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## **A COMPARISON OF THE PIT SCALE GENERA OF NORTH AND SOUTH AMERICA (HEMIPTERA: COCCOIDEA: ASTEROLECANIIDAE).**

### ABSTRACT

A COMPARISON OF THE PIT SCALE GENERA OF NORTH AND SOUTH AMERICA  
(HEMIPTERA: COCCOIDEA: ASTEROLECANIIDAE).

Of the 12 asterolecaniid genera known from the New World, six are believed to have been introduced from other faunal regions. The distinctive morphological characters and generic relationships of the New World species are discussed, along with their biogeography and host plant affinities.

Key Words: *Asterodiaspis*, *Asterolecanium*, *Bambusaspis*, *Grammococcus*, *Mycetococcus*, *Mycococcus*, *Neoasterodiaspis*, *Palmaspis*, *Planchonia*, *Pollinia*, *Russellaspis*, *Sclerosococcus*.

### INTRODUCTION

The pit scales (Asterolecaniidae) constitute one of the largest and more economically important groups of scale insects worldwide. The fauna is rich and diversified, with its members occurring in all major zoogeographical regions of the world. The taxonomy of the pit scales is poorly known on a world-wide basis. Indeed, a significant lack of knowledge of the lesser known asterolecaniid taxa exists, and the relationships between many species or species-groups are not well defined.

The genus *Asterolecanium* was established by Targioni-Tozzetti in 1868. Ferris elevated the subfamily Asterolecaniinae to family rank in 1937 and Russell (1941) described and catalogued the 156 species that had been described between 1758 and 1940 and which she put into 12 groups; these have since been raised to generic status. The only other significant changes which have been made since Russell's work have been the separation from the Asterolecaniidae of the families Lecanodiaspididae (Borchsenius, 1959) and the Cerococcidae (Koteja, 1974).

In North and South America, the family Asterolecaniidae currently consists of 12 genera: *Asterodiaspis* Signoret, *Asterolecanium* Targioni Tozzetti, *Bambusaspis* Cockerell, *Grammococcus* Miller & Lambdin, *Mycetococcus* Ferris, *Mycococcus* Ferris, *Neoasterodiaspis* Borchsenius, *Palmaspis* Bodenheimer, *Planchonia* Signoret, *Pollinia* Targioni Tozzetti, *Russellaspis*

Bodenheimer and *Sclerosococcus* McKenzie. The objective of this study was to define the New World genera and to help clarifying the status of the family.

## RESULTS

The subfamily Asterolecaniinae in the New World includes the seven genera: *Asterodiaspis*, *Asterolecanium*, *Bambusaspis*, *Neoasterodiaspis*, *Palmaspis*, *Planchonia* and *Russellaspis*. The main distinctive character of species in these genera is the presence of a marginal row or band of both 8-shaped pores and multilocular pores, which can be either trilocular, quadrilocular or quinquelocular.

The oak feeding genera *Asterodiaspis* and *Neoasterodiaspis* were both introduced from the Palaearctic region. *Asterodiaspis* may be widespread in both continents, but *Neoasterodiaspis* is only known in North America from an infestation on *Quercus hemisphaerica* in the New York Botanical Gardens. Species in these two genera are very similar and share a shield-like, fused, anal ring with one pair of setae, but differ in that *Neoasterodiaspis* has prominent sclerotized projections from the marginal 8-shaped pores which are absent in *Asterodiaspis*.

The anal area of some species of the palm feeding genus *Palmaspis* appears similar to that of *Asterodiaspis*, although it is never shield-like. *Palmaspis* is believed to have originated in the Neotropical region but is also frequent in other zoogeographic regions. It has not so far been recorded from the USA, although suitable hosts are available. The interspecific morphological characters of species in this genus are rather variable and the genus may not represent a monophyletic taxon. Most species possess trilocular pores (sometimes also quadrilocular pores) together with (or instead of) quinquelocular pores in the marginal row and in the spiracular furrows. There is also a tendency to reduce the length of the arms of the clypeolabral shield and the length of the spiracular arm in some species. In addition, the structures of the anal area vary considerably, i.e. in the number of apical setae and in the structure of the anal ring, which may be separated or fused, with one, two, or no pairs of setae. Interestingly, some species of *Palmaspis* (e.g., *P. pallida* (Russell) and *P. truncata* (Russell)) show considerable similarities to species in the non-asterolecaniine genus *Grammococcus*, both groups having trilocular pores (although these are restricted to the spiracular furrows in *Grammococcus*) and a separated anal ring with two pairs of setae. *Grammococcus* also occurs on palms and has been reported from Trinidad,

Colombia and the Peruvian Amazon region. Species in this genus possess unique submarginal clusters of multilocular pores on their dorsum. It is the only non-asterolecaniine genus that has a hard translucent cover, all other genera producing whitish, waxy, non-translucent covers similar to the typical cover of male scale insects.

Members of the bamboo feeding genus *Bambusaspis* can be found wherever bamboo grows, although no reports are known from Bolivia, Ecuador, Paraguay and Uruguay. The eight species currently recognized from the New World were probably introduced from the Oriental region. Species in the genus *Bambusaspis* are characterised by the presence of dorsal tubes (a character unique to species of this genus), an interrupted row of submarginal setae and a labium without setae. It shares a closed anal ring with 3 pairs of setae and the lack of trilocular pores with the genera *Asterolecanium*, *Planchonia* and *Russellaspis*. However, these characters may be plesiomorphic and may, therefore, not be useful for defining relationships among these genera.

Two species in the genus *Planchonia*, which may have originated in the Palaearctic or Ethiopian regions, have been introduced into the Nearctic region and can now be found in Canada, in northeastern USA, Florida and in several of the western States, where they cause periodic damage on a variety of host plants. Species in the genus *Planchonia* are characterized by a double or triple row of marginal 8-shaped pores accompanied by a dorsal and a ventral row of disc pores.

The genus *Russellaspis* is probably of Oriental origin and is represented in the New World by one species, the oleander pit scale, *R. pustulans* (Cockerell), which has been recorded from more than 100 host plants in 46 plant families. It is known from the USA and most Central and South American countries. Species in this genus are characterized by a ventral marginal row of disc pores and the presence of distinctive sclerotized areas on the ventral apex of the abdomen. This genus may be closely related to the genera *Asterolecanium* and *Planchonia*.

The genus *Asterolecanium* once included all the species in the subfamily Asterolecaniinae but it now contains only ten species in North and South America, infesting a variety of plants from agavas to orchids. The habits of these species seem to suggest a New World origin. No single character can be used to define this genus but its members generally possess single marginal rows of 8-shaped pores, disc pores and quinquelocular pores, and 4-6 pairs of anal setae. A thorough analysis of the species currently remaining in *Asterolecanium* is needed to elucidate a possible polyphyletic or paraphyletic origin.

The other four genera (*Mycetococcus*, *Mycococcus*, *Pollinia* and *Sclerosococcus*) do not belong to the Asterolecaniinae and their relationship to that subfamily and to *Grammococcus* are not well studied. With the exception of *M. corticis*, none possess tubular ducts. The two species of the genus *Mycetococcus* live on oaks in Mexico, California and Arizona and are distinguished by the heavily sclerotized anal lobes. *Pollinia pollini* (Costa), which is characterized by the distribution of the quinquelocular pores on the venter and by a ventral anal lobe with 5 pairs of setae, was introduced from Europe into the olive growing areas of California and Argentina, where it is an important pest. The four species in the genus *Sclerosococcus* have characteristically-shaped tubular duct-like 8-shaped pores and quinquelocular pores on both the dorsum and venter; they are known from Florida, Mexico, Chile and Ecuador, where they feed on Bromeliaceae. *Mycococcus coperniciae* Ferris is known only from palms in Cuba and has a very unique sclerotized plate on the dorsum and a ventral band of quinquelocular pores around the mouthparts, while other characters, such as 8-shaped pores, are not expressed in the adult female. More detailed studies, including all developmental stages, are necessary to elucidate the evolutionary position of this and most other pit scale genera.

#### REFERENCES.

- BORCHSENIUS, N.S., 1959 - Notes on coccid fauna of China. 7. A new family of soft scales - Lecanodiaspididae, fam. n. (Homoptera: Coccoidea). (In Russian). *Entomologicheskoe Obozrenie*, 38: 840-846.
- FERRIS, G.F., 1937 - *Atlas of the Scale Insects of North America*. Stanford University Press, Palo Alto, California. 136pp.
- KOTEJA, J., 1974 - Comparative studies on the labium in the Coccinea (Homoptera). *Zeszyty Naukowe Akademii Rolniczej, Kraków*, 89: 1-162.
- RUSSELL, L.M., 1941 - A classification of the scale insect genus *Asterolecanium*. *United States Department of Agriculture Miscellaneous Publication*, 424: 1-322.
- TARGIONI-TOZZETTI, A., 1868 - Introduzione alla seconda memoria per gli studji sulle Cocciniglie, catalogo dei generi e delle specie della famiglie dei Coccidi. *Atti della Società Italiana di Scienze Naturali*, 11: 694-738.