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## Marine insects of Guam: Heteroptera and Diptera

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**Abstract**—A list of marine Heteroptera and Diptera currently known from Guam is given. Some notes on biology and distribution are also included.

### Introduction

Although insects are the most abundant animals on land, relatively few species are known to live or breed in marine environments. They are actually not uncommon in many near-shore habitats and may be rather abundant in mangrove swamps or salt marshes, but are often overlooked (Cheng 1976, Cheng & Frank 1993). We know of no specific studies on the marine insects of Guam, but several species from marine habitats had been included in “Insects of Guam” (Usinger 1946). The following is a list of marine insects in the orders Heteroptera (Families: Gerridae, Veliidae and Saldidae) and Diptera (Families: Tethinidae, Ephydriidae and Canacidae) presently known from Guam. There are undoubtedly other species or insects in other orders associated with mangroves or near-shore vegetation in salt marsh areas that are yet to be collected and identified.

#### Order Heteroptera Family Gerridae

The gerrids, commonly known as pond-skaters or water-striders, constitute one of the largest families of aquatic Heteroptera. Although most of the genera occur in freshwater, many species can be found in marine or brackish-water habitats. They are predators and will feed on any insects, small invertebrates or even fish fry or tadpoles that are trapped at the water surface. Only two genera have been reported from Guam, *Halobates* and *Limnogonus*.

### Genus *Halobates*.

The genus *Halobates* is almost exclusively marine. There are 45 known species, five are pelagic, the others are found in coastal waters around tropical islands (Cheng 1985). Only one coastal species, *Halobates mariannarum* Esaki, is known from Guam. Some information on its biology can be found in Cheng (1981). It is common within protected coral reefs at Piti but rather less common around Tumon beach (Usinger 1946). Many specimens have been collected from mangrove areas at Apra Harbor and Merizo (Cheng 1981). Additional locations for this species include Pago Bay and a sheltered bay at Bagbag Beach, Orote Point Naval Station (Polhemus & Cheng 1982). Originally described from the island of Rota, *H. mariannarum* is common elsewhere in Micronesia and has been collected from Yap, Truk, Pohnpei, Kosrae and Arno Atoll (Cheng 1981, Herring 1961).

The following coastal *Halobates* species are known from Micronesia but have not been reported from Guam so far:

*H. flaviventris* Eschscholtz – Belau (Palau) and tropical Indian Ocean shores (Cheng 1981, Herring 1961, Polhemus & Cheng 1982).

*H. nereis* Herring - Belau, also known from Papua New Guinea (Herring 1961, Cheng 1981, Polhemus & Cheng 1982).

*H. princeps* White - Belau, also known from Papua New Guinea, Celebes, Indonesia and Malaysia (Herring 1961).

In addition, three open-ocean *Halobates* species, *H. micans* Eschscholtz, *H. germanus* White and *H. sericeus* Eschscholtz are widely distributed in the Pacific (Cheng 1989) and are likely to be found in offshore waters around Guam. *H. sericeus* has been reported from Johnston Island (Bryan & Swezey 1926) and the other two have been collected elsewhere in Micronesia:

*H. micans* - Enewetak, Belau, Truk (Cheng 1981).

*H. germanus* - Belau (Cheng 1981).

### Genus *Limnogonus*

Only one species, *Limnogonus luctuosus* (Montrouzier), was collected at Agana Swamp (Usinger 1946). This is normally a freshwater species, but is known to tolerate brackish water.

### Family Veliidae

Veliidae is a family of rather small aquatic bugs. Only one genus, *Halovelina*, is known from Guam. It is exclusively marine and usually found among coral rocks or boulders in the intertidal.

### Genus *Halovelia*

The species *Halovelia marianarum* Usinger, described by Usinger in 1946, was later found to be a synonym of *Halovelia bergrothi* Esaki (Andersen 1989a). It was reported to be common within protected coral reefs and at a rocky coral shore at Asanite Bay, occurring in 3s or 4s, but not in large numbers. Several pairs were captured in copula (Usinger 1946). It has also been collected elsewhere in Micronesia, in the Marianas, Carolines, and the Marshall Islands (Andersen 1989b).

Another species, *Halovelia carolinensis* Andersen, was described from the Caroline Islands (Andersen 1989a) and may be found in Guam.

### Family Saldidae

Saldidae are shore bugs usually found along shorelines where they hunt for food. Although most genera are found in freshwater habitats, many species are known to occur in brackish areas. Two genera have been reported from Guam, each represented by one species.

### Genus *Saldula*

The species *Saldula marianarum* Usinger was collected from Agana Swamp, presumably brackish, and described by Usinger (1946).

### Genus *Salduncula*

The species, *Salduncula swezeyi* Drake, originally described as *Saldula swezeyi* by Usinger (1946), was collected at Tarague, Guam.

### Order Diptera

### Family Tethinidae

The family Tethinidae has comparatively few species worldwide (126 spp, Mathis & Munari 1996) and is commonly found in coastal marine habitats (Karl 1930). Some species, however, occur inland, usually associated with saline biotopes, such as salt lakes and alkaline hot springs. Coastal marine habitats include the intertidal zone, wrack heaps (usually brown algae that are most abundant along temperate seashores bathed by cold currents), salt marshes, dune vegetation, lagoon-litoriparian zones, mangroves (particularly species of *Dasyrhicnoessa*), and on salty soils or bare sand. Three genera and six species have been reported from Guam (Sasakawa 1995). The six species on Guam are notable in having comparatively wide distributions, and have affinities largely if not wholly to the Oriental and Australasian faunas.

### Genus *Dasyrhicnoessa*

Four species, *D. ferruginea* (Lamb), *D. sexseriata* (Hendel), *D. tripunctata* Sasakawa and *D. vockerothi* Hardy and Delfinado, are known from Guam, and others, such as *D. insularis* (Aldrich), may occur there, being found elsewhere in Micronesia. The four species occurring on Guam have widespread distributions in Micronesia and in the Oriental Region, and *D. vockerothi* is also known from Hawaii and as far west as the Seychelles (Munari 1990).

### Genus *Pseudorhicnoessa*

A single species, *P. spinipes* Malloch, has been reported from Guam and is also known from Micronesia as well as Malaysia, Ryukyus, Taiwan and Vietnam.

### Genus *Tethina*

One species, *T. orientalis* (Hendel), is known from Guam. It has also been reported from Hong Kong, Ryukyus and Taiwan.

### Family Ephydriidae

Among acalyptrate Diptera, the family Ephydriidae demonstrates exceptional diversity, with nearly 1,800 species worldwide (Mathis & Zatwarnicki 1995). The family, more commonly known as shore- or brine-flies, also exhibits considerable adaptive evolution. Oldroyd (1964), a noted British dipterist, wrote that the family Ephydriidae is "...nothing if not versatile..." and is "...in the full flower of its evolution." We concur with Oldroyd and submit this checklist to document the family's richness and evolutionary diversity on Guam, where 15 genera and 17 species have been recorded.

The diversity exhibited by shore-flies includes more than species richness, as Oldroyd alluded. Although most shore-fly species are aquatic or semiaquatic as immatures, feeding as browsers or filter feeders, the larvae of others are terrestrial, feeding as leaf miners, parasitoids in spider eggs, predators in clusters of frog eggs, or being saprophagous on carrion, feces, or stranded snails. Many species have adapted to such inhospitable environments as sulfurous hot-springs, highly alkaline or saline lakes, and, perhaps most notably, exposed pools of crude petroleum.

### Genus *Clasiopella*

Only one species, *C. uncinata* Hendel, is known from Guam. This species, although apparently originating in the Australasian/Oceanian and/or Oriental Region, is now widespread in the tropics, occurring in the African and New World tropics as well as northern Australia (Mathis 1994). Cresson (1945, 1946a,

1946b) noted that the specimens he studied from Midway Island, the Caribbean and Kenya were interceptions on airplanes. This may be how this fly was introduced to such widely separated regions.

#### Genus *Discomyza*

A single, widespread species, *D. maculipennis* (Wiedemann), is known from Guam. This is one of the most widespread shore-flies, occurring throughout Oceania, the Oriental Region, Japan and the Caribbean. The species, which is frequently associated with highly organic debris, has apparently been introduced to the Caribbean from the Old World, probably through human commerce.

Bergensstamm (1864) apparently first observed larvae of this genus developing in the snail *Helix pomatia* L. Cresson (1939) reported that larvae of *D. maculipennis* are necrophagous in land snails, particularly those occurring near saline water. On Guam, Bohart & Gressitt (1951) found larvae breeding in small carrion, especially mollusks.

#### Genus *Hostis*

*Hostis* is a monotypic shore-fly genus with *H. guamensis* Cresson as its only known species, and the type locality is Guam (Mathis 1993). It is also known from the Seychelles, Australia, Fiji, French Polynesia, Hawaiian Islands, Marshall Islands, Micronesia and Palmyra Atoll. Specimens are found on sandy beaches where some debris has accumulated, usually at the high tide mark. The immature stages are unknown.

#### Genus *Trypetomima*

Two species are found on Guam: *T. completa* Cresson, also known from American Samoa, and *T. solitaria* Cresson, which is also known from Papua New Guinea and the Solomon Islands.

#### Genus *Psilopa*

Only one species, *P. rufipes* Hendel, is known from Guam. The species also occurs in Australia, Papua New Guinea, India, Ryukyus, Malaysia, Philippines and Taiwan.

#### Genus *Chlorichaeta*

The only species known from Guam is *C. tuberculosa* Becker, which has also been reported to occur widely in Africa, the Middle East, the Oriental Region and on Hawaii in Oceania (Mathis & Zatwarnicki 1993). Cresson (1945) reported that *C. tuberculosa* bred in rotten oil-cake manure in Madras, India, and that the dissemination of the manure may account for the wide distribution of this

species. Adults are attracted to moisture on animals, including humans on Guam (Bohart & Gressitt 1951), and are frequently associated with livestock with suppurating sores (Cresson 1946b).

#### Genus *Placopsidella*

A single, widespread species, *P. cynocephala* Kertész, is found on Guam. Elsewhere the species occurs extensively in the Australasian, Oceanian, Oriental and Neotropical Regions. Its occurrence in the New World, the Caribbean region specifically, is apparently adventive, perhaps as a recent introduction (Mathis 1997). It has been collected from seashore habitats that were covered with large rocks, such as man-made jetties or seawalls or naturally occurring cliffs and beach rock (Mathis 1986).

#### Genus *Ochthera*

Only one species has been reported, *O. pilimana* Becker. It is also known from tropical Africa, Australasia, India, Indonesia, The Philippines, Taiwan, Egypt, Israel and Japan. Both larvae and adults are predatory. Bohart & Gressitt (1951) found adults on Guam near the Pago garbage dump, where they preyed on *Culex* mosquito larvae.

#### Genus *Hecamede*

This genus is also represented by one species on Guam, *H. granifera* (Thomson). Like many shore-flies reported from the island, it is very widespread, occurring from Hawaii in the west-central Pacific through Oceania, eastern Oriental, the Palearctic, and throughout the Indian Ocean to East Africa.

Bohart & Gressitt (1951) found adults of this species (as *H. persimilis*) to be abundant on beaches of Guam. Specimens occurred on moist sand, low-growing beach vegetation, and dead fish. They also discovered large numbers of maggots in damp, foul-smelling sand beneath a human carcass. Only rarely did they find adults on vegetation in a coconut grove, about a mile from sea.

#### Genus *Orasiopa*

From Guam, this genus is known by one species, *O. mera* (Cresson). It is found on organic debris on shores and is widely distributed in Australasian/Oceanian and Oriental Regions. More recently, this species has apparently been introduced to the Caribbean (Mathis 1997).

#### Genus *Hecamedoides*

The single species known from Guam, *H. hepaticus* (de Meijere), is also known from Australasia, Oceania and the Orient.

### Genus *Polytrichophora*

Only one species, *P. brunneifrons* (de Meijere), is known from Guam. It is also known from Aldabra, Seychelles, Australasia, Oceania and the Orient.

### Genus *Paralimna*

Two species of *Paralimna* occur on Guam and both belong to the subgenus *Phaiosterna*: *P. fusca* Bock and *P. lineata* de Meijere. *P. lineata* is relatively abundant on Guam and is widespread in the Australasian/Oceanian and Oriental Regions. *P. fusca*, although much less common, has essentially the same distribution as *P. lineata*. Both species are tolerant of brackish-water environments but also occur in freshwater habitats. Bohart & Gressitt (1951) found larvae of *P. lineata* in pig droppings, and adults were abundant in bogs below Agana Spring and elsewhere on Guam.

### Genus *Brachydeutera*

A single species, *B. adusta* Mathis & Ghorpade, is reported from Guam. It is also known from the Caroline Islands, Australia and the Solomon Islands. On Guam, Bohart & Gressitt (1951) found adults associated with stagnant water that was muddy and usually contaminated.

### Genus *Setacera*

Only one species is known from Guam, *S. breviventris* (Loew). It is a widely distributed species and has been found in tropical Africa, Australia, Pacific Islands, the Orient and Europe.

### Family Canacidae

The Canacidae, more commonly known as beach- or surf-flies, occur in temperate and tropical zones throughout the world, usually associated with maritime beaches. The family has comparatively few known species (113 spp, Mathis 1992) but many more remain to be described, especially from the Pacific.

### Genus *Nocticanace*

On Guam, the Canacidae are represented by a single species, *N. peculiaris* Malloch, which is associated with algae on rocks. This species also occurs on the Austral Islands, Marianas Islands, Marquesas, Mangareva and Okinawa.



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