**Crawler**
- Antennae 5 segmented	- Antennae 6 segmented
- Stigmatic setae usually 3, with median stigmatic setae longest	- Stigmatic setae numbering 1-3, usually subequal in length
- Ventral median setae usually 3 pairs	- Ventral median setae 4-6 pairs

Diaspididae (5-6), Margarodidae (5-7) and Putoidea (7) (Miller 1991). However, these families are not closely related and therefore it is likely that the reduction of antennal segments has evolved independently.

In the New World Myzolecaniinae, only crawlers of *Toumeyella sonorensis* (Cockerell & Parrott) retain 6 antennal segments. Crawlers of *Toumeyella lomagundiae* Hall and *T. obunca* De Lotto described from Africa also have 6-segmented antennae, but these latter two are not congeneric.

The Brazilian species *Neolecanium silveirai* Hempel is transferred to *Cryptostigma* as *Cryptostigma silveirai* (Hempel) comb.nov. Morphological characters of the adult female and crawler stages suggest that *Cryptostigma* and *Myzolecanium* are closely related to species in the Old World genera *Cribrolecanium* and *Houardia*. The crawlers of these four genera are usually large in size, with claw denticles usually absent, dorsal microducts with a long inner ductule, presence of large dorsal simple pores, spiracular apodemes connected to edge of peritreme and presence of numerous spiracular pores. According to adult morphology, *Halococcus* may be synonymous with *Cribrolecanium* as suggested by Hodgson (1994). *Cribrolecanium andersoni* (Newstead) is not congeneric as indicated by crawler morphology.

DISCUSSION

The Old World Myzolecaniinae appears to be composed of several unrelated lineages. However, *Cribrolecanium*, *Halococcus*, *Houardia*, and *Myzolecanium* together with the New World *Cryptostigma* show many similarities in the adult female and crawler stages and make up the Myzolecanium-group. In the past, *Myzolecanium endoeucalyptus* and *M. magnetinsulae* were included in the closely related genus *Cryptostigma* (Qin & Gullan, 1989). The geographical distribution of *Cryptostigma silveirai* comb. nov. in Minas Gerais, Brazil fulfills the prediction of Qin & Gullan (1989) that *Cryptostigma* (*sensu* Qin & Gullan, 1989) has a Gondwanan origin and that the theory of continental drift would predict their distribution in southern South America. It is possible that *Cryptostigma* has evolved from an ancestral *Myzolecanium* species. Crawler morphology suggests that *Richardiella*, *Alecanium*, *Alecanopsis*, *Torarchus* and *Xenolecanium* are not related to the Myzolecanium- group. Although *Paractenochiton sutepensis* Takahashi and *Akermes pingue* (Maskell) lack visible eyes in the adult stage, a character of the Myzolecaniinae, it appears to have more affinities with the Coccinae: Paralecaniini, to which they share various characters, such as the presence of a stigmatic cleft with a sclerotized base. *Akermes scrobiculatus* (Maskell) which is closely related to *A. pingue* (Maskell) has well-developed eyes positioned further from the margins, supporting the affinities of the Australian species of *Akermes* to the Paralecaniini. The Australian *Akermes* are being revised in a future paper by Hodgson and Gullan (Gullan personal communication). *Akermes montanus* (Green) described from India is not congeneric with either New World or Australian *Akermes* and awaits further study.

The New World Myzolecaniinae appears to be composed of two major groups. The Myzolecanium-group composed of *Cryptostigma*, and the Toumeyella- group composed by *Akermes*, *Cyclolecanium*, *Megasaissetia*, *Neolecanium*, *Pseudophilippia* and *Toumeyella*.

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