

The mealybugs of southern Iran (Hem.: Coccoidea: Pseudococcidae)

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Abstracts

The mealybug fauna of southern Iran (Sistan & Baluchestan, Hormozgan, Bushehr, Khuzestan and Fars provinces) is unknown to many coccidologists. In this paper, 17 mealybug species from the south of Iran with their host plants are reported.

Maconellicoccus hirsutus (Green), *Nipaecoccus viridis* (Newstead) and *Planococcus ficus* (Signoret) are the important pests and *Ferrisia virgata* (Cockerell), *Dysmicoccus brevipes* (Cockerell) and *Planococcus vovae* (Nasonov) are regarded as potential pests. *Antonina graminis* (Maskell), *Brevennia rehi* (Lindinger), *Dysmicoccus boninsis* (Kuwana), *Peliococcopsis priesneri* (Laing), *Peliococcus kimmericus* (Kiritshenko), *Phenacoccus solani* Ferris, *Formicococcus robustus* (Ezzat & McConnell), *Planococcus citri* (Risso), *Pseudococcus viburni* (Signoret), *Trabutina serpentina* (Green) and *Trionymus multivorus* (Kiritshenko) are regarded as pests but no records of damage have been reported from the south of Iran.

Key words: Pseudococcidae, southern Iran, host plants, Iran

چکیده

فون شپشک‌های آرد آلود جنوب ایران (استان‌های سیستان و بلوچستان، هرمزگان، بوشهر، خوزستان و فارس) برای بسیاری از شپشک شناسان ناشناخته می‌باشد. در این تحقیق، ۱۷ گونه شپشک آردآلود و گیاهان میزبان آنها معرفی می‌گردد. *Maconellicoccus hirsutus* (Green) و *Nipaecoccus viridis* (Newstead) و *Planococcus ficus* (Signoret) از آفات مهم و *Ferrisia virgata* (Cockerell)، *Dysmicoccus brevipes* (Cockerell) و *Planococcus vovae* (Nasonov) به عنوان آفات بالقوه معرفی می‌گردند. *Antonina graminis* (Maskell)، *Brevennia rehi* (Lindinger)، *Dysmicoccus boninsis* (Kuwana)، *Peliococcopsis priesneri* (Laing)، *Peliococcus kimmericus* (Kiritshenko)، *Phenacoccus solani* Ferris، *Formicococcus robustus* (Ezzat & McConnell)، *Planococcus citri* (Risso)، *Pseudococcus viburni* (Signoret)، *Trabutina serpentina* (Green) و *Trionymus multivorus* (Kiritshenko) به عنوان آفت در نظر گرفته می‌شوند ولی گزارشی مبنی بر خسارت‌زا بودن آنان در استان‌های جنوب ایران وجود ندارد.

واژه‌های کلیدی: شپشک‌های آرد آلود، جنوب ایران، گیاهان میزبان، ایران

Introduction

The study of the scale insect fauna (Hemiptera: Coccoidea) of Iran was started by M. Kaussari in the 1940's with the co-operation of A. S. Balachowsky in his comprehensive studies on Mediterranean scale insects including Iran. They studied mainly on armoured scale insects (Diaspididae). Seghatoleslami (1977) also published a list of the Diaspididae (Phoenicococcidae and Diaspididae) which had been described or recorded from Iran, and enumerated 93 species in 53 genera with collection data. Moghaddam (2004) has revised and supplemented the list, enumerating 107 species and arranging them in 41 genera. The contributions of Archangelskaya (1937), Borchsenius (1966) and Danzig (1993) should also

be mentioned, although their work was not directed especially to Iran. In recent years, D. J. Williams and S. Takagi have co-operated in faunistic studies of Iranian scale insects.

Even so, the scale insect fauna of Iran has been poorly studied especially the mealybugs. The number of recorded mealybug species in Iran is not more than 12 according to published papers. Most of these mealybugs have been introduced, probably on original plant material. For the first time, Kiriukhin (1947) listed five mealybug species for Iran. They were: *Pseudococcus adonidium* (L.), *Pseudococcus maritimus* (Ehrhorn), *Pseudococcus citri* Risso, *Pseudococcus comstocki* (Kuwana) and *Pseudococcus filamentosus* (Cockerell). He believed the species *P. filamentosus* known from Jahrom and Fasa in Fars province, was imported with infected plants from Egypt to Iran and *P. comstocki* had been imported with infected plants from Palestine.

The climate throughout Iran varies considerably and, therefore, has a rich scale insect fauna especially the mealybugs. No comprehensive study has been carried out on the mealybug fauna of Iran especially that in the south. For many years, the only mealybug known in southern Iran was *Nipaecoccus viridis* that caused damage to different host plants. Asadeh & Mosaddegh (1991) carried out a good research on the mealybug fauna in Khuzestan province and recorded eight mealybug species, four of which were new for Iran.

Mealybugs are abundant in the tropical and subtropical regions at low or medium elevations and southern Iran has a warm and moist climate and also long joint boundaries (terrestrial and aquatic) with neighbouring countries, so the exchange of plant produce is conducive to the importation and establishment of insect pests especially mealybugs because of their small size.

This paper discusses the mealybugs of southern Iran (Systan & Baluchestan, Hormozgan, Bushehr, Khuzestan and Fars provinces), and particularly the mealybugs on agricultural crops and forest trees so that the information is a basis for the development of plant protection programmes, especially biological control. Mealybugs are also recorded from wild plants. It is hoped also that the paper stimulates further study on biological aspects and methods to control mealybug pests. One of the most important aspects of control is effective quarantine inspection within the region both for imports and exports of plant material.

Materials and methods

Mealybugs were sampled with irregular surveys at different locations in the south of Iran (Systan & Baluchestan, Hormozgan, Bushehr, Fars and Khuzestan provinces) during 1999-

2004. The mealybug specimens were carefully removed from plant surfaces to 75% alcohol. In the laboratory, mealybug specimens were mounted on microscope slides using the method given by McKenzie (1967). The slide-mounted material of the mealybug species were deposited at Insects Taxonomy Research Department, Plant Pests and Diseases Research Institute, Tehran, Iran.

***Antonina graminis* (Maskell)**

This species is completely enclosed in a flat sac in life and lacks legs after the crawler stage and it can be easily distinguished from all others. *A. graminis* occurs on the aerial roots or subterranean nodes of grasses including sugarcane. There are no records of this mealybug in Persian literature, but Williams (1970) and Commonwealth Institute of Entomology (Anonymous, 1966) recorded it from Iran. At present, it has not become troublesome on sugarcane in southern Iran.

Material examined – Khuzestan: Ahwaz, on *Saccharum officinarum*, 8.III.2000, leg. Nareii.

***Brevienia rehi* (Lindinger)**

Brevienia rehi feeds on grasses and occurs beneath the leaf sheaths and the bases of the plants. It was recorded only in Khuzestan province by Asadeh & Mosaddegh (1991) and there are no records of damage to crops. This mealybug is an important pest in Bangladesh (Alan *et al.*, 1979) causing significant damage to rice.

Material examined – Khuzestan: Ahwaz, on *Sorghum* sp., 19.VIII.1980, leg. Asadeh.

***Dysmicoccus boninsis* (Kuwana)**

This mealybug normally feeds on grasses and has been recorded only from Khuzestan, mentioning that it occurs mainly on weeds especially *Lactuca* sp. in the water canals around sugarcane farms (Asadeh & Mosaddegh, 1991). There are vast sugar cane farms in Khuzestan, but there are no records of this mealybug on sugarcane in the region.

Material examined – Khuzestan: Ahwaz, on *Lactuca* sp., 5.VIII.1990, leg. Asadeh.

***Dysmicoccus brevipes* (Cockerell)**

Dysmicoccus brevipes is known as the pineapple mealybug. This mealybug infests the roots, leaves and natural cavities of the host plants. It can transmit pineapple mealybug wilt

diseases (Zimmerman, 1948), but it is a cosmopolitan species recorded from a long of host plants and is often found feeding on the roots. It seems to prefer pineapple and is occasionally found on sugarcane and rice (Williams, 1970). *D. brevipes* has been repeatedly introduced to Iran on bananas, pineapples and ornamental plants from the Philippines and other East Asian countries. It must be regarded as a potential pest of crops in the south of Iran and effective quarantine measures are needed at the frontiers.

Material examined – Systan & Baluchestan: Iranshahr, on root of *Medicago sativa*, V. 2002, leg. Achak.

***Ferrisia virgata* (Cockerell)**

Ferrisia virgata is easily recognized by the powdery secretion and the pair of longitudinal submedian dark stripes. This mealybug attacks a wide variety of host plants. It feeds on the leaves, shoots, and fruits and will move onto the roots in dry weather and causes serious damage to a number of crops throughout the world. It is found in the Baluchestan area on tropical plants. This mealybug is thought to have been introduced into Iran from eastern countries. It is a pest on several crops in India and Pakistan. *F. virgata* is not found in other southern provinces of Iran. It seems that damage by this mealybug is limited by the activity of the pink hibiscus mealybug (*Maconellicoccus hirsutus*) in the same areas.

Material examined – Systan & Baluchestan: Chabahar, on *Solanum melongena*, 2.VI.2003; on *Psidium guajava*, 22.V.2003; on *Myrtus communis*, 24.V.2003; Chabahar, Tiss, on *Prosopis spiciagera*, 22.V.2003.

***Maconellicoccus hirsutus* (Green)**

The pink hibiscus mealybug, *M. hirsutus*, is a serious pest of many plants in tropical and subtropical regions. This mealybug attacks most of the agricultural crops cultivated mainly in Systan & Baluchestan provinces. *M. hirsutus* is responsible for serious damage causing withering of plants, crinkling of leaves and deforming buds, shoots and fruits owing to the toxicity of the mealybug's saliva. Leaves sometimes show a characteristic curling, "rosetta", similar to the damage caused by viruses. *M. hirsutus* was introduced into Iran, probably from eastern countries. It is a well-known pest in Pakistan, India, Saudi Arabia and Yemen (Ben-Dov, 1994). It is found also in Hormozgan and Fars provinces. At present, *M. hirsutus* is the dominant mealybug in Baluchestan and it seems to prefer *Morus alba* and *Mangifera indica*. There is increasing concern that this mealybug may spread to other southern provinces. The

appearance in life of the adult female is described as orange pink to reddish, sparsely covered with white mealy wax but the insects become completely covered in the white ovisac material (Williams, 1996).

This species is considered to be a serious threat and a special programme for its control is needed.

Material examined – Systan & Baluchestan: Nikshahr, on *Citrus sinensis*, 13.VIII.2001; on *Psidium guajava*; Nikshahr, Sarbook-Koshok, on *Tamarix* sp., 30.VI.2003; Chabahar, on *Morus alba*, 23.IV.2001; on *Hibiscus syriacus*, 3.V.2001; Chabahar, Tiss, on *Prosopis* sp., 26.V.2001; on *Terminalia catappa*, 22.V.2001; on *Prosopis spicigera*, 24.IV.2003; Chabahar, Kahir, on *Lawsonia inermis*, 23.IV.2001, 26.IV.2003; on *Hibiscus rosa-sinensis*, 7.XI.2000; Chabahar, Ouraki, on *Zizyphus spina-christi*, 9.II.2001; on *Acacia arabica*, 25.V.2003; on *Morus alba*, 25.IV.2001; Chabahar, Bahukalat, on *Phoenix dactylifera*, 1.V.2001; on *Syzygium cumini*, 1.V.2001; on *Hibiscus rosa-sinensis*, 1.V.2001; on *Albizia* sp., 7.XI.2001; on *Terminalia catappa*, 7.XI.2000. Hormozgan: Minab, on *Mangifera indica*, unknown date; Gheshm Island, on *Acacia* sp., 22.X.2002. Fars: Jahrom, on *Morus alba*, 26.XI.2002.

***Nipaecoccus viridis* (Newstead)**

The spherical mealybug, *N. viridis*, is widespread throughout the tropics and subtropics and is a highly polyphagous pest, attacking more than 100 species of herbaceous and woody plants in at least 34 families (Sharaf & Meyerdirk, 1987). It was first described from India as *Dactylopius viridis* by Newstead (1894) and since then there have been many synonyms. It causes damage to buds, flowers, stems and foliage by nymphs and adult females resulting in stunting, distortion, chlorosis, and defoliation.

Nipaecoccus viridis is one of the most important pests on citrus trees in Fars, Bushehr and Khuzestan provinces. This mealybug was recorded for the first time by Kiriukhin (1947) and misidentified as *P. filamentosus*. The spherical mealybug has been studied more than any other mealybug species in Iran.

Material examined – Bushehr: Borazjan, Faryab, on *Morus alba*, 3.VI.2001, leg. Fasihi; Talheh, on *Citrus limonum*, 23.VII.2001, leg. Fasihi; Kaiiz, on *Tamarix* sp., 25.VI.2001, leg. Fasihi; Genaveh, on *Zizyphus spina-christi*, 21.X.2001. Khuzestan: Safi Abad, on *Citrus sinensis*, 15.VI.2002; Haft Tappeh, on *Citrus* sp., 8.VII.2003, leg. Jemsi & Ghobeyti; Dezful, on *Citrus* sp., 30.VI.2003, leg. Jemsi & Ghobeyti; Andimeshk, on *Citrus* sp. 30.VI.2003, leg. Jemsi & Ghobeyti. Hormozgan: Larak, on *Zizyphus spina-christi*, 12.XI.2003. Fars: Jahrom,

on *Morus alba*, 14.V.2002, leg. Zibaii; on *Citrus* sp., 12.V.2002; Kazeroun, on *Citrus* sp., Leg. Serri & Haj Esmailian.

***Peliococcopsis priesneri* (Laing)**

Peliococcopsis priesneri is spreading in the Middle East, and in Iran the only record is from Fars province. It feeds on Poaceae and, at present, this mealybug is not regarded as an important pest.

Material examined – Fars: Zargan, on *Cynodon dactylon*, 30.VI.2002, leg. Taghizadeh.

***Peliococcus kimmericus* (Kiritshenko)**

Peliococcus kimmericus is Palaearctic in distribution. It is present in almost all neighbouring countries of Iran (Ben-Dov, 1994).

Material examined – Khuzestan: Shadegan-Jefal, on *Prosopis stephaniana*, 10.V.2002.

***Phenacoccus solani* Ferris**

This mealybug occurs on the leaves and roots of host plants. *P. solani* could be important probably in greenhouses and on ornamental plants. The only records from the Palaearctic region are from Italy (Mazzeo *et al.*, 1999) and Israel (Ben-Dov, 2005).

Material examined – Fars: Shiraz, on root of *Chrysanthemum morifolium*, IX.2002, leg. Zibaii; on root of *Celosia cristata*, VI.2002, leg. Zibaii.

***Formicococcus robustus* (Ezzat & McConnell)**

Formicococcus robustus was observed only from Ghesm Island. This mealybug is common in the Oriental region (Pakistan, India, and Bangladesh) (Ben-Dov, 1994), who listed it as *Planococcoides*.

Material examined – Hormozgan: Ghesm Island, Band-e Haj Ali, on *Prosopis specigera*, 8.III.2001.

***Planococcus citri* (Risso)**

Although *P. citri* is generally regarded as being polyphagous, which is indeed the case in greenhouses; in the field it is sometimes absent (Cox, 1989). Kiriukhin (1947) has mentioned that this mealybug is not a pest and that he has never seen any outbreak. At present, damage

occurs mainly in the north of Iran, especially in greenhouses. It can not currently be regarded as an economically important pest in the south of Iran.

Material examined – Fars: Firouz Abad, on *Fraxinus* sp., 29.XI.1997; Shiraz, on *Cupressus* sp., 25.IV.1966.

***Planococcus ficus* (Signoret)**

Planococcus ficus is a pest throughout Fars province spreading especially to the main grape-vine producing areas in Beyza and fig-producing areas in Estahban. In the scale insect collection in Hayk Mirzayans Insect Museum (HMIM), all the specimens have been misidentified earlier as *Planococcus vitis* Ezzat & McConnell and all records under this name should be referred to *P. ficus*. This mealybug is spreading in many areas in Iran, and especially on grape-vines and fig trees.

Material examined – Fars: Estahban, on *Ficus carica* (leaves and trunks), 25. VI. 2003, leg. Zibaii; Shiraz, on *Vitis* sp., 1.VI.1998.

***Planococcus vovae* (Nasonov)**

In recent years, *P. vovae* has become a serious pest in Iran causing damage to *Cupressus* spp., especially to the leaves. Some characters of *P. vovae*, as represented in the species in Iran, differ from those in most specimens found elsewhere and have been discussed by Williams & Moghaddam (1999). *P. vovae* is distributed throughout Iran. In recent years, some researchers have worked on the natural enemies in Iran. Lotfalizadeh *et al.* (2000) studied the biology of *Exochomus quadripuslatus* (L.) (Col.: Coccinellidae) on *P. vovae* in Shiraz, and *Geocoris quercicola* Linnavuori (Hem.: Lygaeidae) was recorded as a predator of *P. vovae* in Shiraz by Lotfalizadeh (2000a, 2000b).

Material examined – Fars: Firouz Abad, on *Cupressus* sp., 25.X.1997; Shiraz, on *Cupressus* sp., 6.XI.1998; Jahrom, on *Cupressus* sp., unknown date.

***Pseudococcus viburni* (Signoret)**

Syn.: *Pseudococcus affinis* Maskell

This mealybug is normally present in greenhouses and this is the first record of *P. viburni* in the south of Iran. Bodenheimer (1944) listed 62 scale insect species from Iran including *P. viburni* which was found in the north. Heidari (1986) has studied this mealybug and has pointed out that *P. viburni* is a serious pest of tea, citrus and some ornamentals in the

northern part of Iran. In fact, all the specimens of this species in the HMIM were misidentified previously as *Pseudococcus maritimus* Ehrhorn.

Material examined – Khuzestan: Ahvaz, III.2000, on *Diefenbachia* sp., leg. Bani-Ameri.

***Trabutina serpentina* (Green)**

Syn.: *Naiacoccus minor* Borchsenius

Naiacoccus serpentina Green

Trabutina serpentina is a common mealybug of the family Tamaricaceae and has a wide distribution. This mealybug exists in all areas in Iran wherever *Tamarix* sp. trees are present. There were two species of the genus *Naiacoccus*: *N. minor* and *N. serpentina*. According to recent publication (Miller & Ben-Dov, 2005), they are both known as *T. serpentina*.

There is no evidence for using the honeydew excretion of this mealybug known as manna in Iran.

Material examined – Khuzestan: Shadegan, Jafal, on *Tamarix* sp., 31.V.2002. Bushehr: Bushehr, Mond River, on *Tamarix* sp., 18.X.2001; Borazjan, Samanlu, 10.X.2001; Pol Shir, on *Tamarix* sp., 12.V.1963. Sistan& Baluchestan: Bampur, on *Tamarix* sp.

***Trionymus multivorus* (Kiritchenko)**

Trionymus multivorus is polyphagous and usually occurs on the roots of plants. This mealybug is Palearctic in distribution and, at present, it not regarded as an economically important pest.

Material examined – Fars: Shiraz, Zargan, on *Lactuca* sp., 19.XI.1998, leg. Lothfalizādeh.

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References

- Anonymous** (1966) *Distribution maps of insect pests*. No. 216. Commonwealth Institute of Entomology, London, England.
- Alam, S., Alam, M. S. & Karim, A. N. M.** (1979) Rice mealybug outbreak in Bangladesh. *International Rice Research Newsletter* 4, 20-21.
- Archangel'skaya, A. D.** (1937) *The Coccidae of Middle Asia*. 158 pp. Izdatel'stvo Komiteta Nauk UZSSR, Tashkent.
- Asadeh, Gh. & Mosaddegh, M. S.** (1991) The mealybug fauna of Khuzestan province. *The Scientific Journal of Agriculture* 6(1, 2), 47-52.
- Ben-Dov, Y.** (1994) *A Systematic catalogue of the mealybugs of the world (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidea) with data on geographical distribution, host Plants, biology and economic importance*. 685pp. Intercept Ltd, Andover.
- Ben-Dov, Y.** (2005) The Solanum mealybug, *Phenacoccus solani* Ferris (Hemiptera: Coccoidea: Pseudococcidae), extends its distribution range in the Mediterranean Basin. *Phytoparasitica* 33(1), 15-16.
- Bodenheimer, F. S.** (1944) Note on the Coccoidea of Iran, with description of new species. *Bulletin de la Societe Fouad 1er d'Entomologie* 28, 85-100.
- Borchsenius, N. S.** (1966) *A catalogue of the armoured scale insects (Diaspidoidea) of the world*. 449 pp. Nauka, Moscow & Leningrad.
- Cox, J. M.** (1987) Pseudococcidae (Insecta: Hemiptera). pp. 1-229 in Duval, C. T. (series Ed.) *Fauna of New Zealand*. 11. DSIR Science Information Publishing Centre.
- Danzig, E. M.** (1993) *Fauna of Russia and neighbouring countries, scale insects (Coccinea), Rhynchota, families Phoenicococcidae and Diaspididae*. Vol. X, 452 pp. Nauka Publishing House.
- Heidari, M.** (1986) Introduction to the Caspian sea mealybug: *Pseudococcus affinis* (Hom.: Pseudococcidae). *Proceedings of the Eighth Plant Protection Congress of Iran*, 44.
- Kiriukhin, G.** (1947) The pests of subtropical plants in Iran. *Applied Entomology and Phytopathology* 4, 17-33.
- Lotfalizadeh, H.** (2000a) Lacewings parasitoids (Neu.: Chrysopidae) in Shiraz. *Journal of Entomological Society of Iran* 19(1/2), 31-44. [In Persian with English Summary].

- Lotfalizadeh, H.** (2000b) The first record of predaceous bug, *Geocoris quercicola* Linnavuori (Hem.: Lygaeidae) in Iran. *Journal of Entomological Society of Iran* 19(1/2), 103-104. [In Persian with English Summary].
- Lotfalizadeh, H., Hatami, B. & Khalaghani, J.** (2000) Biology of *Exochomus quadripustulatus* (L.) (Col.: Coccinellidae) on cypress tree mealybug, *Planococcus vovae* (Nasnov) (Hom.: Pseudococcidae) in Shiraz. *Journal of Entomological Society of Iran* 20(1), 61-76.
- Mazzeo, G., Russo, A. & Suma, P.** (1999) *Phenacoccus solani* Ferris (Homoptera Coccoidea) on ornamental plants in Italy. *Bollettino di Zoologia Agraria e di Bachicoltura (Milano)* 31(1), 31-35. [In Italian with English Summary].
- McKenzie, H.L.** (1967) *Mealybugs of California with taxonomy, biology, and control of north American species (Homoptera: Coccoidea: Pseudococcidae)*. 525pp. University of California Press.
- Miller, D. & Ben-Dov, Y.** (2005). ScaleNet: a database of the scale insects of the world. Available on: www.sel.barc.usda/scalenet/scalenet.htm (accessed 1 November 2005).
- Moghaddam, M.** (2004) *Insects of Iran: the list of Coccoidea in the Insect Museum of Hayk Mirzayans in Plant Pests and Diseases Research Institute, Hemiptera: Diaspididae and Phenococcidae*. Plant Pests and Diseases Research Institute, Insect Taxonomy Research Department, No. 11, 53 pp.
- Newstead, R.** (1894) Scale insects in Madras. *Indian Museum Notes* 3, 21-32.
- Seghatoleslami, H.** (1977) List of scale insects (Fam. Diaspididae) of Iran. *Journal of Entomological Society of Iran* 4, 5-19.
- Sharaf, N. S. & Meyerdirk, D. E.** (1987) A review on the biology, ecology and control of *Nipaecoccus viridis* (Homoptera: Pseudococcidae). *Entomological Society of America, Miscellaneous Publication* 66, 1-18.
- Williams, D. J.** (1970) The mealybugs (Homoptera: Coccoidea: Pseudococcidae) of sugar-cane, rice and sorghum. *Bulletin of Entomological Research* 60, 109-188.
- Williams, D. J.** (1996) A brief account of the hibiscus mealybug *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae) a pest of agriculture and horticulture, with descriptions of two related species southern Asia. *Bulletin of Entomological Research* 86, 617-628.
- Williams, D.J. & Moghaddam, M.** (1999). Mealybug species of the genus *Planococcus* Ferris in Iran (Homoptera: Coccoidea: Pseudococcidae) with a discussion of

Planococcus vovae (Nasonov). *Journal of Entomological Society of Iran* 18(1/2), 32-43. [In Persian with English Summary].

Zimmerman, E. C. (1948) *Insects of Hawaii, Homoptera: Sternorrhyncha*. Vol. 5, 464 pp. University of Hawaii Press.

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