THE TAXONOMIC STATUS OF THE PLANT BUGS (HEMIPTERA: MIRIDAE) OF SRI LANKA

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ABSTRACT

A taxonomic study of the plant bugs, or Miridae (Hemiptera), of Sri Lanka was initiated in April 1998. Assistance in the survey was given by one graduate student and by parataxonomists, who have been trained in insect collection and preservation. The first part of the project involved a review of the widely scattered literature to determine what plant bugs have been reported from the country. Published records have been supplemented with records from specimens housed in various entomological collections and from specimens collected in field surveys. Based on the literature, 118 species of plant bugs in 69 genera have been reported from Sri Lanka. Preliminary study of museum and field-collected specimens indicates numerous new country records and several species new to science. The final goal of the project is to produce a synopsis of the Sri Lankan Miridae, including an annotated checklist, identification keys, distributions, host plants, and review of economic importance.

KEY WORDS : Hemiptera, Miridae, Plant bugs, Taxonomy

INTRODUCTION

The family Miridae, often called plant bugs, is the largest family of true bugs, containing over 10,000 species worldwide (Schuh, 1995). Their great diversity, wide range of feeding habits, and damage inflicted on fruits, food and field crops, and ornamental plants make Miridae one of the most important insect groups. In addition, an increasing number of plant bugs are being recognized as important predators, making such genera as *Deraeocoris* and *Phytocoris* that prey on aphids, leafhoppers, lepidopterous larvae, scale insects, and other soft-bodied arthropods potentially important in biological control programmes (Henry and Wheeler, 1988).

The first collective account of Miridae of Sri Lanka was given by Kirby (1894), in his summary of the history of Ceylonese Hemiptera. This work was followed by the description of many new species by such workers as Distant (1904a, 1910b) in his papers on the "Fauna of British India." Poppius (1911) published the only paper dealing exclusively with the Sri Lankan mirid fauna, where he treated 37 species. Since then there have been only occasional new species descriptions by relatively few taxonomists. Most of these early workers neither visited Sri Lanka nor were their works based on collections specifically directed at Miridae. More than 87% of the mirids known from Sri Lanka were recorded before 1914 (Table 1).

Table 1. Number of Miridae described or reported from Sri Lanka from 1858 to present

Time Period	*Number of Species*
1858 - 1891	30
1892 - 1904	30
1905 - 1913	45
1914 - 1969	03
1970 - 1992	12

In this paper, we report on the first part of our project designed to survey and acquire specimens, study material in collections, and summarize what species of Miridae have been reported in the literature. Our objectives are to give an overview of the procedures used for collecting specimens and gathering information, summarize what Miridae are presently known from Sri Lanka, and to highlight some of the species of interest that are important as pests or predators.

Fieldwork for this study was initiated in 1998. From April 1998 to March 1999, the first author, one of his students, Chamari Ariyadasa, and field parataxonomists collected specimens from a wide array of habitats throughout much of Sri Lanka. In March 1999, the second author (T.J.H) joined the group for one month to help train parataxonomists, to work on sorting the Horticultural Crop Research and Development Institute (HORDI) mirid collection, and to perform fieldwork.

In addition to records gained from the literature and from fieldwork, information is also being gathered from specimens housed in several major entomological collections. Collections studied so far are the British Natural History Museum, London [BNHM]; Department of Zoology, University of Peradeniya, Peradeniya [DZUP]; Horticultural Crop Research and Development Institute, Sri Lanka Department of Agriculture, Peradeniya [HORDI]; National Museum of Natural History, Smithsonian Institution, Washington, DC [NMNH], and Sri Lankan National Insect Collection, Colombo [SNIC].

METHODS

In the current survey, Miridae were collected from the three major agroecological regions in Sri Lanka: low country, mid country and up country. Within each of these three regions, three climatic zones (dry; wet; and intermediate) were identified, and within these zones, seven habitat types were recognized: virgin forests, reforested areas, agricultural fields, forest edges, roadside vegetation, homegardens, and fallow lands.

A system using parataxonomists also was employed to aid in the survey of Sri Lanka plant bugs. Students having completed advanced-level studies in biology were selected from each region. These assistants were given training in insect collecting methods and preservation techniques, and were selected from areas close to agricultural research stations so that they could obtain advice and discuss their problems with a

trained entomologist. Each parataxonomist was supplied with insect collecting gear, including a net, aspirator, killing jar, insect pins, card points for mounting, glue, and an insect storage box. Properly mounted, dried, and labeled specimens were purchased from them for the study. The primary depositories for Miridae resulting from this project are HORDI and NMNH, but when adequate material is available, specimens will also be deposited in the BMNH, DZUP, and SNIC.

RESULTS AND DISCUSSION

One hundred and eighteen species of Miridae in 69 genera have been recorded from Sri Lanka. Of the eight subfamilies recognized in the Schuh (1995) catalogue, seven are represented. Of the 118 species, 15% are Bryocorinae; 3%, Cylapinae; 8%, Deraeocorinae; 3%, Isometopinae; 39%, Mirinae; 10%, Orthotylinae; and 22%, Phylinae.

In the following list, a brief overview of the subfamilies is given and a few species from each group are highlighted.

Table 2. Number of genera and species of Miridae recorded from Sri Lanka

Subfamily	*General*	*Species*
Bryocorinae	11	18
Cylapinae	4	4
Deraeocorinae	4	9
Isometopinae	4	4
Mirinae	25	46
Orthotylinae	6	12
Phylinae	15	25

Subfamily Bryocorinae

Eighteen species belonging to 11 genera have been reported from Sri Lanka (Table 2). Four genera, *Helopeltis*, *Pachypeltis* and *Prodromus*, and unrecorded species of *Nesidiocoris* have been identified. The DZUP collection has two species, one of which also represents an apparent new record for Sri Lanka.

Helopeltis antonii Signoret

Helopeltis antonii Signoret 1858: 502

Remarks: This is the first mirid described from Sri Lanka. The genus is easy to identify by the long scutellar process or horn. This species is a serious pest of cashew, cocoa, and tea in India and Sri Lanka (Stonedahl, 1991). In India, it may cause up to 30-40% crop loss to cashew (Devasahayam and Nair, 1986). Other host plants include cinchona, eucalyptus, grape, guava, jambola (*Eugenia jambos*), mango, murunga (*Moringa oleifera*), and neem (Rajapakse and Jeevaratnam, 1983; Fernando and Manickavasagar, 1956).

Distribution: India, Sri Lanka (Stonedahl, 1991).

Material examined: Kandy Dist., Peradeniya, 13. V.98 (2 ex.) (HORDI).

Helopeltis bradyi Waterhouse

Helopeltis bradyi Waterhouse 1886: 458
Helopeltis ceylonensis De Silva 1957: 459. Synonymized by Stonedahl 1991: 476.

Remarks: *Helopeltis ceylonensis* is a junior synonym of *H. bradyi*. Although De Silva (1957) indicated that type material of *H. ceylonensis* was to be deposited in the Department of Agriculture (now HORDI) entomology collection, no types were found. *Helopeltis bradyi* also is a pest of cashew, cinchona, cocoa, tea and other crops (Stonedahl, 1991).

Distribution: South India, Indonesia, Malaysia, Singapore, Sri Lanka (Carvalho, 1957; Schuh, 1995).

Material examined: Without label data (12 ex.) (HORDI); Ceylon, 6.iii.1956, on cocoa, Department of Agriculture (1 ex.) (HORDI).

Pachypeltis politum Walker

Monalonion politum Walker 1873:163
Pachypeltis politum Carvalho 1957: 141

Remarks: This species is commonly known as the avocado or mango capsid. Adults and nymphs puncture tender leaves of avocado (*Persea americana* Mill.), mango and other plants, causing numerous brownish angular spots. This polyphagous species also damages guava and chilli plants. We have observed considerable numbers feeding on sweet potato leaves and causing necrotic lesions at the Horticulture Research Station, Gannoruwa.

Distribution: Borneo, India, New Guinea, Sarawak, Sri Lanka, Tennasserin (Carvalho, 1957; Schuh, 1995).

Material examined: Kandy Dist., Nawalapitiya, 01.XII.98-27.II.99, (44 ex.) (HORDI), Kandy Dist., Gannoruwa, 24.X.98-28.XI.98, (3 ex.) (HORDI), Polonnaruwa Dist., Hingurakgoda, 20.II.99 (1 ex.), Kegalle Dist., Ruwanwella, 17.IX.98 (1 ex.) (HORDI)

Subfamily Cylapinae

Four species in four genera have been recorded from Sri Lanka (Table 2). In the current study two species belonging to the predatory genera *Peritropis* and *Fulvius*, have been collected.

Fulvius praefectus Distant

Silanus praefectus Distant 1909b: 520
Fulvius praefectus Bergroth 1920: 76

Remarks: Nothing is known about *F. praefectus*, but its habits are probably similar to those of other species of *Fulvius*, which are often found under the bark of dead trees, in stumps, decaying vegetation, and similar situations. They are likely predators of other soft-bodied arthropods.

Distribution: Sri Lanka (Distant, 1909b).

Specimens examined: Kandy Dist. Peradeniya, 25,XII.98 (1 ex.) (HORDI), Galle Dist. Kanneliya, 15-17.X.76 (2 ex.) (DZUP), Kandy Dist. Udawattakele, 4-5.X.76 (1 ex.) (SNIC), Galle Dist. Kanneliya, 15-17.X.76 (2 ex.) (SNIC).

Subfamily Deraeocorinae

Nine species in four genera have been recorded from Sri Lanka (Table 2). We have collected four species of *Deraeocoris* that are yet to be identified. Members of this subfamily are predatory.

Deraeocoris signatus Distant

Camptobrochis signatus Distant 1904b: 274
Deraeocoris signatus Carvalho 1957: 80

Remarks: Little is known about this species, but many other members of this genus are known to be predatory. Five other species of *Deraeocoris* are reported from Sri Lanka.

Distribution: Australia, India, Sri Lanka (Carvalho, 1957; Schuh, 1995).

Material examined: Kandy Dist., Kandy, 1000 ft., Peak View Motel, 15-24 Jan. 1970, Davis and Rowe (2 ex.) (NMNH); Kandy Dist., Hasalaka Irrigation Bungalow, 30 March-9 April 1971, black light (1 ex.) (DZUP); Man. Dist., 4 miles NW of Mannar, black light, 100 ft., 3 Nov. 1976, Hevel *et al.* (3 ex.) (NMNH).

There are also specimens in the NMNH collection from India.

Stethoconus praefectus Distant

Apollodotus praefectus Distant 1909a: 454
Stethoconus praefectus Carvalho 1957: 206

Remarks: Members of this genus are known lace bug predators (Henry *et al.*, 1986). Mathen *et al.* (1967) considered *S. praefectus* as a major predator of coconut palm lace bug, *Stephanitis typica* Distant, and Yasunaga *et al.* (1977) found this species preying on *Stephanitis subfasciata* Horvath in Japan. Mathen and Kurian (1972) studied the life history and described the immature stages.

Distribution: Sri Lanka (Distant, 1909a).

Specimens examined: We have examined specimens from Hong Kong, India, Malaysia, and Japan (NMNH). No Sri Lankan specimens have been collected during the current study.

Subfamily Isometopinae

Four species in the genera *Isometopidea*, *Isometopus*, *Myiomma*, and *Sophianus* have been reported from Sri Lanka. Members of this subfamily are scale predators and are potentially important as biological control agents (Wheeler and Henry, 1978). No specimens of this group have been collected during our study.

Isometopus cuneatus Distant

Turnebus cuneatus Distant 1904a: 485
Isometopus cuneatus Eyles 1971: 942

Remarks: Nothing is known of the habits of this species, but Stusak and Stys (1958) found the European *I. intrusus* associated with scale insects, including *Chionaspis salicis* (Linnaeus) on *Tilia chordata* Mill. and Cobben (Wheeler and Henry, 1978) observed this species preying on oystershell scale, *Lepidosaphes ulmi* (Linnaeus) on apple trees.

Distribution: Sri Lanka (Distant, 1904a)

Myiomma vittata McAtee and Malloch

Myiomma vittata McAtee and Malloch 1932: 69

Remarks: The habits of this species have not been studied, but they are probably similar to other species in the genus. Wheeler and Henry (1978) showed that *M. cixiiforme* (Uhler) in North America is a scale specialist.

Distribution: Sri Lanka (McAtee and Malloch, 1932).

Subfamily Mirinae

Forty-six species belonging to 25 genera (Table 2) have been reported from Sri Lanka. Of the 28 species we have collected, the genera *Argenis*, *Creontiades*, *Dolichomiris*, *Eurystylus*, *Hyalopeplus*, *Lygocoris*, *Megacoelum*, *Proboscidocoris*, *Stenotus*, and *Taylorilygus* have been identified. Little information is available on the hosts or habits of most Mirinae known from Sri Lanka. One identified species of *Trigonotylus* represents a new country record, and the DZUP collection contains 13 species, two of which are in the genera *Creontiades* and *Eurystylus* and apparently represent new records for Sri Lanka.

Eurystylus bellevoyei Reuter

Eurycyrtus bellevoyei Reuter 1879: 33
Eurystylus bellevoyei Poppius 1911:17

Remarks: Of the three species of *Eurystylus* occurring in Sri Lanka, the most common and widespread is *E. bellevoyei*. Little is known of the habits of this species, but other species of the genus are known to be pests of certain crops, including *E. marginatus* which causes serious injury to sorghum in Niger (Steck *et al.*, 1989).

Distribution: Algeria, Angola, Botswana, Burkina Faso, Canary Is., Cyprus, Dijbouti, Egypt, Ethiopia, Ghana, India, Libya, Madagascar, Mali, Mauritania, Mauritius, Pakistan, Reunion, Somalia, South Africa, South Yemen, South West Africa, Sri Lanka, Sudan, Tanzania, Togo, Uganda, Yemen, Zaire (Stonedahl, 1995).

Material examined: Hambantota Dist., Palatupana, 10-12 Aug. 1972 (1 ex.) (DZUP).

Phytocoris crinitus Distant

Phytocoris crinitus Distant 1904a: 449

Remarks: Nothing is known of the habits of *P. crinitus* but it is likely to be predatory. The genus *Phytocoris* represents the world's largest mirid genus and contains many predatory species in all zoogeographic regions (Schuh, 1995).

Distribution: Sri Lanka (Distant, 1904a)

Proboscidocoris malayus Reuter

Proboscidocoris malayus Reuter 1908: 188

Remarks: Nothing is known of the habits of this widespread species, but adults are most frequently encountered on flowering herbs. Four other species of *Proboscidocoris* are known from Sri Lanka.

Distribution: Celebes, Guam, Japan, Java, Korea, Lombok, Malacca, Metawey Is., New Guinea, Philippine Is., Sri Lanka, Sumatra, Taiwan (Carvalho, 1959; Schuh, 1995).

Material examined: Kandy Dist., Peradeniya, 26-28.III.1971 (1 ex.) (DZUP), Kandy Dist. Peradeniya, 1-15.II.71 (1 ex.) (SNIC).

Mecistoscelis scirtetoides Reuter

Mecistoscelis scirtetoides Reuter 1891: 132

Remarks: This species is a bamboo specialist (Carvalho, 1956). The second author has observed *M. scirtetoides* causing severe chlorosis to bamboo foliage in Taiwan, making it a potentially important pest, particularly on ornamental species of *Bambusa*.

Distribution: Burma, Caroline Is., Java, Palau, South India, Sri Lanka, Taiwan, Yap Is. (Carvalho, 1959; Schuh, 1995).

Specimens examined: Kandy Dist., Peradeniya, Royal Botanical Gardens, Apr. 1999, T. J. Henry and C. Ariyadasa, on bamboo (9 ex.) (HORDI, NMNH).

Stenotus bipunctatus Poppius

Stenotus bipunctatus Poppius 1911: 17

Remarks: Nothing is known of the habits of this species, but other members of the genus, such as *S. binotatus* (Fabricius), are grass specialists and occasionally become pests of small grains, particularly that are grown for seed production (Wheeler and Henry, 1992). Two other species occur in Sri Lanka.

Distribution: Sri Lanka (Poppius, 1911).

Taylorilygus apicalis Fieber

Lygus apicalis Fieber 1861: 275
Taylorilygus apicalis Schuh 1995: 959

Remarks: This widespread species apparently moves easily via trade and now occurs in nearly all zoogeographic regions, including Sri Lanka (Wheeler and Henry, 1992). It feeds mostly on plants in the Asteraceae, such as *Conyza*, *Matricaria*, *Parthenium*, *Pluchea*, *Pulicaria*, and *Tamarix*.

Distribution: Cosmopolitan (Wheeler and Henry, 1992).

Subfamily Orthotylinae

Eleven species in six genera have been recorded from Sri Lanka (Table 2). So far three species belonging to the genera *Cyrtorhinus*, *Halticus*, and *Zanchius* have been collected in the current study.

Cyrtorhinus lividipennis Reuter

Cyrtorhinus lividipennis Reuter 1885:199

Remarks: This species is an important predator of the brown planthopper, *Nilaparvata lugens* (Stål), on rice in Sri Lanka. Liquido and Nishida (1983; 1985) studied distribution, behaviour, and life history.

Distribution: Borneo, Burma, Caroline Is., China, Fiji, Great Nicobar Is., Guam, India, Java, Japan, Marianas Is., New Guinea, New Hebrides, Philippine Is., Rota Is., Samoa, Sri Lanka, Sumatra (Carvalho, 1958; Schuh, 1995).

Material examined: Polonnaruwa Dist., Hingurakgoda, 5.XI.98 (6 ex.) (HORDI); Polonnaruwa, 6.XI.99, (5 ex.) (HORDI); Badulla Dist., Meegaha Kiula (5 ex.) (HORDI); Kandy Dist., Peradeniya, Hantana Hill, 28.III.73 (1 ex.) (DZUP); Trincomalee Dist., China Bay, 9-11.XI.70, black light (1 ex.) (DZUP); Ratnapura Dist., Ukgalkaltota Irrigation Bungalow, 8.II.70, black light (1 ex.) (DZUP).

Halticus minutus Reuter

Halticus minutus Reuter 1885:197

Remarks: Species of *Halticus,* often called fleahoppers, are frequently mistaken for flea beetles because of their small size, swollen hind femora, and ability to jump. *Halticus minutus* and *H. tibialis* are important pests of vegetable crops in Sri Lanka.

Distribution: Belgian Congo, China, Singapore, Sri Lanka (Carvalho, 1958).

Material examined: Anuradhapura Dist., Maha Illuppallama, 25.V.98-10.IX.98 (8 ex.) (HORDI); Kandy Dist., Galagedara, 29.V.98 (1 ex.) (HORDI); Polonnaruwa Dist., Hingurakgoda, 15.IX.98-22.IX.98 (9 ex.) (HORDI).

Subfamily Phylinae

Twenty-five species belonging to 15 genera have been recorded from Sri Lanka (Table 2). The current survey has collected 20 species. Identified genera include *Acrorrhinus*, *Campylomma*, *Decomia*, *Hallodapus*, *Opuna*, *Pilophorus*, *Sejanus*, *Sthenaridea*, and *Tytthus*. The DZUP collection has seven species of Phylinae, one of which represents a new record for Sri Lanka.

Campylomma livida Reuter

Campylomma livida Reuter 1885: 199

Remarks: Little is known about this small pale species, but Schuh (1984) records *Acacia* and a prickly Euphorbiaceae as hosts. Certain other members of the genus, such as *C. verbasci* (Meyer) also have strong predaceous tendancies (Wheeler and Henry, 1992). One other species occurs in Sri Lanka.

Distribution: Australia, Bengal, Cape Verde Is., India, Java, Philippine Is., Samoa, Sri Lanka, Taiwan (Carvalho,1958; Schuh, 1984; 1995).

Moissonia importunitas Distant

Ragmus importunitas Distant 1910a: 18
Moissonia importunitas Schuh 1995: 353

Remarks: This widespread species, described from Peradeniya, Sri Lanka, occurs on species of *Crotalaria* (Distant, 1910a).

Distribution: Indian, Indonesia, Malaysia, Papua New Guinea, Sri Lanka, Solomon Is., Thailand, Viet Nam (Schuh, 1984).

Specimens examined: Central Prov., Sri Lanka Agricultural Research Station, Sita Eliya (3 km SE of Nuwara Eliya), 22 Mar. 1999, T. J. Henry, A. Wijesekara, and C. Ariyadasa, on *Crotalaria* sp. (7 ex.) (HORDI, NMNH).

Pilophorus typicus Distant

Thaumaturgus typicus Distant 1909b: 519
Pilophorus typicus Poppius 1911: 31

Remarks: The myrmecomorphic genus *Pilophorus* occurs in most zoogeographic regions of the world (Schuh, 1984). Many species are host specific, while others, such as *P. typicus,* are found on a wide range of plant species, suggesting that they may be predatory. One other species occurs in Sri Lanka.

Distribution: China (including Hong Kong), Indian, Indonesia, Japan, Macao, Malaysia, Philippine Is., Ryukyu Is., Sri Lanka, Taiwan, Thailand, Viet Nam (Schuh, 1984).

Tytthus chinensis Stäl

Capsus chinensis Stäl 1859: 258
Tytthus chinensis Carvalho 1956: 41

Remarks: Members of this genus are well-known predators of leafhopper and planthopper eggs. Usinger (1939) observed *T. chinensis* preying on the eggs of *Sogata ochrias* Kirkaldy (on a grass *Sporolobus virginicus*) and the brown planthopper, *Nilaparvata lugens* (Stäl), on rice in Guam. The introduction of *Tytthus mundulus* (Breddin) from Queensland into Hawaii to control the sugarcane delphacid, *Perkinsiella saccharicida* Kirkaldy, provided a classic case of successful biological control (Zimmerman, 1948).

Distribution: Bonin Is., Caroline Is., China, Fiji, Guam, India, Korea, Mariana Is., New Hebrides, Samoa, Society Is., Sri Lanka, Tahiti, Taiwan, tropical southeast Asia, tropical western Pacific (Carvalho, 1958; Schuh, 1995).

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