

Notes on Immigrant Delphacid Planthoppers in Hawaii (Homoptera: Fulgoroidea)¹

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ABSTRACT

Immigrant delphacid planthoppers which have become established in Hawaii since 1960 are discussed, and a revised key to Hawaiian Delphacini (sensu Zimmerman 1948) is presented.

The endemic delphacid fauna of Hawaii contains around 140 described species (Zimmerman 1948). The small non-endemic (immigrant) fauna known from the islands at the time of Zimmerman's treatment included three pests of major economic importance: the sugarcane planthopper (*Perkinsiella saccharicida* Kirkaldy), the corn planthopper (*Peregrinus maidis* (Ashmead)), and the taro planthopper (*Tarophagus proserpina* (Kirkaldy)). The correct name for the latter now appears to be *T. colocasiae* (Matsumura) (Asche and Wilson 1989). One other species, listed by Zimmerman as *Megamelus angulatus* Osborn (= *M. davis* Van Duzee, Beamer 1955), also is an obvious introduction. Additionally, Zimmerman listed *Liburnia paludum* (Kirkaldy) (now placed in *Opiconsiva* Distant) as an immigrant species. This now seems questionable in view of Fennah's (1971) statement that *paludum*, so far as is known, is restricted to Hawaii.

Since 1960 four additional delphacid species have become established in Hawaii. The present paper summarizes information which is available on these recently established immigrants.

Muir (1916), followed by Zimmerman (1948), placed the majority of the endemic Hawaiian Delphacidae in the Tribe Alohini, based primarily on the structure of the large hind tibial spur (calcar). Species in this group feed mainly on dicotyledonous hosts, but also, to a limited extent, on ferns and some monocots other than grasses. See Zimmerman (1948) for list of host genera of Hawaiian delphacids.

The remainder of the Hawaiian delphacids, including all the non-endemic species as well as the native grass-feeding "*Kelisia*" complex (see below), were placed by Muir and Zimmerman in the tribe Delphacini. However, more recently, Asche (1985) dismantled the Alohini and placed all the formerly included genera in the Delphacini.

The key to Hawaiian Delphacini below excludes the endemic species formerly placed in the Alohini, and is restricted to forms belonging to the Delphacini, as formerly defined by Muir (1916) and Zimmerman (1948).

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Most of these species feed normally on grasses, sedges and a few other monocot hosts (e.g. taro). *Megamelus davis* on water lily is an exception. They include *Opiconsiva paludum*, which may be endemic, and the apparently endemic complex of grass-feeding forms that were placed by their describers in the genus *Kelisia* Fieber. Dr. Stephen Wilson (personal communication) has pointed out that the Hawaiian "*Kelisia*" appear to belong to the Delphacini, sensu Asche (1985), and therefore are incorrectly placed in *Kelisia*, since that genus was placed by Asche in a different subfamily, the Kelisiinae. It appears that Kirkaldy's (1910) placement of these species in *Kelisia* has never been critically reevaluated.

KEY TO HAWAIIAN DELPHACINI

Excluding Alohini of Muir (1916)

(partly after Zimmerman 1948)

1. First and second antennal segments flattened, the first subtriangular in outline; primarily on sugarcane *Perkinsiella saccharicida* Kirkaldy
- First and second antennal segments cylindrical or at most only slightly flattened 2
2. Mesal carina of frons forking relatively low on face, at or near level of lower margin of compound eyes; primarily on maize and sorghum..... *Peregrinus maidis* (Ashmead)
- Mesal carina forking higher on face, well above the lower margin of compound eyes, or on vertex 3
3. Antennal segments with dark, longitudinal stripes; basal segment moderately elongate, more than one-half, as long as second; largely pale colored; endemic grass-infesting species complex "*Kelisia*" spp.
- Antennal segments without dark longitudinal stripes; body color sometimes dark, or partly dark; or with basal antennal segment relatively short 4
4. Tibial calcar of hind leg exceptionally large, about twice as long as second segment of antenna, thin, leaflike, concave; on waterlily (*Nymphaea*) *Megamelus davis* Van Duzee
- Tibial calcar smaller, at most only slightly longer than second antennal segment 5
5. Head (in lateral view) distinctly produced, its length in front of eye equal to one-third length of eye or more 6
- Head not appreciably produced, its length anterior to eye less than one-third length of eye 7
6. Head relatively strongly produced, extending in front of eye for a distance equal to more than one-half length of eye (Fig. 1A); both sexes largely dark, head and thorax usually without conspicuous pale longitudinal stripe; on *Cyperus rotundus* *Sardia rostrata pluto* (Kirkaldy)

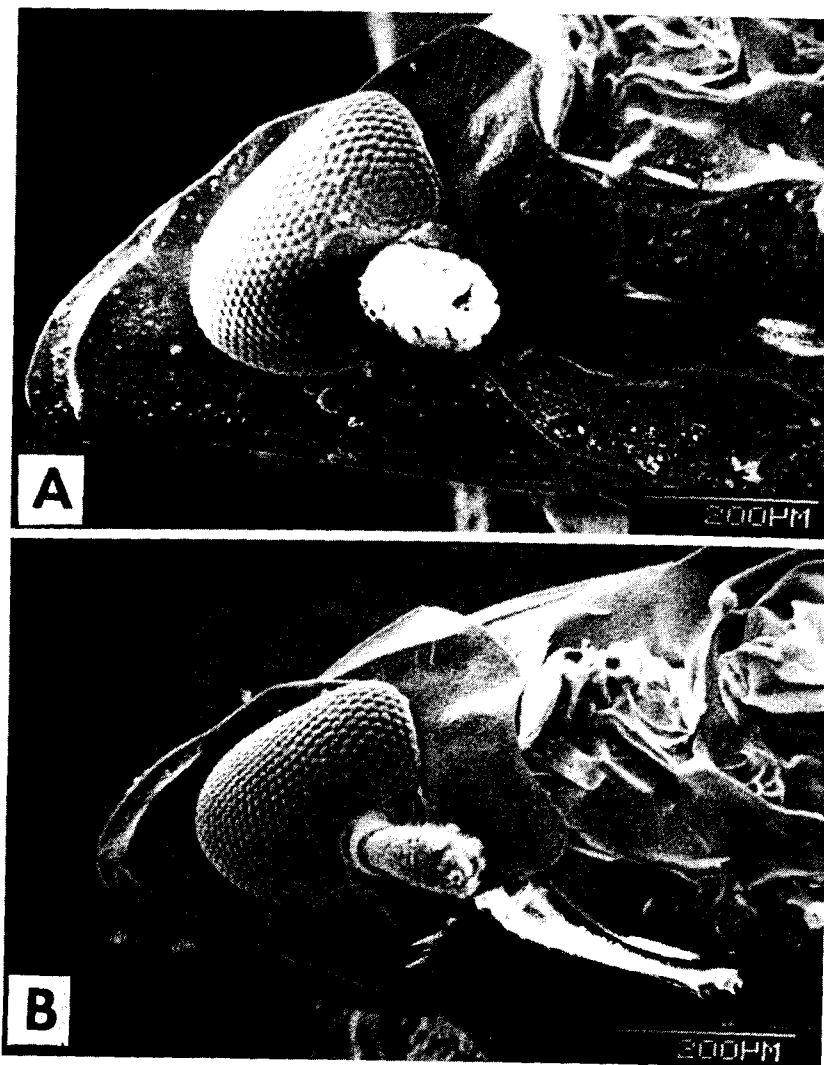


FIGURE 1. Lateral aspect of head and pronotum; A, *Sardia rostrata pluto* (Kirkaldy); B, *Sogatodes eupompe* (Kirkaldy).

Head less strongly produced, length in front of eyes less than one-half length of eye (Fig. 1B); females mostly pale; males blackish with a broad mesal pale stripe extending from vertex to scutellum; on grass (?) *Sogatodes eupompe* (Kirkaldy)

7. Antennal segments relatively elongate, length of basal segment approximately equal to greatest width of frons; largely dark colored species with pale mesal stripe on dorsum of thorax and yellow spot on posterior portion of abdomen; on taro *Tarophagus colocasiae* (Matsumura)

Antennal segments relatively short, length of basal segment conspicuously less than maximum width of frons; generally light brown to straw-colored forms (sometimes dark brown) with pale dorsal stripe; on grasses 8

8. Fork of mesal carina of frons located on upper part of face, the branches enclosing an elongate slender triangular area about 6 to 8 times as long as its basal width (Fig. 2A); apex of male genital style with inner lobe slender, finger-like, conspicuously shorter than outer lobe (Fig. 2B); straw colored to brown species usually with prominent mesal pale stripe on mesonotum *Sogatella kolophon* (Kirkaldy)

Fork of mesal carina located at or near apex of dorsal surface of head (vertex), the branches forming a less acute triangle not more than three times as long as basal width; apex of male genital style with inner and outer lobes relatively similar in shape (Figs. 2C, D); brownish to pale forms without conspicuously pale dorsal stripe 9

9. Vertex and frons more or less concolorous, or with frons slightly darker, vertex not conspicuously paler than frons; carinae of frons and clypeus narrowly somewhat paler than intercarinal areas; male genital styles relatively small and slender (Fig. 2C); ventral processes of male anal segment set close together (similar to Fig. 2B) *Opiconsiva paludum* (Kirkaldy)

Vertex (at least posterior part) strikingly paler than intercarinal areas of frons; carinae of frons and clypeus more broadly, strikingly paler than intercarinal areas; male genital styles relatively large and thick; ventral processes of male anal segments widely separated (Fig. 2D) *Toya dryope* (Kirkaldy)

TAXONOMIC NOTES

Opiconsiva paludum (Kirkaldy) (Fig. 2C).

Kelisia paludum Kirkaldy 1910, Fauna Hawaiiensis 2(6):579.

Liburnia paludum, Zimmerman 1948, Ins. Hawaii 4:242.

Chloriona (*Sogatella*) *paludum*, Fennah 1956, Ins. Micronesia 6(3):120.

Corbulo paludum, Fennah 1971, Ins. Micronesia 6(8):576.

Opiconsiva paludum, Asche 1988, Rev. Fr. Entomol. (n.s.) 10:198.

Prior to 1965 this species had been considered to be widely distributed in the Pacific and somewhat variable in form and color. Fennah (1965) described the genus *Corbulo* with *Delphax dilpa* Kirkaldy, an Australian species, as the type. He also described a second Australian species, *C. dodona*, as new, indicating that this form had been misidentified as *paludum* by Muir (1917). Under *C. dodona* (*loc. cit.*) he stated that the Australian, eastern Asiatic and Fijian forms which Muir had assigned to *paludum* are not conspecific with the Hawaiian form. In a later paper (1971) Fennah placed *Delphacodes guamensis* Metcalf in *Corbulo*, and noted that Micronesian specimens which he had earlier (1956) placed as *paludum*, should be assigned to *guamensis*. In the 1971 paper the distribution for *guamensis* was listed as "Hawaii, Micronesia". This appears to be erroneous as I could not find any other published records, or any specimens determined as *guamensis*, which are from Hawaii. Furthermore, none of the specimens from Hawaii that I examined appear to fit Fennah's concept of *guamensis*. Fennah (1971) discussed differences between *dodona*, *guamensis* and *paludum*, and stated that, so far as is known, *paludum* is restricted to Hawaii.

Fennah (1975) placed *C. dodona* in *Opiconsiva* Distant, but did not mention the other Pacific species which he had placed previously in *Corbulo*. Asche (1988) placed *Corbulo* in synonymy under *Opiconsiva*.

In his 1971 paper Fennah also described two new species of *Corbulo*, *C. bronteo* from the Gilbert Islands and *C. messalina* from Wake Island. After reexamining specimens from the Hawaiian Leeward Islands collected by myself and others, which previously had been determined as *paludum* (Beardsley 1966), I found that these specimens seem closer to *messalina* than to *paludum* from the main Hawaiian Islands.

A reevaluation of all Hawaiian *Opiconsiva* material is needed to clarify the status of the Leeward Island populations. Local collections contain specimens from Laysan, Midway, and Pearl and Hermes Atoll in the Leeward group.

Sardia rostrata phuto (Kirkaldy) (Fig. 1A).

Hadeodelphax phuto Kirkaldy 1906, Expt. Stn. H.S.P.A. Entomol. Bul. 1(9):410.

Sardia phuto, Fennah 1956, Ins. Micronesia 6(3):114; Beardsley 1979, Proc. Hawaii. Entomol. Soc. 23:21.

Sardia rostrata phuto, Fennah 1965, Bul. British Museum (Nat. Hist.) Entomol. 17:44.

The type locality of this subspecies is Queensland, Australia. Fennah (1956) listed it from eastern Australia, New Caledonia, Fiji, Samoa, Tahiti, Philippines, Formosa, and Caroline Islands. The type locality of the typical form of *S. rostrata* Melichar is Sri Lanka.

This planthopper was first collected in Hawaii during September 1976, in a light trap operated at Honolulu International Airport (Beardsley 1979).

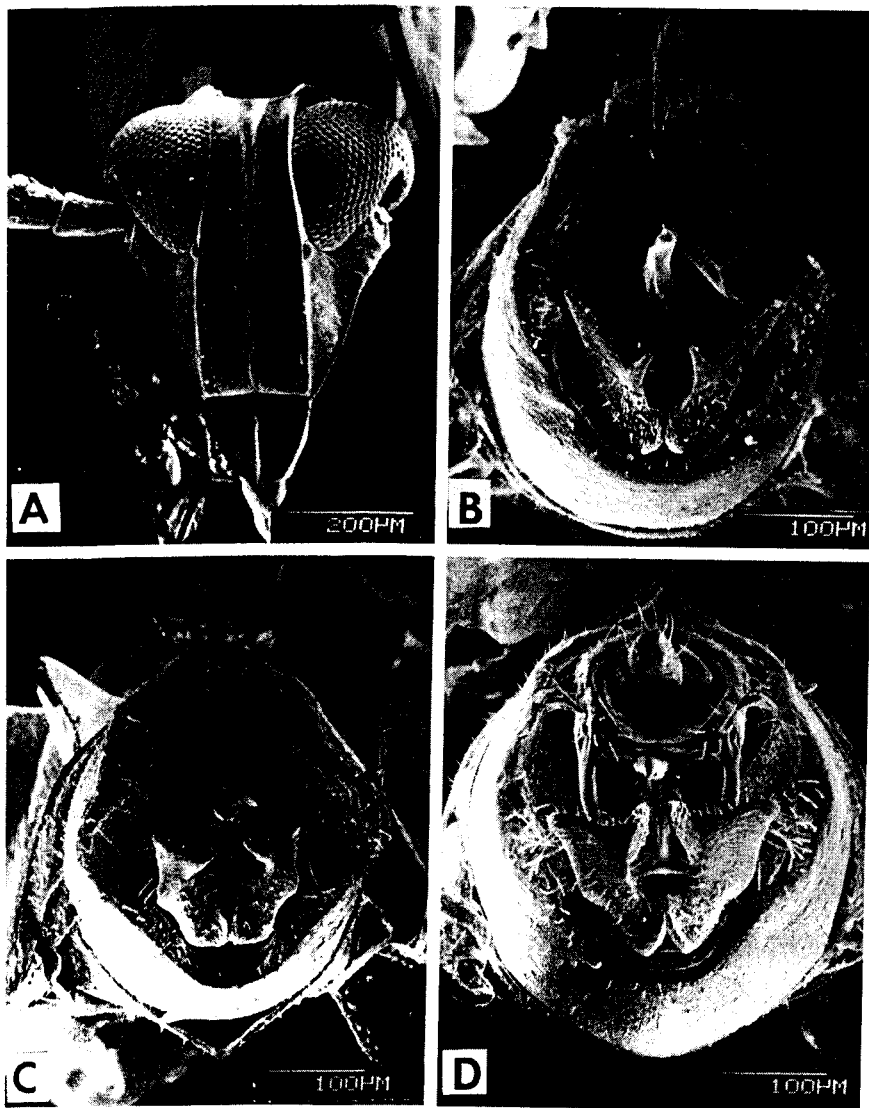


FIGURE 2. A,B, *Sogatella kolophon* (Kirkaldy). A, frontal view of head; B, male genitalia, posterior view (note that right side of pygofer is broken); C, *Opiconsiva paludum* (Kirkaldy), male genitalia; D, *Toya dryope* (Kirkaldy), male genitalia.

Specimens were taken on Kauai in a light trap at Haena, Oct. 1981, by M. Conant, and at Hilo, Hawaii in July 1988 by S. Matayoshi.

During 1980, D.A. Muruvanda found all stages of *Sardia rostrata* *pluto* infesting the common purple nutsedge, *Cyperus rotundus* L., on Oahu (Muruvanda and Beardsley 1983).

Sogatella kolophon (Kirkaldy) (Figs. 2A, B).

Delphax kolophon Kirkaldy 1907, Expt. Stn. H.S.P.A. Entomol. Bul. 3:157.

Chloriona (*Sogatella*) *kolophon*, Fennah 1956, Ins. Micronesia 6(3):116; Beardsley 1962, Proc. Hawaii. Entomol. Soc. 18:18.

Sogatella kolophon, Fennah 1963, Bul. Entomol. Res. 54:58; Ins. Micronesia 6(8):573.

This is another widely distributed planthopper which was originally described from Australian material. Fennah (1963, 1971) listed its distribution as Queensland, Fiji, Formosa, Philippines, Micronesia and Hawaii. Fennah (1963) confirmed the identity of Hawaiian specimens. It was first collected here in material from a light trap operated at Waipio, Oahu, in 1961 (Beardsley 1962). Local collections contain specimens from Nihoa, Kauai, Oahu, Molokai, Maui, Lanai and Hawaii islands.

This species has been taken in Hawaii on various grasses, including *Eleusine indica* (L.) Gaertn. It is a member of a complex of species that includes *S. furcifera* (Horvath), a well-known pest of rice. Fennah (1963) treated this complex.

Sogatodes eupompe (Kirkaldy) (Fig. 1B).³

Delphax eupompe Kirkaldy 1907, Expt. Stn. H.S.P.A. Entomol. Bul. 3:162.

Liburnia eupompe, Swezey 1946, B. P. Bishop Mus. Bul. 189:153.

Chloriona (*Sogatella*) *eupompe*, Fennah 1956, Ins. Micronesia 6(3):118.

Sogatodes eupompe, Fennah 1965, Bul. British Mus. (Nat. Hist.) Entomol. 17:46.

Sogata eupompe, Beardsley 1986, Proc. Hawaii. Entomol. Soc. 27:13.

This planthopper was first collected in Hawaii in light trap material from Hickam Air Force Base Oahu, during May 1985 (Beardsley 1986). It was taken at Hilo, Hawaii in January 1988 by S. Matayoshi.

Kirkaldy's description of this species was based on specimens from Australia (Queensland and New South Wales) and Fiji. Apparently it is widespread in the south and western Pacific islands. Kramer (pers. comm.) listed it as occurring in Philippines, Fiji, Samoa and Tahiti. Fennah (1956) recorded it in Micronesia from Guam, Saipan, Palau and Woleai.

No breeding hosts have been recorded for this species; it is presumed to feed on grasses.

³Dr. Manfred Asche (pers. comm.) informed me that this species is being placed in the genus *Latistria* Huang et al., in a paper now in press.

Tarophagus colocasiae (Matsumura).

Liburnia (*Delphax*) *colocasiae* Matsumura 1920. Dainippon Gaichu Zensho, Fulgoroidea (in Japanese), p. 225.

Megamelus proserpina Kirkaldy; misinterpretation by Fullaway 1937. Proc. Hawaii. Entomol. Soc. 9:405.

Tarophagus proserpina Kirkaldy; misinterpretation by Zimmerman 1948. Insects of Hawaii. Vol. 4. Homoptera: Auchenorrhyncha; p. 247.

Tarophagus colocasiae (Matsumura), Asche and Wilson 1989. Bul. Entomol. Res. 79:288.

The taro leafhopper of Hawaii has been referred to Kirkaldy's *proserpina* since it was discovered here in 1930 (Fullaway 1937, Zimmerman 1948). However, the recent paper by Asche and Wilson (1989) recognizes three distinct species of *Tarophagus* associated with taro in the Pacific. Furthermore, these authors placed Hawaiian specimens as *T. colocasiae*, a species described originally from Japan, but which Asche and Wilson showed to be widely distributed from south Asia, through the Western and Central Pacific islands, to Hawaii.

Toya dryope (Kirkaldy) (Fig. 2D).

Delphax dryope Kirkaldy 1907, Expt. Stn. H.S.P.A. Div. Entomol. Bul. 3:154.

Delphacodes dryope, Muir 1917, Proc. Hawaii. Entomol. Soc. 3:333.

Toya dryope, Fennah 1965, Bul. British Mus. (Nat. Hist.) Entomol. 17:56;

Beardsley 1989, Proc. Hawaii. Entomol. Soc. 30:8.

This planthopper is another widespread form of south Pacific origin. Fennah (1965) listed its distribution as Australia (type locality, Queensland) and New Zealand, but it is known also from Fiji, New Caledonia, Samoa and Tahiti, based on my examination of specimens in the Bishop Museum collection. It was first collected in Hawaii on Oahu in May 1988 (Beardsley 1989).

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