

**Report on Aquatic Insect Monitoring of 17 September 2000 in Kaipapa'u Stream, O'ahu,
Hawaii'i**

Submitted to:

**Oceanit Laboratories, Inc.
1001 Bishop Street, Pacific Tower, Suite 2970
Honolulu, Hawaii'i**



Kaipapa'u Falls left. *Scatella oahuense*, right. Kaipapa'u Stream, 800 ft

Photographs © 2000 David Preston and Ron Englund, Bishop Museum



Telmatogeton williamsi, Kaipapa'u Stream, 800 ft

Contribution No. 2000-020 to the Hawaii Biological Survey
September 2000

Ronald A. Englund
Hawaii Biological Survey
1525 Bernice Street
Bishop Museum
Honolulu, Hawaii, 96817

Introduction and Methods

On 17 September 2000 collections of aquatic insects were made in flowing sections of Kaipapa'u Stream, O'ahu, in elevations ranging from 200 to approximately 800 ft. This sampling was conducted in conjunction with fish and physical habitat surveys conducted by personnel from Oceanit Laboratories, Inc. On the sampling day the weather was generally clear with light tradewinds around Oahu. However, at the site there was almost constant cloud cover against the mountains above 400 feet resulting in an intermittent light rain at the upper stations throughout most of the day.

Sampling consisted of aerial netting of adult aquatic insects, visual observations, and benthic sampling of immature stages of aquatic insects, and was conducted according to Englund et al. (2000). Randomly selected benthic samples were made in different stream habitats by disturbing the substrate through kicking and scraping rocks together while holding an aquatic net downstream of the disturbed stream area. However, most aquatic insect species were captured through aerial netting around aquatic habitats near riffles and cascade splash-zone areas. Some aquatic insect species (e.g., *Saldula exulans*) were also manually collected with a hand aspirator as these species were not readily captured through either aerial netting or benthic sampling.

Although all aquatic habitats around the stream corridor were sampled, emphasis was placed on sampling riffle, cascade, rheocrene (seep), and waterfall areas. Previous research (Howarth and Polhemus, 1991) has shown that the majority of native taxa in Hawaiian streams are found in these high energy zones as most species have evolved from wave-swept marine areas. Aquatic insect species determinations were made by R. Englund, K. Arakaki, and N.L. Evenhuis of the Hawaii Biological Survey, Bishop Museum.

Study Area Description

Kaipapa'u Stream flows for approximately four miles and originates in the northern section of the windward Ko'olau Mountains. Kaipapa'u Stream begins as a series of sinuate and gradually descending headwater streams originating at an elevation of 2600 ft in a bowl-like catchment southeast of Pu'uuka'inapua'a, an area containing dense montane native forest (Polhemus, 1995). At approximately 1400 ft elevation the stream becomes more incised and begins to plunge over a series of 30-50 ft high waterfalls (Polhemus, 1995). The last waterfall drops about 60 feet from an elevation of approximately 860 ft and marks the upper limit of the stream accessible by foot. Stream flow below this point steadily and naturally disappears into the alluvium and completely

disappears at approximately 200 ft elevation. This stream drains an undeveloped and highly pristine native forest, and the very clear stream flow reflects the undisturbed nature of this catchment. The upper Kaipapa'u watershed has no water diversions or water development, and the disappearance of flow into the stream alluvium is a natural characteristic of other interrupted streams found in this area of the northern Ko'olau mountains.

Aquatic insects were sampled at five stations for this assessment with the highest station sampled located at the terminal falls lying at approximately (Site 1 - The Falls) 800 ft, and at (Site 2 - The Wall) 600 ft, (Site 3 - Small Wall) 500 ft, (Site 4 - Hau Trees) 300 ft, and (Site 5 - Low Flow) 200 ft in elevation. Stream substrates in the upper areas consisted of a mixture of boulders, large rocks, cobbles and gravel, with seeping bedrock exposures especially common in the area of the waterfalls and the uppermost sampling station. Stream depth was variable, but averaged approximately one foot in riffle areas and 3-4 ft deep in larger pools. Below the waterfalls the stream exhibited a typical riffle and pool pattern, but many large cascades from the 600 ft elevation upstream to the terminal falls provided excellent habitat for native aquatic insects. Stream flow above 500 ft elevation appeared to be fairly permanent in nature, while the lower stations exhibited little algal growth and may flow only intermittently. Overall, aquatic habitats at Kaipapa'u Stream should be considered of the highest quality on the island of O'ahu, and this stream is one of the best remaining in the Hawaiian archipelago.

The riparian vegetation of Kaipapa'u Stream was noteworthy in that a scattering of a remnant native loulu (*Pritchardia martii*) palms lined the banks in many areas, and this further reflects the unusual undisturbed state of this watershed. Loulu palms were found at an unusually low elevation starting nearly at 200 ft and were common to the terminal waterfalls at 800 ft elevation. Other native plants that were common along the upper reaches of the stream included 'ākōolea (*Boehmeria grandis*), 'ōhi'a (*Metrosideros polymorpha*), and māmaki (*Pipturus albidus*), while an introduced overstory of guavas (*Psidium* sp.) predominated in many areas. Hau (*Hibiscus tiliaceus*) becomes predominant along the stream bed in lower (< 300 ft elevation) stream areas. Almost no feral ungulate damage was observed throughout the area of Kaipapa'u Stream surveyed, and pig hunters appear to have reduced pig populations enough to completely minimize any pig damage. Feral pigs can lead to increased sedimentation in the watershed and affect native aquatic insect species which are sensitive to sedimentation.

Because of near constant drizzle and overcast cloud cover, weather throughout the course of the survey was poor for sampling native Odonata (damselflies and dragonflies).

Results and Discussion

A total of 17 aquatic insect species were collected or observed in Kaipapa'u Stream during approximately 8 hours of sampling on 17 September 2000 (Table 1). Of the 17 aquatic insect taxa collected during the current study, 82% were native species, which is similar to the 83% native aquatic insect species collected in Kaipapa'u Stream during earlier Bishop Museum surveys (Polhemus, 1995). Previous Bishop Museum surveys were conducted mainly in the upper Kaipapa'u Stream falls and stream area which correlates with Station One (800 ft) of the present study. A significant finding of this survey is the continued absence of alien fish species, with the crustacean *Macrobrachium lar* currently the only species of introduced macrofauna known to occur in Kaipapa'u Stream. The introduced aquatic insect species currently found in Kaipapa'u Stream (Table 1) should be considered relatively innocuous.

Another important finding of this survey was the discovery of one of the rarest native aquatic insect species, the giant Hawaiian midge *Telmatogeton williamsi*. This species was not found in Kaipapa'u Stream during previous Bishop Museum surveys (Polhemus, 1995) but was relatively common from the waterfalls at Station 1 to Station 2 (600 ft) during the present study. *Telmatogeton williamsi* is an Oahu endemic and although formerly common is currently only known from one other stream. Although this species is currently not a candidate for listing under protection of the Endangered Species it is in fact one of the rarest aquatic insect species in the Hawaiian Islands.

Native damselflies are considered sensitive to disturbance and are a good indication of the health of the native aquatic ecosystem (Polhemus and Asquith, 1996). Weather conditions during this survey included rain and overcast conditions, and these conditions undoubtedly led to the absence of any native damselflies being collected. Native damselflies and dragonflies are generally only observed during periods of sunny, clear weather and poor weather conditions usually preclude their capture (Polhemus and Asquith, 1996). Previous Bishop Museum surveys in the 1990's of Kaipapa'u Stream found three rare species of stream-dwelling native damselflies *Megalagrion hawaiiense*, *M. n. nigrolineatum*, and *M. oceanicum* (Polhemus, 1995). Two of the damselfly species (*M. n. nigrolineatum* and *M. oceanicum*) found in Kaipapa'u Stream during recent Bishop Museum surveys in the 1990's (Polhemus, 1995) are currently listed as candidates for protection under the Endangered Species Act. It is highly likely these damselfly species are still found in Kaipapa'u Stream because this stream lacks introduced fish species and the watershed is lacking in feral ungulate damage. Many other rare native aquatic insect species such as *Telmatogeton williamsi* and *Eurynogaster minor* were found during the current survey

and are still extant in this watershed, and this further reinforces the highly pristine nature of this stream.

Because of a lack of introduced fish and only a relatively few innocuous introduced aquatic insect species, Kaipapa'u Stream is one of the most important watersheds for the preservation of native biodiversity in O'ahu and also for the State of Hawai'i. For instance, native species of damselflies that have nearly become extinct and have had their ranges severely restricted on Oahu (Englund 1999) were abundant in Kaipapa'u Stream during Bishop Museum surveys conducted in the 1990's (Polhemus, 1995). Because many rare native aquatic insect species are found there, Kaipapa'u Stream should be considered to contain one of the most complete assemblages of native aquatic insects found in the Hawaiian Islands.

Table 1. Aquatic insect species collected or observed in Kaipapa'u Stream, 17 September 2000, and Threatened, Endangered, Species of Concern, or Candidate status for listing on the Federal Register (updated as of November 29, 1999).

Taxon	Station (Elevation - ft)					Threatened, Endangered or Candidate Status ²	Biogeographic Status
	1 (800)	2 (600)	3 (500)	4 (300)	5 (200)		
Aquatic Insects							
Dragonflies & Damselflies (Odonata)							
None Observed ¹							
True flies (Diptera)							
Canacidae							
<i>Procanace bifurcata</i>	X					None	Endemic
Ceratopongidae							
<i>Dasyhelea hawaiiensis</i>	X					None	Endemic
Chironomidae							
<i>Micropsectra prob. hawaiiensis</i>	X					None	Endemic
<i>Telmatogeton williamsi</i>	X	X				None	Endemic
Culicidae							
<i>Aedes albopictus</i>	X	X	X	X	X	-	Introduced
Dolichopodidae							
<i>Campsicnemus brevipes</i>			X	X		None	Endemic
<i>Chrysotus longipalpus</i>	X					-	Introduced
<i>Eurynogaster minor</i>	X					None	Endemic
Ephydriidae							
<i>Scatella cilipes</i>	X	X	X	X	X	None	Endemic
<i>Scatella hawaiiensis</i>	X	X	X			None	Endemic
<i>Scatella oahuense</i>	X					None	Endemic
Tipulidae							
<i>Limonia advena</i>	X	X					
<i>Limonia jacobae</i>	X	X	X	X		None	Endemic
<i>Limonia stygipennis</i>	X					None	Endemic
Aquatic Moths (Lepidoptera)							
<i>Hyposmocoma</i> sp.	X	X	X	X	X	None	Endemic
Caddisflies (Trichoptera)							
<i>Cheumatopsyche pettiti</i>	X	X	X	X	X	-	Introduced
True bugs (Heteroptera)							
<i>Saldula exulans</i>	X	X	X			None	Endemic

¹Rainy and overcast weather likely led to no Odonata being observed, see text for further details.

²Species status: **E** = Endangered; **T** = Threatened; **C** = Candidate for listing; **SOC** = species of concern (USFWS 1999).

References

- Englund, R.A. 1999. The impacts of introduced poeciliid fish and Odonata on endemic *Megalagrion* (Odonata) damselflies on O'ahu Island, Hawai'i. *J. Insect Conserv.* 3: 225-243.
- Howarth, F.G. and Polhemus, D.A. 1991. A review of the Hawaiian stream insect fauna. In: *New directions in research, management, and conservation of Hawaiian freshwater stream ecosystems, Proceedings of the 1990 Symposium on Freshwater Stream Biology and Management, State of Hawaii*, pp. 40-51. Hawaii Division of Aquatic Resources, Honolulu.
- Polhemus, D.A. 1995. A survey of the aquatic insect faunas of selected Hawaiian streams. Unpublished Report and Database for the Hawaii Biological Survey, Bishop Museum.
- Polhemus, D.A. and A. Asquith. 1996. Hawaiian damselflies: a field identification guide. Bishop Museum Press, Honolulu. 122 pp.
- USFWS (United States Department of the Interior Fish and Wildlife Service). 1999. Listed and Candidate Species, as designated under the U.S. Endangered Species Act. Published on November 29, 1999 at (<http://www.r1.fws.gov/pacific/wesa/mesa/hianimals.PDF>).