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Neal L. Evenhuis, editor

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Cover photo: *Newcombia canaliculata* from Maui (see page 31).

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RECORDS OF THE HAWAII BIOLOGICAL SURVEY FOR 2017

Editor's Preface

I am pleased to present the annual compilation of *Records of the Hawaii Biological Survey;* this year for the year 2017. The Hawaii Biological Survey, established by the Hawaii State Legislature in 1992 as a program of Bishop Museum, is an ongoing natural history inventory of the Hawaiian Archipelago. It was created to locate, identify, and evaluate all native and nonnative species of flora and fauna within the state; and by State Law to maintain the reference collections of that flora and fauna for a wide range of uses. In coordination with related activities in other federal, state, and private agencies, the Hawaii Biological Survey gathers, analyzes, and disseminates biological information necessary for the wise stewardship of Hawaii's biological resources.

An intensive and coordinated effort has been made by the Hawaii Biological Survey to make our products, including many of the databases supporting the papers published here, available to the widest user-community possible through our web server. Products currently available include taxonomic authority files (species checklists for terrestrial arthropods, flowering plants, nonmarine snails, marine invertebrates, fossil taxa, and vertebrates), bibliographic databases (vascular plants, nonmarine snails, and insects), specimen databases (fungi, fish, invertebrates, portions of the insect collection) and type specimens (entomology; botany—including algae and fungi; and vertebrates), collections data (lists of holdings for select groups of flies as well as Cicadellidae and Pentatomidae), detailed information and/or images on endangered, threatened, and extinct plants and animals; as well as our staff publication lists. Additional reference databases include: the list of insect and spider collections of the world (based on Arnett, Samuelson & Nishida, 1993, *Insect and spider collections of the world*) with links to institutional web pages where known; and the historical world Diptera taxonomists list with names of over 6,100 authors who have described flies.

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'
Hawaii Biological Survey's "Good Guys/Bad Guys" website
http://hbs.bishopmuseum.org/good-bad/

World Diptera taxonomist list
http://hbs.bishopmuseum.org/dipterists/

The *Records of the Hawaii Biological Survey for 2016* were compiled with reviews by and/or assistance of Clyde Imada (botany), Robert Cowie and Norine Yeung-Hayes (malacology), and Gustavo Spinelli and Art Borkent (entomology). Many of the new records reported here resulted from curatorial projects and field surveys funded by the National Science Foundation, the U.S. Geological Survey Biological Resources Division, the U.S. Fish & Wildlife Service, the Hawaii Department of Transportation, and the Hawaii Department of Land and Natural Resources; they are thanked for their support and partnership of the Hawaii Biological Survey over the years.

We encourage authors with new information concerning flora or fauna occurring in the Hawaiian Islands to submit their data to the editor for consideration for publication in the *Records.* Submission and format of papers must follow our guidelines. Information on submission of manuscripts and guidelines for contributors may be obtained at:

http://hbs.bishopmuseum.org/guidelines.pdf

——*N.L. Evenhuis, editor*

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Records of the Hawaii Biological Survey for 2017. Edited by Neal L. Evenhuis. *Bishop Museum Occasional Papers* 123: 3–6 (2018)

New Plant Records from Midway Atoll, Kahoʻolawe, and Maui[1]

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The following contributions include new state, island, and high elevation records from Midway Atoll, Kahoʻolawe, and Maui. All records are for nonindigenous species. Images of the material examined can be seen at starrenvironmental.com. Voucher specimens and collections mentioned in the text are housed in Bishop Museum's Herbarium Pacificum (BISH), Honolulu, Hawai'i.

Aizoaceae

Trianthema portulacastrum L. **New island record**

Commonly known as horse purslane, this plant is previously documented in Hawai'i from the islands of Kaua'i, O'ahu, and Maui (Wagner *et al.* 1999; Herbst & Wagner 1996; Lorence & Flynn 2006). Recently, it was also found naturalized on the island of Kahoʻolawe in a gravelly area on the side of the main road, just outside of Base Camp, near the point on the south side of Honokanai'a Bay.

Material examined. **KAHOʻOLAWE**: Honokanai'a, just off road in gravelly disturbed area, lowland disturbed coastal grassland, with *Prosopis pallida* and *Cenchrus ciliaris,* few patches here and there in open areas, 25 ft [8 m] (20.509839 N, -156.681968 W), 14 Dec 2017, *Starr & Starr 171214-01.*

Brassicaceae

Arabidopsis thaliana (L.) Heynh. **New state record**

Known as mouse-ear or thale cress, this species was recently found at the summit of Haleakalā National Park during early detection surveys. About 20 small plants were found growing in a disturbed area near the parking lot and sidewalk areas. This is one of a handful of temperate species that have recently established in the high traffic areas of the summit area. Plants were hand pulled but had gone to seed and continue to germinate from a seed bank. A winter annual native to Eurasia (Europe, Asia, and NW Africa) in tropical Afro-alpine ecosystems and naturalized worldwide in disturbed areas as a pioneer of rocky, sandy, and calcareous sites (Wikipedia 2018). *Arabidopsis thaliana* was the first plant to have its entire genome sequenced and is widely used to study molecular biology (Kew Science 2018). Previously not known in Hawai'i, this species can be distinguished by the following characteristics. "Annual (rarely biennial) plant, usually growing to 20–25 cm tall. The leaves form a rosette at the base of the plant, with a few leaves also on the flowering stem. The basal leaves are green to slightly purplish in color, 1.5–5 cm long and 2–10 mm broad, with an entire to coarsely serrated margin; the stem leaves are smaller and unstalked, usually with an entire margin. Leaves are covered with small, unicellular hairs (trichomes). The flowers are 3 mm in diameter, arranged in a corymb; their structure

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is that of the typical Brassicaceae. The fruit is a siliqua 5–20 mm long, containing 20–30 seeds" (Wikipedia 2018).

Material examined. **MAUI**: East Maui, Haleakalā National Park, summit, near parking lot, in crack between cinder and sidewalk near the bottom of the stairs to the Summit Building, in sparse subalpine rock land, in association with *Argyroxiphium sandwicense* subsp. *macrocephalum* and *Dubautia menziesii*, 10000 ft [3048 m] (20.709977 N, -156.252851 W), 03 May 2017, *Starr & Starr 170503-01*.

Lobularia maritima (L.) Desv. **High elevation record**

Sweet alyssum was originally reported from low sandy areas of Kure Atoll, Midway Atoll, and "apparently sparingly naturalized on Maui" (Wagner *et al.* 1999). It has since been reported as naturalized from the islands of Molokaʻi, Oʻahu, and Hawaiʻi, mostly in low elevation sites, except for Hawaiʻi where it was collected at 2,700 ft (823 m) (Lorence *et al.* 1995; Wagner & Herbst 1995; Oppenheimer 2003; Staples & Herbst 2005). On Maui, this species has been collected within Haleakalā National Park near the Kalahaku Lookout, elevation 9,200 ft (2,804 m), and in the summit region at Science City, elevation 10,000 ft (3,048 m), representing a more widely naturalized status and new high elevation record.

Material examined. **MAUI**: East Maui, Haleakalā National Park, above Kalahaku Lookout, subalpine sparse grassland, in association with *Leptecophylla tameiameiae*, *Argyroxiphium sandwicense* subsp. *macrocephalum*, and *Deschampsia nubigena*, 9,200 ft [2,804 m] (787,274 E, 2,295,335 N), 14 Aug. 2000, *Starr & Starr 000814-01*; East Maui, Haleakalā National Park, Science City, near PanSTARRS telescope, in sparse subalpine rock land, in association with *Leptecophylla tameiameiae*, *Deschampsia nubigena*, and *Oenothera stricta* subsp. *stricta*, 10,000 ft [3,048 m] (20.707034 N, -156.256174 W), 05 May 2017, *Starr & Starr 170505-01*.

Euphorbiaceae

Ricinus communis L. **New island record**

Castor bean was first reported from Midway in 1955 from both Sand and Eastern Island (Neff & DuMont 1955). At the time, they reported there were a few small plants found on Eastern with large patches found on Sand, some far from residences. In 1999, no plants were found on Eastern, but there were still several patches, some large, found scattered about Sand Island and control work to remove all patches began (Starr & Starr 2015). By 2015, only a few seedlings were seen and pulled on Radar Hill (Starr & Starr 2015). Similarly, in 2017, a larger fertile plant was found growing out of the remnant concrete structure in the same area (Radar Hill) (Starr & Starr 2017). Though previously reported from the atoll, this is the first collection.

Material examined: **MIDWAY ATOLL**: Sand Island, near Town, Radar Hill, one plant in flower and fruit growing out of the old radar facility concrete remnants, in coastal disturbed scrub in association with *Lobularia maritima, Solanum americanum,* and *Euphorbia peplus*, 25 ft [8 m] (28.212721 N, -177.379711 W), 28 Jun 2017, *Starr & Starr 170628-01.*

Nyctaginaceae

Boerhavia coccinea Mill. **New island record**

Boerhavia coccinea, scarlet spiderling, is previously known from Kure Atoll and all the main Hawaiian Islands except Niʻihau (Wagner *et al.* 1999; Starr *et al.* 2003; Oppenheimer & Bartlett 2002; Oppenheimer 2003). It is also now reported here as a new island record for Midway Atoll. The collection was made in 2017 from the Community

Garden, where a small patch was found. Plants had both flowers and seeds. It was first sighted on Midway in 2015 by Meg Duhr-Schultz and has been targeted for eradication since. Scattered individual plants continue to be found from the Community Garden north to the old Cannon School.

Material examined: **MIDWAY ATOLL**: Sand Island, Town, Community Garden, single small patch or plant in garden, in flower and fruit at the time, in coastal urban disturbed garden, in association with *Eleusine indica, Lobularia maritima,* and *Cymbopogon citratus*, 15 ft [5 m] (28.213183 N, -177.376065 W), 16 Jun 2017, *Starr & Starr 170616-01.*

Poaceae

Ehrharta erecta Lam. **High elevation record**

First recorded from Maui as a new naturalized grass (Herbst & Clayton 1998), recent collections of *Ehrharta erecta* made from disturbed areas of Haleakalā National Park represent new high elevation records for this species in Hawai‘i. The grass is common at the Haleakalā Visitor Center at 9,769 ft (2,977 m), and a few small patches occur along the walkway up to the Red Hill Summit Building at about 10,000 ft (3,048 m).

Material examined. **MAUI**: East Maui, Haleakalā National Park, Haleakalā Visitor Center, in cinder areas of subalpine shrubland, common near the bathrooms, main building, and main path to the parking lot, in association with *Dubautia menziesii*, *Silene struthioloides*, and *Deschampsia nubigena*, scattered clumps at base of boulders, 9,769 ft [2,977 m] (20.714978 N, -156.250041 W), 23 Jul 2013, *Starr & Starr 130723-03*; Haleakalā National Park, summit, in rocks near foot path by parking lot, subalpine sparse rock/grassland with *Argyroxiphium sandwicense* subsp. *macrocephalum*, scattered clumps at base of boulders, 10,000 ft [3,048 m] (20.709954 N, -156.253322 W), 01 Aug 2013, *Starr & Starr 130801-02.*

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Parmarion martensi Simroth, 1893 (Gastropoda: Ariophantidae), an intermediate host of *Angiostrongylus cantonensis* (rat lungworm), on Maui[1]

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Ariophantidae

Parmarion martensi Simroth **New island record**

This Southeast Asian species, sometimes referred to as a semislug (e.g., Qvarnstrom *et al*. 2007) as it bears a small shell, partly or mostly covered by the mantle, atop its slug-like body (Fig. 1), was originally described from Cambodia (Simroth 1893). It was subsequently reported from other parts of Southeast and East Asia (see references in Hollingsworth *et al*. 2007), although the identifications are unconfirmed. The records from American Samoa (Cowie 2001) and Samoa (Cowie & Robinson 2003) were based on a misidentification of *Parmella planata* Adams, 1867 (K.A. Hayes, D.G. Robinson, J. Slapcinsky & N.W. Yeung, unpublished), which is native to Fiji, and, with the exception of the Hawaiian Islands, *Parmarion martensi* has not been reported on other Pacific Islands (Robinson & Hollingsworth 2009). It was first recorded in the Hawaiian Islands, on O'ahu, in 1996 (Cowie 1997) and subsequently on the island of Hawai'i in 2004 (Hollingsworth *et al*. 2007).

Until 2017, *P. martensi* had only been recorded on the islands of O'ahu and Hawai'i in the Hawaiian archipelago (e.g., Cowie *et al*. 2008; Jarvi *et al*. 2012). It has now been reported from Maui, initially anecdotally (without reference to vouchers; Cowie 2017; Howe & Jarvi 2017). We now substantiate its presence on Maui with vouchered speci-

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Fig. 1. *Parmarion martensi* on Maui in June 2017, showing the small shell partially covered by the mantle.

mens collected in April and June 2017. Their identity was confirmed through anatomical examination and by sequencing a portion of the mitochondrially encoded cytochrome *c* oxidase subunit I (MT-COI). These data were compared with the anatomy and sequences from previously collected vouchers on O‘ahu, and material from other parts of the world. All MT-COI sequences of specimens collected from Maui and those previously collected on O‘ahu share 100% identity with GenBank sequence FJ481180, from Taiwan. Additionally, these sequences are identical to unpublished sequences from individuals collected in Malaysia, Taiwan, and the island of Hawai‘i. As yet, *P. martensi* has not been recorded on any other than these three of the Hawaiian Islands. Its potential for future spread is cause for concern, and warrants continued monitoring via surveys.

Parmarion martensi is a host of the rat lungworm, *Angiostrongylus cantonensis* (Chen, 1935) (e.g., Hollingsworth *et al*. 2007; Kim *et al*. 2014). This parasite is the cause of neural angiostrongyliasis (also known as CNS angiostrongyliasis and angiostrongylus eosinophilic meningitis, among other monikers), manifested as eosinophilic meningitis, in humans and other animals (Cowie 2013; Murphy & Johnson 2013; Barratt *et al*. 2016). Although many species of gastropods can act as hosts of *A. cantonensis*, both globally and in the Hawaiian Islands (Kim *et al*. 2014), it has been suggested that *P. martensi* is a particularly important host in the Islands. It is a highly competent host with 78% and 68% of individuals screened by Hollingsworth *et al*. (2007) and Kim et al. (2014), respectively, testing positive for the parasite. It has been verified as a host of *A. cantonensis* on Maui (Yeung, Kim & Hayes, unpubl.).

There are hints that cases of human disease are associated with the spread of *P. martensi* (e.g., Hollingsworth *et al*. 2007; Howe & Jarvi 2017). And it has been suggested that various aspects of its behavior lead to it coming into contact with humans more readily than other gastropod hosts (Hollingsworth *et al*. 2007). However, there are no published studies definitively demonstrating a causal link and although *P. martensi* is probably important in transmission of angiostrongyliasis in the Hawaiian Islands, other hosts should not be ignored in efforts to understand human infection dynamics and implement management interventions. This is especially pertinent given that 16 species of land snails in Hawaii, and species from 46 families of gastropods globally have been recorded as positive for *A. cantonensis* (Kim *et al*. 2014). Although some of these hosts are not as competent as *Parmarion martensi*, these diverse species can act as reservoirs for this nematode to persist in the Hawaiian Islands, thus increasing the potential for transmission.

Collections were made by Kenneth A. Hayes (KAH), Norine W. Yeung (NWY), Jaynee R. Kim (JRK), Keahi M. Bustamente (KMB), Chuong T. Tran (CTT), Jennah R. Bedrosian (JRB), Sigurdur H. Arnason (SHA), and personnel of the Maui Invasive Species Council. All collected material is deposited in the Bishop Museum Malacology Collection. Latitude and longitude coordinates were recorded by GPS.

Material examined: **MAUI**: Hana, no geographical coordinates available, Christine Davis, 5 Apr 2017 (BPBM Malacology 283934); Hana, N20°47.887′ W156°2.181′, KAH, NWY, JRK, KMB, 16 Jun 2017 (283935); Hana, N20°46′37.03″ W55°59′58.59″, KAH, NWY, JRK, KMB, 16 Jun 2017 (283936); Hana, N20°47.183′ W156°0.159′, KAH, NWY, JRK, KMB, 16 Jun 2017 (283937). **O‘AHU**: Punalu‘u, N21°34′57″ W157°53′31.9″, CTT, JRB, SHA, 09 Dec 2006 (282605).

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A Lost Species of Salt Marsh Snail: *Blauneria gracilis* Pease, 1860 (Gastropoda: Ellobiidae) in the Hawaiian Islands[1]

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INTRODUCTION

Blauneria gracilis Pease, 1860 was described from the "Sandwich Islands" (*i.e.*, the Hawaiian Islands) without more precise locality; its author later commented on the living animal and the habitat preferences of the species (Pease 1860, 1869). Kay (1979: 493) stated that the species "has not been recorded since its original description" and there are no known observations of living *B. gracilis* in the Hawaiian Islands since the mid-19th century. There are, however, several recent finds of dead shells of this species, mostly from archaeological contexts. Athens *et al*. (1994) and Cowie *et al.* (1995) recorded a single specimen from an archaeological site on O'ahu, collected in 1993, and Cowie *et al*. (1995) briefly reported another specimen from Moloka'i, also from an archaeological excavation, collected in 1982. Severns (2011: 424, pl. 193, fig. 6 [not fig. 5 as stated in caption]) illustrated a specimen found in beach drift at Hana, Maui. This note provides additional information on the O'ahu and Moloka'i records cited by Cowie *et al*. (1995), reports two additional records from archaeological sites on O'ahu, reviews available information on the ecology of *B. gracilis* and other members of the genus, and clarifies the status of the designated lectotype of the species. Notwithstanding the loss of many of the coastal wetlands formerly inhabited by *B. gracilis* and the lack of recent observations of living examples of this species, it probably survives in the Hawaiian Islands and may be encountered by those conducting biological surveys of such sites, especially in sedge marshes and mangrove swamps.

METHODS AND MATERIALS

Federal and state historic preservation laws establish procedures to mitigate the adverse effects of development projects on historic properties and may require implementation of archaeological survey, excavation, and salvage efforts. These may include analysis of non-marine molluscs and other faunal remains. The present report is based on specimens from recent such studies and other material held by Bishop Museum.

Material examined. HAWAIIAN ISLANDS: "SANDWICH ISLES": Andrew Garrett, coll., *ex* Garrett. (BPBM 1584, 6 spms. [Fig. 1]); **O'AHU**: Waikīkī, Tax Map Key [TMK] 1-2-3-038:006, sidewalk adjacent to Kona Street next to Ala Moana parking structure, test excavation T-207, in sediment 135–170 cm below surface, Stratum IIB. Cultural Surveys Hawai'i, Inc., 2012 (BPBM 277005, 3 spms. [Fig. 2]); Waikīkī, TMK 1-2-6-005:001, Fort DeRussy Military Reservation, Loko Kaipuni, Hawai'i State Inventory of Historic Places [HSIHP] Site 50-80-14-4573, Profile 21, Manhole KA 2, Station KA 1+50, Stratum II, 180–200 cm below surface. Cultural Surveys Hawai'i, Inc., 2015 (1 spm.; archived at U.S. Army Garrison Hawaii, Cultural Resources Program Curation Facility, Schofield Barracks, Hawai'i); **MOLOKA'I**: Kūpeke, TMK 2-5-7-6:11, inland (north) of the pond and seaward

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(south) of highway, House Lot no. 11, archaeological excavation TP2, layers 2/3/4, depth ca. 30–50 cm below surface. Paul H. Rosendahl & Mikk Kaschko 1982 (BPBM 274968, 1 spm. [Fig. 3]).

DISCUSSION

Andrew Garrett was a contemporary and correspondent of William Harper Pease and visited the Hawaiian Islands at various times from 1847 to 1863 (Thomas 1979); thus Bishop Museum's Garrett specimens (BPBM 1584) date from approximately the same period as does Pease's type material.

As noted above, Cowie *et al*. (1995) briefly noted two then-recent finds of *B. gracilis* but said nothing of the archaeological contexts from which they were recovered. The single O'ahu specimen of *B. gracilis* they reported was obtained from an excavation at Kewalo, Waikīkī, O'ahu, located near the intersection of Pi'ikoi Street and Kapi'olani Boulevard and designated as HSIHP Site No. 50-80-14-4847. The site was marshland prior to its reclamation and urbanization in the 1920s; pollen analysis indicated that sedges were abundant. Other fresh- and brackish-water mollusks present at the site included "*Assiminea* sp." and "?*Tryonia* sp." (Athens *et al*. 1994). The former is presumably the species now known as *A. parvula* (Mousson, 1865) and the latter is undoubtedly the species now known as *T. porrecta* (Mighels, 1845). Cowie *et al.* (1995) also noted the recent collection of a single specimen of *B. gracilis* from Moloka'i. This specimen (BPBM 274968) was obtained from a sediment core taken immediately south (seaward) of Kūpeke Fishpond, HSIHP Site No. 50-60-04-206, at a location probably once under cultivation for taro (Rosendahl 1982). Also present were *T. porrecta, Melanoides tuberculata* (Müller, 1774), *Tarebia granifera* (Lamarck, 1816), and *A. parvula, Physella* cf. *acuta* (Draparnaud, 1805), and a damaged specimen tentatively identified as *Ferrissia californica* (Rowell, 1863) (Bishop Museum collection records, BPBM 274963–274970).

More recently, three specimens of *B. gracilis* (BPBM 277005) were obtained in an archaeological excavation near the Ala Moana Shopping Center (Christensen 2013). Pollen analysis indicated that the site was a sedge marsh as the pollen record was dominated by pollen of Cyperaceae (Cummings 2013); historic records indicate that the site was marshland in 1897 but had become urbanized by 1919 (Hammatt 2013). Other aquatic mollusks present included *T. porrecta, M. tuberculata, T. granifera*, and *A. parvula* (Christensen 2013). An additional specimen of *B. gracilis* was obtained during archaeological excavations at Fort DeRussy in Waikīkī, in the vicinity of the former Loko Kaipuni Fishpond. The site was buried under coral fill in the 1920s during construction of the Ala Wai Canal and is now heavily urbanized. Other aquatic mollusks present included *Theodoxus neglectus* (Pease, 1861), *T. porrecta, M. tuberculata*, and *P.* cf. *acuta* (Christensen 2017).

In addition to the Hawaiian records discussed above, *B. gracilis* has also been reported from Mauritius (Nevill 1878; Griffiths & Florens 2006), the Mariana Islands (Moellendorff 1900) and Tahiti (Grasset 1884). Two additional species of *Blauneria* have been described from the Indo-Pacific region: *B. leonardi* Crosse, 1872, reported from New Caledonia (Crosse 1872a, b) and Queensland, Australia (Hedley 1901), and *B. quadrasi* Moellendorff *in* Quadras & Moellendorff, 1895, reported from the Philippines (Quadras & Moellendorff 1895; Habe 1980), Okinawa (Romero *et al*. 2016), Malaysia (Raven & Vermeulen 2007), Vietnam (Vermeulen & Maassen 2003; Raven & Vermeulen 2007), and Singapore (Tan & Woo 2010). Severns (2011: 424, pl. 193, figs. 7 [not fig. 6 as stated in caption]) figured a specimen identified as *B. quadrasi* from an unspecified locality. It is unclear, however,

Figs. 1–3. *Blauneria gracilis* Pease, 1860. **Fig. 1.** BPBM 1584a. "Sandwich Isles." **Fig. 2.** BPBM 277005a. Waikīkī, O'ahu. **Fig. 3.** BPBM 274968. Kūpeke, Moloka'i.

whether this non-Hawaiian material is in fact conspecific with *B. gracilis* as the status of the various described members of the genus vis-à-vis each other remains uncertain (Backeljau *et al*. 1987); in particular, no recent author has critically examined the relationships of *B. gracilis*, *B. leonardi*, and *B. quadrasi*.

Pease (1869: 60) reported that *B. gracilis* "is found in the crevices of stones overflown at high tide" and is never found "on the sides or tops of stones when the tide was out but [only] around their bases where the water stood in little pools." Speaking of non-Hawaiian species, Martins (1996: 186) commented that "*Blauneria* commonly lives in mangroves at the high-tide mark in the sediment under rocks and decaying branches" and that it "lies buried in the black sediment, and under rocks and rotting vegetable matter at the high-tide mark". The occurrence of various species of *Blauneria* in salt marshes, in mangrove swamps, and under rocks and rotting vegetation at the shoreline has also been noted by Marcus & Marcus (1965), Griffiths & Florens (2006), Raven & Vermeulen (2007), and Andrade *et al.* (2014).

Kay (1965) designated as lectotype of *B. gracilis* a specimen in the British Museum (Natural History): [BM(NH) 1962770]. Earlier, however, Baker (1964) had designated a specimen in the collection of the Academy of Natural Sciences of Philadelphia (ANSP 22474a) as the lectotype of this species, thus preempting Kay's action. Kay's type designation was noted by Johnson (1994, 1996) and Cowie *et al*. (1995), who were also unaware of Baker's action.

CONCLUSION

Coastal wetlands similar to the archaeological sites yielding recent finds of *Blauneria* are

now much-reduced in area in the Hawaiian Islands as a result of urbanization and other changes in land use, especially on O‘ahu (Van Rees & Reid 2014). The adverse impact on *Blauneria* is demonstrated by the destruction in the late 19th and early 20th centuries of each of the three O‘ahu sites where the former occurrence of *Blauneria* has been demonstrated archaeologically. *Blauneria* may survive, however, in some of those coastal wetlands that remain. Biological surveys of such sites more recent than Pease’s time have not encountered *B. gracilis* (*e.g.*, Maciolek & Brock 1974; Brock & Kam 1997; Englund *et al.* 2000; Hoover & Gold 2006; Tango *et al.* 2012), but it is unsurprising that this minute snail would be overlooked by those unaware of its potential presence. Furthermore, non-Hawaiian studies show that mangrove swamps are a preferred habitat for *Blauneria*. Mangroves are not native to the Hawaiian Islands, but in the early 1900s several species were intentionally introduced for various purposes and are now well-established throughout the state, particularly on O‘ahu and Moloka‘i (Wester 1981; Allen 1998). Their spread has created new potential habitat for this rare snail. A recent collection of a specimen in beach drift (Severns 2011) indicates that living populations of *Blauneria* do survive in the Hawaiian Islands, notwithstanding the destruction of many coastal wetlands; and those conducting future biological surveys of such areas should be alert to its possible presence, especially in sedge marshes and mangrove swamps.

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Rat Lungworm (*Angiostrongylus cantonensis*) in Hawai‘i: Updated Host Gastropod Records and Distributions on Maui[1]

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INTRODUCTION

Rat lungworm (RLW), *Angiostrongylus cantonensis*, is an emerging infectious disease that causes eosinophilic meningitis. The first reported case of angiostrongyliasis in Hawai‘i was in 1961 (Horio & Alicata 1961) and between 2001 and 2016, 85 cases of this disease were reported (Cowie 2017), three of which were fatal. This is nearly four and a half times as many cases (19) as reported from 1959 to 2000 (Cowie 2017). Kim *et al.* (2014) in their state-wide assessment of intermediate hosts (gastropods) for RLW found that 16 of the 37 species tested carried the parasite, including two native species.

The report of recent cases of eosinophilic meningitis from Maui (Cowie 2017) prompted increased interest in identifying the potential host gastropods and developing a better understanding of the distribution of RLW hosts across the island. As such, surveys for gastropods were conducted December 2016–August 2017, and resulted in the collection of 205 non-native land snails representing 21 species from 13 sites across Maui (Fig. 1), all of which were screened for rat lungworm using the non-quantitative PCR approach from Kim *et al*. (2014).

Nine species from these recent collections tested positive for RLW. Of these, two were new island records as hosts for the parasite, and one is a new state record, never having been reported as a carrier of RLW in Hawai‘i. In total, this brings the number of gastropod hosts for RLW in Hawai‘i to 21. Knowing which snails serve as vectors for the RLW and their distributions on each island is critical to developing effective management and educational outreach strategies to protect the public and natural ecosystems.

Collections were made by Norine W. Yeung (NWY), Jaynee R. Kim (JRK), Keahi M. Bustamente (KMB) and Kenneth A. Hayes (KAH). All collected material are deposited in the Bishop Museum (BPBM) Malacology collection. Catalog numbers are BPBM Malacology collection numbers. Latitude and longitude coordinates were recorded by GPS. Many areas are owned privately, therefore, exact locations are kept in the State of Hawai‘i Invasive Species Council and Bishop Museum Malacology databases.

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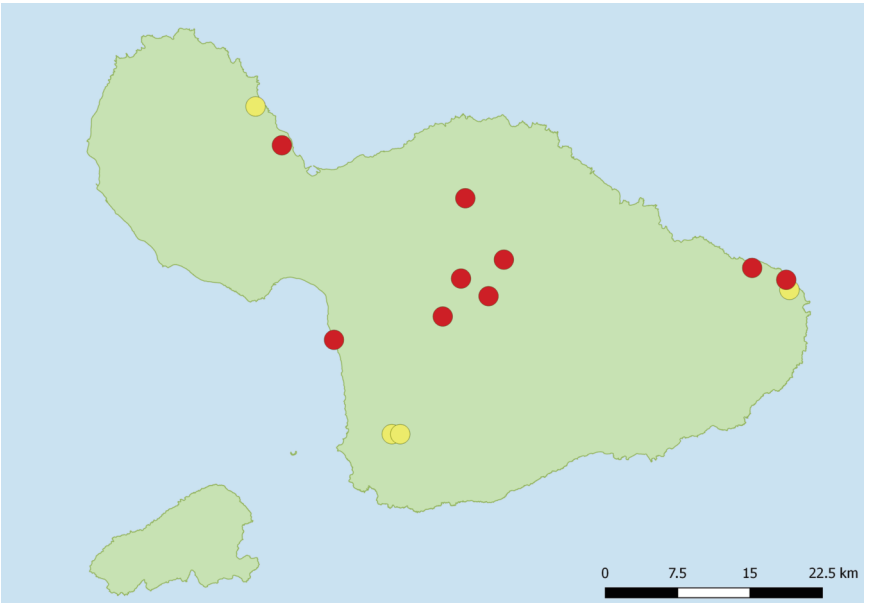


Figure 1. Sites surveyed on Maui as part of this study. Red circles are sites with non-native land snails that were positive for RLW. Yellow circles sites with non-native snails that tested negative for RLW. Map created in QGIS v. 2.18.

Achatinidae

***Lissachatina fulica* (Bowdich, 1822)**

(Fig. 2A)

This species, also known as the giant African snail, was first recorded in Hawai‘i in 1936 and is present on all main Hawaiian Islands (Cowie 1997). Wallace & Rosen (1969) first reported this species on O‘ahu as a RLW host, and 11.3% (7/62) of the individuals tested were positive in Kim *et al*. (2014), while only 10% (1/10; BPBM 284201) were positive among the 15 collected (BPBM 284187, 284201, 284211, 284219, 284247).

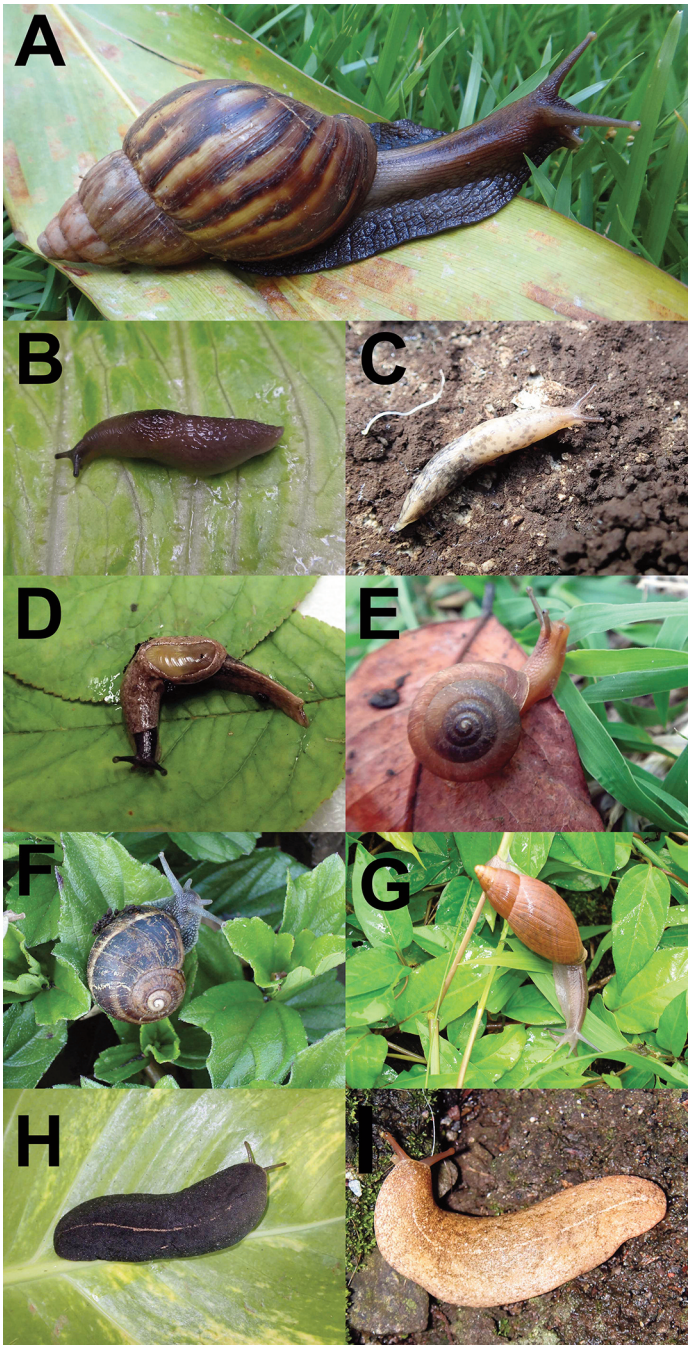
Agriolimacidae

***Deroceras laeve* (Müller, 1774)** **New Island Record for Gastropod Host**

(Fig. 2B)

This Western European snail (Kerney & Cameron 1979) was first recorded in Hawai‘i in 1897 and considered wide spread on all the main Hawaiian Islands (Cowie 1997). This

Figure 2 (opposite page)**. A**) *Lissachatina fulica* (shell length = 10 cm); **B**) *Deroceras laeve* (length = 1.5 cm); **C**) *Deroceras reticulatum* (length = 2.0 cm); **D**) Parmarion martensi (length = 4.0 cm); **E**) *Bradybaena similaris* (shell diameter = 1.0 cm); **F**) *Cornu aspersum* (shell diameter = 3.0 cm); G) *Euglandina rosea* (shell length = 5.0 cm); **H**) *Laevicaulis alte* (length = 7.0 cm); **I**) *Veronicella cubensis* (length = 7.0 cm).


A
B
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species was first reported as a carrier of RLW on O‘ahu by Wallace & Rosen (1969), but none of the individuals tested by Kim *et al*. (2014) were positive. In this study, ~56% (10/18) of individuals tested were positive (BPBM 284177, 284191, 284194, 284228, 284234, 284239) from a total sample of 21 individuals collected (BPBM 284177, 284191, 284194, 284228, 284234, 284239, 284252).

***Deroceras reticulatum* (Müller, 1774)**
(Fig. 2C)
This Western European species (Kerney & Cameron 1979) was first recorded in Hawai‘i in 1963 and is found on all main Hawaiian Islands (Cowie 1997, Hayes *et al*. 2012). Kim *et al*. (2014) first reported this species in Hawai‘i as a RLW carrier. Nine individuals were collected (BPBM 284178, 284195) and three out of six (50%) individuals tested positive in this study (BPBM 284178, 284195).

Ariophantidae
Parmarion martensi Simroth, 1893
(Fig. 2D)
First recorded from the islands in 1996 on O‘ahu, then on Hawai‘i Island, and more recently spread to Maui (Cowie 1997; Cowie *et al*. 2008, 2018), but went unnoticed until 2017 when it became anecdotally associated with multiple cases of angiostrongyliasis on Maui (Howe & Jarvi 2017). Hollingsworth *et al.* (2007) first reported this species on Hawai‘i Island as a RLW carrier with 77.5% of specimens screened testing positive. Kim *et al*. (2014) found a similar rate of infection, with 70% of specimens tested being carriers. Fifty-three individuals were collected (BPBM 284202, 284212, 284220) for this study, but only five out of 16 (31%) individuals screened tested positive (BPBM 284202, 284220), a considerably lower rate of infection than found in Hawai‘i Island populations.

Bradybaenidae
Bradybaena similaris (Férussac, 1821) **New Island Record for Gastropod Host**
(Fig. 2E)
Commonly known as the Asian tramp snail, this species was first recorded in Hawai‘i in 1893 and is considered established throughout the main Hawaiian Islands (Cowie 1997). Similar to the *Deroceras laeve* account, Wallace & Rosen (1969) first reported this species on O‘ahu as a RLW carrier, but none of the individuals tested by Kim *et al*. (2014) were positive. However, twenty-eight individuals were collected (BPBM 284181, 284192, 284235, 284240) for this study, and one of the fourteen (7%) individuals screened was positive (BPBM 284240). It is possible that this species may be less susceptible to *A. cantonensis* infection in general, or just here in the islands, when compared to other species (Kim *et al*. 2014).

Helicidae
Cornu aspersum (Müller, 1774) **New State Record for Gastropod Host**
(Fig. 2F)
The brown garden snail is native throughout the Mediterranean and Western Europe (Kerney & Cameron 1979, Cowie 1997). It was first recorded in Hawai‘i in 1952 on O‘ahu, and subsequently on Kaua‘i, Maui and Hawai‘i Island, but and is currently considered established only on Maui and Hawai‘i (Cowie 1997). Twelve individuals were

collected (BPBM 284179, 284188, 284193, 284196, 284237) for this study, and of these, 20% (2/10; BPBM 284196) were positive. This is the first record of *Cornu aspersum* as a carrier of RLW in the islands.

Spiraxidae

***Euglandina rosea* (Férussac, 1821)**

(Fig. 2G)

This predatory snail species was first introduced to Hawai‘i in 1955 as a biological control agent for the giant African snail *Lissachatina fulica* (Cowie 1997). During this introduction, two species were inadvertently introduced, and it is likely that neither is the true *Euglandina rosea* (Meyer *et al*. 2017). However, here, we refer it to *E. rosea* until this is resolved. It has been reported from all the main Hawaiian Islands, but only as shells on Lāna‘i (Hayes *et al*. 2007; Meyer *et al*. 2017). Wallace & Rosen (1969) first reported this species on O‘ahu as a RLW carrier and eight of the thirty-nine individuals tested positive in Kim *et al*. (2014). Three individuals were collected (BPBM 284230, 284241, 284256), but only one (33%) of these was positive in this study (BPBM 284230).

Veronicellidae

***Laevicaulis alte* (Férussac, 1822)**

(Fig. 2H)

The tropical leatherleaf was first recorded from Hawai‘i Island in 1900 (Cowie 1997), but is currently found on all main Hawaiian Islands and Midway Atoll (Hayes *et al*. 2007, Cowie *et al.* 2008). Wallace & Rosen (1969) first reported this species from O‘ahu as a RLW carrier, and 13 of the 44 individuals tested positive by Kim *et al*. (2014) were positive. Notably, one of these individuals had the highest parasite load in that study. Twelve (BPBM 284185, 284209, 284217, 284244) individuals were collected for this study, and two (BPBM 284209) of nine (22%) were positive for RLW.

***Veronicella cubensis* (Pfeiffer, 1840)**

(Fig. 2I)

This species, known as the Cuban slug, was first recorded in Hawai‘i in 1985 (Cowie 1997) and is currently found on all main Hawaiian Islands (Hayes *et al*. 2007, Cowie *et al*. 2008). Qvarnstrom *et al*. (2007) first reported this species from Hawai‘i as a RLW carrier, and only 2.5% (4/159) of individuals screened by Kim *et al*. (2014) were positive. However, this study found double that rate (5%). Only two (5%) out of 39 individuals tested positive in this study (BPBM 284233, 284259) from 122 individuals collected (BPBM 284186, 284190, 284210, 284218, 284226, 284233, 284245, 284250, 284259).

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A New Species of Flightless *Campsicnemus* (Diptera: Dolichopodidae) from the Wai‘anae Range, O‘ahu, Hawaiian Islands[1]

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INTRODUCTION

Flightless forms of otherwise normally alate insects are usually an adaptation to extreme environmental conditions. Islands, whether oceanic or island-ecosystems such as mountain summits or areas isolated from easy dispersal, are the most common places flightless insects may be found. In Hawaii, flightlessness has also developed in response to the lack of predatory ants. Ants have only recently (the last few hundred years) been introduced; thus, the Hawaiian fauna has evolved over millions of years in the absence of these predatory organisms. In the Dolichopodidae, flightlessness is extremely rare. Of the more than 7,700 species of long-legged flies found worldwide (Grichanov & Brooks, 2017), only 16 flightless species are known (0.2%). Within that number, eight, a remarkable 50% of all flightless dolichopodids, are found in the Hawaiian Islands. Bickel (2006) and Evenhuis (1997) summarized the species of flightless dolichopodids and noted that most are found above 1500 m and are found on islands. A seventeenth flightless species, the ninth in Hawai‘i, *Campsicnemus hao,* **n**. **sp**. is described herein. One population of the new species described herein is noteworthy in that it was found at roughly 400 m (one of the lowest elevations recorded for a flightless dolichopodid) in the midst of large populations of introduced ants.

MATERIAL AND METHODS

Specimens examined are housed in the Bishop Museum (BPBM). Morphological terminology follows Evenhuis (1997). Wing Interference Patterns were also investigated and species-specific differences, though slight, were noted [see Shevtsova *et al*. (2011) for details on this relatively new character suite]. Since virtually all the character that define species in *Campsicnemus* Haliday are found on the male, the male is the sex upon which most of the descriptions are based. I here describe the male, but also give the characters of the characters that differ in the female.

TAXONOMY

Campsicnemus Haliday

Campsicnemus Haliday *in* Walker, 1851: 187. Type species: *Dolichopus scambus* Fallén, 1823, by validation of I.C.Z.N., 1958: 351. *Nomen protectum* (see Evenhuis, 2003: 3).

1. Contribution No. 2018-005 the Hawaii Biological Survey.

Campsicnemus hao Evenhuis, **new species**
(Figs. 1–2, 4–6)

Campsicnemus bryophilus (Adachi). Evenhuis, 1997: 19, 20 (misidentification).

Diagnosis. Similar to *Campsicnemus bryophilus* (Adachi) but can be separated from it based on the antennal shape (flagellomere shorter than in *C. bryophilus*), wing shape (more bowed than *C. bryophilus*), wing venation (radial and cubital veins effaced and only evident as row of microtrichiae; these veins present without microtrichiae in *C. bryophilus*); Wing Interference Pattern (without a long blue streak subapically; this blue streak present in *C. bryophilus*), and the different setal number and pattern on the male mid tibia (cf. Figs. 3–4); specifically two different areas are marked in the figures as S1 and S2. S1 points to a row of three peg-like setae in *C. bryophilus*; this same area has only one such seta in *C. hao*; S2 points to a short socketed hair below the patch of peg-like setae in *C. bryophilus*; this hair is absent in *C. hao*.

Description. **Male**. Body length: 1.8–2.5 mm. Wing length: 2.2–2.8 mm.

Head. Black; oc and vt black, about one-half length of antennal arista; face constricted at middle, eyes holoptic, contiguous below antennae for length of 4–6 ommatidia; palp small, dark brown; proboscis brown, extending below eye in lateral view; antennal segments dark brown; postpedicel rounded, length about 1.5 x width; arista slightly longer than head height.

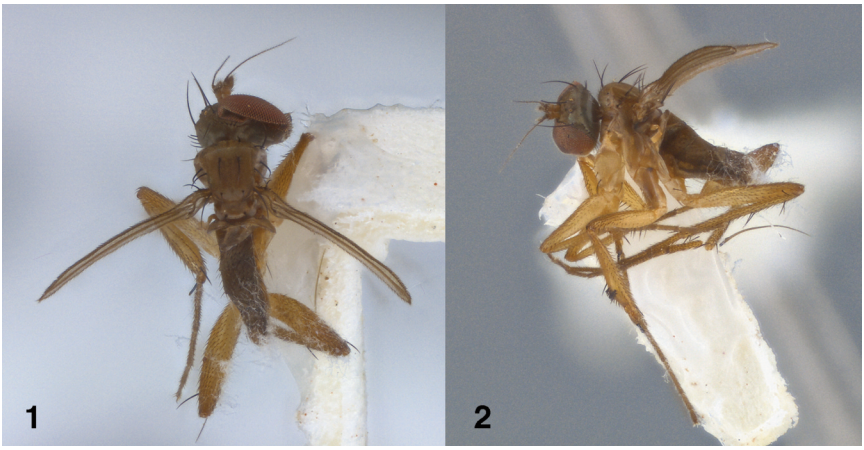
Thorax (Figs. 1, 2). Dorsum of mesoscutum, scutellum, and mediotergite brown with some brassy and green highlights, darker brown anteriorly; upper pleura concolorous with mesoscutum, lower pleura yellowish; thoracic setae long, strong, black: 3 dc; 2 np; 2 ph; 1 pa; 1 sc; ac absent; halter stem and knob pale brownish.

Legs. CI, CIII yellowish white, CI with two strong black setae apically, numerous smaller curved stiff setae; CII brown; remainder of legs yellowish brown; foreleg and hindleg unmodified, without MSSC; FII with row of 4–6 strong black setae ventrally on subbasal one-third, smaller setae in same row extending to apex; patch of 5–6 smaller black setae lateroventrally on subapical one-fourth; TiII (Fig. 4) swollen, widest subapically, apical one-fourth bearing dense patch short stiff peg-like black setae and longer hairs anterolaterally, paired rows of short black hairs on basal one-half, single thick strong long black chaeta at apical one-third, row of stiff setae laterally on basal half (all MSSC), smaller black setae and hairs along entire ventral surface, single strong black seta mesoapically. IIt_1 short, one-third length of IIt_2, dark brown, with thick apical black spur, semi-spatulate; IIt_2 ca. 1.5 x length of IIt_3; remainder of tarsi without MSSC.

Wing (Fig. 5, 6). Long, thin, bowed; pale smoky hyaline; anal field and venation absent; radial and cubital veins effaced and evident only as row of microtrichiae; medial vein present; Wing Interference Pattern (Fig. 6) with pale yellow area apically.

Abdomen. Brown, with short stiff curved black hairs dorsally on each tergite, uniformly distributed, a few longer hairs laterally, lateral hairs longest on tergite I; sternites brown. Hypopygium brown, not dissected.

Female. As in male except for lack of MSSC; antennal postpedicel subtriangular, length slightly shorter than width.

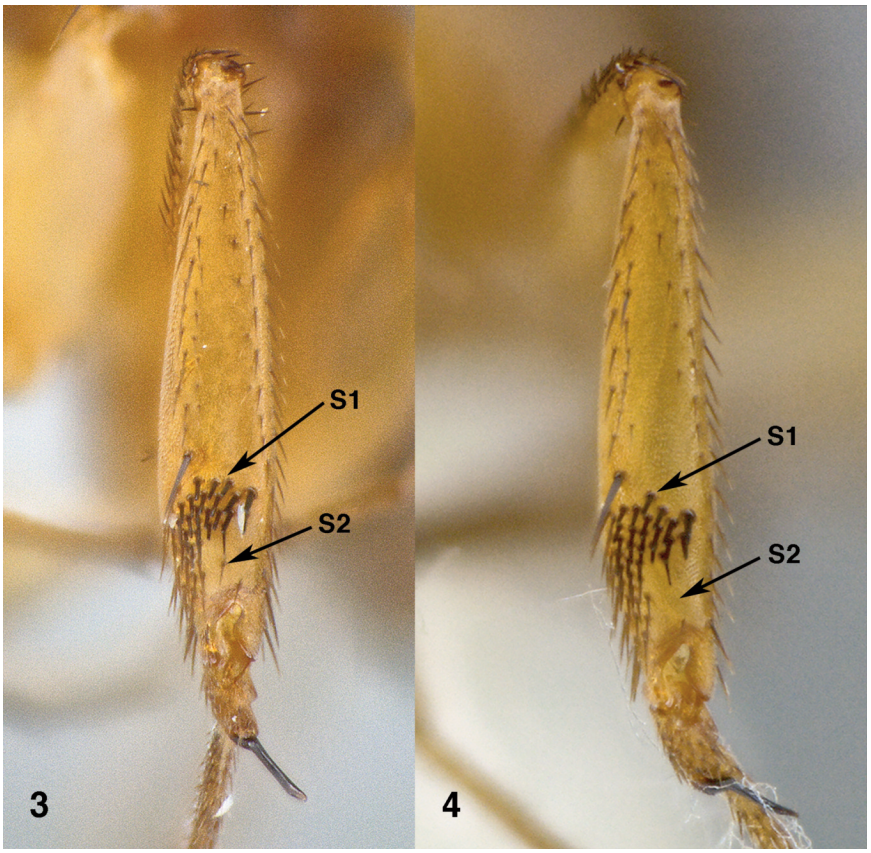


Figs. 1–2. *Campsicnemus hao*, n. sp., male holotype **1.** Dorsal view. **2.** Lateral view, male holotype.

Types. *Holotype* ♂ (BPBM Type 17,482) and 2♂,2♀ *paratypes* from HAWAIIAN ISLANDS: **O'ahu**: Mt. Ka'ala, [c. 1225 m], summit bog, leaf litter, 13 Jan 1993, S. Montgomery (BPBM). *Other paratypes*: **O'ahu**: 1♂,1♀, Lualualei Naval Magazine Annex, Halona Valley, 1404 ft [c. 425 m], N21.42472° W158.10368°, 18–21 Sep 2017, C. Campora, N. Evenhuis, C. Imada, pitfall trap, station #10. Holotype (pinned) and paratypes (pinned and in fluid) in BPBM.

Remarks. The discovery of a male and female of this flightless species in a pitfall trap in Halona Valley, Lualualei Naval Magazine Annex, O'ahu is noteworthy. In 1993, specimens of this flightless species were collected by Steve Montgomery and published (Evenhuis 1997) in a review of flightless dolichopodids on the Hawaiian Islands. After examination at that time, the specimens were identified as *Campsicnemus bryophilus* (Adachi), which occurs on Moloka'i. It was surmised that in order for a flightless fly to have such a disparate distribution (Moloka'i and O'ahu), the fly must have moved from one island to the other when the two were connected; the plausibility of that connection was made using data from Carson & Clague (1995). However, the hypothesis was extremely weak since the flies would have to have made that migration roughly 1.5 mya when the two islands were connected and maintain their conspecific status for 1.5 million years without contact outside of the gene pool of each disparate population after the island connection disappeared and have remained isolated since. After the 1997 review paper was published and no further specimens were observed despite frequent trips to the same site, it was thought possible that they might have been mislabeled specimens and no further thought was given to them.

Recently, when two specimens were found in one of the pitfall traps in a relatively low-elevational and much drier site in Halona Valley, O'ahu, they were re-examined and seen to be the same species as those collected at the high elevations in Wai'anae range on O'ahu (both the Ka'ala summit bog site and the Halona Valley site). I then re-examined the Moloka'i specimens of *Campsicnemus bryophilus* and compared them with the O'ahu specimens. More than 25 years have elapsed since I first described *C. bryophilus* and I



Figs. 3–4. Mid tibiae of *Campsicnemus*, lateral view of left leg. **3.** *C. bryophilus*. **4.** *C. hao*, n. sp. Numbered arrows point to differences in setation (see text for discussion).

have obtained much more knowledge on specific differences in *Campsicnemus* during that time. More characters were examined and it was found that the O‘ahu specimens do indeed belong to a separate and new species.

The differences in antennal flagellomere shape, leg setal pattern, Wing Interference Pattern, and venation are consistent between the two populations with no variation within each population, thus I feel confident that the two are separate species, the speciation having occurred at some point during that 1.5 million-year old migration event from one island to the other and then remaining isolated since.

Molecular analysis on the O‘ahu species could help determine if *C. bryophilus* and *C. hao*, n. sp. share a common winged or wingless ancestor. The molecular analysis conducted by Goodman *et al*. (2014) did not have available fresh specimens of the Wai‘anae specimens for analysis. In that study, *C. bryophilus* was found to be the sister of another flightless species from Maui, *C. aeptus* Hardy & Kohn.

Figs. 5–7. Wings of *Campsicnemus*. **5**. *C. hao*, bright field image showing venation; arrow points to microtrichiae on cubital vein. **6.** *C. hao*, Wing Interference Pattern. **7.** *C. bryophilus* Wing Interference Pattern; arrow points to blue streak.

The area in which the two specimens were collected in Halona Valley was observed to be replete with primarily two species of ants; the yellow crazy ant, *Anoplolepis gracilipes* (Smith) and the Papuan thief ant, *Solenopsis papuana* (Emery). How these flightless flies survived in the midst of these ants is unknown. The flightless flies in Hawai‘i are normally found at higher elevations in Hawai‘i where ants do not occur.

Etymology. The specific name derives from the Hawaiian, *ha‘o* = unusual, surprising; referring to the unusual finding of a flightless dipteran at such a low elevation.

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sorted the pitfall trapped material that led to the discovery of the flightless population of the Halona specimens. Dan Bickel kindly reviewed the manuscript and provided useful comments and corrections that helped improve the paper.

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Rediscovery of *Newcombia canaliculata* (Baldwin, 1895) (Gastropoda: Achatinellidae) and *Laminella venusta* (Mighels, 1845) (Gastropoda: Amastridae)[1]

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INTRODUCTION

There have been at least 752 native land snail species recognized from the Hawaiian Archipelago, but many of these are already extinct or threatened (Cowie *et al*. 1995). Although extinction estimates as high as 95% have been reported for some families (Régnier *et al.* 2015), it is often difficult to determine if a species is extinct, or just extremely rare and difficult to find (Keith *et al*. 2017), especially without adequate surveys (Hirano *et al.* 2018).

Since the 1980s, most studies of land snails across the archipelago, focused on taxa within the subfamily Achatinellinae (e.g. Thacker & Hadfield 2000; Holland & Hadfield 2004; Cowie & Holland 2008) with a few studies within the Succineidae (Rundell *et al*. 2004; Holland & Cowie 2007; Cowie & Holland 2008). For example, the island of Moloka'i once boasted 85 species from eight families (Cowie *et al*. 1995), and there are only nine described species of *Partulina* on Moloka'i (Cowie *et al*. 1995). Yet, published research from the last half century reporting on land snails of Moloka'i have been almost exclusively focused on achatinelline species (Hadfield & Miller 1989; Kobayashi & Hadfield 1996; Thacker & Hadfield 2000; Holland & Hadfield 2004; Hadfield & Saufler 2008; Price *et al*. 2015), with few, if any other land snails recorded or mentioned (for exceptions see Rundell et al. 2004; Holland & Cowie 2007). While there are numerous and complex factors that have likely played a role in the lack of studies on other land snails broadly, this pattern may be partly explained by the erroneous assumption that most land snails had already suffered the same fate as many of those in the Achatinellinae, an idea that was prevalent among the research and conservation community in Hawaii over the last few decades. This assumption,

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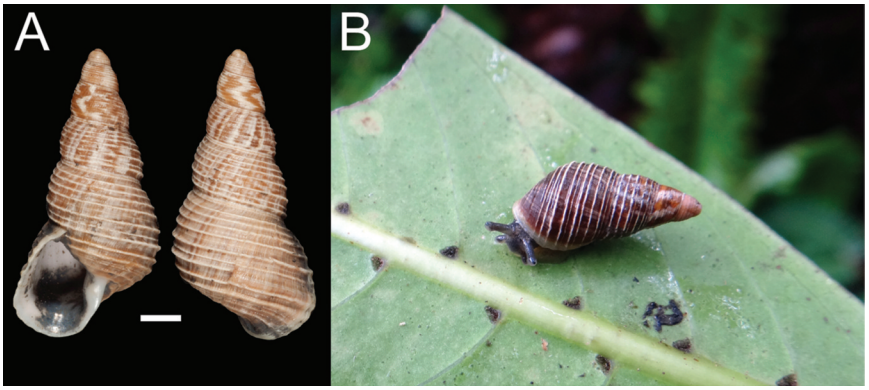

Figure 1. A) *Newcombia canaliculata* (ANSP 65713), scale bar = 2 mm; purported holotype (Johnson 1996) **B**) Live *Newcombia canaliculata* (BPBM 284174).

further fueled by an already narrow focus on this single subfamily may explain the dearth of survey efforts aimed at understanding the conservation status of Hawaiian land snails more comprehensively. Over the last decade we have built a strong network of conservationists, researchers, and resource managers that have begun to help us fill the gaps in knowledge about Hawaiian land snails. Recent survey efforts (Yeung & Hayes unpublished) have revealed that indeed many Hawaiian land snails have most likely been lost forever. At the same time these efforts have provided a more accurate picture of Hawaiian land snail extinctions, and a better understanding of the conservation status of those that remain has begun to emerge. As Solem (1990) noted, there is still time left to save many species, and through continued and increasing surveys in remote areas, we are realizing the vision of C. Montague Cooke, Jr. and those he inspired (Solem 1990). Here we report the notable rediscovery of two species of endemic snails from two of the most threatened, and frequently studied families in the islands, Achatinellidae and Amastridae. While both species are endemic to Hawai‘i, the circumstances and story of their rediscovery is neither unique to Hawai‘i, nor as unexpected as they may appear. Like other recent rediscoveries of presumably extinct taxa (Gargominy 2008; Brook 2012; Hirano *et al*. 2018) on Pacific islands, these taxa were found surviving in high elevation, often difficult to access, refugia. Many such refugia may still exist, and as Solem (1990) noted, they may be the last places where these jewels of the Pacific still exist, and if we have any hope of saving them, we have to look, and then act. We hope publishing and extolling such rediscoveries will serve as a reminder that hope still exists.

Achatinellidae

Newcombia canaliculata (Baldwin, 1895) **Notable rediscovery**

(Fig. 1)

Newcombia canaliculata belongs in the Achatinellinae, a Hawaiian endemic land snail subfamily with 99 species (Cowie *et al*. 1995). It was originally described from “Hālawa” on the island of Moloka‘i in 1895 and was subsequently recorded in the same and other localities: Hālawa (BPBM 51611, 24844, 134572, 107588; collection dates: 1912–1931);

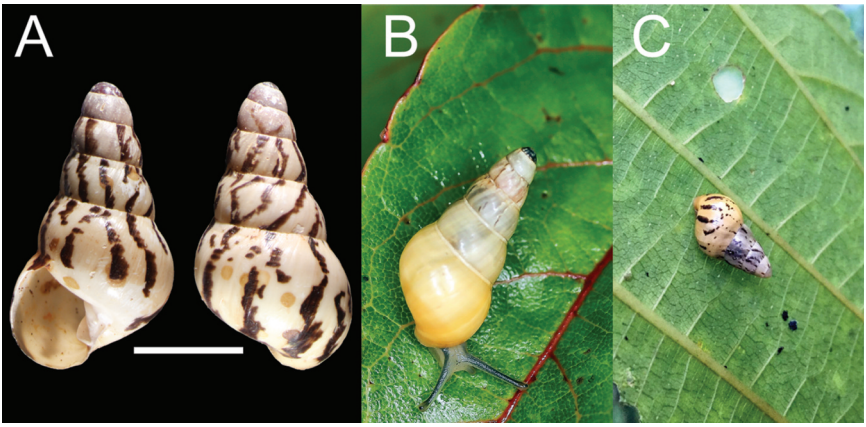

Figure 2. A) *Laminella venusta* (BPBM 191652), topotypic material as "original type has been destroyed by fire" (Hyatt & Pilsbry 1911: 347–348), scale bar = 5 mm; **B** and **C**) Live adult and subadult *Laminella venusta* (BPBM 284175), respectively.

Kawaikapu (BPBM 59832, 59833, 59835, 59836, 59834A; 1922); Keopukaloa (BPBM 134534–6, 107587, 117325–8, 134570, 184286–9; 1931–1935); Wailau (BPBM 24858, 24862, 51605, 129268; 1912–1933). Other museums (Museum of Comparative Zoology, National Museum of Natural History, Academy of Natural Sciences of Drexler University, Delaware Museum of Natural History, Carnegie Museum of Natural History) have similar records (locality and collection date) and there are no known museum or published records of this species after 1935. In July 2015, Keahi M. Bustamente (KMB), Chris Johns (CJ), and Geena Hill (GH) recorded a *Newcombia* sp. on Moloka'i. In January 2018, Norine W. Yeung (NWY), Kenneth A. Hayes (KAH), David R. Sischo (DRS), James K. Espaniola and KMB revisited the locality and NWY and KAH identified this species as *Newcombia canaliculata* (Fig. 1B). The population size was not estimated but numerous adults, subadults, and juveniles were recorded at multiple locations, primarily on *olopua*, *Nestegis sandwicensis* (A. Gray) O.Deg., I.Deg. & L.A.S.Johnson (Oleaceae). Eighteen adults were live collected for captive rearing by DRS. The exact locality data are not listed here for conservation purposes but are kept in the State of Hawaii Department of Land and Natural Resources Snail Extinction Prevention Program and Bishop Museum Malacology databases. Tissue samples (BPBM 284175) have been collected and deposited at the Bishop Museum. Any individuals that die in the captive populations will be vouchered at the Bishop Museum (BPBM 284175). *Newcombia canaliculata* and the Maui endemic, *Newcombia cumingi* (Newcomb), are now the only two *Newcombia* species, out of seven described species, known to be extant.

Amastridae

Laminella venusta (Mighels, 1845) **Notable rediscovery**

(Fig. 2)

Laminella venusta belongs in the Amastridae, a Hawaiian endemic land snail family with 325 described species. Prior to this report, only 20 extant species of Amastridae were left

(Régnier *et al.* 2015; Hayes, Chung, Yeung, unpublished). However, the rediscovery of *Laminella venusta* brings the total number of extant amastrid species to 21, and it is the only extant amastrid known from Molokaʻi. There were 14 described *Laminella* species and, until recently, only two, *Laminella sanguinea* (Newcomb) (Oʻahu endemic) and *L. aspera* Baldwin (Maui endemic), were considered extant (Régnier *et al*. 2015). *Laminella venusta* was originally described from Oʻahu. However, Hyatt & Pilsbry (1911: 348) provided localities only on Molokaʻi and stated that "no such shell occurs on Oahu". This species has been recorded on various Molokaʻi localities such as: East ʻŌhiʻa Gulch (BPBM 134425; 1931); Kaluaʻaha (BPBM 24814, 24092, 24103, 24780, 24793; 1912); Kamalō (BPBM 36855; 1913); Mapulehu (BPBM 24164, 24819, 24824, 51636, 102902, 102903, 191652, 191658; 1912–1943); ʻOhiʻalele (BPBM 47000, 47014; 1919); Olokuʻi (BPBM 24863, 24864; 1912); Ualapue (BPBM 24223, 24235; 1912). Other museums (Museum of Comparative Zoology, National Museum of Natural History, Florida Museum of Natural History, Academy of Natural Sciences of Drexler University, Delaware Museum of Natural History, Denver Museum of Nature and Science, Carnegie Museum of Natural History, Illinois Natural History Survey) have similar records (locality and collection date) with the last known museum record in 1967 (UF167339). During the reconnaissance survey for *Newcombia canaliculata* (Baldwin) in January 2018, nine *Laminella venusta* (Figs. 2B, C) individuals were discovered on a *hāhā*, *Cyanea* cf. *solenocalyx* Hillebr. (Campanulaceae). Previous records (BPBM 24164, 24092, 24223) have reported this species on *olonā*, *Touchardia latifolia* Gaudich (Urticaceae). Because of the imminent threat from rat predation, the omnivorous snail [*Oxychilus alliarius* (Miller)], and predatory flatworms, in the area with these snails, all individuals were collected for captive rearing by DRS. Tissue samples (BPBM 284175) have been collected and deposited at the Bishop Museum, and any individuals that die in the captive population will be vouchered as well (BPBM 284175). The exact locality data are not listed here for conservation purposes but are kept in the State of Hawaii Department of Land and Natural Resources Snail Extinction Prevention Program and Bishop Museum Malacology databases.

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New records of bark beetles for the Hawaiian Islands (Coleoptera: Curculionidae: Scolytinae)

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Surveys conducted for the U.S. Department of Agriculture (USDA) relating to the presence/absence in the Hawaiian Islands of target pestiferous bark beetles were conducted from October–November 2016 on Maui and Moloka'i using prescribed lures and traps. The collections resulted in negative results for the target species but identifications of specimens in the by-catch resulted in three new state records listed below. Collections were made by all three of us. Determinations were made by one of us (KTA) and verified by A. Tishechkin at USDA (now California Department of Food and Agriculture). All specimens listed below are vouchered in Bishop Museum.

Coleoptera: **Curculionidae**

Hypothenemus brunneus Hopkins **New state record**

This bark beetle has a wide range in southern North America and throughout Central America to Panama. In the U.S. it was previously known from Florida, Texas, and Alabama; and has also been recorded from the islands in the Caribbean as well as the Galápagos Islands in the Pacific. The discovery in our surveys marks the first record of this species in the Hawaiian Islands. Its status as a potential pest in Hawai'i has not been determined. Although the coffee berry boring beetle [*Hypothenemus hampei* (Ferrari)] is a member of this genus and is a serious pest of coffee, many members of the genus *Hypothenemus* are benign and bore primarily into dead and dying branches (Johnson *et al.* 2016). Study should be conducted on this species in Hawai'i to determine its potential impact, if any, on native vegetation and commercial crops.

Material examined. HAWAIIAN ISLANDS: **Moloka'i**: 1 spm, Kaunakakai, Wastewater Treatment Plant, N21.09070°, W157.02605°, 26 Oct–28 Nov 2016, Platypus lure/Lindgren funnel, C.T. Imada, N.L. Evenhuis; 3 spms, Kaunakakai, Koheo Wetland, N21.08512°, W157.01341°, 26 Oct–28 Nov 2016, Manuka Oil/Lindgren funnel, C.T. Imada, N.L. Evenhuis; 2 spms, Ho'olehua, Mahana Gardens, N21.14390°, W157.13089°, 27 Oct–29 Nov 2016, Manuka Oil/Lindgren funnel, C.T. Imada, N.L. Evenhuis; 1 spm, Ho'olehua, Mahana Gardens, N21.14358°, W157.13168°, 27 Oct–29 Nov 2016, Manuka Oil/Lindgren funnel, C.T. Imada, N.L. Evenhuis; 2 spms, Ho'olehua, Mahana Gardens, N21.14322°, W157.13036°, 27 Oct–29 Nov 2016, ETOH/Alpha-Pinene/Lindgren funnel, C.T. Imada, N.L. Evenhuis; 1 spm, Ho'olehua, Mahana Gardens, N21.143770°, W157.13155°, 27 Oct–29 Nov 2016, ETOH-Alpha-Pinene/Lindgren funnel, C.T. Imada, N.L. Evenhuis.

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Pityophthorus sp. from Maui. BPBM 17-NLH-002. Spcm 0016.

Cyrtogenius brevior Eggers **New state record**

This bark beetle is found primarily in tropical countries of the Indo-Malayan Region from Myanmar eastward, with records from the Andaman Islands, Indonesia, Malaysia (Peninsular, Sarawak), Myanmar, Papua New Guinea, Philippines, Solomon Islands, and Thailand; as well as islands in the Pacific (American Samoa, Federated States of Micronesia, Fiji, Marianas Islands, Samoa) (Beaver 1976; Wood & Bright 1992; Bright & Skidmore 1997, 2002). The finding in our surveys marks the first record of this species in the Hawaiian Islands and, aside from occasional interceptions at ports of entry, possibly the first established record from the United States. The tree hosts are primarily varied angiosperms and the species has been recorded making galleries in mango, figs, and pines (Beaver 1976).

Material examined: HAWAIIAN ISLANDS: **Maui**: 3 spms, Olinda, N20°49.327′, W156°17.784′, 14 Oct–15 Nov 2016, ETOH/Alpha-Pinene/Lindgren funnel, K.T. Arakaki, C.T. Imada, N.L. Evenhuis.

Pityophthorus sp. **New state record**

(Fig. 1)

This bark beetle genus occurs primarily in North and Central America, but also Europe, Asia, and Africa, comprising more than 370 species. Expertise in identifying the collected specimens below the genus level was unavailable, yet the finding here marks the first

record of the genus for the Hawaiian Islands. The beetles breed in twigs, seedlings, boles, and pith and have a variety of hardwood and conifer hosts (Arnett *et al*. 2002). They are primarily secondary bark beetles and restricted to partly living shaded out branches and small diameter twigs. Except for *P. juglandis* Blackman on walnuts in the U.S., species may not be considered of economic importance (Smith & Hulcr 2015).

Material examined: HAWAIIAN ISLANDS: **Maui**: 2 spms, Poli Poli, Kula Forest Reserve, N20°42.75′, W156°18.453′, 13 Oct–14 Nov 2016, ETOH/Alpha-Pinene/Lindgren funnel, K.T. Arakaki, C.T. Imada, Y. Ishibashi, N.L. Evenhuis.

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New Species Records and Voucher Specimens of Marine Benthic Algae from Kahoʻolawe, Main Hawaiian Islands[1]

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Kahoʻolawe is the smallest (18.0 km long and 9.7 km wide) of the eight main volcanic islands of the Hawaiian Islands, and is located 11 km SW of Maui. It is one of four islands (Maui, Molokaʻi, Lānaʻi, Kahoʻolawe) of the Maui Nui Complex (Price & Elliott-Fisk 2004), which was connected as a single landmass in the past (1.2 million years ago). The annual rainfall is less than 65 cm and the shortage of water contributes to the current lack of a permanent human population. The island was used as a live-fire training ground and bombing range by the U.S. Armed Forces from the early 1950s to 1990. In 1993, military controlled Kahoʻolawe was transferred to the jurisdiction of the State of Hawaiʻi which established the Kahoʻolawe Island Reserve. The Kahoʻolawe Island Reserve Commission was established the following year by the Hawaiʻi State Legislature to oversee the whole island and its surrounding waters (3 km radius from shore). Today, the island is unique in that commercial use on the island is prohibited and the Reserve is used only for native Hawaiian cultural, spiritual and subsistence purposes (Wikipedia 2018).

The written records of marine benthic algal species from Kahoʻolawe are recent. Dames & Moore (1997) listed 12 species of marine algae in the Kahoʻolawe Ocean Management Plan prepared for the Kahoʻolawe Island Reserve Commission, with no reference to where the listing originated. The following year, Coles *et al.* (1998) conducted a baseline survey and reported the marine algae and invertebrates observed in the intertidal and subtidal waters of Kahoʻolawe. The algal species were predominantly identified via observations in the field, and voucher specimens were not specified nor were the sites of specimen deposition, if any, identified. The study was mainly to identify non-indigenous and invasive species in the nearshore marine waters of the Kahoʻolawe Island Reserve. Eighty species of macroalgae, i.e., three Cyanobacteria (blue-green algae), 38 Rhodophyta (red algae), 16 Phaeophyceae (brown algae) and 23 Chlorophyta (green algae), were listed which included nine taxa identified only to genera. *Asparagopsis taxiformis* (Delile) R.Trevis. (gametophyte) and "*Falkenbergia hillebrandii*" (sporophyte) listed as two taxa are considered here as one species. None of the algae are considered invasive species.

Abbott (1999) and Abbott & Huisman (2004) documented 70 species of marine algae with voucher specimens from Kahoʻolawe which included 35 species of red algae, 13 species of brown algae and 22 species of green algae (see Appendix). Abbott (1999) stated "…, this volume contains the first comprehensive reports of marine algae from Kahoʻolawe, and we look forward to more collections from that island in the future." Among the species, Abbott (1999) cited one specimen (IA 21063) of *Acanthophora spicifera*, an invasive species, from Kahoʻolawe. This single specimen, however, is not deposited in *BISH*. In their study of invasive algal species in Hawaiʻi, Smith *et al.* (2002)

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examined the algal specimens at *BISH* but did not find any specimens of *A. spicifera* from Kahoʻolawe among the collection.

Shultz (2004) compared the intertidal and shallow subtidal (<4 m deep) marine algal communities at three sites at Kahoʻolawe and two sites at adjacent Maui. His Masters of Science thesis recorded 71 taxa, including 11 taxa identified only to genus, from Kahoʻolawe during the months of January, February, April, August and October during 2002 and 2003. Twenty nine specimens collected solely by Shultz from Kahoʻolawe were listed in the BISH algal database with all except one collected on 23 April 2002. The exception was *Padina melemele* I.A. Abbott & Magruder, which was collected on 28 February 2002.

Alcohol preserved specimens of marine algae, representing six species collected during the Coles *et al*. (1998) study were recently found in November 2017 in the Invertebrate Collection of the Bishop Museum. The specimens were sorted, identified, mounted on herbarium paper, cataloged (BISH 769051 to 769056) in *Herbarium Pacificum*, and represent the only voucher algal specimens from that study in *BISH*. The species included three new records, two previously recorded species and one taxon identified only to genus.

Eighteen species of unreported marine benthic algal species from the island of Kahoʻolawe (1 blue-green alga, 12 red algae, 1 brown alga, and 4 green algae) were found in *Herbarium Pacificum (BISH)*, reexamined, and reported here. An additional 21 species (1 blue-green alga, 10 red algae, 6 brown algae and 4 green algae) were also found in *Herbarium Pacificum* based on other collections from Kahoʻolawe. These specimens can serve as voucher specimens for selected species listed in Dames & Moore (1997), Coles *et al.* (1998) and Shultz (2004). The species distribution from the other seven main Hawaiian Islands (MHI) are also provided. All algal species had been previously reported from one or more of the MHI. The species distribution in the coastal waters of the 10 islands, atolls and shoals of the Papahānaumokuākea Marine National Monument (Northwestern Hawaiian Islands) (PMNM) are summarized in Tsuda (2014) and Tsuda *et al.* (2015). AlgaeBase (Guiry & Guiry 2018) was consulted for currently accepted algae names and synonyms. Pukui *et al.* (1974) was consulted for spelling of Hawaiian place names (collecting sites), when available, along the coast of Kahoʻolawe.

Phylum CYANOBACTERIA

Leptolyngbya crosbyana (Tilden) Anagn. & Komárek **Voucher specimen**

MHI distribution. Oʻahu (Tilden 1910; as *Phormidium crosbyanum* Tilden, Huisman *et al.* 2007); Kahoʻolawe (Coles *et al.* 1998).

Material examined. BISH 694018, E. Waikahalulu Bay, coll. S. Hau & F. Oishi, 09 Sep 1992 (IA 21001).

Symploca hydnoides Kütz. ex Gomont **New island record**

MHI distribution. Specific MHI not designated (Huisman *et al.* 2007).

Material examined. BISH 694015, Puʻukoaʻe, coll. S. Hau & F. Oishi, 09 Sep 1992 (IA 20878); BISH 694016, Lae o Kealaikahiki, coll. S. Hau, 20 Oct 1992 (IA 21016); BISH 694017, Kanapou Bay, 3.0–9.1 m deep, coll. G. Jeane II, 21 Dec 1992 (IA 21150).

Phylum RHODOPHYTA

Ahnfeltiopsis concinna (J.Agardh) P.C.Silva & DeCew **Voucher specimen**

MHI distribution. Kauaʻi, Oʻahu, Maui, Lānaʻi, Hawaiʻi (Abbott 1999); Kahoʻolawe (Dames & Moore 1997; as *Ahnfeltia concinna* J.Agardh).

Material examined. BISH 692541, coll. D. McGregor, 17 Sep 1993 (IA 21874).

Amansia fimbrifolia (R.E.Norris) L.E.Phillips **New island record**

MHI distribution. Kauaʻi, Oʻahu (Abbott 1999; as *Melanamansia fimbrifolia* R.E.Norris).

Material examined. BISH 666878, Hakioawa Bay, 9.1–12.2 m deep, coll. R. Okano & K. Schultz, 16 Aug. 2000 (IA 24766), det. I.A. Abbott.

Amphiroa valonioides Yendo **New island record**

MHI distribution. Kauaʻi, Oʻahu, Lānai (Abbott 1999).

Material examined. BISH 666880, Hakioawa Bay, 9.1–12.2 m deep, coll. R. Okano & K. Schultz, 17 Aug 2000 (IA 24772), det. I.A. Abbott.

Asparagopsis taxiformis (Delile) R.Trevis. **Voucher specimen**

MHI distribution. Kauaʻi, Oʻahu, Molokaʻi, Hawaiʻi (Abbott 1999); Kahoʻolawe (Coles *et al.* 1998, Shultz 2004).

Material examined. BISH 693746, coll. D. McGregor, 17 Sep 1993 (IA 21876); BISH 771019 (slide), coll. R. Okano, 16 Aug 2000 (IA 24769), det. I.A. Abbott.

Caulacanthus ustulatus (Mertens ex Turner) Kütz. **New island record**

MHI distribution. Kauaʻi, Oʻahu, Molokaʻi, Maui, Hawaiʻi (Abbott 1999).

Material examined. BISH 769053, NE Hakioawa Bay, coll. R. DeFelice, S. Coles & J. Smith, 12 Jan 1998 (*s.n.*).

Ceramium clarionense Setch. & N.L.Gardner **Voucher specimen**

MHI distribution. Oʻahu, Maui, Hawaiʻi (Abbott 1999); Kahoʻolawe (Coles *et al.* 1998).

Material examined. BISH 771031 (slide), Hakioawa Bay, 1.5–6.1 m deep, coll. R. Okano, 16 Aug. 2000 (IA 24780b), det. I.A. Abbott.

Ceramium hanaense R.E.Norris & I.A.Abbott **Voucher specimen**

MHI distribution. Maui, Hawaiʻi (Abbott 1999); Kahoʻolawe (Coles *et al.* 1998).

Material examined. BISH 689402 (slide), Kūheia, coll. K. Shultz, 23 Apr 2002 (KS 06), det. J.R. Fisher.

Ceratodictyon intricatum (C.Agardh) R.E.Norris **Voucher specimen**

MHI distribution. Oʻahu, Maui (Abbott 1999; as *Gelidiopsis intricata* (C.Agardh) Vickers); Kahoʻolawe (Coles *et al.* 1998).

Material examined. BISH 691878, W of Lae o Kākā, coll. S. Hau, 19 Oct 1992 (IA 21059); BISH 691879, Puʻukoaʻe, coll. S. Hau & F. Oishi, 09 Sep 1992 (IA 20884c); BISH 772655, Hakioawa Bay, 7.0–13.7 m deep, coll. S. Hau, 18 Jan 2001 (IA 28174), det. I.A. Abbott.

Champia parvula (C.Agardh) Harv. **Voucher specimen**
MHI distribution. Kauaʻi, Oʻahu, Molokaʻi, Maui, Lānaʻi (Abbott 1999); Kahoʻolawe (Coles *et al.* 1998, Shultz 2004).

Material examined. BISH 771032 (slide), Hakioawa Bay, 1.5–6.1 m deep, coll. R. Okano, 16 Aug 2000 (IA 24780c), det. I.A. Abbott; BISH 689041, Kūheia, coll. K. Shultz, 23 Apr 2002 (KS 05), det. J.R. Fisher.

Chondria simpliciuscula Weber Bosse **New island record**
MHI distribution. Oʻahu, Maui, Lānaʻi, Hawaiʻi (Abbott 1999).

Material examined. BISH 689055 (slide), Kūheia, coll. K. Shultz, 23 Apr 2002 (KS 19), det. J.R. Fisher; BISH 769054, NE Hakioawa Bay, coll. R. DeFelice, S. Coles & J. Smith, 12 Jan 1998 (*s.n.*); BISH 771009 (slide), coll. R. Okano, 16 Aug 2000 (IA 24751).

Chondrophycus undulatus (Yamada) Garbury & J.T.Harper **New island record**
MHI distribution. Oʻahu, Maui (Abbott 1999; as *Laurencia undulata* Yamada).

Material examined. BISH 771029 (slide), Hakioawa Bay, coll. R. Okano, 16 Aug 2000 (IA 24780).

Corallophila itonoi (Ardré) R.E.Norris **Voucher specimen**
MHI distribution. Oʻahu, Maui (Abbott 1999); Kahoʻolawe (Shultz 2004).

Material examined. BISH 771017 (slide), Hakioawa Bay, coll. R. Okano, 16 Aug 2000 (IA 24759), det. I.A. Abbott.

Dasya anastomosans (Weber Bosse) M.J.Wynne **New island record**
MHI distribution. Kauaʻi, Oʻahu, Hawaiʻi (Abbott 1999 as *Dasya pilosa* (Weber-van Bosse) Millar).

Material examined. BISH 689052 (slide), Kūheia, coll. K. Shultz, 23 Apr 2002 (KS 16).

Dichotomaria marginata (J.Ellis & Sol.) Lam. **Voucher specimen**
MHI distribution. Oʻahu, Maui, Hawaiʻi (Abbott 1999; as *Galaxaura marginata* (J.Ellis & Sol.) J.V.Lamour.); Kahoʻolawe (Coles *et al.* 1998; as *Galaxaura marginata*).

Material examined. BISH 680056, ʻOawapalua, 4.9–9.1 m deep, coll. S. Hau, 17 May 2000 (IA 24372); BISH 692288, Honukanaenae, tidal shelf, <1 m deep, coll. M. LeGrande & K.R. Wood, 18 Jul 2001(*s.n.*); BISH 772929, W Hālona, 9.4–16.8 m deep, coll. S. Hau, 17 May 2000 (IA 24865)

Dotyella hawaiiensis (Doty & Wainwr.) Womersley & Shepley **New island record**
MHI distribution. Kauaʻi, Oʻahu, Maui (Abbott 1999).

Material examined. BISH 771027 (slide), coll. R. Okano, 16 Aug 2000 (IA 24777), det. I.A. Abbott.

Drouetia coalescens (Farlow) G.De Toni **New island record**
MHI distribution. Kauaʻi, Oʻahu, Maui (Abbott 1999; as *Halichrysis coalescens* (Farlow) R.E. Norris & Millar).

Material examined. BISH 691708, coll. S. Hau, Sep 1992 (IA 20844); BISH 771015 (slide), Hakioawa Bay, 1.5–6.1 m deep, coll. R. Okano, 16 Aug. 2000 (IA 24756).

Ganonema farinosum (J.V.Lamour.)
K.C.Fan & Yung C.Wang **New island record**
MHI distribution. O‘ahu, Maui, Hawai‘i (Abbott 1999).
Material examined. BISH 700491, N of Keana Keiki, coll. S. Hau & F. Oishi, 21 Oct 1992 (IA 20871), det. I.A. Abbott.

Haloplegma duperreyi Mont. **Voucher specimen**
MHI distribution. Kaua‘i, O‘ahu, Moloka‘i, Maui, Hawai‘i (Abbott 1999); Kaho‘olawe (Coles *et al.* 1998, Shultz 2004).
Material examined. BISH 691893, W. Kamōhio Bay, coll. S. Hau & F. Oishi, 09 Sep 1992 (IA 21027).

Hypoglossum minimum Yamada **New island record**
MHI distribution. O‘ahu, Moloka‘i (Abbott 1999).
Material examined. BISH 771012 (slide), Hakioawa Bay, 1.5–6.1 m deep, coll. R. Okano, 16 Aug 2000 (IA 24754), det. I.A. Abbott.

Nitophyllum adhaerens M.J.Wynne **New island record**
MHI distribution. Maui, Hawai‘i (Abbott 1999).
Material examined. BISH 771024 (slide), Hakioawa Bay, 1.5–6.1 m deep, coll. R. Okano, 16 Aug 2000 (IA 24774), det. I.A. Abbott.

Polysiphonia foetidissima Cocks ex Bornet **New island record**
[= *Neosiphonia tepida* (Hollenb.) S.M.Guim. & M.T.Fujii]
MHI distribution. O‘ahu, Moloka‘i (Hollenberg 1968; as *Polysiphonia tepida* Hollenb.).
Material examined. BISH 769056, epiphytic on *Chondria* sp., Hakioawa Bay, coll. R. DeFelice, S. Coles & J. Smith, 12 Jan 1998 (*s.n.*).

Portieria hornemannii (Lyngb.) P.C.Silva **Voucher specimen**
MHI distribution. O‘ahu, Maui, Hawai‘i (Abbott 1999); Kaho‘olawe (Coles *et al.* 1998).
Material examined. BISH 666874, Hakioawa Bay, 9.1–12.2 m deep, coll. R. Okano & K. Schultz (IA 24760); BISH 680059, ‘Oawapalua, 4.9–9.1 m deep, coll. S. Hau, 17 May 2000 (IA 24374), det. I.A. Abbott; BISH 693859, W of Lae o Kākā, coll. S. Hau, 19 Oct 1992 (IA 21056), det. I.A. Abbott; BISH 720282, Honukanaenae, tidal shelf, <1 m deep, coll. M. LeGrande & K.R. Wood, 18 Jul 2001 (*s.n.*), det. I.A. Abbott; BISH 772653, Hakioawa Bay, 7.0–13.7 m deep, coll. S. Hau, 18 Jan 2001 (IA 28176), det. I.A. Abbott.

Class PHAEOPHYCEAE
Asteronema breviarticulatum (J.Agardh)
L.C.Ouriques & Z.L.Bouzon **Voucher specimen**
MHI distribution. Kaua‘i, O‘ahu, Hawai‘i (Abbott & Huisman 2004); Kaho‘olawe (Coles *et al.* 1998; as *Hincksia breviarticulata* (J.Agardh) P.C.Silva, Shultz 2004).
Material examined. BISH 700699, E. Waikahalulu Bay, coll. S. Hau & F. Oishi, 09 Sep 1992 (IA 21004).

Feldmannia mitchelliae (Harv.) H.S.Kim **Voucher specimen**
MHI distribution. O‘ahu, Maui, Hawai‘i (Abbott & Huisman 2004; as *Hincksia mitchelliae* (Harvey) P.C.Silva); Kaho‘olawe (Shultz 2004; as *Hincksia mitchelliae*).
Material examined. BISH 689038 (slide), Kūheia, coll. K. Shultz, 23 Apr 2002 (KS 02), det. I.A. Abbott.

Padina australis Hauck **New island record**
MHI distribution. O‘ahu, Maui (Abbott & Huisman 2004).

Material examined. BISH 700862, Keana Keiki to Honukanaenae, coll. D. McGregor, 17 Sep 1993 (IA 21792a), det. I.A. Abbott.

Sargassum aquifolium (Turner) C.Agardh **Voucher specimen**
MHI distribution. O‘ahu, Maui, Hawai‘i (Abbott & Huisman 2004; as *Sargassum echinocarpum* J.Agardh); Kaho‘olawe (Dames & Moore 1997 and Coles *et al*. 1998; as *Sargassum echinocarpum*).

Material examined. BISH 553879 (alcohol specimen), Hakioawa Bay, tidepool, coll. P.K. Higashino, Apr 1980 (*s.n.*); BISH 700789, Pu‘ukoa‘e, coll. S. Hau & F. Oishi, 09 Sep 1992 (IA 21120), receptacles; BISH 700796, E. Waikahalulu Bay, coll. S. Hau & F. Oishi, 09 Sep 1992 (IA 21007), filiform leaves with smooth branch.

Sargassum obtusifolium J.Agardh **Voucher specimen**
MHI distribution. O‘ahu, Moloka‘i, Maui, Hawai‘i (Abbott & Huisman 2004); Kaho‘olawe (Coles *et al.* 1998, Shultz 2004).

Material examined. BISH 553876 (alcohol specimen), Hakioawa Bay, tidepool, coll. P.K. Higashino, Apr 1980 (*s.n.*).

Sphacelaria rigidula Kütz. **Voucher specimen**
MHI distribution. Kaua‘i, O‘ahu, Moloka‘i, Maui, Hawai‘i (Abbott & Huisman 2004); Kaho‘olawe (Coles *et al.* 1998).

Material examined. BISH 689044 (slide), coll. K. Shultz, 23 Apr 2002 (KS 08).

Turbinaria ornata (Turner) J.Agardh **Voucher specimen**
MHI distribution. O‘ahu, Maui, Hawai‘i (Abbott & Huisman 2004); Kaho‘olawe (Coles *et al.* 1998).

Material examined. BISH 700904, Kanapou Bay, 3.0–9.1 m deep, coll. G. Jeane II, 21 Dec 1992 (IA 21147).

Phylum CHLOROPHYTA

Bryopsis pennata J.V.Lamour. **New island record**
MHI distribution. Kaua‘i, O‘ahu, Maui (Abbott & Huisman 2004).

Material examined. BISH 771016 (slide), Hakioawa Bay, 1.5–6.1 m deep, coll. R. Okano, 16 Aug 2000 (IA 24758), det. I.A. Abbott.

Codium arabicum Kütz. **New island record**
MHI distribution. Kaua‘i, O‘ahu, Maui, Hawai‘i (Abbott & Huisman 2004).

Material examined. BISH 553872 (alcohol specimen), Hakioawa Bay, tidepool, coll. P.K. Higashino, Apr 1980 (*s.n.*); BISH 711606, Kūheia, coll. K. Shultz, 23 Apr 2002 (KS 20, IA 30047a), det. I.A. Abbott.

Codium edule P.C.Silva **Voucher specimen**
MHI distribution. O‘ahu, Moloka‘i, Maui, Hawai‘i (Abbott & Huisman 2004); Kaho‘olawe (Dames & Moore 1997, Coles *et al.* 1998, Shultz 2004).

Material examined. BISH 553871 (alcohol specimen), Hakioawa Bay, tidepool, coll. P.K. Higashino, Apr 1980 (*s.n.*).

Halimeda gracilis Harv. ex J.Agardh **New island record**
MHI distribution. O‘ahu (Abbott & Huisman 2004).

Material examined. BISH 701153, Halona Pt., coll. S. Hau & F. Oishi, 10 Sep1992 (IA 20990), det. L.M. Hodgson.

Halimeda kanaloana P.Vroom **New island record**
MHI distribution. Maui, Moloka‘i (Abbott & Huisman 2004; as *Halimeda incrassata* (J.Ellis) J.V.Lamour.

Material examined. BISH 724259, Ku‘ia Shoal via ROV (HURL), 50–95 m deep, coll. E.H. Chave, 21 Aug 2002 (IA 30048).

Siphonocladus tropicus (P.Crouan & H.Crouan) J.Agardh **Voucher specimen**
MHI distribution. Kaua‘i, O‘ahu, Maui (Abbott & Huisman 2004); Kaho‘olawe (Coles *et al.* 1998).

Material examined. BISH 553870 (alcohol specimen), Hakioawa Bay, tidepool, coll. P.K. Higashino, Apr 1980 (*s.n.*).

Ulva lactuca L. **Voucher specimen**
MHI distribution. Kaua‘i, O‘ahu, Moloka‘i, Lāna‘i, Maui (Abbott & Huisman 2004; as *Ulva fasciata* Delile); Kaho‘olawe (Dames & Moore 1997, Shultz 2004; as *Ulva fasciata*).

Material examined. BISH 701696, Keana Keiki to Honukanaenae, coll. D. McGregor, 17 Sep 1993 (IA 21792c).

Valonia ventricosa J.Agardh **Voucher specimen**
MHI distribution. Kaua‘i, O‘ahu, Moloka‘i, Lāna‘i, Maui, Hawai‘i (Abbott & Huisman 2004; as *Ventricaria ventricosa* (J.Agardh) Olsen & West); Kaho‘olawe (Coles *et al.* 1998 and Shultz 2004; as *Ventricaria ventricosa*).

Material examined. BISH 666870, Hakioawa Bay, 1.5–6.1 m deep, coll. R. Okano & K. Schultz, 16 Aug 2000 (IA 24750), det. I.A. Abbott.

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APPENDIX
Previously Reported Marine Algae with Voucher Specimens from Kaho‘olawe (Abbott 1999, Abbott & Huisman 2004)
[Species listed in Dames & Moore 1997 (+), Coles *et al*. 1998 (*) and Shultz 2004 (^)]

Phylum Rhodophyta

**Acanthophora pacifica* (Setch.) Kraft
Acanthophora spicifera (Vahl) Børgesen
Acrothamnion butleriae (Collins) Kylin
^**Actinotrichia fragilis* (Forssk.) Børgesen
^**Amansia glomerata* C.Agardh [= *Melanamansia glomerata* (C. Agardh) R.E.Norris]
Centroceras clavulatum (C.Agardh) Mont.
^*Chondria polyrhiza* Collins & Hervey
Chondrophycus dotyi (Y.Saito) K.W.Nam [= *Laurencia dotyi* Y.Saito]
+*Chondrophycus succisus* (A.B.Cribb) K.W.Nam [= *Laurencia succisa* A.B.Cribb]
Crouania minutissima Yamada
^**Dasya iridescens* (Schlech) A.Millar & I.A.Abbott
Digenea cymatophila (R.E.Norris) Diaz-Tapia & Maggs [= *Alsidium cymatophilum* R.E.Norris]
Diplothamnion jolyi C.Hoek
Galaxaura divaricata (L.) Huisman & R.A.Townsend [= *Galaxaura fasciculata* Kjellman]
^**Galaxaura rugosa* (J.Ellis & Sol.) J.V.Lamour.
Gayliella flaccida (Kütz.) T.O.Cho & L.McIvor [= *Ceramium flaccidum* (Kütz.) Ardissone]
^**Gibsmithia hawaiiensis* Doty
^+*Gracilaria coronopifolia* J.Agardh
Heterosiphonia crispella (C.Agardh) M.J.Wynne
Hypnea spinella (C.Agardh) Kütz.
Laurencia brachyclados Pilger
Laurenica dendroidea J.Agardh [cited as *Laurencia majuscula* (Harv.) Lucas]
Laurencia galtsoffii M.Howe
^*Martensia fragilis* Harv.
Melanthamnus apiculatus (Hollenb.) Diaz-Tapia & Maggs [= *Neosiphonia apiculata* (Hollenb.) Masuda & Kogame, *Polysiphonia apiculata* Hollenb.]
Peyssonnelia inamoena Pilger
Predaea weldii Kraft & I.A.Abbott
^**Spyridia filamentosa* (Wulfen) Harv.
Stylonema cornu-cervi Reinsch
^**Taenioma perpusillum* (J.Agardh) J.Agardh
^*Tolypiocladia glomerulata* (C.Agardh) Schmitz
**Tricleocarpa fragilis* (L.) Huisman & R.A.Townsend
Trichogloeopsis mucosissima (Yamada) I.A.Abbott & Doty
Womersleyella pacifica Hollenb.
Womersleyella setacea (Hollenb.) R.E.Norris [= *Polysiphonia setacea* Hollenb.]

Class Phaeophyceae

^**Chnoospora minima* (Hering) Papenf.
^**Dictyota acutiloba* J.Agard
**Dictyota ceylanica* Kütz. [also cited as *Dictyota divaricata* J.V.Lamour.]
**Dictyota friabilis* Setch.
Dictyota sandvicensis Sond.
Dictyota stolonifera E.Y.Dawson
Feldmannia indica (Sond.) Womersley & A.Bailey [= *Hincksia indica* (Sond.) J.Tanaka]
^**Lobophora variegata* (J.V.Lamour.) Womersley ex Oliveira
^*Padina melemele* I.A.Abbott & Magruder
Rosenvingea orientalis (J.Agardh) Børgesen
**Sargassum polyphyllum* J.Agardh
**Sphacelaria novae-hollandiae* Sond.
^*Sphacelaria tribuloides* Menegh.

Phylum Chlorophyta

**Bornetella sphaerica* (Zanardini) Solms
Caulerpa lentillifera J.Agardh
**Caulerpa serrulata* (Forssk.) J.Agardh
**Caulerpa taxifolia* (Vahl) C.Agardh
Caulerpa verticillata J.Agardh
^**Caulerpa webbiana* Mont.
Cladophora hawaiiana Tilden
^**Cladophora socialis* Kütz.
^*Cladophora vagabunda* (L.) C.Hoek
Cladophoropsis fasciculata (Kjellm.) Wille [= *Cladophoropsis sundanensis* Reinbold]
**Cladophoropsis membranacea* (Hoffman Bang ex C.Agardh) Børgesen
^**Dictyosphaeria cavernosa* (Forssk.) Børgesen
^**Dictyosphaeria versluysii* Weber Bosse
^*Halimeda discoidea* Decaisne
^**Halimeda opuntia* (L.) J.V.Lamour.
^**Microdictyon setchellianum* M.Howe
**Microdictyon umbilicatum* (Velley) Zanardini [also cited as *Microdictyon japonicum* Setch.]
^**Neomeris annulata* Dickie
^**Neomeris vanbosseae* M.Howe
Parvocaulis clavatus (Yamada) S.Berger, U.Fettweiss, S.Gleissberg, L.B.Liddle, U.Richter, H.Sawitzky & G.C.Zuccarello [= *Acetabularia clavata* Yamada]
Ulva paradoxa C.Agardh [= *Enteromorpha paradoxa* (J.Agardh) Kütz.]
Valonia aegagropila C.Agardh

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New Records of Two-Winged Flies (Insecta: Diptera) from O‘ahu, Hawaiian Islands[1]

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Recent collected material of Diptera from various localities on O‘ahu has resulted in two new state records, one new island record, and range extensions. All material is deposited in the Bishop Museum (BPBM).

Cecidomyiidae
Winnertziinae
Heteropezini
Neostenoptera sp. **New state record**

This unusual heteropezine paedogenetic cecidomyiid was collected from a three fairly widely separated localities on O‘ahu, so it may have been established for some time but just not collected previously. Given its extremely small size (1–2mm), it can easily be overlooked in general collecting samples (cf. Plakidas 2017). The provenance and species identification remain unknown. Originally described from an Afrotropical Copal specimen (Meunier 1901, 1902), the genus has since been found extant represented by species from the Congo (Gagné 1979) and the southeastern and eastern United States (Plakidas & Ferro 2016). This marks the first record of the genus from the Hawaiian Islands. Using the key in Plakidas (2017) it easily keys to *Neostenoptera* Meunier, but it does not key to either of the described species and may be new.

Material examined: HAWAIIAN ISLANDS: **O‘ahu**: 1 spm, Barbers Point, 0–5 ft, 3–10 May, 2017, 1–14 Sep 2017, W.D. Perreira, D.A. Yee, yellow sticky board trap; 1 spm, Foster Botanical Garden, 20–115 ft, 5–12 May 2017, W.D. Perreira, D.A. Yee, yellow sticky board trap; 9♂♀, Moanalua Valley, 260–350 ft, 27 Apr–14 May 2017, 2–9 Aug 2017, 2–16 2017, W.D. Perreira, D.A. Yee, yellow sticky board trap (all BPBM)

Xylomyidae
Solva sp. **Range extension**

Since the first record of this genus and family in the Hawaiian Islands (Evenhuis 2016), more specimens have been collected on O‘ahu extending the range from the middle of the island to both the northern and southern portions. Its native provenance and species identity remain unknown.

1. Contribution No. 2018-010 to the Hawaii Biological Survey.

Fig. 1. Specimen of *Leptopteromyia mexicanae* Martin from O‘ahu.

Material examined: HAWAIIAN ISLANDS: **O‘ahu**: 1♂, Ted Makalena Golf Course, 15–30 ft, 8–16 Nov 2016, W.D. Perreira, D.A. Yee, yellow sticky board trap; 2♂, Makaleha Stream, 3 ft, 18–22 Jun 2017, 22–28 Jun 2017, W.D. Perreira, D.A. Yee, yellow sticky board trap (all BPBM).

Asilidae

Leptopteromyia mexicanae Martin, 1971 **New island record**

This small leptogastrine asilid that mimics wasps (Fig. 1) was originally reported from Maui (Howarth *et al*. 2012: 166) from a 2011 collection, but efforts to re-collect it from the island after the original record proved fruitless (M.T. Fukada, pers. comm. Jun 2013). Recent collecting on O‘ahu, however, show that it has made it to this island. Given its small size, it may have been overlooked in general collecting and may be present on other islands as well. It is a predator on small soft-bodied invertebrates such as plant and leafhoppers and inhabits tall grassy areas where it perches on grass blades awaiting prey to ambush.

Material examined: HAWAIIAN ISLANDS: **O‘ahu**: 23♂♀, Barbers Point, 0–5 ft, 7–12 Jun 2017, 21–27 Jun 2017, 27 Jun–5 Jul 2017, 5–12 Jul 2017, W.D. Perreira, D.A. Yee, yellow sticky board trap (BPBM).

Fig. 2. Male of *Tylopterna* sp. from O‘ahu.

Chloropidae

Tylopterna sp. **New state record**

Tylopterna was originally described (Bezzi 1916) from the Philippines based on a single male specimen described as *Tylopterna monstrosum* Bezzi, 1916. It was originally treated in “Ortalidae’ [= Ulidiidae] but was transferred to Chloropidae by Sabrosky (1951). The male

has a distinctive flattened face and a wing with a unique erect protuberance in open cell m1 (Fig. 2). Females collected with the males are dimorphic and do not have modified features in the wing and the head is compressed to a substantially lesser degree. This genus is currently under revision by the senior author and will result in a number of new species and synonymies. It is listed here now to record the new state record in a timely manner.

Material examined: HAWAIIAN ISLANDS: **O'ahu**: 4♂,7♀, Makaleha Stream, 3ft, 3–10 Apr 2017, 8–15 May 2017, W.D. Perreira, D.A. Yee, yellow sticky board trap (BPBM).

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