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EDITOR



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Cover photo: *Clidemia hirta* (L.) D.Don. See page 3 for details on the history of its mistaken common name “Koster’s Curse”. Photo: Clyde T. Imada.

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BISHOP MUSEUM

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RECORDS OF THE HAWAII BIOLOGICAL SURVEY FOR 2013

Editor's Preface

We are pleased to present the annual compilation of *Records of the Hawaii Biological Survey*; this year for the year 2013. This *Records* volume is a combined one containing records pertaining to both animals and plants.

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 5,800 authors who have described flies.

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<http://hbs.bishopmuseum.org/>

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<http://hbs.bishopmuseum.org/codens/>

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 2013* were compiled with the assistance of Clyde Imada and Alison Sherwood (botany), David Preston (entomology), and Robert Cowie (snails). 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, and the Hawaii Department of Land and Natural Resources.

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 next *Records*. Submission and format of papers must follow our guidelines. Information on submission of manuscripts and guidelines for contributors may be obtained on the web (via pdf format) at:

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

—*N.L. Evenhuis, editor*
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“Koster’s Curse”: mistaken blame in the common name for the invasive melastome, *Clidemia hirta*?¹

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The invasive melastome *Clidemia hirta* (L.) D.Don was introduced into Hawai‘i (first observed on O‘ahu as early as 1941 but not collected until 1949; Wester & Wood, 1977), and quickly spread to all the islands where it has posed a problem for native plants by out-competing for resources and choking out native understory plants. It has been called “Koster’s Curse” for many years and apparently no one has bothered to find the source of the name or if the name is correctly applied.

Clidemia hirta is native to the Neotropics with a wide distribution from southern Mexico, the West Indies, throughout central America, and into the northern half of south America including Argentina, Paraguay, and Brazil. Wester & Wood (1977) gave a detailed account of the history of its introductions throughout the Pacific and noted that Fiji was where the current common name originated. Simmonds (1937) stated that it was probably introduced accidentally into Fiji with coffee plants originating from mainland South America between 1880 and 1886 (probably Guyana). Apparently, a man named Koster was the culprit and the appellation “Koster’s Curse” was given and it stuck.

Delving into the literature a bit more, I have come up with some evidence that lends support to the possibility that the wrong man was blamed for the importation of the plant and that the common name may be wrongly attributed. The first published use of the common name seems to be in 1906 by Frederick Muir, an entomologist with the Hawaii Sugar Planters’ Association (at the time the only entomological research institution in Hawai‘i). Muir was sent out to the tropical areas of the South Pacific, Australia, and the Melanesian Archipelago to search for potential biological control agents for sugar cane pests. In his report of a trip to Fiji, he mentioned *Clidemia hirta* as an invasive pest on the island of Viti Levu and said it was called “Koester’s Curse” (Muir, 1906: 5). As there had been no published reports using that common name, he must have heard the common name from locals. However, researching subsequent literature from agricultural reports in Fiji indicates that the common name was incorrectly applied but unfortunately no reasons were given why.

“Considerable interest has been aroused by a reference in some correspondence with Mr. F. Muir, an Entomologist, who visited Fiji some time ago, to a fungus present on leaves of *Clidemia hirta* (sometimes, apparently erroneously, called Kōster’s Curse) a common weed in some parts of Fiji.” (Anonymous, 1914: 65).

In compiling the diaries and journals of Bishop Museum naturalist Edwin H. Bryan, Jr. during his 1924 trip in to Samoa and Fiji as part of the Whitney South Seas Expeditions (see Evenhuis, 2007 for a detailed account of his trip based on his journals and photography), I came across a June 1924 journal entry that gives the possible origin of the plant and the name.

Bryan spent from February through November of 1924 as part of the Whitney South Seas Expedition where he was tasked by Bishop Museum Director, Herbert Gregory to

1. Contribution No. 2014-002 the Hawaii Biological Survey.

“collecting everything except birds”. The expedition stopped at many South Seas islands but spent most of its time in the Lau Group of Fiji. Upon arriving in Suva at the beginning of the Fiji portion of the trip, Bryan made short collecting trips around Suva, and visited a number of naturalists and agriculture folks on the island of Viti Levu to become acquainted with the fauna and flora before venturing out to the Lau Group to collect.

One of the persons he met was an artist by the name of A.E. Ward. Mr. Ward watched Bryan pressing plants and identified one of the plants he was pressing (Fig. 1) as “Köster’s Curse” and proceeded to tell Bryan the origin of the plant in Fiji and how it got its name.

“It was introduced as a garden plant by a Mr. Parr. It later escaped and became a great pest because of its ability to spread rapidly. Someone asked the son of Mr. Köster, a neighbor of Parr’s who it was that introduced the plant. Young Köster replied “Parr”. Thinking he had said “pa”, the misinformation became fixed that Köster had introduced it and despite Köster’s efforts to correct the mistake it has been known as Köster’s Curse.” (*Bryan journal entry, Monday 9 June 1924, Suva, Fiji*; see Evenhuis 2007: 135).

So there are two differing stories: 1) the plants were brought in accidentally by Köster for his coffee plantation between 1880 and 1886; and 2) the plants were brought in purposefully by Parr [unknown date of introduction] as an ornamental for his garden. In order to get to the bottom of this story, I conducted some research on just who Köster and Parr were. Possibly this would explain why there were two differing stories.

Parr is William Fillingham Parr (1844–1912), a English-born planter who was an advocate of slavery (Parr, 1895), but he essentially mistreated local Fijians and kept them indentured slaves on his plantations (Ali, 2008). He was a powerful and wealthy person in Fiji and, although a vocal opponent of the government at the time, held sway with a number of individuals in business, including the powerful Planters’ Association in Fiji. He owned a coffee plantation and was known to introduce ornamentals and other plants into Fiji (an introduced *Parkia* tree on his property was described as new and named after him [cf. Baker (1884)], and he exchanged seeds and plants with foreign herbaria and societies, including the Botanic Gardens in Sydney, Australia (Anonymous, 1882: 24). Some of the earlier Fiji Agriculture reports on *Clidemia hirta* indicate that the officials at that time believed that Parr’s estate was where the plant originated and not Köster’s:

“Acting upon information given by Mr. Corbett, visits were paid to his estate, and to those of Mr. Koster and Mr. Witherow adjoining to investigate a disease which was said to be killing the weed *Clidemia hirta*. A visit was also paid to the old coffee plantation of Mr. Parr, where the weed is said to have first appeared in this country.” (Simmonds & Knowles, 1920: 9).

Köster was a lesser-known Mr. Carl H. Köster, who owned land in Waimanu in the Rewa District, near where *Clidemia hirta* is purported to have been introduced. It is unclear if he farmed coffee or tried to, but he had a sugar plantation in the Ra District (Angus, 2013) and apparently also had some cows as he won awards for his buttermilk and cheese (Anonymous, 1915). Upon hearing of his name applied to the pest *Clidemia*, he tried to correct the mistake, but was unsuccessful. He died in 1920 and most of the agricultural reports coming out of Fiji using the “Köster’s Curse” common name were published in the 1930s, after his death. With no one to defend his presumed innocence, the name Köster Curse has persisted and strengthened and, at some point in time, it lost the umlaut over the “ö” to have the orthography currently used.

If Simmonds is correct in his estimation that *Clidemia* was introduced sometime between 1880 and 1886, this would fit the scenario of the times when Parr was running his



Figure 1. Herbarium sheet in Herbarium Pacificum of the *Clidemia hirta* plant from Fiji that Bryan was pressing when Mr. Ward explained the mistaken origin of the name. See Bryan's note at bottom right.

coffee plantation. Given that the Fiji Agriculture officials were attempting to determine origin and timing of the introduction not until many years later (1900s–1910s) and the fact the plant spreads so quickly, it would be too late to accurately determine exactly where the plants had originally been introduced. With regard to being introduced with coffee plants, they could have also easily been introduced into a garden of the owner of a coffee farm and birds eating the fruits could have helped quickly spread seeds to nearby areas. Given the known facts and personalities, it seems much more probable that Parr purposefully introduced the plant from Brazil for his garden (along with other plants he introduced), rather than Köster accidentally introducing the plant with coffee plants from Guyana.

So, if Mr. Ward's story is true, the plant should more accurately be called "Parr's Curse"; but nevertheless, the current spelling is incorrect since it should really be "Köster" and not "Koster" if it is to be blamed on that poor boy's father.

Acknowledgments

Clyde Imada reviewed the article and helped improve it. Shelley James assisted with access to the image of *Clidemia hirta*. Imaging of the *Herbarium Pacificum* sheet was funded by National Science Foundation DBI-1057453.

Literature Cited

- Ali, S.** 2008. *The federation movement in Fiji, 1880–1902*. iUniverse, New York. 192 pp.
- Angus, B.M.** 2013. *My colonial Fiji*. Trafford Publishing, Singapore. xiv + 95 pp.
- Anonymous.** 1882. Botanical gardens. (Plants and seeds received and distributed.), pp. 1–40. In: *Votes and Proceedings of the Legislative Assembly [New South Wales] during the Session 1882, II The various documents connected therewith*. Government Printer, Sydney. 1629 pp.
- Anonymous.** 1914. *Fiji Department of Agriculture Annual Report*. Government Printing Office, Suva, Fiji.
- Anonymous.** 1915. Prize list. *Windsor and Richmond Gazette* **1915** (30 April): 1–2.
- Baker, J.G.** 1884. Recent additions to our knowledge of the flora of Fiji. *Journal of the Linnean Society of London* (Botany) **20**: 358–373.
- Evenhuis, N.L.** 2007. Field notes of E.H. Bryan, Jr. on the Whitney South Seas Expedition (February–November 1924). *Bishop Museum Technical Report* **37**, x + 322 pp.
- Muir, F.** 1906. Notes on some Fijian insects. *Hawaii Sugar Planters' Association, Bulletin of the Division of Entomology* **2**: 1–11.
- Parr, W.F.** 1883. *The Polynesian labour trade: remarks on the report written by Rear-Admiral J. Crawford Wilson on the labour trade in the Western Pacific*. The Mercury Office, Hobart. 14 pp.
- Parr, W.F.** 1895. *Slavery in Fiji*. Address delivered before the Balloon Society on September 24th, 1895. Clarendon Press, London. 20 pp.
- Simmonds, H.W.** 1937. The biological control of the weed *Clidemia hirta*, commonly known in Fiji as "The Curse". *Fiji Agricultural Journal* **8**(3), 37–39.
- Simmonds, H.W. & Knowles, C.H.** 1920. A disease of *Clidemia hirta* in the lower Rewa District. *Fiji Department of Agriculture, Circular* **1**: 9–12.
- Wester, L.L. & Wood, H.B.** 1977. Koster's Curse (*Clidemia hirta*), a weed pest in the Hawaiian forests. *Environmental Conservation* **4**(1): 35–39.

New plant records for the Hawaiian Islands 2012–2013¹

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Here, O'ahu Early Detection documents two new state records, 13 new naturalized records, 11 new island records, and 3 range extensions found by us and other individuals and agencies. A total of 26 plant families are discussed.

Information regarding the formerly known distribution of flowering plants is based on the *Manual of the Flowering Plants of Hawai'i* (Wagner *et al.* 1999) and information subsequently published in the *Records of the Hawaii Biological Survey*. All supporting voucher specimens are deposited at Bernice Pauahi Bishop Museum's *Herbarium Pacificum* (BISH), Honolulu, Hawai'i.

Alismataceae

Sagittaria platyphylla (Engelm.) J.G.Sm.

New naturalized record

This perennial aquatic herb is native to southeastern North America and Central America, and is cultivated as an aquatic ornamental. It was first collected in Hawai'i in 1991, but has likely been in the aquarium trade here for some time before then. It was collected from a *lo'i kalo* in Waihe'e, O'ahu, where it was occasionally occurring in high density "thickets" over multiple *kalo* (*Colocasia esculenta*) patches, and appeared to be competing for resources and significantly reducing fitness of the planted *kalo*. It is unclear how it came to occur in this site, though local farmers believe it may have been transferred accidentally as seed in soil when sharing *huli* from infested *lo'i* elsewhere. This species can be distinguished from the congener *S. latifolia*, the only other species known to be naturalized in Hawai'i, by its generally larger size (to 150 cm tall); emerged leaves with petioles 21–71 cm long, blades linear-ovate to ovate; submersed leaves present; and flowers with pubescent filaments (*S. latifolia* grows to about 45 cm tall; emerged leaves with petioles 6–51 cm long, blades sagittate or sometimes hastate; submersed leaves absent; and flower filaments glabrous) (Haynes & Hellquist 2000).

Material examined. O'AHU: Windward O'ahu, Waihe'e, lowland cultivated taro patch, hundreds of individuals seen in patch, said to have been introduced from taro starters brought from Kaula'i, 20 Sep 2013, D. Frohlich, A. Lau & J. Beachy 2013092002.

Araceae

Anthurium schlectendalii Kunth hybrid

New naturalized record

This hybrid was found in a local botanical garden, spreading sparingly in two localized areas. Araceae experts consulted for an identification agreed that the plants fit within *Anthurium* section *Pachyneurium*, which is characterized by simple, unlobed, epunctate leaves with blades neither cordate nor subcordate at the base. The hybrid is believed to incorporate the species *A. schlectendalii*, as well as other species, which may include *A.*

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crenatum (L.) Kunth, *A. cowanii* Croat, *A. asplundii* Croat, *A. upalaense* Croat & R. Baker, and possibly others (L. Miyano, pers. comm., 2013) The full description of *Anthurium schlectendalii* can be found in a revision of the genus by Tom Croat (Croat 1983). *Anthurium schlectendalii* hybrids have been seen spreading in other botanical garden settings as well, growing epiphytically and epipetrically in deep or partial shade.

Material examined. O'AHU: Wahiawā Botanical Garden, growing on *Schefflera actinophylla* and *Ficus playpoda*, which were epiphytic on *Pritchardia* sp., 12 Jul 2012, OED 2012071202.

Asteraceae

Chromolaena odorata (L.) R.M.King & H.Rob. **Range extension**

This species was recently reported from *mauka* areas of Kahuku on O'ahu, with no other reported localities on the island (Frohlich & Lau 2012). Ongoing surveys and collections have revealed other populations on the island, including a small population in Schofield Barracks West Range, Kahana Valley, Pūpūkea, and a single individual growing on the coastal side of the highway near the Velzyland surf break access. This highly invasive species may be dispersing long distances, and ongoing eradication efforts continue. Given its apparent ease of dispersal to new locations through accidental introductions, governmental agencies, private landowners, and active land users such as the U.S. military, dirt bikers, and hikers need to be cognizant of the potential for dispersal when traversing infested sites or moving equipment or soil from known areas of infestation. Any suspected findings should be reported to the Hawai'i Department of Agriculture's Plant Pest Control Branch, the O'ahu Invasive Species Committee, or the authors.

Material examined. O'AHU: Schofield Barracks West Range, Lower Mohiākea Gulch along Area X, 25 May 2013, J. Beachy & J. Gustine-Lee US Army 312.

Begoniaceae

Begonia cucullata Willd.

New island record

This collection represents a new island record of naturalization for *Begonia cucullata*, which was previously collected on the islands of Kaua'i and Hawai'i (Lorence *et al.* 1995). This naturalized population of around 100 plants of multiple size classes (including seedlings) was found growing among *Acacia koa*, *Metrosideros polymorpha*, *Clidemia hirta*, and *Doodia kunthiana* in the Wai'ānae Range.

Material examined. O'AHU: Wai'ānae Mountains, Kalua'ā, 13 Mar 2013, US Army 308.

Boraginaceae

Carmona retusa (Vahl) Masam.

New island record

Carmona retusa has long been known to spread in residential settings on the island of O'ahu (Staples & Herbst 2005), but this collection marks the first time it was collected specifically to document its naturalization (see references to other collections in "Material examined"). Fukien tea, as it is commonly known, is frequently seen along roadsides, popping out of hedges and other home plantings. It was previously collected as naturalized on the islands of Kaua'i, Moloka'i, and Maui (Imada 2012).

Material examined. O'AHU: Pearl City, 1468 Kawelu Street, along roadside in residential area, growing in landscaped area but not planted, 6 Oct 2013, K. Kawelo US Army 326; Kailua, 209 Oneawa Kai Place, seedlings collected at drip-line from house roof, where birds defecate and seeds germinate on ground, 9 Oct 1997, G.W. Staples 1148; Waimānalo, naturalizing along roadsides, yards, fences, lowland mesic forest, along side of road, residential/agricultural area, 10 Aug 2006, D. Frohlich, A. Lau, F. Starr, & K. Starr OED 0608104; Kailua, Nā Pōhaku o Hauwahine, Kapa'a

Quarry Road, in previously cleared dryland restoration area, with *Citharexylum caudatum*, *Syzygium jambos*, *Schefflera actinophylla*, *Panicum maximum*, *Colubrina asiatica*, several seedlings removed from the area, 2 May 2010, S.A. James 2010_1; Honolulu, 1651 Young Street, residence of Tom Mukaida, several plants volunteering in yard, 7 Dec 1993, W. Kobayashi s.n. (BISH 635357)

Combretaceae

Quisqualis indica L.

New naturalized record

Quisqualis indica, a rampant climber native to Malaysia and possibly Africa (Staples & Herbst 2005), was found spreading sparingly outside a home site and at a nearby wetland, where it reached over 7 m into the canopy of a tree. This species can be differentiated from other members of the Combretaceae family in Hawai'i by its climbing habit and tube-shaped flowers, which start out white and turn red with age (Staples & Herbst 2005).

Material examined. O'AHU: Kailua, near 1659 Kanapu'u Dr., Jul 2013, US Army 319.

Fabaceae

Acacia auriculiformis A. Cunn. ex Benth.

New naturalized record

Acacia auriculiformis was originally collected as naturalized on O'ahu from Waimānala Agricultural Experiment Station (Frohlich & Lau 2007), but it was later decided this original collection warranted only "adventive" status, since the seedlings were found in the vicinity of the cultivated parent (Wagner *et al.* 2012). This most recent collection documents a true naturalization of this species, in that over 15 individuals of various sizes, including large mature trees, were found spreading over more than a mile on a major highway. It is unclear whether this species was originally planted along this highway, or if it spread here from the nearby Ho'omaluhia Botanical Garden.

Material examined. O'AHU: H-3 on-ramp from Likelike Highway, town-bound direction, 20 Nov 2013, US Army 329.

Flacourtiaceae

Dovyalis hebecarpa (Gardner) Warb.

New island record

Dovyalis hebecarpa, an infrequently cultivated plant already collected as naturalized on the island of Hawai'i (Herbst 1998), was found on O'ahu in Waimea Valley Botanical Garden, sparingly naturalized with a well-scattered distribution outside the maintained portions of the garden. This species has been eradicated from plantings in Florida, because of concerns regarding its invasive nature. It received a score of High Risk on the Hawai'i-Pacific Weed Risk Assessment, and is not recommended for cultivation in Hawai'i (Chimera 2011).

Material examined. O'AHU: Waimea Valley Botanical Garden, 11 Dec 2012, OED 2012121107.

Iridaceae

Gladiolus dalenii Van Geel

New island record

Gladiolus dalenii, native to parts of Africa (Staples & Herbst 2005) and previously collected as naturalized on the islands of Maui and Hawai'i (Imada 2012), was found in a disturbed mesic, non-native forest in Schofield Barracks, growing among *Citharexylum caudatum* and non-native grasses, including *Andropogon virginicus*. Over a hundred plants were found in the area.

Material examined. O'AHU: Schofield Barracks East Range, along centerline road, 20 Sep 2012, US Army 293.

***Trimezia steyermarkii* R.C. Foster**

New naturalized record

Trimezia steyermarkii, a popular species in O'ahu landscaping, was found on a survey of an O'ahu botanical garden, spreading along a seasonally flooded streambank. It is likely that this species spread vegetatively in this area, as it is known to produce plantlets in abundance. The extent of spread was notable—this species was occasional to common along a large portion of the stream, and it is implausible that it was planted in all the areas where it was found. *Trimezia steyermarkii* can be differentiated from the less commonly planted *T. martinicensis* by its larger flower size, persistent spent ovaries on threadlike pedicels, and keeled inflorescence bracts with undulate margins (Staples & Herbst 2005).

Material examined. O'AHU: Waimea Valley Botanical Garden, in unmaintained part of garden, streamside, 5 Aug 2013, OED 2013080505.

Juncaceae

***Juncus tenuis* Willd.**

New island record

This species, which is usually seen naturalized in wet sites along trails and other disturbed areas in Hawai'i, and was previously collected from the islands of Kaua'i, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999), was recently collected from O'ahu along a roadside in Schofield Barracks East Range.

Material examined. O'AHU: Schofield Barracks East Range, along road, 10 Apr 2013, US Army 310.

Lindsaeaceae

×*Lindsaeosoria flynnii* W.H. Wagner

New island record

×*Lindsaeosoria flynnii*, a sterile hybrid of the naturalized fern species *Lindsaea ensifolia* Sw. and the native fern *Sphenomeris chinensis* (L.) Maxon (Palmer 2003), was noted on O'ahu at a landing zone inside Kawailoa Training Area. Three or four clumps of the hybrid were spotted, and both parent plant species were common in the area. This collection marks the first time this hybrid has been noted on the island of O'ahu; it had previously been documented only from Kaua'i (Palmer 2003).

Material examined. O'AHU: Kawailoa Training Area at the "Red" LZ, 12 Feb 2013, J. Gustine-Lee US Army 302.

Moraceae

***Castilla elastica* Sessé**

New naturalized record

This self-compatible species, which thrives in tropical climates and has already been noted as naturalized in Samoa, Puerto Rico, Australia, Tanzania, French Polynesia, and Singapore (Chimera 2012), has recently been found to be naturalizing in an O'ahu botanical garden. Surveys in the garden are not yet complete but as of 1 November 2013 there have been around 60 individuals found within the garden boundary, both in managed and unmanaged portions of the property. It is probable that this species is being spread by birds, and possibly by pigs. In its native range, it is able to establish itself in intact forest (Woodson & Schery 1960), and this has proven to be the case in Hawai'i as well, as immature individuals been found primarily in the understory of mature secondary forest. Mature naturalized individuals, on the other hand, were around 10 m tall and growing in

full sun. This species is considered an environmental weed in American Samoa, and received a score of High Risk on the Hawaii-Pacific Weed Risk Assessment (Chimera 2012). The garden plans to remove the accessioned individuals, in addition to controlling the naturalized plants.

Castilla elastica can reach up to 10 m in height, the young branches densely pubescent with spreading or appressed golden hairs, turning glabrate with age. Leaves are 20–30 cm long, 10–14 cm broad, oblong-ovate, and cordate at the base (the bases often somewhat unequal) with subcuspidate to acuminate tips; margins are minutely ciliate-dentate, and both surfaces are covered in golden spreading hairs. Inflorescences are in clusters of 2–4 in the upper leaf axils (occasionally solitary). The fruiting heads are thickly discoid and sessile, about 4–5 cm in diameter, and develop a fleshy orange or reddish pulp when mature (Woodson & Schery 1960).

Material examined. O'AHU: Waimea Arboretum, near old greenhouse, 11 Dec 2012, OED s.n. (BISH 757506).

Myrtaceae

Myrciaria floribunda (H. West ex Willd.)

O. Berg

New naturalized record

Myrciaria floribunda, or rumberry, a plant used for a popular liqueur in St. Martin and the Virgin Islands and native to southern Mexico through tropical America (Morton 1987), was apparently introduced to Hawai'i but never became popular as a fruit tree—there are only two other specimens of this species documented in the *Herbarium Pacificum*. Nonetheless, over 60 plants of varying size (including seedlings) were recently found naturalized in a non-native secondary forest. This species may have been originally planted in this area, but it has certainly spread well beyond the original planting site.

Myrciaria floribunda can be distinguished from *M. cauliflora*, the other *Myrciaria* species more commonly seen in Hawai'i, by its downy reddish brown branchlets and flaking bark; evergreen, opposite leaves with acute apices minutely dotted with oil glands; and round to oblate fruit borne in lateral or axillary clusters, or singly (the fruit of *M. cauliflora* is borne on the trunk and main branches) (Morton 1987).

Material examined. O'AHU: On the border of Kaukonahua and Waikakalaua, 19 Oct 2013, US Army 328; Kahana, along trail that branches from Schofield-Waikāne Trail to jump into Kahana at the saddle behind Pu'u 'Ōhulehule, growing with *Psidium cattleianum*, *Ficus* sp., *Bischofia* sp., *Syzygium jambos*, *Casuarina glauca*, 23 Mar 2006, US Army 38a.

Onagraceae

Oenothera curtiflora W.L. Wagner & Hoch

New state record

This annual herb is probably native to some regions of central North America, though it is considered naturalized in certain states, including California. It is not a cultivated species, and appears to be an accidental arrival to Hawai'i. It was first noted in the spring of 2011 along Kalaniana'ole Highway near Bellows Air Force Base, and later collected from a nearby coastal city beach park in a lawn area where 70–100 individuals of various sizes were seen. It can be distinguished from other species of *Oenothera* by its relatively small (5–11 mm long), indehiscent fruits with a stalklike base. A full description of this species and a key to the genus in California can be found online at the *Jepson eFlora* page (Wagner 2012).

Material examined. O‘AHU: Windward side, Waimānalo Beach Park in lawn area just behind gate, area is mowed about every 2 months, 3 Jul 2013, *K. Stender s.n.* (BISH 757488).

Orchidaceae

Epidendrum nocturnum Jacq.

Range extension

This epiphytic species, previously documented as very sparingly naturalized on O‘ahu (Frohlich & Lau 2012), has now been found in several locations in both the Wai‘anae and central Ko‘olau Mountain ranges, where it has been seen spreading abundantly in various tree species in mid-elevation native forest areas. This species appears to be expanding its range, based on field observations from local resource management staff (K. Kawelo, O‘ahu Army Natural Resources Program, pers. comm., 2013).

Material examined. O‘AHU: Poamoho drainage, native-dominated area, canopy *Metrosideros polymorpha* and *Acacia koa*, understory *Dicranopteris linearis*, 10 Dec 2012, *US Army 301*.

Pittosporaceae

Pittosporum senacia Putt.

New naturalized record

Native to the Seychelles and Mascarene Islands, *Pittosporum senacia* is virtually unknown outside its native range. This species is only known from two botanical gardens on O‘ahu, and was collected as naturalized at one of them. Fifteen plants of various sizes were seen in the collection area, and many more were scattered upslope from the original planting site, growing in the understory of a non-native mesic forest in an unmanaged portion of the garden, presumably spread by birds.

Species description translated from French (Sarrailh *et al.* 2007):

“Shrub to small tree, glabrous, with many branches. Bark of older branches light-colored. [Leaves] simple, entire, alternate, petiolate, clustered at the ends of branches, forming false whorls or isolated and distant-lamina obovate or elliptical. [Inflorescences] grouped at the ends of branches, in umbels or panicles. Petals white, oblong. Male flowers with rudimentary ovary, and style not exceeding the stamens. Female flowers with staminodes resembling stamens, but shorter; ovary supported by a short gynophore with a robust style that exceeds staminodes. Capsules 4–10; red, viscous (often black when dry), 2–3 mm long.”

Material examined. O‘AHU: Waimea Valley Botanical Garden, in unmanaged part of garden, 3 Jun 2013, *OED 20130603*.

Poaceae

Saccharum spontaneum L.

Range extension

This species, which was previously documented as naturalized along the Pali Highway on O‘ahu (Wagner *et al.* 1999), has now been collected in a remote natural area in native forest, along and in a seasonal stream near the Schofield-Waikāne Trail in the Ko‘olau Mountain range, where it appears to be fairly well established.

Material examined. O‘AHU: Streamside near Schofield-Waikāne Trail, 12 Sep 2013, *G. Schuenger NARS s.n.* (BISH 757402).

Thysanolaena latifolia (Roxb. ex Hornem.) Honda

New naturalized record

Thysanolaena latifolia, an ornamental tropical grass with a bamboo-like habit, was first spotted on the Laie Trail in 2009, seemingly planted in an erosion-prone area along a pop-

ular hiking trail (J. Lau, pers. comm., 2013) In the years following, it has spread considerably from the original small, contained patches of cultivated culms, and has established itself in an area about 100 × 50 m. Hundreds of mature plants and numerous seedlings and immature plants were seen in the area.

Description from the *Flora of China Online* (Liu & Phillips 2006):

“Culms 1–3 m tall, hard, unbranched, often arching. Leaf sheaths smooth; leaf blades broadly lanceolate-oblong, leathery, up to 40 × 3–7 cm; ligule truncate, 1–2 mm. Panicle up to 60 cm, open or contracted; main branches 1–3 per node, pilose in axils, bare of spikelets in lower part, lowest branch up to 30 cm; pedicels ca. 2 mm. Spikelets 1.5–1.8 mm; glumes 1/5–1/4 spikelet length, ovate-lanceolate; lower lemma as long as spikelet; upper lemma slightly shorter than lower lemma, marginal hairs rigid, to 1 mm, spreading at maturity, apex slightly recurved. Anthers brown, 0.5–1 mm. Caryopsis oblong, ca. 0.5 mm. Fl. and fr. summer to autumn.”

Material examined. O‘AHU: Lā‘ie Falls Trail, 2 Aug 2013, K. Kawelo US Army 325.

***Urochloa distachya* (L.) T.Q. Nguyen**

New island record

Urochloa distachya, which is found in open disturbed sites in subtropical to tropical climates worldwide, was recently collected on a roadside in Schofield Barracks on O‘ahu. It is unclear how this species came to this area, but presumably, it was an accidental introduction. Under the now-synonymous name *Brachiaria subquadripara* (Trin.) Hitchc., O‘Connor (1990) noted that it was an escape and possibly naturalizing on O‘ahu, Moloka‘i, and Maui, and Lorence *et al.* (1995) confirmed its naturalization on Kaua‘i.

Description of this species from *Flora of Tropical East Africa* (Clayton & Renvoize 1982):

“Creeping annual; culms 5–20 cm high, ascending from a prostrate base. Leaf-blades broadly linear to narrowly lanceolate, 2–8 cm long, 3–7 mm wide. Inflorescence of 2–3 racemes on an axis 0.5–2 cm long; racemes 1–3 cm long, bearing the spikelets on a narrowly winged rachis. Spikelets narrowly elliptic, 2.4–3 mm long, glabrous, acute; lower glume 1/3–1/2 as long as the spikelet, clasping; upper glume separated from the lower by a short internode; upper lemma rugulose, bluntly acute.”

Material examined. O‘AHU: Schofield Barracks, Kolekole Range, 25 May 2013, J. Gustine-Lee US Army 316.

Polypodiaceae

***Pyrrhosia longifolia* (Burm. f.) C.V. Morton**

New naturalized record

This epiphytic fern has a somewhat wide native distribution in Southeast Asia, and is found in northern Australia, southern China, and India as well. It is unclear to what degree it is cultivated worldwide, though it was first collected as cultivated in Hawai‘i in 1985 in Foster Botanical Garden on O‘ahu. It is documented here as naturalized in a different botanical garden, probably having escaped cultivation there. It was forming thick, complete, extensive coverings of whole palm trunks and large tree branches, growing in both full sun and deep shade. It can be distinguished from other *Pyrrhosia* species in Hawai‘i by rhizomes with dense, distinctly bi-colored scales with subentire (rather than ciliate) margins; and linear, erect or pendulous fronds ranging from 9–70 cm long by 1–2(–4) cm wide (Lindsay & Middleton 2012). A full description of this and other species of *Pyrrhosia*

can be found at the *Ferns of Thailand* site referenced above. A monograph of the genus is also available (Hovenkamp 1986).

Material examined. O'AHU: Wahiawā Botanical Garden Hawaiian section, epiphyte on *Pritchardia* sp., ca 8 plants in the vicinity, but species is occasionally naturalized in garden, sometimes forming thick carpet on branches, 12 Jul 2012, A. Lau & D. Frohlich 2012071203.

Pontederiaceae

Heteranthera reniformis Ruiz & Pav.

New state record

Also known as kidneyleaf mudplantain, this aquatic species from a broad native range of climates in North, Central, and South America has been introduced outside that range for ornamental purposes and has subsequently become naturalized and weedy in Australia and Europe. This species, with documented negative impacts to agricultural yields in rice fields (Ferrero 1996), has now been documented on O'ahu from a *lo'i kalo* in Waihe'e. Local farmers estimated significant reductions in yield at the site, where it was found in multiple *kalo* (*Colocasia esculenta*) patches on two farms in the area. Control of the species has been difficult, and one current strategy has been to dry, then flood, individual patches to induce germination out of the seed bank, then removing the plants before they set new seed. This species has been rated as High Risk by the Hawai'i-Pacific Weed Risk Assessment (Anonymous 2013), and should be monitored for and controlled throughout the state, where possible. One potential vector for long term dispersal of this species could be seeds or other propagules hitchhiking on shared *huli* between farms within and between islands. It can be distinguished from other Pontederiaceae in Hawai'i by its leaves with petioles 2–13 cm long; reniform blades 1–4 × 1–5 cm; inconspicuous inflorescences of 2–8 flowers that elongate in one day; and flowers opening in the morning and wilting by afternoon, composed of a white, salverform perianth, the tube 5–10 mm long, the lobes narrowly elliptic, 3–7 mm long. A full description and keys to similar species can be found in the *Flora of North America* (Horn 2002).

Material examined. O'AHU: Waihe'e Valley off of Waihe'e Road, mauka of Ahilama Road, lowland wet to mesic residential and agricultural area, 20 Jul 2013, J. Beachy & J. Gustine-Lee US Army 320.

Rosaceae

Rosa laevigata Michx.

New island record

This rampant, aggressive climber has previously been collected as naturalized on Hawai'i Island and at the Lāna'ihale summit on Lāna'i (Imada 2012), and is spreading profusely from plantings in Kōke'e on Kaua'i. It was recently found on O'ahu outside an abandoned homesite, spreading from a probable cultivated plant. Over 30 individuals of all sizes, including seedlings, were seen in the area.

Material examined. O'AHU: Wai'anae Range, Pālehua, in yard of abandoned house, 16 Aug 2012, OISC 2012081601..

Rubiaceae

Cyclophyllum barbatum (G. Forst.)

N. Hallé & J.Florence

New naturalized record

Cyclophyllum barbatum, a species very rarely cultivated in Hawai'i and previously known only from two locations on O'ahu, was found spreading sparingly, with a rather

widely scattered distribution, in the understory of established secondary forest in Waimea Valley Botanical Garden. Little is known about this species outside its native range in the Caroline and Solomon Islands, and Fiji through to the South Pacific, where it is common in dry and coastal forests, forest patches in open country, and on crests and ridges (Smith & Darwin 1988). It is a slender tree, reaching 2–15 m in height; leaves opposite, with pocketlike domatia in the axils of the secondary veins (sometimes absent); flowers axillary, 5-merous, fragrant; corolla tube 2.5–5.0 mm long, white to cream-colored; stigmatic knob subcylindric-capitate; and fruit 8–15 mm wide, red turning black at maturity (Smith & Darwin 1988).

Material examined. O‘AHU: Waimea Valley Botanical Garden, along upper maintenance road, 15 Feb 2013, OED 2013021502.

Sapotaceae

Mimusops elengi L.

New naturalized record

Mimusops elengi, which can be differentiated from other *Mimusops* species present in Hawai‘i by its abruptly pointed leaf apices and sweetly fragrant flowers (Staples & Herbst 2005), was recently collected spreading near the Kaunala Trail in Pūpūkea, O‘ahu. Tens of individuals of varying size (including seedlings) were seen in the area.

Material examined. O‘AHU: Kaunala Trail, Pūpūkea, 24 Aug 2013, K. Kawelo US Army 325.

Sterculiaceae

Heritiera littoralis Aiton

New island record

Heritiera littoralis, a species occasionally seen as a street tree or feature plant in O‘ahu landscapes (Staples & Herbst 2005), was recently found spreading locally in a natural area on Round Top Drive on O‘ahu. Hundreds of seedlings and immature plants were seen in the area. It is probable that the largest plant seen in the collection site was planted there. Seedlings and immature plants were mostly seen near the parent plant, but some significant spread (40 m away) was also noted. The species was previously noted as naturalizing on Kaua‘i (Lorence & Flynn 2006).

Material examined. O‘AHU: Round Top Drive, next to Boy Scout camp facility, on side trail cutting across a loop of the road, 10 m off of trail, 5 Oct 2012, J. Beachy US Army 296.

Urticaceae

Laportea aestuans (L.) Chew.

New island record

Laportea aestuans was previously vouchered from an O‘ahu plant nursery, and noted but unvouchered from Big Island nurseries in Lau & Frohlich (2013), so this collection formally notes its naturalization on the island of Hawai‘i. This species, which is a weed of plantations in Central America and the West Indies (Clifford 2012), is believed to be spread through potting mix, but the original source of the planting medium is still unclear (B. Azama, Hawai‘i Department of Agriculture, pers. comm., 2012).

Material examined. HAWAI‘I: Kurtistown, plant nursery, 28 Nov 2012, K. Fujimoto s.n. (BISH 757458).

Zingiberaceae

Alpinia zerumbet (Gardner) Warb.

New island record

Alpinia zerumbet, a species widely cultivated in the tropics and previously collected as naturalized on the islands of Maui, Moloka‘i, and Kaua‘i (Imada 2012), was found scat-

tered along a periodically flooded streamside in Waimea Valley Botanical Garden.

Material examined. O'AHU: Waimea Valley, along stream in unmanaged area, 10 Jun 2013, OED 2013061005.

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Literature Cited

- Anonymous.** 2013. *Heteranthera reniformis*. Hawai'i-Pacific Weed Risk Assessment. Available from: <http://www.plantpono.org/files/Heteranthera%20reniformis.pdf> [Accessed 6 Nov 2013]
- Chimera, C.** 2011. *Dovyalis hebecarpa*. Hawai'i-Pacific Weed Risk Assessment. Available from: <http://plantpono.org/files/Dovyalis%20hebecarpa.pdf>. [Accessed 6 Nov 2013]
- . 2012. *Castilla elastica*. Hawai'i-Pacific Weed Risk Assessment. Available from: <http://plantpono.org/files/Castilla%20elastica.pdf>. [Accessed 6 Nov 2013]
- Clayton, W.D. & Renvoize, S.A.** 1982. Gramineae (part 3). *Flora of Tropical East Africa*: 451–898.
- Clifford, P.** 2012. *Laportea aestuans*. Hawai'i-Pacific Weed Risk Assessment. Available from: <http://plantpono.org/hpwra-plant.php?id=1494>. [Accessed 6 Feb 2013]
- Croat, T.** 1983. A revision of the genus *Anthurium* (Araceae) of Mexico and Central America. Part I: Mexico and Middle America. *Annals of the Missouri Botanical Garden* **70**(2): 211–420.
- Ferrero, A.** 1996. Prediction of *Heteranthera reniformis* competition with flooded rice using day–degrees. *Weed Research* **36**(2): 197–201.
- Frohlich, D. & Lau, A.** 2007. New plant records from O'ahu for 2006. *Bishop Museum Occasional Papers* **96**: 8–13.
- . & Lau, A. 2012. New plant records for the Hawaiian Islands 2010–2011. *Bishop Museum Occasional Papers* **113**: 27–54.
- Haynes, R.R. & Hellquist, C.B.** 2000. *Sagittaria* Linnaeus, pp. 11–23. In: Flora of North America Editorial Committee (eds.), *Flora of North America*. Volume 22. Magnoliophyta: Alismatidae, Arecidae, Commelinidae (in part), and Zingiberidae. Oxford University Press, New York. xxiii + 352 pp.
- Herbst, D.R.** 1998. New records for Hawaiian plants. I. *Bishop Museum Occasional Papers* **56**: 2–4.
- Horn, C.N.** 2002. *Heteranthera* Ruiz & Pavón, pp. 41–45. In: Flora of North America Editorial Committee (eds.), *Flora of North America*. Volume 26. Magnoliophyta:

- Liliidae: Liliales and Orchidales. Oxford University Press, New York. xxvi + 723 pp.
- Hovenkamp, P.H.** 1986. *A monograph of the fern genus Pyrrosia (Polypodiaceae)*. Leiden Botanical Series 9. E.J. Brill/Leiden University Press, Leiden. 280 pp.
- Imada, C.T.** 2012. *Hawaiian native and naturalized vascular plants checklist (December 2012 update)*. Hawaii Biological Survey, Bishop Museum, Honolulu. 29 pp. + 7 appendices.
- Lau, A. & Frohlich, D.** 2013. New plant records for the Hawaiian Islands 2011–2012. *Bishop Museum Occasional Papers* **114**: 5–16.
- Lindsay, S. & Middleton, D.J.** 2012. *Ferns of Thailand, Laos and Cambodia*. Available at: http://rbg-web2.rbge.org.uk/thaiferns/factsheets/index.php?q=Pyrrosia_longifolia.xml. [Accessed Date?]
- Liu, L. & Phillips, S.M.** 2006. *Thysanolaena* Nees, p. 446. In: Wu, Z., Raven, P.H. & Hong, D. (eds.), *Flora of China*. Volume 22. Poaceae. Available at: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=20757. [Accessed Date?]
- Lorence, D.H. & Flynn, T.** 2006. New naturalized plant records for Kaua'i and Hawai'i. *Bishop Museum Occasional Papers* **88**: 1–5.
- , **Flynn, T. & Wagner, W.L.** 1995. Contributions to the flora of Hawai'i. III. *Bishop Museum Occasional Papers* **41**: 19–58.
- Morton, J.F.** 1987. *Fruits of warm climates*. Published privately, Miami. 505 pp.
- O'Connor, P.J.** 1990. *Brachiaria* (Trin.) Griseb., pp. 1503–1504. In: Wagner, W.L., Herbst, D.R. & Sohmer, S.H., *Manual of the flowering plants of Hawai'i*. 2 vols. University of Hawai'i Press & Bishop Museum Press, Honolulu. 1853 pp.
- Palmer, D.D.** 2003. *Hawai'i's ferns and fern allies*. University of Hawai'i Press, Honolulu. 336 pp.
- Sarrailh, J.-M., Baret, S. & Rivière, E.** 2007. *Arbres et arbustes indigènes de la Réunion*. Available at: http://arbres-reunion.cirad.fr/especes/pittosporaceae/pittosporum_senacia_putterl. [Accessed 6 Nov 2013]
- Smith, A.C. & Darwin, S.P.** 1988. *Cyclophyllum*, pp. 232–237. In: Smith, A.C., *Flora vitiensis nova: a new flora of Fiji*. Volume 4. Pacific Tropical Botanical Garden, Lāwa'i, Kaua'i, Hawai'i. 377 pp.
- Staples, G.W. & Herbst, D.R.** 2005. *A tropical garden flora*. Bishop Museum Press, Honolulu. xxiv + 908 pp.
- Wagner, W.L.** 2012. *Oenothera*. In: Jepson Flora Project (eds.), *Jepson eFlora*, http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=89229. [Accessed 22 Nov 2013]
- , **Herbst, D.R., Khan, N. & Flynn, T.** 2012. Hawaiian vascular plant updates: a supplement to the *Manual of the Flowering Plants of Hawai'i* and *Hawai'i's Ferns and Fern Allies*, version 1.3 (12 April 2012).
- , **Herbst, D.R. & Sohmer, S.H.** 1999. *Manual of the flowering plants of Hawai'i*. Revised edition. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu. 1919 pp.
- Woodson, R.E. & Schery, R.W.** 1960. *Castilla* Cerv. *Annals of the Missouri Botanical Garden* **47**(2): 139–142.

New Hawaiian plant records for 2013¹

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Ongoing field work, collections, and research continue to produce new, previously unpublished distributional records for the Hawaiian flora. In this paper eight new island records and two range extensions are reported. A total of 10 taxa in nine plant families are discussed. Seven taxa are dicotyledonous angiosperms, and three are monocots. One taxon is endemic. Collections were made on Kaua'i, O'ahu, Lāna'i, and Maui. Information regarding the formerly known distribution of flowering plants is based on the *Manual of Flowering Plants of Hawaii* (Wagner *et al.* 1999) and information subsequently published in the *Records of the Hawaii Biological Survey*. Voucher specimens are deposited at the Bernice Pauahi Bishop Museum *Herbarium Pacificum* (BISH), Honolulu, with duplicates at the National Tropical Botanical Garden (PTBG), Lāwa'i, Kaua'i. A few specimens may be at only one facility; only in these cases will the herbarium acronym be cited.

Acanthaceae

Barleria repens Nees

New island record

Commonly cultivated as a ground cover or bedding plant, this species easily escapes and has been documented as a naturalized species on O'ahu (Staples *et al.* 2002: 3), Lāna'i, and East and West Maui (Oppenheimer 2003: 3). It was recently collected on Kaua'i, where it is naturalized in disturbed lowland areas.

Material examined. KAUA'I: Koloa Distr., Maha'ulepū, 24 m, 3 May 2013, Oppenheimer, M. Sporck, & J.Q.C. Lau H51302.

Asteraceae

Erigeron karvinskianus DC.

New island record

A weedy herb known from Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1990: 315; Hughes 1995: 2), this species was recently collected on Lāna'i. It is a known habitat modifier of riparian areas and other mesic to wet sites. All plants observed were removed, and monitoring is ongoing.

Material examined. LĀNA'I: headwaters of Hau'ola Gulch, 950 m, 5 Feb 2013, Oppenheimer & Perlman H11301.

Begoniaceae

Begonia hirtella Link

New island record

Uncommonly cultivated, and naturalized in Hawai'i in disturbed, wet, shaded sites, especially moist banks on Kaua'i, O'ahu, East & West Maui, and Hawai'i (Wagner *et al.* 1999: 384; Lorence *et al.* 1995: 25; Oppenheimer 2004: 9), this begonia was found on Lāna'i

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growing in a clogged rain gutter at a single story residence, where it was growing in soil with *Phlebodium aureum*.

Material examined. LĀNAʻI: Lānaʻi City, 490 m, 20 Jul 2011, *Oppenheimer, Bustamente, & Perlman H71109*.

Marantaceae

Calathea crotalifera S. Watson

New island record

This large ornamental herb was documented as naturalized on Oʻahu (Wagner *et al.* 1999: 1464) and Hawaiʻi (Parker & Parsons 2010: 42). On windward East Maui it was found to be locally common in disturbed sites in secondary lowland forest.

Material examined. MAUI: East Maui, Hāna Distr., Wakiu, N of Olopawa, 183 m, 24 Jan 2013, *Oppenheimer & Perlman H11304*.

Melastomataceae

Pterolepis glomerata (Rottb.) Miq.

New island record

A weedy herb naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, and Hawaiʻi (Wagner *et al.* 1999: 912; Hughes 1995: 7; Wood 2006: 18), this species was recently collected in two sites in wet lowland forest on East Maui.

Material examined. MAUI: East Maui, Hāna Distr, Kawaipapa, 792 m, 23 Apr 2013, *Oppenheimer, Bustamente, & J.Q.C. Lau H41325* (BISH); Waihoi Valley, vicinity of Waiohonu Stream, 930 m, 29 May 2013, *Oppenheimer et al. H51316*.

Moraceae

Ficus religiosa L.

New island record

Due to the presence of its pollinator wasp, Bo tree is now starting to escape cultivation on Oʻahu (Frohlich & Lau 2008: 7–8) and Hawaiʻi (Parker & Parsons 2012: 20). On Maui, seedlings and saplings are becoming increasingly common in and around Lahaina. It has been observed along fences, roads, and walls, apparently below places where frugivorous birds would perch and pass the seeds. No mature trees have been observed growing near any of these immature plants.

Material examined. MAUI: West Maui, Lahaina Distr, Honoapiʻilani Hwy., 7 m, 23 Apr 2013, *Oppenheimer & J.Q.C. Lau H41330*.

Myrsinaceae

Ardisia crenata Sims

Range extension

Previously reported as naturalized on Kauaʻi, Oʻahu, West Maui, and Hawaiʻi (Wagner *et al.* 1999: 932; Oppenheimer 2004: 13; Frohlich & Lau 2012: 41), this shrub was found to be occasional along a small perennial stream on East Maui.

Material examined. MAUI: East Maui, Hāna Distr, Keaʻakai Gulch, 206 m, small shrubs naturalized along stream on rocks beneath *Ardisia elliptica* in degraded *Pandanus-Acacia-Metrosideros* forest, 27 Feb 2013, *Oppenheimer & Perlman H21313*.

Poaceae

Dichelachne crinita (L.f.) Hook.f.

Range extension

Previously documented from East Maui (Starr *et al.* 2003: 29), this grass was collected on West Maui in disturbed mesic forest.

Material examined. MAUI: West Maui, Wailuku Distr., SE slopes of Hanaʻula, extreme head of Kaunoahua Gulch, 951 m, 21 May 2007, *Oppenheimer H50724*.

Phleum pratense* L.*New island record**

A pasture grass, this species was included as a note in the introduction of the Poaceae in Wagner *et al.* (1999: 1483). It had been collected as an escape on Kaua'i, O'ahu, and Maui. Later, Herbst & Wagner (1999: 29) considered it naturalized on Kaua'i and O'ahu, but the Maui occurrence was still questionable, with only a 1941 specimen collected at the Makawao Experiment Station. The following specimen documents this grass as sparingly naturalized on East Maui.

Material examined. MAUI: East Maui, Makawao Distr., Waikamoi Stream drainage basin, SE of Pu'u Lu'au, near gate before Hosmer Grove campground, unpaved road from Haleakalā National Park into Haleakalā Ranch and Waikamoi Preserve, 2057 m, 28 Sep 2010, *Oppenheimer & Bily H91018*.

Rutaceae***Zanthoxylum dipetalum* H. Mann****New island record**

This species occurs on Kaua'i, O'ahu, Moloka'i, and Hawai'i islands and is divided into two varieties, with variety *tomentosa* endemic to Hawai'i Island and extremely rare. Recently a small population of six trees was located in mesic forest on West Maui. They differ from the other two taxa in the size, shape, and number of leaflets, as well as pubescence; the abaxial surface is covered in very fine, minute white to gray hairs. Further study is needed in order to assign this population to either subtaxon.

Material examined. MAUI: West Maui, Lahaina Distr, Kaua'ula Valley, south slope, 853 m, 24 Apr 2013, *Oppenheimer, Bustamente, & J.Q.C. Lau H41338*.

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Literature Cited

- Frohlich, D. & Lau, A.** 2008. New plant records from O'ahu for 2007. *Bishop Museum Occasional Papers* **100**: 3–12.
- . 2012. New plant records for the Hawaiian Islands for 2010–2011. *Bishop Museum Occasional Papers* **113**: 27–54.
- Herbst, D.R. & Wagner, W.L.** 1999. Contributions to the flora of Hawai'i. VII. *Bishop Museum Occasional Papers* **58**: 12–36.
- Hughes, G.D.** 1995. New Hawaiian plant records. II. *Bishop Museum Occasional Papers* **42**: 1–10.
- Imada, C.T., Staples, G.W. & Herbst, D.R.** 2000. New Hawaiian plant records for 1999. *Bishop Museum Occasional Papers* **63**: 9–16.
- Lorence, D.H., Flynn, T.W. & Wagner, W.L.** 1995. Contributions to the flora of Hawai'i. III. *Bishop Museum Occasional Papers* **41**: 19–58.

- Oppenheimer, H.L.** 2003. New plant records from Maui and Hawai'i counties. *Bishop Museum Occasional Papers* **73**: 3–30.
- . 2004. New Hawaiian plant records for 2003. *Bishop Museum Occasional Papers* **79**: 8–20.
- . 2008. New Hawaiian plant records for 2007. *Bishop Museum Occasional Papers* **100**: 22–38.
- Parker, J.L. & Parsons, B.** 2010. New plant records for the Big Island for 2008. *Bishop Museum Occasional Papers* **107**: 41–43.
- . 2012. New plant records from the Big Island for 2010-2011. *Bishop Museum Occasional Papers* **113**: 65–74.
- Staples, G.W., Herbst, D.R. & C.T. Imada.** 2000. Survey of invasive or potentially invasive cultivated plants in Hawai'i. *Bishop Museum Occasional Papers* **65**: 1–35.
- , **Imada, C.T. & Herbst, D.R.** 2002. New Hawaiian plant records for 2000. *Bishop Museum Occasional Papers* **68**: 3–18.
- . 2003. New Hawaiian plant records for 2001. *Bishop Mus. Occas. Pap.* **74**: 7–21.
- Starr, F., Starr, K. & Loope, L.L.** 2003. New plant records from the Hawaiian archipelago. *Bishop Museum Occasional Papers* **74**: 23–34.
- Wagner, W.L., Herbst, D.R. & Sohmer, S.H.** 1990. *Manual of the flowering plants of Hawai'i*. Revised edition. 2 vols. University of Hawai'i Press & Bishop Museum Press, Honolulu. 1919 pp.
- Wood, K.R.** 2006. New plant records and rediscoveries within the Hawaiian Islands. *Bishop Museum Occasional Papers* **88**: 15–19.

Endemism of marine algae in the Hawaiian Islands¹

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Abbott (1995) posed the question of endemism in Hawaiian marine algae in a presentation on the state of systematics of marine algae in Pacific tropical islands. She answered this question by providing examples of algal species described as new in the Hawaiian Islands and collected later from other sites in the world, and algal species which were never found outside the topographic boundaries of the initial topotype collection site. If we are to consider the latter, i.e., species described and only known from the Hawaiian Islands, as Hawaiian endemics, 56 species of Hawaiian marine algae (Chlorophyta, Phaeophyceae and Rhodophyta) fall within this category. The Cyanobacteria and crustose coralline algae (Corallinaceae) of Hawaii were excluded from this analysis.

The numbers of marine algae in the Hawaiian flora were based on the valid and currently accepted species names for the red algae (Abbott 1999) and for the green and brown algae (Abbott & Huisman 2004), published new records (e.g., Bailey-Brock & Magalhães 2010) and 14 subsequently newly described marine algal species in the Hawaiian Islands, i.e., Abbott & McDermid (2001, 2002), Abbott & Huisman (2003), Huisman *et al.* (2004), Kraft *et al.* (2004), Vroom & Abbott (2004a, 2004b), Vroom (2005), Abbott *et al.* (2010), Kogame *et al.* (2011), Kurihara *et al.* (2012), Hernández-Kantún *et al.* (2012) and Kraft *et al.* (2014).

Aside from distributional information in Abbott (1999) and Abbott & Huisman (2004), other distributional records were gleaned from species compilations on Micronesian algae (Lobban & Tsuda 2003), French Polynesian algae (N'Yeurt & Payri 2006, 2007, 2010), Central Polynesian algae (Tsuda & Walsh 2013) and AlgaeBase (Guiry & Guiry 2014). AlgaeBase was also used to substantiate the currently accepted species names for the algae reported from the Hawaiian Islands.

An alphabetized listing is presented below of 56 of 519 species of green, brown and red marine algae described as new from the Hawaiian Islands, but, thus far, have not been reported from other Pacific islands or elsewhere in the world. This listing includes three of 102 species of green algae (Chlorophyta), three of 62 species of brown algae (Phaeophyceae) and 50 of 355 species of red algae (Rhodophyta).

Chlorophyta (3 of 102 recognized species, 2.9% in Hawaiian Islands only)

Boodleopsis hawaiiensis W.J. Gilbert

Codium phasmaticum Setchell

Valonia trabeculata Egerod

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Phaeophyceae (3 of 62 recognized species, 4.8% in Hawaiian Islands only)*Newhousia imbricata* Kraft, G.W. Saunders, I.A. Abbott & Haroun*Petalonia tatewakii* Kogame & Kurihara*Sporochmus dotyi* Brostoff**Rhodophyta** (50 of 355 recognized species, 14.1% in Hawaiian Islands only)*Acrochaetium dotyi* I.A. Abbott*Acrosymphyton brainardii* Vroom & I.A. Abbott*Callidictyon abyssorum* J.N. Norris & I.A. Abbott*Centroceras corallophiloides* R.E. Norris*Ceramium cingulum* Meneses*Ceramium dumosertum* R.E. Norris & I.A. Abbott*Ceramium tranquillum* Meneses*Ceramium womersleyi* R.E. Norris & I.A. Abbott*Corallophila ptilocladioides* (R.E. Norris & I.A. Abbott) R.E. Norris*Dasya atropurpurea* Vroom*Dasya kristeniae* I.A. Abbott*Dotyophycus pacificum* I.A. Abbott*Dudresnaya babbittiana* I.A. Abbott & K.J. McDermid*Dudresnaya littleri* I.A. Abbott*Euptilocladia magruderii* I.A. Abbott & R.E. Norris*Ganonema yoshizakii* Huisman, I.A. Abbott & A.R. Sherwood*Gelidium pluma* Bornet ex N.H. Loomis*Gelidium reediae* N.H. Loomis*Gracilaria dawsonii* M.D. Hoyle*Gracilaria dotyi* M.D. Hoyle*Grateloupia corymbifera* (I.A. Abbott) S. Kawaguchi & A.W. Wang*Grateloupia hawaiiiana* E.Y. Dawson*Halymenia chiangiana* I.A. Abbott & Kraft*Halymenia cromwellii* I.A. Abbott*Halymenia hawaiiiana* J.J. Hernández-Kantún & A.R. Sherwood*Hawaiiia trichia* Hollenberg*Helminthocladia rhizoidea* Doty & I.A. Abbott*Hypoglossum wynei* I.A. Abbott*Janczewskia hawaiiiana* K.E. Apt*Laurencia mcdermidiae* I.A. Abbott*Liagora donaldiana* I.A. Abbott & Huisman*Liagora julieae* I.A. Abbott & Huisman*Lophocladia kipukaia* K.E. Schleich*Lophocladia kuesteri* I.A. Abbott, D.L. Ballantine & O'Doherty*Macrocarpus perennis* (I.A. Abbott) S.-M. Lin, S.-Y. Yang & Huisman*Micropeuce setosus* I.A. Abbott*Naccaria hawaiiiana* I.A. Abbott*Neosiphonia profunda* (Hollenberg) M.-S. Kim & I.A. Abbott*Parviphycus womersleyanus* (Kraft & I.A. Abbott) B. Santelices

Rhodophyta (continued)*Pleonosporium intricatum* R.E. Norris*Polyopes hakalauensis* (Tilden) I.A. Abbott*Polysiphonia tuberosa* Hollenberg*Pterocладиella bulbosa* (H.N. Loomis) B. Santelices*Rhodachlya hawaiiiana* A. Kurihara, J.A. West, K.Y. Conklin & A.R. Sherwood*Scinaia furcata* Zablackis*Scinaia huismanii* Vroom & I.A. Abbott*Spirocladia hodgsoniae* I.A. Abbott*Tylotus laqueatus* Kraft, K.Y. Conklin & A.R. Sherwood*Ululania stellata* K.E. Apt & K.E. Schlech*Wrangelia elegantissima* R.E. Norris

As previously published world distributional records applicable to Hawaiian algal species are discovered and more taxonomic studies are conducted on other Pacific Island algae, the overall endemism of 10.8% for Hawaiian marine algae should decrease based on past trends. Abbott (1999:11) included 343 species of red algae in her flora and, at that time, recognized 67 species which were not found elsewhere in the world, i.e., an endemism of 19.5%. Today, this percentage is 14.1% for the red algae in Hawaiian waters. Endemism for the green algae (Chlorophyta) and brown algae (Phaeophyceae) are substantially lower at 2.9% and 4.8%, respectively.

Molecular sequence data (O’Kelly et al. 2010) in Hawaiian species of the green alga *Ulva* (including “*Enteromorpha*”) suggested that many specimens were unique and should not be associated with names of temperate and boreal European and North American species. The eventual renaming of these specimens will increase the endemism of Hawaiian algae. There is a stronger tendency of more endemics being recognized through molecular studies since cryptic algal species abound in the Hawaiian Islands (Alison R. Sherwood, University of Hawaii, personal communication, 26 March 2014). The overall percentage of endemism for marine algae in Hawaiian waters is low at 10.8% when one considers that endemism of the 371 marine shore fishes in the Hawaiian Islands is 25% (Randall 2010:2).

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Literature Cited

Abbott, I.A. 1995. The state of systematics of marine algae in tropical island Pacific. *In*: Maragos, J.E., Peterson, M.N.A., Eldredge, L.G., Bardach, J.E. & Takeuchi, H.F. (eds.), *Marine and coastal biodiversity in the tropical islands Pacific region, Volume 1, Species systematics and information management priorities*. East-West Center, Honolulu. xxi + 424 pp.

- . 1999. *Marine red algae of the Hawaiian Islands*. Bishop Museum Press, Honolulu. 477 pp.
- , **Ballantine, D.L.** & **O'Doherty, D.C.** 2010. Morphological relationships within the genus *Lophocladia* (Rhodomelaceae, Rhodophyta) including a description of *L. kuesteri* sp. nov. from Hawai'i. *Phycologia* **49**: 390–401.
- , & **Huisman, J.M.** 2003. The Liagoraceae (Nemaliales, Rhodophyta) of the Hawaiian Islands II: The species of *Liagora* with quadripartite carposporangia, including descriptions of *L. donaldiana* sp. nov. and *L. julieae* sp. nov. *Phycologia* **42**: 594–605.
- , & **Huisman, J.M.** 2004. *Marine green and brown algae of the Hawaiian Islands*. Bishop Museum Press, Honolulu. 259 pp.
- , & **McDermid, K.J.** 2001. *Dudresnaya babbittiana* (Dumontiaceae, Gigartinales), a new red algal species from Midway Atoll, North Central Pacific. *Cryptogamie, Algologie* **22**: 249–261.
- , & **McDermid, K.J.** 2002. On two species of *Kallymenia* (Rhodophyta: Gigartinales: Kallymeniaceae) from the Hawaiian Islands, Central Pacific. *Pacific Science* **56**: 149–162.
- Bailey-Brock, J.H.** & **Magalhães, W.F.** 2010. *Udotea argentea* (Bryopsidales: Udoteaceae), a new record for the Hawaiian Islands. *Marine Biodiversity Records* **3**: e63, 4 pp. doi:10.1017/S1755267210000552. Published online 8 June 2010.
- Guiry, M.D.** & **Guiry, G.M.** 2014. *AlgaeBase*. World-Wide Electronic Publication, National University of Ireland. Galway, January 2014. <http://www.algaebase.org>.
- Hernández-Kantún, J.J., Sherwood, A.R., Riosmena-Rodríguez, R., Huisman, J.M. & De Clerck, O.** 2012. Branched *Halymenia* species (Halymeniaceae, Rhodophyta) in the Indo-Pacific region, including descriptions of *Halymenia hawaiiiana* sp. nov. and *H. tondoana* sp. nov. *European Journal of Phycology* **47**: 421–432.
- Huisman, J.M., Abbott, I.A. & Sherwood, A.R.** 2004. The Liagoraceae (Nemaliales, Rhodophyta) of the Hawaiian Islands III: The genus *Ganonema*, with a description of *G. yoshizakii* sp. nov. *Phycologia* **43**: 296–310.
- Kogame, K., Kurihara, A., Cho, G.Y., Lee, K.M., Sherwood, A.R. & Boo, S.M.** (2011) *Petalonia tatewakii* sp. nov. (Scytosiphonaceae, Phaeophyceae) from the Hawaiian Islands. *Phycologia* **50**: 563–573.
- Kraft, G.T., Saunders, G.W., Abbott, I.A. & Haroun, R.J.** 2004. A uniquely calcified brown alga from Hawaii: *Newhousia imbricata* gen. et sp. nov. (Dictyotales, Phaeophyceae). *Journal of Phycology* **40**: 383–394.
- , **Conklin, K.Y. & Sherwood, A.R.** 2014. *Tylotus laqueatus*, a new species of Dicranemataceae (Gigartinales, Rhodophyta) from the Hawaiian Islands. *Phycological Research* **62**: 16–28.
- Kurihara, A., West, J.A., Conklin, K.Y. & Sherwood, A.R.** 2012. A second species of *Rhodachlya* (Rhodachlyales, Rhodophyta) from Hawaii, with a description of *R. hawaiiiana* sp. nov. *Cryptogamie, Algologie* **33**: 21–33.
- Lobban, C.S. & Tsuda, R.T.** 2003. Revised checklist of benthic marine macroalgae and seagrasses of Guam and Micronesia. *Micronesica* **35-36**: 54–99.
- N'Yeurt, A.D.R. & Payri, C.E.** 2006. Marine algal flora of French Polynesia. I. Phaeophyceae (brown algae). *Cryptogamie, Algologie* **27**: 111–152.

- . & **Payri, C.E.** 2007. Marine algal flora of French Polynesia. II. Chlorophyceae. *Cryptogamie, Algologie* **28**: 3–88.
- . & **Payri, C.E.** 2010. Marine algal flora of French Polynesia. III. Rhodophyta, with additions to the Phaeophyceae and Chlorophyta. *Cryptogamie, Algologie* **31**: 1–205.
- O’Kelly, C.J., Kurihara, A., Shipley, T.C. & Sherwood, A.R.** 2010. Molecular assessment of *Ulva* spp. (Ulvophyceae, Chlorophyta) in the Hawaiian Islands. *Journal of Phycology* **46**: 728–735.
- Randall, J.E.** 2010. *Shore fishes of Hawaii*. Revised Edition. University of Hawai‘i Press, Honolulu. 234 pp.
- Tsuda, R.T. & Walsh, S.K.** 2013. Bibliographic checklist of the marine benthic algae of Central Polynesia in the Pacific Ocean (excluding Hawai‘i and French Polynesia). *Micronesica* **2013-02**: 91 pp. Available at: www.uog.edu/up/micronesica/2013.
- Vroom, P.S.** 2005. *Dasya atropurpurea* sp. nov. (Ceramiales, Rhodophyta), a deep-water species from the Hawaiian Archipelago. *Phycologia* **44**: 572–580.
- . & **Abbott, I.A.** 2004a. *Acrosymphyton brainardii* sp. nov. (Gigartinales, Rhodophyta) from French Frigate Shoals, Northwestern Hawaiian Islands. *Phycologia* **43**: 68–74.
- . & **Abbott, I.A.** 2004b. *Scinaia huismanii* sp. nov. (Nemaliales, Rhodophyta): An addition to the exploration of the marine algae of the Northwestern Hawaiian Islands. *Phycologia* **43**: 445–454.

Rediscovery of *Melicope quadrangularis* (Rutaceae) and other notable plant records for the island of Kauaʻi, Hawaiʻi¹

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Although several previously funded surveys by the U.S. Fish and Wildlife Service (USFWS) and the National Tropical Botanical Garden (NTBG) between 1993 and present had failed to relocate any living individuals of the Kauaʻi endemic *Melicope quadrangularis* (Rutaceae), a recent USFWS-funded survey has brought about its rediscovery and is reported here. In addition, *Bidens hillebrandiana* subsp. *polycephala* (Asteraceae) has been documented on Kauaʻi for the first time, possibly indicating a recent inter-island introduction; and a single individual of *Lysimachia filifolia* (Primulaceae) was discovered within the remote upper headwater drainages of Wainiha, representing the only known living individual on Kauaʻi.

Asteraceae

Bidens hillebrandiana (Drake) O. Deg. ex Sherff

subsp. *polycephala* Nagata & Ganders

New island record

Previously recorded from the islands of Molokaʻi and Maui, *Bidens hillebrandiana* subsp. *polycephala* has now been documented along the coastal strand of Kalalau, Kauaʻi. Although all Hawaiian *Bidens* have evolved with reduced dispersal ability (Carlquist 1974) and are predominantly single-island endemics (Wagner *et al.* 1990; Knope *et al.* 2012), *B. hillebrandiana* subsp. *polycephala* has retained some ancestral mechanisms for dispersal by birds (i.e., setose achenes with spreading awns) and is usually associated with near-shore bluffs and cliffs that are frequented by sea birds. In 2013, ca. 50 plants of this *Bidens* species were discovered around a Kalalau coastal bluff site that had been botanically surveyed by the senior author numerous times in the past without being previously detected. The presence of *B. hillebrandiana* subsp. *polycephala* on Kauaʻi may possibly be an example of a recent natural inter-island introduction by sea birds, which are often seen in the general region. Plants are being cultivated by the NTBG.

Material examined. **KAUAʻI:** Hanalei Distr., Kalalau, coastline around river mouth, *Scaevola taccada* coastal shrubland, with *Chenopodium oahuense*, *Artemisia australis*, *Vigna marina*, *Capparis sandwichiana*, *Panicum fauriei* var. *latius*, *Lysimachia mauritiana*, *Adiantum capillus-veneris*, threatened by goats, landslides, *Digitaria ciliaris*, 3 m elev., herb, decumbent, 25–35 cm tall, several older plants dried up, a few with flowering left, some achenes, ca. 50 plants, observed mostly on north side of Kalalau Stream, a few on south side of stream near *heiau*, 26 Jul 2013, Wood, Kirkpatrick & Clark 15589 (PTBG).

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Primulaceae***Lysimachia filifolia* C.N. Forbes & Lydgate Range rediscovery**

The extremely rare Hawaiian primrose *Lysimachia filifolia* has been recorded on Kaua'i and O'ahu. In 1912 John Lydgate made the holotype collection in upper Olokele, Kaua'i below the Kawaikini summit (Wagner *et al.* 1990; Marr & Bohm 1997; Wood 2012), and subsequently, up till now, the only other reported collection from Kaua'i was made in 2008 in the Waikoko headwater region, below Kamanu Ridge (Wood 2012). Plants of *L. filifolia* on Kaua'i can be erect shrubs up to 1.5 m tall as compared to the O'ahu plants, which are smaller, more delicate, and only known to be pendulous (Wood 2012). Within the Ko'olau Mountain Range of O'ahu several colonies still remain around waterfall sites of Uwao, Waianu, and Wai'ahole Streams. Recent research around the only known Kaua'i colony of *L. filifolia* (i.e., Waikoko) revealed that a large landslide had destroyed the plants, causing a regional extinction from a singular stochastic event (Wood, pers. obs.). Fortunately, in October 2013 a single plant was documented on the northwestern side of Kaua'i, within the upper headwaters of Wainiha Valley. The Kaua'i Plant Extinction Prevention (PEP) Program and NTBG are planning for additional surveys to attempt conservation collections and to search for additional plants around this last known individual on Kaua'i. There is also potential for additional colonies around the holotype locality of Olokele, Kaua'i, which is privately owned and historically off-limits for biotic surveys.

Material examined. **KAUAI:** Lihū'e Distr., upper Olokele Valley, Jan. 1912, *Lydgate 2* (holotype, BISH); Lihū'e Distr., Waikoko headwaters, below Kamanu Ridge, S of Wailua River and above Wailua Ditch, associated with *Cheirodendron*, *Pipturus* spp., *Dubautia*, *Cyrtandra*, *Kadua centranthoides*, *K. elatior*, *K. foggiana*, *Psychotria*, *Melicope*, *Machaerina*, *Isachne*, with ferns of *Microlepia*, *Asplenium*, *Cyclosorus*, *Deparia*, terrestrial in *Diplazium* with *Boehmeria grandis*, threats include pigs, landslides, *Buddleia asiatica*, and *Erigeron karvinskianus*, 732 m elev., 1.5 m tall with erect stems brown-red, pendent corolla light purple, terrestrial near land slide and on wet cliff, ca 30 plants, 12 Jan 2008, *Wood 12774* (BISH, PTBG); Hanalei Distr., Wainiha, upper northeastern fork, closed *Metrosideros* lowland wet forest, 8–12 m canopy, surrounded by steep valley walls with *Dicranopteris* and mixed shrubs, understory dominated by *Antidesma* with *Syzygium*, *Broussaia*, *Perrottetia*, *Cyrtandra* spp., *Psychotria* spp., *Dubautia* spp., *Labordia* spp., *Coprosma waimeae*, *Cheirodendron* spp., *Polyscias kawaiensis*, and *P. oahuensis*, rich fern and bryophyte understory, threatened by pigs, rats, slugs, *Sphaeropteris cooperi*, *Buddleia asiatica*, *Clidemia hirta*, *Hedychium gardnerianum*, *Juncus planifolius*, *Erigeron karvinskianus*, *Psidium guajava*, *Cyperus meyenianus*, and *Rubus rosifolius*, 845 m elev., herb, 30 cm tall, unbranched young plant, vegetative, single plant seen, 10 Oct 2013, *Wood & Kishida 15697* (PTBG).

Rutaceae***Melicope quadrangularis* (H. St. John &**

E.P. Hume) T.G. Hartley & B.C. Stone **Rediscovery**

Melicope quadrangularis is a Kaua'i endemic tree known from the holotype collection made by Charles Forbes in 1909, and rediscovered in the same general region of Wahiawa in May 1991 (Lorence *et al.* 1995; Lorence & Flynn 1997). The rediscovered population, consisting of 13 trees in close proximity, was subsequently destroyed by Hurricane 'Iniki in September 1992 (Wood 2000, 2009, 2011) and reported as possibly extinct, as no living individuals were known (Wood 2012). Recent field research funded by the USFWS has rediscovered four individuals of this taxon in the headwater region of Wai'ahi Stream, ca. 2 km to the north of the holotype locality. Fruit capsules were present and seeds are actively being monitored for collection by PEP and NTBG. *Melicope quadrangularis* can

be easily distinguished from other *Melicope* species on Kaua'i by its large, 12–14 mm long × 19–22 mm wide, cube-shaped capsules that have an unusual central depression at their apex, yet can be very difficult to recognize when not in fruit (Wood 2012). The extreme vulnerability of these last known individuals of *M. quadrangularis* cannot be overstated, especially being a wet forest understory species susceptible to the severe storms that frequent Kaua'i. Continued botanical surveys are encouraged in order to discover more individuals and prevent the extinction of this taxon. Recommended regions for survey include the prime *Metrosideros* wet forests of Wahiawa and adjacent drainages to its north, including Kamo'oloa, Wai'ahi, 'Iole, and 'Ili'ili'ula.

Material examined. **KAUA'I:** Līhu'e Distr., vicinity of Wahiawa Swamp, Aug 1909, *C. N. Forbes 273.K* (holotype, BISH); Līhu'e Distr., Wahiawa, drainage between Hulua and Kapalaoa, *Metrosideros-Dicranopteris* lowland wet forest with *Syzygium*, *Polyscias oahuensis* & *P. waialealae*, *Labordia*, *Perrottetia*, area rich with bryophytes, threats include severe storms, pigs, rats, *Psidium cattleianum* & *P. rosifolius*, *Melastoma candidum*, 820 m, 2 m tall, branches ascending, 13 trees in general area, 20 May 1991, *Wood, Flynn & Lorence 0859* (PTBG); *loc. cit.*, with *Broussaia*, *Eurya*, *Cyanea coriacea*, *Labordia hirtella*, *Syzygium*, 850 m, 4 m tall tree, 13 trees in general area, single tree in fruit, 13 cm diameter at base, vigorous, east aspect, 20 May 1991, *Wood, Flynn & Lorence 0858* (PTBG); Līhu'e Distr., Wai'ahi, upper southern headwaters, *Metrosideros-Cheirodendron* mixed wet forest with dissecting drainages and matting ferns of *Diplopterygium* & *Dicranopteris*, with *Broussaia arguta*, *Perrottetia sandwicensis*, *Touchardia latifolia*, *Pipturus albidus*, *P. ruber*, *Psychotria marianiana*, *P. hexandra*, *Antidesma platyphylla* var. *hillebrandii*, *Polyscias oahuensis*, *Kadua affinis*, *Melicope wawraeana*, *Vaccinium calycinum*, *Coprosma kauaense*, *Dubautia laxa*, *D. paleata*, *D. imbricata* subsp. *acronaea*, *Sadleria* spp., *Cyanea hirtella*, *C. recta*, *C. kahiliensis*, *C. fissa*, *Machaerina angustifolia*, *M. mariscoides*, *Cyrtandra pickeringii*, *C. paludosa*, *C. heinrichii*, *C. longifolia*, and *C. kealiae*, immediate threats include rats, goats, pigs, slugs, *Clidemia hirta*, *Rubus rosifolius*, *Axonopus fissifolius*, *Juncus planifolius*, *Cyperus meyenianus*, *Paspalum conjugatum*, *Psidium cattleianum*, *Melastoma candidum*, *Rhodomyrtus tomentosa*, *Sphaeropteris cooperi*, *Sacciolepis indica*, 830 m elev, tree, 3 m tall, moderately branched, stems covered in moss, immature fruit cauliflorous, tree 10 m above small side gulch, west aspect, single individual, 19 Nov 2013, *Wood, Kirkpatrick & Perlman 15728* (PTBG); Līhu'e Distr., Wai'ahi, upper central headwaters, 820 m elev, tree 2.5 m tall, few-branched, trunk 7 cm diameter near base, stems gray-brown, with fruit, 5–7 m above gulch bottom, 30 Dec 2013, *Wood, Kirkpatrick & Perlman 15773* (PTBG); *loc. cit.*, 823 m elev, tree, 3 m tall, moderately branched, gray-brown, base of trunk 10 cm diameter, female, immature fruit, on slope just above south side of stream lowermost of 2 trees, 30 Dec 2013, *Wood, Kirkpatrick & Perlman 15780* (PTBG); *loc. cit.*, 823 m elev, tree, 3 m tall, moderately branched, gray-brown, base of trunk 8 cm diameter, cf male, on slope just above south side of stream uppermost of 2 trees, female immediately below, 30 Dec 2013, *Wood, Kirkpatrick & Perlman 15781* (PTBG).

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Literature Cited

- Carlquist, S.** 1974. *Island biology*. Columbia University Press, New York. 660 pp.
- Knopé, M.L., Morden, C.W., Funk, V.A. & Fukami, T.** 2012. Area and the rapid radiation of Hawaiian *Bidens* (Asteraceae). *Journal of Biogeography* **39**: 1206–1216.
- Lorence, D.H. & Flynn T.** 1997. Botanical survey of the Wahiawa drainage, Kaua'i. Final report prepared for and available from State of Hawai'i, Department of Land and Natural Resources, Division of Forestry and Wildlife.
- , **Flynn, T. & Wagner, W.L.** 1995. Contributions to the flora of Hawai'i. III. New additions, range extensions, and rediscoveries of flowering plants. *Bishop Museum Occasional Papers* **41**: 19–58.
- Marr K.L. & Bohm, B.A.** 1997. A taxonomic revision of the endemic Hawaiian *Lysimachia* (Primulaceae) including three new species. *Pacific Science* **51**: 254–287.
- Wagner, W.L., Herbst, D.R. & Sohmer, S.H.** 1990. *Manual of the flowering plants of Hawai'i*. 2 vols. University of Hawai'i Press & Bishop Museum Press, Honolulu. 1853 pp.
- Wood, K.R.** 2000. Biogeographical research and conservation. Three *Melicope* survey: *Melicope degeneri*, *M. knudsenii*, & *M. quadrangularis*. USFWS Grant No. 1448–12200–99–M090. Final report prepared for and available from the US Fish and Wildlife Service. 41 pp.
- . 2009. Further notes on *Melicope quadrangularis* (Rutaceae) Kaua'i, Hawai'i. Biological report prepared for and available from the National Tropical Botanical Garden (NTBG), Kalaheo, Hawai'i. 6 pp.
- . 2011. Rediscovery, conservation status and taxonomic assessment of *Melicope degeneri* (Rutaceae), Kaua'i, Hawai'i. *Endangered Species Research* **14**: 61–68.
- . 2012. Possible extinctions, rediscoveries and new plant records within the Hawaiian Islands. *Bishop Museum Occasional Papers* **113**: 91–102.

***Melania baldwini* Ancey, 1899, synonymized with
Melanoides tuberculata (Müller, 1774) (Gastropoda: Thiaridae)**

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Two globally invasive species of thiarid snails inhabiting fresh and brackish water occur in the Hawaiian Islands: *Melanoides tuberculata* (Müller, 1774), and *Tarebia granifera* (Lamarck, 1816) (Cowie *et al.* 1995; Cowie 1997). During the second half of the nineteenth century, seven species-level taxa of thiarids were described from the Hawaiian Islands by various European and American authors; most or all of these will no doubt prove to be synonyms of *M. tuberculata* or *T. granifera*, but their identities have heretofore remained unresolved (Cowie *et al.* 1995; Cowie 1997). The purpose of this note is to identify one of these, *Melania baldwini* Ancey, 1899, as a synonym of *M. tuberculata*.

César-Marie-Felix Ancey (1860–1906) was a French malacologist active in the late nineteenth and early twentieth centuries who published descriptions of a large number of Hawaiian nonmarine mollusks (Wood & Gallichan 2008), including *Melania baldwini*. Ancey's original description of *M. baldwini* stated that the type material was from Lahaina, Maui, and was obtained from "Baldwin" (undoubtedly D.D. Baldwin). Examination of Ancey's original description and, especially, the excellent illustration accompanying that description (Ancey 1899: 273–274, pl. 3, fig. 6) shows *M. baldwini* to be a synonym of *Melanoides tuberculata*, **new synonymy**.

The National Museum of Wales holds a single specimen of *M. baldwini* obtained from Ancey's collection via dealer Paul Geret and John R. le B. Tomlin (Wood & Gallichan 2008). This specimen, catalogued as NMW 1955.158.24088, is illustrated by Wood & Gallichan (2008: pl. 26, fig. 2; not fig. 3, as stated in the caption on p. 150; the illustrations of *M. baldwini* and *M. brazieri* [pl. 26, fig. 3] are reversed; J. Gallichan, pers. comm. 13 May 2013). This specimen closely resembles Ancey's figure of *M. baldwini*, and it "measures very close to the dimensions given in [his] description" (Wood & Gallichan 2008: 27). Although considered as a "Possible Syntype" (Wood & Gallichan 2008: 150), the label accompanying it does not identify it as a type. C. Montague Cooke, Jr., Malacologist at Bishop Museum, visited Ancey at his home in Algeria shortly before the death of the latter and examined the type specimens of all the Hawaiian taxa that were then present in his collection; no types of *M. baldwini* were found (Cooke 1907: 312). After Ancey's death, Bishop Museum purchased more than 14,000 specimens of Hawaiian nonmarine mollusks from his collection (Brigham 1909: 186), but no specimens identified as *Melania baldwini* were included in that material. It thus appears that Ancey did not retain the type material of *M. baldwini* in his collection and that no extant specimen can be identified with certainty as having been among Ancey's type material. For the purpose of clarifying the status of this hitherto unrecognized taxon, the specimen illustrated by Ancey (1899, pl. 12, fig. 6) is **here designated as the lectotype** of *M. baldwini*

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pursuant to Article 74.4 of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999) in order to stabilize the name.

Acknowledgments

I thank Ms. Jennifer Gallichan of the National Museum of Wales for information regarding the illustration of *M. baldwini* in Wood & Gallichan (2008).

Literature Cited

- Ancey, C.-F.** 1899. Some notes on the non-marine molluscan fauna of the Hawaiian Islands, with diagnoses of new species. *Proceedings of the Malacological Society of London* **3**: 268–274, pl. 12, pl. 13 figs. 8, 16, & 20.
- Brigham, W.T.** 1909. Director's report for 1908. *Occasional Papers of the Bernice Pauahi Museum* **4**: 179–198.
- Cooke, C.M., Jr.** 1907. Dr. Cooke's report, pp. 311–316. In: Brigham, W.T., Director's report for 1906. *Occasional Papers of the Bernice P. Bishop Museum* **4**: 301–326.
- Cowie, R.H.** 1997. Catalog and bibliography of the nonindigenous nonmarine snails and slugs of the Hawaiian Islands. *Bishop Museum Occasional Papers* **50**: 1–66.
- , **Evenhuis, N.L., & Christensen, C.C.** 1995. *Catalog of the native land and freshwater molluscs of the Hawaiian Islands*. Backhuys Publishers, Leiden. vi + 248 pp.
- International Commission on Zoological Nomenclature.** 1999. *International Code of Zoological Nomenclature*. Fourth edition. International Trust for Zoological Nomenclature, London. xxix + 306 pp.
- Wood, H. & Gallichan, J.** 2008. The new molluscan names of César-Marie-Felix Ancey including type material from the National Museum of Wales. *Studies in Biodiversity and Systematics of Terrestrial Organisms from the National Museum of Wales* **3**, vi + 162 pp, 26 pls.

A new state record for an introduced broad-nosed weevil (Curculionidae: Entiminae: Trachyploeini) on Haleakalā, with a discussion of the species of *Cathormiocerus* in North America¹

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A weevil not previously encountered in Hawai'i from the subfamily Entiminae, broad-nosed weevils, was collected by James Mar on Maui in Haleakalā National Park in a park house near the headquarters (2160 m elev.). The specimens were determined to be *Cathormiocerus curvipes* (Wollaston, 1854) and the determination was confirmed by Roman Borovec. *Cathormiocerus curvipes* is a Palearctic tramp species originally described from Madeira Island off the coast of Portugal and its native range includes Portugal, Spain, France, Italy and Algeria. *Cathormiocerus curvipes* was first collected in North America in 1971 in North Plains, Oregon (Borovec 1994). More than half of *Cathormiocerus* species are fully parthenogenic or are geographically parthenogenic (Borovec 2009). Voucher specimens have been placed in the University of Hawai'i Insect Museum (UHIM).

Coleoptera

Curculionidae

***Cathormiocerus curvipes* (Wollaston)**

New state record

Material examined. Hawaiian Islands: **Maui:** Haleakalā NP, near headquarters, 2160 m, 1–31 Mar 2013, coll. James Mar in park house (UHIM).

Specimens were first collected in March of 2013 around and in park houses near the headquarters of Haleakalā National Park on Maui. Larvae feed in and around roots of grasses, herbs, shrubs and trees. Adults feed on foliage, primarily at night. Twelve specimens were originally collected and five were examined by C. Ewing.

Since the collection of these 12 specimens, numerous additional individuals have been observed inside several nearby office buildings, and on the lower exterior foundation of a park house (J. Mar, pers. comm.). Vegetation surrounding these buildings is composed of various introduced grasses and herbs, although native shrubland is typically only 5 to 10 m distant. Little is known about specific host plants for individual species of Trachyploeini though all are assumed to be generalists on herbaceous plants and shrubs and are associated with steppe habitats, xeric grasslands and stony and sandy places. The larvae feed on and around roots and the adults feed on foliage, most commonly at night (Borovec 2009). Wollaston (1854) noted that *C. curvipes* was associated

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with grasslands on Madeira Is. and Brown (1965) reported that *Cathormiocerus aristatus* Gyllenhal, 1827 is often found on buildings surrounded by lawns.

Cathormiocerus is closely related to the genus *Trachyphloeus* and the placement of species between these genera has been problematic. The tribe Trachyphloeini was recently revised and the three North American species traditionally placed in *Trachyphloeus* were transferred to *Cathormiocerus* and *Romualdius* (Borovec 2009). The three species formerly placed in *Trachyphloeus* and *C. curvipes* are all introduced to North America from the Palearctic region. Species in these genera are known to invade houses (Brown 1965) which has no doubt facilitated their introduction through human transport. In North America all these four species are fully parthenogenic, with only one of the four having males in the southern portion of its native European range (Brown 1965). The genus *Cathormiocerus* has 49 parthenogenic, 39 amphigonic and 2 geographically parthenogenic species (Borovec 2009). All species in the tribe Trachyphloeini are apterous with the elytra fused, a condition often correlated with the evolution of parthenogenic species (White 1973; Borovec 2009).

Cathormiocerus curvipes was until recently considered the only member of the genus present in North America. In Arnett *et al.* (2002) it is stated that "This genus (*Cathormiocerus*) is questionably distinct from *Trachyphloeus*. We can find no characters to reliably distinguish these two genera." Borovec (2009) revised the tribe Trachyphloeini, transferring two of the three species of *Trachyphloeus* known to occur in North America to the genus *Cathormiocerus* and designating a new genus, *Romualdius*, for species that include the third. "*Trachyphloeus*" *aristatus* and "*Trachyphloeus*" *spinosus* (= *asperatus*) (Goeze, 1777) were transferred to *Cathormiocerus* and "*Trachyphloeus*" *bifoveolatus* (Beck, 1817) was placed in *Romualdius*. Some authors use *C. asperatus* (Boheman, 1843) rather than *C. spinosus*. They argue the name *C. spinosus* cannot be assigned to any species because the type, in the Paris Museum, is poorly prepared and cannot be recognized (Sleeper 1955; Borovec 1994).

Specimens will key to *Cathormiocerus* or *Trachyphloeus* using Arnett *et al.* (2002), but some of the couplets are difficult to interpret. The following is a discussion of the couplet path (couplet numbers in parentheses) that leads to 7 of the 8 genera from the tribe Trachyphloeini present in the North American fauna (the 8th, *Pseudocneorhinus*, diverges at couplet 63).

- (1) Body length less than 6.5 mm.
- (2) Mandible with scar. *Clarification*: very small and difficult to see except under high magnification (80–100 ×).
- (3) Mandible with scar and not prognathous.
- (6) Dorsal surface not dirt encrusted.
- (7) Scales not whitish or opalescent tarsal claws free. *Clarification*: males of *Cathormiocerus*, when present, will have the pro and meso claws connate.
- (8) Side of prothorax with anterior margin straight.
- (44) Lacking postocular vibrissae.
- (55) Antennal scrobe dorsal or dorsolateral, indefinite caudad of antennal insertion; scape in repose not situated in scrobe, usually passing over eye. *Clarification*: the scrobe is dorsolateral, with a thin strip visible from above, it also is definite posterior (caudad) of antennal insertion, especially the dorsal margin. Where an antenna lies in repose on a

mounted specimen cannot always be determined. The form of the scrobe will only allow the scape to pass over the eye.

(56) Corbel open, humeral angle rounded.

(61) Funicule with seven articles, tarsal claws free.

(63) Tarsal claws free.

(84) Antenna with scape with vestiture of fine setae and round flat scales, body size small, 2.3–4.5 mm.

(85) Epistoma very small, indistinct. *Clarification*: the tip of the rostrum does have a very narrow epistoma than is wider than half the anterior margin and is set off by a very fine but distinct carina. Specimens of *Cathormiocerus curvipes* will key to either *Trachyphloeus* if the epistoma is interpreted as large or to *Cathormiocerus* if interpreted as small.

Cathormiocerus curvipes can be distinguished from the three American species formerly placed in *Trachyphloeus*, *Romualdius bifoveolatus*, *Cathormiocerus spinosus* (= *asperatus*), and *Cathormiocerus aristatus* using the following characters based on Brown (1965) and Borovec (2009): *Romualdius bifoveolatus* and *C. aristatus* both have the second abdominal ventrite shorter than three and four combined. Both *C. curvipes* and *C. spinosus* have the second abdominal ventrite longer than the third and fourth combined but in *C. curvipes* the appressed scales of the elytra form a variegate pattern while in *C. spinosus* they are homogeneous in color.

Literature Cited

- Arnett, R.H., Thomas, M.C., Skelley, P.E. & Frank, J.H.** 2002. *American beetles*. Vol. 2. Polyphaga: Scarabaeoidea through Curculionidae. CRC Press, Boca Raton, Florida. 443 pp.
- Beck, M. von.** 1817. *Beiträge zur baierischen Insektenfaune, oder Beschreibung und Abbildung neuentdeckten Käfer, mit angehängtem Namenverzeichnisse der Eleuteraten des Landgerichtbezirks Zusmeshausen*. J. Wolff, Augsburg. 45 [+ 3] pp. + 7 pls.
- Boheman, C.H.** 1843. In: Schoenherr, C.J., *Genera et species curculionidum, cum synonymia hujus familiae; species novae aut hactenus minus cognitae, descriptionibus a Dom. Leonardo Gyllenhal, C. H. Boheman, O. J. Fahraeus et entomologis aliis illustratae*. Tomus septimus.—Pars secunda. Supplementum continens. Roret, Paris & F. Fleischer, Lipsiae [= Leipzig]. [iv] + 461 pp.
- Borovec, R.** 1994. Einige Bemerkungen zur Synonymie drei Arten der Gattung *Trachyphloeus* Germar, 1817 (Coleoptera: Curculionidae). *Elytron* **8**: 177–182.
- . 2009. Revision of the Palaearctic supraspecific taxa of the tribe Trachyphloeini (Coleoptera: Curculionidae: Entiminae). *Klapalekiana* **45**: 1–97.
- Brown, W.J.** 1965. *Trachyphloeus* Germar (Coleoptera: Curculionidae) in North America. *The Canadian Entomologist* **97**: 189–192.
- Goetz, J.A.E.** 1777. *Entomologische Beyträge zu des Ritter Linné zwölften Ausgabe des Natursystems*. Erster Theil. E. & R. Wiedmann, Leipzig, xvi + 736 pp.
- Gyllenhal, L.** 1827. *Insecta Svecica descripta a Leonardo Gyllenhal*. Classis I. Coleoptera sive Eleutherata. Tom. I. Pars IV. Cum appendice ad apertes priores. F. Fleischer, Lipsiae [= Leipzig]. viii + [ii] + 761 + [1] pp.
- Sleeper, E.L.** 1955. A review of the Trachyphloeini of America North of Mexico (Coleoptera, Curculionidae). *The Ohio Journal of Science* **55**: 279–292.

- White, M.J.D.** 1973. *Animal cytology and evolution*. Cambridge University Press, Cambridge. 961 pp.
- Wollaston, T.V.** 1854. *Insecta Maderensia; being an account of the insect of the islands of the Maderian group*. J. Van Voorst, London. xliii + 634 pp., 13 pls.

New records of arthropods from the Hawaiian Islands¹

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This paper reports new island and state records for arthropods collected during the course of three ecological studies conducted on Maui, O'ahu, and Hawai'i islands. The first of these studies examined the effects of invasive ants on arthropod communities at five sites on Maui and Hawai'i Island, and sampling methods and ecological results were reported in Krushelnycky & Gillespie (2008, 2010a,b). New records of arthropods for Haleakalā National Park, collected at the two Maui study sites, were reported in Krushelnycky *et al.* (2007), but new records for the three Hawai'i Island sites used in the study are reported here for the first time. The second study is an ongoing assessment of the effects of intensive rodent trapping on arthropod communities at three sites in the Wai'anāe Mountains of O'ahu. New records obtained to date are reported here. The third study, conducted at Ka'ena Point Natural Area Reserve (NAR), O'ahu, is also ongoing and is evaluating the ecological effects of invasive predator eradication, using a combination of intensive trapping and the construction of a predator proof fence (Young *et al.* 2013). Arthropod sampling methods are described in Young *et al.* (2012). New arthropod records obtained in this effort to date are reported here.

Each of these studies has employed numerous replicated standardized samples. In the interest of brevity, collection information for the material examined is combined such that samples obtained with the same collecting methods (including the same host plant), and that were collected on the same approximate dates at the same sites, are grouped. In addition, GPS coordinates and collector information are not included under material examined; unless otherwise noted, this information is consistent for each collection site, and is as follows:

Hawai'i Island, Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, 19.79372°N–19.79545°N, 155.61120°W–155.61234°W, specimens collected by P. Krushelnycky.

Hawai'i Island, Kīpuka ʻĀināhou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, 19.68369°N–19.68377°N, 155.46290°W–155.46269°W, specimens collected by P. Krushelnycky.

Hawai'i Island, Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, 19.74919°N–19.75223°N, 155.5155°W–155.52058°W, specimens collected by P. Krushelnycky.

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- O'ahu Island, Northern Wai'anae Mountains, Kahanahāiki Valley, 600 m, 21.53981°N–21.54272°N, 158.19368°W–158.19570°W, specimens collected by P. Krushelnycky and O'ahu Army Natural Resources Program staff.
- O'ahu Island, Northern Wai'anae Mountains, Pahole NAR Valley, 500 m, 21.53768°N–21.54204°N, 158.18689°W–158.18919°W, specimens collected by P. Krushelnycky and O'ahu Army Natural Resources Program staff.
- O'ahu Island, Southern Wai'anae Mountains, Palikea area, 850 m, 21.40991°N–21.41418°N, 158.09668°W–158.10037°W, specimens collected by P. Krushelnycky and O'ahu Army Natural Resources Program staff.
- O'ahu Island, Ka'ena Point NAR, 1-21 m, 21.57256°N–21.57542°N, 158.27275°W–158.27974°W, specimens collected in March 2010 by Lindsay Young, specimens collected in April 2012 by Cynthia King.

Determinations of taxonomic identity, unless otherwise noted, were made by P. Krushelnycky. As indicated below, voucher specimens are deposited in the Bernice Pauahi Bishop Museum (BPBM), the University of Hawai'i Insect Museum (UHIM), or are currently being held in P. Krushelnycky's reference collection (PDK collection) until eventual deposition at BPBM or UHIM. Several specimens are also vouchered at the Florida State Collection of Arthropods (FSCA), the National Museum of Natural History (NMNH), the Institute of Systematics and Evolution of Animals (ISEA) at the Polish Academy of Sciences, the Finnish Museum of Natural History (FMNH), and the University of Guelph Insect Collection (UGIC).

Class Arachnida

Order Araneae

Linyphiidae

Centromerus sp. 2

New island record

This is one of three apparently undescribed *Centromerus* species first reported in Krushelnycky *et al.* (2007), and which may be endemic to Hawai'i. In addition to the Hawai'i Island specimens listed below, *Centromerus* sp. 2 has been collected in Haleakalā National Park and Poli Poli State Park on Maui, and in Kīpuka Ki in Hawai'i Volcanoes National Park on Hawai'i Island (Krushelnycky *et al.* 2007). Generic determination was made by Jeremy Miller.

Material examined. **HAWAI'I:** Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, beating *Coprosma ernodeoides*, 22 Aug 2003 (2♀, BPBM); pitfall trap, 30 Aug 2003 (1♀ 1♂ BPBM), 22 Aug 2005 (2♀ 4♂ 1 immature BPBM); litter extraction, 23 Aug 2003 (1♂ UHIM).

Erigone autumnalis Emerton, 1882

New island record

This adventive species has previously been recorded from Maui, Kaua'i and Hawai'i Island (Nishida 2002, Krushelnycky *et al.* 2007).

Material examined. **O'AHU:** Northern Wai'anae Mountains, Kahanahāiki Valley, 600 m, pitfall trap, 2–8 May 2009 (1♀ PDK collection, will be deposited in BPBM); Southern Wai'anae Mountains, Palikea area, 850 m, pitfall trap, 3–11 Nov 2009 (1♂ PDK collection, will be deposited in BPBM); vegetation sweeping, 3–5 Nov 2009 (2♀ PDK collection, will be deposited in UHIM), 20–21 Jul 2010 (1♂ PDK collection, will be deposited in UHIM).

Erigone bifurca Locket, 1982**New state record**

This species joins *E. dentosa* from Maui (Krushelnycky *et al.* 2007) as another new adventive *Erigone* species now established in the state. It is known from Malaysia, the Philippines, and Krakatau (Platnick 2013). Determination was made by Jeremy Miller.

Material examined. **HAWAII:** Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, pitfall trap, 30 Aug 2003 (1♂, BPBM).

Nesioneta lepida Millidge, 1991**New island record**

Nesioneta lepida is another small adventive sheet-web weaver, previously known from Maui, Kaua'i and Hawai'i Island (Nishida 2002, Krushelnycky *et al.* 2007).

Material Examined. **O'AHU:** Northern Wai'anae Mountains, Kahanahāiki Valley, 600 m, beating *Psidium cattleianum*, 12 May 2011 (1♀); Southern Wai'anae Mountains, Palikea area, 850 m, vegetation sweeping, 29 Mar–8 Apr 2010 (1♀). Both specimens in PDK collection, will be deposited in UHIM.

Ostearius melanopygius (Cambridge, 1880)**New island record**

This is a cosmopolitan species (Platnick 2013) that is now widespread in Hawai'i, already recorded on Maui, Kaua'i and Hawai'i Island (Nishida 2002). Many individuals were collected in addition to those vouchered below.

Material Examined. **O'AHU:** Northern Wai'anae Mountains, Kahanahāiki Valley, 600 m, beating *Psidium cattleianum*, 15 Dec 2010 (1♀ PDK collection, will be deposited in BPBM) (an additional unvouchered specimen also collected on *Pisonia umbellifera*); Southern Wai'anae Mountains, Palikea area, 850 m, pitfall trap, 3–11 Nov 2009 (2♀ 2♂ PDK collection, will be deposited in UHIM); vegetation sweeping, 3–5 Nov 2009 (1♂ PDK collection, will be deposited in BPBM).

Oonopidae***Orchestina* sp.****New island record**

This tiny adventive species, previously recorded on Kaua'i and Hawai'i Island (Nishida 2002), is very abundant in the upland forests in the Wai'anae Mountains of O'ahu. Many individuals were collected in addition to those vouchered below, including specimens on *Charpentiera tomentosa*, in pitfall traps and in leaf litter samples. This may also be the same species designated *Orchestina* sp. B by Howarth *et al.* (2012) collected in the Kahului Airport environs, Maui.

Material examined. **O'AHU:** Northern Wai'anae Mountains, Kahanahāiki Valley, 600 m, beating *Pipturus albidus*, 2 May 2009 (3♀ PDK collection, will be deposited in BPBM); Northern Wai'anae Mountains, Pahole NAR, 500 m, beating *Pisonia umbellifera*, 23 Jun 2009 (2♀ PDK collection, will be deposited in BPBM); beating *Psidium cattleianum*, 23 Jun 2010 (1♂ PDK collection, will be deposited in UHIM); Southern Wai'anae Mountains, Palikea area, 850 m, vegetation sweeping, 3–24 Nov 2009 (10♀ 5 immatures PDK collection, will be deposited in UHIM).

Philodromidae***Pagiopalus nigriventris*** Simon, 1900**New island record**

This endemic species was previously known from Maui and Hawai'i Island (Nishida 2002). Specimens collected on O'ahu match Suman's (1970) genitalic descriptions and illustrations for *P. nigriventris*, representing an apparent range extension.

Material examined. **O'AHU:** Southern Wai'anae Mountains, Palikea area, 850 m, vegetation sweeping, 29 Mar–8 Apr 2010 (1♀ 3♂ 4 immatures PDK collection, will be deposited in BPBM), 15–16 Mar 2011 (5♂ PDK collection, will be deposited in UHIM).

Salticidae**?*Afraflacilla* sp.****New state record**

The generic determination of this previously undocumented adventive jumping spider was made by Wayne Maddison. A possible alternate generic placement is in *Pseudicius*, a genus that includes species throughout Asia, the western and southern Pacific. The male pedipalp morphology in the Hawaiian specimen is similar to that of *P. javanicus*, *P. philippinensis* and *P. kraussi* (F.G. Howarth, pers. comm.).

Material examined. O'AHU: Northern Wai'anae Mountains, Pahole NAR, 500 m, beating *Charpentiera tomentosa*, 14 Dec 2010 (1♀ PDK collection, will be deposited in BPBM); beating *Pipturus albidus*, 14 Dec 2010 (1♂ PDK collection, will be deposited in BPBM).

***Habronattus pyrithrix* (Chamberlin, 1924) New state record**

This represents another new adventive jumping spider for the state. It is currently known from the US and Mexico (Platnick 2013). Determination made by Wayne Maddison.

Material examined. O'AHU: Ka'ena Point NAR, 5 m, coastal strand, yellow pan trap, 11 Mar 2010 (1 immature UHIM); invasive grassland, yellow pan trap, 12–13 Apr 2012 (1♂ UHIM); Naio shrubland, yellow pan trap, 12–13 Apr 2012 (1♂ UHIM).

***Myrmarachne nigella* Simon, 1901 New state record**

This adventive ant-mimicking jumping spider has been observed for some time on O'ahu, and now appears to be quite widespread on that island, but has only recently been identified. It is currently known only from the Philippines (Platnick 2013). The species determination was made by G.B. Edwards after examining an adult male and female specimen. Distribution on other islands is currently unknown. In addition to specimens vouchered below, individuals were collected in the Northern Wai'anae Mountains on *Pipturus albidus*, *Charpentiera tomentosa*, and *Psidium cattleianum*.

Material examined. O'AHU: Northern Wai'anae Mountains, Kahanahāiki Valley, 600 m, beating *Pisonia umbellifera*, 2 May 2009 (1 immature PDK collection, will be deposited in BPBM); Northern Wai'anae Mountains, Pahole NAR, 500 m, beating *Pisonia umbellifera*, 15 Dec 2009 (1 immature PDK collection, will be deposited in UHIM); Southern Wai'anae Mountains, Palikea area, 850 m, vegetation sweeping, 3–24 Nov 2009 (2 immatures PDK collection, will be deposited in UHIM), 25–27 Jul 2011 (1♂ FSCA), 13–15 Nov 2012 (2♂ PDK collection, will be deposited in BPBM, 1♀ FSCA); Honolulu, residence in Mānoa Valley, 100 m, 21.30020°N, 157.81179°W, hand collecting, foraging on ground (1♂ FSCA).

***Plexippus paykulli* (Audouin, 1826) New island record**

Plexippus paykulli, an adventive species, has previously been recorded on Kaua'i and Midway Atoll (Nishida 2002). The determination for the O'ahu specimen was made by Wayne Maddison.

Material examined. O'AHU: Southern Wai'anae Mountains, Pālehua, Hokulua cabin, 600 m, hand collected on outside of window on cabin by P. Krushelnycky, 20 Jul 2010 (1♀ PDK collection, will be deposited in UHIM).

Theridiidae***Argyrodes argentatus* Cambridge, 1880 New island record**

This adventive *Argyrodes* species was previously recorded on Kaua'i and Hawai'i Island (Beatty et al. 2000). In addition to the specimens vouchered from Palikea, individuals have also been captured in Kahanahāiki Valley and Pahole NAR in the Northern Wai'anae Mountains.

Material examined. **O‘AHU:** Southern Wai‘anae Mountains, Palikea area, 850 m, vegetation sweeping, 3–24 Nov 2009 (2♀ PDK collection, will be deposited in UHIM), 29 Mar–8 Apr 2010 (1♀ 1♂ PDK collection, will be deposited in UHIM).

***Argyrodus ilipoepoe* Rivera & Gillespie, 2010 New island record**

This endemic kleptoparasitic *Argyrodus* species was previously known only from wet and mesic forests of Kaua‘i (Rivera and Gillespie 2010). A single male captured while beating *Pisonia umbellifera* in Pahole NAR, O‘ahu matches the genitalic descriptions and illustrations for *A. ilipoepoe*, and represents a range extension for this species.

Material examined. **O‘AHU:** Northern Wai‘anae Mountains, Pahole NAR, 500 m, beating *Pisonia umbellifera*, 26 Jun 2012 (1♂ PDK collection, will be deposited in BPBM).

***Phycosoma altum* (Keyserling, 1886) New island record**

This small adventive theridiid was previously collected on Hawai‘i Island.

Material examined. **O‘AHU:** Northern Wai‘anae Mountains, Kahanahāiki Valley, 500 m, beating *Charpentiera tomentosa*, 15 Dec 2010 (1♀ PDK collection, will be deposited in UHIM); Northern Wai‘anae Mountains, Pahole NAR, 500 m, beating *Psidium cattleianum*, 15 Dec 2009 (1♂ PDK collection, will be deposited in UHIM); Southern Wai‘anae Mountains, Palikea area, 850 m, vegetation sweeping, 25–27 Jul 2011 (1♀ PDK collection, will be deposited in UHIM).

***Steatoda capensis* Hann, 1990 New state record**

Steatoda capensis, native to southern Africa (Hann 1994), is the third adventive *Steatoda* species to establish in the state, joining *S. grossa* (C.L. Koch, 1838) and *S. erigoniformis* (Cambridge, 1872). Although *S. grossa* and *S. capensis* are superficially similar, these two species can be easily differentiated by the male and female genitalia. Confirmation of the identity of *S. capensis* was provided by Sean Hann.

Both *S. grossa* and *S. capensis* form loose tangle webs under rocks and within leaf litter, and are extremely abundant in certain terrestrial habitats. They exhibit an interesting distributional pattern: *S. grossa* is dominant in subalpine habitats on Maui and Hawai‘i Island, with only several specimens of *S. capensis* collected among many *S. grossa* on Mauna Kea and none collected on Haleakalā (Krushelnycky *et al.* 2007). In contrast, *S. capensis* is abundant and widespread in the forests of the Wai‘anae Mountains of O‘ahu, with no individuals of *S. grossa* encountered in this range in the current studies. This pattern may indicate differential elevational preferences between the two species, or it may indicate that *S. capensis* became established initially and relatively recently on O‘ahu, and is now in the early stages of colonizing other islands. Many individuals of *S. capensis* were collected on O‘ahu in addition to those vouchered below, most from terrestrial habitats but a few from vegetation sweeping samples.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu‘u Ahumoa, 1880 m, pitfall trap, 7 Sep 2002 (1♀ 1♂ BPBM); **O‘AHU:** Northern Wai‘anae Mountains, Kahanahāiki Valley, 600 m, pitfall trap, 7–14 Dec 2009 (2♂ PDK collection, will be deposited in BPBM); litter extraction, 15 Dec 2009 (1♂ PDK collection, will be deposited in UHIM); Northern Wai‘anae Mountains, Pahole NAR, 500 m, pitfall trap 23 Jun 2010 (1♂ PDK collection, will be deposited in UHIM); Southern Wai‘anae Mountains, Palikea area, 850 m, pitfall trap, 3–11 Nov 2009 (2♀ 2♂ PDK collection, will be deposited in BPBM); litter extraction, 3–11 Nov 2009 (1♀ 1♂ PDK collection, will be deposited in UHIM), 23 Mar–8 Apr 2010 (1♂ PDK collection, will be deposited in UHIM).

Zodariidae***Tropizodium molokai* Jocqué & Churchill, 2005 New island record**

This species was previously known only from Moloka'i (Jocqué & Churchill 2005). Like other zodariids, it is probably a specialized predator of ants (R. Jocqué pers. comm.). Although named for its type locality on Moloka'i, its provenance is uncertain, and its restricted known range may simply reflect a lack of studies of Asian and Oceanic zodariids (R. Jocqué, pers. comm.).

Material examined. O'AHU: Ka'ena Point NAR, 5 m, coastal strand, yellow pan trap, 11 Mar 2010 (1♀ 2♂ UHIM).

Class Insecta**Order Coleoptera****Coccinellidae*****Scymnus horni* Gorham, 1897****New island record**

Scymnus horni has previously been found on O'ahu (Nishida 2002).

Material examined. HAWAII: Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Chenopodium oahuense*, 28–29 Aug 2002 (2 adults BPBM, 1 adult UHIM); beating *Myoporum sandwicense*, 28 Aug 2002 (1 adult BPBM); beating *Sophora chrysophylla*, 9 Aug 2004 (1 adult BPBM).

Dermestidae***Dermestes frischi* Kugelann, 1792****New island record**

This adventive dermestid beetle was previously collected on Nihoa, O'ahu, and Maui (Nishida 2002). Determination made by G.A. Samuelson.

Material examined. HAWAII: Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 7 Sep 2002 (2 adults BPBM).

Order Collembola**Entomobryidae*****Entomobrya unostrigata* Stach, 1930****New island record**

This adventive entomobryid was previously reported only from Midway Atoll (Nishida 2002). It is here reported from Hawai'i Island, where it can attain very high densities in subalpine shrubland and woodland. Determination was made by Kenneth Christiansen.

Material examined. HAWAII: Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall traps, 7 Sep 2002 (25 individuals UHIM); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, pitfall traps, 5 Sep 2002 (7 individuals BPBM).

Hypogastruridae***Brachystomella insulae* Najt & Thibaud, 1988 New state record**

The establishment of this adventive species was determined by Wanda Weiner. It is native to New Caledonia (Najt & Thibaud 1988).

Material examined. HAWAII: Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 20 Aug 2004 (3 individuals ISEA).

Brachystomella* sp.*New state record**

This undescribed species of *Brachystomella* is of unknown provenance. Determination was made by Wanda Weiner.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 20 Aug 2004 (23 individuals, ISEA).

Isotomidae

Folsomides angularis (Axelson, 1905)

New state record

This adventive isotomid species is recorded in Hawai'i for the first time. It currently occurs in Europe and western North America. Provisional determination was made by Arne Fjellberg, noting that this species belongs to a group with unresolved taxonomy.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, litter extraction, 24 Aug–3 Sep 2002 (5 individuals BPBM, 7 individuals UHIM); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, litter extraction, 26 Aug–2 Sep 2002 (9 individuals BPBM, 2 individuals UHIM).

Proisotoma minuta (Tullberg, 1871)

New island record

This adventive springtail has been collected on the islands of Kaua'i, O'ahu, and Lāna'i (Nishida 2002), and is now also recorded from Hawai'i Island. Determination was made by Kenneth Christiansen.

Material examined. **HAWAII:** Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Hulululu NAR, 2040 m, pitfall trap, 30 Aug 2003 (3 individuals BPBM, 2 individuals UHIM), 22 Aug 2005 (4 individuals UHIM).

Order Diptera

Cecidomyiidae

Trisopsis oleae Kieffer, 1912

New island record

Trisopsis oleae, native to South Africa (Hardy 1960), has previously been found on O'ahu (Nishida 2002) and Moloka'i (Gruner 2004).

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 7 Sep 2002 (1 adult BPBM); Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Hulululu NAR, 2040 m, pitfall trap, 30 Aug 2003 (1♂ UHIM), 22 Aug 2005 (2♂ BPBM, 1 adult UHIM).

Ephydriidae

Philygria debilis Loew, 1861

New state record

This shore fly is recorded from Hawai'i for the first time. It is a widespread species in the US and also known from British Columbia and Quebec in Canada (Mathis & Zatwarnicki 1995). Determination was made by Wayne Mathis.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 7 Sep 2002 (2♀ NMNH, 1♀ BPBM), 20 Aug 2004 (1♂ BPBM, 1♀ 1♂ UHIM); Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Hulululu NAR, 2040 m, pitfall trap, 22 Aug 2005 (2 individuals UHIM).

Lonchaeidae

Silba sp.

New state record

The generic determination of this *Silba* species, new to the state, was made by Iain MacGowan. According to him, the two females examined likely belong to *Silba excisa* (Kertész, 1901), a species widely distributed in southern India, parts of Southeast Asia and northern Australia, and on islands across the Indian and Western Pacific Oceans. *Silba perplexa* (Walker, 1861) is another possibility, but males are needed for definitive identification.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, pitfall trap, 5 Sep 2002 (2♀ BPBM).

Muscidae

Coenosia humilis Meigen, 1826

New state record

Coenosia humilis, recorded here for the first time in Hawai'i, is widespread in North America (Huckett 1934). The specimen below was identified by Adrian C. Pont.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 7 Sep 2002 (1♂ BPBM).

Mycetophilidae

Sciophila sp.

New island record

This unidentified *Sciophila* species was previously recorded on Maui (Howarth & Preston 2006); determination made by Neal Evenhuis.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 20 Aug 2004 (1♀ BPBM).

Sarcophagidae

Ravinia anandra (Dodge, 1956)

New island record

This adventive flesh fly has previously been recorded on O'ahu, Moloka'i, and Maui (Nishida 2002), and is reported here from collections on Hawai'i Island.

Material examined. **HAWAII:** Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, pitfall trap, 30 Aug 2003 (2 adults BPBM, 3 adults UHIM), 22 Aug 2005 (1 adult BPBM, 1 adult UHIM).

Sciaridae

Corynoptera sp.

New island record

This undescribed *Corynoptera* species was first reported in the state from Haleakalā National Park, Maui (Krushelnycky *et al.* 2007). According to Pekka Vilkkamaa, it represents a new species whose provenance is unknown. It is relatively common at high elevations on both Maui and Hawai'i Island.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 20 Aug 2004 (3♀ FMNH, 3♀ UHIM); beating *Dubautia linearis*, 11 Aug 2004 (1♀ UHIM); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, pitfall trap, 5 Sep 2002 (1♀ FMNH, 1♀ BPBM, 1♀ UHIM); Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, pitfall trap, 30 Aug 2003 (1♂ FMNH).

Sphaeroceridae

Pullimosina pullula (Zetterstedt, 1847)

New island record

This sphaerocerid fly was first recorded as established in the state in the World Catalog of Sphaeroceridae (Roháček *et al.* 2001), but no locality or island was given. Our collection provides the first locality information for Hawai'i. The determination of the single female of this cosmopolitan species was made by Stephen Marshall.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, pitfall trap, 5 Sep 2002 (1♀ UGIC).

Order Hemiptera**Aphididae*****Hayhurstia atriplicis*** (Linnaeus, 1761)**New island record**

Hayhurstia atriplicis, a native of Europe, has been found on the islands of O‘ahu, Moloka‘i, and Maui (Messing *et al.* 2012). Species determination was made by Michelle Tremblay.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, pitfall traps, 5 Sep 2002 (12 individuals); beating *Chenopodium oahuense*, 9 Sep 2002 (1 individual), 13 Aug 2004 (2 individuals); Mauna Kea Forest Reserve, near Pu‘u Ahumoa, 1880 m, pitfall trap, 7 Sep 2002 (3 individuals), 20 Aug 2004 (5 individuals); beating *Dubautia linearis*, 11 Aug 2004 (1 individual). All specimens currently in PDK collection, will be deposited in UHIM.

Therioaphis trifolii (Monell, 1882)**New island record**

Native to Europe, this aphid has previously been collected in the state on O‘ahu and Maui (Messing *et al.* 2012). The single specimen reported below was identified by Michelle Tremblay.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu‘u Ahumoa, 1880 m, beating *Dubautia linearis*, 3 Sep 2002 (1 individual PDK collection, will be deposited in UHIM).

Cicadellidae***Planioccephalus flavicosta*** (Stal, 1862)**New island record**

This adventive leafhopper has previously been collected on O‘ahu (Nishida 2002) and Maui (Krushelnicky *et al.* 2007).

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu‘u Ahumoa, 1880 m, pitfall trap, 20 Aug 2004 (2 adults BPBM).

Scaphytopius loricatus (Van Duzee, 1894)**New island record**

This adventive species was previously known from Kaua‘i, O‘ahu, and Moloka‘i, and Nihoa (Nishida 2002); we now report it from Hawai‘i Island.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Chenopodium oahuense*, 9 Sep 2002 (1 adult UHIM).

Order Hymenoptera**Sphecidae*****Solierella peckhami*** (Ashmead, 1897)**New island record**

Solierella peckhami, an adventive wasp, has been recorded on Ni‘ihau, Kaua‘i, O‘ahu, Moloka‘i, and Maui (Nishida 2002).

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, pitfall trap, 5 Sep 2002 (1 adult BPBM).

Order Psocoptera**Caeciliidae*****Stenocaecilius*** sp.**New state record**

This unidentified *Stenocaecilius* species is a new arrival in the state. Its country of origin is unknown. Generic determination was made by Edward Mockford.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, pitfall trap, 7 Sep 2002 (1 ♀ PDK collection, will be deposited in BPBM), 20 Aug 2004 (2 adults PDK collection, will be deposited in BPBM); beating *Dodonaea viscosa*, 2–3 Sep 2002 (3 adults PDK collection, will be deposited in UHIM), 11–12 Aug 2004 (3 adults PDK collection, will be deposited in UHIM); beating *Dubautia linearis*, 11–12 Aug 2004 (3 adults PDK collection, will be deposited in BPBM).

Ectopsocidae

Ectopsocus californicus (Banks, 1903)

New island record

Ectopsocus californicus was first recorded in the state on upper Haleakalā, Maui (Krushelnicky *et al.* 2007). It is a very common adventive psocid on vegetation in subalpine shrublands of Maui and Hawai'i Island. Species determination was made by Edward Mockford.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, beating *Dodonaea viscosa*, 2–4 Sep 2002 (4 adults); beating *Dubautia linearis*, 2–4 Sep 2002 (10 adults); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Chenopodium oahuense*, 26 Aug–9 Sep 2002 (3 adults); beating *Myoporum sandwicense*, 26 Aug–9 Sep 2002 (6 adults); beating *Sophora chrysophylla*, 26 Aug–9 Sep 2002 (12 adults); Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, beating *Vaccinium reticulatum*, 22 Aug 2003 (2 adults). All specimens currently in PDK collection, will be deposited in BPBM.

Ectopsocus vachoni Badonnel, 1945

New island record

As with *E. californicus*, *E. vachoni* was recently documented as newly established in the state from collections made on Maui (Krushelnicky *et al.* 2007). Here we report collections on Hawai'i Island. This species is very abundant in leaf litter. Determination was made by Edward Mockford.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, litter extraction, 24 Aug–3 Sep 2002 (58 individuals); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, litter extraction, 26 Aug–2 Sep 2002 (42 individuals); Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, litter extraction, 23 Aug 2003 (9 individuals), 13 Aug 2005 (1 individual). All specimens currently in PDK collection, will be deposited in BPBM.

Lepidopsocidae

Pteroxanium kelloggi (Ribaga, 1905)

New state record

This adventive psocid is recorded in the state for the first time. It is currently known only from New Zealand. Determination was made by Edward Mockford.

Material examined. **HAWAII:** Kīpuka 'Āinahou Bird Sanctuary, near Kīpuka Pu'u Huluhulu NAR, 2040 m, pitfall trap, 22 Aug 2005 (2 adults PDK collection, will be deposited in BPBM).

Philotarsidae

Haplophallus talilus? Thornton & New, 1977

New island record

Tentative determination of this species, also collected on Maui (Krushelnicky *et al.* 2007), was made by Edward Mockford.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, beating *Dubautia linearis*, 3 Sep 2002 (1 ♀ PDK collection, will be deposited in BPBM), 11 Aug 2004 (1 adult PDK collection, will be deposited in UHIM); beating *Dodonaea viscosa*, 12 Aug 2004 (1 adult PDK collection, will be deposited in UHIM).

Pseudocaeciliidae***Austropsocus* sp.****New state record**

This unidentified *Austropsocus* species is newly established in Hawai'i. Its country of origin is unknown. Generic determination was made by Edward Mockford.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, beating *Dodonaea viscosa*, 11 Aug 2004 (2 adults PDK collection, will be deposited in BPBM); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Sophora chrysophylla*, 28 Aug 2002 (2 adults PDK collection, will be deposited in BPBM); pitfall traps, 5 Sep 2002 (4 adults PDK collection, will be deposited in UHIM); litter extraction, 2 Sep 2002 (3 adults PDK collection, will be deposited in UHIM).

Trogiidae***Lepinotus reticulatus* Enderlein, 1905****New island record**

Lepinotus reticulatus was previously collected in Hawai'i on Kaua'i, Maui, and Kure Atoll (Nishida 2002, Krushelnycky *et al.* 2007). We report it from collections on Hawai'i Island. Determination was made by Edward Mockford.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, litter extraction, 24 Aug–3 Sep 2002 (50 individuals PDK collection, will be deposited in BPBM); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, litter extraction, 26 Aug–2 Sep 2002 (95 individuals PDK collection, will be deposited in BPBM).

Order Thysanoptera**Aeolothripidae*****Aeolothrips bicolor* Hinds, 1902****New island record**

This adventive predatory thrips was previously reported from O'ahu, Moloka'i, and Maui (Nishida 2002, Krushelnycky *et al.* 2007). Determination was made by Sueo Nakahara.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, beating *Dubautia linearis*, 11–12 Aug 2004 (1 adult BPBM); Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Chenopodium oahuense*, 26 Aug–2 Sep 2002 (1 adult BPBM).

Aeolothrips nasturtii* Jones, 1912*New island record**

Aeolothrips nasturtii was previously collected on Maui (Nishida 2002); determination made by Sueo Nakahara.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Chenopodium oahuense*, 28 Aug 2002 (1 adult BPBM).

Phlaeothripidae***Apterygothrips remotus* (Bianchi, 1947)****New island record**

The Hawai'i Island collection reported below represents a range extension for this endemic thrips species, previously known only from Maui (Nishida 2002). The specimen was identified by Sueo Nakahara.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Myoporum sandwicense*, 8 Aug 2004 (1♀ BPBM).

Haplothrips leucanthemi* (Schrank, 1781)*New island record**

This adventive thrips was previously known from Maui (Krushelnycky *et al.* 2007); determination made by Sueo Nakahara.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Pu'u Ahumoa, 1880 m, beating *Dubautia linearis*, 12 Aug 2004 (1 adult BPBM).

Thripidae

Frankliniella crotolariae Mound & Marullo **New island record**

Frankliniella crotolariae was recently detected in the state, on Maui (Krushelnycky *et al.* 2007). We report the collection of specimens on Hawai'i Island. Species determination was made by Sueo Nakahara.

Material examined. **HAWAII:** Mauna Kea Forest Reserve, near Mauna Kea State Park, 2060 m, beating *Chenopodium oahuense*, 26 Aug 2002 (1♀ BPBM).

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Literature Cited

- Beatty, J.A., Berry, J.W. & Berry, E.R.** 2000. Additions and corrections to the spider fauna of Hawaii. *Bishop Museum Occasional Papers* **64**: 32–39.
- Gruner, D.S.** 2004. Arthropods from 'ohi'a lehua (Myrtaceae: *Metrosideros polymorpha*), with new records for the Hawaiian Islands. *Bishop Museum Occasional Papers* **78**: 33–52.
- Hann, S.W.** 1994. Descriptions of four *Steatoda* species (Araneae, Theridiidae) found in New Zealand. *New Zealand Journal of Zoology* **21**: 225–238.
- Hardy, D.E & Delfinado, M.D.** 1980. *Insect of Hawaii*. Volume 13. Diptera: Cyclorrhapha III, series Schizophora section Acalypterae, exclusive of family Drosophilidae. University of Hawaii Press, Honolulu. 451 pp.

- Howarth, F.G. & Preston, D.J.** 2006. Monitoring for arthropods (insects and relatives) occurring within the Kahului Airport environs, Maui, Hawaii. Final Report submitted to Edward K. Noda & Associates, Inc., and the State of Hawaii, Department of Transportation, Airports Division. 90 pp.
- , **Preston, D.J. & Pyle, R.** 2012. Surveying for terrestrial arthropods (insects and relatives) occurring within the Kahului Airport environs, Maui, Hawaii. Synthesis Report. *Bishop Museum Technical Report* **58**, 225 pp.
- Huckett, H.C.** 1934. A revision of the North American species belonging to the genus *Coenosia* Meigen and related genera (Diptera: Muscidae). Part I. The subgenera *Neodexiopsis*, *Coenosia*, *Hoplogaster* and related genera *Allognota*, *Bithoracochaeta* and *Schoenomyza*. *Transactions of the American Entomological Society* **60**: 57–119.
- Jocqué, R. & Churchill, T.B.** 2005. On the new genus *Tropizodium* (Araneae: Zodariidae), representing the femoral organ clade in Australia and the Pacific. *Zootaxa* **944**: 1–10.
- Krushelnycky, P.D. & Gillespie, R.G.** 2008. Compositional and functional stability of arthropod communities in the face of ant invasions. *Ecological Applications* **18**: 1547–1562.
- . 2010a. Correlates of vulnerability among arthropod species threatened by invasive ants. *Biodiversity and Conservation* **19**: 1971–1988.
- . 2010b. Sampling across space and time to validate natural experiments: an example with ant invasions in Hawaii. *Biological Invasions* **12**: 643–655.
- Krushelnycky, P.D., Loope, L.L. & Gillespie, R.G.** 2007. Inventory of arthropods of the west slope shrubland and alpine ecosystems of Haleakala National Park. *Pacific Cooperative Studies Unit Technical Report* **148**, 52 pp.
- Mathis, W.N. & Zatwarnicki, T.** 1995. World catalog of shore flies (Diptera: Ephydriidae). *Memoirs on Entomology International* **4**: 1–423.
- Messing, R.H., Pike, K.S. & Foottit, R.G.** 2012. *Invasive aphids in Hawaii*. College of Tropical Agriculture and Human Resources, University of Hawai'i at Mānoa, Honolulu.
- Najit, J. & Thibaud, J.M.** 1988. Collembola Poduromorpha of New Caledonia 3. two new species of the genus *Brachystomella* (Neanuridae, Brachystomellinae). *Mémoires du Muséum National d'Histoire Naturelle (A)* **142**: 33–38.
- Nishida, G.M.** 2002. Hawaiian terrestrial arthropod checklist. Fourth edition. *Bishop Museum Technical Report* **22**: 1–313.
- Platnick, N.I.** 2013. The world spider catalog, version 14.0. American Museum of Natural History. Available at: <http://research.amnh.org/iz/spiders/catalog/>.
- Rivera, M., & Gillespie, R.G.** 2010. New species of endemic kleptoparasitic spiders of the genus *Argyrodes* (Araneae: Theridiidae) in the Hawaiian Islands. *Pacific Science* **64**: 221–231.
- Roháček, J., Marshall, S.A., Norrbom, A.L., Buck, M., Quiros, D.I. & Smith, I.** 2001. *World catalog of Sphaeroceridae (Diptera)*. Slezské Zemské Muzeum, Opava, Czech Republic. 394 pp.
- Suman, T.W.** 1970. Spiders of the family Thomisidae in Hawaii. *Pacific Insects* **12**: 773–864.

- Webster, K.W., Cooper, P. & Mound, L.A.** 2006. Studies on Kelly's citrus thrips, *Pezothrips kellyanus* (Bagnall) (Thysanoptera: Theripidae): sex attractants, host associations and country of origin. *Australian Journal of Entomology* **45**: 67–74.
- Young, L.C., VanderWerf, E.A., Mitchell, C., Yeun, E., Miller, C.J., Smith D.G. & Swenson, C.** 2012. The use of predator proof fencing as a management tool in the Hawaiian Islands: a case study of Ka'ena Point Natural Area Reserve. *Pacific Cooperative Studies Unit Technical Report* **180**, 87 pp.
- , **VanderWerf, E.A., Lohr, M.T., Miller, C.J. & Titmus, A.J.** 2013. Multi-species predator eradication within a predator-proof fence at Ka'ena Point, Hawai'i. *Biological Invasions* **15**: 2627–2638. [DOI 10.1007/s10530-013-0479-y]

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