

Rediscovery of the introduced mayfly *Caenis nigropunctata* (Ephemeroptera: Caenidae) in Waimānalo Stream, O'ahu

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The aquatic insect fauna of the Hawaiian Archipelago is represented by taxa derived from groups that typically exploit marine littoral environments (such as Diptera in the families Ephydriidae, Canacidae, and Chironomidae) or are derived from ancestral stock that had the ability to disperse over considerable distances, such as the Odonata (Howarth & Polhemus, 1991). Other groups well-represented in continental settings are absent: no native Ephemeroptera, Plecoptera, or Trichoptera are found in the Hawaiian Islands. Taxa in these orders characteristically have short-lived terrestrial adult life stages that limit their ability to disperse over the great distances required for mid-ocean colonization.

This paper details the rediscovery of the introduced mayfly, *Caenis nigropunctata* (Klapálek) in Hawai'i. Voucher specimens are deposited in Bishop Museum (BPBM).

Ephemeroptera in Hawai'i

Although at least 3 species have been introduced to Hawai'i, the status of mayflies in the Hawaiian Islands has been uncertain for some time. Two heptageniid species, *Nixe rosea* (Traver) and *Epeorus lagunitas* (Traver) were deliberately introduced to Koke'e and Kawaikoi streams, which originate in the Alaka'i swamp area of Kaua'i (Usinger, 1972). The source material for the introductions was from eggs collected from gravid females found in Waddell Creek of the Santa Cruz Mountains, central California. Approximately 98,600 *N. rosea* eggs and 65,000 *E. lagunitas* eggs were transported to the Koke'e area in 3 shipments in July and August 1961 (Usinger & Needham, 1960, 1961, 1962). The introductions were to serve as a food source for introduced rainbow trout (*Onchorynchus mykiss*) which were stocked (and continue to be stocked) for sportfishing in the region. These introduced mayflies have not been found in recent collections and appear to have died out (Howarth & Polhemus, 1991; Englund *et al.*, 1998).

Ephemeroptera: Caenidae

Caenis nigropunctata (Klapálek)

Rediscovery

Larvae observed and collected in September 1997 and again September 1999 in pool habitat on silt-covered basaltic cobble substrate in lower Waimānalo Stream, O'ahu.

The specimens described here represent the rediscovery of the introduced aquatic insect order Ephemeroptera in the Hawaiian Islands. *Caenis nigropunctata* apparently was an accidental introduction. The first specimens found of this species were recorded in 1944 in Honolulu. By 1948 they were recorded from Pearl City to Mānoa Valley and in Kailua on the windward side of O'ahu where adults were reported to be abundant near lights (Zimmerman, 1957). Since that time, no published records or museum specimens were located confirming the occurrence of *C. nigropunctata* in Hawai'i. The Bishop Museum collection contains a single specimen, an adult from the Kailua area collected in 1948. Some previous publications regarding *C. nigropunctata* in Hawai'i used the generic name *Caenodes* for this species; however, Malzacher (1993) now places the species in the genus *Caenis*.

Caenis nigropunctata is a tropical species from the southern Hemisphere; its range includes Java, Sumatra, Bali, the Philippines, and China (Zimmerman, 1957; Dudgeon, 1999). Caenids are small, typically less than 10 mm in length. Many caenids possess

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abdominal gills that are morphologically adapted to rhythmically beat and create a flow of water; this specialization allows exploitation of organically enriched and silty habitats. The lower reaches of Waimānalo Stream exhibit these characteristics; it is highly modified with an artificially straightened channel, a high silt load, and significant organic pollution. Although it is not known why this species has apparently become rare, it is likely that *C. nigropunctata* may be found in similarly degraded aquatic habitat elsewhere on O'ahu.

Material examined: O'AHU: 2, lower Waimānalo Str. nr. Saddle City Rd bridge, 20 ft [6 m], 26 Sep 1997 (BPBM Acc. 1999.097); 1, same location, 30 Sep 1999, G. Smith.

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