

Annotated List of the Auchenorrhynchous Homoptera (Insecta) of Bermuda

MICHAEL R. WILSON¹ AND DANIEL J. HILBURN²

Ann. Entomol. Soc. Am. 84(4): 412-419 (1991)

ABSTRACT An annotated list of the Homoptera Auchenorrhyncha found in Bermuda is given, with notes on their host plants where known. Forty three species in eight families are recorded, including 26 new records. Three species are considered endemic: the cicada *Tibicen bermudiana* Verrill, almost extinct; the recently described cicadellid *Curtara bermudensis* Freytag; and the delphacid *Neomegamelanus graminicola* (Muir) n. comb. The remaining species are distributed in eastern North America and the Caribbean. The n. comb. *Nothodelphax slossoni* (Ball) is proposed for *Chloriona slossoni*.

KEY WORDS Insecta, Homoptera, Auchenorrhyncha, Bermuda

THIS PAPER, ONE OF A SERIES on the insect fauna of Bermuda (Hilburn & Gordon 1989; Nakahara & Hilburn 1989a,b; Henry & Hilburn 1990; Hilburn et al. 1990), is based on recent survey work in the islands. The auchenorrhynchous Homoptera of Bermuda (cicadas, spittlebugs, leafhoppers, treehoppers, and planthoppers) are listed with details of distribution elsewhere and any known host plants.

Records of 43 species are given, with 26 new records. Several other older records may involve misidentifications based on the absence of recently collected specimens. Some species appear only recently to have become established in Bermuda.

Natural History of Bermuda. Nakahara & Hilburn (1989a) reviewed the natural history of Bermuda. Both the flora and fauna are depauperate because of the island's very small size (54 km² [21 mi²]) and extreme isolation (1,040 km [646 mi] from Cape Hatteras, N.C.).

Earlier Studies on Auchenorrhyncha. Although many papers treat Bermuda's insect fauna, few treat its Auchenorrhyncha. Kevan's (1981) historical review of terrestrial arthropods specifically mentions only the cicada *Tibicen bermudiana* Verrill from literature between 1603 and 1900. Uhler (1889) listed two species (including *T. bermudiana*); Verrill (1902) listed three. Van Duzee (1909), in the first paper devoted to Hemiptera, recorded seven Auchenorrhyncha species. Van Duzee also produced a typed list of 13 species that was published by Ogilvie (1928). Ogilvie's list of 27 species, the most complete inventory of the fauna until the present work, included earlier records as well as Ogilvie's collecting between 1923 and 1927. Many of the specimens were identified by W. E. China, hemipterist at the British Museum (Natural History) (BMNH), London. Specimens that China

identified from Bermuda are present in the BMNH collection as well as in the Bermuda Agriculture Department collection. Hartzell (1954) listed 14 cicadellid (leafhopper) species based on collections made in 1929. Because the depository of his specimens is unknown, his records were not verified.

The Bermuda Department of Agriculture and Fisheries (BDAF) has maintained an insect collection since 1928. This collection comprises specimens collected by Ogilvie (1923-1927 survey) and more recent contributions by I. W. Hughes, F. Monkman, and K. Monkman. Except for a small reference collection at the BDAF, this collection has been moved to the Bermuda Natural History Museum (BNHM).

Materials and Methods

The following list includes all Bermuda specimens present in the BDAF and BMNH collections. Some specimens from the Van Duzee collection in the California Academy of Sciences, San Francisco, were examined, but many of Van Duzee's records could not be verified because specimens could not be traced. As mentioned above, the specimens listed by Hartzell (1954) are also not available. Most specimens used in this study have come from collections made by M.R.W. and D.J.H. (July 1988) and earlier by D.J.H. (1987-1988). Most specimens were identified by M.R.W., but some determinations were confirmed or made by other specialists indicated below.

Names in the paper are arranged alphabetically by family, subfamily, genus, and species within the series Cicadomorpha, superfamilies Cercopoidea, Cicadoidea, Cicadelloidea, and Membracoidea, and the series Fulgoromorpha, superfamily Fulgoroidea. Published Bermuda literature records of each species are given, followed by the parishes (Fig. 1) where they were collected, notes, host plants where known, and general distribution. Records believed to have been based in misidentifications are included under the current name. Unverified records

¹ International Institute of Entomology, 56, Queen's Gate, London, SW7 5JR, UK.

² Bermuda Department of Agriculture and Fisheries, P.O. Box HM834, Hamilton, Bermuda. Current address: Oregon Department of Agriculture, 635 Capitol St. N.E., Salem, Oreg. 97310.

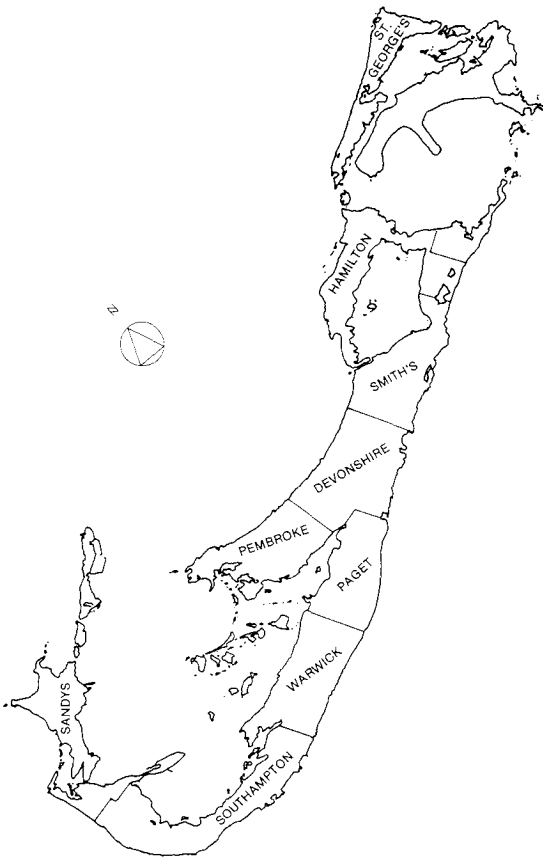


Fig. 1. Map of Bermuda showing parish boundaries.

are listed as they were published. Voucher material is deposited in the Bermuda Natural History Museum, Flatts; the British Museum (Natural History), London, and the National Museum of Natural History, Washington, D.C.

Collecting Sites. About 744 acres of parkland scattered throughout Bermuda are administered by the Department of Agriculture (Jones 1979). Land-use pressure in Bermuda is high, and areas of nature reserve are very small. The majority of the specimens in this study came from just three nature reserve sites: Spittal Pond (Smith's Parish), Paget Marsh (Paget Parish), and Devonshire Marsh (Devonshire Parish). Nevertheless, the small size of the island (32 km long and 3 km wide at maximum) facilitated collecting throughout.

Faunal Relationship. The faunal relationships of the Bermudan Auchenorrhyncha are rather similar to those of the Heteroptera (Henry & Hilburn 1990); most species are widespread in the eastern United States or in the Caribbean. Three species are considered endemic: *Tibicen bermudiana* (Verrill) (Cicadidae), *Curtara bermudensis* Freytag (Cicadellidae), and *Neomegamelanus graminicola* (Muir) (Delphacidae). *T. bermudiana* and *N. graminicola* are closely related to species in the

eastern United States. Most *Curtara* species are known from Central and South America and a few from Mexico and the Caribbean (Delong & Freytag 1976). A few species are almost cosmopolitan, such as *Opsius stactogalus* (Cicadellidae), probably introduced with its host plant (*Tamarix*). Others, including the delphacids *T. cubanus* and *S. kolophon* and the cicadellid *Balclutha incisa*, are widely distributed in tropical and subtropical regions. It is impossible to be certain how most species have arrived in Bermuda or how long they have been established. Almost certainly some have been introduced by man through the importation of plant material, whereas others may have been carried to Bermuda by winds or hurricanes.

Recognition of Bermuda Auchenorrhyncha. No single work will enable one to identify Bermuda Auchenorrhyncha. There is no recent catalog of U.S. Auchenorrhyncha in which to check distributions and nomenclature. References to revisionary works dealing with Bermuda species that contain illustrations, keys, or distributions are given here for each species. The most recent revision for each name has been followed and cited.

Auchenorrhynchoous Homoptera of Bermuda

Cercopoidea: Clastoptera

***Clastoptera undulata* (Uhler).** Dustan 1960: 1-11; Bennett & Hughes 1963: 49. *Parish Records*. Pembroke, St. George's, Smith's, Southampton. *Comment.* First recorded in Bermuda in 1959 on *Casuarina equisetifolia* (Bennett & Hughes 1963), this species spread throughout the islands in <18 mo. Bennett & Hughes described the biology and reported the early attempts at biological control. Elsewhere, *C. undulata* is known from Florida, where it was first recorded in the 1950s (Mead & Bennett 1987), and from Puerto Rico, Mexico, and Cuba. *C. undulata* belongs to a group of closely related species occurring on *Casuarina* in the United States, the West Indies, and Central America (Bennett & Hughes 1963).

Cicadelloidea: Cicadellidae: Agallinae

***Agalliopsis* sp.** New record. *Parish Record*. Paget. *Comment.* One female was collected from Paget Marsh and determined by P. Freytag. The host plant is unknown.

***Aceratagallia sanguinolenta* (Provancher).** Van Duzee 1909: 128; Ogilvie 1928: 21; Hartzell 1954: 379. *Parish Records*. No specimens seen. *Comment.* This record cannot be verified and may refer to *Agalliopsis* sp.

Cicadelloidea: Cicadellidae: Cicadellinae

***Carneocephala flaviceps* (Riley).** New record. *Parish Records*. Paget, Sandys. *Comment.* Ber-

muda specimens have been identified by P. Freytag. *Carneocephala* is a taxonomically difficult genus in which morphological characters often do not adequately separate the species. *C. flaviceps* is widespread in the southern states of North America (Mason & Yonke 1971). Young (1977) recorded *C. flaviceps* as "one of the commonest leafhopper species occurring at light in the coastal plain of North Carolina."

***Draeculacephala producta* (Walker).** Ogilvie 1928: 21; Hartzell 1954: 379. *Parish Records*. Devonshire, Paget, Smith's. *Comment*. A member of another genus of taxonomically difficult species, *D. producta* is commonly collected in grasslands in temperate North America. The genus was revised by Young (1959), and Hartzell (1954) recorded two species: *D. minor* (Walker), regarded as a synonym of *producta* by Young (1959); and *D. mollipes* (Say).

Cicadelloidea: Cicadellidae: Coelidinae

***Jikradia melanota* (Spangberg).** New record. Uhler 1889: 154 (as *Coelidia olitoria*); Verrill 1902: 388; Ogilvie 1928: 21 (as *Jassus olitoria*); Nielson 1979: 86. *Parish Records*. Nonsuch Island; St. George's, Smith's (July). *Comment*. *J. melanota* was found in this survey only at Spittal Pond on buttonwood (*Conocarpus erecta*) (Terminaliaceae). It is a variable species with sexual dimorphism (Nielson 1979). Nielson (1979) considered the closely related *J. olitoria* (Say) to be found in the eastern half of the United States and southeastern Canada. Verrill (1902) (and subsequently Ogilvie [1928]) recorded *Jassus flaviceps* Stål (now, following Nielson [1979], *Kallimorpha flaviceps* (Stål)) from Bermuda. Nielson noted the similarity of this species, which is restricted to Mexico and Panama, to certain *Jikradia* species. Bermuda records of *K. flaviceps* seemingly refer to *J. melanota*.

***Tinobregmus vittatus* Van Duzee.** Osborn 1903: 9; Ogilvie 1928: 21 (Van Duzee ms.). *Parish Records*. None seen in this survey. *Comment*. A series of *T. vittatus* from Bermuda, collected by W. J. Palmer in December 1908 and in the Van Duzee collection at the California Academy of Sciences, San Francisco, has confirmed this record. However, no further specimens appear to have been collected since that date. Osborn (1903) refers to a female specimen collected in Bermuda by C. M. Weed.

Cicadelloidea: Cicadellidae: Deltocephalinae

***Balclutha incisa* (Matsumura).** New record. *Parish Records*. Devonshire, Paget, Sandys, Smith's. *Comment*. Locally abundant on grasses (?sedges) in Bermuda, *B. incisa* belongs to one of the most common and abundant deltocephaline genera in grasslands (Knight 1987). Hartzell (1954: 379) recorded the species *Balclutha abdominalis* (Van Duzee) (as *Eugnathodus abdominalis* (Van Duzee)). This record could not be confirmed and may represent a misidentification of *B. incisa*. In Block-

er's (1967) reclassification of Western Hemisphere *Balclutha*, figures of *B. incisa* were given under *B. hebe* (Kirkaldy) and the figures given as *B. incisa* refer to *B. saltuella* Kirschbaum (Knight 1987). *B. incisa* is widely distributed from North, Central, and South America westward across the Pacific to Asia and eastward to the Canary Islands and Africa. Knight & Webb (1988) recently proposed the subspecies *B. incisa hospes* (Kirkaldy) for populations in Hawaii, Marquesas, and the Americas, based on the structure of the male genitalia. The Bermuda population falls in this subspecies.

***Graminella nigrifrons* (Forbes).** Van Duzee 1909: 128 (as *Thamnotettix perpunctata* Van Duzee); Ogilvie 1928: 21 (Van Duzee ms.) (as *Thamnotettix nigrifrons*); Ogilvie 1928: 21 (as *Thamnotettix colonus* (Uhler)); Hartzell 1954: 379 (as *Thamnotettix nigrifrons*). *Parish Records*. Devonshire, Paget, Sandys, Southampton, Smith's. *Comment*. *G. nigrifrons* is widely distributed in the eastern United States and in the Bahamas, Cuba, Jamaica, and Hispaniola (Kramer 1967). It varies in coloration, and identification requires an examination of the aedeagus. Ogilvie (1928) recorded *Thamnotettix colonus* (Uhler) (now *Unerus colonus*) from Bermuda based on identifications by W. E. China. Specimens identified by China were reexamined and found to be *G. nigrifrons*. Thus, the record of *U. colonus* in Bermuda is probably incorrect.

***Graminella sonora* (Ball).** New record. *Parish Records*. Paget, Smith's. *Comment*. A few specimens were found at Paget Marsh and Spittal Pond, determined by P. Freytag. *G. sonora* is widespread in the southern United States and the Caribbean.

***Exitianus exitiosus* (Uhler).** Van Duzee 1909: 128; Ogilvie 1928: 9, 21 (as *Euscelis exitiosus*); Hartzell 1954: 379 (as *Euscelis exitiosus*). *Parish Records*. Found throughout Bermuda. *Comment*. This grassland leafhopper is widespread in North America (Oman 1949).

***Opsius stactogalus* Fieber.** New record. *Parish Records*. St. George's, Smith's, Southampton. *Comment*. Introduced into the Nearctic Region from the Mediterranean region, *O. stactogalus* is now cosmopolitan and feeds on *Tamarix* and related species (Oman 1949). In Bermuda, this species is abundant on all *Tamarix*.

***Macrosteles quadrilineata* (Forbes).** New record. Ogilvie 1928: 21 (as *Cicadula sexnotata* Fallén (Van Duzee ms.)); Hartzell 1954: 379 (as *Cicadula sexnotata*). *Parish Records*. Devonshire, Paget, Sandys, Smith's. *Comment*. The "aster leafhopper," most commonly known under the name *Macrosteles fascifrons* Stål, is widespread and common across North America and is a vector of aster yellows. North American and Bermudan records of *M. sexnotatus* (Fallén) are incorrect and refer to other species. *M. sexnotatus* is confined to the western Palearctic Region.

***Planicephalus flavicosta* (Stål).** Ogilvie 1928: 20; Hartzell 1954: 379 (as *Deltocephalus flavi-*

costa). *Parish Records*. Devonshire, Paget, St. George's, Sandys, Smith's. *Comment*. *P. flavicosta* is widespread on grasses but is not common. Kramer (1971) recorded *P. flavicosta* among the commonest leafhoppers in the West Indies and Central America; in the continental United States, it is confined to the Gulf states. The related *P. flavicostatus* (Van Duzee) is widely distributed in the eastern and middle western United States and is sympatric with *P. flavicosta* in Louisiana and Florida (Kramer 1971).

Sagatus punctifrons (Fallén). Hartzell 1954: 379. *Parish Record*. Paget (agricultural station, October 1929). *Comment*. No specimens were examined, thus the record was not verified.

Scaphoideus luteolus Van Duzee. Ogilvie 1928: 21. *Parish Records*. No specimens have been seen. *Comment*. No specimens were examined, thus the record was not verified.

Cicadelloidea: Cicadellidae: Gyponinae

Curtara bermudensis Freytag. New record. Freytag 1990: 20. *Parish Records*. Devonshire, Paget, Pembroke, St. George's, Sandys, Smith's. *Comment*. Occurring in low numbers throughout the islands, *C. bermudensis* was described for our study by Freytag (1990) and at present is considered endemic. Other members of *Curtara* are widespread in the Caribbean and South America (Delong & Freytag 1976). The host plant is likely to be a grass.

Cicadelloidea: Cicadellidae: Typhlocybinae

The genus *Empoasca* comprises small, usually green leafhoppers abundant on many herbaceous plants. It is essential to dissect males for correct identification in this genus. Ogilvie (1928) recorded *Empoasca fabae* (Harris) as abundant on a variety of crops and causing damage to them. He also reported *E. fabae* as a pest of gladioli (Waterston 1939) and watermelon (Waterston 1938). Probably several species were involved. Five *Empoasca* species were found during this study, the commonest being *E. bifurcata* Delong. All others were found in low numbers, and only one specimen of *E. fabae* was found in this study. Hartzell (1954) recorded *E. flavescens* (F.) from Bermuda. This Palearctic species was frequently misidentified from the Nearctic Region in early papers. The specimens collected by Hartzell were presumably one of the other *Empoasca* species.

Empoasca abrupta Delong. New record. *Parish Records*. Paget, Sandys. *Comment*. Commonly known as the western potato leafhopper, *E. abrupta* is widely distributed in the western United States and is highly polyphagous. R. J. Gill (California Department of Food & Agriculture, Sacramento) confirmed the identification.

Empoasca bifurcata Delong. New Record. *Parish Records*. Found throughout Bermuda. *Com-*

ment. *E. bifurcata* is the commonest *Empoasca* species in Bermuda and apparently is found on a variety of host plants there. It is widely distributed in the eastern United States and attacks a wide variety of host plants (Poos & Wheeler 1943).

Empoasca fabae (Harris). Ogilvie 1928: 21 (as *Empoa fabae*). *Parish Record*. Sandys. *Comment*. *E. fabae* is commonly known as the potato leafhopper. A single specimen was found during our study. *E. fabae* has a very wide distribution in the eastern part of Canada, the United States, and the Caribbean. Poos & Wheeler (1943) reported a wide range of host plants from which this leafhopper has been collected and reared.

Empoasca fabalis Delong. New record. *Parish Record*. Southampton. *Comment*. Collected in low numbers on *Ipomoea*, *E. fabalis* is elsewhere recorded from Virginia, Maryland, the southern United States (Florida, Texas), the Caribbean, and South America (Metcalf 1968). Caldwell & Martorell (1952) recorded it as common on *Ipomoea* spp. in Puerto Rico.

Empoasca solana Delong. New record. Ogilvie 1928: 21 (as ?*E. unicolor*). *Parish Records*. Devonshire, Paget (agriculture station, specimen determined as *E. unicolor* by W. E. China, in BMNH collection), Sandys. *Comment*. Widespread in the United States, *E. solana* is also found in Mexico, Panama, and Honduras (Metcalf 1968). Poos & Wheeler (1943) recorded a wide variety of host plants and some damage to potato.

Idona minuenda (Ball). Ogilvie 1928: 21 (as *Empoasca minuenda*); Hartzell 1954: 380 (as *Empoasca minuenda*). *Parish Records*. Paget (Hartzell 1954), Paget (February 1989). *Comment*. *I. minuenda* was found on avocado leaves. Elsewhere it is known from Florida, Puerto Rico, Haiti, and Cuba (Metcalf 1968) and also has been noted from avocado in other localities (e.g., Delong 1931, Caldwell & Martorell 1952).

Dikraneura angustata Ball & Delong. New record. Hartzell 1954: 379 (as *D. abnormis* Walsh); Knight 1968: 142 (cited Hartzell record). *Parish Records*. Devonshire, Paget, Sandys, Smith's, Southampton. *Comment*. *D. angustata*, common throughout Bermuda on grasses, is widespread in North America. It is similar to *D. abnormis* Walsh. However, the male genitalia are distinct (Knight 1968).

Cicadoidea: Cicadidae

Tibicen bermudiana (Verrill) (The Bermuda singer or scissors-grinder). Jones 1859: 122 (as *Fidicina tibicen*); Verrill 1902: 736; Ogilvie 1928: 19. *Parish Records*. No live specimens were seen in this survey. *Comment*. One of the earliest insects recorded from Bermuda, *T. bermudiana* was mentioned by Butler (1619) as the "good housewife" because its call resembles the whirring of a spindle. More often, however, it is known as the "singer" or "scissors-grinder" (e.g., Jones 1859, Verrill 1902)

and has been captured in the popular literature (e.g., Earle 1933). This cicada, formerly widespread throughout the islands, is now on the verge of extinction. Its immature stages were apparently associated with the Bermuda cedar, which was devastated by an introduced scale insect (*Carulaspis minima* (Targioni-Tozetti)) in the late 1940s and early 1950s. This cicada has not been seen on the main islands for many years, and only a few individuals have been heard on an isolated island (Nonsuch Is., St. George's Parish), most recently in 1989. The nymphal period underground may be as long as 10 yr, and scattered individuals probably appear intermittently without much success in meeting others. Unfortunately, the future of the species seems doubtful. *T. bermudiana* is considered endemic, but it is very closely related to *Tibicen lyriceus* (DeGeer) from the eastern United States and southern Canada. Song recordings of each species are distinct although similar (T. E. Moore, personal communication).

Membracoidea: Membracidae

Spissistilis festinus (Say). New record. *Parish Records*. Devonshire, Paget, St. George's, Sandys, Smith's. *Comment*. Widespread but not common, specimens of *S. festinus* have been collected June–November. In the United States, *S. festinus* is the most northerly species in the genus and is commonly collected across the United States to the 38th parallel and south into Panama (Kopp & Yonke 1979).

Series Fulgoromorpha: Fulgoroidea: Delphacidae

Delphacodes detecta (Van Duzee). Van Duzee 1909: 128 (as *Liburnia circumcincta* Van Duzee); Ogilvie 1928: 20. *Parish Records*. Sandys, St. George's. *Comment*. *D. detecta* is locally common on *Spartina patens*. Elsewhere, it is widespread in eastern and southeastern United States, Puerto Rico, and the West Indies (Wilson & McPherson 1980a).

Delphacodes puella (Van Duzee). New record. *Parish Records*. Devonshire, Paget, Sandys. *Comment*. Frequently found on grasses in Bermuda, *D. puella* is widespread in the eastern United States (Wilson & McPherson 1980a).

Delphacodes fulvidorsum (Metcalf). New record. *Parish Records*. Paget, Smith's (July, November). *Comment*. A few specimens have been taken from grasslands in Bermuda. Identification was confirmed by S. W. Wilson. In the United States, this species is known from several southern states (Wilson & McPherson 1980a) and is recorded also from Puerto Rico.

Euides weedi (Van Duzee). New record. *Parish Records*. Devonshire, Paget. *Comment*. Two males were taken in Paget Marsh and one male in Devonshire Marsh. Females of this genus were also collected from the same sites but cannot be sepa-

rated to species at present. *E. weedi* is distributed in the eastern and southern United States (Wilson & McPherson 1980a).

Euides triloba (Metcalf). New record. *Parish Records*. Paget, Smith's. *Comment*. One male of *E. triloba* was collected from Paget Marsh and one male from Spittal Pond. The species is known from Florida, Louisiana, and Missouri (Wilson & McPherson 1980a).

Liburniella ornata (Stål). Van Duzee 1909: 128; Ogilvie 1928: 20. *Parish Records*. Devonshire, Paget, St. George's, Sandys, Southampton. *Comment*. Found throughout Bermuda but rarely common, *L. ornata* is widespread and recorded throughout the eastern United States (Wilson & McPherson 1980a) and California (Wilson & Gill 1985).

Neomegamelanus graminicola (Muir). New combination. Ogilvie 1928: 20. *Parish Records*. St. George's, Southampton. *Comment*. Described by Muir (1928) from specimens taken in Southampton Parish on *Spartina patens*, *N. graminicola* was collected again in considerable numbers from this host plant near its type locality and elsewhere in Bermuda. The genus *Neomegamelanus* consists of four species on *Spartina*, which is widespread on the eastern coast of the United States (McDermott 1952). *N. graminicola* resembles closely the North American species *N. elongatus* (Ball) except in characters of the male genitalia; at present, the former is considered endemic to Bermuda.

Nothodelphax slossoni (Ball). New combination. Ogilvie 1928: 20. *Parish Record*. Devonshire. *Comment*. Found in Devonshire Marsh, *N. slossoni* is also found in the eastern United States (Wilson & McPherson 1980a). Concerning the taxonomic position of this species, it was the only "*Chloriona*" recognized in the U.S. fauna, a remnant of a formerly large genus with a diverse assemblage of species now transferred to other genera. *Chloriona* as now applied refers to a small group of pale green, western Palearctic species found on grasses of the genus *Phragmites*. In consultation with S. W. Wilson, *Nothodelphax* seems the most appropriate genus for *N. slossoni* based on the characters of the male genitalia.

Peregrinus maidis (Ashmead). Ogilvie 1928: 20. *Parish Records*. Throughout Bermuda, wherever corn (*Zea mays*) is grown. *Comment*. *P. maidis* is pantropical and is frequently very common on its host plant, *Zea mays*. Ogilvie (1928) recorded it as a "common and serious pest of maize causing discoloration of leaf-sheaths and early dying off." The insect is now known to be the vector of maize mosaic and maize stripe viruses (e.g., Conti 1985).

Pissonotus piceus (Van Duzee). New record. Ogilvie 1928: 20 (as *P. delicatus* Van Duzee). *Parish Records*. Devonshire, Paget, Smith's, Southampton. *Comment*. The determination was confirmed by S. W. Wilson. Widespread in Bermuda but in low numbers. The host plant of *P. piceus* in the United States is *Polygonum* sp. (S. W. Wilson, personal communication). *P. piceus* is found in the

eastern and southeastern United States (Wilson & McPherson 1980a).

***Pissonotus binotatus* Spooner.** New record. *Parish Record*. Southampton. *Comment.* *P. binotatus* was found only at Horseshoe Bay, Southampton Parish. The host plant is not known. *P. binotatus* is known from Florida, Georgia, North Carolina, and Virginia (Wilson & McPherson 1980a).

***Saccharosydne saccharivora* (Westwood).** New record. *Parish Records*. Devonshire, St. George's, Sandys, Smith's. *Comment.* Locally abundant on grasses in dry areas, *S. saccharivora* elsewhere is distributed in the Caribbean, South America, and Florida. In Trinidad, it is a well-known sugarcane pest (e.g., Fennah 1969), but other grasses such as *Andropogon* spp. are also recorded as hosts (Metcalf 1969).

***Sogatella molina* (Fennah).** New record. Ogilvie 1928: 20 (as ?*Liburnia albolineosus* Fowler); Asche & Wilson 1990: 20. *Parish Records*. Devonshire, Paget, Smith's. *Comment.* Locally common in Bermuda on grasses with *Tagosodes cubanus* and *Sogatella kolophon*, *S. molina* is found elsewhere in Mexico, Cayman Islands, and Florida (Asche & Wilson 1990).

***Sogatella kolophon* (Kirkaldy).** Muir & Gifford 1924: 14 (as *S. furcifera*); Ogilvie 1928: 20 (as *Sogata furcifera* Horvath); Fennah 1963: 59 (as *Sogatella kolophon meridiana* (Beamer)); Asche & Wilson 1990: 16 (as *Sogatella kolophon* (Kirkaldy)). *Parish Records*. Devonshire, Paget, Sandys, Smith's. *Comment.* *S. kolophon* is widespread in Bermuda on grasses. The male genitalia resemble those of *S. molina*, but the coloration is usually distinctive, particularly in the males. *S. kolophon* lacks the dark pterostigma of the forewing present in *S. molina* (also, the apical half of the forewing in *S. kolophon* has a grayish or light brownish suffusion of varying extent). *S. kolophon* is widely distributed in the tropics of the Afrotropical, Neotropical, Australian, and Oriental Regions and in the eastern Palearctic Region. In the New World, it occurs in the southern United States, Mexico, the Caribbean, and South America (Asche & Wilson 1990).

***Stobaera concinna* (Stål).** New record. *Parish Record*. Smith's (July, October). *Comment.* One male and one female were taken from Spittal Pond. Kramer (1973) revised the U.S. species and recorded *S. concinna* from Arizona, California, Colorado, Florida, Louisiana, Texas, and Utah. Elsewhere it is known from Mexico, Cuba, Dominican Republic, and Haiti. Species of ragweed (*Ambrosia* spp.) (Calvert et al. 1987) appear to be the host plants. Bermuda specimens are deposited in the BNHM collection.

***Tagosodes cubanus* (Crawford).** New record. *Parish Records*. Devonshire, Paget, Smith's. *Comment.* Locally common in Bermuda on grasses, *T. cubanus* is distributed in the Caribbean region, the southern United States, and West Africa. It resem-

bles *Sogatella molina* (Fennah) in appearance and coloration but differs in the male genitalia. The genus *Tagosodes* was described by Asche & Wilson (1990) who figured the species.

***Toya propinqua* (Fieber).** New record. *Parish Records*. Devonshire, Paget, St. George's, Sandys, Smith's. *Comment.* Common and widespread in grasses throughout Bermuda, *T. propinqua* elsewhere is almost tropicopolitan. It appears to have been omitted from Ogilvie's (1928) list, even though specimens he collected were correctly determined by W. E. China in the BNHM collection.

Fulgoroidea: Flatidae

***Metcalfa pruinosa* (Say).** Ogilvie 1928: 20 (as *Ormenis pruinosa* and as *O. infusata*). *Parish Records*. This species occurs throughout Bermuda. *Comment.* *M. pruinosa* is common on woody shrubs including *Tamarix* spp. and *Juniperus bermudiana*. Ogilvie (1928) listed *Ormenis infusata* Stål (now *Melormenis infusata*) as "found especially near the coast." The BNHM collection and recent collecting yielded no flatid species other than *M. pruinosa*. It is possible that the record of *O. infusata* was a misidentification of *M. pruinosa*, which varies somewhat in color and in quantity of wax bloom. *M. pruinosa* occurs throughout the eastern United States, southern Canada, Cuba, Mexico, and Puerto Rico (Metcalf 1957) and is recorded from 85 plant species (Wilson & McPherson 1980b).

Fulgoroidea: Issidae: Acanaloniinae

***Acanalonia pumila* (Van Duzee).** Van Duzee 1909: 127 (as *Amphiscepa pumila*); Ogilvie 1928: 20. *Parish Records*. St. George's, Smith's, Southampton. *Comment.* Collected from *Borrchia arborescens* (Asteraceae) at various coastal sites, including Spittal Pond and Church Bay, *A. pumila* is known from the coastal areas of Florida and North Carolina (Doering 1932).

Fulgoroidea: Tropiduchidae

***Tangia litoralis* (Fennah).** New record. *Parish Records*. Devonshire, Paget, St. George's, Sandys, Smith's. *Comment.* Widespread throughout Bermuda and frequently very common on a wide range of plants, *T. litoralis* was described from Antigua (Fennah 1945) in the genus *Neurotmeta* and was collected from *Coccoloba wifera* and *Caesalpinia* sp. Fennah (1965) later transferred the species to *Tangia*. No other localities are known at present.

Acknowledgment

The success of this work was made possible by the generous support and provision of funds by Edward Manuel (Director, Bermuda Department Agriculture & Fisheries, Hamilton). We also thank the BDAF (and Hubert Jones, past Parks Administrator) for allowing us

to use the Bermuda Parish map from Jones's (1979) guide. Paul Freytag, (University of Kentucky), Derrick Blocker (University of Kansas), and Ray Gill (California Department of Agriculture) are kindly thanked for confirming and checking some Cicadellidae, and Steve Wilson (Central Missouri State University) assisted with Delphacidae. T. E. Moore (University of Michigan) provided information on *Tibicen bermudiana*. We also thank Tom Henry (USDA-ARS, Washington, D.C.) for useful criticism of this work.

References Cited

- Asche, M. & M. R. Wilson. 1990.** The delphacid genus *Sogatella* and related groups: a revision with special reference to rice-associated species (Homoptera: Fulgoroidea). *Syst. Entomol.* 15: 1-42.
- Bennett, F. D. & I. W. Hughes. 1963.** Studies on the life history and biological control of the spittlebug, *Clastoptera undulata* Uhler (Cercopidae: Hemiptera). *Entomophaga* 8: 49-66.
- Blocker, H. D. 1967.** Classification of the Western Hemisphere *Balclutha* (Homoptera, Cicadellidae). *Proc. U.S. Natl. Mus.* 122: 1-55.
- Butler, N. [1619]. In Lefroy, Sir J. H. [ed.]. 1882.** The history of the Bermudas or Summer Islands. Edited from a MS (750) in the Sloane Collection, British Museum. Publ. Hakluyt Society, vol. 65, no. 1.
- Caldwell, J. S. & L. F. Martorell. 1952.** Review of the auchenorrhynchos Homoptera of Puerto Rico. Part 1. Cicadellidae. *J. Agric. Univ. P.R.* 34: 1-132.
- Calvert, P. D., S. W. Wilson & J. H. Tsai. 1987.** *Stobaera concinna* (Homoptera: Delphacidae): field biology, laboratory rearing and descriptions of immature stages. *J. N.Y. Entomol. Soc.* 95: 91-98.
- Conti, M. 1985.** Transmission of plant viruses by leafhoppers and planthoppers, pp. 289-307. *In* L. R. Nault & J. G. Rodriguez, [eds.], *The leafhoppers and planthoppers*. Wiley, New York.
- Delong, D. M. 1931.** A revision of the American species of *Empoasca* known to occur north of Mexico. *USDA Tech. Bull.* 231.
- DeLong, D. M. & P. H. Freytag. 1976.** Studies of the world Gyponinae (Homoptera: Cicadellidae), a synopsis of the genus *Curtara*. *Brenesia* 7: 1-97.
- Doering, K. C. 1932.** The genus *Acanalonia* in America north of Mexico (Fulgoridae, Homoptera). *Ann. Entomol. Soc. Am.* 25: 758-786.
- Dustan, A. G. 1960.** The spittlebug, *Clastoptera undulata* Uhler, in Bermuda. *Dep. Agric. Bermud. Bull.* 33: 1-11.
- Earle, O. 1933.** Field notes. Bermudian (Jan.): 13.
- Fennah, R. G. 1945.** The Fulgoroidea, or lanternflies, of Trinidad and adjacent parts of South America. *Proc. U.S. Natl. Mus.* 95: 411-520.
- 1963.** The Delphacid species-complex known as *Sogata furcifera* (Horvath) (Homoptera: Fulgoroidea). *Bull. Entomol. Res.* 54: 45-79.
- 1965.** New species of Fulgoroidea (Homoptera) from the West Indies. *Trans. R. Entomol. Soc. Lond.* 117: 95-126.
- 1969.** Damage to sugar cane by Fulgoroidea and related insects in relation to the metabolic state of the host plant, pp. 367-389. *In* J. R. Williams et al. (eds.), *Pests of sugar cane*. Elsevier, Amsterdam.
- Freytag, P. H. 1990.** A new species of *Curtara* (Homoptera: Cicadellidae) from Bermuda. *Entomol. News* 101: 20-22.
- Hartzell, A. 1954.** Notes on the leafhoppers of Bermuda. *Contrib. Boyce Thompson Inst.* 17: 378-380.
- Henry, T. J. & D. J. Hilburn. 1990.** An annotated list of the true bugs (Heteroptera) of Bermuda. *Proc. Entomol. Soc. Wash.* 92(4): 675-684.
- Hilburn, D. J. & R. D. Gordon. 1989.** Coleoptera of Bermuda. *Fla. Entomol.* 72(4): 673-692.
- Hilburn, D. J., P. M. Marsh & M. E. Schauff. 1990.** Hymenoptera of Bermuda. *Fla. Entomol.* 73(1): 161-176.
- Jones, H. 1979.** Guide to Bermuda's public parks and beaches. Department of Agriculture and Fisheries, Hamilton, Bermuda.
- Jones, J. M. 1859.** The naturalist in Bermuda, a sketch of the geology, zoology and botany of that remarkable group of islands; together with meteorological observations. Reeves & Turner, London.
- Kevan, D. K. McE. 1981.** The terrestrial arthropods of the Bermudas: an historical review of our knowledge. *Arch. Nat. Hist.* 10: 1-29.
- Knight, W. J. 1968.** A revision of the holarctic genus *Dikraneura* (Homoptera: Cicadellidae). *Bull. Br. Mus. (Nat. Hist.), Entomol. Ser.* 21: 99-201.
- 1987.** Leafhoppers of the grass-feeding genus *Balclutha* (Homoptera, Cicadellidae) in the Pacific region. *J. Nat. Hist.* 21: 1173-1224.
- Knight, W. J. & M. D. Webb. 1988.** Evidence for an Indo-Pacific origin of Hawaiian endemics in *Balclutha* and related genera (Cicadellidae: Macrostelini). *Great Basin Nat. Mem.* 12: 86-102.
- Kramer, J. P. 1967.** A taxonomic study of *Graminella nigrifrons*, a vector of corn stunt disease and its congeners in the United States (Homoptera Cicadellidae: Deltocephalicae). *Ann. Entomol. Soc. Am.* 60: 604-616.
- Kopp, D. D. & T. R. Yonke. 1979.** A taxonomic review of the tribe Ceresini. *Miscellaneous Publication* 11, Entomological Society of America, College Park, Md.
- Kramer, J. P. 1971.** North American deltocephaline leafhoppers of the genus *Planicephalus* with new generic segregates from *Deltocephalus*. *Proc. Entomol. Soc. Wash.* 73: 255-268.
- 1973.** Revision of the American planthoppers of the genus *Stobaera* (Homoptera: Delphacidae) with new distributional data and host plant records. *Proc. Entomol. Soc. Wash.* 75: 379-402.
- McDermott, B. T. 1952.** A revision of the genus *Megamelanus* and its allies (Homoptera, Fulgoridae, Delphacinae). *J. Kans. Entomol. Soc.* 25: 41-49.
- Mason, C. E. & T. R. Yonke. 1971.** Key to species of Cicadellinae (Homoptera: Cicadellidae) of Missouri with notes on their taxonomy, distribution and biology. *Trans. Mo. Acad. Sci.* 5: 93-120.
- Mead, F. W. & F. D. Bennett. 1987.** Casuarina spittlebug, *Clastoptera undulata* Uhler (Homoptera: Cercopidae). *Fla. Dep. Agric. Consum. Serv. Div. Plant Ind. Entomol. Circ.* 294.
- Metcalf, Z. P. 1957.** General catalogue of the Homoptera. Fasc. IV, Fulgoroidea, Part 13, Flatidae and Hypochthonellidae. North Carolina State College, Raleigh.
- 1968.** General catalogue of the Homoptera. Fasc. VI, Cicadelloidea, Part 17, Cicadellidae. USDA, Washington, D.C.
- 1969.** Studies on the biology of the sugar cane pest *Saccharosydne saccarivora* (Westw.) (Hom.: Delphacidae). *Bull. Entomol. Res.* 59: 393-408.
- Muir, F. 1928.** A new species of *Megamelanus* Ball

- from Bermuda (Homoptera, Delphacidae). *Ann. Mag. Nat. Hist.* (10)2: 213-215.
- Muir, F. & W. M. Gifford. 1924.** Studies in North American Delphacidae. Hawaii. Sugar Plant. Assoc. Exp. Stn. Bull. 15: 1-53.
- Nakahara, S. & D. J. Hilburn. 1989a.** Annotated checklist of the Thysanoptera of Bermuda. *J. N.Y. Entomol. Soc.* 97: 251-260.
- 1989b.** Annotated checklist of the whiteflies (Homoptera: Aleyrodidae) of Bermuda. *J. N.Y. Entomol. Soc.* 97: 261-264.
- Nielson, M. W. 1979.** A revision of the Subfamily Ceolidiinae (Homoptera: Cicadellidae) III. Tribe Teruliini. *Pac. Insects Monogr.* 35: 1-329.
- Ogilvie, L. 1928.** The insects of Bermuda. A preliminary check list. Bermuda Dep. Agric., Hamilton.
- Oman, P. W. 1949.** The Nearctic leafhoppers (Homoptera: Cicadellidae). A generic classification and checklist. Memoir 3, Entomological Society of Washington, Washington, D.C.
- Osborn, H. 1903.** Note on *Tinobregmus vittatus* (Van Duzee). *Ohio Nat.* 4: 9-10.
- Poos, F. W. & N. H. Wheeler. 1943.** Studies on the host plants of the leafhoppers of the genus *Empoasca*. USDA Tech. Bull. 850.
- Uhler, P. R. 1889.** Observations on the insects of the Bermudas, pp. 152-158. In A. Heilprin, The Bermuda Islands: a contribution to the physical history and zoology of the Somers Archipelago. Philadelphia, Pa. (published by author).
- Van Duzee, E. P. 1909.** Notes on some Hemiptera taken in the Bermudas. *Can. Entomol.* 41: 126-128.
- Verrill, A. E. 1902.** The Bermuda Islands. An account of their scenery, climate, productions, physiology, natural history and geology, with sketches of their discovery and early history and changes in their flora and fauna due to man. *Trans. Conn. Acad. Sci.* 9: 1-548 (reprinted by author, 1903, New Haven, Conn., pp. 413-911, "with some changes").
- Waterston, J. M. 1938.** Report of the plant pathologist, 1937. Bermuda Dep. Agric. Rep. 1937: 24-27.
- 1939.** Report of the plant pathologist, 1938. Bermuda Dep. Agric. Rep. 1938: 22-34.
- Wilson, S. W. & R. J. Gill. 1985.** The first record of the delphacid *Lilurniella ornata* in California (Homoptera: Fulgoroidea). *Pan-Pac. Entomol.* 61: 48-49.
- Wilson, S. W. & J. E. McPherson. 1980a.** The distribution of the Fulgoroidea of the eastern United States (Homoptera). *Trans. Ill. Acad. Sci.* 73(4): 7-20.
- 1980b.** A list of the host plants of the Illinois Acanaloniidae and Flatidae (Homoptera: Fulgoroidea). *Trans. Ill. Acad. Sci.* 73(4): 21-29.
- Young, D. A. 1959.** A review of leafhoppers of the genus *Draeculacephala*. USDA Tech. Bull. 1198.
- 1977.** Taxonomic study of the Cicadellinae (Homoptera: Cicadellinae) Part 2. New World Cicadellini and the genus *Cicadella*. N. C. Agric. Exp. Stn. Tech. Bull. 239.

Received for publication 9 April 1990; accepted 19 February 1991.