

SYSTEMATICS AND EVOLUTION OF HAWAIIAN PLANTHOPPERS (HOMOPTERA:  
FULGOROIDEA): COMMON PACIFIC ANCESTRY OR SPLENDID ISOLATION?

M. Asche

Museum für Naturkunde der Humboldt Universität, Institut für Systematische Zoologie, Invalidenstr. 43, D-10115 Berlin, Germany

With 206 endemic species, the phytophagous Fulgoroidea, or planthoppers, are among the most significant elements of the native Hawaiian fauna (e.g., Muir 1916; Zimmerman 1948). These predominantly mono- or oligophagous insects play important roles in nearly all Hawaiian terrestrial ecosystems. Species of only 2 out of 18 planthopper families occurring worldwide have successfully colonized and subsequently radiated in Hawaii. Based on collections mainly made by Perkins, Kirkaldy, Muir, Giffard, and Swezey, more than 95 % of these species were discovered and described in the first three decades of this century. Recent inventories on all islands, and especially studies on the intraspecific communication of selected planthoppers (e.g., cavernicolous taxa of the family Cixiidae, see Hoch and Howarth, 1993) have revealed a much higher degree of species diversity leading to an estimate of a total of 350-400 species.

However, the taxonomy of this group still reflects the standard of the early century. A recent comparative morphological study has revealed that only few Hawaiian planthopper genera can be regarded as monophyletic (Asche in press); others are evidently polyphyletic, including *Nesosydne*, the largest genus of Delphacidae in the Pacific which is also reported from areas outside of Hawaii (e.g., Marquesas, Society, and Galápagos Islands (e.g., Fennah 1958, 1967). According to the morphological data, in Cixiidae apparently two independent primary colonisations of yet uncertain origin of the ancestral species have occurred, i.e. *Iolania* and *Oliarus*. The non-Hawaiian *Iolania* species from Australia do not belong into this group. In Delphacidae at least eight primary invasions from an unknown source can be assumed, today represented by the following monophyletic groups: *Aloha partim*, *Dictyophorodelphax*, *Emoloana*, *Leialoha* + *Nesothoe*, *Nesodryas*, and at least four groups within *Nesosydne* s.l. (Asche in press).

According to our present knowledge, the Hawaiian planthoppers appear to be not closely allied to any taxa on other Pacific islands. Their origin is obscure. However, due to the lack of a sound phylogenetic analysis of this group, any conclusions on biogeography and evolutionary history of the Hawaiian planthoppers are rather tentative. Therefore a modern biosystematic study of the native Hawaiian planthoppers at all biological levels is proposed which will include morphological systematics, behavioral ecology, and population genetics, the latter especially in selected populations which presumably have co-evolved or are presently co-evolving with certain hostplants or plant communities (e.g., a group of ca. 10 apparently closely related morphospecies of *Nesosydne* s.str. with *Acacia koa*, and a group of 10-15 delphacid species in the silversword-alliance). For future research, molecular genetics is strongly needed to provide additional data-sets to elucidate the evolution of planthoppers in Hawaii and elsewhere in the Pacific.

#### REFERENCES

- Asche, M. in press. A review of the systematics of Hawaiian planthoppers (Hemiptera: Fulgoroidea). Pacific Science.
- Fennah, R.G. 1958. Fulgoroidea of South-Eastern Polynesia. Transactions of the Royal Entomological Society London 110: 117--220.
- , 1967. Fulgoroidea from the Galapagos Archipelago. Proceedings of the California Academy of Sciences (4th Ser.) 35: 53-102.
- Hoch, H. and F.G. Howarth 1993. Evolutionary Dynamics of Behavioral Divergence among Populations of the Hawaiian Cave-dwelling Planthopper *Oliarus polyphemus* (Homoptera: Fulgoroidea: Cixiidae). Pacific Science 47: 303--318. Hawaii Press, Honolulu, 160 pages.
- Muir, F. 1916. Review of the Autochthonous Genera of the Hawaiian Delphacidae. Proceedings of the Hawaiian Entomological Society 3: 168-221.
- Zimmerman, E.C. 1948. Homoptera Auchenorrhyncha. Pages 1-268 in Insects of Hawaii, vol. 4. University of Hawaii Press, Honolulu.

**PROGRAM & ABSTRACT BOOK**



# **9th International Auchenorrhyncha Congress**

**17-21 FEBRUARY 1997**

**Supported by**

The Australian Academy of Science  
Australian Entomological Society  
and Industry



**SYDNEY AUSTRALIA**