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Cover: *Campsicnemus conanti* Evenhuis, n. sp. from the Big Island of Hawaii (see page 161),

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RECORDS OF THE HAWAII BIOLOGICAL SURVEY FOR 2024

Editor's Preface

I am pleased to present the annual compilation of *Records of the Hawaii Biological Survey*; this year for the year 2024. 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 Hawai'i'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 sites; and an authority file with full names and vital dates of more than 7,100 authors who have described new taxa of flies (Diptera).

The Records for 2024 include descriptions of 2 new endemic species, 37 new state records of alien species, and 212 new island records of alien species.

Our Primary Web Products:
Hawaii Biological Survey Home Page
http://hbs.bishopmuseum.org/

Natural Sciences Databases
http://nsdb.bishopmuseum.org/

Hawaii Endangered and Threatened Species Web Site
http://hbs.bishopmuseum.org/endangered/

Insect and Spider Collections of the World Web Site
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/

Many of the new records reported here resulted from curatorial projects and field surveys funded by the National Science Foundation, the U.S. Department of Defense, the U.S. Geological Survey, the U.S. Fish & Wildlife Service, the U.S. National Park Service, and the Hawaii Department of Land and Natural Resources; they are thanked for their support and partnership of the Hawaii Biological Survey over the years.

We encourage authors with new information concerning flora or fauna occurring in the Hawaiian Islands to submit their data to the editor for consideration for publication in the Records. Submission and format of papers must follow format of recent papers. Information on submission of manuscripts and guidelines for contributors may be obtained at: http://hbs.bishopmuseum.org/guidelines.pdf ——*N.L. Evenhuis, editor*

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New Hawaiian bryophyte records from Herbarium Pacificum for 2023: 106 new island records for Hawaiian liverworts and hornworts[1]

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Abstract. We report 106 new island records for Hawaiian liverworts and hornworts, including 27 species from Kaua'i, 24 from O'ahu, 15 from Moloka'i, 16 from Maui, and 24 from Hawai'i Island, based upon examination of specimens at the Herbarium Pacificum, Bernice P. Bishop Museum; National Tropical Botanical Garden Herbarium; Hawaii Volcanoes National Park Herbarium; Joseph F. Rock Herbarium, UH-Mānoa (HAW); Haleakalā National Park Herbarium (HALE); and our own collections.

INTRODUCTION

These records represent island record updates from the Staples & Imada (2006) checklist; see Judziewicz & Freire 2023 for nomenclatural updates from this same checklist. The new records are based on collections examined at or deposited in the Herbarium Pacificum, Bernice P. Bishop Museum (BISH); the National Tropical Botanical Garden Herbarium (PTBG); the Hawaii Volcanoes National Park Herbarium (HAVO); the Joseph F. Rock Herbarium, University of Hawai'i at Mānoa (HAW), the Haleakalā National Park Herbarium (HALE), and our own collections. According to collection labels at BISH and PTBG, duplicates of specimens have been distributed (as noted in the text) to these herbaria: ASSAM (Botanical Survey of India, Eastern Regional Centre), C (University of Copenhagen), CANB (Australian National Herbarium), CAS (California Academy of Sciences), CBM (Natural History Museum and Institute, Chiba), COLO (University of Colorado Museum of Natural History), E (Royal Botanic Garden, Edinburgh), F (Field Museum of Natural History), HIRO (Hiroshima University), HSNU (East China Normal University), MSB (Ludwig-Maximilians-Universität München), NY (New York Botanical Garden), TALL (Tallinn Botanical Garden), and UBC (University of British Columbia). Thomas was principal collector during the 17 May and 9 November 2022 visits to Mt Ka'ala, O'ahu, and Judziewicz and Freire are among several co-collectors during these forays. We follow the synonymy of Staples & Imada (2006), updated through the Söderström *et al.* (2016) checklist of world liverworts, the current version of Tropicos.org (https://www.tropicos.org/home) through 16 October 2023, and Judziewicz & Freire (2023).

1. Contribution No. 2004-001 to the Hawaii Biological Survey.
2. Distinguished Affiliates, Herbarium Pacificum, Bernice Pauahi Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817, USA.

RESULTS

We report 106 new island records for Hawaiian liverworts and hornworts, including 27 species from Kauaʻi, 24 from Oʻahu, 15 from Molokaʻi, 16 from Maui, and 24 from Hawaiʻi Island.

ANTHOCEROTOPHYTA

Anthocerotaceae

Folioceros fuciformis (Mont.) D.C. Bharadw. **New Island Records**

This indigenous, subcosmopolitan species has been previously documented from Oʻahu, Maui, and Hawaiʻi (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **KAUAʻI:** Lihuʻe, ditch north of Lihuʻe Gap, with *Marchantia crenata*, 8 Jul 1909, *C.N. Forbes s.n.* (BISH); Hiʻi Mts, 21 Oct 2016, *C.N. Forbes 645k* (BISH); Wainiha Dam Road, 27 Feb 1956, *R.D. Svihla 2125* (BISH); Lihuʻe District; Headwaters of the N fork of the Wailua River, scattered trees and shrubs of *Metrosideros, Diplazium, Cyrtandra* spp., and *Perrottetia* 1.0–1.5 m tall, mat-forming on decaying boulder along drainage course, thallus dark green, 600–670 m, 30 Oct 1992, *T. Flynn 5113* (BISH, COLO, NY, PTBG, UBC); Lihuʻe District; Blue Hole, headwaters North Fork Wailua River, 22.0645°N, 159.47311°W, disturbed lowland wet forest, shaded rock face, mat-forming over mosses, with *Adiantum, Sphenomeris, Blechnum*, and numerous bryophytes, 389 m, 18 Jan 2015, *T. Flynn 8276* (BISH, CANB, PTBG); Lihuʻe District; Blue Hole, headwaters North Fork Wailua River, 22.0653°N, 159.49152°W, low-statured wet shrubland over rubble, with *Perrottetia, Pipturus, Cyclosorus, Diplazium, Broussaisia*, growing on rocks of dripping watercourse with *Marchantia crenata*; thallus deep, bright green, 600–700 m, 19 Feb 2016, *T. Flynn 8276* (BISH, CANB, PTBG). **MOLOKAʻI:** Settlement Trail, 30 Mar 1975, *P.K. Higashino 505* (BISH); Kapuʻuʻiki, mixed native and exotic vegetation, 750 ft [229 m], 23 Jan 1983, *W.P. Char 83-10* (BISH).

Dendrocerotaceae

Megaceros flagellaris (Mitt.) Steph. **New Island Records**

This indigenous species (also known from Asia, other places in Oceania, and Madagascar) has been previously documented from Kauaʻi, Oʻahu, and Hawaiʻi (Staples & Imada, 2006).

Material examined. **MAUI:** Haleakalā, Waikamoi Preserve, 20°46′16–47″N, 156°13′34″–14′11″W, 1,860–2,012 m, 23 Feb 2023, *A.V. Freire, E.J. Judziewicz, H. Oppenheimer & Z. Pezzillo 23-129d, 23-151* (BISH).

MARCHANTIOPHYTA

Acrobolbaceae

Acrobolbus integrifolius (A. Evans) Briscoe. **New Island Records**

This endemic species has been previously documented from Molokaʻi and Maui (Staples & Imada (2006) as *Tylimanthus integrifolius*); see Judziewicz & Freire (2023). The Cooke collection from Kauaʻi may represent a different species of *Acrobolbus*.

Material examined. **KAUAʻI:** Kalalau Flats, 28 Oct 1903, *C.M. Cooke, Jr. 103* (BISH); Lihuʻe/Waimea District boundary, Kawaikini Summit region, 22.06253°N, 159.4982°W, *Metrosideros-Cheirodendron* short-statured wet forest with open bog habitat dissected by headwater drainages, with genera such as *Melicope, Myrsine, Dubautia, Cheirodendron, Metrosideros, Coprosma, Labordia, Psychotria, Vaccinium*, and *Kadua*, fern genera include *Asplenium, Adenophorus, Dryopteris, Sadleria, Elaphoglossum, Polypodium, Lycopodium*, and *Cibotium*, bogs, liverwort, light green, lithophytic on

stream bank walls, common, 1,573 m, 21 Jan 2015, *K.R. Wood, S. Perlman & M. Query 16249* (CAS, MSB, PTBG). **HAWAIʻI:** Kīlauea East Rift, kīpuka NE of Kane Nui o Hamo, lowland wet *Metrosideros-Cibotium* forest, 2,950 ft [900 m], 26 Jan 1984, *L.W. Cuddihy* [*Pratt*] *1748a* (HAVO).

Adelanthaceae

Cuspidatula labrifolia (H.A. Mill.)
A.V. Freire & Judz. **New Island Records**

This endemic species has been previously documented from Molokaʻi, Maui, and Hawaiʻi (Staples & Imada (2006) as *Jamesoniella labrifolia*); see Judziewicz & Freire (2023).

Material examined. **KAUAʻI:** Waiʻaleʻale summit, montane bogs with riparian vegetation of *Metrosideros-Cheirodendron*, 22.07442°N, 159.4956°W, 1,524 m, 8 Mar 2007*, K.R. Wood 12311* (PTBG). **OʻAHU:** Waiʻanae Mts, forest trail from Mauna Kapu north to summit of Palikea, on *Metrosideros* bark, 2,660–3,020 ft [810–920 m], 4 Nov 2021, *E.J. Judziewicz 21-966a* (BISH); Waʻahila Ridge Trail, growing on fallen *Metrosideros* branch in partially shaded, dry area, 14 Apr 1979, *C.S Futa 33, 37* (BISH); Punaluʻu, 4 Aug 1935, *R.D. Svihla 35-175* (BISH); Koʻolau Mountain Range: Puʻu Kōnāhuanui Trail, 1,600–3,000 ft [488–914 m], 5 Dec 1970, *L.E. Bishop 127033* (BISH); Mt Kaʻala, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, *M.K. Thomas et al. 536a* (BISH).

Aytoniaceae

Asterella parva (Steph.) H.A. Mill. **New Island Record**

This endemic species was previously known only from Molokaʻi (Staples & Imada, 2006).

Material examined. **MAUI:** Haleakalā, Kahikinui State Forest Reserve, W fork Manawainui Gulch, rocks and cliffs in gulch, 1,509 m [4,950 ft], 27 Aug 2014, *H. Oppenheimer & K. Bustamente H81414* (PTBG).

Calypogeiaceae

Mnioloma fuscum (Lehm. & Lindenb.)
R.M. Schust. **New Island Records**

This indigenous species has been previously documented from Maui and Hawaiʻi (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023). It is also found in the Old World tropics, Macaronesia, east to New Zealand, but is not found in the Americas (Váňa *et al.* 2014).

Material examined. **KAUAʻI:** Alakaʻi Wilderness Preserve, Alakaʻi Swamp, bog NW of Mohihi, Montane wet sedgelands, bog, 22.12667°N, 159.5745°W, growing mixed with various other liverworts, 1,281 m, 27 May 2015, *T. Flynn 8161a* (PTBG). **OʻAHU:** Mt Kaʻala, on wet dripping roadside rock embankment below summit, 21°30′28″N, 158°08′43″W, 1,198 m, 6 May 2023, *M.K. Thomas s.n.* (BISH). **MOLOKAʻI:** W of Pēpēʻōpae, wet, shaded canyon [mixed with *Dumortiera hirsuta*], 23 Apr 1928, *O. Degener & H. Wiebke s.n.* (BISH).

Cephaloziaceae

Cephalozia lucens (A. Evans) Steph. **New Island Records**

This endemic species has been previously documented from Maui (Staples & Imada (2006), as *Metahygrobiella lucens*); see Judziewicz & Freire (2023). Also found on Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **KAUA‘I:** Alaka‘i Swamp, Waimea Drainage, W side, 3 Jul–17 Aug 1917, *C.N. Forbes 1648k* (BISH); Kōke‘e State Park, Kaua‘ikinana Stream W of Pihea Trail, *Metrosideros*-dominated wet forest, on vertical, shaded dripping wet face, 1,097 m, 23 Jul 1992, *T. Flynn 5083* (COLO, NY, PTBG, UBC); Along trail to Blue Hole, following North Fork Wailua River from gauging station, 22.0645°N, 159.4731°W, degraded lowland wet forest, on dripping rock face, 389 m, 18 Feb 2016, *T. Flynn et al. 8257* (ASSAM, BISH, CANB, CAS, HSNU, PTBG); Kawaihau Dist, Makaleha Mountains, Keālia Forest Reserve, 22.11705°N, 159.408167°W, short-statured wet forest with open weedy grass areas, dominated by *Metrosideros* and *Dicranopteris*, on rocks in small drainage, bright lime green, 887 m, 23 Feb 2016, *T. Flynn et al. 8326* (BISH, PTBG); Hanalei Dist, Nāmolokama Summit, *Metrosideros* mixed montane shrubland, epipetric on basalt stream walls, 22.14°N, 159.5°W, 1,305 m, 26 Feb 2019, *K.R. Wood 18105* (PTBG). **O‘AHU:** Mt Ka‘ala, on wet dripping roadside rock embankment below summit, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 366, 385a* (BISH); same locality, 9 Nov 2021, *M.K. Thomas et al. 479, 480b, 522b, 540c* (BISH). **HAWAI‘I:** Hawaii Volcanoes National Park, ‘Ōla‘a Trench, montane wet *Metrosideros* forest, mixed with *Leucobryum seemannii*, 3,600 ft [1,097 m], 10 Jul 2001, *M. Waite s.n.* (HAVO); Hawaii Volcanoes National Park, Kāhuku Unit, 19°14′46–52″N, 155°36′02–22″W, terrestrial in *Metrosideros* forest, 1,885 m, 19 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-700* (HAVO); Hakalau Forest National Wildlife Refuge, Honohina Gulch, at the Refuge Administrative Site, just east of the boundary: 19°49′12″N, 155°19′57″W, 6,450 ft [1,965 m], 24 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-192a* (BISH), *23-209c* (BISH), *23-210b* (BISH), *23-211b* (BISH); Hakalau Forest National Wildlife Refuge, road below Pua ‘Ākala cabin, paralleling ‘Āwehi Gulch, 19°47′12–21″N, 19°47′12–21″N, 5,750–6,200 ft [1,753–1,890 m], 26 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-239b* (BISH), *23-250b* (BISH); Pu‘u O ‘Umi Natural Area Reserve, forest of *Metrosideros polymorpha* and *Cibotium glaucum*, trail from ‘Eke gate NE to ‘Eke summit and then down steep slope to margin of sedge bog, 20°04′55″–05′00″N, 155°43′30–50″W, 5,000–5,300 ft [1,525–1,615 m], 5 Sep 2023, *A.V. Freire & E.J. Judziewicz 23-595* (BISH).

Cephaloziellaceae

Cephaloziella heteroica (C.M. Cooke) Douin. **New Island Records**

This endemic species has been previously documented from Kaua‘i, Moloka‘i, and Maui (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023). It is common in the Ka‘ū Desert of Hawai‘i Island, often growing with *Isopaches bicrenatus* (Hoffm.) H. Buch.

Material examined. **O‘AHU:** Pauoa Flats to Kōnāhuanui, Castle Trail, 11 Mar 1915, *C.N. Forbes 2155bO* (BISH). **HAWAI‘I:** Hawaii Volcanoes National Park, Kāhuku Unit, 19°06′13″N, 155°41′04″W, terrestrial on embankment along road in open *Metrosideros* forest, 960 m, 12 Feb 2021, *A.V. Freire & E.J. Judziewicz 21-220* (HAVO); Hawaii Volcanoes National Park, Kāhuku Unit, 19°10′37″N, 155°41′17″W, terrestrial in koa forest, 1,600 m, 9 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-632* (HAVO); Hawaii Volcanoes National Park, Chain of Craters road, 19°18′53″N, 155°07′45″W, shaded embankment on hairpin turn, 400 m, 9 Aug 2022, *A.V. Freire & E.J. Judziewicz 21-229* (HAVO); Hawaii Volcanoes National Park, trail 0.8 mi N of end of Mauna Loa Road, in shaded pit on moist shelf, 19°30′02″N, 155°23′15″W, 2,120 m, 20 Apr 2021, *A.V. Freire & E.J. Judziewicz 21-475a* (HAVO); Hawaii Volcanoes National Park, off Firebreak Road off Mauna Loa Road, in shaded pit on moist shelf, 19°26′22″N, 155°17′12″W, 1,220 m, 25 Apr 2021, *A.V. Freire & E.J. Judziewicz 21-483* (HAVO); Hawaii Volcanoes National Park, Footprints Trail, in moist ash embankment in full sun, 19°21′11”N, 155°21′39”W, 888 m, 22 Oct 2020, *A.V. Freire & E.J. Judziewicz 20-886* (HAVO); Hawaii Volcanoes National Park, near Kulanaokuaiki Campground, in desert in moist ash embankment in full sun, 19°20′34″N, 155°16’42″W, 972 m, 24 Oct 2020, *A.V. Freire & E.J.*

Judziewicz 20-909 (HAVO); Hawaii Volcanoes National Park, Mauna Loa Road, Kīpukakulalio, terrestrial in koa forest, 19°28′35″N, 155°21′55″W, 1,725 m, 13 Nov 2020, *A.V. Freire & E.J. Judziewicz 20-963* (HAVO).

Cephaloziella kiaeri (Austin) Pearson **New Island Records**

This indigenous, nearly pantropical species has been previously documented from Kauaʻi and Oʻahu (Staples & Imada (2006), as *Cephaloziella lilae*); see Judziewicz & Freire (2023).

Material examined. **MAUI:** Haleakalā, Waikamoi Preserve, 20°46′16–47”N, 156°13′34”–14′11”W, 1,860-2,012 m, 23 Feb 2023, *A.V. Freire, E.J. Judziewicz, H. Oppenheimer & Z. Pezzillo 23-68b, 23-69c, 23-103, 23-106* (BISH). **HAWAIʻI:** Hawaii Volcanoes National Park, ʻŌlaʻa Trench, montane wet *Metrosideros* forest, 3,600 ft [1,097 m], 5 June 2001, *M. Waite s.n.* (HAVO); Hawaii Volcanoes National Park, Halemaʻumaʻu Trail, 19°25′32 ″N, 155°15′30 ″W, on large rock on side of trail, 1,140 m, 23 Nov 2021, *A.V. Freire & E.J. Judziewicz 21-987* (HAVO); Puʻu Makaʻala N.A.R., near old Mauna Loa Boys School, *Metrosideros-Cibotium* kīpuka, 19°34’45”N, 155°20′03″W, 1,760 m, 19 Aug 2021, *A.V. Freire & E.J. Judziewicz 21-664* (BISH); Puʻu Makaʻala N.A.R., near old Mauna Loa Boys School, *Metrosideros-Cibotium* kīpuka, 19°35′38″N, 155°20′28″W, 1,750 m, 25 Aug 2021, *A.V. Freire & E.J. Judziewicz 21-683a* (BISH); Hakalau Forest National Wildlife Refuge, road below Pua ʻĀkala cabin, paralleling ʻĀwehi Gulch, 19°47′12–21″N, 19°47′12–21″N, elevation 5,750–6,200 ft [1,753–1,890 m], 26 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-224* (BISH)..

Cephaloziella kilohanensis (C.M. Cooke) Douin **New Island Records**

This endemic species has been previously documented from Kauaʻi and Maui (Staples & Imada, 2006).

Material examined. **OʻAHU:** Mt. Tantalus, 17 Mar 1919, *C.N. Forbes 2539o* (BISH). **HAWAIʻI:** Volcano Guest House, 19°25′31″N, 155°12′25″W, shaded open ground next to cabin, in mats with *Kurzia hawaiica* and *Telaranea nematodes*, 1,050 m, 30 Apr 2021, *A.V. Freire & E.J. Judziewicz 21-493a* (BISH).

Fossombroniaceae

Fossombronia pusilla (L.) Nees **New Island Records**

This indigenous species has been previously documented from Maui (Staples & Imada, 2006). It is known from Europe, Australia, and is scattered in the north and south temperate zones and Oceania. These Maui collections (from Krayesky *et al.*, 2005) were not examined by us: Haleakalā National Park, near Leleiwi overlook, on W-facing slope, on soil at exposed place, 2,550 m, 5 June 1998, *T. Furuki 14735* (CBM); Haleakalā National Park, near Palikū Cabin, along trail on cliff of crater, on rock, 2,050 m, 23 June 1998, *T. Furuki 15083* (CBM). Observed and photographed in Haleakalā National Park on 25 Feb 2023 by Zach Pezzillo in the company of A.V. Freire & E.J. Judziewicz.

Material examined. **KAUAʻI:** Poʻomau Canyon, on damp, shaded soil, 1,400–1,800 ft [460–590 m], 19 Jan 1993, *T. Flynn 5207* (PTBG). **HAWAIʻI:** Hawaii Volcanoes National Park, trail 0.8 mi N of end of Mauna Loa Road, in shaded pit on moist shelf, patch 10 cm across, 19°30′02″N, 155°23′15″W, 2,120 m, 20 Apr 2021, *A.V. Freire & E.J. Judziewicz 21-474* (HAVO); same locality, 17 May 2021, *A.V. Freire & E.J. Judziewicz 21-509* (HAVO); Mauna Kea, Mānā Road at Wailuku River crossing, 2,085 m, 26 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-328* (BISH); Hawaii Volcanoes National Park, Mauna Loa Road, spur road on NE side of second cattleguard, 19°27′42″N,

155°20′23″W, 1,502 m, 23 Apr 2022, *A.V. Freire & E.J. Judziewicz 23-321* (BISH); Amaumau Road, roadside soil embankment next to agricultural experiment station, 19°28′23″N, 155°14′14″W, 1,242 m, 11 May 2023, *A.V. Freire & E.J. Judziewicz 23-345* (BISH).

Herbertaceae

Herbertus hawaiiensis H.A. Mill. **New Island Records**

This indigenous species, also known from Canada (British Columbia) has been previously documented from Maui (Staples & Imada, 2006).

Material examined. **KAUA‘I:** Lihu‘e Dist, Blue Hole, headwaters North Fork Wailua River, low-statured wet shrubland over rubble, clump-forming; leaves dark reddish-brown, 600 m, 19 Feb 2016, *T. Flynn 8271, 8278* (BISH, PTBG); same locality, 23 Feb 2016, *T. Flynn 8316* (BISH, PTBG). **O‘AHU:** Wai‘anae Mountain Range, summit of Mt. Ka‘ala, 1,219 m, 23 Jul 1977, *G.Y. Daida 57* (BISH).

Lejeuneaceae

Acrolejeunea sandvicensis (Gottsche) Steph. **New Island Records**

This indigenous, mainly subtropical Asian species has been previously documented from O‘ahu and Hawai‘i (Staples & Imada (2006) as *Trocholejeunea sandvicensis*); see Judziewicz & Freire (2023).

Also found on Lāna‘i (Judziewicz, Freire & Bogner, 2023). It is common and weedy in wet lowland areas.

Material examined. **KAUA‘I:** Kipu, Aug 1897, *C.M. Cooke, Jr. 7 CB a6* (BISH); Keahu, 25 Oct 1903, *C.M. Cooke, Jr. 55* (BISH); Lehuamakanoi [Kōke‘e area], 25 Oct 1903, *C.M. Cooke, Jr. 78* (BISH); Hā‘ena, end of road, along Nā Pali Trail, 28 Feb 1956, *R.D. Svihla 2127* (BISH); Waimea Dist, Wai‘alae Ridge, N-facing slopes, *Metrosideros-Acacia* mesic forest, on *Euphorbia atrococca*, green-yellow or tinged purple-red, common, 1,100 m, *K.R. Wood, S. Walsh & S. Perlman 18178* (BISH, E, F, PTBG). **MOLOKA‘I:** Honomuni, 23 Dec 1953, *E.T. Ozaki 709* (BISH); Hālawa Stream, 100 ft [30 m], 26 Dec 1953, *E.T. Ozaki 836* (BISH); Wailau, Mapulehu Trail, 29 Dec 1953, *E.T. Ozaki 911, 936* (BISH); gulch S of Pakuwoaku Ridge, Wailau Valley, 500 ft [152 m], 7 Apr 1977, *R.L. Stemmermann 2069* (BISH); far eastern Moloka‘i, just before end of road (Kamehameha V Hwy or 450), secondary vegetation with *Syzygium cumini, Syzygium uniflora, Aleurites, Furcraea, Leucaena*, on rock in full sun, 19 Jan 2020, *T. Flynn 9075* (BISH, PTBG). **MAUI:** Kīpahulu Valley, E of Palikea, partial shade, moist forest; on rock, 1,400 ft [430 m], 19 Jul 1980, *G.Y. Daida 704* (BISH); East Maui, Makawao District, Kaupakulua ahu, W side of ‘Ōpana Point, northing: 2818297, easting: 782302, 7 May 2021, *H.K. Oppenheimer H72113* (BISH); West Maui, road to Kahakuloa, wet bank of gully, 31 Dec 1955, *R.D. Svihla 1748, 1755* (BISH); Haleakalā, Waikamoi Preserve, 20°46′16–47″N, 156°13′34″–14′11″W, 1,860–2,012 m, 23 Feb 2023, *A.V. Freire, E.J. Judziewicz, H. Oppenheimer & Z. Pezzillo 23-143* (BISH).

Cheilolejeunea decursiva (Sande Lac.) R.M. Schust. **New Island Record**

This indigenous species, also found in tropical Asia and Africa, has previously been documented from Kaua‘i, O‘ahu, Moloka‘i, and Maui (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **HAWAI‘I:** Hawaii Volcanoes National Park, ‘Ōla‘a Trench, montane wet *Metrosideros-Cibotium* forest, 1,050 m, 5 Jun 2001, *M. Waite s.n.* (HAVO); Forest N of Nāpau Crater, closed wet *Metrosideros* forest, 2,680 ft [816 m], 27 Apr 1984, *L.W. Cuddihy* [*Pratt*] *1524c* (HAVO); South Kona Dist, Kona Unit, Hakalau National Wildlife Refuge, closed *Metrosideros* forest, epiphyll on *Adenophorus pinnatifidus*, 21 Aug 2003, *L.W. Pratt 3356a* (HAVO).

Cheilolejeunea stenoschiza (Ångstr.) A. Evans **New Island Record**

This endemic species has been previously documented from Kauaʻi, Oʻahu, Molokaʻi, and Maui (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **HAWAIʻI:** Hawaii Volcanoes National Park, *A.V. Freire & E.J. Judziewicz 21-822a* (HAVO); Volcano Guest House, 19°25′31″N, 155°12′25″W, on upper canopy branches of 15 m tall koa tree, 1,050 m, 22 May 2022, *A.V. Freire & E.J. Judziewicz 22-548* (BISH), same location, 1 Oct 2021, *A.V. Freire & E.J. Judziewicz 22-822* (BISH); Volcano, Akatsuka Gardens, 19°27′15″N, 155°10′35″W, 2,800 ft [855 m], 8 Feb 2022, *A.V. Freire & E.J. Judziewicz 22-239* (BISH).

Cololejeunea obcordata (Austin) A. Evans **New Island Records**

This endemic species has been previously documented from Oʻahu, Molokaʻi, and Maui (Staples & Imada, 2006).

Material examined. **KAUAʻI:** Kilohana, 20 Oct 1903, *C.M. Cooke, Jr. 145, 146* (BISH); Waimea drainage basin, W side, 3 Jul 1917, *C.N. Forbes 1509K* (BISH); Keʻāku, cave near Waiʻaleʻale, 4,500 ft [1,372 m], 25 Oct 1903, *C.M. Cooke, Jr. 47* (BISH). **HAWAIʻI:** Halealoha to Wailuku River, 6 Jun 1915, *C.N. Forbes 736fH, 743H* (BISH); Hawaii Volcanoes National Park, pit crater W of Nāpau Crater, epiphyte on *Elaphoglossum pellucidum*, 2,650 ft [808 m], 21 Nov 1995, *T. Belfield 11b* (HAVO); Puʻu Makaʻala N.A.R., ca. 1 mi N of end of Amaumau Road, 19°27–28’N, 155°16’W, 1,325 m, 25 Jan 2022, *A.V. Freire & E.J. Judziewicz 22-177* (BISH); Hawaii Volcanoes National Park, Nāhuku Lava Tube, 19°24′50″N, 155°14′17″W, 1,190 m, 18 Apr 2021, *A.V. Freire & E.J. Judziewicz 21-468a* (HAVO).

Cololejeunea planissima (Mitt.) Abeyw. **New Island Records**

This indigenous species (also found in Asia, Australia, and elsewhere in Oceania) has been previously documented from Kauaʻi and Oʻahu (Staples & Imada (2006), as *Cololejeunea lanciloba*); see Judziewicz & Freire (2023). Also found on Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKAʻI:** Pelekunu Valley: Molokaʻi Forest Reserve, on leaves of Myrtaceous tree; common, 10 m, 10 Jan 1975, *P.K. Higashino s.n.* (BISH); Molokaʻi Forest Reserve, on *Pelekium*, 10 Jan 1975, *P.K. Higashino 75-706* (BISH). **MAUI:** Haʻikū, Maui Ranch Estates, 20°54′05″N, 156°16′49″W, on trunk of planted palm, 285 m, 25 Feb 2023, *A.V. Freire & E.J. Judziewicz 23-170* (BISH). **HAWAIʻI:** Waiʻpio Valley, epiphyte on leaves of *Syzygium cuminii*, 29 Dec 1971, *L. Yoshida s.n.* (BISH); Pohoku [sic] Valley Road, streambed, 7 Jan 1956, *R.D. Svihla 1908* (BISH); Waiʻpio Valley, on *Syzygium cuminii*, 29 Dec 1971, *L. Yoshida s.n.* (BISH); 550 Lama Street, Hilo, epiphyllic on cultivated *Camellia* sp., 53 m, 26 Jan 2023, *A.V. Freire & E.J. Judziewicz 23-46* (BISH); Ala Road, Kurtistown, 275 m, 12 Jan 2023, 19°35′12″N, 155°04′30″W, *A.V. Freire & E.J. Judziewicz 23-24a* (BISH); Hanawī Stream NW of Hilo, 25 m, 23 Aug 2023, 19°48′15–30″N, 155°05′35–40″W, *A.V. Freire & E.J. Judziewicz 22-813a* (BISH); Manukā Park loop trail, on living leaves of exotic shrub *Ochna serrulata*, 550 m, 19°06.5–07.0′N, 155°49.0–49.5′W, 9 Jan 2022, *A.V. Freire & E.J. Judziewicz 22-58, 63, 65b* (BISH); Captain Cook, Amy Greenwell Ethnobotanical Garden, 19°29′30”N, 155°54′44”W, on trunk of *Calophyllum inophyllum*, 445 m, 9 Oct 2021, *A.V. Freire & E.J. Judziewicz 21-908* (BISH).

Lejeunea pacifica Mont. **New Island Record**

This indigenous species, also found in Asia, has been previously documented from Kauaʻi, Oʻahu, Molokaʻi, and Hawaiʻi (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MAUI:** Honokahau Drainage Basin, 25 Sep 1917, *C.N. Forbes 612aM* (BISH); East Maui, Waikamoi, 7 Jul 1935, *R.D. Svihla 35-274* (BISH); Wailua to Hāna, 1 Jan 1956, *R.D. Svihla 1858* (BISH); Koʻolau Dist, Piʻinaʻau at "pig camp", *Metrosideros* wet forest, 20.797°N, 156.197°W, 2,800 ft [853 m], 21 Oct 2021, *K. Severson 038* (BISH).

Microlejeunea lunulatiloba Horik. **New Island Record**

This indigenous species, also found elsewhere in Oceania, has been previously documented from Oʻahu, Molokaʻi, Maui, and Hawaiʻi (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **KAUAʻI:** Waiakoali, 27 Oct 1903, *C.M. Cooke, Jr. 89* (BISH) [mixed with *Radula cordata*]; Kōkeʻe State Park, 300 m W of Kalalau Overlook, 22°08′55″N, 159°38′10″W, 1,220 m, 4 Apr 2022, *A.V. Freire, E.J. Judziewicz & T. Flynn 22-532d* (PTBG).

Myriocoleopsis minutissima (Sm.) R.L. Zhu, Y. Yu & Pócs subspecies ***minutissima*** **New Island Records**

This indigenous, pantropical subspecies has been previously documented from Hawaiʻi Island (Judziewicz & Freire, 2023), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKAʻI:** Between Maunahui and Waikolu Canyon, 3,000–3,500 ft [914–1,067 m], Jul 1903, *C.M. Cooke, Jr. 14, 15* (BISH). **MAUI:** West Maui, Maunahoʻoma, Jun 1910, *C.N. Forbes s.n.* (BISH); East Maui, Hāna, 7 Jul 1935, *R.D. Svihla 35-243* (BISH).

Spruceanthus planiusculus (Mitt.) X.Q. Shi, R.L. Zhu & Gradst. **New Island Records**

This indigenous species, also found in Asia, has been previously documented from Oʻahu (Staples & Imada (2006) as *Archilejeunea planiuscula*; see Judziewicz & Freire (2023). Also found on Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MAUI:** Honokahau Drainage Basin, 25 Sep 1917, *C.N. Forbes 603m* (BISH); West Maui, road to Kahakuloa, 31 Dec 1955, *R.D. Svihla 1759* (BISH); Wailua near Kīpahulu, 2 Jan 1956, *R.D. Svihla 1828* (BISH); road to Hāna, Waikamoi Stream, 1 Jan 1956, *R.D. Svihla 1836* (BISH). **HAWAIʻI:** Honokaʻa, mouth of old lava tube, 7 Jan 1956, *R.D. Svihla 1907* (BISH); ʻAkaka Falls, 9 Jan 1956, *R.D. Svihla 1937* (BISH); Kāhuku Ranch, Kaʻū silversword area, 20 Aug 1977, *R.L. Stemmermann 2508* (BISH); Onomea, on bark of exotic tree, 19°40′22″N, 155°03′09″W, 25 m, 14 Dec 2022, *A.V. Freire & E.J. Judziewicz 22-989* (BISH); 4 mi NW of Hilo, along Honoliʻi Stream, 19°45′30″N, 155°04′44″W, 18 m, 4 Mar 2022, *A.V. Freire & E.J. Judziewicz 22-244* (BISH),

Spruceanthus polymorphus (Sande Lac.) Verd. **New Island Records**

This indigenous species, also found in Asia, has been previously documented from Kauaʻi and Oʻahu (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKAʻI:** Far eastern Molokaʻi, just before end of road (Kamehameha V Hwy or Hwy 450), secondary vegetation with *Syzygium cuminii, Syzygium uniflora, Aleurites, Furcraea, Leucaena*, on rocks, 61 m, 19 Jan 2020, *T. Flynn 9072a* (BISH, PTBG). **MAUI:** West Maui, road to Kahakuloa, wet bank of gully, 31 Dec 1955, *R.D. Svihla 1756* (BISH). **HAWAIʻI:** Hilo, Nani Mau Gardens, Makalika Street, 19°40′22″N, 155°03′09″W, on exotic tree trunk, 50 m, 22 Oct 2022, *A.V. Freire & E.J. Judziewicz 22-893.5a* (BISH); Manukā Park loop trail, on bark, common, 500–600 m, 19°06.5–07.0′N, 155°49.0–49.5′W, *A.V. Freire & E.J. Judziewicz 22-62, 82, 83a* (BISH).

Lepidoziaceae

Bazzania baldwinii A. Evans **New Island Records**

This endemic species has been previously documented from Kauaʻi, Molokaʻi, and Maui (Staples & Imada, 2006).

Material examined. **OʻAHU:** Mt Kaʻala, on wet dripping roadside rock embankment below summit, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 369c, 388c* (BISH).

Bazzania inaequabilis C.M. Cooke **New Island Records**

This indigenous species (Miller, 1983) has been previously documented from Kauaʻi and Oʻahu (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MAUI:** West Maui, ridge, tree trunk, 4,000 ft [1,219 m], anno 1875, *D.D. Baldwin 68* (BISH). **HAWAIʻI:** Hilo, Territory Veterinary Quarantine Station, 19 May 1915, *C.N. Forbes 577h, 593h* (BISH); Laupahoehoe, 1,040 m, 4 Feb 1982, *L.W. Pratt 967-2* (HAVO); Hawaii Volcanoes National Park, Boundary Kīpuka, 2,350 ft [715 m], 1984, *P.K. Higashino 9978a* (HAVO); Volcano, Niaulani Forest, 19°25′35″N, 155°14′23″W, 1,160 m, 2 Feb 2022, *A.V. Freire & E.J. Judziewicz 22-188* (BISH).

Bazzania nuuanuensis C.M. Cooke **New Island Records**

This endemic species has been previously documented from Oʻahu and Hawaiʻi (Staples & Imada, 2006).

Material examined. **KAUAʻI:** W Waimea drainage basin, 3 Jul 1917, *C.N. Forbes 1479K, 1579K* (BISH). **MAUI:** ʻUkulele, Jul 1919, *C.N. Forbes 1468M, 1579aM* (BISH); N Haleakalā, 15 Aug 1919, *C.N. Forbes 1468M* (BISH); West Maui, Maunahoʻoma, Jun 1910, *C.N. Forbes s.n.* (BISH), N Haleakalā, below Waiʻānapanapa, Aug 1919, *C.N. Forbes 1451M* (BISH); Kīpahulu Valley, Transect 6, closed low *Metrosideros* forest, on trunk, 6,700 ft [2,042 m], 17 Jul 1983, *L.W. Cuddihy [Pratt] 1418* (HAVO).

Lepidozia australis (Lehm. & Lindenb.) Mitt. **New Island Record**

This endemic species has been previously documented from Kauaʻi and Maui (Staples & Imada, 2006).

Material examined. **HAWAIʻI:** Palakea fence line, 29 Jun 1915, *C.N. Forbes 1013aH* (BISH); Laumaiʻa, in koa-lehua forest, 6,000–6,500 ft [1,830–1,980 m], 17 Aug 1935, *M.C. Neal 838* (BISH); Hawaii Volcanoes National Park, lava tube trail, 3,900 ft [1,189 m], 6 Jan 1956, *R.D. Svihla 2055* (BISH); ʻŌlaʻa Forest Tract; 1 km NE of the first bend in Wright Road, 1,150 m, 28 Mar 1979, *P.J. Burton 414* (BISH); Hawaii Volcanoes National Park, Volcano House, 19°25′53″N, 155°16′49″W, 1,219 m, 25 Jan 2020, *Freire & E.J. Judziewicz 20-22a* (HAVO); Hawaii Volcanoes National Park, Large ʻŌlaʻa Forest Tract, Wright Road, 19°25’53”N, 155°16’49”W, 1,170 m, 19 Feb 2021, *A.V. Freire & E.J. Judziewicz 21-271* (HAVO); Volcano, Niaulani Forest, 19°25′35″N, 155°14′23″W, 1,160 m, 13 Mar 2021, *Freire & E.J. Judziewicz 21-337* (BISH); Hawaii Volcanoes National Park, Volcano House, 19°25′53″N, 155°16′49″W, 1,219 m, 25 Jan 2020, *Freire & E.J. Judziewicz 20-22a* (HAVO); Hawaii Volcanoes National Park, Kāhuku Unit, near small waterholes along road, 19°13′36″N, 155°38′00″W, 1,865 m, 9 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-682* (HAVO); Puʻu Makaʻala N.A.R., near old Mauna Loa Boys School, *Metrosideros-Cibotium* kīpuka, 19°34′45″N, 155°20′03″W, 1,760 m, 19 Aug 2021, *A.V. Freire & E.J. Judziewicz 21-648* (BISH); Puʻu Makaʻala N.A.R., ca. 1 mi N of end of Amaumau Road, 19°27–28′N, 155°16′W, 1,325 m, 16 June 2022, *A.V. Freire & E.J. Judziewicz 22-613b, 22-616b, 22-618b* (BISH); Hakalau Forest National Wildlife Refuge, road below Pua ʻĀkala

cabin, paralleling ʻĀwehi Gulch, 19°47′12–21″N, 19°47′12–21″N, elevation 5,750–6,200 ft [1,753–1,890 m], 26 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-228b* (BISH), *23-237a* (BISH); *23-246b* (BISH); *23-279* (BISH); Puʻu O ʻUmi Natural Area Reserve, forest of *Metrosideros polymorpha* and *Cibotium glaucum*, trail from ʻEke gate NE to ʻEke summit and then down steep slope to margin of sedge bog, 20°04′55″–05′00″N, 155°43′30–50″W, 5,000–5,300 ft [1,525–1,615 m], 5 Sep 2023, *A.V. Freire & E.J. Judziewicz 23-573a* (BISH).

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Lepidozia sandvicensis Lindenb.
ex Gottsche, Lindenb. & Nees **New Island Records**

This indigenous species, also found in Alaska and Canada (British Columbia) has been previously documented from Kauaʻi, Molokaʻi, and Maui (Staples & Imada, 2006).

Material examined. **OʻAHU:** Mt. Kaʻala, May 1924, *O.H. Swezey D89* (BISH); same locality, 1 Sep 1929, *F.C. Hadden s.n.* (BISH); same locality, 22 Feb 1975, *C.W. Smith 1507* (BISH); same locality, 6–8 Feb 1954, *E.T. Ozaki 982* (BISH); same locality, 4,000 ft [1,219 m], 23 July 1977, *G.Y. Daida 66* (BISH); same locality, 17 May 2022, *M.K. Thomas et al. 375a, 379* (BISH). **HAWAIʻI:** Saddle Road silversword bog; Mauna Loa off Powerline Road, ca. 5,000 ft [1,515 m], 21 Aug 1977, *R.L. Stemmermann 2553* (BISH); headwaters of Alakahi Valley, Kohala, 3,800 ft [1,158 m], 27 Aug 1949, *O. Degener 19861* (BISH); Kaiholena, Old Plantation Springs, closed to open *Metrosideros* forest, matting terrestrial along stream banks, leaves light green, common, 914 m, 12 Mar 2008, *K.R. Wood 12894* (BISH, PTBG).

Lophocoleaceae

Chiloscyphus lambertonii H.A. Mill. **New Island Records**

This endemic species has been previously documented from Molokaʻi and Maui (Staples & Imada, 2006).

Material examined. **OʻAHU:** Mt Kaʻala, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, dripping roadside embankment below summit, 9 Nov 2022, *M.K. Thomas et al. 527* (BISH). **HAWAIʻI:** Hawaii Volcanoes National Park, Old Kalapana Trail, 2,900 ft [884 m], *W.J. Hoe 1335.1* (BISH); Hawaii Volcanoes National Park, Kāhuku Unit, near TMA/CCC cabin, 19°14′46–52″N, 155°36′02–22″W, terrestrial in *Metrosideros* forest, 1,885 m, 9 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-749* (HAVO); Hakalau Forest National Wildlife Refuge, road below Pua ʻĀkala cabin, paralleling ʻĀwehi Gulch, 19°47′12–21″N, 19°47′12–21″N, elevation 5,750–6,200 ft [1,753–1,890 m], 24 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-226* (BISH); Nāuhi Gulch (above the cabin, but below the tent frames), 19°51′22″N, 155°17′56″–18′06″W, elevation 5,200–5,300 ft [1,585–1,615 m], 25 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-303b* (BISH).

Cryptolophocolea bartlettii (H.A. Mill.)
Judz. & A.V. Freire **New Island Record**

This endemic species has been previously documented from Molokaʻi, Maui, and Hawaiʻi (Staples & Imada (2006) as *Chiloscyphus bartlettii*); see Judziewicz & Freire (2023). Also on Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **OʻAHU:** Mt Kaʻala, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, on bark, 9 Nov 2022, *M.K. Thomas et al. 496* (BISH).

Heteroscyphus argutus (Reinw., Blume & Nees) Schiffn. **New Island Record/Correction**

This indigenous, mainly Asian species has been previously documented (by Miller, 1963, as *Chiloscyphus argutus*). Staples & Imada (2006) list it as a dubious record, but we can confirm its presence on Hawai‘i Island.

Material examined. **HAWAI‘I:** 11-3733 Ala ‘Ōhi‘a Street, Volcano, on bark of cultivated *Camellia* in *Metrosideros polymorpha* wet forest, 1,050 m, 5 Jan 2023, 19°25′29″N, 155°12′26″W, *A.V. Freire & E.J. Judziewicz 23-1* (BISH).

Lophocolea autoica Steph. **New Island Records**

This indigenous species (reportedly also found in New Caledonia) has been previously documented from O‘ahu and Hawai‘i (Staples & Imada (2006) as *Chiloscyphus autoicus*); see Judziewicz & Freire (2023). Also found on Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **KAUA‘I:** W side, Waimea drainage basin, 3 Jul–18 Aug 1917, *C.N. Forbes 1516K* (BISH).

Lophocolea biscuspidata Steph. **New Island Records**

This endemic species has been previously documented from Maui and Hawai‘i (Staples & Imada, 2006).

Material examined. **KAUA‘I:** Ke‘āku, 25 Oct 1903, *C.M. Cooke, Jr. 54* (BISH); Kōke‘e camps, road to YWCA camp, 3,000 ft [914 m], 10 Feb 1956, *R.D. Svihla 2063* (BISH). **O‘AHU:** Mt. Ka‘ala, 4,000 ft [1,219 m], 28 Jun 1934, *R.D. Svihla 34-47, 34-56* (BISH); Wai‘anae Mountain Range: Wai‘anae Kai, 1,580 ft [482 m], 15 Mar 1975, *P.K. Higashino 331* (BISH); Wai‘anae Mts, forest trail from Mauna Kapu north to summit of Palikea, 2,660–3,020 ft [820–910 m], 4 Nov 2021, *E.J. Judziewicz 21-965, 21-970* (BISH). **MOLOKA‘I:** Settlement Trail, 29 Mar 1915, *C.N. Forbes 678aMo* (BISH).

Lophocolea hawaica Steph. **New Island Records**

This endemic species has been previously documented from Kaua‘i, Moloka‘i, and Hawai‘i (Staples & Imada (2006) as *Chiloscyphus hawaicus*); see Judziewicz & Freire (2023). Also found on Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **O‘AHU:** Mt Ka‘ala, 1,200 m, 28 Jun 1934, *R.D. Svihla 34-34* (BISH). **MAUI:** Haleakalā, Kīpahulu, 1984, *P.K. Higashino 10042* (HAVO).

Lophocolea kilauensis (Steph.) H.A. Mill. **New Island Record**

This endemic species has been previously documented from O‘ahu and Hawai‘i (Staples & Imada (2006) as *Chiloscyphus kilauensis*); see Judziewicz & Freire (2023). Also found on Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKA‘I:** Settlement Trail, 29 Mar 1915, *C.N. Forbes 670 Mo* (BISH).

Lophocolea spinosa Gottsche **New Island Record**

This endemic species has been previously documented from Kaua‘i, O‘ahu, Maui and Hawai‘i (Staples & Imada (2006).

Material examined. **MOLOKAʻI:** Kilohana, summit of Wailau Trail, cloud forest, mixed in collection of *Herbertus*, 2,800 ft [853 m], 10 Apr 1977, *R.L. Stemmermann 2108* (BISH).

Lunulariaceae

Lunularia cruciata (L.) Dumort. Ex Lindenb. **New Naturalized Island Record**

Material examined. **KAUAʻI:** Kōloa Distr., Kōloa, common weedy bryophyte in nursery pots, said to have come in on nursery stock purchased from North Carolina, 200 ft [61 m], 7 Sep 2011, *D. Boucher s.n.* (PTBG).

Marchantiaceae

Dumortiera hirsuta (Sw.) Nees **New Island Record**

This indigenous, cosmopolitan species has been previously documented from Kauaʻi, Oʻahu, Maui, and Hawaiʻi (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKAʻI:** Wailau Valley: Mālama, Wailau Trail, 6 Apr 1977, *R.L. Stemmermann 2036* (BISH); Spring to lee of summit of Wailau Trail, 9 Apr 1977, *R.L. Stemmermann 2116* (BISH); W of Pēpēʻōpae, 24 Apr 1928, *H. Wiebke 2782* (BISH); Hanalilolilo pipeline, end, 24 Apr 1928, *H. Wiebke 2854* (BISH).

Marchantia crenata Austin **New Island Record**

This endemic species has been previously documented from Kauaʻi, Oʻahu, Maui, and Hawaiʻi (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKAʻI:** Hīpuapua Falls, Moaʻula Falls, Hālawa Stream, Hālawa, 0–250 ft [0–82 m], 26 Dec 1953, *E.T. Ozaki 848* (BISH); Kaunakakai Gulch, 28 Mar 1915, *C.N. Forbes 644Mo* (BISH).

Notoscyphaceae

Notoscyphus lutescens (Lehm. & Lindenb.) Mitt. **New Island Record**

This indigenous species (nearly pantropical but not found in the Americas) has been previously documented from Kauaʻi, Oʻahu, Maui, and Hawaiʻi (Staples & Imada, 2006), as well as Lānaʻi (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKAʻI:** Settlement Trail, 29 Mar 1915, *C.N. Forbes 654, 666 Mo* (BISH); Edge of Waihānau, 31 Mar 1915, *C.N. Forbes 707 Mo* (BISH).

Pallaviciniaceae

Pallavicinia lyellii (Hook.) Carruth. **New Island Records**

This indigenous, cosmopolitan species has been previously documented from Molokaʻi, Maui, and Hawaiʻi (Staples & Imada, 2006).

Material examined. **KAUAʻI:** Kōloa Dist, Lihuʻe-Kōloa Forest Reserve, Wahiawā Stream and mountains, up unnamed tributary and ridge flank E towards ridge connecting Kāhili and Kapalaoa peaks, lowland wet forest, growing on very moist and shady vertical stream bank, thallus translucent, light clear green, occasional, 680–770 m, 28 Mar 1991, *D.H. Lorence et al. 6746* (PTBG, UBS, TALL); Hanalei Dist, Waiʻahuʻakua, upper drainage, Hono o Nā Pali N.A.R., 22.183788°N, 159.606749°W, *Metrosideros-Cheirodendron* montane wet forest and riparian habitat, liverwort on basalt walls along stream, thallus light green, common, 1,021 m, 28 Sept 2016, *K.R. Wood, S. Perlman & M. Query 17127* (PTBG); Along trail to Blue Hole, following North Fork Wailua River

from gauging station, degraded lowland forest, 18 Feb 2016, *T. Flynn 8259* (BISH, PTBG); Lihu‘e Dist, Kawaikini summit area, small, protected gully, 1,572 m, 2 Oct 2020, *T. Flynn 9144* (BISH, PTBG); Hanalei Dist, Lumaha‘i Valley, back, E side, slopes, *Metrosideros-Cheirodendron* montane wet forest, 723 m, 4 Jul 2018, *S.K. Walsh SKW597* (BISH, PTBG). **O‘AHU:** Mt. Ka‘ala, roadside, 3,800 ft [1,158 m], 2 Aug 1967, *A.Y. Yoshinaga 111* (BISH); Wai‘anae Mts, forest trail from Mauna Kapu north to summit of Palikea, locally abundant on soil of trailside embankment in one place; with the hornwort *Megaceros flagellaris*, 2,660–3,020 ft [810–920 m], 4 Nov 2021, *E.J. Judziewicz 21-959* (BISH).

Plagiochilaceae

Plagiochila baldwinii Austin ex A. Evans **New Island Record**

This endemic species has been previously documented only from Maui (Staples & Imada, 2006).

Material examined. **HAWAI‘I:** Forest N of Nāpau Crater, 2,660 ft [810 m], 27 Apr 1984, *L.W. Cuddihy* [*Pratt*] *s.n.* (HAVO).

Plagiochila conduplicata Steph. **New Island Records**

This endemic species has been previously documented from Kaua‘i, O‘ahu, Moloka‘i, and Hawai‘i (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **MAUI:** Ko‘olau Gap, east side. 20.7727°N, 156.1875°W, 1,463 m, 4 Oct 2017, *H.K. Oppenheimer H101708* (CAS, MSB, PTBG).

Plagiochila convoluta Steph. **New Island Records**

This endemic species has been previously documented from Kaua‘i, O‘ahu, and Hawai‘i (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **MOLOKA‘I:** Moloka‘i Forest Reserve, summit area of Kawela Gulch, near gaging station, 3,500 ft [1,067 m], *Cheirodendron-Metrosideros-Sadleria* rain forest, 29 Mar 1975, *K. Nagata s.n.* (BISH). **MAUI:** NW Haleakalā: Ahupua‘a of Kalialinui S of Pu‘u Ni‘ani‘au, on underside of rock ledge in gully floor, 6,600 ft [2,012 m], 1 Jun 1977, *W.J. Hoe 4405.0* (BISH); Ahupua‘a of Kalialinui, between Pu‘u o Kāka‘e and Pu‘u Ni‘ani‘au, along upper boundary of the Makawao Forest Reserve, closed *Metrosideros*-dominated mesic forest, on fallen log, 1,967 m, 15 Jun 1975, *W.J. Hoe 3586.0* (PTBG).

Plagiochila gracillima A. Evans **New Island Records**

This endemic species has been previously documented from Moloka‘i, Maui, and Hawai‘i (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **KAUA‘I:** Awa‘awapuhi, 2.25 miles down trail, north facing slopes, 22.150794°N, 159.67168°W, *Metrosideros-Acacia* montane mesic forest, liverwort, terrestrial or epiphytic, green-yellow, matting, common, 905 m, 28 Apr 2016, *K.R. Wood 16820* (E, MSB, PTBG).

Plagiochila grossispina Steph. **New Island Records**

This endemic species has been previously documented from O‘ahu, Maui, and Hawai‘i (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **KAUA‘I:** Kalalau Valley, back of Huna [box canyon], with towering basalt mesic cliffs on all sides of narrow valley, *Diospyros sandwicensis, D. hillebrandii* mixed mesic forest, matting, epilithic, leaves light green, 610 m, 2 Oct 2008, *K.R. Wood 13322* (PTBG); Kawaikini

Summit region, 1,590 m, 2 Oct 2020, *K.R. Wood 18529* (BISH, CAS, E, F, PTBG). **MOLOKA‘I:** Wailau, Mapulehu Trail, 29 Dec 1953, *E.T. Ozaki 910* (BISH).

Plagiochila hawaica Steph. **New Island Record**

This endemic species has been previously documented from Maui and Hawai‘i (Staples & Imada, 2006), and on O‘ahu (Thomas, 2022).

Material examined. **KAUA‘I:** Alaka‘i Swamp E of base camp at Kelekua and headwaters of Halepa‘akai Stream, on large decorticating trunk in mossy *Metrosideros-Cheirodendron* forest, 4,600 ft [1,402 m], 9 Aug 1974, *W.J. Hoe 3189.0* (BISH); Kalalau Valley, in back of valley, diverse forest, terrestrial under fern canopy, leaves pale green, 1,700–2,500 ft [518–762 m], 10 Jun 1992, *T. Flynn 5059* (NY, PTBG); Kōke‘e State Park, Honopū trail, north to Honopū Valley rim, *Acacia koa/Metrosideros polymorpha* mixed mesic forest, mat-forming on exposed roots, 1,129 m, 23 Jan 2015, *T. Flynn 8062* (CAS, MSB, PTBG, TALL).

Plagiochila maunakeana Steph. **New Island Record**

This endemic species has been previously documented from Kaua‘i, Moloka‘i, Maui, and Hawai‘i (Staples & Imada, 2006).

Material examined. **O‘AHU:** Mt. Ka‘ala, arboreal, 1,300 m, 2 Aug 1967, *A.Y. Yoshinaga 99* (BISH).

Porellaceae

Porella acutifolia (Lehm. & Lindenb.) Trevis **New Island Records**

This indigenous, mainly Asian species has been previously documented only from Maui (Staples & Imada, 2006).

Material examined. **KAUA‘I:** Kōke‘e, near stream, 3,500 ft [1,067 m], 18 Feb 1956, *R.D. Svihla* 2099 (BISH); Nā Pali-Kona Forest Reserve, Awa‘awapuhi Valley, N and below trail on S flank of valley to stream, *Acacia-Metrosideros* forest, epiphytic on base of tree, leaves medium green, 2,820–3,350 ft [859–1,021 m], 16 Oct 1991, *T. Flynn 4777* (BISH, C, COLO, F, MSB, UBC); Side gulch of Hanakāpī‘ai stream that branches off to the left, right before Hanakāpī‘ai Falls, about 0.25 mi up gulch side stream, 22.188059°N, 159.593195°W, on rock faces in stream amongst semi-native forest, 213 m, 1 Apr 2016, *S.M. Deans SMD115* (E, MSB, PTBG). **O‘AHU:** Mt. Ka‘ala, 28 Jun 1934, *R.D. Svihla 34-73, 74, 75, 76, 77* (BISH); Mt. Ka‘ala, bog, 3,600 ft [1,097 m], 2 Aug 1967, *A.Y. Yoshinaga 99* (BISH). **MOLOKA‘I:** without locality, trunks of trees, 3,500 ft [1,067 m], 1876, *D.D. Baldwin 213* (BISH). **HAWAI‘I:** Mauna Loa, on trunks, 1,500 m, *J.F.C. Rock 2672* (BISH, F), the type of *Madotheca rockii* Steph.; Hakalau Forest National Wildlife Refuge, Nāuhi Gulch (above the cabin, but below the tent frames), 19°51′22″N, 155°17′56″–18′06″W, elevation 5,200–5,300 ft [1,585–1,615 m], 25 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-298* (BISH)*, 23-306* (BISH).

Pseudolepicoleaceae

Blepharostoma trichophyllum (L.) Dumort **New Island Records**

This indigenous species (mainly Holarctic but found in scattered sites throughout the tropics) has been previously documented only from Maui (Staples & Imada, 2006).

Material examined. **KAUA‘I:** Waimea Dist, Mohihi, N-facing slopes below Mohihi-Wai‘alae trail, *Metrosideros-Cheirodendron-Dicranopteris* mixed montane wet forest, 22.113407°N, 159.588473°W, terrestrial herb, decumbent, leaves dark green above, pale light green below, fertile, occasional to common, 1,195 m, 29 Nov 2018, *K.R. Wood, M. Query & S. Perlman 17993* (BISH, CAS, MO, NY, PTBG). **HAWAI‘I:** TNC Ka`ū Preserve, Kaiholena Unit, Old Plantation Springs area, closed to open

Metrosideros forest, 3,000 ft [914 m], 12 Mar 2008, *K.R. Wood 12902a* (PTBG); Hawaii Volcanoes National Park, Kāhuku Unit, near TMA/CCC cabin, 19°14′46–52″N, 155°36′02–22″W, terrestrial in *Metrosideros* forest, 1,885 m, 9 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-696a, 22-697a* (HAVO).

Temnoma setigerum (Lindenb.) R.M. Schust.
var. ***hawaiicum*** Inoue **New Island Record**

This endemic subspecies has been previously documented only from Maui (Staples & Imada, 2006).

Material examined. **KAUA‘I:** Hanalei Dist, Wai‘oli, hanging valley on N face of Nāmolokama, prominent ridge to east of main falls, *Metrosideros-Cheirodendron* windswept forest and shrubland, with *Chiloscyphus greenwelliae*, 930 m, 18 Oct 2006, *K.R. Wood, N. Tangalin & D. Hodel 12192a* (PTBG).

Radulaceae

Radula cavifolia Gottsche, Lindenb, & Nees **New Island Records**

This indigenous species (also found in eastern Asia and Malesia) has been previously documented from Kaua‘i, Maui, and Hawai‘i (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **O‘AHU:** Lanihuli, Mar 1902, *C.M. Cooke, Jr. 22* (BISH) [mixed with *Metzgeria furcata*]; Mt Ka‘ala, 21°30′18–30″N, 158°08′36–45″W, on wet dripping roadside rock embankment below summit, 1,200 m, 17 May 2022, *M.K. Thomas et al. 388f* (BISH), same location, 9 Nov 2022, *M.K. Thomas et al. 538* (BISH).

Radula curvilobula M.L. So **New Island Record**

This endemic species has been previously documented only from Maui (Staples & Imada, 2006).

Material examined. **KAUA‘I:** Waimea Dist, Ku‘ia Natural Area Reserve, forests between headwaters of Ku‘ia and Mahanaloa, *Metrosideros-Acacia* montane mesic forest, 22.13°N, 159.67°W, epiphyte creeping and matting on *Psychotria mariniana*, leaves medium green, common, 1,050 m, 13 Dec 2018, *K.R. Wood 18016* (BISH, E, F, NY); Kawaikini Summit area, 22.058°N, 159.497°W, small protected gully, epiphylls on stems of *Labordia*, 1,573 m, 2 Oct 2020, *T. Flynn 9129* (BISH, PTBG) [mixed with *Pleurozia subinflata*]; Kōke‘e State Park, 300 m W of Kalalau Overlook, 22°08′55″N, 159°38′10″W, 1,220 m, 4 Apr 2022, *A.V. Freire, E.J. Judziewicz & T. Flynn 22-530g* (PTBG).

Radula javanica Gottsche **New Island Record**

This indigenous, pantropical species has been previously documented from O‘ahu, Moloka‘i, Lāna‘i, Maui, and Hawai‘i (Staples & Imada, 2006).

Material examined. **KAUA‘I:** end of road, ca. 3 mi from Kalalau Lookout, 4,000 ft [1,219 m], 23 Feb 1956, *R.D. Svihla 2117* (BISH); Kōke‘e State Park. along Hwy 550 at mile 18.2, *Metrosideros*-dominated forest, epiphyte, 1,219 m, 1 Mar 1990, *T. Flynn 3801* (COLO, PTBG); Hā‘ena Dist, Wai‘ahu‘akua Valley, *Aleurites* non-native forest associated with mesic *Diospyros-Nestegis* relic forest, lithophyte, leaves thickly matting in layers, dark green, common, 113 m, 8 May 2008, *K.R. Wood 13011* (PTBG).

Radula mauiensis M.L. So **New Island Records**

This endemic species has been previously documented only from Maui (Staples & Imada, 2006).

Material examined. **KAUA‘I:** Border of Lihu‘e and Waimea Dist, Kawaikini summit region, 22.056627°N, 159.496052°W, *Metrosideros-Cheirodendron* short-statured wet forest with open bog habitat dissected by headwater drainages, epiphytic on *Metrosideros*, matting and creeping, 1,590 m, 29 Jan 2018, *K.R. Wood 17774* (E, F, PTBG), *17779* (BISH, E, F, PTBG); Kōke‘e State Park, 300 m W of Kalalau Overlook, 22°08′55″N, 159°38′10″W, 1,220 m, 4 Apr 2022, *A.V. Freire, E.J. Judziewicz & T. Flynn 22-510* (PTBG). **O‘AHU:** Mt Ka‘ala, on wet dripping roadside rock embankment below summit, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 402* (BISH).

Ricciaceae

Riccia hawaiiensis Hürl. **New Island Records**

This endemic has been previously documented only from Hawai‘i (Staples & Imada, 2006). Perhaps naturalized on Kaua‘i.

Material examined. **KAUA‘I:** Puhi, Kaua‘i Nursery and Landscaping. 3-1550 Kaumuali‘i Hwy., maintained nursery area with secondary vegetation along margins, 109 m, 30 Aug 2016, *T. Flynn & K. Brock 8684* (BISH, CANB, F, PTBG) [det. By Christine Cargill (CANB)]. **OAHU:** East side, Nu‘uanu Valley, Cooke Trail, 11 Mar 1915, *C.N. Forbes 2139.O* (BISH); south ridge, Kīpapa Gulch, 1,200 ft [366 m], 15 May 1932, *E.H. Bryan, Jr. s.n.* (BISH); without locality, 1 Nov 2021, *M. Waite & M.K. Thomas s.n.* (BISH). **MAUI:** Honokohau Drainage Basin, 17 Oct 1917, *C.N. Forbes 614.M* (BISH); Wailua, East Maui, 7 Jul 1935, *R.D. Svihla 35-211* (BISH).

Scapaniaceae

Anastrepta orcadensis (Hook.) Schiffn. **New Island Records**

This indigenous, Holarctic species has been previously documented only from Kaua‘i (Staples & Imada, 2006).

Material examined. **O‘AHU:** Mt Ka‘ala, on wet dripping roadside rock embankment below summit, 21°30′29″N, 158°08′43″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 361, 362, 384, 387a, 401* (BISH). **MAUI:** Makawao Dist, Honomanū drainage basin, TNC Waikamoi Preserve and Haleakalā Ranch, E 788357, N 2299783, along trail and unpaved road in forestry plantings of *Pinus, Cryptomeria, Cupressus*, 6,300–6,500 ft [1,920–1,981 m], 7 May 2021, *H.K. Oppenheimer H52109* (BISH); Hāna Dist, Hāna Forest Reserve, Helele‘iki‘ona drainage basin, 20.737°N, 156.109°E, *Metrosideros* montane wet forest, 5,375 ft [1,638 m], 10 May 2022, *H.K. Oppenheimer H52205* (BISH); Honomanū Stream headwaters, TNC Waikamoi Preserve, E 785467, N 2300220, 5,000–5,600 ft [1,524–1,707 m], 13 Apr 2021, *H.K. Oppenheimer H42117* (BISH) [in matrix of moss *Leucobryum*]; same location, 23 Feb 2023, *A.V. Freire, E.J. Judziewicz, H.K. Oppenheimer & Z. Pezzillo 23-49, 23-113, 23-121, 23-126* (BISH); Ko‘olau-Hāna Dist, Helele‘iki‘ona, montane *Metrosideros* forest, 1,890 m, 4 Nov 2021, *K. Severson 045* (BISH). **HAWAI‘I:** Hakalau Forest National Wildlife Refuge, road below Pua ‘Ākala cabin, paralleling ‘Āwehi Gulch, 19°47′12–21″N, 19°47′12–21″N, elevation 5,750–6,200 ft [1,753–1,890 m], 24, 26 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-215a, 23-216, 23-217a, 23-218a, 23-219* (BISH).

Anastrophyllum esenbeckii (Mont.) Steph. **New Island Record**

This endemic species has been previously documented from Kaua‘i, Moloka‘i, Maui, and Hawai‘i (Staples & Imada, 2006), as well as Lāna‘i (Judziewicz, Freire & Bogner, 2023).

Material examined. **O‘AHU:** Kīpapa Gulch, S, ridge, on tree trunk, 2,000 ft [610 m], 4 Jul

1932, *E.Y. Hosaka 8* (BISH), Puʻu Kōnāhuanui Trail, Koʻolau Mts, 1,600–3,000 ft [488–914 m], 5 Dec 1970, *L.E. Bishop 127002, 127013* (BISH); Koʻolau Mts, Kāhuku Military Training Area, 1,600 ft [500 m], 10 May 1979, *J. Sorenson H-10* (BISH); Waiʻanae Mts, forest trail from Mauna Kapu north to summit of Palikea, uncommon on soil of trailside embankment, 2,660–3,020 ft [810–920 m], 4 Nov 2021, *E.J. Judziewicz 21-974* (BISH).

Anastrophyllum fissum Steph. **New Island Record**

This indigenous species, also known from New Caledonia (Thouvenot *et al.*, 2011) and French Polynesia (Bardat *et al.*, 2021) has been previously documented from Kauaʻi and Maui (Staples & Imada, 2006).

Material examined. **OʻAHU:** Kaipapau Valley, Koʻolau Mts, 31 Jan 1953, *E.T. Ozaki 216* (BISH); Waikāne, Schofield Trail, 3 May 1954, *E.T. Ozaki 1140* (BISH); Puʻu Kōnāhuanui Trail, 5 Dec 1970, *L.E. Bishop 127040* (BISH); Poamoho, Northern Koʻolau Mountains, ahupuaʻa of Paʻalaʻa uka, 21.53°N, 157.92015°W, epiphytic on *Metrosideros rugosa* in mostly native cloud/wet forest, 820 m, 29 Jan 2022, *M.K. Thomas 231* (BISH); Mt Kaʻala, bog boardwalk trail, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 381* (BISH).

Scapania ciliata Sande Lac.

subsp. ***hawaiica*** (Müll. Frib.) Potemkin **New Island Records**

This endemic subspecies has been previously documented from Kauaʻi and Maui (Staples & Imada (2006) as *Scapania hawaiica*); see Judziewicz & Freire (2023).

Material examined. **OʻAHU:** Mt Kaʻala, on wet dripping roadside rock embankment below summit, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 365* (BISH); same location, 9 Nov 2022, *M.K. Thomas et al. 491* (BISH). **HAWAIʻI:** Hawaii Volcanoes National Park, Nāhuku Lava Tube, 19°24′50″N, 155°14′17″W, on old trailside stone wall, 1,190 m, 1 Apr 2021, *A.V. Freire & E.J. Judziewicz 21-359* (HAVO). Hawaii Volcanoes National Park, Kāhuku Unit, 19°11′34″N, 155°39′35″W, terrestrial in koa forest, 1,670 m, 9 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-640a* (HAVO); Hawaii Volcanoes National Park, Kāhuku Unit, near TMA/CCC cabin, 19°14′46–52″N, 155°36′02–22″W, terrestrial in *Metrosideros* forest, 1,885 m, 9 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-723a* (HAVO); Puʻu O ʻUmi Natural Area Reserve, forest of *Metrosideros polymorpha* and *Cibotium glaucum*, trail from ʻEke gate NE to ʻEke summit and then down steep slope to margin of sedge bog, 20°04′55″–05′00″N, 155°43′30–50″W, 5,000–5,300 ft [1,525–1,615 m], 5 Sep 2023, *A.V. Freire & E.J. Judziewicz 23-532a* (BISH).

Scapania grossidens Steph. **New Island Records**

This endemic species has been previously documented only from Maui (Staples & Imada, 2006).

Material examined. **KAUAʻI:** Hanalei Distr., Upper Limahuli Preserve, Hanakāpīʻai side in upper back bowl, terrestrial on streambank, olive green leaflets with dark brown to black stipe, 989 m, 23 Feb 2012, *N. Tangolin 3030* (PTBG); Hanalei Distr., Hanalei Valley, terrestrial; leaves very pale translucent green, rachis reddish-brown, 2,220–2,340 ft [677–713 m], 22 Mar 1993, *T. Flynn 5341* (PTBG); Waimea Distr., Nā Pali-Kona Forest Reserve, Kohua Ridge, on slope to north of Mohihi-Waiʻalae Trail, ca 60 ft below trail, N facing slope of Mohihi Stream, about 1.25 mi in on Mohihi-Waiʻalae Trail, terrestrial on detritus, 1,143 m, 30 Jan 1995, *T. Flynn 5705* (PTBG). **HAWAIʻI:** TNC Kaʻū Preserve, Kaiholena Unit, Old Plantation Springs area, closed to open *Metrosideros* forest, terrestrial, matting, leaves green, rachis brown-red, common, 975 m, 12 Mar 2008, *K.R. Wood 12878* [in matrix of *Acroporium fuscoflavum*], *12879* (PTBG); Hawaii Volcanoes National Park, Kāhuku Unit, near TMA/CCC cabin, 19°14′46–52″N,

155°36′02–22″W, terrestrial in *Metrosideros* forest, covering large rock, orangish, 1,885 m, 25 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-726* (HAVO); Puʻu Makaʻala N.A.R., near old Mauna Loa Boys School, 19°35′29″N, 155°20′34″W, old growth *Metrosideros-Cibotium* kīpuka, 1,770 m, 19 Aug 2021, *A.V. Freire & E.J. Judziewicz 21-709* (BISH); Hakalau Forest National Wildlife Refuge, the road below Pua ʻĀkala cabin, paralleling ʻĀwehi Gulch, 19°47′12–21″N, 19°47′12–21″N, elevation 5,750–6,200 ft [1,753–1,890 m], on 24 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-250a* (BISH); Nāuhi Gulch (above the cabin, but below the tent frames), 19°51′22″N, 155°17′56″–18′06″W, elevation 5,200–5,300 ft [1,585–1,615 m], 25 Mar 2023, *A.V. Freire & E.J. Judziewicz 23-304* (BISH); Puʻu O ʻUmi Natural Area Reserve, forest of *Metrosideros polymorpha* and *Cibotium glaucum*, trail from ʻEke gate NE to ʻEke summit and then down steep slope to margin of sedge bog, 20°04′55″–05′00″N, 155°43′30–50″W, 5,000–5,300 ft [1,525–1,615 m], 5 Sep 2023, *A.V. Freire & E.J. Judziewicz 23-594a* (BISH).

Scapania javanica Gottsche **New Island Records**

This indigenous, pantropical species has been previously documented from Molokaʻi and Hawaiʻi (Staples & Imada (2006) as *Scapania paucidens*); see Judziewicz & Freire (2023).

Material examined. **KAUAʻI:** Lihuʻe Dist, Blue Hole, headwaters North Fork, Wailua River, 22.065332°N, 159.491517°W, *Metrosideros-Cheirodendron* short-statured wet forest with open bog habitat, 600 m, 19 Feb 2016, *T. Flynn 8262* (BISH, CAS, HIRO, MSB, NY, PTBG, TALL); same location, 21 Feb 2017, *K.R. Wood 17286* (BISH, F, NY, PTBG, US); Hanalei Dist, Nāmolokama summit, closed to open *Metrosideros* forest, 1,286 m, 19 Feb 2019, *K.R. Wood 18090* (BISH, E, F, PTBG). **OʻAHU:** Mt Kaʻala, on wet dripping roadside rock embankment below summit, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 397, 399* (BISH); same location, 9 Nov 2022, *M.K. Thomas et al. 510, 514a* (BISH). **MAUI:** Waikamoi, Pipeline Trail, ca. 3,000 ft [914 m], 3 Jan 1956, *R.D. Svihla 1809* (BISH); Haleakalā, Waikamoi Preserve, 20°46′16–47″N, 156°13′34″–14’11″W, 1,860–2,012 m, 23 Feb 2023, *A.V. Freire, E.J. Judziewicz, H. Oppenheimer & Z. Pezzillo 23-61* (BISH); Hāna Dist, Haleakalā National Park, Kuiki planeze, Alelele drainage basin, along perennial stream, *Metrosideros* montane wet forest, 5,000–5,100 ft [1,524–1,554 m], N 2290721, E 801173, 12 Jan 2022, *H.K. Oppenheimer 12220* (BISH); Hāna Dist, Hāna Forest Reserve, Helelеʻikiʻona stream, vicinity of State Camp, N 2296083, E 801815, *Metrosideros* montane wet forest, 5,400 ft [1,646 m], 25 Sep 2022, *H.K. Oppenheimer et al. 92220* (BISH); Hāna Dist, Koʻolau Forest Reserve, headwaters of Helelеʻikiʻona stream, vicinity of State Camp, N 2296083, E 801815, *Metrosideros* montane wet forest, 5,400 ft [1,646 m], 25 Sep 2022, *H.K. Oppenheimer et al. 92242* (BISH); Koʻolau Dist, Piʻinaʻau at “pig camp”, 20.797°N, 156.197°W, *Metrosideros* wet forests with invading *Psidium cattleianum* and *Hedychium gardnerianum*, 2,800 ft [853 m], 21 Oct 2021, *K. Severson 034* (BISH).

Scapania verrucosa Steph. **New Island Records**

This indigenous species (also found in Eurasia) has been previously documented only from Maui (Staples & Imada (2006) as *Scapania mauina*); see Judziewicz & Freire (2023).

Material examined. **KAUAʻI:** Hanalei Dist, Nāmolokama summit, 1,286 m, *Metrosideros* mixed montane wet shrubland and forest, epipetric on basalt, common, 1,244 m, 26 Feb 2019, *K.R. Wood 18095* (BISH, PTBG). **OʻAHU:** Mt. Kaʻala, along the road that turns off to the left off the main road as you leave the summit, rainforest, growing on ground, 4,000 ft [1,219 m], 22 Feb 1975, *E.J. Funk s.n.* (BISH); Mt Kaʻala, on wet dripping roadside rock embankment below summit, 21°30′18–30″N, 158°08′36–45″W, 1,200 m, 17 May 2022, *M.K. Thomas et al. 370* (BISH). **HAWAIʻI:**

Metrosideros polymorpha forest at Punaluʻu Kahawai, CCC Cabin east to plant exclosure at Park boundary, Upper Kāhuku Unit, Hawaii Volcanoes National Park, 19°14′46–52″N, 155°36′02–22″W, El. 6,075–6,185 ft [1,852–1,885 m], 10 Aug 2022, *A.V. Freire & E.J. Judziewicz 22-737a* (HAVO).

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New naturalization records for *Amaranthus* in the Hawaiian Islands

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Amaranthus L. is a genus of ca. 74 species mostly found in subtropical and tropical regions worldwide (Waselkov *et al*. 2018). The genus is of major economic importance, containing grain species, ornamentals, species used as pot herbs and medicine, and notorious agricultural weeds capable of C4 photosynthesis and rapid reproduction. Study of this genus in Hawai‘i has been minimal, partly due to the relatively small collection at BISH, as most material was lost on loan (Wagner *et al*. 1990). The last substantial work on the genus in Hawai‘i was by Wagner *et al*. (1990) but, as noted, their treatment was incomplete due to undercollection.

Between 2022 and 2023 all *Amaranthus* material in the BISH, PTBG, and HAW herbaria were examined as part of this taxonomic revision. A special effort was also made to collect unusual *Amaranthus* during fieldwork across the islands, and 44 new specimens were made. The following additions and corrections to Hawaiian naturalized *Amaranthus* are reported herein: 12 new island records, 5 island-level corrections, and 4 new state records. A new key was also prepared for naturalized *Amaranthus* species in Hawai‘i. All identifications were made by the authors unless otherwise stated. All voucher specimens cited for this paper have been deposited at the Herbarium Pacificum (BISH).

Amaranthus albus L. **New state record**

Amaranthus albus, commonly called “white amaranth” or “tumbleweed amaranth” (Mosyakin & Robertson 2003), has now been found naturalized on O‘ahu and questionably naturalized on Maui. On O‘ahu, *A. albus* was found in the vicinity of Mānoa growing from a yard. This site has been revisited by the author multiple times and the population has persisted from May 2021 to June 2023. One plant was found in 2021, disappeared in early 2022, and expanded to about 20 plants in 2023. *Amaranthus albus* was also collected in a vegetable garden on Maui by Forest & Kim Starr, where it may have been introduced as a contaminant in potting soil. *Amaranthus albus* has also been found as a contaminant in birdseed and may have been introduced via that route (Oseland *et al*. 2020).

Amaranthus albus has a broad climatic niche and is found in ruderal communities up to 1000 ft in elevation. It has a preference towards medium- or coarse-textured soils and away from heavy clays (Costea & Tardif 2003). Tumbleweed amaranth is so-named as it is one of several species of Amaranthaceae that break off at the base and form windblown

tumbleweeds. *Amaranthus albus* is native to western North America (Waselkov *et al*. 2018) and has become widely naturalized across almost the entirety of the Northern Hemisphere, along with Argentina and Uruguay in the Southern Hemisphere (POWO 2023). It is of little practical use (Costea & Tardif 2003) and has been associated with agricultural losses in assorted row crop systems (Vizantinopoulos & Katranis 1994; Costea & Tardif 2003).

The following description is taken from Mosyakin & Robertson (2003: 434):

> "Plants annual, glabrous or glabrescent or viscid-pubescent. Stems usually erect, ascending proximally, rarely almost prostrate, much-branched, bushy (large plants forming tumbleweeds), 0.1–1 m. Leaves: petiole 1/2 as long as blade, or longer in young proximal leaves; blade obovate to narrowly spatulate, mostly 0.5 × 0.5–1.5 cm, early proximal leaves to 8 cm, base tapering, narrowly cuneate, margins entire, plane (or ± distinctly undulate), apex obtuse, with whitish or yellowish, subspinescent mucro. Inflorescences axillary glomerules, green, whitish green, or yellowish. Bracts of pistillate flowers subulate to linear-lanceolate, narrow, 2–3 mm, 2 times as long as tepals. Pistillate flowers: tepals 3, narrowly ovate to linear, slightly unequal, 1–1.5 mm, thin, apex acute; style branches erect; stigmas 3. Staminate flowers intermixed with pistillate; tepals 3; stamens 3. Utricles ellipsoid-ovoid, 1.5 mm, equaling or exceeding tepals, smooth proximally, coarsely rugose distally, dehiscence regularly circumscissile. Seeds dark reddish brown to black, lenticular, 0.6–1 mm diam., shiny."

Figure 1: *Amaranthus albus* seen at the Mānoa population.

Material examined. **O‘AHU:** Mānoa, intersection of Kalie and Kalele Rd, from gravel yard of residence, sunny area, one individual seen, low-growing herb to 20 cm, somewhat spiny, 21.291103, -157.816297, 08 May 2021, *K. Faccenda 1771*; *loc. cit*. ~5 plants seen, 12 m, 21.290980, -157.816348, 22 Nov 2022, *K. Faccenda 2851*. **MAUI:** Olinda, Hawea Pl, veggie garden, lone individual in weedy section of garden, may have been a contaminant in potting soil, 2700 ft [820 m], 15 Nov 2021, *F. Starr & K. Starr 211115-01*.

Amaranthus arenicola I.M. Johnst. **New state record**

Amaranthus arenicola is now known to be naturalized on West Maui at Honolua Bay, where plants of an indeterminate population size were found in 2004 by Hank Oppenheimer. It may have been introduced by dirty footwear by tourists as the area is a popular snorkeling spot, or from plantings at a nearby homestead (H. Oppenheimer, pers. comm.). This specimen had been misidentified, as the previous determiners had evidently overlooked that it is entirely female. *Amaranthus arenicola* is known from only this collection in Hawai‘i, and the current extent of the population is unknown.

Amaranthus arenicola is native from the midwestern United States south into Mexico (Sauer 1955) and has been introduced into Korea and has spread into eastern and western states of the U.S. (POWO 2023). It can be identified by its dioecious habit and obtuse tepals with weakly or non-excurrent midveins. In its native range, *A. arenicola* grows in sandy habits, including lake or river margins and sand hills, along with disturbed areas and agricultural fields (Mosyakin & Robertson 2003).

The following description is taken from Mosyakin & Robertson (2003: 419):

> “Plants glabrous or nearly so. Stems erect, usually branched or occasionally ± simple, 0.4–1.5(–2) m; branches sometimes ascending. Leaves: petiole shorter than or rarely ± equaling blade; blade mostly narrowly ovate, obovate, elliptic, or lanceolate, 1.5–8 × 0.5–3 cm, thin and soft, base cuneate to nearly rounded, margins entire, plane or irregularly undulate, apex subacute to obtuse, with terminal mucro. Inflorescences mostly terminal, spikes to panicles, erect to nodding, rarely with axillary clusters in proximal part of plant. Bracts: of pistillate flowers with short, excurrent midrib, (1.5–)2–2.5 mm, equaling tepals or nearly so, apex acute or acuminate; of staminate flowers with prominent midribs, 2–3.5 mm, shorter than tepals, apex acute. Pistillate flowers: tepals spatulate, 1.5–2.5 mm, apex obtuse, with terminal mucro; style branches ± erect; stigmas 2–3. Staminate flowers: tepals 5, equal or subequal, 3 mm, apex obtuse to subacute; inner tepals with apex indistinctly mucronulate; stamens 5. Utricles light brown to brown, subglobose, 1.5–2 mm, shorter than tepals, walls thin, usually smooth. Seeds dark reddish brown, (0.9–)1–1.2 mm diam., shiny.”

Material examined. **MAUI:** West Maui, Honolua Bay, shady, alien forest seaward of highway, 2 m tall shrubs, 21°0′51″N, 156°38′6″E, 25 Aug 2004, *H. Oppenheimer H120407*.

Amaranthus blitum L. subsp. ***emarginatus*** (Salzm. ex Uline & Bray) Carretero, Muñoz Garm. & Pedrol **Nomenclatural note**

Previously referred to as *Amaranthus lividus* subsp. *polygonoides* in Hawai‘i (Wagner *et al*. 1990), this taxon is now best referred to using the name *Amaranthus blitum* (Costea *et al*. 2001). All material in Hawai‘i has also been identified to *A. blitum* subsp. *emarginatus*. This taxon is naturalized on Midway, Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i (Imada 2019; Faccenda & Daehler 2024).

Amaranthus dubius Mart. ex Thell. **Correction**

Amaranthus dubius was previously published as occurring on Kauaʻi, Oʻahu, Lānaʻi, Maui, and Hawaiʻi (Imada 2019). However, all these specimens at BISH were dubiously identified and upon critical review were reidentified as *A. retroflexus* or *A. hybridus*. Serendipitously, new collections of authentic *A. dubius* were made by the authors on Oʻahu in Honolulu, confirming that the species is in fact naturalized, despite all herbarium material examined being misidentified.

Material examined. **Oʻahu**: Honolulu, Puʻuhale Rd, growing in a weedy area along an industrial road, ca 5 plants observed, 4–5 m, 21.192572, -157.531702, 28 Jan 2023, *M.C. Ross 1882*; Honolulu, Kahana Stream (tributary to Makiki Stream), completely channelized area N of Wilder Ave, full sun, moist substrate, common, 21.307317, -157.839019, 12 Jun 2021, *K. Faccenda 1967*; Honolulu, Nuʻuanu Stream, growing along stream banks adjacent to Liliʻuokalani Botanical Garden, 4–5 plants seen, 11–12 m, 21.191083, -157.512044, 05 July 2023, *M.C. Ross 1959*.

Amaranthus graecizans L. **Correction**

Amaranthus graecizans was previously reported as naturalized on Oʻahu by Herbst *et al*. (2004) based on a single specimen (*J. Lau 1304*). This specimen was examined and found to represent *Amaranthus tricolor*, a cultivated species used for its edible leaves. As the specimen was described as growing in a lawn, it was likely a volunteer from a cultivated plant and should not be considered naturalized unless more material is found. The plant also had red spots on the leaves, which is typical for *A. tricolor*, and bracts longer than would be expected on *A. graecizans*. As such, *A. graecizans* should be removed from the naturalized checklist.

Amaranthus hybridus L. **New island record**

Amaranthus hybridus is now known to be naturalized on Kauaʻi, where it was found as a weed in the National Tropical Botanical Garden. At least 20 plants were seen on a weedy edge of the canoe plants section. Prior to this specimen, *A. hybridus* was only known from cultivation in Lāwaʻi, and has evidently escaped. *Amaranthus hybridus* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, and Maui (Wagner *et al*. 1990; Faccenda & Daehler in press).

Material examined. **Kauaʻi:** Kalāheo, National Tropical Botanical Garden, weed along fence near Canoe Plants Garden, moist, partly sunny area, common, seen near *Amaranthus spinosus*, 36 m, 21.906826, -159.508472, 01 Jun 2022, *K. Faccenda 2445*; Koloa Distr, Lāwaʻi, cultivated in garden, Akema Rd, leaves eaten as pot herb, 01 Oct 1990, *T. Flynn 4255*.

Amaranthus palmeri S. Watson **New state record**

Amaranthus palmeri, commonly known as "Palmer's amaranth," is now known from several recent collections on Oʻahu. This species is one of only two dioecious amaranths known to be naturalized in Hawaiʻi. It is native to the southwestern United States and northern Mexico, but has become a widespread weed across much of the world (Mosyakin & Robertson 2003). In its natural range it often grows near streams in silt or in sandy or gravelly soils (Sauer 1955). However, the species also favors ruderal habitats, especially outside of its native range (Sauer 1955). Palmer's amaranth is considered to be one of the weediest of all dioecious amaranths (Steckel 2007), and with its rapid spread to the eastern U.S. and overseas to Europe, Asia, and Australia this view is well supported (Mosyakin & Robertson 2003). Due to several invasive traits possessed by this species it has become

a serious agricultural pest (Steckel 2007; Oseland *et al*. 2020). The rapid seed production and unusually high photosynthetic rates, which are amongst the highest recorded for C4 plants, make it highly competitive with many row crops (Steckel 2007; Oseland *et al*. 2020). This species also has a tendency of developing resistance to many common herbicides, including glyphosate and many others (Steckel 2007; Heap 2017). It is unknown if the Hawaiian plants are herbicide resistant.

It is not known at this time how *Amaranthus palmeri* arrived in Hawai‘i, but at least one population seen near a construction site in urban Honolulu may have been introduced from the sand that was brought as fill to the site. Another collection from a disturbed area in Kaimukī could represent an introduction from birdseed since it was found growing in an area where birdseed is frequently cast. The species is a well known birdseed contaminant so it is possible that it is being spread this way (Oseland *et al*. 2020; Sauer 1955). Considering the weediness of Palmer's amaranth, it is unusual, yet fortunate, that the populations observed consisted of only a few plants. It may be possible that larger populations of this species exist on O‘ahu or other islands and have not yet been discovered.

Amaranthus palmeri can be distinguished from other dioecious amaranths by the acuminate tepals with midveins that extend as rigid spines, and pistillate bracts that exceed the tepals in length (Figure 2).

The following description is from *Flora of North America* (Mosyakin & Robertson 2003: 418).

> "Plants glabrous or nearly so. Stems erect, branched, usually (0.3–)0.5–1.5(–3) m; proximal branches often ascending. Leaves: long-petiolate; blade obovate or rhombic-obovate to elliptic proximally, sometimes lanceolate distally, 1.5–7 × 1–3.5 cm, base broadly to narrowly cuneate, margins entire, plane, apex subobtuse to acute, usually with terminal mucro. Inflorescences terminal, linear spikes to panicles, usually drooping, occasionally erect, especially when young, with few axillary clusters, uninterrupted or interrupted in proximal part of plant. Bracts: of pistillate flowers with long-excurrent midrib, 4–6 mm, longer than tepals, apex acuminate or mucronulate; of staminate flowers, 4 mm, equaling or longer than outer tepals, apex long-acuminate. Pistillate flowers: tepals 1.7–3.8 mm, apex acuminate, mucronulate; style branches spreading; stigmas 2(–3). Staminate flowers: tepals 5, unequal, 2–4 mm, apex acute; inner tepals with prominent midrib excurrent as rigid spine, apex long-acuminate or mucronulate; stamens 5. Utricles tan to brown, occasionally reddish brown, obovoid to subglobose, 1.5–2 mm, shorter than tepals, at maturity walls thin, almost smooth or indistinctly rugose. Seeds dark reddish brown to brown, 1–1.2 mm diam., shiny."

Material examined. **O‘AHU**: Honolulu, Algaroba St, near intersection with Makahiki Way, growing in sandy soil near sidewalk, only one plant observed, 3–4 m, 21.173503, -157.494117, 12 Dec 2022, *M.C. Ross 1860*; Honolulu, Kapi‘olani Community College, near NW corner of Koa Building, growing underneath large *Ficus virens* tree in weedy area near dumpster, not irrigated, partial sun, area regularly weed whacked, feral chickens present, 3 plants observed (1 male and 2 female plants), 66–67 m, 21.162037, -157.484949, 23 Mar 2023, *M.C. Ross 1917*; *loc. cit*., 2 additional female plants observed, 28 Mar 2023, *M.C. Ross 1921*; Kaimukī, intersection of Keanu St and 15th Ave, weed spotted along sidewalk, dry sunny area, 2 plants seen, bracts conspicuously distichous, 35 m, 21.282325, -157.794101, 04 Mar 2023, *K. Faccenda 3053.5*; Kaimukī, Pukalani Pl, weedy roadside, dry, sunny, single plant seen, 92 m, 21.286645, -157.793066, 04 Mar 2023, *K. Faccenda 3054*.

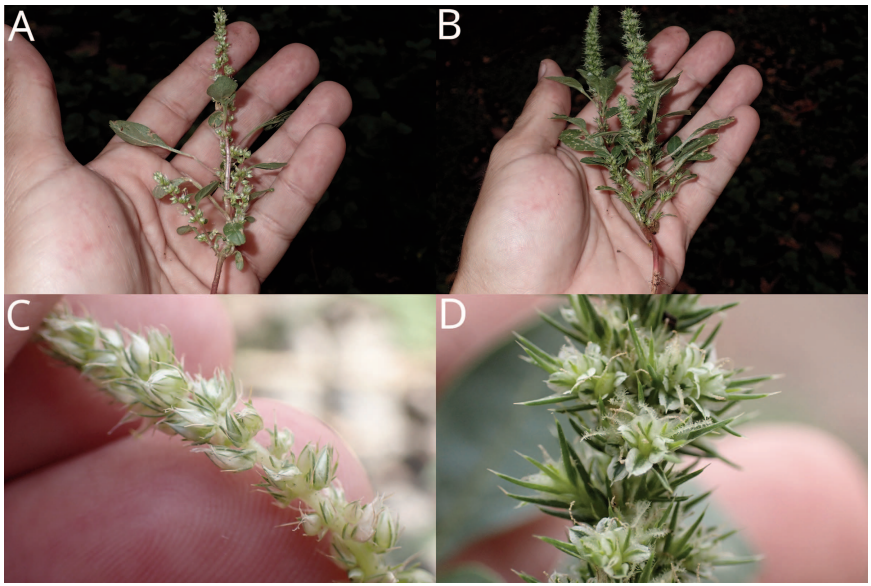

Figure 2: *Amaranthus palmeri* as seen in Honolulu. **A**, male plant; **B**, female plant; **C**, staminate inflorescence; **D**, pistillate inflorescence.

Amaranthus polygonoides L. **New island record**

Amaranthus polygonoides, previously reported as naturalized on Oʻahu (Frohlich & Lau 2020; Ross & Faccenda 2023), is now known on Kauaʻi, where one plant was found at Port Allen along a roadside. Another observation of this species on Kauaʻi, by iNaturalist user sea-kangaroo was made in 2018 at Punahua Point, showing that this species has been naturalized on Kauaʻi for over 5 years (https://www.inaturalist.org/observations/17587272).

Material examined. **KAUAʻI:** Port Allen, Aka Ula St, industrial area near petroleum station and solar park, roadside, dry sunny area near parking lot, leaves bluish green with white chevron centered on leaf, one plant seen, rare, 21.899865, -159.586693, 03 Jun 2022, *K. Faccenda 2477.*

Amaranthus powellii S. Watson **New state record**

Amaranthus powellii is now known in Hawaiʻi from two collections from Maui at both Kula and Pukalani made in the 1980s by Bob Hobdy. These specimens were only identified as *A. powellii* during the course of this research. The current status of the species in the state is unknown, but it has likely persisted, given that this is a famously weedy species.

Amaranthus powellii is native to Mexico and much of the western and southwestern United States and has become naturalized across much of the world (POWO 2023). Across North America it is found in disturbed sites, including agricultural fields, roadsides, railroad tracks, and river margins (Mosyakin & Robertson 2003). *Amaranthus powellii* is an aggressive agricultural weed that can incur major crop losses when uncontrolled (Costea *et al*. 2004). It has also developed herbicide resistance to several herbicides (Costea *et al*. 2004).

Amaranthus powellii is morphologically similar to most other species in the *A. hybridus* complex, but differs in having larger bracts and inflorescence branches that tend to be stiffer. The key below should help distinguish these plants.

The following description is taken from Mosyakin & Robertson (2003: 424):

> "Plants glabrous or moderately pubescent toward inflorescences, becoming glabrescent at maturity. Stems usually erect, green or sometimes reddish purple, branched, mainly in inflorescences, to nearly simple, 0.3–1.5(–2) m, stiff. Leaves: petiole mostly equaling or longer than blade; blade rhombic-ovate to broadly lanceolate, 4–8 × 2–3 cm, occasionally larger in robust plants, base cuneate to broadly cuneate, margins entire, apex cuneate to obtuse or indistinctly emarginate, with mucro. Inflorescences mostly terminal, usually with spikes at distal axils, erect and rigid, green to silvery green, occasionally tinged red, leafless at least distally. Bracts lanceolate to linear-subulate, 4–7 mm, 2–3 times as long as tepals, rigid. Pistillate flowers: tepals usually 3–5, not clawed, unequal; outer tepals narrowly ovate-elliptic or elliptic, 1.5–3.5 mm, apex aristate; style branches spreading, shorter than body of fruit; stigmas 3. Staminate flowers clustered at tips of inflorescence branches; tepals 3–5; stamens 3–5. Utricles subglobose or compressed-ovoid, 2–3 mm, equaling or shorter than tepals, smooth or lid slightly rugose or minutely verrucose, dehiscence regularly circumscissile. Seeds black, subglobose to lenticular, 1–1.4 mm diam., smooth, shiny."

Material examined. **MAUI:** East Maui, Kula, roadside weed, 2400 ft [730 m], 19 Jun 1986, *R. Hobdy 2572*; Pukalani, along roadside 11 Jul 1982, *R. Hobdy 1418*.

Amaranthus retroflexus L. **New island record**

After careful curation of the *Amaranthus* specimens at BISH, it was discovered that many specimens which truly represent *Amaranthus retroflexus* had been misidentified as other species by previous workers. In the field, it appears that *A. retroflexus* is currently the third most common species of weedy amaranth, following *A. spinosus* and *A. viridis*. Previously, *A. retroflexus* had only been reported on Hawai'i Island (Wagner *et al*. 1997), but is now known from Midway, Kaua'i, O'ahu, Lāna'i, Maui, and Hawai'i.

MIDWAY: Sand Island, weed in lawn in Cable Co. compound, 15 Dec 1962, *C.H. Lamoureux 2228* (HAW); *loc. cit.* weed in lawns in housing area 17 Dec 1962, *C.H. Lamoureux 2306* (HAW). **KAUA'I:** Grounds of Pacific Tropical Botanical Garden, 20 Dec 1983, *W.L. Wagner 5141*; Kalāheo, National Tropical Botanical Garden, weed along fence near Canoe Plants Garden, moist, partly sunny area, common, seen near *Amaranthus spinosus*, 36 m, 21.906826, -159.508472, 01 Jun 2022, *K. Faccenda 2445.5*. **O'AHU:** Pali Highway, vicinity of Akamu Pl, crack between sidewalk and wall, sunny exposed area, from crack in sidewalk next to a wall, partially shaded from sun. rare, only one individual seen, 21.331092, -157.843517, 29 May 2021, *K. Faccenda 1930*; Kawainui Marsh, east edge of park near Kailua Rd, open sunny area which had recently been cleared, 3 m, 21.389881, -157.748572, 09 Jan 2022, *K. Faccenda 2190*; Kapolei, Campbell Industrial Park, Olai St. between Kalaeloa Blvd and Hanua St, roadside weed, rare, only one plant seen, growing next to *Amaranthus spinosus*, 3 m, 21.299340, -158.099211, 17 Jan 2023, *K. Faccenda 2994*; Wai'anae, Lualualei Homestead Rd, at entrance to farmland about 200 m SW of Kuwale Rd, roadside weed in dry area, rare, only 3 plants seen, 17 m, 21.440779, -158.152237, 16 Jan 2023, *K. Faccenda & M. Ross 2991*; *Batis* meadow west of Barbers Point deep draft harbor, 01 May 1990, *E. Funk 416*; Base of Hau'ula mountain range along jeep trail, passing the third gate, near soya bean and papaya cultivated area, 22 Aug 1972, *T. Herat 212*; Makakilo, landfill area, 01 Dec 1987, *M. Leu 73*; Mānoa campus, Univ. Hawai'i, 03 Jan 1976, *J.T. Swarbrick H-11*; At entrance to Sacred Falls State Park near main highway, 21 Mar 1978, *C. Corn s.n.* (BISH 668186). **LĀNA'I:** Keōmoku, NE shore of island, occasional

roadside weed in arid disturbed *Prosopis* thicket, 5 ft [2 m], *D. Herbst 4022* (HAW); Kaumalapau Harbor, Young Brothers shipping terminal, rocky soil on edge of road, full sun, about 20 plants seen, only seen in this area, 20.787740, -156.990730, 19 Jun 2023, *K. Faccenda 3121*. **MAUI:** West Maui, Kahakuloa, 04 Jun 1934, *E.S. Handy 34.15*; Pu‘u o Kali, 1000 ft, 20° 43′ -156° 24′, 27 May 2004, *F. Starr 040527-1*.

Key to *Amaranthus* in Hawai‘i

This key is principally based on the treatment of the genus by Mosyakin & Robertson (2003). The fruit in *Amaranthus* is an utricle; if the utricle is dehiscent, it will split latitudinally into two parts, revealing a (typically) shiny seed.

1. Leaves with pink markings or solid bronze purple [species not yet known to be naturalized, but occur in cultivation and may yet escape]
   2. Leaves green with pink markings; inflorescences mainly axillary .... *A. tricolor* [in part]
   2′. Leaves solid-colored purple; inflorescences mainly terminal ..... *A. cruentus*

1′. Leaves green or occasionally marked with white
   3. Paired spines present in leaf axils ..... *A. spinosus*
   3′. Plants without any spines in leaf axils
      4. Inflorescences of axillary clusters
         5. Pistillate flowers with 4–5 tepals, tepals fused at basal ⅓ ... *A. polygonoides*
         5′. Pistillate flowers with 3 tepals, tepals free to base
            6. Utricle indehiscent, leaf blade emarginate at tip .... *A. blitum* subsp. *emarginatus* [in part]
            6′. Utricle dehiscent, leaf blade not emarginate at tip
               7. Leaves varying shades of green ..... *A. albus*
               7′. Leaves with bright red or pink coloration ..... *A. tricolor* [in part]
      4′. Inflorescence mainly terminal
         8. Plants dioecious
            9. Longest (outer) tepal acute or acuminate, midvein excurrent into a rigid point; pistillate bracts and outer tepals longer than inner tepals; staminate bracts equaling outer tepals ..... *A. palmeri*
            9′. Tepals obtuse or retuse, midveins excurrent slightly or not at all; pistillate bracts and outer tepals ± equaling inner tepals; staminate bracts shorter than tepals ..... *A. arenicola*
         8′. Plants monoecious
            10. Utricle indehiscent; plants often weak, flowers often spaced apart from each other making the inflorescence appear thin
               11. Utricles smooth or weakly rugose, leaf apex emarginate .... *A. blitum* subsp. *emarginatus* [in part]
               11′. Utricles rugose, leaf apex emarginate or not
                  12. Leaves ovate to rhombic ..... *A. viridis*
                  12′. Leaves narrowly lanceolate [supposedly extinct] ..... *A. brownii*
            10′. Utricle dehiscent; plants generally robust, flowers usually densely compacted (*Amaranthus hybridus* complex)
               13. Tepals of pistillate flowers with an obtuse apex ..... *A. retroflexus*
               13′. Tepals of pistillate flowers acute or acuminate at apex

14. Bracts <2 mm long, shorter than tepals; tepals 1.5–2.0 mm long .... *A. dubius*

14′. Bracts >2 mm long, equalling or surpassing tepals; tepals 1.5–3.5 mm long

15. Bracts 4–7 mm long, inflorescence usually stiff, with erect branches ..... *A. powellii*

15′. Bracts 2–4 mm long, inflorescence usually soft and lax, with spreading branches ..... *A. hybridus*

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New records of weedy, non-grass plants from Molokaʻi

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In December 2022, roadside surveys were conducted across the island of Molokaʻi with the goal of identifying and mapping the grasses of the island. During these surveys, 12 new records of grasses were found (Faccenda 2023) along with 12 non-grass records, which are enumerated here. *Atriplex muelleri* was also found near the Kaunakakai port, but was not collected and could therefore not be formally included in this report. All identifications were made by the first author. Voucher collections mentioned are housed in Bishop Museum's Herbarium Pacificum (BISH), Honolulu, Hawaiʻi.

Acanthaceae

Barleria repens Nees **New island record**

Barleria repens was found during roadside surveys at Kualapuʻu, where approximately 20 seedlings were found on a roadcut below a yard where *B. repens* may have been planted. *Barleria repens* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Kualapuʻu, intersection of Kahi Pl and Rt 470, partly shady, moist roadside bank, over 15 seedlings present in area, many of these flowering and fruiting, on top of roadside bank was a large colony on edge of a yard, unclear if that colony was planted or not, 477 m, 21.162470, -157.003863, 27 Dec 2022, *K. Faccenda & C. Daehler 2932.*

Ruellia blechum L. **New island record**

A small colony of about 30 plants of *Ruellia blechum* was found during roadside surveys on Rt 450. *Ruellia blechum* is now known to be naturalized on Oʻahu, Molokaʻi, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Rt 450, ca 13 km E of Kaunakakai, roadside weed from sunny area, rare along road, only about 30 plants seen in this colony, only one encountered during roadside surveys, flowers white, 8 m, 21.055782, -156.899522, 29 Dec 2022, *K. Faccenda 2968.*

Amaranthaceae

Amaranthus blitum L. subsp. ***emarginatus*** (Salzm. ex Uline & Bray) Carretero, Muñoz Garm. & Pedrol **New island record**

Amaranthus blitum subsp. *emarginatus* is now known from Molokaʻi, where it was uncommon in the vicinity of Hoʻolehua and many hundreds of plants were observed on roadsides. *Amaranthus blitum* subsp. *emarginatus* is now known from Midway, Kauaʻi, Oʻahu, Hawaiʻi, and is questionably naturalized on Maui (Imada 2019; Faccenda & Ross 2024).

Material examined. **MOLOKAʻI:** Hoʻolehua, intersection of Kolea Ave and Rt 480, occasionally mowed roadside, dry, sunny, small colony, along about 5 m of roadside at this location, several other colonies seen in Hoʻolehua area, 174 m, 21.171628, -157.085781, 27 Dec 2022, *K. Faccenda & C. Daehler 2923.*

Amaranthus hybridus L. subsp. ***hybridus*** **New island record**

Amaranthus hybridus subsp. *hybridus* has previously been reported as naturalized on Oʻahu and Maui (Imada 2019) but is now also known from Molokaʻi, where only five plants were seen in Hoʻolehua.

Material examined. **MOLOKAʻI:** Hoʻolehua, end of pavement on W end Moʻomomi Ave, disturbed roadside, dry, sunny area, rare, <5 plants seen, no other populations observed on island, 118 m, 21.168383, -157.113461, 27 Dec 2022, *K. Faccenda & C. Daehler 2918*.

Asteraceae

Cotula australis (Sieber ex Spreng.) Hook. f. **New island record**

Cotula australis was found growing as an uncommon weed on roadsides between Hoʻolehua and Kualapuʻu, where thousands of plants were observed germinating out of the seedbank along with other annuals, including *Eragrostis barrelieri*, *Malva parviflora*, and *Dysphania carinata*. *Cotula australis* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Hoʻolehua, intersection of Kolea Ave and Rt 480, occasionally mowed roadside, dry, sunny, many thousands of plants seen around Hoʻolehua on roadsides with other annuals, 174 m, 21.171468, -157.085880, 27 Dec 2022, *K. Faccenda & C. Daehler 2924*.

Brassicaceae

Capsella bursa-pastoris (L.) Medik. **New island record**

Capsella bursa-pastoris is now known to be naturalized on Molokaʻi, where hundreds of plants were found on roadsides across the island. The species was generally uncommon across the island and was found in low densities only. *Capsella bursa-pastoris* is now known to be naturalized on Midway, Oʻahu, Molokaʻi, Maui, Lānaʻi, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Hoʻolehua, Airport Loop, just outside of terminal, mowed roadside, sunny, rather dry area, uncommon roadside annual, uncommon in that populations found were generally small but were widely dispersed around Hoʻolehua, 140 m, 21.157262, -157.094628, 27 Dec 2022, *K. Faccenda & C. Daehler 2916*.

Convolvulaceae

Ipomoea aquatica Forssk. **New island record**

Ipomoea aquatica is now known to be naturalized on Molokaʻi, where four large colonies were found growing as emergent aquatics in a ditch near ʻUalapuʻe. *Ipomoea aquatica* is now known to be naturalized on Midway, Oʻahu, Molokaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Rt 450, ca 3 km E of ʻUalapuʻe, roadside ditch which is permanently flooded, sunny area, 4 large clumps growing as an emergent aquatic, covering about 10 sq. meters, rooting freely from lower stems, flowers white, 13 m, 21.072802, -156.797684, 29 Dec 2022, *K. Faccenda 2940*.

Heliotropiaceae

Euploca procumbens (Mill.) Diane & Hilger **New island record**

Euploca procumbens is now known to be naturalized on Molokaʻi, where approximately 30 plants were seen along the highway between ʻUalapuʻe and Kaunakakai. *Euploca procumbens* was previously published as naturalized in Hawaiʻi under the name *Heliotropium procumbens*, but the genus *Euploca* is now recognized as distinct based on molecular evidence (Frohlich et al. 2022). *Euploca procumbens* is now known to be

naturalized on Kauaʻi, Oʻahu, Molokaʻi, and Maui (Imada 2019). It is also present on Hawaiʻi Island but has yet to be vouchered.

Material examined. **MOLOKAʻI:** Rt 450, ca 3 km W of ʻUalapuʻe, roadside weed in dry, sunny area, 5 plants seen in this area, more seen when driving towards Kaunakakai, 11 m, 21.053809, -156.869421, 29 Dec 2022, *K. Faccenda 2958*.

Juncaceae

Juncus ensifolius Wikstr. **New island record**

Juncus ensifolius is now known to be naturalized on Molokaʻi, where thousands of plants were seen along the road leading through the Nature Conservancy's Kamakou Preserve. *Juncus ensifolius* is now naturalized on Molokaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Road leading through TNC Kamakou Preserve, from saturated soil along road on edges of puddles and depressions, in sunny or partly sunny areas, common, 1120 m, 21.117153, -156.912707, 28 Dec 2022, *K. Faccenda 2936.*

Juncus polyanthemos Buchenau **New island record**

A population of about 20 plants of *Juncus polyanthemus* was seen during roadside surveys on the Kalae Hwy. about 1 km south of the Kalaupapa overlook. Unfortunately, these were not recognized as island records at the time, and a specimen was not made, but a specimen was later obtained thanks to help from Danielle Frohlich.

Material examined. **MOLOKAʻI**: Rt 470, heading to Kalaupapa lookout, outside gate on right hand side of road halfway to lookout from town, moist, shady area, small colony of around 20 plants, -156.996221, 21.163751, 07 Jun 2023, *D. Frohlich s.n.*

Molluginaceae

Mollugo cerviana (L.) Ser. **New island record**

A small patch of 4 plants of *Mollugo cerviana* was found about 6 km east of ʻUalapuʻe on a roadside. *Mollugo cerviana* is now known from Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Rt 450, ca 6 km E of ʻUalapuʻe, roadside weed in sunny, rather dry area, rare, only 4 plants seen in this population and no other populations seen along road, 12 m, 21.082984, -156.783354, 29 Dec 2022, *K. Faccenda 2948.*

Passifloraceae

Passiflora suberosa L. **New island record**

A small population of about 20 plants of *Passiflora suberosa* was found at Kualapuʻu during roadside surveys. *Passiflora suberosa* is now known to occur on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **MOLOKAʻI:** Kualapuʻu, intersection of Kahi Pl and Rt 470, partly shady, moist roadside bank, rare, several seedlings and vines seen only in this area, 477 m, 21.162470, -157.003863, 27 Dec 2022, *K. Faccenda & C. Daehler 2931.*

Taxa showing signs of naturalization

Fabaceae

Acacia mangium Willd.

Three seedlings of *Acacia mangium* were found adjacent to large *A. mangium* trees planted as a windbreak along Huaʻai Rd. Several rootsuckers were also found where roots were hit by mowers, but the seedlings were pulled up to confirm that they were not

connected to a larger root system. *Acacia mangium* has now been reported as naturalized on Kauaʻi, Oʻahu, and Hawaiʻi (Imada 2019), and potentially naturalizing on Molokaʻi.

Material examined. **MOLOKAʻI:** Hoʻolehua, Huaʻai Rd about 100 m S of its intersection with Rt 460, trees planted as a windbreak around perimeter of a farm, several plants found growing in roadside ditch, 2 appeared to be rootsuckers, but another 3 clearly seedlings as they were able to be uprooted, 115 m, 21.146565, -157.097284, 27 Dec 2022, *K. Faccenda & C. Daehler 2917.*

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Updates to the Hawaiian grass flora and selected keys to species: Part 3

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During the course of a complete taxonomic revision of the Hawaiian introduced grass flora (see Faccenda 2022, 2023), several taxa were found that were difficult to identify morphologically. Genetic methods were therefore sought to identify these plants. Although efforts were principally focused on members of the *Sporobolus indicus* complex, other groups were also added as this work progressed. DNA barcoding was used as the genetic technique to identify these species. All material cited below was identified by the first author.

SEQUENCING

The internal transcribed spacer (ITS) is a non-coding DNA region between the small and large ribosomal subunits in the nucleus and is a widely used barcoding region for plants (Cheng *et al.* 2016). At least one sample of each species in this study had the ITS region sequenced. The rpl32-trnL chloroplast region was also used for some samples, but was of comparatively little value and is only discussed for certain samples. These regions were chosen due to the abundance of reference sequences in databases such as the NCBI GenBank (https://www.ncbi.nlm.nih.gov/genbank/) and they are generally variable between closely related species.

Plant material was largely collected in the field and immediately dried in silica gel, but some material was destructively sampled from herbarium specimens at BISH. Herbarium specimens were made for almost all genetic samples collected in the field and are stored at BISH. All other vouchers are also stored at BISH, unless otherwise indicated.

Fresh material, silica-dried leaves, or fragments from pressed specimens were used for DNA extractions using the CTAB method (Doyle & Doyle 1987), with some modifications (Morden *et al.* 1996). The concentration and quality of DNA were determined using a NanoDrop Spectrophotometer (ND-1000, v 3.6.0, Thermo Scientific). Extra DNA materials were deposited into the Hawai'i Plant DNA library (HPDL) (Morden *et al.* 1996; Randell & Morden 1999).

The primers ITS5a and ITS4 were used to sequence the ITS region and trnl(UAG) and rpL32-F were used for rpl32-trnL region based on sequences reported in Peterson *et al.* (2010). PCR amplifications were carried out with GoTaq G2 Colorless Master Mix (Promega, Madison, WI, USA). The successful PCR products were cleaned using Exo-Sap-It (Affymetrix, Santa Clara, CA, USA). Sanger sequencing of the PCR products was performed by Azenta (Chelmsford, MA) or at the University of Hawai'i ASGPB sequencing facility with both forward and reverse amplification primers. The raw sequences were aligned using Geneious Prime 2022.0.1 (https:www.geneious.com) utilizing the Geneious aligner with default parameters. Final adjustments were done by visual inspection. Most sequences have been submitted to NCBI GenBank (Table 1).

Table 1. **Material sampled for this analysis, HPDL#, and GenBank accession number**. Several *Cynodon* specimens could not have their sequences submitted to GenBank, as the sequences showed multiple peaks at most sites. See comments under *C. nlemfuensis*.

Species	Location	Year	Specimen	HPDL#	GenBank Acc.
Andropogon bicornis	Hawai‘i, Volcano	2022	*K. Faccenda 2622*	12957	ITS: OR056243
Bothriochloa pertusa	O‘ahu, Mānoa	2022	none	12986	ITS: OR056271
Chloris pycnothrix	O‘ahu, Wahiawā	2023	*K. Faccenda 3045*	13002	ITS: OR056278 rpl32-trnL: OR129967
Cynodon aethiopicus	Maui, Kula	1982	*R. Hobdy s.n.* (BISH 460060)	13010	ITS: OR056282
Cynodon aethiopicus × *C. nlemfuensis*	Maui, Nāpili	1999	*H. Oppenheimer H49919*	13009	ITS: not submitted
Cynodon aethiopicus × *C. nlemfuensis*	Kaho‘olawe, summit	1984	*R. Hobdy 1964*	13011	ITS: not submitted
Cynodon aethiopicus × *C. nlemfuensis*	O‘ahu, Kualoa	2023	*K. Faccenda 3057*	13018	ITS: not submitted rpl32-trnL: OR129970
Cynodon nlemfuensis	O‘ahu, Pearl Harbor	2005	*L. Crago 2005-068*	13012	ITS: OR056283
Cynodon nlemfuensis	Maui, Waihe‘e	2004	*C. Imada 2004-46*	13013	ITS: not submitted rpl32-trnL: OR129968
Cynodon nlemfuensis	Maui, Wailuku	2001	*H. Oppenheimer H120103*	13014	ITS: OR056284
Cynodon nlemfuensis	O‘ahu, Honolulu	2023	*K. Faccenda 3073*	13015	ITS: OR056285 rpl32-trnL: OR129969
Cynodon nlemfuensis	O‘ahu, One‘ula	2023	*M. Ross 1919*	13020	ITS: not submitted
Cynodon nlemfuensis	O‘ahu, Kaimana	2023	*M. Ross 1916*	13021	ITS: OR056287
Cynodon nlemfuensis	O‘ahu, Airport	2023	*M. Ross 1912*	13022	ITS: OR056288
Digitaria velutina	Maui, Kula	2022	*K. Faccenda 2804*	12985	ITS: OR056270
Echinochloa crus-galli	Hawai‘i, Hilo	2022	*K. Faccenda 2336*	12960	ITS: OR056246
Echinochloa crus-galli	Kaua‘i, Hanalei	2022	*K. Faccenda 2435*	12964	ITS: OR056250
Echinochloa crus-galli	Maui, Keālia	1995	*C. Imada 98-25*	12970	ITS: OR056256
Echinochloa crus-galli	O‘ahu, Wailua	1992	*C. Imada 92-35*	12973	ITS: OR056257
Echinochloa crus-galli	O‘ahu, Bellows AFB	1984	*C. Morden 1171* (HAW)	196	ITS: OR056277
Eriochloa procera	O‘ahu, ‘Āhuimanu	2022	*K. Faccenda s.n.*	12956	ITS: OR056242
Eriochloa procera	Kaua‘i, Kalāheo	2022	*K. Faccenda 2471*	12968	ITS: OR056254
Eriochloa procera	O‘ahu, Queen’s Beach	1985	*C. Morden 1273* (HAW)	336	ITS: OR056280
Festuca rubra	Hawai‘i, Volcano	2022	*K. Faccenda 2621*	12958	ITS: OR056244
Festuca rubra	Hawai‘i, Volcano	2022	*K. Faccenda 2657*	12959	ITS: OR056245
Festuca rubra	Hawai‘i, Volcano	2022	none	12962	ITS: OR056248
Polypogon fugax	O‘ahu, Ka‘ala	2022	*K. Faccenda 2206*	12966	ITS: OR056252
Schizachyrium microstachyum	Hawai‘i, Kahuku	2022	*K. Faccenda 2607*	12961	ITS: OR056247
Sporobolus africanus	Hawai‘i, Pu‘u Huluhulu	2022	*K. Faccenda 2305*	12941	ITS: OR056227 rpl32-trnL: OR129952
Sporobolus africanus	Hawai‘i, Waimea	2022	*K. Faccenda 2308*	12942	ITS: OR056228 rpl32-trnL: OR129953
Sporobolus africanus	O‘ahu, Hawai‘i Loa Ridge	2022	*K. Faccenda 2691*	12943	ITS: OR056229 rpl32-trnL: OR129954
Sporobolus africanus	Hawai‘i, Kahuku	2022	*K. Faccenda 2611*	12947	ITS: OR056233 rpl32-trnL: OR129958

Table 1. **(continued)**

Species	Location	Year	Specimen	HPDL#	GenBank Acc.
Sporobolus africanus	Hawai‘i, Hualālai	2022	*K. Faccenda 2280*	12952	ITS: OR056238 rpl32-trnL: OR129963
Sporobolus africanus	Hawai‘i, Nā‘ālehu	2022	*K. Faccenda 2269*	12954	ITS: OR056240 rpl32-trnL: OR129965
Sporobolus africanus	Kaho‘olawe, Lua Makika	1990	*S. Warren KAH-90-6*	12974	ITS: OR056258
Sporobolus africanus	Hawai‘i, Pu‘u Wa‘awa‘a	1989	*W. Takeuchi 5755*	12976	ITS: OR056260
Sporobolus africanus	Hawai‘i, Pōhakuloa	1985	*C. Morden 1317* (HAW)	410	ITS: OR056275
Sporobolus diandrus	O‘ahu, Mānoa	2022	*K. Faccenda s.n.*	12990	ITS: OR056274
Sporobolus domingensis	Midway, Sand Island	2022	*F. Starr 22-062701*	12979	ITS: OR056263
Sporobolus elongatus	O‘ahu, Waimānalo	2022	*K. Faccenda 2693*	12944	ITS: OR056230 rpl32-trnL: OR129955
Sporobolus elongatus	O‘ahu, base of Wa‘ahila Ridge	2022	*K. Faccenda 2692*	12945	ITS: OR056231 rpl32-trnL: OR129956
Sporobolus elongatus	O‘ahu, Windward CC	2022	*K. Faccenda 2697*	12946	ITS: OR056232 rpl32-trnL: OR129957
Sporobolus elongatus	O‘ahu, ‘Ōhikilolo	2022	*K. Faccenda 2849*	12955	ITS: OR056241
Sporobolus elongatus	Kaua‘i, Līhu‘e	2022	*K. Faccenda 2420*	12969	ITS: OR056255
Sporobolus elongatus	O‘ahu, Ka‘ō‘io Point	1966	*D. Herbst 100*	12978	ITS: OR056262
Sporobolus elongatus	Maui, Lāhainā	2022	*K. Faccenda 2734*	12991	ITS: OR056265
Sporobolus elongatus	Maui, Pā‘ia	2022	*K. Faccenda 2729*	12983	ITS: OR056268
Sporobolus elongatus	O‘ahu, Mānoa	2022	*K. Faccenda 2850*	12984	ITS: OR056269
Sporobolus elongatus	O‘ahu, Mānoa	2022	*K. Faccenda s.n.*	12989	ITS: OR056273
Sporobolus elongatus	O‘ahu, Bellows AFB	1984	*C. Morden 1167* (HAW)	192	ITS: OR056276
Sporobolus fertilis	O‘ahu, He‘eia	2022	*K. Faccenda 2701*	12951	ITS: OR056237 rpl32-trnL: OR129962
Sporobolus fertilis	Hawai‘i, Hilo	2022	*K. Faccenda 2340*	12953	ITS: OR056239 rpl32-trnL: OR129964
Sporobolus fertilis	O‘ahu, Wailupe Valley	2022	*K. Faccenda 2101*	12963	ITS: OR056249
Sporobolus fertilis	Kaua‘i, Kalāheo	2022	*K. Faccenda 2450*	12965	ITS: OR056251
Sporobolus fertilis	Hawai‘i, Kahuku	2022	*K. Faccenda 2603*	12967	ITS: OR056253
Sporobolus fertilis	Maui, Lāhainā	2002	*H. Oppenheimer H10205*	12975	ITS: OR056259 rpl32-trnL: OR129966
Sporobolus fertilis	Maui, Halepua‘a	2005	*F. Starr 050405-27*	12977	ITS: OR056261
Sporobolus fertilis	Maui, Kīpahulu	2022	*K. Faccenda 2746*	12980	ITS: OR056264
Sporobolus fertilis	Maui, Pā‘ia	2022	*K. Faccenda 2778*	12981	ITS: OR056266
Sporobolus fertilis	Maui, Hāna	2022	*K. Faccenda 2758*	12982	ITS: OR056267
Sporobolus indicus	Kaua‘i, Hanalei	2022	*K. Faccenda 2438.5*	12948	ITS: OR056234 rpl32-trnL: OR129959
Sporobolus indicus	Kaua‘i, Waimea Canyon	2022	*K. Faccenda 2469*	12949	ITS: OR056235 rpl32-trnL: OR129960
Sporobolus indicus	Kaua‘i, Kapa‘a	2022	*K. Faccenda 2403*	12950	ITS: OR056236 rpl32-trnL: OR129961
Urochloa glumaris	O‘ahu, Mānoa	2022	none	12988	ITS: OR056272

IDENTIFICATION OF PLANTS BASED ON GENETIC DATA

For all other genera outside of *Sporobolus*, NCBI BLAST (https://blast.ncbi.nlm.nih.gov/Blast.cgi) was used to assign a name to the sequence by finding the most similar sequence in the NCBI reference library, based on the shared percentage of the bases. *Urochloa glumaris* and *Schizachyrium microstachyum* were also sequenced, but lack suitable reference specimens on GenBank to compare to.

For the *Sporobolus indicus* complex, a phylogeny was created based on ITS sequences using the data from Peterson *et al.* (2014) as well-identified references. The sequences were aligned with MUSCLE (Edgar 2004), and RAxML was used to create the phylogeny with default parameters (Stamatakis 2014). Five clades of Hawaiian species belonging to the *Sporobolus indicus* complex were found (Figure 1). This phylogeny ended up being more useful for determining how many species occurred in Hawai‘i than placing a name on them. *Sporobolus elongatus* lacked a reference sequence, and *S. indicus* and *S. africanus* were placed closest to species that they are morphologically dissimilar to. Once the different clades were established, morphological identification was used to place a name on each clade using the keys in Simon & Jacobs (1999) and Clayton (1965). After seed characters were found to reliably separate the genotyped specimens, all *Sporobolus* material at BISH was critically examined, much of which was misidentified. In total, 49 of the 140 (35%) specimens belonging to the *Sporobolus indicus* complex at BISH were misidentified. Most *S. africanus* vouchers were correctly identified, but nearly all material previously identified as *S. indicus* was incorrectly identified and was actually *S. elongatus* or *S. fertilis*.

Bothriochloa pertusa (L.) A. Camus **Note**

Bothriochloa pertusa was published as occurring in Hawai‘i by O’Connor (1990). The ITS region was sequenced and found to be 564/566 base match to GenBank accession DQ005028.1, supporting its current identity.

Chloris pycnothrix Trin. **Note**

Chloris pycnothrix was published as occurring on O‘ahu by Faccenda (2023). It was also sequenced and found to be a 659/660 base match to GenBank accession KP873271.1, supporting its initial identification.

Cynodon aethiopicus Clayton & J.R. Harlan

× ***C. nlemfuensis*** Vanderyst **New state record**

Upon sequencing several *Cynodon* specimens with affinities to both *C. aethiopicus* and *C. nlemfuensis*, the ITS sequence was found to be entirely unusable due to multiple peaks at each base, up until around 630 bases, where the sequence suddenly becomes high quality. It was soon realized that at the location, there is a deletion in the *C. aethiopicus* ITS region, and the pattern of peaks in the messy region is entirely predicted by the ITS sequences of *C. aethiopicus* and *C. nlemfuensis* (data not shown), giving strong evidence that the sample was a hybrid. Hybridization between these species is easily induced under experimental conditions (De Wet & Harlan 1970), and it is most likely that these hybrid populations are of artificial rather than natural origin.

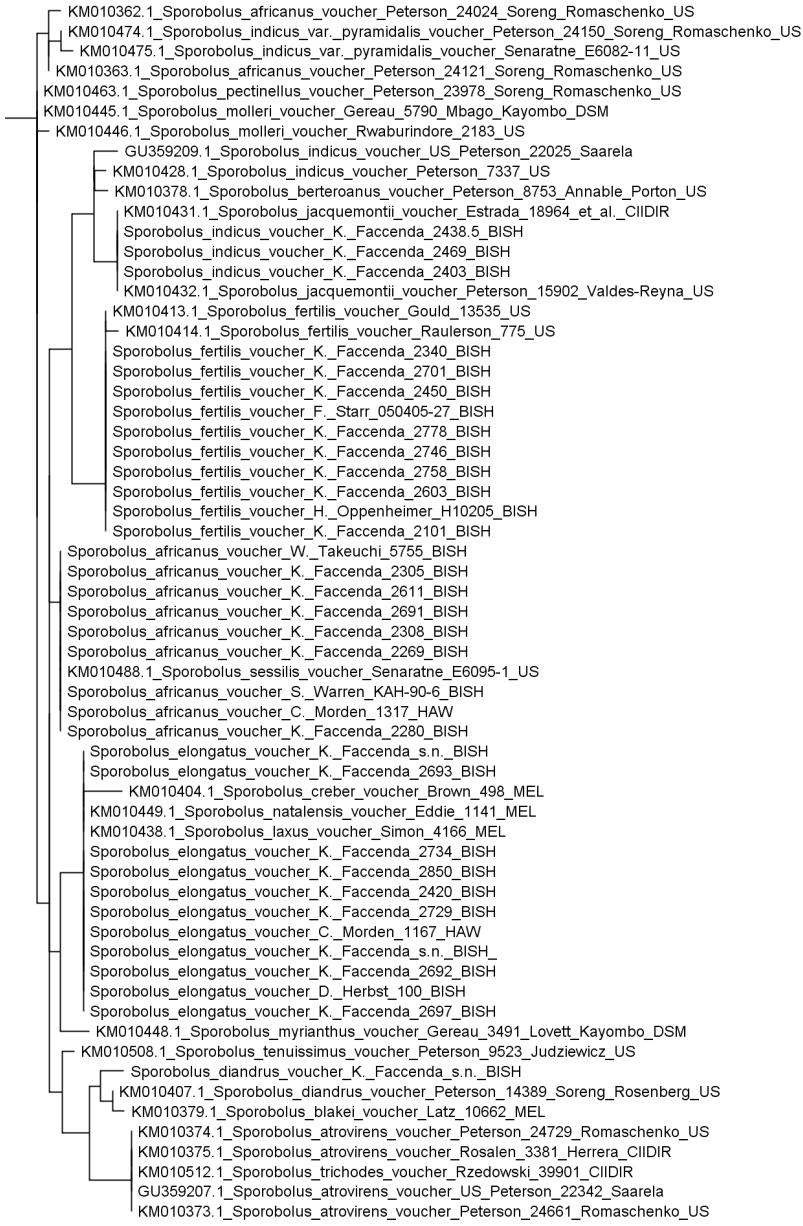

Figure 1. Phylogeny of the *Sporobolus indicus* complex based on only the ITS region. All nodes have low bootstrap support due to low sequence polymorphism among this species complex. Sequences from Peterson *et al*. (2014) are prefixed with their GenBank accession numbers. The scientific names displayed for the species sampled in this study are the final names after morphological identification.

One specimen was cultivated at Kualoa Ranch on Oʻahu, and another was from Maui, which states it was also cultivated and referred to as "Puerto Rican Star Grass." Naturalized specimens have been collected from Maui and Kahoʻolawe; it is unclear if this hybrid can make viable seed or if these populations have spread purely via vegetative means.

Material examined. **OʻAHU:** Kualoa Ranch, pasture immediately behind ranch headquarters, open, rather dry pasture, strongly stoloniferous grass (but not checked for rhizomes) forming a monoculture over at least 100 square meters, quite robust, most inflorescences with one whorl of branches but some rarely with two, very likely planted and given that it has not spread out of the pasture it should not be considered naturalized, 20 m, 21.520237, -157.839328, 07 Mar 2023, *K. Faccenda & J. Lee 3057*. **MAUI:** West Maui, Lāhainā Distr, Moʻomoku, growing on dirt road between pineapple fields at gully bottom, spreading vegetatively by stolons, known to be planted elsewhere on Honolua plantation lands, but not at this locality, 1,200 ft [365 m], 20 Nov 2002, *H. Oppenheimer H110212*; Lāhainā Distr, Nāpili, cultivated to cover areas of bare, exposed soil, mat-forming, 06 Apr 1999, *H. Oppenheimer H49919*. **KAHOʻOLAWE:** Near summit in diversion ditch by LZ-1, long creeping rhizomes, 16 Feb 1984, *R. Hobdy 1964*.

Cynodon nlemfuensis Vanderyst **New island record; Note**

Several populations of *C. nlemfuensis* from across the islands were sequenced (Table 1) and were found to closely match *C. nlemfuensis* sequences in GenBank, e.g. for *K. Faccenda 3073* the rpl32-trnL region is a 683/683(100%) match to KP873541.1 and the ITS region is a 626/628(99%) to KP873323.1.

In the African literature, where these species are native, *C. nlemfuensis* is described as having only stolons and no rhizomes (Clayton & Harlan 1970; Clayton & Renvoize 1982). However, underground rhizomes have been observed in several populations of *C. nlemfuensis* on Oʻahu, including the one documented by *K. Faccenda 3073* that genetically matches *C. nlemfuensis*.

Two populations of plants that morphologically match *C. nlemfuensis* were sequenced and the ITS region shows two peaks at almost all sites, indicating that it has multiple copies of ITS, one of which has an indel relative to the others (data not shown). The rpl32-trnL region of these plants were a close match for *C. nlemfuensis*. It is unclear if these plants are polyploids or hybrids with *C. dactylon*, but it seems likely to be a hybrid with *C. dactylon*, as the species hybridize very easily (De Wet & Harlan 1970). No sequences in GenBank have an indel at the correct location to predict where the other ITS sequence came from and would allow for the determination of the other parent.

Cynodon nlemfuensis is now known to be naturalized on Kauaʻi at Kekaha and Waiakea, based on collections from the 1970s, and Lānaʻi at Kaʻā and Kamoku, where it was collected over 100 years ago as well as by the author in 2023. Based on these specimens, it is also likely that the "Giant bermuda" introduced to other islands at the same time was also *C. nlemfuensis*. As *C. nlemfuensis* was only described in 1922, the correct scientific name could not have been applied at that time.

Material examined. **KAUAʻI:** Waiakea Golf Course, manmade dune, 23 Sep 1977 *C. Corn s.n* (PTBG 068240); Waimea Distr, along road from Kekaha to Kōkeʻe State Park, 25 ft, *D. Herbst & G. Spence 5564* (HAW). **LĀNAʻI:** Kaʻā, introduced to the island in 1914, [no date], *G.C. Munro sn.* (BISH 118482); Kamoku, giant bermuda, Dec 1914, *G.C. Munro 406*; Airport Rd (440) about 3 km makai of Lānaʻi City, roadside, sunny, mowed area, from exposed hardpan soil where no other plants were growing, 414 m, 20.800175, -156.949977, 19 Jun 2023, *K. Faccenda 3125*.

Key to *Cynodon* in Hawai‘i

This key is provisional and is bound to fail with certain plants despite being largely based on the key in Barkworth *et al.* (2003). The genus *Cynodon* is in need of a modern revision and some Hawaiian populations seem to introgress, especially those with affinities to *C. nlemfuensis*. It is very likely that a *C. dactylon* × *C. nlemfuensis* hybrid occurs here, in addition to the *C. aethiopicus* × *C. nlemfuensis* hybrid that certainly occurs here.

1. Plants 5–40 cm tall; inflorescence with 3–6 branches always in a single whorl .... *C. dactylon*

1′. Plants 20–100 cm tall; inflorescence with 5–20 branches in one or more whorls

2. Inflorescences often with >1 whorl; lemma keel glabrous or minutely hairy; plants stiff and woody; inflorescence usually red to purple ..... *C. aethiopicus*

2′. Inflorescence typically with 1 whorl, sometimes with 2 in hybrid populations; lemma keel densely hairy; plants softer; inflorescence typically green but sometimes with red coloration

3. Plants with consistently one whorled inflorescence; found in coastal through montane sites ..... *C. nlemfuensis*

3′. Plants with at least some inflorescences with multiple whorls (examine large sample, at least 40 flowers); not currently known from coastal sites .... *C. aethiopicus* × *C. nlemfuensis*

Digitaria velutina (Forssk.) P. Beauv. **Note**

Digitaria velutina was published as occurring on Maui by Faccenda (2023). It was also sequenced and found to be a 663/669 base match to GenBank accession HM347010.

Echinochloa crus-pavonis (Kunth) Schult. **Correction**

Echinochloa crus-pavonis was first published as occurring in Hawai‘i by the Smithsonian *Flora of the Hawaiian Islands* online checklist by Wagner *et al.* (2012) and that record was then incorporated into the Imada (2019) checklist. This record was based on many specimens filed as *E. crus-pavonis* in the Smithsonian (US) herbarium; however, this species does not occur in the BISH herbarium, as all specimens formerly annotated as *E. crus-pavonis* were annotated as *E. crus-galli* by W.D. Clayton in the work leading to the publication of Herbst & Clayton (1998). Attempts to contact the botanists who annotated the *E. crus-pavonis* material at US did not reveal why that name was applied to Hawaiian material.

Duplicate specimens identified as *E. crus-pavonis* at US were closely examined at BISH and all were determined to be *E. crus-galli*, based on their morphology. Examination of the photographed specimens of *E. crus-pavonis* also showed them to most closely match *E. crus-galli*. Furthermore, when DNA was extracted from two BISH duplicates of sheets annotated as *E. crus-pavonis* at US (*Imada 98-25, Imada 92-35*), the ITS region was sequenced and searched via BLAST only to find that they were close matches to other specimens of *E. crus-galli* in the GenBank database. Three other recently collected specimens (*Faccenda 2336, Faccenda 2435, Morden 1171,*HAW) were also similarly sequenced and also found to be most similar to *E. crus-galli* via BLAST. We therefore conclude that the US specimens are misidentified and that *Echinochloa crus-pavonis* does not occur on any of the islands of Hawai‘i.

The key to *Echinochloa* in *Flora of North America* (Barkworth *et al.* 2003) does not work on Hawaiian material for distinguishing *Echinochloa crus-galli*. On no specimens of *E. crus-galli* examined was a line of minute hairs noticed at the tip of the fertile lemma. It is also worth noting that while researching this species, many taxonomic treatments of *Echinochloa* were examined, some of which used entirely different characters for their circumscription of *E. crus-pavonis*. Among the most markedly so were Clayton & Renvoize (1982) and Wu *et al.* (2006), which both state that *E. crus-pavonis* has long awns and compound panicle branches, whereas nearly all other treatments define the species by its short or absent awns (Gould *et al.* 1972). The characters that appear to be applied more consistently than others are the panicle nodding and spikelets with short awns (Gould *et al.* 1972; Michael 1983; Weakley 2020), which is how we circumscribed the species.

Eriochloa procera (Retz.) C.E. Hubb. **New island records**

Specimens of *Eriochloa* from across the islands have been critically examined and almost all wild specimens published as *Eriochloa punctata* were found to be misidentified and are a better match for *E. procera*. The two species differ in duration and length of the florets; see the key below. *Eriochloa procera* was previously reported as naturalized on Molokaʻi (Oppenheimer 2008), Midway (Snow & Lau 2010), and Oʻahu (Imada & Kennedy 2020), and is now also known from Niʻihau, Kauaʻi, and Maui.

Several specimens of *Eriochloa* morphologically resemble *Eriochloa barbatus* (syn. *E. fatmensis*), as they both have an aristate spikelet. However, when one of these samples (*Morden 1273*, HAW) was sequenced, it was a close match to *E. procera* (654/660 base match to GenBank# MH768193.1) and quite distant to any *E. barbatus* accession. Two other specimens of *E. procera* were also sequenced (Table 1) that did not have aristate spikelets, and these were also most similar to GenBank# MH768193.1. *Eriochloa procera* and *E. barbatus* are very closely related, differing only in whether the spikelet is aristate or acute at the apex (Shaw & Webster 1987). Launert & Pope (1989) report that these species also intergrade in southern Africa. Specimens from Hawaiʻi also vary continuously between acute, short-acuminate, and long-acuminate florets. This continuous variation and lack of genetic differentiation between the extreme forms does not warrant recognition of *E. barbatus* in Hawaiʻi, and as such, all material has been identified as *E. procera*. Further taxonomic work is needed to determine if these species are conspecific globally.

Material examined. **NIʻIHAU:** Old Makanikahau Reservoir, on dried muddy bed of apana, 400 ft [122 m], 01 Apr 1949, *H. St. John 23634*. **KAUAʻI:** Intersection of Lauoho Rd and Rt 50, shady, roadside, moist, with other weeds, rare, one plant seen, 142 m, 21.922714, -159.515804, 30 May 2022, *K. Faccenda 2427*. **MAUI:** Lāhainā, Kahana, neglected, irrigated area, 20.966688, -156.680489, 13 Nov 2005, *H.L. Oppenheimer H110504*.

Eriochloa punctata (L.) Ham. **Correction; New island record**

Eriochloa punctata has previously been published as occurring on, Niʻihau, Oʻahu, Molokaʻi, and Maui (Imada 2019). However, all these reports were based on specimens that were misidentified and were truly *Eriochloa procera*; see further comments above. One specimen from 1961 on Kauaʻi documents the naturalization of this species. *Eriochloa punctata* was intentionally imported by the Hawaii Agricultural Experiment Station (*Lyman s.n.*, BISH 129219), most likely for trial as a forage grass.

Material examined. **KAUA‘I:** Kekaha, rare in swampy place, May 1961, *B. Kumbe s.n.* (BISH 785875).

Key to *Eriochloa* in Hawai‘i

1. Perennial (but sometimes flowering first year); florets 4.2–5.7 mm long .... *E. punctata*

1′. Annual or short-lived perennial; florets 2.7–5 mm long

2. Florets 2.7–3.6 mm long (sometimes with an acuminate tip reaching to 4.6 mm); axis of inflorescence usually glabrous; leaves usually <4 mm wide ..... *E. procera*

2′. Florets 3.8–5.0 mm long; axis of inflorescence usually pubescent; leaves usually >5 mm wide ..... *E. acuminata* var. *acuminata*

Figure 2. Spikelets of *Eriochloa* from Hawai‘i. **A,** *E. procera*, acute floret form (*H. Oppenheimer H71019*). **B,** *E. procera*, acuminate form (*P. O’Connor s.n.,* BISH 510049). **C,** *E. acuminata* var. *acuminata* (*H. Oppenheimer H59002*). **D,** *E. punctata* (*R. Lyman s.n.,* BISH 447489). All photographs taken at BISH under 20× magnification.

Festuca rubra L. **Note**

Festuca rubra was published as occurring in Hawai‘i by O’Connor (1990). A specimen from Volcano, Hawai‘i, was also sequenced and found to be 98.2% match to GenBank accession OQ874980.1.

Polypogon fugax Nees ex Steud. **New island records**

Polypogon fugax was published as occurring in Hawai‘i by Herbst & Clayton (1998) based on one specimen from the Nu‘uanu Pali on O‘ahu. This record is, however, quite problematic as many other vouchers from the same population were also annotated as *P. interruptus* by W.D. Clayton (one of them being a duplicate sheet of the specimen annotated as *P. fugax*!). Morphological identification of these species proved challenging, as they differ only by their duration and lobing of the glumes (Barkworth *et al.* 1993). The Hawaiian specimens had a glume lobe of ~1 mm, making that character equivocal (Barkworth *et al.* 1993). After examining herbarium material of both species in their native range, it was also found that duration cannot be reliably implied from herbarium specimens.

Therefore, genetic analysis was undertaken. DNA was extracted from a herbarium specimen from the Nu‘uanu Pali and one from Maka‘eha, Maui. Unfortunately, neither of these successfully amplified, as the DNA was likely too fragmented. The Nu‘uanu Pali was also visited several times and plants were also unable to be located in the field (but were later located after DNA sequencing was completed). ITS was only successfully amplified from a plant collected at the summit of Ka‘ala and found to be a 642/643 base match to *P. fugax* (GenBank accession MH808886.1), compared to a 669/677 match to GenBank accession KX873141.1 (*P. interruptus*). It is therefore concluded that all plants in Hawai‘i are actually *P. fugax*, as there is no considerable difference between the lobing of the glume from the Ka‘ala plant and any of the other Hawaiian specimens formerly labeled as *P. interruptus*. Field observations of the *Polypogon* plants at the Ka‘ala summit also suggest that they are annual, further supporting the *P. fugax* identification (Barkworth *et al.* 1993). *Polypogon fugax* is now known from Kure, Midway, Kaua‘i, O‘ahu, Maui, and Hawai‘i; only the first collection from each island is reported below.

Material examined. **KURE:** Near tennis court, 08 May 1986, *R. Saito s.n.* (BISH 511549). **MIDWAY:** Sand Island, in saturated soil below dripping air conditioner, 29 Jun 1980, *D. Herbst & W. Takeuchi 6383* (US). **KAUA‘I:** Nā Pali Coast, about 25 min past Hanakāpī‘ai Beach, on rocky cliff face, locally common, 07 May 1976, *J. Arakawa s.n.* (PTBG 1000036808). **O‘AHU:** Nu‘uanu Pali, 17 Jun 1916, *A.S. Hitchcock 13789*. **MAUI:** Kula, 01 Oct 1902, *J.G. Smith s.n.* (BISH 786511). **HAWAI‘I:** Kanehoha, Kona, 25 Jun 1911, *C.N. Forbes 261.H.*

Polypogon interruptus Kunth **Correction**

Polypogon interruptus is no longer known to occur in Hawai‘i, as all material has been reidentified as *P. fugax*. See note above.

Sporobolus domingensis (Trin.) Kunth **Note**

Sporobolus domingensis was published by Faccenda (2023). It was also sequenced and found to be a match to 620/622 base match to KM010410.1.

Sporobolus elongatus R. Br. **New island records; Note**

Sporobolus elongatus is now known to be naturalized on Kaua‘i, Moloka‘i, and Maui, in addition to being previously reported on Midway, O‘ahu, Lāna‘i, and Hawai‘i (Imada 2019; Faccenda 2022). *Sporobolus elongatus* was first collected on O‘ahu, where it was naturalized as a weed at an experiment station in 1920 (*Westgate 32*). It was intentionally imported between 1901 and 1915 as “*Sporobolus indicus*” but was stated to be from Australia, and must be *S. elongatus*, as *S. indicus* does not occur in Australia (McClelland

1915; Simon & Jacobs 1999). It quickly spread to Lānaʻi, where it was found in 1925 and was also found on Hawaiʻi Island as a weed at the Kohala Ditch Trail in 1924 (*Lee 111*). It was found to be widespread on Kauaʻi, Molokaʻi, and Maui during roadside surveys and has surely been present but overlooked on these islands for many years.

Sporobolus elongatus and *S. indicus* are very similar species, and finding adequate characters to identify them was a difficult task. The inflorescence structure is very similar, although *S. elongatus* tends to have a looser structure and more flexible branches. The florets are basically identical, although they differ slightly based on seed position and seed shape (Clayton 1965). Examining the grain free of the pericarp at high magnification is the best way to reliably identify these species. The grain on *S. indicus* is 1 mm long × 0.6 mm wide and oblong with a rounded tip, and the embryo also tends to be dark on *S. indicus* (Figure 4C). The grain on *S. elongatus* is 0.7 mm × 0.5 mm with an acute base and concave to truncate tip. The embryo is the same color as the rest of the grain on *S. elongatus* (Figure 4D).

Material examined. **KAUAʻI:** Nininí Point Road running along the edge of Līʻhuʻe Airport, roadside weed, sunny, dry area, common, 45 m, 21.971244, -159.352368, 29 May 2022, *K. Faccenda 2420*; Kalāheo, National Tropical Botanical Garden, native plant garden area, weed in infrequently mowed grass, sunny, moist area, common, 57 m, 21.904929, -159.508933, 31 May 2022, *K. Faccenda 2440* (PTBG). **MOLOKAʻI:** Maunaloa town, intersection of Maunaloa Rd and N Waiʻeli St, in mowed lawns around town, rather dry, sunny areas, uncommon in mowed lawns, <10 plants seen, 314 m, 21.131932, -157.212399, 26 Dec 2022, *K. Faccenda 2905*; Rt 450, ca. 6 km E of ʻUalapuʻe, roadside weed in sunny, moist area, uncommon, 11 m, 21.081986, -156.784592, 29 Dec 2022, *K. Faccenda 2949* (PTBG); ʻUalapuʻe, Wavecrest Resort, weed in irrigated, mowed grass at resort in sunny area, common here and also along roadsides, 7 m, 21.054636, -156.840225, 30 Dec 2022, *K. Faccenda 2971* (US). **MAUI:** Pāʻia, Holomua Rd, Old Maui High School, MISC Baseyard, weed in mowed lawn, common, clump-forming, 93 m, 20.915407, -156.348011, 22 Oct 2022, *K. Faccenda 2729*; Lāhainā, Lāhainā Recreation Center off of Shaw St, mowed and irrigated grass field, weed, uncommon, 9 m, 20.867549, -156.668351, 22 Oct 2022, *K. Faccenda 2734*.

Sporobolus fertilis (Steud.) Clayton **New state record**

Sporobolus fertilis has been present in Hawaiʻi since at least 1936, when it was first collected on Kauaʻi and Hawaiʻi, then subsequently found on Oʻahu in 1937. It has now spread to Kauaʻi, Oʻahu, Molokaʻi, Maui, and Hawaiʻi and is common and widespread on each of these islands.

Herbarium specimens of this grass were found misidentified as *S. africanus*, *S. indicus*, and *S. elongatus*. *Sporobolus fertilis* is very similar to these species, and small plants are often indistinguishable unless the grains are examined under a microscope. However, *S. fertilis* can reach much larger sizes than those species, approaching 1.5 m tall and with panicles up to 50 cm, whereas the other species rarely have panicles >30 cm long. *Sporobolus fertilis* also has straw-colored inflorescences (Figure 3), whereas the other members of the *S. indicus* complex have inflorescences that are various shades of green or gray.

Sporobolus fertilis is native from South to Southeast Asia, and is naturalized in Australia and throughout the Pacific (POWO 2023). In Australia, where it is a weed of pastures (Yobo *et al.* 2009), it is reported to be invasive (Grice *et al.* 2013). Even in its native range, it is referred to as a common weed, where it is found on roadsides, field margins, grassy places, and mountain valleys (Wu *et al.* 2006).

Figure 3. *Sporobolus fertilis* showing its distinctive straw-colored inflorescence and rather loose branches that separate from the main axis when the inflorescence is bent. Photo taken in Volcano, Hawai‘i.

The following description is taken from Wu *et al.* (2006:484):

> “Perennial. Culms densely tufted, erect, rigid, 25–100(–120) cm tall. Leaf sheaths glabrous but margin ciliolate, basal sheaths papery, lightly keeled; leaf blades linear, flat or involute, 15–50(–65) × 0.2–0.5 cm, glabrous or adaxial surface thinly pilose, tapering to a long filiform apex; ligule ca. 0.5 mm. Panicle linear, contracted to spikelike, often interrupted especially at base, 7–45 × 0.5–1.5 cm; branches 1–2.5(–5) cm, erect and appressed to main axis, or looser and narrowly ascending, densely spiculate throughout. Spikelets grayish or yellowish green, 1.7–2 mm; lower glume oblong, ca. 0.5 mm, veinless, apex truncate-erose; upper glume oblong-elliptic, 1/2–2/3 spikelet length, 1-veined, ± acute; lemma ovate, as long as spikelet, indistinctly 1(–3)-veined, acute. Anthers 3, 0.8–1 mm. Grain red-brown, obovate-elliptic, 0.9–1.2 mm, distinctly shorter than its lemma and palea, these gaping widely beyond its top, apex truncate. Fl. and fr. Mar–Dec. 2n = 36, 48, 54.”

Material examined. **KAUA‘I:** Kālaheo, Pu‘u Rd about 1 km S of Pu‘u Lani Pl, in valley, partly sunny area in forest along road, 179 m, 21.911338, -159.534860, 02 Jun 2022, *K. Faccenda 2450*; Wailua Game Reserve, above Wailua, plots stripmined for bauxite in 1958–1960, 20 Oct 1985, *R.A. Howard 20191*; roadside near end of road at Hā‘ena Beach, 16 Jun 1978 *C. Corn s.n.* (BISH 667185); Kapa‘a, common on roadsides, 400 ft, 28 Oct 1936, *E.Y. Hosaka 1632*; Kalalau Trail, along first mile or so, 21 Dec 1983, *W.L. Wagner et al. 6173*. **O‘AHU:** Wailupe middle ridge, partly sunny under mixed native and invasive forest, collected from habitat 23 May, cultivated in pot for about 5 months

before flowering and pressing, 21.313427, -157.753800, 28 Aug 2021, *K. Faccenda 2101*; Kamehameha Hwy outside of Heʻeia State Park, weedy, partly sunny, moist area, to 80 cm tall, inflorescence loose, 2 m, 21.440399, -157.809360, 20 Sep 2022, *K. Faccenda 2701*; Waiʻalae Nui Ridge, "dry forest zone" along trail, occasional, 27 May 1937, *F.E. Egler 37-53*. **MOLOKAʻI:** Maunaloa, intersection of Rt 460 and Kalua Koi Rd, roadside weed in dry, sunny area, uncommon, forming dense clumps, 309 m, 21.147184, -157.198381, 26 Dec 2022, *K. Faccenda 2906*; Hoʻolehua, end of pavement on Rt 482 on its western end, disturbed, occasionally mowed roadside, dry, sunny, uncommon, scattered patches seen around the island, 163 m, 21.181892, -157.091685, 27 Dec 2022, *K. Faccenda & C. Daehler 2920* (US); Kalaupapa National Park, restoration site at switchback 1, 07 Oct 2004, *M.L. Wysong 385*. **MAUI:** Hāna Hwy ca. 6 km W of Waiʻānapanapa State Park, wet, sunny roadside dominated by weeds, common along road, 197 m, 20.798314, -156.061320, 23 Oct 2022, *K. Faccenda 2758*; Pāʻia, Lower Pāʻia Park, dry, sunny area on edge of parking lot, compressed soil, 1 m, 20.915075, -156.384976, 24 Oct 2022, *K. Faccenda & B. Hobdy 2778*; West Maui, Lāhainā Distr, Nāpili, growing along unimproved road through gulch between pineapple fields, 700 ft, 20° 58' 47" -156° 38; 38", 08 Jan 2002, *H. Oppenheimer H10205* (PTBG); Palikea Stream, Haleakalā National Park, Kīpahulu Valley, 29 Apr 1977, *P.K. Higashino 5779*; Hāna Distr, Ka Iwi o Pele, secondary forest, steep NE slope, common with *Panicum* in *Casuarina* grove, 40–440 ft., 13 Nov 1987, *T. Flynn 2624*. **HAWAIʻI:** Hilo, Liliʻuokalani Gardens, weed under shade trees, moist area, common, 1 m, 19.727753, -155.067817, 06 Mar 2022, *K. Faccenda 2340*; Kahuku Unit of Hawaiʻi Volcanoes National Park, near main parking lot and toilet, one plant seen, killed, 654 m, 19.064500, -155.678610, 09 Aug 2022, *K. Faccenda with HAVO I&M Vegetation Crew 2603*; Hawaiʻi Volcanoes National Park, outside of Visitor Center, near trailhead for Sulfur Banks Trail, shady area on edge of forest, one plant seen, killed, 1214 m, 19.430718, -155.259337, 12 Aug 2022, *K. Faccenda & J. Gross 2613*; Hilina Pali, above cliff, common in trampled parking lot area, 25 Mar 1984, *F.R. Fosberg 64301*; Hāwī, Kohala, weed along roadside in moist places, 500 ft [152 m], 19 Sep 1936, *E.Y. Hosaka 1631*.

Sporobolus indicus (L.) R. Br. **Corrections; New island record**

Sporobolus indicus was previously published as occurring on Lānaʻi, Maui, and Hawaiʻi by O'Connor (1990); however, no specimens could be found from Lānaʻi to support this record, nor could any be found in the field. Also, all Maui specimens previously filed as *S. indicus* have been redetermined as *S. fertilis* and all Hawaiʻi Island specimens have been reidentified as *S. elongatus*. During fieldwork on Molokaʻi, the first record of *S. indicus* was found for that island. *Sporobolus indicus* is now only known from Midway, Kauaʻi, Oʻahu, and Molokaʻi (Imada 2019).

Sporobolus indicus was likely accidentally introduced as a seed contaminant as the first specimen (*Anon s.n.* BISH 591291) was made from the Pensacola Experiment Station and was described as a "Volunteer with *Brachiaria ciliatissima*". This specimen was not dated, but examining the HAES accession inventory (HAES n.d.), *B. ciliatissima* was only imported in 1938 making the accidental introduction of *S. indicus* most likely 1938. Three live plants of *S. indicus* were also imported in 1912 from Louisiana (HAES n.d), but given that no specimens were made until later, it is likely they did not naturalize.

Material examined. **MOLOKAʻI:** Hoʻolehua, 100 m SE of intersection of Rt 482 and Ala ʻĒlua St, partly shaded, moist roadside, uncommon on the island, small colony of <10 plants at this spot, 239 m, 21.169220, -157.052205, 27 Dec 2022, *K. Faccenda & C. Daehler 2928*.

Key to *Sporobolus* in Hawai‘i

Morphological identification of plants in the *S. indicus* complex (*S. africanus*, *S. diandrus*, *S. elongatus*, *S. fertilis*, and *S. indicus*) is notoriously difficult and, in the author's opinion, mostly impossible in the field. If species level ID is required, a microscope is usually required to examine the seeds. The seed characters listed in this key are for the seed after it has been freed from the pericarp (the wrinkly, greenish or yellowish coating around the seed). If no seeds naturally freed from their pericarp are available on the specimen, a fruit can be dissected from its lemma, soaked in water for 5 minutes, then gently separated from the pericarp with a needle. Note that fresh material must be dried before the soaking technique works to remove the pericarp. Identification characteristics for these species have been largely adapted from the excellent *Sporobolus* treatment by Simon & Jacobs (1999), with minor influence from the treatments by Clayton (1965), Baaijens & Veldkamp (1991), and Barkworth *et al.* (2003).

1. Plant annual, rarely surpassing 30 cm tall
   2. Lower inflorescence branches not whorled; often associated with horticulture or moist disturbed areas ..... *S. tenuissimus*
   2′. Lower inflorescence branches whorled; often associated with dry saline or calcareous conditions
      3. Leaves often with papillose-based hairs and conspicuously spiny margins; lemmas minutely scabrous; panicle usually open even when immature; panicle with secondary branches usually divergent from the main axis ..... *S. coromandelianus*
      3′. Leaves without papillose-based hairs, margins scabrous; lemmas smooth; panicle spikelike when immature; panicle with secondary branches appressed .... *S. pyramidatus* (in part)

1′. Plant perennial, 20–150 cm tall
   4. Upper glume >⅔ as long as floret; only found in coastal areas
      5. Rhizomatous; blades distichous [native] ..... *S. virginicus*
      5′. Not rhizomatous; blades not conspicuously distichous
         6. Lower inflorescence node whorled ..... *S. pyramidatus* (in part)
         6′. Lower inflorescence node not whorled ..... *S. domingensis*
   4′. Upper glume <⅔ as long as floret; uncommonly found in coastal areas, if in coastal area, in areas with low soil salinity (*S. indicus* species complex)
      7. Panicle racemelike, secondary branches strongly divergent from main axis at >45° angle
         8. Secondary inflorescence branches lacking florets on lower 1/6–1/4, these branches 1–4 (rarely up to 10) cm long; spikelets 1.2–1.6 mm long ... *S. diandrus*
         8′. Secondary inflorescence branches with florets to the base, these branches <2 cm long; spikelets 1.6–2.0 mm long ..... *S. fertilis* (in part)
      7′. Panicle spikelike, secondary branches ascending and loosely to tightly contracted to main axis, if divergent from main axis only up to <30° angle
         9. Spikelets 2.0–2.5 mm long; spike densely contracted; spike 6–20 cm long; inflorescence usually gray ..... *S. africanus*
         9′. Spikelets <2 mm long; spike densely or loosely contracted; spike 13–50 cm long; inflorescence various shades of green, gray, or straw-colored

10. Seed blunt, bearing no sharp edges, generally 0.4–0.5 mm thick, minutely rugose in texture (Figure 4A); mature inflorescence straw-colored; inflorescence 15–50 cm long; plants 50–150 cm tall ..... *S. fertilis* (in part)

10′. Seed with or without sharp edges, generally ≤0.3 mm thick, smooth or rugose in texture; mature inflorescence generally green or greenish gray (the only straw-colored ones observed were old sun-bleached ones); inflorescence 13–30 cm long (may be up to 35 cm in robust *S. elongatus*); plants <100 cm tall

11. Seed with a blunt and convexly rounded apex (Figure 4C); grain of mature florets held such that it appears to be 80–90% as long as the lemmas; stamens always 3 ..... *S. indicus*

11′. Seed with a truncate apex with sharp edges, often concave distally (Figure 4D); grain of mature florets held lower, appearing closer to 60% as long as the lemmas; stamens usually 2 but can infrequently be 3 .... *S. elongatus*

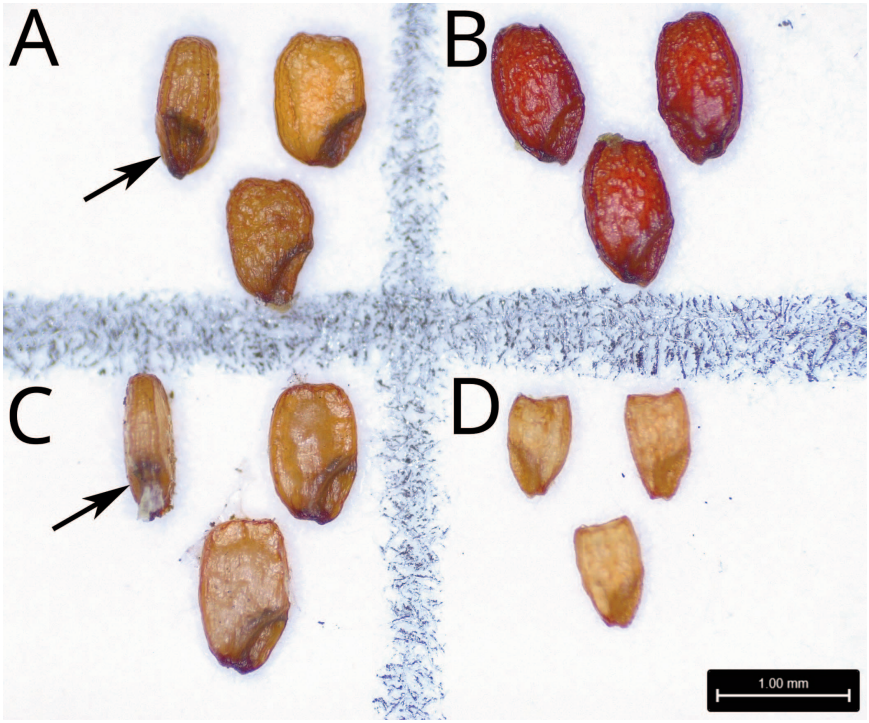

Figure 4. Grains of selected members of the *Sporobolus indicus* complex; all three grains of each species came from the same plant. **A,** *S. fertilis*, note that the grain indicated with the arrow is sitting on its dorsal face. **B,** *S. africanus*, note that the color of the grain is often lighter than these photographed. **C,** *S. indicus*, note that the grain indicated with the arrow is sitting on its dorsal face. **D,** *S. elongatus*.

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New Hawaiian plant records for 2023

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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, six new naturalized records, three new state records, 25 new island records, and six range extensions are reported. Additionally, there are notes regarding 19 taxa that appear to be in the early stages of naturalization but thus far are best considered garden escapes or adventive. Some have been previously documented as naturalized or adventive on other islands.

A total of 59 taxa in 33 plant families are discussed; 39 are dicotyledonous angiosperms, 14 are monocots, five are pteridophytes, and a single gymnosperm is reported. Eight of the taxa are indigenous or a hybrid thereof. Collections were made on the islands of Lāna'i, Moloka'i, Maui, and Hawai'i. Information regarding the formerly known distribution of flowering plants is based on the *Manual of Flowering Plants of Hawai'i* (Wagner *et al*. 1990), *Hawai'i's Ferns and Fern Allies* (Palmer 2003), and information subsequently published in the *Records of the Hawaii Biological Survey*.

Voucher specimens are deposited at Bernice Pauahi Bishop Museum's *Herbarium Pacificum* (BISH), Honolulu, with duplicates at the National Tropical Botanical Garden (PTBG), Lāwa'i, Kaua'i. Some specimens are deposited at only one of the two facilities, or in other herbaria; only in these cases are herbarium acronyms cited.

Apocynaceae

Carissa macrocarpa (Eckl.) A. DC. **New island record**

Natal plum is commonly cultivated as a hedge, due to its thorns. The bright red fruit is edible, and while it is unclear exactly what is dispersing the seeds, it is slowly spreading into adjacent *Scaevola* Coastal Shrubland areas. Seedlings and immature plants are scattered across a broad area, and there appears to be no effort to control the spontaneous plants. Previously it was documented outside of cultivation on O'ahu (Lau & Frohlich 2012: 7) based on a single individual, also found in a coastal area but dominated by *Leucaena leucocephala*.

Material examined. **MAUI:** West Maui, Lahaina Distr, Honokahua, coastal zone near Hawea Pt, 12 m, 5 Mar 2023, *Oppenheimer H32301*.

Araceae

Caladium bicolor (Aiton) Vent. **New island record**

Recently reported from Puna and South Hilo Districts on Hawai'i Island (Resslar 2010), only a 1975 specimen from Puna was cited. This terrestrial aroid was collected on East Maui, where it is occasional in alien-dominated lowland wet forest along old trails and unpaved roads.

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Material examined. **MAUI:** East Maui, Hāna Distr, Mokulehua, N of Puʻu Hīnāʻi, 259 m, 14 Dec 2008, *Oppenheimer, J. Elliot, & T. Pierce H1208126*.

Monstera siltepecana Matuda **New naturalized record**

Not previously known as a naturalized species in Hawaiʻi, this aroid resembles climbing species of *Philodendron*. It differs from *Monstera deliciosa* Liebmann, which is commonly cultivated, in its mostly entire-margined leaves (vs. margins regularly pinnately divided in *M. deliciosa*). Staples & Herbst (2005: 606) separate the two species in their key by the leaves being perforated (as in *M. deliciosa*) or not (*M. siltepecana*), but the narrative for *M. siltepecana* notes that cultivated plants in Hawaiʻi have highly perforated leaves. Both are known as Swiss-cheese plant.

Material examined. **MAUI:** East Maui, Hāna Distr, Wailua, 67 m, 19 Nov 2005, *Oppenheimer H110508*.

Arecaceae

Phoenix sylvestris (L.) Roxb. **New naturalized record**

This spiny palm is known from the plains of India and Pakistan, where its sap is used fresh as a drink or processed into a dark sugar or alcoholic beverage (Barrow 1998). Its habitat ranges from the plains to the coast and includes sandy soil, wetlands, and waterlogged or seasonally inundated areas. This is consistent with the collection locality cited. Leaflets are concolorous with abaxial surfaces lacking ramenta or tannin-stained veins, up to 100 on each side of the rachis, irregularly arranged in more than one plane of orientation. It is also believed to hybridize with other species of *Phoenix*. Barrow (1998) provides a key to and descriptions of the species of *Phoenix* L.

Material examined. **MAUI:** East Maui, Wailuku Distr, Kanahā Pond Wildlife Sanctuary, 8 m, 29 Oct 2000, *Oppenheimer & F. Duvall H100048* (BISH).

Pinanga coronata (Blume ex Mart.) Blume **New island record**

This palm has already been documented to spread outside of cultivation on Oʻahu and Hawaiʻi (Daehler & Baker 2006: 5; Parker & Parsons 2012: 66). On Maui, it is naturalized and spreading onto slopes beyond plantings, with dozens to hundreds of seedlings observed beneath mature individuals.

Material examined. **MAUI:** East Maui, Hāna Distr, Keʻanae, 30 m, 11 Jun 2019, *Oppenheimer H61912.*

Asteraceae

Blainvillea gayana Cass. **New state record**

Native to the African continent, Cape Verde Islands, and Saudi Arabia, this rough-haired annual herb has been introduced to Queensland, Australia as well as Socotra. Placed in Tribe Heliantheae, it grows up to 2m tall, usually with opposite leaves, and small white disc and ray florets. Apparently it has been in Hawaiʻi for several years.

Material examined. **MAUI:** West Maui, Lahaina Distr, just inland from Lahaina on land to be developed as Leialiʻi, 12 Feb 2008, *W.A. Whistler s.n.* (BISH 1141179); Hāhākea Gulch, 400 m, 9 May 2008, *R.W. Hobdy 4291* (BISH); Hāhākea Gulch stream bottom, 200 m, 9 May 2008, *R.W. Hobdy 4292* (BISH); East Maui, Wailuku Distr, Kamaʻole ahupuaʻa, 354 m, naturalized shrubs to 1.75 m tall, erect or sprawling on intermittent stream banks, in pasture and degraded remnant *Erythrina* Dry Forest, 25 Feb 2011, *Oppenheimer, S. Perlman, & J.S. Meidell H21115*; **HAWAIʻI:** South Kohala Distr, Kawaihae, 50 m, 11 Apr 2008, *W.A. Whistler s.n.* (BISH 1141186); Puakō, mauka of Queen Kaʻahumanu Hwy, 10 Apr 2014, *R.W. Hobdy 4354* (BISH).

Helianthus annus L. **New island record**

Previously known from two collections on Hawai‘i Island (Wagner *et al.* 1990: 322), the common sunflower was recently found outside of cultivation on Maui. It is likely an escape from either a nearby sunflower farm, where it is grown to extract oil from the seeds as a biofuel, or from another site as an ornamental and visitor attraction.

Material examined. **MAUI:** West Maui, Wailuku Distr, Waikapū, near Honoapi‘ilani Hwy, 76 m, 31 Mar 2021, *Oppenheimer H32150.*

Pseudognaphalium attenuatum (DC.) Anderb. **New island record**

Previously documented from Hawai‘i Island (Herbst *et al*. 2004: 4), the specimen at PTBG was examined by Christopher Warneke of Michigan State University and determined to be this species, representing a new record for Maui. The Hawai‘i Island collection of this Mexican species was a new record for the United States.

Material examined. **MAUI:** East Maui, Makawao Distr, Kanaio NAR, occasional, terrestrial, erect herbs, 622 m, 22 Dec 2015, *Oppenheimer & M. Padgett H121503*.

Tetramolopium filiforme Sherff **New island record**

Two varieties of this federally listed Endangered species are recognized, both restricted to the Wai‘anae Range on O‘ahu (Wagner *et al*. 1990: 366). Previously, a specimen collected on Maui was erroneously identified as *T. capillare* (Gaudich.) H. St. John, probably based on geographic provenance (Herbst & Wagner 1996: 10). More material from this location and study of herbarium specimens at BISH show that Maui populations are a close but not perfect match for O‘ahu populations. Further examination may reveal them to represent an undescribed taxon. It is more similar to *T. filiforme* var. *polyphyllum* (Sherff) Lowrey than the nominate variety. The Maui populations grow in very wet *Metrosideros polymorpha* riparian habitat along perennial streams commonly associated with species of *Clermontia, Cyanea, Cyrtandra, Hillebrandia,* Urticaceae, and Hymenophyllaceae. Recently there has been a steep decline, with approximately 11 plants in Kaua‘ula (down from 60 just a few years ago), and less than 20 in Hāhākea. The Perlman specimen cited below was the basis for the rediscovery of *T. capillare* (Herbst & Wagner 1996: 10). Since no plants of that species have been observed since the early 1990s (S. Perlman, pers. comm.), it is presumed extinct.

Material examined. **MAUI:** West Maui, Lahaina Distr, Kaua‘ula Valley, 16 Sep 1993, *S. Perlman 13764* (BISH, NY, PTBG, US); *loc. cit.*, 890 m, about 100 plants on vertical cliff, from 1.75–8.00 m above base in open areas, often on moss- or lichen-covered basalt substrate, 2 Dec 2008, *Oppenheimer & S. Perlman H120803* (BISH); Hāhākea Gulch, rooted in cracks of light basaltic, vertical rock walls, 1.5–8.0 m above stream, 823 m, 23 Feb 2006, *Oppenheimer & C. Brosius H20622* (BISH); East Maui, Makawao Distr, Olinda Rare Plant Facility, 1074 m, cultivated, seeds originally from Kaua‘ula Valley, 12 Jul 2017, *Oppenheimer H71701* (BISH, PTBG, US); *loc. cit.*, seeds from Hāhākea Gulch, 12 Jul 2017, *Oppenheimer H71702*.

Athyriaceae

Athyrium haleakalae K.R. Wood & W.L. Wagner **New island record**

Described from specimens collected on windward Haleakalā (Wood & Wagner 2017), this diminutive fern of riparian zones was recently documented from Kaua‘i (Wood & Walsh 2022). Now it has also been collected in Kohala, Hawai‘i Island, where it was noted to be rare, with less than 10 individuals in a single population in wet forest growing on a ledge near a waterfall.

Material examined. **HAWAIʻI:** North Kohala Distr, Puʻu O ʻUmi NAR, 1,090 m, 15 Aug 2022, *Z. Pezzillo & E. Datlof 29* (BISH).

Bignoniaceae

Dolichandra unguis-cati (L.) Miers **New island record**

Cat's-claw climber is known from cultivation and to be sparingly naturalized on Kauaʻi, Oʻahu, Lānaʻi, Maui, and Hawaiʻi (Wagner *et al*. 1990: 388; Imada *et al*. 2000: 10; Oppenheimer & Bartlett 2000: 2; Starr *et al*. 2002: 18). Now it is documented from Molokaʻi.

Material examined. **MOLOKAʻI:** Kualapuʻu, climbing alien, roadside vegetation, 500 m, 18 Nov 2001, *Oppenheimer H110121*.

Brassicaceae

Lepidium bidentatum Montin

var. ***o-waihiense*** (Cham. & Schltdl.) Fosberg **Range extension**

Although Wagner *et al.* (1990: 406) report this herb from Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi, Maui specimens at BISH and PTBG are all from Hāna District, East Maui. The following specimen documents this taxon from Mauna Kahalawai, West Maui, where it was locally common near the shoreline in *Scaevola* Coastal Shrubland with *Schiedea globosa* and other coastal species.

Material examined. **MAUI:** West Maui, Wailuku Distr, Makamakaʻole Stream, 32 m, 30 Jun 2022, *Z. Pezzillo & J. Tabura 18* (BISH).

Bromeliaceae

Neoregelia sp. **New naturalized record**

This bromeliad seems to be popular in cultivation as a ground cover, but it is universally reported as an epiphyte in its South American native range. It rarely- if ever- flowers in Hawaiʻi, so the identification is tentative. Inflorescences are reported to be small and included in the cup. It was collected from an apparently naturalized population, where a few plants were growing on a small cliff in *Metrosideros/Diospyros* Lowland Forest along a steep ledge, where it was well removed from any habitation. Leaves are red, plants spreading by stolons onto nearby steep slopes and into adjacent *ʻōhiʻa* trees. Offshoots, known as "pups" have been collected and although none have flowered yet after almost 10 years in cultivation, the leaf color can change and become green or green and red. There are 1000's of known cultivars.

Material examined. **MAUI:** West Maui, Wailuku Distr, ʻĪao Valley, SW of ʻĪao Needle above Kinihāpai Stream, 415 m, 10 Sep 2013, *Oppenheimer, K. Bustamente, & S. Perlman H91302* (BISH).

Caryophyllaceae

Scleranthus annuus L. **New state record**

Known as German knotweed or annual knawel, this small annual or biennial herb is native to Europe, Asia, and North Africa. It is a common weed in temperate areas, often in disturbed habitat, in the U.S., Central and South America, South Africa, Japan, India, and elsewhere. However, it apparently is in decline in its native range and is no longer present in many sites in Britain and Ireland, and is listed in the Great Britain Vascular Plant Red Data List as Endangered, and in Northern Ireland as a Priority Species. Plants were observed in Haleakalā Crater, as well as near the Park stable area and nursery, and were being controlled by Park staff by foliar herbicide application. It has been theorized that seed may have arrived as a contaminant in imported horse feed.

Material examined. **MAUI:** East Maui, Hāna Distr., Haleakalā Crater, along Halemauʻu Trail between ʻŌʻili Puʻu and Honokahua planting area, 2100 m, 3 May 2018, *P. Welton 2403* (BISH); Makawao Distr., Kalialinui, Haleakalā National Park baseyard, horse pasture, in kikuyu grass and evening primrose, 2,072 m, 7 May 2018, *P. Welton & B. Haus 2404*; *loc. cit.*, 9 May 2018, *P. Welton 2405* (BISH); *loc. cit.*, 2065 m, locally common weedy herb in disturbed subalpine shrubland, 14 June 2018, *Oppenheimer, P. Welton, & B. Haus H61803* (US).

Casuarinaceae

Casuarina cunninghamii Miq.

× ***C. glauca*** Sieber ex Spreng. **New island record**

Previously documented as spreading on Kauaʻi (Lorence *et al.* 1995: 31) and Maui (Oppenheimer & Bartlett 2002: 5), a recent specimen is now known from Lānaʻi.

Material examined. **LĀNAʻI:** Pālāwai basin, near nursery/piggery, 20 Mar 2007, *Oppenheimer, N. Tangalin, B. Plunkett, & S. Perlman s.n.* (BISH 731372).

Cibotiaceae

Cibotium* ×*heleniae D.D. Palmer **New island record**

Palmer (2003: 98) reported this natural hybrid of *C. chamissoi* Kaulf. and *C. menziesii* Hook. from both the Koʻolau and Waiʻanae Ranges on Oʻahu. He suspected it would be found on other islands as well. On Maui it was found growing with both parental species. *Cibotium chamissoi* seems to be uncommon on Maui.

Material examined. **MAUI:** West Maui, Wailuku Distr, Waiheʻe Valley, 785 m, 20 Jun 2016, *Oppenheimer & M. Padgett H61608*.

Costaceae

Costus guanaiensis Rusby **New naturalized record**

This species has not previously been documented as naturalized in Hawaiʻi. Apparently it is most similar to *C. g*. var. *macrostrobilus* (K. Schum.) Maas (D. Skinner, pers. comm. to T. Flynn, PTBG). Staples & Herbst (2005: 651) provided a key to *Costus* in Hawaiʻi and discuss this species (*ibid.*: 653). It is native to Puerto Rico, Mexico, Central America and South America.

Material examined. **MAUI:** East Maui, Hāna Distr, Hāhālawe Gulch, 104 m, 2 m tall herbs, forming thickets in open gullies, with *Hedychium*, flowers white, distal end tinged red, 17 Dec 2005, *Oppenheimer H120505.*

Cyperaceae

Oreobolus furcatus H. Mann **New island record**

Wagner *et al.* (1990: 1424) cites the distribution of this species as Kauaʻi, Oʻahu, Molokaʻi, and Maui. Apparently, specimens collected on Hawaiʻi Island as early as 1974 were overlooked or unavailable during the preparation of the *Manual*. It was also reported to occur at several sites south of the Saddle Road between 1400 m and 1700 m asl (Clarkson 1992).

Material examined. **HAWAIʻI:** Kaʻū Distr, Kaʻū Forest Reserve, Kahuku Ranch, about 1,829 m, 19 Sep 1974, *D. Herbst & G. Spence 5043* (HAW); South Hilo Distr, Kaulana Manu Nature Trail, common along edge of kīpuka, 1665 m, 17 Aug 2022, *Z. Pezzillo & E. Datlof 30* (BISH).

Schoenoplectiella mucronata (L.)
J. Jung & H.K. Choi **New island record**

Known from tropical Africa, southern Europe to southern Asia, Japan, Malesia, the Philippine Islands, and Australia, and naturalized in the United States, Strong & Wagner (1997: 47) documented the first Hawaiian record of this species on Hawai‘i Island (as *Schoenoplectus mucronatus* (L.) Pallas). In a recent revision (Shiels *et al.* 2014) this taxon was transferred to *Schoenoplectiella*. The collection cited here documents this taxon on Maui.

Material examined. **MAUI:** East Maui, Hāna Distr, Kopili‘ula Stream, 366 m, upstream of Hāna Hwy, 4 Jan 2023, *Oppenheimer & K. Bustamente H12305* (BISH, PTBG, US).

Fabaceae

Aeschynomene falcata (Poir.) DC. **New naturalized record**

Australian joint-vetch is native to Argentina, Bolivia, Brazil, Colombia, and Paraguay, and naturalized in eastern Australia. Previously, Hughes (1995: 5) documented *A. paniculata* Willd. ex Vogel as a naturalized species in the Hawaiian Islands, also from the island of Moloka‘i. The identification of the specimen cited here is tentative, and may instead represent *A. elegans* Schltdl. & Cham., which is native to South and Central America. More collections will help clarify which taxon or taxa are represented.

Material examined. **MOLOKA‘I:** Pūniu‘ōhua 2, 390 m, common in pastures, flowers yellow, open in morning, 10 Aug 2006, *Oppenheimer H80604*.

Stylosanthes guianensis (Aubl.) Sw.
var. ***guianensis*** **New island record**

Herbst *et al.* (2004: 7) first documented this taxon from Kaua‘i, but included a voucher from Moloka‘i taken from plants cultivated at the USDA Plant Materials Center in Ho‘olehua. It was uncertain at the time if it was naturalized on the island. The following collection documents this taxon from Moloka‘i.

Material examined. **MOLOKA‘I:** Lūpehu, 330 m, sprawling to ascending subshrubs, woody at base, in degraded forest at edges of pastures and unpaved roads, 7 Nov 2007, *Oppenheimer H110718*.

Vicia sativa L. subsp. ***nigra*** (L.) Ehrh. **Range extension**

Common vetch has been documented from Kaua‘i (Wood 2007: 15), East Maui, and Hawai‘i (Wagner *et al.* 1990: 717). The following collections document a range extension to Mauna Kahalawai, West Maui.

Material examined. **MAUI:** Wailuku Distr, vicinity of Pu‘u Anu, along unpaved road, 914 m, 12 May 2020, *Oppenheimer H52007*; Lahaina Distr, near Manawainui, 914 m, along unpaved road, 21 May 2020, *Oppenheimer, K. Bustamente, & K. Kaiakala H52007*.

Vigna hosei (Craib) Backer **New island record**

Sarowak bean has been previously documented from O‘ahu (Staples *et al,* 2006: 7) and Hawai‘i (Pratt & Bio 2012: 77). Now it is known from East Maui, where it was locally common.

Material examined. **MAUI:** East Maui, Makawao Distr, Kaupakulua ahupua‘a, west side of Uaoa Bay, near ‘Ōpana Pt, 49 m, locally common vines in grassy pasture, flowers yellow, 28 Jul 2021, *Oppenheimer H72112.*

Lamiaceae

Mesosphaerum suaveolens (L.) Kuntze **New island record**

[syn.: *Hyptis suaveolens* (L.) Poir.]

Widely naturalized and in Hawai‘i cultivated by Filipino laborers for medicinal use and as food flavoring, this herb has been reported from the islands of O‘ahu, Maui, and Hawai‘i (Wagner *et al.* 1990: 802; Wagner & Herbst 1995: 22; Starr *et al.* 2006: 36; Oppenheimer 2008: 29). The change in name was reported by Imada (2019: 119).

Material examined. **LĀNA‘I:** Palawai Basin, around abandoned structures, vicinity of Pāwili and Palikoa‘e Gulch, 400 m, herbs to 1 m+ tall, sparingly branched, 30 Nov 2022, *Oppenheimer, K. Bogner, & Z. Pezzillo H112216.*

Linderniaceae

Torenia asiatica L. **New island record**

[syn: *Torenia glabra* Osbeck]

Formerly placed in Scrophulariaceae and documented as naturalized in Hawai‘i from the island of Hawai‘i (Wagner *et al.* 1990: 1246), this annual herb, known as ‘Ōla‘a beauty or *nani-o-‘Ōla‘a*, is now known from similar lowland wet habitats on Maui.

Material examined. **MAUI:** Hāna Distr, Nāhiku, west of Kahawaihapapa, 268 m, herbs, decumbent to sprawling in disturbed understory on flower farm, flowers blue/purple, 31 May 2019, *Oppenheimer H51915*; 4 km W of Wai‘ānapanapa State Park, 173 m, 23 Oct 2022, *K. Faccenda 2749* (BISH).

Malvaceae

Hibiscus furcellatus Desr. **Range extension**

Native in low elevations in the West Indies, Florida, Central and South America, and apparently also in Hawai‘i (Wagner *et al.* 1990: 885), the local range of *Hibiscus furcellatus* was reported as Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i. There have been no collections from Mauna Kahalawai (West Maui) until now (C. Imada, pers. comm.; T. Flynn, pers. comm). A small but dense stand comprised of approximately 100 plants appeared after the site was cleared of alien vegetation as part of a restoration project (D. Sparkman, pers. comm.).

Material examined. **MAUI:** West Maui, Lahaina Distr, Olowalu Valley, N side of stream, 61 m, 26 Aug 2022, *Oppenheimer H82202*.

Hibiscus ovalifolius (Forssk.) Vahl **New island record**

[syn.: *Hibiscus calyphyllus* Cav.]

Naturalized in low elevation, dry areas on Kaua‘i (Wagner *et al.* 1990: 884), a small population was recently found on Maui in similar habitat. Staples *et al.* (2003: 14) reported the taxonomic change.

Material examined. **MAUI:** West Maui, Lahaina Distr, Honokahua, 244 m, sprawling 1.0–1.5 m tall patch approximately 500 m², 12 Mar 2023, *Oppenheimer H32334.*

Myrtaceae

Eucalyptus obliqua L’Hér. **New state record**

This was the first *Eucalyptus* species ever described. It was collected on Captain Cook’s third voyage by David Nelson in Tasmania. Known all messmate stringybark, it has grey to brown fissured bark; leaves are concolorous, asymmetrical; flowers white; capsules are barrel-shaped to globose, with 3-4 valves included just below the rim (Euclid, accessed

January 2024). Skolmen (1980: 186) lists only 4 trees of this species being planted in Hawai‘i, on Hawai‘i Island at Humu‘ula in the Mauna Kea Forest Reserve in 1958.

Material examined. **LĀNA‘I:** Ka‘ohai, Lōpā Gulch, vicinity of Pu‘u Nēnē, 530 m, common trees, bark rough, grayish, spreading from plantings with *E. robusta,* 3 Apr 2019, *Oppenheimer & K. Bogner H41904* (BISH).

Eucalyptus sideroxylon A. Cunn. ex Woolls subsp. ***sideroxylon*** **New island record**

Red ironbark was reported as planted on the islands of Kaua‘i, O‘ahu, Moloka‘i, and Maui, and regenerating both within and near the plantations (Wagner *et al.* 1990: 958). This is the first record for Lāna‘i.

Material examined. **LĀNA‘I:** Paoma‘i, between Hawai‘ilānui and Kahue Gulches, 520 m, trees spreading locally from plantings, bark rough and furrowed, 18 Apr 2019, *Oppenheimer, K. Bogner, M. Keir, & M. Walker H41909* (BISH).

Nephrolepidaceae

Nephrolepis* ×*medlerae W.H. Wagner **New island record**

Palmer (2003: 193–194) reported this hybrid between an endemic taxon (*N. exaltata* (L.) Schott subsp. *hawaiiensis* W.H. Wagner) and an introduced species (*N. multiflora* (Roxb.) F.M. Jarrett ex C.V. Morton) only on O‘ahu. It also occurs on Maui, and is likely more widespread. *Nephrolepis multiflora* is now treated as *N. brownii* (Desv.) Hovenkamp & Miyam. (Hovenkamp & Miyamoto 2005: 293).

Material examined. **MAUI:** East Maui, Makawao Distr, Kailua Stream, E tributary, 866 m, 28 Mar 2007, *Oppenheimer, S. Perlman, & N. Tangalin H30726*.

Phyllanthaceae

Phyllanthus leucanthus Pax **New island record**

Recently reported as naturalized on Kaua‘i, O‘ahu, Maui, and Hawai‘i (Faccenda 2023a: 7), this weedy herb is now also known from Lāna‘i. It was noted to be locally common, with hundreds of plants observed on the island.

Material examined. **LĀNA‘I:** Palawai Basin, around abandoned structures, vicinity of Pāwili and Palikoa‘e Gulch, 400 m, 30 Nov 2022, *Oppenheimer, K. Bogner, & Z. Pezzillo H112217*; Lāna‘i City, weed in garden bed, 21 Jun 2023, *K. Faccenda 3165* (BISH).

Pinaceae

Pinus pentaphylla Mayr **New naturalized record**

Japanese white pine, or *goyomatsu*, is used for bonsai (Staples & Herbst 2005: 71). It differs from other species introduced to Hawai‘i by its unscented needles in bundles of 5. Richardson & Rejmánek (2004) reported the Pinaceae as having the highest percentage of invasive taxa, compared to other woody families. Skolmen (1980) does not list this species as being planted in forest reserves in Hawai‘i.

Material examined. **MOLOKA‘I:** Kikiakalā, 935 m, 25 Sep 2008, *Oppenheimer H90818* (BISH).

Piperaceae

Peperomia cookiana C. DC. **New island record**

This endemic herb is known from Kaua‘i, Moloka‘i, Maui, and Hawai‘i (Wagner *et al.* 1990: 1022). More recently it was documented from O‘ahu (Imada & Kennedy 2019: 78–

79). It was found on Lānaʻi growing as both a low epiphyte and on a small waterfall along an intermittent stream.

Material examined. **LĀNAʻI:** Hauʻola Gulch, 950 m, 26 Sep 2018, *Oppenheimer & K. Bogner H91801*; Hauʻola Gulch, along main stream, 850 m, 11 Aug 2021, *Oppenheimer, K. Bogner, & A. Jaquemin H82106, H82107* (BISH).

Plantaginaceae

Veronica peregrina L. subsp. ***xalapensis*** (Kunth) Pennell **Range extension**

Necklace weed has been previously placed in Scrophulariaceae and reported from Hawaiʻi (Wagner *et al.* 1990: 1250), Kauaʻi (Lorence *et al.* 1995: 54), and East Maui (Starr *et al.* 2002: 25). It was found on West Maui growing in an agricultural area.

Material examined. **MAUI:** West Maui, Lahaina Distr, Honokahua, between Kahauiki and Honolua, 91 m, 29 Feb 2020, *Oppenheimer H22005*.

Poaceae

Botriochloa barbinodis (Lag.) Herter **New island record**

Fuzzy Top has been previously documented as naturalized on Niʻihau, Oʻahu, Molokaʻi, East Maui, and Hawaiʻi (Wagner *et al.* 1990: 1502; Starr *et al.* 2006: 38). Now this grass is also known from Lānaʻi.

Material examined. **LĀNAʻI:** Kuamoʻo Ridge, 300 m, in degraded *Dodonaea* Lowland Dry Shrubland, 20 Apr 2011, *Oppenheimer H41107*; Kaʻa, vicinity Kapukaloa, 540 m, occasional in dry, disturbed areas in degraded *Dodonaea* Lowland Dry Shrubland, 11 Oct 2018, *Oppenheimer, M. Kier, & K. Bogner H101810* (BISH).

Eragrostis curvula (Schrad.) Nees **Range extension**

Previously reported from Oʻahu, Kahoʻolawe, and East Maui (Herbst & Clayton 1998: 26; Oppenheimer 2003: 20), and recently reported from Molokaʻi, Lānaʻi, and Hawaiʻi (Faccenda 2023b), this lovegrass also occurs on West Maui.

Material examined. **MAUI:** Wailuku Distr, ʻĪao Valley, gulch E of Needle, occasional on talus slope below cliff, 518 m, 9 Feb 2016, *Oppenheimer & M. Padgett H21609* (BISH).

Hyparrhenia rufa (Nees) Stapf **Range extension**

Thatching grass was reported as naturalized on Kauaʻi, Oʻahu, Molokaʻi, Maui, and Hawaiʻi (Wagner *et al.* 1990: 1554). At the time all the Maui specimens had been collected on East Maui. The following voucher documents this species from West Maui. Herbst & Clayton (1998: 28) provided a key to the species known to be naturalized in Hawaiʻi.

Material examined. **MAUI:** Lahaina Distr, N of Wahikuli Gulch, 658 m, locally common in open areas, along unpaved roads, trails, and disturbed/degraded lowland dry shrubland, 6 Dec 2018, *Oppenheimer & D. Tanaka H121801*.

Sporobolus diandrus (Retz.) P. Beauv. **New island record**

Documented from the islands of Kauaʻi, Oʻahu, and Hawaiʻi (Wagner *et al*. 1990: 1596; Lorence & Flynn 1997: 11) (as *S. diander*), this grass is now known to occur on Maui, where it is occasional in low elevation, disturbed lawns and agricultural areas.

Material examined. **MAUI:** Hāna Distr, Honomāʻele, 20 m, clumping grass, occasional in lawn, 2 Sep 2014, *Oppenheimer, K. Bustamente, C. Lum, & R. Lee H91401* (BISH); Nānuʻalele, north side of Hāna Bay, 3 m, sparingly naturalized in disturbed coastal site, 16 Jul 2018, *Oppenheimer, F. Duvall, & S. Hau H71808* (BISH); Hāna, intersection of highway and Uakea Rd, 35

m, 23 Oct 2022, *K. Faccenda 2744* (BISH); E of Waiʻānapanapa, 53 m, 23 Oct 2022, *K. Faccenda 2772* (BISH); Makawao Distr, Kanaio, 488 m, in *Dodonaea* Dry Shrubland, 14 Nov 2017, *Oppenheimer, A. Lau, D. Frohlich, & J. Breeden H111712*.

Pteridaceae

Doryopteris subdecipiens W.H. Wagner **New island record**

Possibly a hybrid, *Doryopteris subdecipiens* is intermediate between the endemic *D. decipiens* (Hook.) J. Sm. and *D. decora* Brack. (Palmer 2003: 133; W.H. Wagner *et al*. 1999: 146–152), and known from isolated populations in dry to mesic, rocky, exposed sites on Kauaʻi, Oʻahu, Lānaʻi, Maui, Kahoʻolawe, and Hawaiʻi. On Molokaʻi in mesic shrubland it is at least locally common following significant reductions in the feral goat population, with fronds reappearing during the wet season.

Material examined. **MOLOKAʻI:** East Kawela, unnamed gulch to E of road to Puʻu Kolekole Cabin, E of East Kawela Gulch, 820 m, common terrestrial fern on rocky substrates, on slopes and gulch bottom, 2 Apr 2009, *Oppenheimer & A. Bakutis H40906* (BISH).

Rosaceae

Rosa laevigata Michx. **New island record**

Cherokee rose was first documented as naturalized in Hawaiʻi by Nagata (1995: 12), citing a specimen from the summit of Lānaʻi. Pūlama Lānaʻi has been working to eradicate this thorny species (K. Bogner, pers. comm.). It has also been documented from Hawaiʻi Island (Parker & Parsons 2012: 61) and Oʻahu (Frohlich & Lau 2014: 14), and more recently Kauaʻi (Brock *et al.* 2023: 139). Here it is reported for the first time as naturalized on Maui, where it forms a dense thicket that is sprawling down a cliff into a nearby gulch. What is likely this taxon has been observed during helicopter reconnaissance on Mauna Kahalawai (West Maui), but specimens have not yet been collected.

Material examined. **MAUI:** East Maui, Makawao Distr, 1250 m, between Kailua and Kahakapao Gulches, locally naturalized sprawling, vining, or climbing shrubs, flowers white, fragrant in late afternoon, may not open until afternoon, 24 Apr 2020, *Oppenheimer H42001*.

SPECIES SHOWING SIGNS OF NATURALIZATION

Amaryllidaceae

Hymenocallis pedalis Herb.

This large herb was observed to be escaping beyond its cultivated plantings into nearby shady lawns, pastures, and waste areas. It has also been observed, but not collected, spreading locally beyond plantings in Hāna District, Maui.

Material examined. **MOLOKAʻI:** N coast of E Molokaʻi, Wailau Valley, rocky flat above beach near old habitation, 4 Jul 1933, *Fosberg 9668* (BISH); S bank of Pāpio Gulch, 200 m, 7 Nov 2007, *Oppenheimer H110722* (BISH).

Asteraceae

Cosmos sulphureus Cav.

This annual has been collected at least twice outside of cultivation. The Lahaina collection was made near Honoapiʻilani Highway, and an adjacent resident who had it under cultivation stated that the roadside individual was not planted and that it volunteers in nearby lots and yards, with the wind dispersing the seeds. Plants are usually unbranched, up to 1 m tall, with orange flowers.

Material examined. **MAUI:** West Maui, Lahaina Distr, Wahikuli, 3 m, 3 Dec 2000, *Oppenheimer H120001* (BISH); Wailuku Distr, along Route 30 between Māʻalaea and Ukumehame, mile marker 9 west of scenic lookout, 31 m, 8 Feb 2004, *Oppenheimer H20401* (BISH).

Gerbera jamesonii Adlam

This small, tap-rooted herb was found amongst planted conifers in a grassy area. The ray florets are pink. It did not appear to be cultivated nearby.

Material examined. **MAUI:** East Maui, Makawao Distr, Olinda, 1128 m, 6 Apr 2002, *Oppenheimer, F. Duvall, & L. Nelson H40204* (BISH).

Tagetes erecta L.

A single 75 cm tall plant with bright orange, fragrant flowers was found growing along a weedy roadside.

Material examined. **MAUI:** East Maui, Makawao Distr, ʻŌmaʻopio, 91 m, 16 Mar 2002, *Oppenheimer H30214* (BISH).

Begoniaceae

Begonia cf. 'Lucerna'

Of hybrid origin, this is one of the most popular of the so-called cane-stem begonias. Staples & Herbst (2005: 175) include this hybrid in their key and provide a description.

Material examined. **MAUI:** East Maui, Hāna Distr, Honolulunui, 61 m, terrestrial shrubs/herbs, growing in shady, wet *Ardisia elliptica* forest, flowers red, possibly naturalized, 16 Nov 2012, *Oppenheimer & S. Perlman H111219* (BISH).

Bignoniaceae

Tabebuia aurea (Silva Manso) Benth. & Hook. ex S. Moore

This yellow-flowered tree was escaping into nearby fallow pineapple fields, where many seedlings and saplings up to 2 m tall were observed up to 25 m downwind of the parent tree. It is a popular street tree, and seedlings are commonly observed in areas downwind from cultivated trees where there is sufficient irrigation and infrequent weed control.

Material examined. **MAUI:** West Maui, Lahaina Distr, Honokahua, 82 m, 12 May 2001, *Oppenheimer H50107*.

Caryophyllaceae

Lampranthus amoenus (Salm-Dyck) N.E. Br.

This sprawling succulent was found in a site where it was unlikely to be under cultivation. Two large, tangled clumps with purple flowers were observed in *Scaevola* Coastal Shrubland.

Material examined. **MAUI:** West Maui, Lahaina Distr, Hāwea Pt, 8 m, 6 May 2004, *Oppenheimer & G. Hansen H50402*.

Fabaceae

Strongylodon macrobotrys A. Gray

Jade vine is commonly used in lei. In Hāna District, single individual vines were observed sprawling in secondary alien-dominated forest where it appeared unlikely to be under cultivation, or near former residences. A few seeds pods were also observed, but seeds were not tested for viability.

Material examined. **MAUI:** East Maui, Hāna Distr, Nāhiku, Kālepalehua Gulch, 70 m, large vines, inflorescence pendent, flowers green/blue when fresh but drying blue, in dense shade of secondary forest, 31 May 2019, *Oppenheimer H51914*.

Iridaceae

Neomarica gracilis (Herb.) Sprague

The walking iris was observed spreading vegetatively beyond its plantings. It spreads via rhizomes as well as plantlets on the tips of the leaves, which root when the leaves age and touch the ground. It also appeared to be setting seeds, although none were collected and propagated to test their viability.

Material examined. **MAUI:** West Maui, Lahaina Distr, Honolua Valley, 250 m, 19 Mar 2002, *Oppenheimer & E. Romanchak H30215*.

Lamiaceae

Mentha* ×*piperita L.

Peppermint is widely cultivated but is a sterile hybrid not producing any seeds, and is propagated vegetatively (Staples & Herbst 2005: 357).

Material examined. **MOLOKA'I:** Wailau Valley, 90 m, originally cultivated, now escaped and common in muddy and/or rocky sites nearby, flowers purple, 11 Oct 2009, *Oppenheimer & S. Perlman H100905* (BISH).

Perilla frutescens (L.) Britton

Chiso is an aromatic herb used to garnish sushi platters. It was collected along a rocky, intermittent stream in alien-dominated forest, as well as observed in nearby sidewalk cracks. The collection was a purple-leaved form; others apparently can be green.

Material examined. **HAWAI'I:** South Hilo Distr, Waiākea Stream, 37 m, 2 Aug 2001, *Oppenheimer H80104* (BISH).

Malvaceae

Hibiscus acetosella Welw. ex Hiern

The red-leaved hibiscus is native to Africa and includes both green- and red-leaved forms. Apparently, only the red-leaved form is cultivated in Hawai'i. It is propagated by cuttings or seeds and can be grown in most habitats except oceanfront, but thrives in hot, sunny places sheltered from the wind (Staples & Herbst 2005: 388). On Maui it is noted as a garden escape that could become naturalized if grown in suitable habitat.

Material examined. **MAUI:** West Maui, Lahaina Distr, Olowalu, 3 m, in abandoned field near where a small nursery was located, 15 Dec 2004, *R.W. Hobdy 4196* (BISH); Kahana, 12 m, cultivated, but a garden escape, 14 Nov 2005, *Oppenheimer H110506*.

Hibiscus hastatus L. f.

This species was found growing amongst *H. tiliaceus* L., and potentially will hybridize with it. It is native to India and differs from *H. tiliaceus* by its unevenly 3-lobed leaves, the terminal lobe twice as long as the lateral lobes; the petals as well are lobed at their apex.

Material examined. **MAUI:** East Maui, Hāna Distr, Nānu'alele, N side of Hāna Bay, in coastal area, 3 m, trees to 6 m tall, 16 Jul 2018, *Oppenheimer, F. Duvall, & S. Hau H71807* (BISH).

Pedaliaceae

Sesamum orientale L.

Sesame is a short-lived annual herb common in the culinary arts and in baked goods. The specimen was made near a grocer, where leftovers from the kitchen may have been discarded in a landscaped hedge of *Hibiscus*. It has apparently been observed near bakeries on Oʻahu (G. Staples, pers. comm.).

Material examined. **MAUI:** West Maui, Wailuku Distr, Kahului, 8 m, 3 Jun 2000, *Oppenheimer H60010* (BISH).

Phyllanthaceae

Breynia androgyna (L.) Chakrab. & N.P. Balakr.

[syn.: *Sauropus androgynus* (L.) Merr.]

Reported as naturalized on Oʻahu (Frohlich & Lau 2008: 5), a single plant obviously not under cultivation was found on East Maui. This species has been reported to be dioecious and propagated by seed (*ibid.*); however, Staples & Herbst (2005: 296) state that the flowers are unisexual, with both male and female flowers borne on the same plant. The change in name was reported by Imada (2019: 137).

Material examined. **MAUI:** East Maui, Hāna Distr, lower Nāhiku, Honolulunui, 61 m, single shrub 2 m tall in shady, wet *Ardisia elliptica* forest along trail, flowers red or yellow, possibly naturalized, 16 Nov 2012, *Oppenheimer & S. Perlman H111220.*

Scrophulariaceae

Leucophyllum frutescens (Berland.) I.M. Johnst.

This ornamental shrub, known as Texas Ranger, is native to Texas and adjacent northern Mexico (Staples & Herbst 2005: 527). It has silvery/gray hairy foliage and rose-purple flowers. It has been found growing in a couple of sites where it is obviously not under cultivation.

Material examined. **MAUI:** Lahaina Distr, Honokahua, in *Scaevola* Coastal Shrubland, 18 m, 18 Aug 2012, *Oppenheimer H81227* (BISH); *loc. cit.*, 19 May 2019, *Oppenheimer H51913*; Wailuku Distr, between Māʻalaea Bay and McGregor Pt along roadside, 30 m, 16 Mar 2016, *Oppenheimer H31920*.

Selaginellaceae

Selaginella pallescens (C. Presl) Spring

This spikemoss was found spreading from its original planting, which was used as a groundcover. Native to Mexico and known as “leather fern,” the fronds are erect and arranged in a shuttlecock fashion.

Material examined. **MAUI:** East Maui, Makawao Distr, Waiohuli, 914 m, 25 Jan 2003, *Oppenheimer & E. Romanchak H10303* (BISH).

Urticaceae

Pilea cadierei Gagnep. & Guillaumin

Cultivated for its attractive variegated foliage (Whistler 2000: 361), this species was observed in an area obviously not under cultivation.

Material examined. **MAUI:** East Maui, Hāna Distr, Honolulunui, 61 m, growing in dense shade of wet *Ardisia elliptica* forest, adaxial leaf surface with silvery white bands, 16 Nov 2012, *Oppenheimer & S. Perlman H111218*.

Pilea serpyllacea (Kunth) Liebm.

Similar to but much larger than *P. microphylla* (L.) Liebmann, this species is used as a border plant in landscaping (Whistler 2000: 363). It was observed growing with weedy *P. microphylla* and spreading locally.

Material examined. **MAUI:** Wailuku Distr, ʻĪao Valley, Kepaniwai Park, 213 m, apparently spreading from plantings in landscaping, 19 Jun 2023, *Oppenheimer H62336.*

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Report of 24 new naturalized weeds across the islands of Hawai‘i

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Between 2021 and 2023, extensive roadside plant surveys were conducted across the islands of Hawai‘i. While the goal of these surveys was to identify and map grasses, many new non-grass plants were also found. For further details about these surveys, see Faccenda (2023). This paper enumerates 12 new state records (species never before reported in the islands of Hawai‘i) and 10 new naturalizations (species recorded reproducing outside of cultivation for the first time), along with confirmation of naturalization for 2 species previously published as questionably naturalized, and 5 new questionable naturalizations.

The citizen science platform inaturalist.org was quite useful for this work for both identifying other populations of naturalized plants not seen by the author, and drawing attention to certain new naturalizations. Naturalizations of *Euphorbia ophthalmica, Lindernia rotundifolia, Pilea nummulariifolia, Solanum chaoense,* and *Thalia geniculata* were all brought to the attention of the author through the iNaturalist platform and proved to be legitimate.

Among the 24 new naturalized records reported herein, *Aneilema beniniense*, *Dracaena aubryana*, *Epidendrum calanthum*, *Galianthe brasiliensis*, *Hedychium greenii*, *Lobelia xalapensis*, and *Thalia geniculata* are reported as naturalized for the first time outside of their native range. All identifications were made by the author, unless otherwise noted. Voucher collections mentioned are housed in Bishop Museum’s Herbarium Pacificum (BISH), Honolulu, Hawai‘i.

Aizoaceae

Tetragonia echinata Aiton **New state record**

Tetragonia echinata was found during casual botanizing in Kapolei, where hundreds of plants were found in three scattered populations along Kualakai and Kapolei Parkways. A further population was later found in ‘Ewa at One‘ula Beach Park. The identity of this species was determined using the keys in Adamson (1955). *Tetragonia echinata* is native to South Africa and has previously been reported as naturalized in the Canary Islands (Padrón-Mederos *et al.* 2009). In its native range, it is described as a pioneer plant, and is reported growing from roadsides and open areas (Adamson 1955). From where it has been observed in Hawai‘i, it was only common on shallow, rocky soils where *Cenchrus ciliaris* was unable to establish, or from disturbed areas, making this plant unlikely to have a major environmental impact in Hawai‘i. During roadside surveys on Hawai‘i Island, *T. echinata* was also encountered and photographed at Waikoloa Village [link], but was unfortunately not collected. *Tetragonia echinata* differs from *T. tetragonoides* (the only other naturalized *Tetragonia* in Hawai‘i) by its smaller leaves, only four anthers per flower, minute flowers with sepals only 2 mm long, and multiple fruits per node (Figure 1).

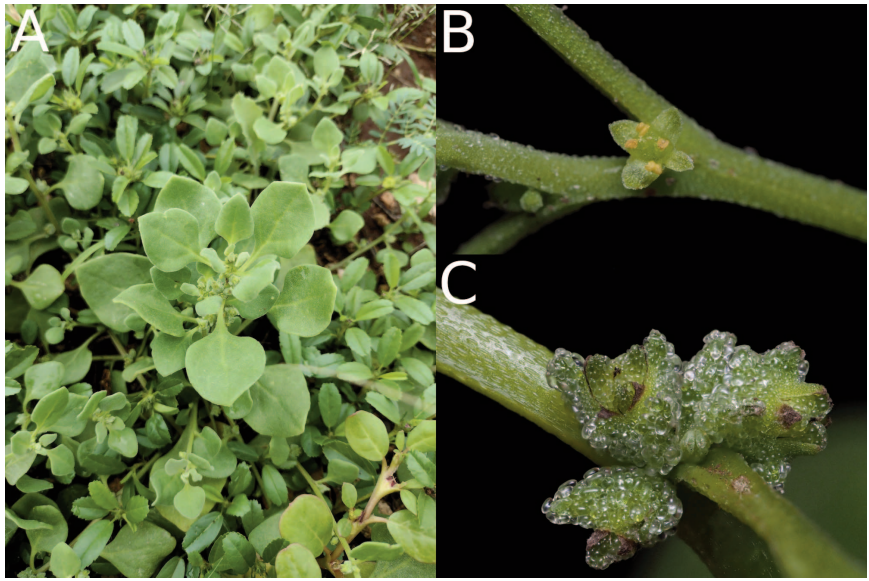

Figure 1. *Tetragonia echinata* photographed in Kapolei, Oʻahu. **A,** habit and leaves. **B,** flower. **C,** fruits.

The following description is taken from Adamson (1955: 144):

> "A more more less prostrate many stemmed papulose slightly succulent annual. Stems up to 40 cm long, with raised decurrent lines from the leaf bases. Leaves petiolate, the blades oval, rhombic or deltoid, or occasionally almost orbicular, 1–2.5 cm long, 0.8–1.75 cm wide, obtuse; petiole 0.3–0.8 cm long. Flowers small, 2 mm long, in axillary groups of 2–4 on very short pedicels. Perianth densely papulose, the segments 3–5, erect, triangular, obtuse, concave inside. Stamens 3–5, alternate with the perianth segments but occasionally paired: anthers oval. Styles usually 3 less often 4 or 5, not longer than the stamens. Ovary densely papulose, inferior but with 3–5 obtuse projections opposite the perianth segments. Fruit papulose, 3–5 mm long and wide, round or partly truncate at the top with 3–5 projecting ridges each with few or many spine like outgrowths."

Material examined. **Oʻahu**: Kapolei, intersection of Kinoiki St and Kapolei Pkwy, in undeveloped, grassy area outside fire station, from shallow, rocky soil where buffelgrass wasn't growing, full sun, unirrigated, over 400 plants seen at this location, populations also seen about 0.7 km E of this location and 1 km N of here, flowers minute, greenish yellow, most of them 4-merous, but about 1/4 3-merous, fruits covered in conspicuous "ice" cells, 18 m, 21.336208, -158.053663, 18 Feb 2023, *K. Faccenda 3028*; ʻEwa, Oneʻula Beach Park, northwestern edge of park along park boundary, from gravelly substrate, full sun, dry, around 100 plants seen, 3 m, 21.307346, -158.030940, 13 Mar 2023, *K. Faccenda & M. Ross 3072*.

Figure 2. *Crinum asiaticum* naturalized north of Swanzy Beach Park, O‘ahu.

Amaryllidaceae

Crinum asiaticum L. **New naturalized record**

Crinum asiaticum is naturalized on O‘ahu, where it has been observed naturalizing in coastal areas on the windward side of the island. The main population examined by the author consisted of around 20 plants growing amongst driftwood from wet sandy soil within 10 meters of the ocean (Figure 2). Further populations exist on the beach at Ahupua‘a ‘O Kahana State Park nearby. *Crinum asiaticum* is also naturalized on the north shore of Kaua‘i, based on observations from iNaturalist [link], but has not yet been collected. *Crinum asiaticum* was imported to Hawai‘i as an ornamental and is still widely grown in gardens across the islands (Staples & Herbst 2005). It has been present on O‘ahu since at least 1928 (*F.B.H. Brown 1468*).

Material examined. **O‘AHU**: Along Hwy 83 about 1 km N of Swanzy Beach Park, about 10 m from beach, coastal, about 20 plants seen, naturalized and spreading, 1 m, 21.557790, -157.866925, 23 Aug 2022, *K. Faccenda & T. Chapin 2687.*

Asparagaceae

Dracaena aubryana Brongn. **New naturalized record**

A small patch of about five individuals of *Dracaena aubryana* was found about 15 meters away from a road in the back of Kalihi Valley. The plants were far enough from the road that it seemed unlikely they were dumped (dumped plants were noticed closer to the road). Plants of *D. aubryana* have also been posted to iNaturalist from forested areas of

Figure 3. *Dracaena aubryana* seen in Kalihi, O‘ahu.

Waimānalo along the Maunawili Ditch Trail, and Moanalua valley where they also are naturalized [link] [link] [link]. Fruits were found on the plant in Kalihi and were photographed on one of the plants from Waimānalo, giving further evidence that this species is reproducing sexually and spreading.

Dracaena aubryana is a small shrub identified by its distinctive lanceolate leaf shape (Figure 3). This species is native to tropical Africa and was imported to Hawai‘i for ornamental use; it has been present on O‘ahu since at least 1955 (*H.F. Clay s.n.*, BISH147007).

The following description is from Mwachala & Mbugua (2007: 1):

> “Shrub 0.4–2.5 m high, usually unbranched; stem erect, often twisted spirally. Leaves distichous, often asymmetric, ovate to narrowly ovate, 10–40(–60) cm long, (1.5–)4–10(–15) cm wide, base rounded or cuneate, apex acute to cuspidate; petiole 5–30(–100) cm long. Inflorescence erect, spicate or paniculate, 9–70 cm long, unbranched or with a few branches near the base; flowers in groups of 1–3(–7) on distinct knobs with a single triangular bract to 10 mm long; pedicel 0–2 mm long, articulated below the middle. Flowers white or greenish-white, each lobe often with purple-red central band, (10–)15–30(–55) mm long, tube 5–10(–30) mm long, lobes 10–20 mm long, to 2.5 mm wide. Fruits shiny bright orange, deeply 1–3-lobed, lobes ovoid, 8–18 mm long, 4–9 mm in diameter; seeds dirty white, ovoid, 6–14 mm wide, 5–7 mm long.”

Material examined. **O‘AHU**: Kalihi Valley, Kalihi St in back of valley, roadside, wet, full shade, about 30 ft into woods off road, a few plants seen, 138 m, 21.362912, -157.847049, 19 May 2022, *K. Faccenda & B. Najarian 2377*.

Asphodelaceae

Aloe aff. ***littoralis*** Baker **New naturalized record**

An *Aloe* species has escaped from cultivation from the Koko Crater Botanical Garden and now is well naturalized on the southern slope of the crater, especially at the upper elevations. At least 400 plants have been observed, although the population is likely in the thousands, as red inflorescences could be seen up and down the slope of the crater when scanning with binoculars (Figure 4D). Given the size of this population and the size of the plants, it has likely been established for a minimum of 10–20 years.

Some inflorescences on this population had many fruits, but none of the inflorescences flowering in April 2023 made fruit, suggesting it is not being pollinated sufficiently at all times of the year. Some plants also had their leaves and flowers severely galled, likely by the Aloe mite (*Aceria aloinis*). Observations on iNaturalist.org also suggest that 1 to 2 other species of *Aloe* have also escaped on the upper slopes of the crater, but have yet to be vouchered or identified.

Identification of this *Aloe* proved challenging, even with the aid of the accession list of the Koko Crater Botanical Garden, as around 70 species have been accessioned and planted in the garden (Talia Portner, pers. comm.). The key and photographs in Carter *et al.* (2011) were principally used to attempt to identify this plant, but no satisfying match could be found. Attempts to contact *Aloe* experts for assistance were unsuccessful, so only a tentative identity is published at this time.

Based on the keys in Carter *et al.* (2011), the closest match for this plant is *Aloe littoralis*, a species of shrubby or shorter tree aloe that often flowers before growing an upright trunk. The Koko Crater plants principally differ from *A. littoralis* in the length of their corolla and how deeply the sepals are cut, but otherwise are a reasonable match. The seedlings of this *Aloe* have spotted leaves, while the adult plants do not, which is also a match for *Aloe littoralis* (Walker 2018).

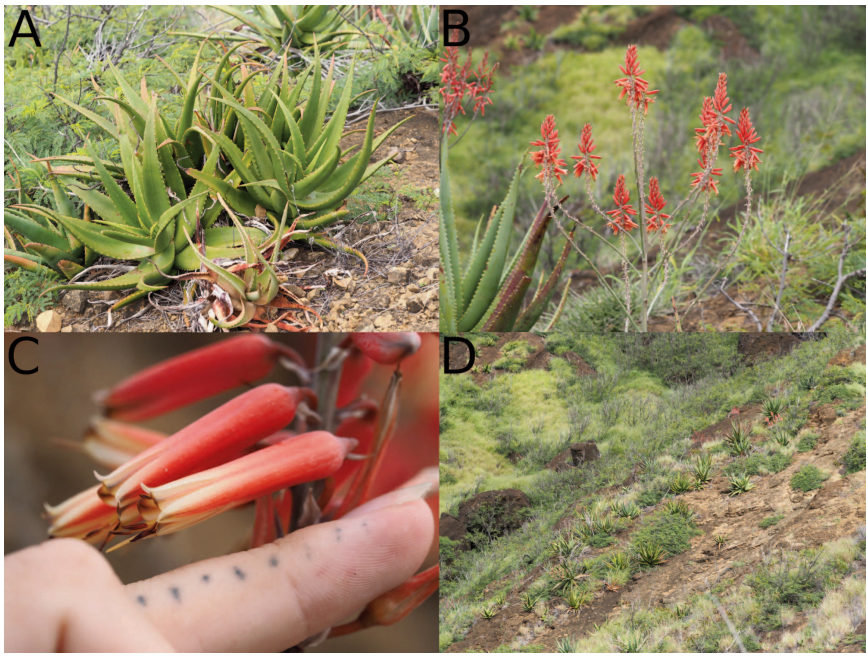

Figure 4. *Aloe* aff. *littoralis* seen at the base of Koko Crater arch, O‘ahu. **A,** leaves. **B,** inflorescence. **C,** flowers; note that increments on scale bar tattoo are 5 mm. **D,** habit showing at least 35 plants naturalized on the tuff slopes, largely from cracks in rock.

It is also possible that this population is a hybrid swarm. Carter *et al.* (2011) stated that “most *Aloes* are self incompatible … therefore, plants grown from seed arising from uncontrolled pollination in the garden are likely to be hybrids.” There is certainly the germplasm in Koko Crater for such hybridization, and the inability to match these plants to any pure species also suggests it may be a hybrid.

Material examined. **O‘AHU**: Koko Crater, Koko Crater arch on N side of tuff cone, seen at base of arch, dry, sunny areas from cracks in rocks on cliffs and shallow soil, from base of arch to nearly sea level, 86 m, 21.281124, -157.681956, 07 Apr 2023, *K. Faccenda & M. Ross 3094*.

Brassicaceae

Rorippa indica (L.) Hiern **New state record**

An unusual brassicoid was noticed along Kapi‘olani Blvd. near the Ala Wai Community Park while walking to go get Chinese food for dinner. Approximately 40 plants were seen growing as weeds in an irrigated flower bed along the road. No other colonies have been observed around Honolulu. This plant was subsequently identified as *Rorippa indica* using the key in Al-Shehbaz (2010) and comparison to photographed specimens. *Rorippa indica* is native to much of South and Southeast Asia, Egypt, and the Democratic Republic of the Congo and neighboring countries (POWO 2023). It has become naturalized in scattered localities in the United States and Central and South America (POWO 2023).

Figure 5. *Rorippa indica* seen at Kapiʻolani Blvd, Oʻahu. **A,** inflorescence and fruits. **B,** leaves.

Rorippa indica can be identified by its lyrate-serrate leaves, annual habit, yellow petals that only shortly surpass the sepals, and linear fruits (Figure 5).

The following description is from Al-Shehbaz (2010: 501):

> "Annuals; usually glabrous, rarely sparsely pubescent. Stems erect, unbranched or branched proximally or distally, (0.6–)2–6(–7.5) dm. Basal leaves not rosulate; blade margins pinnatifid. Cauline leaves petiolate (to 4 cm) or (distal) sessile; blade lyrate-pinnatipartite or undivided, obovate, oblong, or lanceolate, (lobes 0 or 1–5 (or 6) on each side), (2.5–)3.5–12(–16) cm × (8–)15–40(–50) mm, base auriculate or not, margins entire, irregularly crenate, or serrate, (entire or denticulate distally). Racemes elongated. Fruiting pedicels usually ascending or divaricate, rarely slightly reflexed, straight, (2–)3–10(–15) mm. Flowers: sepals ascending, oblong-ovate, 2–3 × 0.8–1.5 mm; petals yellow, obovate or spatulate, (2.5–)3–4(–4.5) × 1–1.5 mm; median filaments 1.5–3 mm; anthers oblong, 0.5–0.8 mm. Fruits siliques, often curved-ascending, linear, (7–)10–24(–30) × 1–1.5(–2) mm; ovules (60–)70–110 per ovary; style (0.5–)1–1.5(–2) mm, (slender, narrower than fruit). Seeds biseriate or nearly so, reddish brown, ovate or ovate-orbicular, 0.5–0.9 mm (0.4–0.6 mm diam.), foveolate. 2n = 16, 24, 32, 48."

Material examined. **Oʻahu**: Honolulu, intersection of Paʻani St and Kapiʻolani Blvd, on Ala Wai Park side of road, in irrigated garden plot between road and sidewalk, full sun, 1 m, 21.288457, -157.829865, 03 Apr 2023, *K. Faccenda 3090*.

Campanulaceae

Lobelia xalapensis Kunth **New state record**

A strange, annual, weedy *Lobelia* was found growing as a weed at Kauai Nursery & Landscaping, where it was common growing in both pots and from the ground in the nursery. It was identified as *Lobelia xalapensis* by Tina Ayers (ASC). This species is native to Central and South America and is the first time it has been reported outside of its native range. Given that it was found in a nursery, it is almost certain this species was introduced as a contaminant in soil of nursery stock. In its native range, *L. xalapensis* has also been described as weedy (Senterre & Castillo-Campos 2008) or a weed in agriculture (De Egea *et al.* 2016), and inhabits riverbanks, forest edges, rocky slopes, and open moist places (Daly *et al.* 2006).

The following description is from (Jeppesen 1981: 135):

> "Erect, often profusely branched herb 15–60 cm high with terete, often striate, puberulent stems, glabrate with age. Lower leaves sessile or petiolate; petiole when present 5–20 mm, narrowly winged; blade ovate, 30–50 mm long, up to 40 mm wide, obtuse to acute, cordate, truncate, or attenuate at base, margin coarsely crenate-sinuate with irregularly spaced, minute, callose teeth, at least basally ciliate; glabrous to strigose above, glabrous or pubescent beneath. Upper leaves gradually smaller and narrower. Flower in lax, terminal, few- to 30–40-flowered racemes. Bracts linear-subulate, 2–5 mm, entire, ciliate. Pedicels 5–10 mm, ascending, appressed puberulent, with two minute bracteoles at base. Hypanthium very short, hemispherical, 0.3–0.6 mm long, glabrous or puberulent. Sepals erect, subulate, 2–4 mm, entire. Corolla blue or purple, sometimes almost white, 3–5 mm; tube 2–2.5 mm, dorsally cleft two thirds to the base; limb bilabiate, the two dorsal lobes erect, c. 1.5 mm, linear, the three ventral lobes united into an erect lip with two longitudinal swellings at base. Filaments connate into a tube for the distal third only, glabrous, ciliate on the free margins. Anther tube 0.5–1 mm, dorsally pilose, rarely glabrous, the two shorter anthers penicillate at tips. Capsule one-quarter or less covered by the hypanthium, ellipsoid, 4–6 mm × 2–3 mm."

Material examined. **KAUA'I**: Kauai Nursery & Landscaping off of Kaumuali'i Hwy just W of Puhi, weed around garden center area, seen growing in both pots of plants for sale as well as from the ground, common, hundreds of plants seen, small annual, 101 m, 21.962828, -159.405831, 08 Jul 2022, *K. Faccenda & S. Vanapruks 2517.*

Cleomaceae

Cleome rutidosperma DC. **New state record**

Cleome rutidosperma is now widely naturalized across O'ahu but is currently rather uncommon. It was first found at Iwilei in 2009 by Bob Hobdy, and subsequently in Chinatown and at the University of Hawai'i Waimānalo Research Station by the author. It was also observed in Lā'ie in 2023 (Danielle Frohlich, pers. comm.). The largest population of at least 30 plants was that seen in Waimānalo. It can be identified by its trifoliate leaves, trailing habit, typical *Cleome* fruits, and purple flowers (Figure 6).

Cleome rutidosperma is native from Africa through India and has become widely naturalized across the tropics in both the Americas and Southeast Asia. It is an invasive weed throughout most lowland wet tropical areas of Asia and Australia (Chamara *et al.* 2017). In China, it is reported growing from lowland areas including paddy fields, streamsides, and wetlands. It has documented allelopathic abilities (Mutmainna *et al.* 2021).

The following description is from Wu *et al.* (2008: 430):

> "Herbs, annual or rarely perennial, 30–100 cm tall. Stems branched, often with decumbent branches, glabrous or glabrescent to slightly scabrous but sometimes glandular pubescent. Stipules ca. 0.5 mm, scalelike or absent. Petiole 0.5–3.5 cm, proximally winged; leaflets 3; leaflet blades oblanceolate to rhomboid-elliptic, 1–3.5 × 0.5–1.7 cm, abaxially with curved trichomes on veins especially when young, adaxially glabrous, margins entire or serrulate-ciliate, apex acute, obtuse, or sometimes acuminate. Inflorescences terminal and axillary, 2–4 cm but 8–15 cm in fruit, 3–6-flowered; bracts leaflike, 3-foliate, 1–3.5 cm. Pedicel 1.1–2.1 cm but 1.8–3 cm in fruit. Sepals yellow, narrowly lanceolate, 2.5–4 × 0.2–0.3 mm, ± persistent, glabrous, margin ciliate. Petals white or speckled with purple, oblong to narrowly ovate, 7–10 × 1.5–2.3 mm; central 2 petals outside with a yellow transverse band.

Filaments yellow, 5–7 mm; anthers purplish brown, 1–2 mm. Pistil 2–3 mm, glabrous; style 0.5–1.4 mm. Fruit with a 4–12 mm gynophore; capsule 40–70 × 3–4 mm, striate. Seeds 4–25 per capsule, reddish brown to black with white funicular aril, 1–1.5 mm, slender, striately verrucose. Fl. and fr. Jun-Sep. 2n = 20, 30."

Material examined. **O'AHU**: Waimānalo, University of Hawai'i Research Station, flowers purple, trailing herb growing in mulched flower bed near aquaponics area, only seen in this flower bed but common within it, at least 30 plants seen, 17 m, 21.336089, -157.711126, 02 Aug 2022, *K. Faccenda 2557*; Honolulu, Chinatown municipal parking across street from Maunakea Marketplace, weed in small neglected garden area, flower lilac, about a dozen plants seen, 6 m, 21.313328, -157.862160, 24 Sep 2020, *K. Faccenda s.n.*; Iwilei, growing as weeds along a fence at Flora Dec business site, 29 Jan 2009, *R.W. Hobdy s.n.* (BISH 755418).

Figure 6. *Cleome rutidosperma* habit and flower from the plants seen in Waimānalo, O'ahu.

Commelinaceae

Aneilema beniniense (P.Beauv.) Kunth **New state record**

A strange commelinaceous plant was found growing wild at Lyon Arboretum, where it was growing in weedy, wet, sunny areas in flower beds. Photographs were sent to Robert Faden (US), who graciously identified the plant as *Aneilema beniniense*, a species widespread across much of tropical Africa. It is unclear how it arrived at Lyon Arboretum, as it was never intentionally imported, according to the Arboretum's accession list. In its native range it is described as abundant, especially in wet areas near watercourses or areas where sunlight reaches the forest floor (Morton 1966). Given that this species is quite competitive in its native range, and was growing as a rather aggressive weed at Lyon, it would be best to eradicate this species before it spreads further. The inflorescence of *A. beniniense* is dramatically distinct among the Commelinaceae found in Hawai'i, making identification easy (Figure 7).

Figure 7. *Aneilema beniniense* inflorescence photographed at Lyon Arboretum, O‘ahu.

The following description is from Faden (2012: 105):

> “Perennial, decumbent, rooting at the nodes; roots thin, fibrous; shoots erect to ascending, (15–)40–130 cm tall, densely branched below, usually unbranched distally, glabrous. Leaves spirally arranged; sheaths 1–4 cm long, glabrous or very sparsely puberulous along the fused edge distally, sparsely ciliolate or eciliolate at apex; lamina (sub-) petiolate, narrowly lanceolate to elliptic, (5–)7–15(–18.5) × (1.2–)2–5(–6.7) cm, base cuneate to ± rounded, margins scabrid distally, apex acuminate; both surfaces glabrous or the abaxial sparsely puberulous. Thyrses terminal and occasionally on a short shoot from a distal leaf or inflorescence bract, very dense, ovoid or cylindric, 2–6 × 1.5–6 cm, of (10–)18–55 ascending cincinni (or the lowest patent); inflorescence axes glabrous or sparsely puberulous; peduncles 2–4 cm long with a bract halfway; cincinni to 3 cm long and 9-flowered; bracteoles cup-shaped, perfoliate, prominently glandular subapically, glabrous. Flower bisexual and male, 7–10(–13) mm wide; pedicels 3–6 mm long in flower, 4–7 mm long and erect to strongly recurved in fruit, glabrous. Sepals with the medial slightly larger, green or greenish white, ovate or elliptic, 2–3 × 2–2.5 mm, convexo-concave, hooded apically, glandular subapically, glabrous; paired petals white or pale lilac, lavender or violet, 4–5 × 2.5–4 mm of which the claw 1–1.5 mm long; medial petal white or greenish white, ovate or broadly ovate, 3–4 × 2–3 mm; staminodes 2–3, yellow, antherode bilobed; lateral stamens with filaments 3.5–5 mm long, sigmoid, sparsely bearded, anthers 0.8–1 mm long; medial stamen filament 3–3.5 mm long, anther 0.8–0.9 mm. Ovary 1.5–2 × 1 mm, glabrous; style arcuate-descending, ± 4 mm long; stigma capitellate. Capsules dark brown or grey-brown, oblong-ellipsoid, (4.5–)5–7 × 2.5–3.5 mm, bi- or trilocular, bivalved, glabrous; dorsal locule 0–1-seeded, ventral locules (1–)2–3-seeded. Ventral locule seeds broadly ovoid to reniform, 1.3–2.4 × 1.2–1.8 mm, testa pinkish brown, orange-brown or grey.”

Material examined. **O‘AHU**: Lyon Arboretum, Mānoa, garden beds just N of main visitor parking lot, weed in flower beds, common weed in these beds only, not seen further back in arboretum, erect to 50 cm tall, rooting at nodes, petals 2, strongly clawed, very pale blue, almost white in color, 165 m, 21.333798, -157.803195, 29 Sep 2022, *K. Faccenda 2717*.

Crassulaceae

Kalanchoe ×houghtonii D.B. Ward **New naturalized record**

Kalanchoe ×houghtonii is a hybrid between *K. delagoensis* and *K. daigremontiana* that is now naturalized in disturbed lowland areas on Kaua‘i, O‘ahu, and Maui. *Kalanchoe ×houghtonii* has been reported as naturalized in Florida (Ward 2006), Portugal (Smith *et al.* 2015), Spain, Italy (Herrando-Moraira *et al.* 2020), and China (Wang *et al.* 2016). It is rather weedy and has a tendency to spread from gardens to natural areas in many regions where it has escaped (Sukhorukov *et al*. 2018).

The leaves of *K. ×houghtonii* are generally intermediate between the two parents: narrow like *K. delagoensis,* but bearing plantlets along its entire length like *K. daigremontiana* (Figure 8). The key below should help separate the hybrid from its parents. *Kalanchoe ×houghtonii* has been reported to arise spontaneously when its parents are grown in proximity (Herrando-Moraira *et al.* 2020) but is also extensively cultivated. Several cultivars exist, some being fertile diploids and others being infertile triploids (Ward 2006). The ploidy of the Hawaiian populations is unknown, but this hybrid generally reproduces asexually, while sexual reproduction is less common. It is also unknown whether these populations formed via spontaneous hybridization by the naturalized parents, or were derived from cultivated plants. As the hybrid is common in cultivation across Hawai‘i, it is conservatively considered a naturalization of these cultivated plants.

Material examined. **KAUA‘I**: Waimea Canyon Dr, about 400 m up road from edge of town, makai of Panini Ln, dry exposed roadside, from hard soil on a S-facing slope, large clump of plants about 2 m wide and reproducing asexually by plantlets, at least 200 plants present in this clump, most very young and only 2 flowering, 21.964294, -159.666144, 02 Jun 2022, *K. Faccenda 2468*. **O‘AHU**: Ridge between Pia Valley and Kuli‘ou‘ou (Kulepeamoa), along trail, dry sunny area at low elevations, small clump present in dry grass and *Leucaena* area, 21.292706, -157.736006, 23 Oct 2021, *K. Faccenda 2127*; Upper Makakilo, adjacent to Palehua Heights subdivision, on SW slope of Kalo‘I Gulch, 800 ft [243 m] 30 Mar 2004, *C. Imada et al. 2004-34*. **MAUI**: East Maui near Puu Pīmoe, Kanaio, 1500 ft [457 m], 20° 36’ N 156° 22’ W, 31 Mar 2004, *F. Starr et al. 040331-3*.

KEY TO DIFFERENTIATE *KALANCHOE ×HOUGHTONII* FROM ITS PARENTS

1. Leaves bearing plantlets only at the tip, smooth along most of its margin; leaves terete or cylindrical ..... *K. delagoensis*

1′. Leaves bearing plantlets along their entire length, serrated or rough along most of its margin; leaves flattened or V shaped

2. Leaves lacking auricles, leaf base tapering to the petiole ..... *K. ×houghtonii*

2′. Leaves with auricles and usually cordate at the base ..... *K. daigremontiana*

Figure 8. *Kalanchoe ×houghtonii* from the O‘ahu population on Kulepeamoa Ridge, O‘ahu.

Euphorbiaceae

Euphorbia ophthalmica Pers. **New state record**

Euphorbia ophthalmica is now known to be naturalized in Hawai‘i from collections on O‘ahu and Maui, and has been found growing in potted plants for sale at Kauai Nursery & Landscaping on Kaua‘i and is likely also naturalized on that island. This species also occurs on Hawai‘i Island, where it has been photographed [link] but not yet vouchered. While visiting nurseries on Kaua‘i and O‘ahu, this plant was observed as a common or uncommon weed growing in the soil of potted plants for sale, suggesting that as the mechanism of introduction. Many (but not all) plants collected were also from recently planted flower beds, showing that seeds are moving via nursery stock.

Euphorbia ophthalmica is native to the Americas from Florida though South America and has previously been reported as naturalized in Australia, Sicily, and the Galapagos (POWO 2023). It is most similar to the common *Euphorbia hirta* but differs from that species in that *E. hirta* has axillary inflorescences, whereas *E. ophthalmica* has only terminal inflorescences (Figure 9).

The following description is from Steinmann *et al.* (2016: 280):

> "Herbs, usually annual, rarely short-lived perennial, with slender to slightly thickened taproot. Stems usually prostrate, rarely ascending, 6–22 cm, usually both strigillose and hirsute. Leaves opposite; stipules distinct, subulate-filiform, undivided or divided into 2–4 narrowly triangular to linear-subulate segments, no dark, circular glands at base of stipules, 0.9–1.5 mm, pilose or strigillose; petiole 0.3–1.2 mm, glabrescent, strigillose, or sericeous; blade usually ovate or oblong, rarely subrhombic, 4–13 × 3–7 mm, base asymmetric, one side usually angled and other side rounded, margins coarsely serrulate, apex acute, surfaces often with red spot in center, strigillose or sericeous, or adaxial surface glabrescent; 3-veined from base. Cyathia in dense, terminal, capitate glomerules, with reduced, bractlike leaves subtending cyathia; peduncles 0–0.8 mm. Involucre obconic, 0.5–0.7 × 0.4–0.6 mm, strigillose; glands 4, yellow green to pink, circular to slightly oblong, 0.1–0.2 × 0.1–0.2 mm; appendages absent or white to pink, forming thin rim around edge of gland or oblong, 0.1–0.2 × 0.1–0.3 mm, distal margin entire or shallowly lobed. Staminate flowers 2–8. Pistillate flowers: ovary strigillose, often canescent when young; styles 0.1–0.3 mm, 2-fid½2 to nearly entire length. Capsules ovoid, 1–1.2 × 1–1.3 mm, strigillose; columella 0.7–1.1 mm. Seeds orange-brown to pinkish, narrowly ovoid, 4-angled in cross section, 0.7–0.9(–1.1) × 0.5 mm, usually rugulose, with 3–6 faint, low, transverse ridges, rarely almost smooth."

Material examined. **KAUA'I**: Kauai Nursery & Landscaping off of Kaumuali'i Hwy just W of Puhi, weed around garden center area, seen growing only in pots of plants for sale, rare, only 2 plants seen, 101 m, 21.962923, -159.405685, 08 Jul 2022, *K. Faccenda & S. Vanapruks 2519*. **O'AHU**: Bishop Museum, along road connecting main entrance to staff parking, irrigated flower bed, sunny area, abundant in flower bed, 21.330680, -157.868744, 17 May 2021, *K. Faccenda 1828*; Honolulu, intersection of Punchbowl St and King St, crack from sidewalk, 4 plants present, 21.304325, -157.859861, 07 Aug 2021, *K. Faccenda 2074*; Kapolei, intersection of Kinoiki St and Kapolei Pkwy, weed in irrigated flower bed, full sun, about 30 plants seen, 19 m, 21.335387, -158.055547, 18 Feb 2023, *K. Faccenda 3026*; Kapolei, Lowe's Garden Center at intersection of Kapolei Pkwy and Kapolei Blvd, weed around garden center area, seen growing only in pots of plants for sale, uncommon weed in pots, 21 m, 21.328793, -158.088990, 10 Jul 2022, *K. Faccenda & S. Vanapruks 2534*; Waimānalo, Sharon's Plants Nursery, weed growing out of both pots and soil around nursery, uncommon,<10 plants seen, 54 m, 21.333019, -157.723747, 02 Aug 2022, *K. Faccenda & E. Peterson 2559*; Waimānalo, intersection of Makakalo St and Mokulama St, growing from gravel on roadside in sunny area, seed possibly moved with what appears to be recently deposited gravel, common only from this gravel, over 100 plants, 26 m, 21.337160, -157.721966, 03 Aug 2022, *K. Faccenda 2575*; Honolulu, east side of Kulamanu Pl, about halfway down the street, growing from cracks in sidewalk and rock planter beds, ca 40–50 plants observed, 7–8 m, 21.152825, -157.474604, 10 Mar 2023, *M.C. Ross 1908*. **MAUI**: Olowalu, Luawai St, ca 1000 m up from highway, irrigated roadside, uncommon weed in grassy area, 59 m, 20.818726, -156.616451, 22 Oct 2022, *K. Faccenda 2731*.

Figure 9. *Euphorbia ophthalmica* growing in a pot at Koba's Nursery in Waimānalo, Oʻahu.

Fabaceae

Arachis pintoi Krapov. & W.C. Greg. **New naturalized record**

Arachis pintoi, commonly called the perennial peanut or pintoi peanut, is now showing evidence of naturalization on Oʻahu and Kauaʻi, where plants have been found in areas where they obviously weren't planted. For example, a single plant was found on a rarely used trail in the back of Lyon Arboretum. Many plants were also seen by the author growing as weeds in mowed lawns at Wiliwilinui and Mauʻumae ridges and also at Whitmore Village. Plants have also been found growing on roadsides in Kapaʻa Valley on Kauaʻi and at Tantalus on Oʻahu. A large population is also found along Drum Rd in the northern Koʻolau where it was hydroseeded and spread from initial plantings. The earliest evidence of naturalization of this plant is from a plant found on a pile of waste soil in Waimānalo in 2005. So far, it has only been seen in disturbed areas such as roadsides, lawns, and trails.

Arachis pintoi was introduced into Hawaiʻi around 1993 by Frankie's Nursery in Waimānalo (*F. Sekiya s.n.*, BISH 644875) from the Kuching Sarawak Research Station in Malaysia. Perennial peanut was then quickly promoted as a cover crop and green mulch in Hawaiʻi (Hensley *et al.* 1997) and the Pacific (Glover 1994). It was ranked as a 4 on the Hawaiʻi Pacific Weed Risk Assessment [link]. Perennial peanut is native to Brazil and has become naturalized across much of South America as well as Australia, Sri Lanka, and Honduras (POWO 2023). *Arachis pintoi* is considered an excellent tropical forage legume (Staples & Herbst 2005) and much of its spread worldwide was for forage purposes (Krapovickas & Gregory 1994), although it seems it is rarely used in pastures in Hawaiʻi.

The following description is from Krapovickas & Gregory (1994: 81) and has been machine translated from Portuguese.

> "Perennial. Root axonomorphic, without thickening. Stems first erect, then creeping, rooting at the nodes, cylindrical. Branching distichous. Leaves quadrifoliolate. Stipules with portion fused to petiole 10–15 mm long × 3 mm wide, setae rigid on back; free portion 10–12 mm long × 2.5 mm wide at the base, longitudinal veins marked, both sides glabrous and margin with silky hairs. Petiole up to 6 cm long, canaliculate, back with rigid setae, glabrous depression and fine, silky hairs on the margins. Rachis 10–15 mm long, canaliculate, back with few setae. Pulvini pubescent. Leaflets obovate, distal pair up to 50 mm long × 32 mm wide, and proximal pair up to 45 mm long × 28 mm wide; upper leaf surface glabrous, with a slightly marked margin; lower leaf surface with scattered setae, margin slightly marked, with silky hairs and some short setae. Axillary spikes, 4–5 flowered, very short, covered by the fused portion of the stipules. Sessile flowers, protected by two bracts, the basal one 12 mm long × 5 mm wide, silky hairs on the midvein and on the margin, the upper bract forked, 10 mm long × 2.5–3 mm wide, silky hairs on the two veins and on the margin. Hypanthium 6.5 (3.5–9.5) cm long, with long silky hairs. Calyx bilabiate, with silky hairs somewhat stiffer than those of the hypanthium and with setae; lower lip 5 mm long, tridentate; upper lip 6 mm long, narrow, falcate, yellow corolla banner 11 mm long × 13 mm wide with yellow veins; wings 8 mm long × 6 mm wide, keel 6–7 mm long, falcate. Four oblong, basifixed anthers, four spherical, dorsifixed anthers, and one staminode. Bi-jointed fruit; nail 5–32.5 cm long, slightly pubescent towards base; proximal stud somewhat smaller than distal, 11–13 mm long × 6–7 mm wide; isthmus 1–8.5 cm long; distal stud 12–14 mm long × 7 mm wide; smooth pericarp, covered with fine hairs that retain the soil."

Material examined. **KAUA'I**: Kapa'a Valley, Olohena Rd 500 m E of Hono Ohala Pl, roadside, with assorted weeds, sunny, moist, spreading on roadside, near house, naturalizing, flowers yellow, very delicate, rooting vigorously at nodes, unsure if this was fruiting as I didn't have a shovel to dig it up, 22.078620, -159.375678, 29 May 2022, *K. Faccenda 2391*. **O'AHU**: Mau'umae Ridge, intersection of Sierra Dr and Mariposa St, weed in mowed, unirrigated lawn, 211 m, 21.293629, -157.789783, 04 Mar 2023, *K. Faccenda 3053*; Lyon Arboretum, Mānoa, in wet rainforest along trail, weed along trail, unlikely planted, small colony 1 m wide, 216 m, 21.337572, -157.805319, 29 Sep 2022, *K. Faccenda 2719*; Whitmore Village, Ahaehe Ave and Ehoeho Ave, in mowed lawn, moist, sunny area, only one clump seen, about 2 m wide and circular, 308 m, 21.511347, -158.020698, 18 Jan 2023, *K. Faccenda 3010*; Tantalus, Round Top Rd near Pu'u Kakea Pl, moist, partly shady roadside, near houses, naturalizing on side of road in mowed grass and in unmowed weedy area, 21.322443, -157.815472, 27 May 2022, *K. Faccenda 2381*; Drum Rd, Helemano Reservation end, plants germinating out of erosion control matting, 27 Apr 2007, *J. Gustine USArmy 48*; Waimānalo, Kakaina St, vacant lot, growing on piles of red clay topsoil among weeds and grasses, 21°20.138′, -157°44.4264′, 17 Feb 2005, *G. Staples 1224*.

Linderniaceae

Lindernia rotundifolia (L.) Alston **New state record**

A new species of *Lindernia* was noticed by the author in Mānoa growing as both a weed in lawns and also as a weed in a lo'i kalo in Mānoa. It was further found to be widely distributed on Hawai'i Island between Volcano, Honomū, and Pāhoa, where it grows as a weed in lawns, roadsides, and other moist, sunny areas. Using the keys in Wannan (2019) and Lewis (2000) it was identified as *L. rotundifolia,* a species native to the American tropics from Guatemala to the West Indies and Brazil, as well as India, Bangladesh, Sri

Lanka, and Madagascar (Lewis 2000). It has become naturalized in Australia, Fiji, Jamaica, and Cuba (POWO 2023). This species is used in the aquarium trade, as it can grow fully submerged, and was likely imported to Hawai‘i for that use.

Lindernia rotundifolia is a prostrate annual with opposite, orbicular leaves and whitish flowers with blue markings (Figure 10). It can be differentiated from the other *Lindernia* in Hawai‘i by its flowers with blue markings and usually entire leaves, as other species have whitish or purplish flowers and toothed leaves.

The following description is from Lewis (2000: 108):

> “Annual trailing herb. Stems green, 2.5–36(–56) cm long, rooting at the lower or most or all nodes, glabrous; branching only from the base to throughout the stem. Leaves cauline, sessile, minutely glandular-punctate on both surfaces (sometimes inconspicuously so); lamina elliptic, ovate, obovate, or orbicular, 2–16 mm long, 1–12 mm wide, largest leaves usually near the middle of the stem; base cuneate- to rounded- or less commonly attenuate-clasping; margin entire, serrate or remotely toothed; apex acute, obtuse or rounded; palmately 3–5 veined. Flowers chasmogamous, solitary in the axils of well developed or slightly reduced leaves; pedicels alternate or occasionally opposite, 2–18 mm long, half to 3× the length of the subtending leaf, glabrous to stipitate-glandular, especially near the base of the pedicel; erect to spreading, often reflexed in fruit. Calyx zygomorphic or irregular, occasionally 3 long + 2 short sepals, or nearly actinomorphic, 1.0–3.1 mm long, sepals basally connate, the tube 0.1–0.7 mm long; lobes lanceolate, acuminate; glabrous or stipitate-glandular, often only along sepal margin. Corolla white or light blue with darker blotches on the throat and purple on the lower lobes, tufts of trichomes at the base of the anterior lobes; tube 4–9 mm long; posterior lip ca. half the length of the anterior (longer in Old World material seen), apex emarginate. Androecium of 2 fertile stamens and 2 staminodes; free part of the staminodial filament 0.9–2.3 mm long (including the appendage), staminodes slightly exserted from corolla tube, setose, distal portion of filament lacking; fertile anthers coherent, filaments 0.9–1.3 mm long, glabrous. Style 3–5.7 mm long, often persisting until capsule dehisces; stigma 0.3–0.6 mm long, 0.3–0.8 mm wide, 2–parted, appearing capitate. Capsule tan to gold, 1.2–3.7 mm long, approximately equaling to infrequently exceeding the length of the calyx, 1–2.8 mm in diameter, broadly ellipsoid to globose, glabrous, smooth. Seeds yellow to gold or reddish-gold, 0.22–0.43 mm long, 0.11–0.30 mm in diameter, compressed-oblong to rectangular or irregularly tetragonal in outline, usually 4- or 6-angled or ribbed or occasionally terete; seed coat areolate (or appearing nearly smooth under magnification to 70×), minutely tuberculate, and often with waxy cuticular projections or ridges. Flowering and fruiting throughout the year.”

Material examined. **O‘AHU**: University of Hawai‘i Mānoa, lo‘i kalo off of Dole St, sunny, saturated soil, common, stoloniferous, rooting at nodes, covering large areas of saturated soil, 20 m, 21.295653, -157.812658, 11 Jan 2022, *K. Faccenda 2195*; Lyon Arboretum, Mānoa, weed in lo‘i kalo, from saturated soil, creeping and rooting at nodes, flowers largely white with bluish throat and purple spots at base of lobes, small population in lo‘i, 132 m, 21.334049, -157.801504, 29 Sep 2022, *K. Faccenda 2716*. **HAWAI‘I**: Pāhoa Park, near skatepark, weed in mowed grass, full sun, moist, associated with *Axonopus*, corolla mostly white but tube purplish-blue, each of the lower 3 lobes with 2 bluish spots at their base, common weed in lawn, 208 m, 19.492407, -154.946489, 28 Feb 2022, *K. Faccenda 2249*.

Figure 10. *Lindernia rotundifolia* habit and flowers in mowed grass at Hilo, Hawai‘i.

Malvaceae

Malvastrum corchorifolium (Desr.)
Britton ex Small **New state record**

During casual botanizing in Kapolei near University of Hawai‘i West O‘ahu, an unusual *Malvastrum* was found with smaller, bright yellow flowers. Between 50 and 100 plants were seen along a roadside where they had survived the summer dry spell, unlike the *M. coromandelianum* seen nearby, which was regenerating from seed. Examination of the fruits of this plant revealed they have no spine, matching them with *Malvastrum corchorifolium* (Hill 2006). *Malvastrum corchorifolium* is native from the southeastern United States through the Caribbean and Central America. It has previously been reported as naturalized in New York and Ghana (POWO 2023).

Malvastrum corchorifolium is most similar to *M. coromandelianum* but principally differs in its mericarp, as *M. corchorifolium* has a spine 0.1–0.4 mm long, while *M. coromandelianum* has a spine 0.5–2.3 mm long (Figure 17; Hill 2006). This species is likely a stabilized allopolyploid hybrid between *M. americanum* and *M. coromandelianum* and likely originated multiple times in its native range (Hill 2006). No investigation was undertaken to determine if the population discovered in Hawai‘i arose independently, or if seed was somehow introduced from a continental population. No *M. americanum* was seen nearby—the closest population on O‘ahu known by the author is over 15 km away—but that is not reliable evidence that this did not form spontaneously, as it could have formed on a different part of the island where the species do overlap and then dispersed to this spot.

Figure 11. *Malvastrum* spp. Seen near University of Hawai‘i West O‘ahu. **A,** *M. corchorifolium* mericarps. **B,** *M. coromandelianum* mericarps. **C,** *M. corchorifolium* flowers and leaves. The lines on the scale bar tattoo are separated by 5 mm.

The following description is from Hill (2006: 297):

> “Herbs, annual or perennial, suffruticose in age, 0.6–1.5 m, sparsely branched in proximal 1/2, usually with 1 main stem. Stems erect, hairs scattered, appressed, distinctly bilateral, 4-rayed, not sublepidote, swollen-based, or few, minute, marginal, simple hairs. Inflorescences axillary, solitary flowers at first, later congested or loose terminal spikes 1–2 cm, these in distal leaf axils or terminating each branch; floral bracts usually 2-fid, 3–6 × 1 mm, or flowers subtended by leaf and stipules. Pedicels 0.5–2 mm; involucellar bractlets basally adnate to calyx for 0.5–1 mm, lanceolate, subfalcate, 4–6 × 0.8–1 mm, ± equaling calyx lobes, apex acuminate. Flowers: calyx connate for 1/4–1/3 its length, broadly campanulate, 5–6 mm, to 7–11 mm in fruit, surface moderately hairy, hairs simple, 2–4-rayed, mixed with scattered, 4–6-rayed, stellate, minute hairs; corolla campanulate to wide-spreading, yellow to pale yellow-orange, 12–17 mm diam., petals obovate, asymmetrically lobed, 6–7 × 3–4 mm, exceeding calyx by 2 mm; staminal column 2–2.5 mm, sparsely stellate-puberulent; style (9–)11–13(–16)-branched. Schizocarps 4–7 mm diam.; mericarps tardily shed from calyx, (9–)11–13(–16), 2.5–3 × 2–2.5 × 1.1 mm, margins angled, sides radially ribbed, narrowly-notched, with 3 minute, apical cusps 0.1–0.4 mm, 1 at proximal-apical surface, 2 at distal-apical surface, moderately hairy on dorsal 1/3, hairs erect, minute, simple or 2–rayed, and erect, simple, rigid hairs 0.5–1 mm, minutely hirsute with ascending, simple hairs 0.1–0.5 mm mixed with minute, simple or 2- or 3-rayed, stellate hairs. Seeds 1.5–1.7 mm. 2n = 48.”

Material examined. **O‘AHU**: Kapolei, off of Ho‘omohala Ave between community college and rail station, along road, in partial shade of *Leucaena*, about 50 plants seen, 40 m, 21.357667, -158.053937, 19 Feb 2023, *K. Faccenda 3035*.

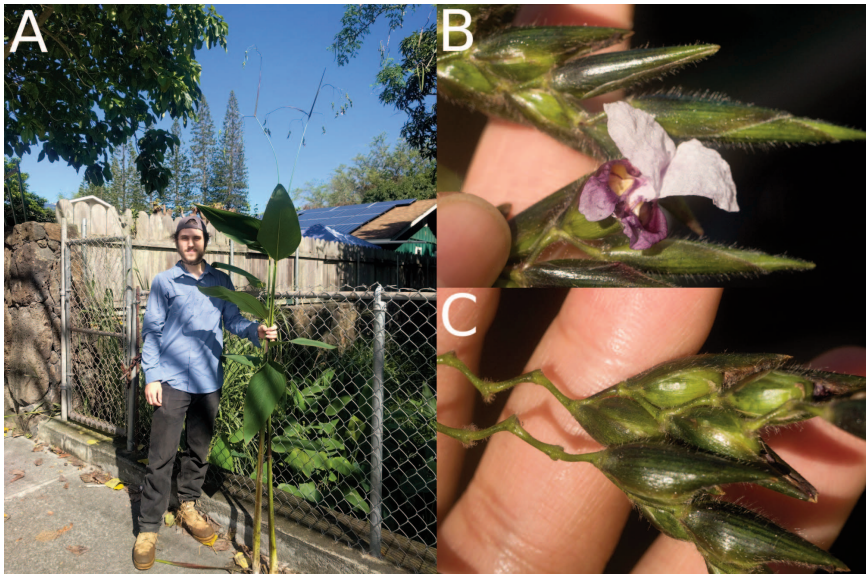

Figure 12. *Thalia geniculata* as seen at Akumu St ditch, Oʻahu. **A,** full plant with author for scale. **B,** flower. **C,** fruits and bracts.

Marantaceae

Thalia geniculata L. **New naturalized record**

While identifying iNaturalist observations from Oʻahu in 2021, an observation of *Thalia geniculata* posted by Adam Almeida was noted as unusual, as it appeared naturalized. The locality reported in the observation was subsequently visited in 2022 and voucher specimens were made. A small population of likely 5–20 plants was seen growing in a ditch under Keolu Dr. near Akamu St. in Kailua (Figure 12). It was difficult to estimate the population size as the clumps were rather large and some were merged together. *Thalia geniculata* is native to most of the tropical Americas and Africa (POWO 2023). In Florida, this species is called Alligator flag and is a rather common wetland species in the Everglades and other wet, lowland areas (Kennedy 2000). This is the first time it is reported as naturalized outside of its native range.

Thalia geniculata can be recognized by its *Heliconia*-like leaves; erect, branched inflorescences up to 3.5 m tall bearing many pinkish flowers; and its obligate wetland habitat (Figure 12). This plant was introduced into Hawaiʻi as an ornamental as the earliest specimen was from Foster Botanical Garden in 1943 (*M.C. Neal s.n.* BISH 649598) and has also been collected at Waimea Botanical Garden in 1986 (*J. Lau & C. Cory 2325*).

The following description is taken from Kennedy (2000: 319):

> "Plants 1–3.5 m. Leaves: basal 2–6, cauline 0–1(–2); sheath green or occasionally red-purple, glabrous; petiole green or occasionally red-purple, glabrous; pulvinus caramel-colored, olive-green, or red-purple, 0.3–2.5 cm, glabrous; blade ovate to

narrowly ovate, 19–60 × 4–26 cm, firm, stiff-papery, base rounded to subtruncate, apex acute to acuminate, occasionally obtuse with acuminate tip, abaxial surface green, faintly pruinose, glabrous, adaxial surface glabrous. Inflorescences lax, broadly spreading to pendant, paniclelike array, up to ca. 0.6 × 1 m; scapes 0.8–2.5 m; rachis not pruinose; internodes 5–20 mm; bracts not pruinose, green or streaked or tinged with purple, narrowly ovate, 1.3–2.8 cm, herbaceous, sparsely to densely villous. Flowers: sepals 0.5–2 mm; outer staminode faint lavender to purple, 15–20 × 5–10 mm; callose staminode base yellow, apex purple, apical rim, reflexed, petal-like. Fruits ellipsoid, 9–12 × 6–7 mm. Seeds smooth dark brown to black, ellipsoid, 7–10 × 5–6 mm. 2n = 18 (Senegal) 2n = 26 (in cultivation)."

Material examined. **O'AHU**: Kailua, ditch near intersection of Akumu St and Keolu Dr, emergent in ditch, partly shaded by trees, growing on both sides of ditch, emergent or from saturated soil, unsure how many plants since the clumps merged together, but probably 20–30 stems seen, petals white, inner part of flower lavender, 3 m, 21.380672, -157.728833, 09 Jan 2022, *K. Faccenda & S. Vanapruks 2187*.

Onagraceae

Ludwigia erecta (L.) H.Hara **New state record**

Ludwigia erecta is now known to be naturalized on Kauaʻi, Oʻahu, and Hawaiʻi. On Kauaʻi it was found at Hulēʻia National Wildlife Refuge. On Oʻahu it can become common in canals, natural stream beds, and at Kawainui Marsh. It is common in streams and canals around Mānoa. A single plant was also found growing as a weed in a potted plant at a nursery in Waimānalo, and on a roadside in a wet forest above Honoliʻi Stream on Hawaiʻi Island. The single plant found in the nursery was unusual and perhaps suggests that it was introduced as a contaminant with nursery stock, but given how widespread this species is across the islands, it is surely not a recent introduction.

Ludwigia erecta grows from wet to saturated soil in sunny sites. It can be identified by its height, as it reaches almost 3 m at maturity, far taller than the common *L. octovalvis*; and by its flowers being 1 cm in diameter with 4 petals, which are very readily deciduous (Figure 13). *Ludwigia erecta* is native to the tropical areas of the Americas and has become naturalized across almost all of Africa (POWO 2023). In its native range it grows on pond margins, ditches, and depressions (Hoch 2021).

The following description is from Hoch (2021: 78):

"Herbs annual, rarely persistent a second year from woody base. Stems erect, 4-angled, rarely 4-winged, sometimes basally terete, 40–280 cm, simple to densely branched, branches often ascending, glabrous. Leaves: stipules deltate, 0.2–0.3 × 0.15–0.2 mm; petiole 0.2–2.2 cm, somewhat flattened and continuous with ridges or wings on stem; blade elliptic to narrowly lanceolate, 2–20 × 0.2–4 cm, base cuneate, margins minutely scabrid, apex acute or acuminate, membranous, surfaces glabrous or sometimes minutely strigillose along abaxial veins; bracts often reduced. Inflorescences leafy spikes, flowers solitary in distal axils; bracteoles attached at base of ovary or on lower 1/2, without subtending glands, deltate, 0.3–0.5 × 0.2–0.3 mm, apex acute. Flowers: sepals ovate or lanceolate, 3–6 × 1–2 mm, apex acute or short-acuminate, surfaces usually glabrous, sometimes strigillose; petals obovate, 3.5–5 × 2–2.5 mm; stamens 8 in 2 subequal series, filaments 1.3–1.5 mm, anthers oblong, 0.6–1 × 0.4–0.5 mm; ovary obconic, 4-angled, 4–10 × 2–4 mm, usually glabrous, rarely strigillose; nectary disc plane on ovary apex, 3–4 mm diam, 4-lobed, glabrate; style 0.5–1.5 × 0.5–0.6 mm, stigma globose, 0.8–1 × 1–1.2 mm, not exserted beyond anthers and pollen shed directly on it. Capsules oblong-linear to

squarish-cylindric, 4-angled, 10–22 × 2–4 mm, thin-walled, irregularly dehiscent, subsessile. Seeds elongate-ovoid, 0.3–0.5 × 0.2–0.3 mm, raphe very reduced and inconspicuous. 2n = 16."

Material examined. **KAUA'I**: Hulē'ia National Wildlife Refuge, Management Unit #H4N, a single shrub or possibly a few more, first record of the species in the State, 17 Dec 2014, *K.J. Uyehara & M. Milinichik s.n.* (BISH 764375). **O'AHU**: Honolulu, Kahana Stream (tributary to Makiki Stream), completely channelized area N of Wilder Ave, full sun, moist substrate, dominant, 21.306733, -157.838156, 12 Jun 2021, *K. Faccenda 1959*; Kawainui Marsh State Wildlife Sanctuary, palustrine emergent wetland, germinates during spring drawdown, 1–2.5 m tall, growing in thick monospecific stands or individually especially in disturbed moist soil 21.383556, -157.758979, 16 Oct 2022, *L. Nietmann s.n.* (BISH 779017); Waimānalo, Sharon's Plants Nursery, weed seen growing in a pot, 49 m, 21.333003, -157.723209, 02 Aug 2022, *K. Faccenda & E. Peterson 2561*; Hawai'i Kai, Kamilo'iki Park off of Lunalilo Home Rd, from concrete stormwater canal running along the N edge of park, 2 plants seen, ca 1.5 m tall, 3 m, 21.297636, -157.687754, 03 Dec 2022, *K. Faccenda 2858*; Ka Iwi area, Wāwāmalu Channel where it goes under the road, at least 100 plants seen, up to 3 m tall, 3 m, 21.297310, -157.662740, 07 Apr 2023, *K. Faccenda & M. Ross 3091*. **HAWAI'I**: Honoli'i, Kahoa St along Honoli'i Stream, weed on roadside, wet, shady forest, 2 plants seen, 10 m, 19.756412, -155.093194, 14 Aug 2022, *K. Faccenda & M. Murphy 2644*.

Figure 13. *Ludwigia erecta*. **A,** plants approximately 2.5 m tall to the left of the author at the Wāwāmalu Stream, O'ahu. **B,** flowers seen in the Kahana Stream, O'ahu. Increments on the scale bar tattoo are 5 mm.

Orchidaceae

Dendrobium 'Jaquelyn Thomas' **Confirmation of naturalization**

Dendrobium 'Jaquelyn Thomas'was previously reported as a questionable naturalization on O'ahu by Lau & Frohlich (2013) based on a single collection at West Makaleha. A

Figure 14. *Dendrobium* ‘Jaquelyn Thomas’ seen at Kulepeamoa Ridge, O‘ahu.

population of at least 2 plants was seen along trails on the sides and summit of Kulepeamoa Ridge (Figure 14). Two further plants were found on Mau‘umae Ridge, but were not collected.

Material examined. **O‘AHU**: Ridge between Pia Valley and Kuli‘ou‘ou (Kulepeamoa), along trail, from strawberry guava scrubland, full sun, growing above scrub, windy, one plant seen, very robust, stem about 3 cm at its widest, 21.302664, -157.737728, 23 Oct 2021, *K. Faccenda 2133*.

Epidendrum calanthum Rchb. f. & Warsz. **New naturalized record**

Approximately 100 plants of *Epidendrum calanthum* were seen growing along the Hawai‘i Loa Ridge Trail about 200 m mauka from the trailhead in dry, open areas along the trail. *Epidendrum* ×*obrienianum* was also seen in this area. Photos of these plants were sent to James Ackerman, who confirmed the author’s tentative identification. A plant of *E. calanthum* from Hawaii Volcanoes National Park has also been posted to iNaturalist [link] showing that the species is also naturalized on Hawai‘i Island, but it has yet to be vouchered.

Epidendrum calanthum is native to most of northern South America (POWO 2023) and this is the first naturalization of this species outside of its native range. There were no specimens of *E. calanthum* at BISH, so it is unclear how long this species has been present on O‘ahu. It is certain that this species was imported as an ornamental. *Epidendrum calanthum* can be distinguished from the other naturalized *Epidendrum* in Hawai‘i by its pink flowers (Figure 15).

Material examined. **O‘AHU**: Hawai‘i Loa Ridge Trail, ca 0.2 km mauka from trailhead, dry, sunny, invasive-dominated area, flowers pink, ca 100 plants present, flowering and fruiting, common, 21.299144, -157.745731, 29 Aug 2021, *K. Faccenda 2105*.

Figure 15. *Epidendrum calanthum* flower photographed at the Hawai‘i Loa Ridge Trail, O‘ahu.

Vanilla planifolia Andrews **Confirmation of naturalization**

Vanilla planifolia was reported as questionably naturalized at Lyon Arboretum, where it was forming dense patches near ‘Aihualama (Daehler & Baker 2006). No specimen was collected by Daehler & Baker (2006), as they hypothesized that it was spreading via vegetative reproduction only. However, in 2022 a lone plant was found on the ‘Aihualama Trail distant from any other plants and far above Lyon Arboretum, suggesting that this species is reproducing via seed. Further exploration of the area found an extensive population in the area consisting of hundreds to thousands of plants growing epiphytically and forming dense thickets in areas with abundant sunlight (Figure 16). It is unclear if *V. planifolia* is being insect-pollinated or selfing, but selfing seems more probable given that it has been reported to occur at up to 6% of flowers of *V. planifolia* in Mexico, although some *V. planifolia* cultivars are sterile (Bory *et al.* 2008). As such, *V. planifolia* should now be considered naturalized on O‘ahu. *Vanilla planifolia* has also been reported as naturalized in 37 countries scattered throughout the tropics (POWO 2023).

Material examined. **O‘AHU**: ‘Aihualama switchback trail descending from Tantalus to Mānoa Falls, disturbed moist forest, full shade, climbing vine, only one plant seen along trail, 309 m, 21.341354, -157.803010, 29 Jan 2022, *K. Faccenda 2217.5*.

Plantaginaceae

Plantago rugelii Decne. **New state record**

Plantago rugelii has been present on Hawai‘i Island since at least 1974 but was misidentified as the morphologically similar *Plantago major* until now. Its known range on Hawai‘i Island spans much of the eastern side of the island, from Hilo through much of the Ka‘ū District. Recent collections also show that it is also naturalized across mid- to

Figure 16. *Vanilla planifolia* photographed along the ʻAihualama Trail in Mānoa Valley, Oʻahu.

high-elevation areas of Oʻahu in both the Koʻolau and Waiʻanae Ranges, where it is mostly found along roadsides and trails.

Plantago rugelii is native to the continental United States and Canada to the east of the Rocky Mountains (POWO 2023). It has previously been introduced to Cuba. *Plantago rugelii* is easily confused with *P. major*, and fruits must be examined to reliably separate these species. On *P. rugelii* the fruits are 4–6 mm long, dehisce proximal to the middle, contain 4–5 (rarely up to 8) seeds, and have bracts 2 mm long. On *P. major* the fruits are 4–5 mm long, dehisce at the middle, contain 5–35 seeds that are 0.5–1 mm long, and have bracts 0.5–1 mm long (Shipunov 2019).

The following description is from Shipunov (2019: 292):

> "Perennials, sometimes annuals; caudex absent; roots fibrous, thick. Stems 0–20 mm. Leaves 20–150 × 10–120 mm; petiole to 200 mm; blade ovate to cordate-ovate, margins entire or toothed, veins conspicuous, surfaces glabrous or hirsute. Scapes 50–250 mm, glabrous or hirsute. Spikes brownish or greenish, 50–300 mm, densely or loosely flowered; bracts narrowly lanceolate, 2 mm, length 1–1.2 times sepals. Flowers: sepals 1.5–2 mm; corolla radially symmetric, lobes reflexed, 0.5–1 mm, base obtuse; stamens 4. Fruits 4–6(–8) mm, dehiscing proximal to middle. Seeds 4 or 5(–8), 1.5–2 mm. 2n = 24."

Figure 17. *Veronica persica* seen at Kahilu Rd, Hawai‘i.

Material examined. **O‘AHU**: Pu‘u Ka‘ala summit, roadside, moist, cool, open area, common, 1216 m, 21.507878, -158.143864, 21 Jan 2022, *K. Faccenda 2203*; Kōnāhuanui, summit, along trail, locally common at summit, 894 m 21.352333, -157.788900, 29 Jan 2022, *K. Faccenda 2217*. **HAWAI‘I**: Ka‘ū Distr., Kiolaka‘a-Kea‘ā Homesteads addition, Ka‘ū Forest Reserve, in jeep road, 2000 ft, 13 Aug 1980, *L.W. Cuddihy & J. Davis 523*; Puna Distr., ahupua‘a of Halepua‘a, common on dirt roads on Puna Trail, 08 Mar 1979, *L. Yoshida 79.071*; Disappointment Rd, near Pu‘u Maka‘ala, locally abundant, 06 Sep 1980, *F.R. Fosberg 60577*; Puna Distr., ‘Ōla‘a Forest Reserve, along jeep track 6.4 km from junction of Stainback Hwy & Hwy 17 towards Kulani Prison, common, 870 m, 06 Jul 1974, *T. Herat et al. 954*; Pāhoa Park, near skatepark, weed in mowed grass, full sun, moist, 207 m, 19.492125, -154.946383, 28 Feb 2022, *K. Faccenda 2253*; Hawai‘i Volcanoes National Park, Escape Road, about 200 m S of Hwy 11, wet, shady roadside, in mowed areas, common along road, 1169 m, 19.420314, -155.242967, 16 Aug 2022, *K. Faccenda & J. Gross 2665*; Hawai‘i Volcanoes National Park, offices near Visitor Center, wet, shady areas, common, 1207 m, 19.427340, -155.256357, 18 Aug 2022, *K. Faccenda & J. Gross 2673.*

Veronica persica Poir. **New state record**

Veronica persica was found during a roadside grass survey on Hawai‘i Island, where it was naturalized on a roadside in Waimea. The area was not exhaustively surveyed, but approximately 10 plants were found along approximately 200 m of mowed roadside. *Veronica persica* is native to the Middle East but is now naturalized throughout much of the world (Albach 2019). It is associated with disturbed areas such as gardens, lawns, fields, and roadsides.

This species can be differentiated from the other naturalized *Veronica* principally by its large, solitary, blue flowers 8–14 mm wide, and serrated leaves (Figure 17). Of the other naturalized species, *Veronica plebeia* appears the closest to this, but has flowers in short racemes and leaves that are coarsely dentate, rather than serrate.

The following description is from Albach (2019: 319):

> "Annuals. Stems creeping to decumbent, 10–50(–60) cm, eglandular-hairy. Leaves: blade suborbiculate, broadly ovate, or broadly lanceolate, (6–)9–18(–30) × (5–)8–15(–20) mm, base truncate, margins serrate, apex acute, surfaces sparsely eglandular-hairy. Racemes 1–6, terminal, 100–500(–600) mm, 5–30-flowered, axis eglandular-hairy; bracts suborbiculate or broadly ovate or broadly lanceolate, (6–)9–18(–25) mm. Pedicels spreading, deflexed in fruit, (12–)15–27(–38) mm, length 1–2(–3) times subtending bract, densely eglandular-hairy. Flowers: calyx lobes (4.5–)5.5–8(–9.5) mm, (1.7–)2.4–3.6(–4.2) mm wide, apex acuminate, eglandular-hairy; corolla intense bright blue, 8–14 mm diam.; stamens 1.2 mm; style (1.5–)2–2.8(–3.2) mm. Capsules compressed in cross section, broadly obcordiform, 4–6 × (5–)6–8.5(–9.5) mm, apex acute, sinus angle (80–)90–120(–150)°, reticulate with prominent veins, ± sparsely to densely eglandular- and/or glandular-hairy or glabrate. Seeds (10–)12–18(–20), pale brownish yellow, ellipsoid to globular, cymbiform, (1.3–)1.4–2.3(–2.5) × (0.8–)0.9–1.6(–1.9) mm, 0.5–1 mm thick, cristate-rugose. 2n = 28."

Material examined. **HAWAI'I**: Waimea, Kahilu Rd, about 700 m from Mana Rd, moist, sunny, mowed roadside, uncommon, 855 m, 20.023110, -155.643197, 05 Mar 2022, *K. Faccenda 2317*.

Rubiaceae

Galianthe brasiliensis (Spreng.) E.L. Cabral & Bacigalupo **New naturalized record**

Galianthe brasiliensis has now been documented as naturalizing on O'ahu and Hawai'i, where it was found in the rear of Pālolo Valley and Kalopā Rd. in the Hāmākua District, respectively. Both populations were found growing on wet, partly sunny to shady areas on roadsides. Approximately 20 plants were seen in Pālolo and at least a dozen were seen at Kalopā Rd. A population of 40 plants has also been observed at the University of Hawai'i Hilo campus [link].

Galianthe brasiliensis was introduced to Hawai'i as an ornamental; two specimens exist in cultivation from BISH, the first from Foster Botanical Garden in 1960 (*C. Potter 9476*) and the second from Wahiawa Botanical Garden in 1986 (*J. Lau 2541*). Photos of these wild plants were sent to Dave Lorence (PTBG), who graciously identified this species.

Galianthe brasiliensis is native from Mexico south to northern Argentina (POWO 2023), and this is the first time it has been reported as naturalized outside of its native range. In its native range it grows in low grasslands, river margins, forests, and forest edges (Florentín *et al.* 2017). It can be identified by its low shrubby habit, narrowly winged stems, prototypical Rubiaceae flowers, and elliptic to obovate leaves (Figure 18).

The following description is from Florentín *et al.* (2017:624):

> "Shrub erect, branched, 0.25–1.5 m tall, with xylopodium; stems tetragonal, angles narrowly winged. Stipular sheath hispidulous, with 5–7 fimbriae. Leaves frequently pseudoverticillate, leaf blades elliptic or obovate, 3–35 × 0.7–11 mm, middle vein glabrous on the adaxial surface and scabridulous on the abaxial surface, with only

primary nerve visible. Inflorescences thryrsoid-spiciform, with oral node of fasciculate flowers of main and secondary branches. Flowers shortly pedicellate; hypanthium turbinate, hispidulous; calyx 4-lobed, with 2 large lobes; corolla internally with ring of moniliform hairs. LS flower with corolla 1.9–2.2 mm long. SS flower with corolla 2.7 mm long. Capsule 1.5 (2.5) mm long, turbinate, dorsoventrally compressed, hispidulous, with indehiscent valves. Seeds 1.8–2 mm long, ventral face with a small strophiole; testa reticulate."

Material examined. **O'AHU**: Pālolo Valley, agricultural lots at rear of valley, roadside, wet, very shady area, about 20 plants on roadside, 21.295196, -157.797552, 04 Mar 2023, *K, Faccenda 3052*. **HAWAI'I**: Hāmākua Distr., Kalopā Rd near intersection with Kalopā Mauka Rd, ditch on side of road, shady, moist, plant uncommon in area, only growing in shady areas, at least a dozen present, naturalized, 313 m 20.062522, -155.431474, 06 Mar 2022, *K. Faccenda 2346.*

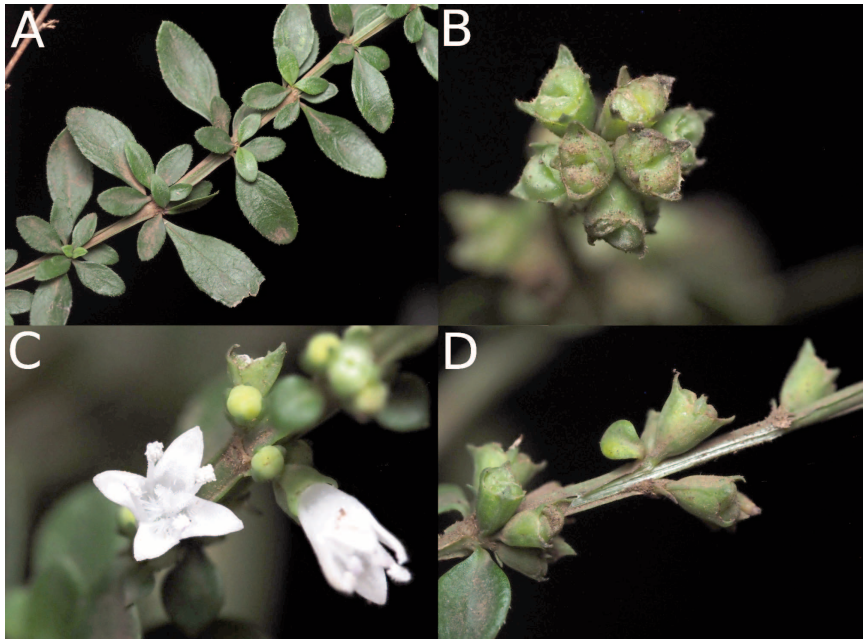

Figure 18. *Galianthe brasiliensis* photographed in Pālolo Valley, O'ahu. **A,** leaves. **B,** fruits. **C,** flowers. **D,** fruits and calyx, side lateral view.

Solanaceae

Solanum chacoense Bitter **New state record**

Several hundred wild potato plants were found during roadside surveys on East Maui along Kawehi Pl. growing on an unmowed roadside, and as a weed under pomegranate trees cultivated on a nearby property, where it was being mowed by the property owner (Figure 19). These were initially assumed to be domestic potato (*Solanum tuberosum*), but this identification was corrected thanks to iNaturalist user @plantperson7654.

Comparisons between the specimen and the description and key from from Spooner *et al.* (2016) further confirmed this ID. *Solanum chacoense* can be separated from domestic potato as *S. chacoense* has stellate to pentagonal corollas whereas domestic potato has rotate to rotate-pentagonal corollas. *Solanum chacoense* is closely related to the domestic potato, and is reproductively compatible with it but it is not an ancestor of the domestic potato (Spooner *et al.* 2016).

Solanum chacoense is native from southern Brazil and Peru to central Argentina and Uraguay where it is found in wide ranging climates from deep shade, to full sun, savannas, subtropical forests, and rocky slopes from 0 to 3700 m (Spooner *et al.* 2016). In its native range it is also found as a weed on roadsides, cultivated fields, and banana plantations. It has also become naturalized in Australia, China, New Zealand, United Kingdom and the United States where it has been exclusively found escaping from botanical gardens and agricultural research stations (Simon *et al.* 2010). No published reports or herbarium material could be found reporting the importation of *S. chacoense* to Hawai‘i, and the site is 1.5 miles away from the nearest agricultural research station. It is unclear how this arrived in Hawai‘i, but an intentional importation seems most likely. *Solanum chacoense* has several qualities which predispose it to invasiveness including being the only known *Solanum* which can self-pollinate, production of large volumes of seed, insect & disease resistance, and broad climatic adaptability (Simon *et al.* 2010). If not managed, it is expected that this potato will spread further across Maui. Its limited population size would make it a worthwhile eradication target.

The following description is taken from Spooner *et al*. 2016: 95):

> “Herbs 0.5–2 m tall, erect. Tubers typically borne singly at the end of each stolon. Stems 3.5–10 mm in diameter at base of plant, unwinged or with wings up to 2 mm wide, green to purple or green and purple mottled, glabrous to densely short-pubescent. Pseudostipules 3–20 mm long, pubescent with hairs like those of the stem. Leaves 10–39 cm long, 6–24 cm wide, odd-pinnate, green, glabrous to densely short-pubescent adaxially and abaxially with hairs like those of the stems; petioles 1–4 cm long, glabrous to densely short pubescent; lateral leaflet pairs 4–7, often subequal except for the most proximal 1 or 2 pairs, which are greatly reduced in size; distalmost lateral leaflets 2.7–9 cm long, 0.9–3.5 cm wide, narrowly to broadly ovate to elliptic, apex acute to acuminate, base typically oblique, rounded to truncate, petiolules 0–5 mm long; terminal leaflet 4.1–9.4 cm long, 0.9–4.3 cm wide, ovate to elliptic, apex acute to acuminate, base truncate to attenuate; interjected leaflets 0–20, ovate to orbicular, sessile to short petiolulate. Inflorescences 2–15 cm long, usually forked, with 8–25 flowers, the axes pubescent with hairs like stem; peduncle 0.5–10.5 cm long; pedicels 12–23 mm long in flower and fruit, articulated at or slightly distal to the midpoint. Calyx 3–5 mm long, with hairs like those of the stem; lobes 1–4 mm long, acute to long attenuate, acumens 0.5–2 mm long. Corolla 1.6–3.7 cm in diameter, pure white to creamy yellow-white adaxially and abaxially, deeply stellate to pentagonal, acumens 2–5 mm long. Anthers 5–7 mm long. Style 8–15 mm long, exceeding stamens by 3–6 mm; stigma clavate to capitate. Fruit 1.5–2 cm in diameter, globose to slightly ovoid, green to green with purple streaks when ripe, often with scattered white dots, glabrous.”

Material examined. **MAUI**: Kula, Kawehi Pl, roadside weed in unmowed area, appears naturalized, growing on roadside and under pomegranate trees in orchard, not intentionally planted as the owners of the olive trees have been mowing/weed whacking it, 1012 m, 20.736255, -156.327185, 24 Oct 2022, *K. Faccenda 2781*.

Figure 19. *Solanum chacoense* growing as a weed under pomegranate trees at Kawehi Pl, Maui.

Urticaceae

Pilea nummulariifolia (Sw.) Wedd. **New naturalized record**

A new naturalized species of *Pilea* has been observed in moist areas around O‘ahu, and comparison to specimens at BISH reveals that it is *Pilea nummulariifolia*, a species previously only known from cultivation in Hawai‘i. *Pilea nummulariifolia* has been cultivated on O‘ahu since at least 1961 (G. *Ing et al. s.n.*, BISH 71306) and cultivated specimens also exist from Kaua‘i and Hawai‘i. *Pilea nummulariifolia* is native from the Caribbean south to Peru and has also become naturalized on several tropical and subtropical islands including Bermuda, the Cook Islands, Taiwan, Trinidad-Tobago, and the Tubuai Islands, along with the Democratic Republic of the Congo (Friis 1989; POWO 2023). Pilea *nummulariifolia* can be identified by its sprawling habit and pubescent, ovate leaves with impressed veins (Figure 20).

Naturalized vouchers have been made from populations on Nu‘uanu Pali Dr. and from several spots along Telephone Rd on Tantalus. The two populations at Tantalus extended over 20 m along the side of the road, growing in wet, shady areas mostly along the road margin. Sexual reproduction was observed, as many small seedlings were seen. The Nu‘uanu population was smaller, only several meters wide. An apparently naturalized population was also seen on Maui along the Hāna Hwy., but was not collected [link]. Several other populations that appear to be naturalized have been reported on iNaturalist.org at Wahiawā [link], Hilo [link], and Hualālai [link], but none of these were visited by the author.

Figure 20. *Pilea nummulariifolia* seen at Tantalus Rd, Oʻahu.

The following description is from Friis (1989: 598):

> "Perennial herbs, with prostrate and erect stems, up to c. 15 cm high or more, internodes 5–30 mm long, puberulous. The two leaves of a pair usually of same size; stipules ovate to orbicular, 2–3 mm long, translucent, ciliolate petioles 0.3–1.2 cm long, pubescent; lamina very broadly ovate to suborbicular, c. 1 cm diam., rounded, truncate or subcordate at base, margin finely crenate, apex rounded or broadly obtuse, pubescent on both sides, cystoliths often obscure, lateral nerves obscure. Inflorescences axillary and apparently terminal (axillary in the uppermost two pairs of leaves), paniculate, with the flowers in small, cymose clusters, up to c. 1 cm long. Flowers up to 0.8 mm long. Achene c. 0–5 mm long, compressed ovoid, brown, smooth."

Material examined. **Oʻahu**: Nuʻuanu Pali Dr, above where the housing development ends, roadside, shaded, moist, small patch along road in shade, 21.347486, -157.823822, 29 May 2021, *K. Faccenda 1927*; Tantalus road between Telephone Rd and large parking lot for Puʻu ʻŌhiʻa Trail, wet ginger and invasive-dominated area, large colony ca 20 m long present along road, 21.331294, -157.819444, 01 Aug 2021, *K. Faccenda 2070*.

Figure 21. *Hedychium greenii* growing in a ditch surrounded by uluhe at Kawailehua Rd, Volcano, Hawai‘i.

Zingiberaceae

Hedychium greenii W.W. Sm. **New naturalized record**

Hedychium greenii was commonly seen around Volcano on Hawai‘i Island; many were in the vicinity of houses and may have been planted, but most were found in overgrown areas and seemed rather unlikely to have been planted. However, one plant was found growing in a roadside ditch over 20 m from any house and was entirely surrounded by weeds, giving a high confidence that this plant dispersed and germinated in place (Figure 21). Further colonies were later found in ‘Ō‘hia Estates across the Highway from Volcano village also found not in immediate proximity to houses. As such *Hedychium greenii* should now be considered naturalized on Hawai‘i Island. This species was imported to Hawai‘i as an ornamental and can be distinguished from other *Hedychium* by its bright orange flowers and pink to purple leaf undersides. *Hedychium greenii* has been cultivated in Hawai‘i since at least 1958 at Foster Botanical Garden on O‘ahu (*C. Potter s.n.*, BISH 147214)

Material examined. **HAWAI‘I**: Volcano, Kawailehua Rd, roadside ditch, partly sunny area, flowers reddish orange, underside of leaves purple, 1127 m, 19.449714, -155.233682, 13 Aug 2022, *K. Faccenda 2624*.

TAXA SHOWING SIGNS OF NATURALIZATION

Brassicaceae

Diplotaxis tenuifolia (L.) DC. **Showing signs of naturalization**

Diplotaxis tenuifolia was found growing from a crack between a building and the sidewalk along King St. near Cedar St. in urban Honolulu (Figure 22). Only one plant was seen at this site, and no other plants have been seen in any other locations. Given that only one individual was found and urban Honolulu has been relatively heavily botanized recently, this should be considered a questionable naturalization until more plants are found. *Diplotaxis tenuifolia* is native to Europe but has become naturalized across the Americas, Australia, New Zealand, Japan, and much of Eastern Europe (POWO 2023). It can be identified by its perennial habit (most mustards in Hawai‘i are annual), yellow flowers ca. 1 cm in diameter, and pinnately lobed leaves (sometimes entire) with 1–5 lobes on each side. In its introduced range it grows in waste places, disturbed areas, beaches, shores, wet woods, and mountain slopes (Martínez-Laborde 2010).

The following description is from Martínez-Laborde (2010: 433):

> “Perennials, (usually suffrutescent, roots with shoots from adventitious buds), strongly scented (with glucosinolates), (glaucescent). Stems erect, 2–7(–10) dm, glabrescent or sparsely pubescent basally. Basal leaves: blade elliptic to obovate, 2–15 cm × 10–60(–80) mm, margins sinuate to deeply pinnatifid, (2–5 lobes each side). Cauline leaves petiolate; similar to basal, (distal cauline shortly petiolate, blade similar, with narrower segments), surfaces usually glabrescent. Fruiting pedicels 8–35 mm. Flowers: sepals 4–6 mm, glabrous or pubescent, trichomes straight; petals yellow, 7–11(–13) × 5–8 mm, (apex rounded); filaments 4–8 mm; anthers 2.5–3 mm; gynophore 0.5–3 mm. Fruits usually erect, rarely ascending, (somewhat torulose, slightly compressed), 2–5 cm × 1.5–2.5 mm; terminal segment (stout), beaklike, 1.5–3 mm, seedless; (ovules 20–32(–46) per ovary). Seeds 1–1.3 × 0.6–0.9 mm. 2n = 22.”

Material examined. **O‘AHU**: King St, near Cedar St, from crack in sidewalk near business, apparently perennial with rather thick taproot, flowers yellow, only a single plant seen, 5 m, 21.298889, -157.841527, 09 Jan 2023, *K. Faccenda 2980.*

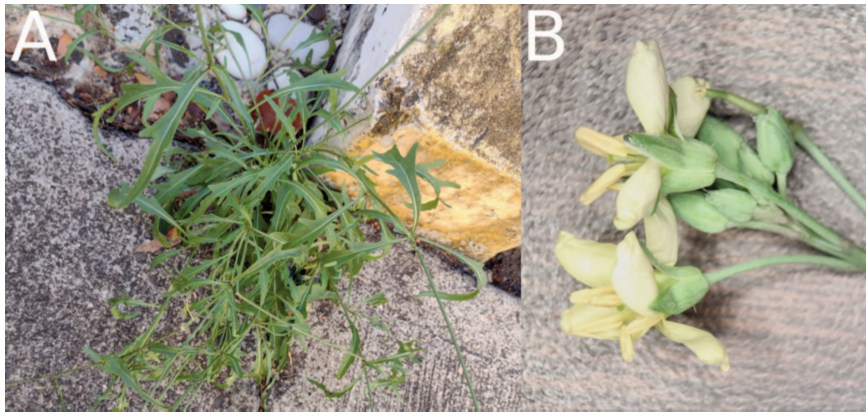

Figure 22. *Diplotaxis tenuifolia* seen along King St, O‘ahu. **A,** leaves. **B,** flower.

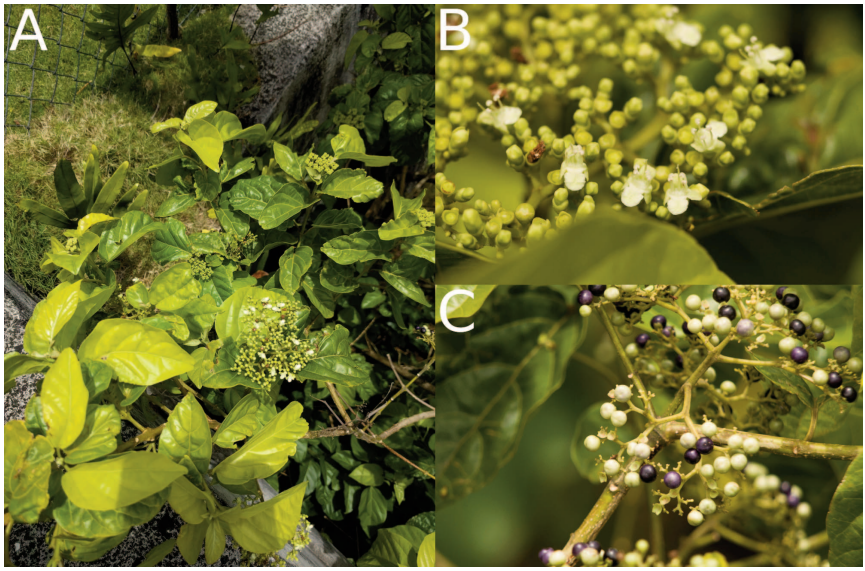

Figure 23. *Premna serratifolia* seen at the Pawaina St bridge over Mānoa Stream, O‘ahu. **A,** habit. **B,** flowers. **C,** fruits.

Lamiaceae

Premna serratifolia L. **Showing signs of naturalization**

A single, mature *Premna serratifolia* tree was found in Mānoa growing from a crack in concrete under a bridge over Mānoa Stream. Given that the tree was growing from a crack in concrete, it was obviously not planted. The tree was flowering and fruiting heavily. The nearby area was not surveyed for more trees.

Premna serratifolia was imported to Hawai‘i in 1930 by the Lyon Arboretum from the Singapore Botanical Garden (Jesse Adams, pers. comm). Given that the plant was found in a streambed that drains from the Lyon Arboretum and is a close morphological match to specimens from those trees, the tree at Lyon was likely the parent of this naturalized individual.

Premna serratifolia is native from East Africa, India through Southeast Asia and Malesia, Australia, and much of the Pacific (POWO 2023). This tree grows in coastal locations in its native range (de Kok 2013), and if further plants are found in Hawai‘i they will likely be more makai than the one reported herein. *Premna serratifolia* can be identified by its opposite, coriaceous leaves, and corymbose inflorescence of white flowers and orbicular fruits that turn black or dark purple at maturity (Figure 23).

The following description is from de Kok (2013: 74):

> “Shrub or small tree, sometimes scandent or creeping, 1–10 m tall, DBH 3–40(80) cm. Bark green to (dark or reddish) brown or grey, smooth to scaly or fissured. Sapwood cream coloured, hardwood brown. Twigs sometimes with conspicuous interpetiolar ridges, hairy when young, becoming more glabrous as they mature, patches often remaining on interpetiolar ridges, bracts absent at base of new shoots.

> Leaves opposite to subopposite, ovate or obovate (2)4–21 × (1)3–16 cm, apex obtuse to acuminate, base cuneate to cordate, margins entire or rarely serrate, characteous [chartaceous] to membranous, glabrous sometimes with hairs on veins and/or in axil of the main-vein with the side-veins, dull to glossy, crushed leaves with foetid smell; glands yellow or brown, sessile; venation 4–9 main side-veins, often tri-veined from base; petioles 0.5–7 mm long, channeled, glabrous to the channeled filed with hairs, becoming more glabrous as they mature. Inflorescence 2–20 cm long, corymbose cymes, glabrous to velutinous; bracteoles linear, <5 mm long. Flowers: calyx 0–5-lobed, clearly to obscurely two-lipped, outer surface glabrous or sparsely pubescent, not to slightly accrescent, shortly pedicellate, green to yellow-white; lobe apex rounded to acute; glands yellow, sessile; flowering calyx 1–2 mm, variously lobed; fruiting calyx 2–4 mm long, variously lobed. Corolla tube 1.2–5 × 1–2 mm, slightly two-lipped to lobes iso-morphous, glabrous to sparsely hairy on lobes, (greenish-)white to reddish, scent absent or slightly lemon-like; glands yellow, sessile; central lobe of lower lip orbicular to oblong or spathulate, 0.8–3.5 × 0.5–2 mm, apex rounded, sometimes reflexed; other lobes 0.8–1.7 × 0.5–1.5 mm, apex rounded, erect to reflexed. Stamens 1–5 mm long, just exserted from the tube, ± didynamous, white; anthers 0.2–0.6 mm long, brown to yellowish green. Ovary globose, 0.5–1.3 mm diam, glabrous, sometime with a dense patch of glands at apex; style 2–7 mm long, exserted, white; stigma 0.5–1 mm long, apex acute. Fruit globose, 3–8 × 3–5 mm, glabrous, outer surface sometimes warty, glossy, green turning sometimes white, then black, purple or dark red when mature, endocarp smooth. Seeds four, equally developed when mature."

Material examined. **O'AHU**: Mānoa, where Mānoa Stream runs under Pawaina St, growing from channelized area of Mānoa Stream, from crack in concrete placed to channelize stream, tree to 4 m tall, reaching up from stream bed to road level, flowers white, fruits pale green when immature, turning black when ripe, 73 m, 21.323151, -157.802536, 29 Sep 2022, *K. Faccenda 2721*.

Salvia reflexa Hornem. **Showing signs of naturalization**

Two plants of *Salvia reflexa* were found in Kaimuki at Pukalani Place growing from mowed grass on the edge of the road, where they obviously were not planted. *Salvia reflexa*, commonly called mint weed, is native from the midwestern United States through Mexico and has become naturalized in temperate and tropical regions across almost all continents (POWO 2023). It is considered a rather aggressive weed in much of its introduced range (Shao *et al.* 2019) and releases allelopathic chemicals (Lovett & Lynch 1979). *Salvia reflexa* can be identified by its annual habit, blue flowers, strongly laterally compressed perianth (Figure 24), and pleasant, minty smell when crushed.

The following description is from Hussain *et al.* (2019: 18):

> "Annual herb c. 50 cm tall. Tap root fibrous. Stem green, 4-angled, covered with short rigid retrorse hairs. Leaves opposite, decussate, 3–6.5 cm × 8–14 mm, glabrous on the adaxial surface, sparsely pubescent on the abaxial surface, petiolate, petiole 1–4 cm long, petiole pubescent, lamina lanceolate, obtuse, cuneate, crenate, nerves in 5–6 opposite or alternate pairs. Flowers bracteate, borne in terminal verticillasters. Pedicel c. 2 mm. Bracts 0.4–0.5 cm × 1 mm, acuminate, calyx, green, tubular, 4–8 mm long, hairy along nerves, gland dotted between nerves, throat sparsely hairy, persistent, pale brown at maturity, upper lip acute, 5 nerved, lower lip bifid, 7 nerved. Corolla pale lilac to white, 0.8–1 × 0.6 cm, internally pubescent, upper lip smaller, lower lip laterally lobed, apex emarginate. Anthers c. 1 mm long, filament about 2 mm. Carpel c. 7 mm, ovary c. 1 mm. Nutlets oblong, flat, yellowish, c. 1.5 mm long, surface reticulate."

Figure 24. *Salvia reflexa* calyx and bracts from the plants at Pukalani Pl, Oʻahu.

Material examined. **Oʻahu**: Kaimuki, Pukalani Pl, weedy roadside, dry, sunny, 2 plants seen, flowers light blue, plant with a rather pleasant mint scent, 92 m, 21.286645, -157.793066, 04 Mar 2023, *K. Faccenda 3054.5*.

Piperaceae

Piper sarmentosum Roxb. **Showing signs of naturalization**

Piper sarmentosum (syn. *P. lolot*) is now showing signs of naturalization where it is spreading aggressively via stolons on Oʻahu and Maui. On Oʻahu it was found forming a large colony of at least 50 square meters at the Judd Trail trailhead off Nuʻuanu Pali Dr., where it was likely dumped at one point. Another colony was also found over 100 meters away from the road on the other side of the stream suggesting it may be reproducing via seed. Even larger colonies were seen at Lyon Arboretum, but this was purely vegetative spread from cultivated plants (Figure 25). It was also seen forming large patches on East Maui, where it was spreading from cultivation.

Material examined. **Oʻahu**: Lyon Arboretum, Mānoa, in rainforest, shady areas, planted and forming a monotypic understory in several large patches, these patches over 20 m wide, 170 m, 21.334580, -157.803326, 29 Sep 2022, *K. Faccenda 2720*; Nuʻuanu, parking lot for Judd Trail on Nuʻuanu Pali Dr, wet forest in understory on edge of road and expanding into forest in shady to partially shady areas, forming monocultures and covering at least 50 sq. meters but perhaps more, 223 m, 21.347043, -157.820846, 27 Nov 2022, *K. Faccenda & S. Coles 2852*; *loc. cit*., 08 Jan 2023, *N. Walvoord et al. 2023-004*. **Maui**: East Maui, Hāna Distr., Mokulehua Stream, NW of Puʻu Hinai, cultivated originally but seems to be spreading from large patch by underground rhizomes, unsure at this time if viable seeds are produced, 14 Mar 2009, *H. Oppenheimer H30907*.

Figure 25. *Piper sarmentosum* colony at Lyon Arboretum, where it was cultivated at one point, but has now spread extensively.

Urticaceae

Pilea cadierei Gagnep. & Guillaumin **Showing signs of naturalization**

Pilea cadierei is now showing signs of naturalization on Maui, where a large colony was found covering several hundred square meters along the Hāna Hwy. It was effectively growing under the shade of *Hedychium* sp. and excluding all other species besides the *Hedychium* (Figure 26). It was likely planted in the area given that it is near some driveways, but has begun to spread at least 10 meters away from the driveways. It is likely that most of this spread is vegetative but it is unclear if seeds were also produced. A patch of *Pilea cadierei* was also seen at Lyon Arboretum along the dirt road where it did not appear planted [link], but a specimen was not made of this plant.

Material examined. **MAUI**: Hāna Hwy ca 4 km W of Waiʻānapanapa State Park at roadside coconut stand and restaurant, wet, shady roadside dominated by weeds, likely planted along driveway, but spreading aggressively away from that area, covering hundreds of square meters and forming a monotypic understory in degraded forest, even forming a thick stand in shade underneath *Hedychium flavescens,* leaves dark green with white patch, 175 m, 20.793919, -156.051755, 23 Oct 2022, *K. Faccenda 2751*.

Figure 26. *Pilea cadierei* seen growing under *Hedychium* along Hāna Hwy, Maui.

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New records of introduced Lepidoptera in the Hawaiian Islands for the year 2023

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Thirteen new state records and six new island records are reported for introduced Lepidoptera in Hawai'i. One new species-level identification, two new corrections to previous identifications, and one new status change are noted. Additional taxonomic corrections and updates to the lists in Austin & Rubinoff (2022, 2023) are provided.

The Hawaiian Islands are the "invasion capital" of the world with more introduced species than virtually anywhere else on per-area basis. Despite having nearly 1.5 million residents and over 140 years of entomological surveys, Hawai'i still has countless new native insect species awaiting discovery and dozens of new introduced insect species continuing to arrive year after year to the state, demonstrating both the incomplete state of knowledge of the native fauna and poor quarantine controls over imports. Understanding the number of new alien species establishing every year is an important baseline for evaluating quarantine effectiveness against serious invasive pests. Records of new alien species are an important part of such an effort because they reflect the effectiveness of exclusion efforts across the state. Increasing or decreasing numbers of newly introduced species serve as a warning system for understanding the efficacy of quarantine and exclusion efforts in the archipelago.

Information regarding the formerly published distributions in Hawai'i of species discussed herein is based on Nishida (2002), Starr *et al*. (2004), Howarth *et al*. (2012), and Austin & Rubinoff (2022, 2023). Identifications were made by the first author except where otherwise noted. Label data were transcribed verbatim except for corrections to Hawaiian spelling and orthography. Any other corrections to data labels are provided in brackets following the verbatim label. Atypical coordinates are presented verbatim but more conventional coordinates are provided in brackets. Identifications were based on external morphology, genitalia dissections, and cytochrome oxidase I sequence data (COI barcode; GenBank accession numbers provided). COI sequence data, including data from Austin & Rubinoff (2022), is available as a BOLD dataset [link]. Specimens were compared with illustrations and figures in the published literature as well as through comparisons with material deposited at the Bernice Pauahi Bishop Museum (BPBM), Hawai'i Department of Agriculture (HDOA), Natural History Museum, London (NHMUK), and the University of Hawai'i Insect Museum (UHIM). Voucher specimens and other examined material are deposited in these collections as noted.

Crambidae

Terastia sp. A — Status change

This species has previously been considered introduced in Hawai'i (Swezey 1923, Zimmerman 1958). It had been identified as either *Terastia meticulosalis* (Swezey 1923,

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Zimmerman 1958) or *T. subjectalis* (Nishida 2002), but Austin & Rubinoff (2022) considered it distinct from both of these species and listed it as "*Terastia* sp. A" after examining recent specimens from Maui, which represented the first records since Swezey (1923). We recently collected two more specimens from remnant native dry forest on Oʻahu, representing the first Oʻahu records in over a century, and which also differ significantly from any of the described species of *Terastia* (see Sourakov *et al*. 2015, 2022). We now propose that the species of *Terastia* in Hawaiʻi is an undescribed, endemic, likely endangered species associated with wiliwili (*Erythrina sandwicensis*). Andrei Sourakov (University of Florida) agreed with this assessment (pers. comm., 2024). This is not the first time a native species has been mistaken for something invasive, but it demonstrates the poor level of basic knowledge concerning not just the taxonomy but the conservation status of native Hawaiian insects.

Material examined. **Oʻahu**: 1♂, 1♀, Kuaokalā F[orest] R[eserve], Kaluakauila Gulch, 21.5476, -158.2239, 430 m, 24–25 Dec 2023, K. A. Austin, UV bucket trap (UHIM).

Dryadaulidae

Dryadaula advena (Zimmerman) **New island record**

Zimmerman (1978) treated this species as introduced. Nishida (2002) reported it from Oʻahu; Austin & Rubinoff (2023) reported it from Kauaʻi and Maui. We report it from Hawaiʻi island for the first time. It is likely a generalist detritivore and fungivore.

Material examined. **Hawaiʻi**: 1♂, Puna Distr[ict], 12 SSW Pāhoa, 335 m, logs coll. 2 Nov [19]77 / ex. logs of *Suttonia* [=*Myrsine*] *lessertiana* (A. DC.) Mez., emerged 17 Jan [19]78, R. Papp (BPBM).

Erebidae

Galtara extensa (Butler) **New island record**

This species was deliberately released on Maui and Hawaiʻi island in 2013 to control Madagascan Fireweed (*Senecio madagascariensis*) and Cape Ivy (*Delairea odorata*) under the name *Secusio extensa*. Matsunaga *et al.* (2019) mentioned that larvae of this species had been found attacking vines of *Delairea odorata* at Palehua-Palikea, Oʻahu, but considered establishment questionable. No voucher specimens were taken. Therefore, we report it from Oʻahu for the first time from a female collected on Tantalus Drive and tentatively consider it established on Oʻahu.

Material examined. **Oʻahu**: 1♀, Papakōlea, Tantalus Drive, 21.3183, -157.8362, 130 m 19 Apr 2023, L.-A. Beamer, hand collecting (UHIM).

***Maguda* sp. A** **New state record**

This species closely resembles an undescribed species of *Maguda* known from northern Queensland, Australia. The host for *Maguda* is unknown, but other members of the tribe to which it belongs (Boletobiini) are known to feed as larvae on bracket fungi in the family Polyporaceae (Holloway, 2005). The genus *Maguda* occurs in southeast Asia and northern Australia.

Material examined. **Oʻahu**: 1♂, Honolulu Watershed F[orest] R[eserve], Tantalus Arboretum Trail, 21.3266, -157.8260, 330 m, 11–12 Feb 2023, K. A. Austin, LED bucket trap / DNA extraction KA0737 / KAA diss. #0969 (UHIM).

Gelechiidae

Anacampsis obscurella (Denis & Schiffermüller)**New state record**

Five specimens of this species had been identified as *Tachyptila subsequella*, now considered a synonym of *Anacampsis obscurella*, by Syuti Issiki in BPBM from specimens collected over a century ago. It was likely introduced via the nursery trade. We can find no evidence of its establishment and suggest it to be treated as "adventive, but not established."

Material examined. **Oʻahu**: 1♂, 4♀, Honolulu, 6 Apr [19]11, Severin / ex. Japanese cherry / det. Issiki (BPBM).

Mesophleps adustipennis (Walsingham) **New island record**

This species was first recorded in Hawaiʻi in 2020 where it was reported from Oʻahu (Austin & Rubinoff 2022). We report it from Hawaiʻi island for the first time. It has been reared in Hawaiʻi from seeds of koa haole (*Leucaena leucocephala*), but can occasionally be encountered in native mesic forest, where it presumably feeds on the seeds of koa (*Acacia koa*).

Material examined. **Hawaiʻi**: 1♂, Nani ʻEkolu, above Kealakekua, 19.5230, -155.8510, 1175 m, 23–25 Jun 2023, K. A. Austin et al., UVLED light sheet / DNA extraction DNA01738 (UHIM).

Symmetrischema striatella (Murtfeldt) **New state record**

This species was collected by Klaus Sattler during his extensive collecting trips in Hawaiʻi in the 1970s and 1980s but had gone unreported until now. It is native to North America, but has also been introduced into New Zealand (Hoare & Hudson 2018). It has been reported to feed on leaves and berries of various species of *Solanum* (Solanaceae). Given the widespread distribution of the host genus in Hawaiʻi, it is odd that the moth has not been found elsewhere or recently. It is possible that it has been extirpated from the state.

Material examined. **Kauaʻi**: 1♂, Waimea Canyon State Park, Puʻu Hinahina area, 3,400 ft, 18 Aug 1973, K. &. E. Sattler / NHMUK diss. #21340 (NHMUK). 1♀, same as previous except 16 Aug 1973 / NHMUK diss. #21341 (NHMUK).

Geometridae

Chloroclystis pyrrholopha Turner **New island record**

This species was first reported in Hawaiʻi as *Chloroclystis* sp. A by Austin & Rubinoff (2022) from specimens collected on Oʻahu. Austin & Rubinoff (2023) identified it as *Chloroclystis pyrrholopha* and included an additional record from Kauaʻi. We report it here from Hawaiʻi island for the first time. Its life history is unknown.

Material examined. **Hawaiʻi**: 1♀, Nani ʻEkolu, above Kealakekua, 19.5230, -155.8510, 1175 m, 23–25 Jun 2023, K. A. Austin et al., UVLED light sheet (UHIM).

Thyrinteina arnobia (Stoll) **New state record**

In Hawaiʻi, this species appears superficially similar to *Iridopsis fragilaria* (Grossbeck), but to our knowledge it has only recently arrived in the state. A specimen was first photographed on Kauaʻi in August 2023 [link] before adults were collected on Oʻahu in December 2023. The genus is Neotropical in distribution, with *T. arnobia* the most widespread species. It is known from much of Central and South America and north to south Texas and the Caribbean. Several subspecies have been described for *T. arnobia* (see Rindge 1961), primarily based on the ratio of gray and white scaling on the male forewings, but individuals are variable even within a given subspecies or geographic area,

rendering subspecific distinction of questionable value. *Thyrinteina arnobia* is a pest on guava (*Psidium* spp.), but has also expanded its host range to become a major pest of *Eucalyptus* plantations in Brazil (Almeida *et al.* 2021). Monitoring will be required to track any host expansions to other Myrtaceae in Hawai‘i, such as ‘ōhi‘a (*Metrosideros* spp.), as has unfortunately been the case for other introduced Lepidoptera (e.g., *Ophiusa disjungens*, *Targalla delatrix*). The two localities listed below both had guava present in the immediate vicinity, with scattered small ‘ōhi‘a nearby in low densities. Historical *Eucalyptus* groves were also nearby.

Material examined. **O‘ahu**: 1♂, Kuaokalā F[orest] R[eserve], small ridge between Kuaokalā trail and 4WD road, 21.5545, -158.2215, 565 m, 24 Dec 2023, K. A. Austin, UVLED light sheet (UHIM). 2♂♂, Kuaokalā F[orest] R[eserve], Kaluakauila Gulch, 21.5476, -158.2239, 430 m, 24–25 Dec 2023, K. A. Austin, UV bucket trap (UHIM).

Gracillariidae

Ketapangia leucochorda (Meyrick) **New state record & name update**

This species was first reported in Hawai‘i by Perreira & Yee (2017) as *Ketapangia* sp. We identify it here based on dissected specimens reared from *Terminalia catappa* (Combretaceae) from Barbers Point and Nu‘uanu, O‘ahu. It is likely much more widespread on O‘ahu than currently recognized. Outside of Hawai‘i, this species is known from India, the Ogasawara Islands (Japan), and the Gilbert Islands (Kiribati) (Kumata 1995).

Material examined. **O‘ahu**: 10♂, 1♀, Barbers Point Beach Park, 21.2968, -158.1048, 1 m, mines coll. 25 Feb 2023, adults ecl. 10–22 Mar 2023, K. A. Austin, K. Faccenda / HOST: *Terminalia catappa* (Combretaceae), leaf-miners / DNA extraction KA0758 / KAA diss. #0988 (♂), DNA extractions DNA01787, DNA01788 (UHIM). 5♂, 1♀, Honolulu, Pauoa Rd. n[ea]r Nu‘uanu Ave., along Nu‘uanu Stream, 21.3208, -157.8511, 30 m, mines coll. 6 Aug 2023, adults ecl. 16–21 Aug 2023, C. Doorenweerd / HOST: *Terminalia catappa* (Combretaceae), leaf-miners (UHIM).

Heliodinidae

Aetole prenticei Hsu **Note**

This species was first reported in Hawai‘i by Austin & Rubinoff (2023) from a series of specimens collected in 1994 at Barbers Point, O‘ahu. No specimens had been collected since, so it was unclear whether or not this species had become established. We report it here from a large series of specimens reared from mines on the non-native *Sesuvium verrucosum* (Aizoaceae) from near the original 1994 locality. Mines were also observed on the indigenous *Sesuvium portulacastrum* but were not collected. No collections or observations of *Aetole prenticei* have been made from other locations on O‘ahu, but extensive surveys have not been done and we believe it is likely that this species is more widely distributed than currently known.

Material examined. **O‘ahu**: 14♂, 3♀, Kalaeloa Beach, 21.2970, -158.1071, 1 m, mines coll. 25 Feb 2023, adults ecl. 2 Mar–24 Mar 2023, K. A. Austin, K. Faccenda / HOST: *Sesuvium verrucosum* (Aizoaceae), leaf-miner / DNA extraction KA0757 / KAA diss. #0987 (♀).

Lycaenidae

Brephidium exilis (Boisduval) **New island record**

This species was previously known from Kaua‘i, O‘ahu, Maui, Lāna‘i, and Kaho‘olawe (Howarth & Preston 2002, Nishida 2002, Starr *et al.* 2004, Austin & Rubinoff 2023). We report it from Hawai‘i island for the first time. Its larvae are known to utilize a wide variety of native and non-native hosts in Hawai‘i, especially in Amaranthaceae. This identification was provided by Janis Matsunaga (HDOA).

Material examined. **Hawai‘i**: 3 specimens (sex unknown), Kawaihae, 20.030265, -155.829695, 1 m, 31 Jul 2023, S. Chun, hand collected adults on *Atriplex* (HDOA).

Noctuidae

Noctua pronuba (Linnaeus) **New state record**

Despite this species being highly invasive in North America and rapidly spreading across the entire continent since its initial introduction in Nova Scotia in 1979, this Hawai‘i species is only known from a single specimen collected on Ka‘ala, O‘ahu in 2012. It has not been collected since, suggesting that if this species is established in Hawai‘i, it is not abundant like it is in North America. However, an individual was photographed on a plane that landed in Honolulu from San Jose in 2022 [link]. The San Jose airport was apparently overrun by them, suggesting that this is a likely avenue of introduction for this species. Care should be taken to prevent this polyphagous species from becoming established in Hawai‘i, as it is one of the most invasive and widespread moth species in North America.

Material examined. **O‘ahu**: 1♂, Ka‘ala, wet high mountain, 25 Feb 2012, Haines & Prestes (UHIM).

Oecophoridae

Borkhausenia nefrax Hodges **New state record & correction**

This species had been previously identified in Hawai‘i as *Oecia oecophila* (Autostichidae) (Staudinger) by Zimmerman (1978) where it had been reported from O‘ahu (Nishida 2002) and Hawai‘i island (Howarth *et al*. 2020). However, to our knowledge Zimmerman never dissected any specimens and did not figure any Hawaiian material, instead only including photographs of the holotype of *O*. *maculata* Walsingham, a synonym of *O*. *oecophila*, from the U.S. Virgin Islands. *Borkhausenia nefrax* and *Oecia oecophila* are superficially two very similar species, but are distinct in the male and female genitalia.

Borkhausenia nefrax was commonly seen on buildings and other structures in October 2022 in the immediate vicinity of Hale Pōhaku (Onizuka Center for International Astronomy) on Maunakea and a few were collected. One male was dissected and confirmed to be *B*. *nefrax* based on comparison to illustrations in Kuchlein & Van Lettow (1999). The genitalia is stored in a glycerin-filled microvial instead of slide-mounting. A 1,494 base pair fragment of COI (Genbank Accession PP214158) of a sequenced specimen is a 100% match to several BIN members of BOLD:AAD8018, identified as *Borkhausenia nefrax* from California and Norway.

Borkhausenia nefrax is known from the western United States (Hodges 1974), France (Minet 1978), Spain (Vives Moreno 1981), and the Netherlands (Kuchlein & Van Lettow 1999). Though described from Arizona, it likely is an introduced species in North America and originated in Europe. Prior to Minet (1978), this species had been identified in France as *Oecia oecophila*, which may explain why Zimmerman identified the Hawai‘i species as such. *Oecia oecophila* is not known to occur in Hawai‘i and all previous records of it in Hawai‘i (e.g., Zimmerman 1978, Howarth *et al.* 2020) should be considered misidentifications of *B*. *nefrax*. Larvae are detritivorous and fungivorous. As a synanthropic species, it should be expected in and around other buildings in Hawai‘i, but its small size and dull forewing coloration has probably helped it escape notice until now.

Material examined. **Hawai‘i**: 3♂, Mauna Kea Ice Age N[atural] A[rea] R[eserve], Hale Pōhaku, 19.7617, -155.4560, 2830 m, 18 Oct 2022, K. A. Austin, J. B. Reil, S. Schachat, hand collecting at night outside / DNA extraction KA0712 (UHIM).

Tachystola hemisema (Meyrick) **New state record**

This species was photographed and later collected in Waikōloa Village, Hawai‘i island. It may belong to a complex of at least five *Eucalyptus*-associated Australian species (Sterling *et al.* 2023), some of which have recently become established in New Zealand (Hoare & Hudson 2018), California (Pohl & Landry 2023), and England (Sterling *et al*. 2023). At present, we choose to treat the Hawai‘i taxon as conspecific with the New Zealand and California species (*T. hemisema*) and distinct from the England species (*T. mulliganae*) based on the yellower wings more contrasting terminal forewing markings. Unfortunately, the only specimen collected in Hawai‘i is a female, which lack significant morphological differences to separate species. Future molecular work is needed to confirm the status of the Hawai‘i taxon.

Material examined. **Hawai‘i**: 1♀, Waikōloa Village, 19.9494, -155.7800, 308 m, 21 Jul 2023, Kyle Kashner, UV light / DNA extraction KA0938 (UHIM).

Opostegidae

Pseudopostega zelopa (Meyrick) **New state record**

Three specimens of this miniscule moth were collected in Wailupe Valley in heavily disturbed open lowland forest. It closely agrees with the description and figures of *P. zelopa* provided in Puplesis & Robinson (1999), which is a common and widespread species in South and Southeast Asia. The host plant is unknown, but is likely to be a stem miner (Erik van Nieukerken, pers. comm., 2023). *Ficus*, *Justicia*, and *Asystasia* are potential hosts that are present in the area that may be worth searching for mines. This is the first record of a non-native opostegid in Hawai‘i. The endemic opostegid genus *Paralopostega* are leaf-miners on *Melicope* spp. (Rutaceae) but are rarely collected.

Material examined. **O‘ahu**: 2♂, 1♀, Wailupe Valley, 21.3011, -157.7567, 100 m, 31 Mar 2023, UVLED light sheet, K. A. Austin, K. Faccenda / DNA extractions DNA01654, DNA01655, DNA01656 (UHIM).

Pyralidae

Assara seminivale (Turner) **New state record & correction**

This species has been previously identified in Hawai‘i as *Assara albicostalis* Walker based on O‘ahu material examined by Dr. Klaus Sattler (Howarth & Sattler 1982). Austin & Rubinoff (2023) reported it from Hawai‘i island, but suggested that the species in Hawai‘i may be *A. seminivale* (Turner), the macadamia kernel grub, but lacked molecular data at the time. Having now sequenced a 1,494 base pair fragment (GenBank Accession PP214157) of COI for the Hawai‘i taxon and finding it a 99.85% match to a specimen from Australia (GU695437.1), which is a BIN member of BOLD:AAD8506, along with other specimens of *Assara seminivale* from Australia, Papua New Guinea, and French Polynesia, we now confirm the presence of *A. seminivale* in Hawai‘i and suggest that all previous identifications of *A. albicostalis* in Hawai‘i are misidentifications of *A. seminivale*. This is important because *A. seminivale* is a significant pest of macadamia nuts in Australia whereas *A. albicostalis*, although very closely related, is not known to use macadamia, instead using various species of Dipterocarpaceae to complete development (Nakagawa *et al.* 2003).

Sphingidae

Hippotion rosetta (Swinhoe) **New island record**

Nishida (2002) listed a junior synonym of this species, *Hippotion depictum* Dupont, as having been intercepted in quarantine and not established in the Hawaiian Islands. It was first collected in 1998 from Oʻahu and Kauaʻi (Kumashiro *et al*. 2002) before being reported from Maui by Howarth *et al*. (2012) and considered established by Austin & Rubinoff (2022). We report it from Hawaiʻi island for the first time.

Material examined. **Hawaiʻi**: 1♂, Puʻu Makaʻala N[atural] A[rea] R[eserve], Kulani Section, along road at E border of S Boundary Unit, 1500 m, 19.55456, -155.28568, UV light on sheet, 21 Oct 2011, W. Haines, A. Prestes (UHIM).

Tineidae

Xystrologa grenadella (Walsingham) **New state record**

This species is widespread in the Caribbean, where it occurs from Grenada north to Puerto Rico and Jamaica. It is also present in south Florida and Bermuda, but it is unclear if it is native there or not. It has also been recently reported infesting greenhouses in Germany (Davis *et al*. 2012). It has been reported as a general detritovore and fungivore, but can also be a significant pest of the bark of *Ficus* and the roots of cultivated orchids and pineapple (Davis *et al*. 2012). This identification was provided by Bruno Rasmussen.

Material examined. **Oʻahu**: 2♂, 1♀, Honolulu Watershed F[orest] R[eserve], Tantalus Arboretum Trail, 21.3266, -157.8260, 330 m, 11–12 Feb 2023, K. A. Austin, UV light trap (UHIM). 5♂, 5♀, Honolulu Watershed F[orest] R[eserve], Makiki Valley Trail, 21.3259, -157.8244, 340 m, 11–12 Feb 2023, K. A. Austin, UV light trap / DNA extractions KA0735, 0736 / KAA diss. #0967(♂), #0968(♀) (UHIM).

Tortricidae

Cacocharis cymotoma (Meyrick) **New state record**

This species was first detected in Hawaiʻi from photographs posted on iNaturalist from January 2022 on Kauaʻi [link] and January 2023 on Hawaiʻi island [link]. Larvae were subsequently found in many locations on Oʻahu feeding on the introduced species *Phyllanthus debilis* (Phyllanthaceae), where it appears to be common and widespread. A single specimen was also found by Army Natural Resources, Oʻahu (ANRPO) staff on leaves of the critically endangered mēhamehame (*Flueggea neowawraea*, Phyllanthaceae) in one of their greenhouses. ANRPO staff later noticed numerous additional caterpillars in their greenhouse, again attacking *Flueggea,* suggesting this moth may be of conservation concern by impeding restoration of this rare tree. *Cacocharis cymotoma* natively occurs in Florida, Central America, the Caribbean, and much of South America, where it has been reared from *Phyllanthus acidus* Skeels and *P. niruri* L. (Brown 2008).

Material examined. **Oʻahu**: 4♂, 7♀, Kahanaiki, n[ea]r Kawainui Marsh, 21.3794, -157.7653, 20 m, larvae coll. 5 Feb 2023, adults ecl. 18 Feb–3 Mar 2023, K. A. Austin / HOST: *Phyllanthus debilis* (Phyllanthaceae), leaflet-tiers (UHIM). 1♂, Honolulu Watershed F[orest] R[eserve], Tantalus Arboretum Trail, 21.3266, -157.8260, 330 m, 11–12 Feb 2023, K. A. Austin, UV light trap (UHIM). 4♂, 1♀, Kuliʻouʻou For[est] Res[erve], Kuliʻouʻou Ridge Trail, 21.3078, -157.7231, 200 m, larvae coll. 18 Mar 2023, adult ecl. 6–12 Apr 2023, K. Faccenda et al. / HOST: *Phyllanthus debilis* (Phyllanthaceae), leaflet-tiers (UHIM). 1♂, Waialua, UH Experimental Station, 21.5374, -158.0889, 220 m, larva coll. 29 Mar 2023, adult ecl. 24 Apr 2023, K. Faccenda / HOST: *Phyllanthus debilis* (Phyllanthaceae), leaflet-tiers (UHIM). 1♀, Schofield Barracks, Army Natural Resources Program greenhouse, 21.4999, -158.0787, 295 m, larva coll. 12 Apr 2023, adult ecl. 26 Apr 2023, F. Joy / HOST: *Flueggea neowawraea* (Phyllanthaceae), leaf-tier (UHIM).

Zygaenidae

***Illiberis* sp. A.** **New state record**

A single specimen of this species is present in BPBM identified as *Goe diaphana* Hampson. However, the wing shape, scale pattern, and venation more closely resembles species of *Illiberis* Walker, such as *I. pruni* Dyar and *I. kardakoffi* Alberti. Though the specimen lacks rearing data, *I. pruni* is an especially interesting possibility, considering that Severin collected *Anacampsis obscurella* on the same date in Honolulu from Japanese cherry, a known host for *I. pruni* (see *Anacampsis obscurella* account above). Regardless of its identity, it should be considered "adventive, but not established" in Hawai'i. This is the first record of Zygaenidae from Hawai'i.

Material examined. **O'ahu**: 1♀, Honolulu, 6 Apr [19]11, Severin (BPBM).

ADDITIONAL CORRECTIONS TO NISHIDA (2002) OVERLOOKED BY MATSUNAGA *ET AL.* (2019) AND AUSTIN & RUBINOFF (2022, 2023)

Noctuidae

Amyna octo (Guenée) in Nishida (2002) should be *Amyna axis* (Guenée) per Nielsen et al. (1996). This synonymy was overlooked by Austin & Rubinoff (2022). To our knowledge, this species is known in Hawai'i from two specimens: the type of *Celaena perfundens* Walker, 1858, described from the "Sandwich Islands" and currently treated as a synonym of *A. axis*, and a more recent record from O'ahu in BPBM. Because of the minor pest status of *A. axis*, we find it more likely these two records stem from separate introduction events and failed subsequent establishments than a population that has persisted in Hawai'i nearly undocumented for 165+ years. Thus, we suggest that *A. axis* be treated as "adventive, but not established" in Hawai'i.

Leucania loreyimima Rungs in Nishida (2002) should be *Leucania stenographa* Lower (Edwards 1992). This synonymy was overlooked by Austin & Rubinoff (2022).

Pyralidae

There has been some recent confusion regarding *Ectomyelois ceratoniae* (Zeller) in Hawai'i [see Austin & Rubinoff (2022, 2023)]. Nishida (2002) included it as *Ectomyelois ceratoniae*, but Austin & Rubinoff (2022) listed it as *Apomyelois ceratoniae* (Zeller), following Nuss *et al*. (2003–2023). Austin & Rubinoff (2023) listed it again as *Ectomyelois ceratoniae*. According to Ren & Yang (2016), the current accepted combination is *Ectomyelois ceratoniae*, the name used in Nishida (2002) and Austin & Rubinoff (2023).

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Assorted additions to the Hawaiian weed flora

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Between 2021 and 2023, extensive roadside plant surveys were conducted across the islands of Hawai'i. While the goal of these surveys was to identify and map grasses, many new non-grass records were also found. For further details about these surveys, see Faccenda (2023c). This paper includes records located during these surveys but not fitting into previous reports, which were largely thematic (Faccenda 2023a–c; Faccenda 2024; Faccenda & Daehler 2024).

This paper herein enumerates 14 new island records, 2 corrections of previously published misidentified plants, 2 confirmations of naturalization for species previously published as questionably naturalized, 1 new naturalization, and 1 new questionable naturalization across Kaua'i, O'ahu, Maui, and Hawai'i. All identifications were made by the author. Voucher collections mentioned are housed in Bishop Museum's Herbarium Pacificum (BISH), Honolulu, Hawai'i.

Acanthaceae

Asystasia gangetica

subsp. ***micrantha*** (Nees) Ensermu **New island record**

Previously documented on Kaua'i, Maui, and Hawai'i (Starr & Starr 2016; Starr & Starr 2022; Brock *et al*. 2023), *Asystasia gangetica* subsp. *micrantha* is now known to be naturalized on O'ahu, where it was found growing on a roadside in Waimānalo.

Material examined. **O'AHU**: Waimānalo, Mahiku Pl, partly sunny, moist area near houses, typical form of *Asystasia gangetica* also seen in this area, flowers white and more closed than typical variety, <10 plants seen on roadside, 39 m, 21.346510, -157.738430, 02 Aug 2022, *K. Faccenda 2571*.

Araceae

Philodendron hederaceum (Jacq.) **New naturalized record**;

Schott var. ***hederaceum*** **Nomenclatural note**

Philodendron scandens was previously reported as naturalized on Kaua'i and Maui (Imada 2019) and adventive at Lyon Arboretum (Daehler & Baker 2006); however, this name has now been synonymized with *P. hederaceum* var. *hederaceum* (Croat 1997). *Philodendron hederaceum* is now also known to be naturalized on O'ahu, and Hawai'i, where large colonies have been seen spreading vegetatively far from cultivation, along with seedlings being found off of the Pu'u Pia Trail on O'ahu.

Material examined. **O'AHU**: Kalihi Valley, Kalihi St in back of valley, roadside, wet, full shade, appearing wild on side of road, climbing over 8 m up a tree, near houses but not directly in a yard, 21.363871, -157.844978, 19 May 2022, *K. Faccenda & B. Najarian 2376*; Mānoa, Pu'u Pia Trail at base of trail in stream bed, shady forest floor, small patch 1 m wide, separated by several hundred meters from large main patch further up trail, evidence of reproduction and dispersal of this species, 122 m, 21.322551, -157.797446, 27 Aug 2022, *K. Faccenda 2690*; Lyon Arboretum, Mānoa,

near Hawaiian plant section, in wet rainforest, common climbing vine in arboretum, growing over 20 m up trees into canopy, leaves almost satinlike in texture when young, 184 m, 21.335749, -157.803648, 29 Sep 2022, *K. Faccenda 2718*. **HAWAIʻI**: Hāmākua Distr, ca mile marker 33 along Hwy 19, besides bridge over Mohuna Stream, sterile vine to 25 ft high, 20° 1.524′ N, 155° 20.019′ W, 03 Feb 2007, *G. Staples 1246*; South Hilo Distr, Waiākea Uka, along Hoaka Rd at telephone pole #13, just below intersection with Malaʻai Rd, 275 m, 19° 39.642′ N, 155° 7.164′ W, 17 Jan 2007, *G. Staples & E. Wilson 1238*; Hāmākua Distr, ca mile marker 25 along Hwy 19, 19° 58.941′ N, 155° 13.761′ W, 06 Feb 2007, *G. Staples 1249*.

Philodendron lacerum (Jacq.) Schott **New island record**

Philodendron lacerum was published as a taxon showing signs of naturalization at Lyon Arboretum, Oʻahu (Daehler & Baker 2006). It is now showing evidence of naturalization on Kauaʻi, where it was found roadside on a steep bank opposite from house lots, where it seemed unlikely to have been planted. *Philodendron lacerum* has also been reported as naturalizing on East Maui (Oppenheimer 2004).

Material examined. **KAUAʻI**: Wainiha, along road in valley about 2 km up from valley base, roadside, moist shady area, within several hundred feet of houses but not immediately adjacent to a house, on hillside above road, not in close proximity to any houses/gardens, climbing vine along forest understory and up trees, naturalized, 22.200367, -159.555496, 30 May 2022, *K. Faccenda 2467*.

Philodendron pinnatifidum (Jacq.) Schott **Correction**

Philodendron pinnatifidum was published as naturalized on Kauaʻi by Flynn & Lorence (2002); however, the plant they collected was actually *P. radiatum*. As there are no other naturalized records of *Philodendron pinnatifidum* in Hawaiʻi, it should be removed from the naturalized checklist.

Philodendron radiatum Schott **New naturalized record**

Philodendron radiatum is now known to be naturalized on Kauaʻi, where a colony was found on a roadside in Kalāheo not in close proximity to houses. After collecting this specimen, it was realized that the same population was collected 22 years prior, but was misidentified as *P. pinnatifidum* (see correction above). *Philodendron radiatum* was intentionally introduced as an ornamental into Hawaiʻi. It can be identified by its large leaves up to 80 cm long, which are deeply pinnately lobed to bipinnately lobed (Croat 1997), as opposed to *P. pinnatifidum*, which does not have bipinnately lobed leaves.

Material examined. **KAUAʻI**: Kalāheo, Puʻu Rd about 0.5 km S of Puʻu Lani Pl, near side of road with *Panicum maximum* and koa haole, naturalized on side of road, not in proximity to any houses, 21.914441, -159.536279, 02 Jun 2022, *K. Faccenda 2453*; Kōloa Distr, Kalāheo, along Puʻu Rd ca 0.9 mi from the northernmost junction with Papalina Rd, secondary vegetation of *Syzygium cuminii*, *Leucaena leucocephala*, *Grevillea robusta*, *Panicum maximum*, and *Scindapsus aureus*, ca 189 m, 14 Nov 2000, *T. Flynn 6762* (PTBG).

Asteraceae

Pseudogynoxys chenopodioides

(Kunth) Cabrera **New island record**

Pseudogynoxys chenopodioides, a species formerly only known to grow in gardens on Oʻahu, has now been documented growing in a naturalized context on the Crouching Lion Trail in Kaʻaʻawa, where two large patches about 3 m in diameter were found along the

trail. *Pseudogynoxys chenopodioides* has previously been reported as naturalized on Hawai‘i Island (Wagner *et al.* 1990).

Material examined. **O‘AHU**: Crouching Lion Trail N of Ka‘a‘awa, about 300 m up trail, along trail, open, moist sunny area, 2 large patches seen growing mostly on *Schinus*, each patch about 3 m long and of probably similar depth, 2 patches relatively close to each other, flowers red to orange, vine, 128 m, 21.557201, -157.863741, 23 Aug 2022, *K. Faccenda & T. Chapin 2686*; Kahana, trailside, woody vine ca 3 m high, unsure if naturalized, one mature plant with 7 immature plants, none found anywhere along trail except under mature plant, possibly beginning to naturalize in area, 21.55792, -157.86636, 16 Nov 2018, *M. Cain & S. Pilman 1*.

Cactaceae

Harrisia martinii (Labour.) Britton **New island record**

Harrisia martinii was found naturalized along the road running through Mau‘umae Nature Park as well as further into the park, almost 50 m away from the road. At least 2 colonies were found, but it was difficult to judge exactly how many plants were in each colony. The cactus was both sprawling on the ground and also climbing up trees. Unlike *Selenicereus undatus*, the other naturalized sprawling cactus in the area, this species has long spines exceeding 1 cm per node, as well as having swollen areoles (Figure 1). *Harrisia martinii* was previously published as naturalized on Kaua‘i (Wagner *et al.* 1990).

Material examined. **O‘AHU**: Honolulu, Mau‘umae Nature Park, trail though upper portion of park, dry, sunny, scrubby area along road, climbing cactus like dragon fruit, fruits green, interior white, tepals greenish on outside and pure white on inside, stems vaguely circular, some stems with prominent areoles and others without areoles, 21.287182, -157.791873, 14 May 2022, *K. Faccenda 2363*.

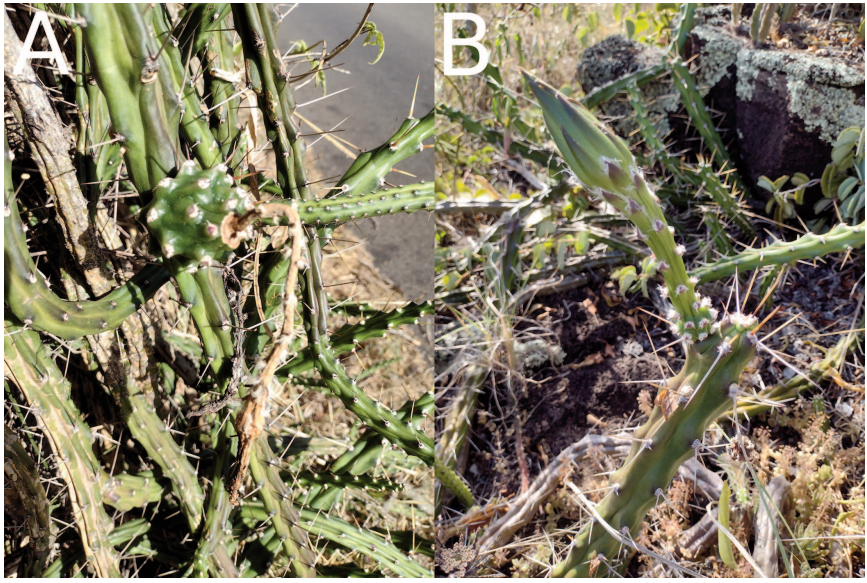

Figure 1. *Harrisia martinii* found in Mau‘umae Nature Park, O‘ahu. **A**, fruit. **B**, bud.

Caryophyllaceae

Cerastium glomeratum Thuill. **New island record**

Cerastium glomeratum, previously reported only from Maui (Starr *et al.* 2004), is now known to be naturalized on Oʻahu and Hawaiʻi, where it was found growing from roadsides in moist, relatively cool areas at Puʻu Kaʻala and Haleʻiwa on Oʻahu and Hāmākua on Hawaiʻi

Material examined. **OʻAHU**: Puʻu Kaʻala, summit, roadside, moist, cool, from gravel in open area, common, 1219 m, 21.507837, -158.143615, 21 Jan 2022, *K. Faccenda 2205*; Haleʻiwa, intersection of Kawailoa Dr. and Kamehameha Hwy, shady, moist roadside, common annual, 2 m, 21.608095, -158.094806, 22 Dec 2022, *K. Faccenda 2878*. **HAWAIʻI**: Hāmākua Distr, Kalaniai Rd about 1 km from Hwy 19, roadside, sunny, moist, uncommon, 359 m, 20.054118, -155.421904, 06 Mar 2022, *K. Faccenda 2345*.

Crassulaceae

Kalanchoe daigremontiana

Raym.-Hamet & H. Perrier **Correction**

Kalanchoe daigremontiana is no longer known to be naturalized on Maui, as the specimen published by Starr *et al.* (2006) has been reidentified as *K.* × *houghtonii* (Faccenda 2024) and no other specimens document its naturalization on the island.

Kalanchoe delagoensis Eckl. & Zeyh. **Nomenclatural note**

The name *Kalanchoe tubiflora*, first applied to Hawaiian plants by Wagner *et al.* (1990), has been reduced to a synonym of *Kalanchoe delagoensis* as *K. tubiflora*, due to priority (Shaw 2008).

Fabaceae

Kummerowia striata (Thunb.) Schindl. **Confirmation of naturalization**

Kummerowia striata was treated as adventive on Hawaiʻi Island (Wagner *et al.* 1990) based on one collection from 1932. It has evidently persisted, as populations were found in Hawaiʻi Volcanoes National Park along both the base of Mauna Loa Strip Road and along Chain of Craters Road (Figure 2). It was uncommon along roadsides and in total less than 50 plants were seen, all of which were on gravelly soil within 1 meter of the edge of the road. This species was introduced in 1929 for use as a forage legume (HAES n.d.). *Kummerowia striata* is now known to be naturalized on Oʻahu, Maui, and Hawaiʻi (Imada 2019).

Material examined. **HAWAIʻI**: Hawaii Volcanoes National Park, base of Mauna Loa Strip Rd near Belt Rd, mowed roadside, dry sunny area, common along first 1 km or so of road, decumbent trailing herb growing only on gravel of roadbed and not seen further away from road, flowers pinkish purple, forming small mats about 40 cm in diameter, no plants seen growing erect, 1230 m, 19.430844, -155.284080, 12 Aug 2022, *K. Faccenda & J. Gross 2615*.

Heliconiaceae

Heliconia bihai (L.) L. **New island record**

Previously reported as naturalized on Maui (Wagner *et al.* 1990), *Heliconia bihai* is now also known to be naturalized on Oʻahu, where naturalized plants were found in Nuʻuanu and Kalihi Valleys along roadsides and far from gardens. In Kalihi Valley, there were over 20 clumps seen in wet, deeply shaded woods (Figure 3). Plants were also seen naturalized in Makiki Valley, but were not collected.

Figure 2. *Kummerowia striata* as seen at the base of Mauna Loa Strip Road, Hawai‘i Island.

Figure 3. *Heliconia bihai* naturalized in Kalihi Valley, O‘ahu.

Material examined. **O‘AHU**: Nu‘uanu Pali Dr above where housing development ends, roadside, shaded, moist, 21.348822, -157.818839, 29 May 2021, *K. Faccenda 1929*; Kalihi Valley, Kalihi St in back of valley, roadside, wet, full shade, common, going over 50 ft into woods from edge of road, naturalized and abundant in this area, 21.362859, -157.846711, 19 May 2022, *K. Faccenda & B. Najarian 2375.*

Malvaceae

Malvastrum americanum (L.) Torr. **New island record**

Malvastrum americanum was found naturalized during roadside surveys on Maui, where large stands were found in pasture lands near Kaupō. *Malvastrum americanum* is now known to be naturalized on O‘ahu, Moloka‘i, and Maui (Imada 2019).

Material examined. **MAUI**: Kaupō, Pi‘ilani Hwy, ca 3 km W of Kaupō town, roadside weed along edge of pasture, abundant shrubby weed to 1 m tall, forming large stands in areas where it is apparently avoided by cattle, flowers bright yellow, 100 m, 20.629782, -156.159367, 26 Oct 2022, *K. Faccenda 2794*.

Sida ciliaris L. **New island record**

Sida ciliaris, a common weed throughout Hawai‘i, is now reported to have colonized Hawai‘i Island, making it known from all the main islands except Ni‘ihau (Imada 2019). This species is widespread on the leeward side of Hawai‘i and has likely been naturalized for some time before it was finally vouchered in 2022. This weed was seen at South Point, Kailua-Kona, Waikoloa, and Hāwī (Figure 4), although only the Hāwī population was vouchered.

Material examined. **HAWAI‘I**: Kohala, Rt 270, about 7 km NW of Kawaihae, just N of Kohala Kai, dry sunny roadside, uncommon annual near roadside, one patch seen, 20.213527, -155.887168, 05 Mar 2022, *K. Faccenda 2330*; Hawaii Volcanoes National Park, Chain of Craters Rd, at parking lot for Holei sea arch, edge of parking lot, only seen on edge of parking lot, <20 plants, no flowers, 19 m, 19.295652, -155.097191, 19 Aug 2022, *K. Faccenda 2682.*

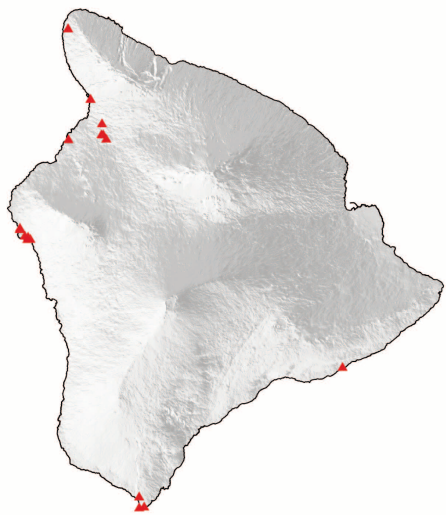

Figure 4. Distribution of *Sida ciliaris* on Hawai‘i Island, based on iNaturalist data reviewed by the author.

Mazaceae

Mazus pumilus (Burm. f.) Steenis **Questionable naturalization**

Mazus pumilus has formerly been reported as naturalized on Maui, and as a questionable naturalization on Oʻahu (Imada 2019). A single plant was found growing as a weed in a potted plant for sale at Kauai Nursery & Landscaping. Given that no plants were found growing from the ground in the area, it should be considered a questionable naturalization, as it is likely to spread from the nursery.

Material examined. **KAUAʻI**: Kauai Nursery & Landscaping off of Kaumualiʻi Hwy just W of Puhi, weed around garden center area, growing out of potted plant for sale, rare, only one plant seen, flowers purple and white, 102 m, 21.964674, -159.405269, 08 Jul 2022, *K. Faccenda & S. Vanapruks 2518*.

Plantaginaceae

Veronica arvensis L. **New island record**

Veronica arvensis, recorded as naturalized on Oʻahu, Molokaʻi, Maui, and Hawaiʻi (Imada 2019), is now also known to be naturalized on Kauaʻi, where it was seen between 580 and 1250 m elevation in the Kōkeʻe area.

Material examined. **KAUAʻI**: Waimea Canyon Road, hunter check in station ca 10 km N of Waimea, mowed grass near check in station building, semi-moist, sunny area, flowers bright blue, rare, 799 m, 22.043643, -159.662802, 02 Jun 2022, *K. Faccenda 2455*; Mākaha Ridge, near Kōkeʻe, Pacific Missile Testing Range, 1900 ft [580 m], 05 Mar 2011, *A. Whistler s.n.* (BISH 778991); Kōkeʻe State Park, Puʻu O Kila lookout, weed all around lookout, 4100 ft [1250 m], 09 Oct 1988, *T. Flynn 3101*.

Proteaceae

Macadamia tetraphylla L.A.S. Johnson **New island record**

Seedlings of *Macadamia tetraphylla* have been seen around Oʻahu, showing that this species is naturalizing in shady mesic sites near where trees had been planted and abandoned (Figure 5). These seedlings are reaching considerable size, with the larger ones up to 3 m tall and likely soon to reach reproductive size. So far three sites have been observed with seedlings. There were 25 seedlings counted at the Tantalus Arboretum Trail in close vicinity to what appeared to be a single parent tree. Five seedlings were found along the Puʻu Kaua Trail about 500 m mauka of the trailhead. *Macadamia integrifolia* and *M. tetraphylla* were also seen planted nearby. Four seedlings were found at Puʻu Pia about 200 m mauka of the trailhead and about 20 m off the trail. *Macadamia tetraphylla* is commonly called the rough-shelled macadamia nut and was introduced for nut production (Staples & Herbst 2005). It can be identified by its sessile or subsessile leaves with petioles up to 4 mm long, and leaves typically 4 per node, as opposed to 3 in *M. integrifolia*.

Material examined. **Oʻahu**: Tantalus, Tantalus Arboretum Trail, wet forest, full shade, 25 seedlings seen in area, plants of various sizes seemingly from just one parent tree, seedlings up to 2.5 m tall, along about 100 ft of trail surveyed for seedlings, 315 m, 21.325967, -157.827419, 19 Jan 2022, *K. Faccenda 2202*; Waiʻanae Mts, trail to Puʻu Kaua, mesic forest, deep shade, 5 seedlings seen along trail, area not surveyed off trail, plantings of *M. tetraphylla* and *M. integrifolia* also seen in area, seedlings reaching about 3 m tall, healthy, 21.441886, -158.084946, 28 May 2023, *K. Faccenda 3111*.

Figure 5. *Macadamia tetraphylla* seedling along the Puʻu Kaua Trail, Oʻahu.

Rubiaceae

Pentas lanceolata (Forssk.) Deflers **New island record**

Pentas lanceolata, a common garden ornamental, has already been documented as naturalized on Maui and Hawaiʻi (Imada 2019). It is now also known to be naturalized on Oʻahu, where it was seen growing out of a rock wall along a stream in Pauoa (Figure 6) and also spreading along a roadside on Round Top, apparently from a nearby garden.

Material examined. **O‘AHU**: Round Top Rd, 200 m mauka of Makiki St, shady roadside, relatively dry, probably persisting from planting, but spreading, many plants seen, 21.310339, -157.830046, 27 May 2022, *K. Faccenda 2382*.

Figure 6. *Pentas lanceolata* naturalized on a rock wall in Pauoa, O‘ahu.

Verbenaceae

Verbena bonariensis L. **Confirmation of naturalization**

Verbena bonariensis was published as a questionable naturalization on O‘ahu by Frohlich & Lau (2008), as the population was controlled by the O‘ahu Invasive Species Committee. However, the species was not successfully eradicated, as another plant was found in Waimānalo, confirming that it is naturalized on O‘ahu.

Material examined. **O‘AHU**: Waimānalo, at end of Mahailua St, moist, shady roadside, uncommon in this area, one plant seen, flowers very congested, light purple, 62 m, 21.333089, -157.735846, 02 Aug 2022, *K. Faccenda & E. Peterson 2564*.

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New plant records from the Big Island for 2021

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The Big Island Invasive Species Committee (BIISC) has supported its Early Detection program since May 2008. Roadside surveys are conducted on major, secondary, tertiary, and residential roads in all districts on Hawai'i Island. Here, BIISC Early Detection documents 1 new state record, 8 new naturalized records, 2 new island records, and 1 eradication.

A total of 10 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), *A Tropical Garden Flora* (Staples & Herbst 2005), and information subsequently published in the *Records of the Hawaii Biological Survey*. Voucher specimens are deposited at Bishop Museum's *Herbarium Pacificum* (BISH), Honolulu, Hawai'i, and the herbarium at the National Tropical Botanical Garden (PTBG), Lāwa'i, Kaua'i.

Acanthaceae

Strobilanthes hamiltoniana (Steud.) Bosser & Heine — **New naturalized record**

This is the first naturalized collection of Chinese rain bells in the state. Cultivated plants are purported to be sterile, but naturalization has occurred in many tropical locales and it is becoming an invasive weed on the island of Réunion (Wu *et al*. 2011). In 2004, a survey showed that Chinese rain bells covered about 1,000 ha of wet mountain areas on La Réunion between 900 m and 1,500 m elevation (Kiehn 2011). It has been observed on Hawai'i Island that many cultivated plants seem to be sterile; however, naturalization has been observed in Mountain View and Pāhoa.

Material examined. **HAWAI'I:** Puna Distr, Hwy 130, mile marker 15 near steam vent pullout, vigorous shrub, 5–6 ft [1.5–1.8 m] tall, with abundant, pink, tubular flowers, growing in shady conditions, 2150716N 295995E, 3 Nov 2015, *J. Parker, R. Parsons & M. Murphy BIED183*.

Asteraceae

Chromolaena odorata (L.) R.M. King & H. Rob — **New island record**

First collected as naturalized on O'ahu in 2011 (with thorough description of characteristics; Frohlich & Lau 2012), devil weed has been detected in 11 locations on Hawai'i Island in the Puna and South Hilo Districts (Molly Murphy, pers. comm.). This highly invasive shrub exhibits allelopathic effects on crops such as corn, and toxic effects on cat-

tle (Mabberley 2008). Devil weed was selected as an eradication target by the BIISC Steering Committee in April 2021. Control of this species is ongoing in coordination with the Hawai‘i Department of Agriculture.

According to interviews with residents who have had *Chromolaena* naturalize on their properties, the introduction mechanism of *Chromolaena* to Hawai‘i Island was through online seed sellers that labeled it as “Mexican dream herb” (*Calea ternifolia* Kunth), a plant reported to increase the intensity of dreams when consumed. Thus, this was not an issue of contaminated seed, but a total misidentification of the species among online sellers. Browsing eBay and other online marketplaces frequently show photos of *Chromolaena* incorrectly labeled as *Calea*. From one (or potentially multiple) importations of the mislabeled seed, live plants were distributed between friends and family around Puna, furthering its spread in Hawai‘i (Molly Murphy, pers. comm.).

Material examined. **HAWAI‘I:** South Hilo Distr, Pana‘ewa Drag Strip, Hilo, semi-woody forb to 8 ft [2.4 m], leaves with pitchfork venation, terminal panicles, heavily fruiting with many tufted seeds, many naturalizing plants in this location and growing in mowed area, 2177091N 287513E, 9 Feb 2021, *S. Kaye*, *J. Parker & R. Parsons BIED214*.

Gaillardia pulchella Foug. **New island record**

Indian blanket or blanket flower has previously been collected as naturalized on O‘ahu, Maui, Moloka‘i, and Kaua‘i. While previous collections have all been near the coast, this specimen was collected at just above 9,000 ft [2,700 m] elevation. Strother (2006) stated an elevational range for *G. pulchella* of up to 1800 m, but this collection represents a large shift in viable range. The plasticity in regards to elevation range may come about due to the hybridization of *G. aristata* Pursh and *G. pulchella*, which, according to Staples & Herbst (2005), are probably the majority of cultivated gaillardias currently grown. This plant may have originated from cultivated plants of hybrid origin, but was distinguished from *G. aristata* on the basis of the length of the receptacular setae (Barbara Kennedy, pers. comm.).

Material examined. **HAWAI‘I:** Hāmākua Distr, Hale Pōhaku, Maunakea, small forb with rosette of leaves and inflorescence with bright orange/yellow flower, achenes present, 2186787N 242581E, 17 Nov 2014, *A. Sullivan & R. Parsons BIED182*.

Burseraceae

Bursera simaruba (L.) Sarg. **New naturalized record**

Gumbo limbo is native to tropical regions of the Americas from South Florida, Mexico, the Caribbean, Brazil, and Venezuela (USDA 2010b). It is not often cultivated outside of its native range. Burseraceae is known as the family whose members produce the oils frankincense and myrrh, while the genus *Bursera* is more often found cultivated by succulent growers who dwarf specimens in containers (Staples & Herbst 2005). Gumbo limbo was found spreading into a vacant lot from an intentional planting in a Kona condo property. Three large, mature, cultivated trees were observed to have canopies full of fruit in January 2021. The adjacent vacant lot had around 20 mature, fruiting trees spread across the 3-acre [1.2 ha] property.

Material examined. **HAWAI‘I:** North Kona Distr, Kailua-Kona, Walua Rd, trees with peeling red and green bark and pinnately compound leaves, inflorescence axillary with multiple blueberry-sized fruit, population of 11–20 fruiting trees and multiple seedlings growing in vacant lot, 2173321N 186709E, 4 Jan 2021, *J. Parker & R. Parsons BIED213*.

Caprifoliaceae

Lonicera hildebrandiana Collett & Hemsley **New naturalized record**

Giant Burmese honeysuckle is by far the largest honeysuckle in the genus *Lonicera* with 12–15 cm long, slender, tubular, fragrant, yellow flowers. It was introduced to Hilo by H. Shipman sometime in the 1930s and may have been removed by the same party, as he said it was found to grow "too rankly" (Staples & Herbst 2005). It was found growing near an abandoned nursery in Volcano Village. Several individuals were present on both sides of the road, climbing high (>50 ft [15 m]) into the native forest canopy. Over the course of subsequent visits, it was clear that the heavy weight of the liana had toppled at least one large ʻōhiʻa tree. This species was selected as an eradication target by the BIISC Steering Committee in August 2021.

Material examined. **HAWAIʻI:** Puna Distr, private road off of Volcano Rd, Volcano Village, thick vine climbing to 50 ft [15 m] high on top of *ʻōhiʻa* trees, glossy, opposite, large leaves with stipules, green, fleshy fruit with 2 seeds each, 2150086N 265843E, 30 Aug 2016, *J. Parker & R. Parsons BIED191*.

Dicksoniaceae

Dicksonia squarrosa (G. Forst.) Sw. **New naturalized record**

Rough tree fern, or whekī, is native to New Zealand and forms a woody trunk up to 7 m tall. It is easily recognized by the black stipe bases on the trunk (Brownsey & Perrie 2021). It was found naturalizing in an abandoned nursery in Volcano Village next to possibly cultivated individuals. Judging by the presence of standing, crownless trunks, they had been cultivated there long enough that some had died of old age. It was reported that a tree fern similar to this record was growing at the Volcano Art Center, but the groundskeeper had removed them before a collection could be made.

Staples & Herbst (2005) reported: "At least five species of *Dicksonia* are cultivated in Hawaiʻi. They differ from *Cibotium* in having upper, outer indusium valves that are green and only slightly differentiated from the blade segment, and leaf blades with the pinnae gradually becoming smaller toward the base." This species may be of concern because of its ability to spread vegetatively via rhizomes, forming dense thickets, making it one of the most common tree ferns in its home range of New Zealand (Poole 1966).

Material examined. **HAWAIʻI:** Puna Distr, Volcano, Volcano Village, tree fern up to 25 ft [7.6 m] tall in 7–8 clumps near abandoned home, average frond length 55.75 in [1.4 m], 2150086N 265865E, 30 Jan 2020, *J. Parker & R. Parsons BIED212*.

Malpighiaceae

Heteropterys brachiata (L.) DC. **New naturalized record**

Red wings is a woody vine native to Central and South America (POWO 2023). It has wind-dispersed samaras and the ability to climb high (>60 ft [18 m]) into native and introduced forest, which aids the dispersal of its seeds. This plant is easiest to spot when the terminal ends of the vines are full of the bright red samaras. It differs from *H. glabra* Hook. & Arn. in having stipules and more than 2 glands on the leaves (Barbara Kennedy, BISH, pers. comm.). This species was selected as an eradication target by the BIISC Steering Committee in August 2021.

Material examined. **HAWAIʻI:** Puna Distr, Paradise and 29th Ave, Hawaiian Paradise Park subdivision, woody, strangling vine, lenticels present on bark, compound leaves, opposite, 6–8 leaflets, reddish new growth, pink-purple flowers with red samara-type winged fruits, climbing into the tops of trees at this site with many seedlings present, 2164375N 291760E, 28 Apr 2016, *J. Parker & M. Murphy BIED184*.

Poaceae

Cenchrus elegans (Hassk.) Veldkamp **Eradication**

Cenchrus elegans was previously reported as naturalized on Hawai‘i by Parker & Parsons (2016), where about 10 apparently naturalized plants were found. However, subsequent resurveys found that the plants had disappeared. As this was the only recent report of *C. elegans* naturalizing on Hawai‘i, it should now be considered a questionable naturalization across the state, based on old collections from O‘ahu (Faccenda 2022).

Imperata cylindrica (L.) Raeusch. **New naturalized record**

Imperata cylindrica, commonly called cogongrass, has now been found growing along a roadside in Hawaiian Paradise Park (HPP). The colony is approximately 0.5 acre [0.2 ha] in area. Only one population was found in HPP despite extensive roadside surveys in the Puna subdivisions. Interviews with local residents indicate that the patch of cogongrass at HPP has been present for many years. It is unclear how this species arrived in Hawai‘i.

Cogongrass is a federal noxious weed (USDA 2010a) and is currently under an eradication campaign by the Hawaii Department of Agriculture and the Big Island Invasive Species Committee, and most of the known HPP population has already been destroyed (Molly Murphy, pers. comm.). Any plants found should be reported to these agencies for eradication.

Cogongrass is one of the world’s 100 worst weeds (Lowe *et al*. 2000) and has major ecological impacts in areas where it has become established, including invading undisturbed native vegetation, increasing fire frequency, and decreasing community diversity (Estrada & Flory 2015). Cogongrass has several traits that lend itself to its invasive nature, including wind-dispersed seeds, aggressive rhizomatous growth, allelopathy, tolerance to poor soils, and being readily adapted to fire.

The following description is from Flora of China (Wu *et al*. 2006: 584).

> “Perennial, basal sheaths becoming fibrous; rhizomes widely spreading, tough, scaly. Culms solitary or tufted, 25–120 cm tall, 1.5–3 mm in diam., 1–4-noded, nodes glabrous or bearded. Leaf sheaths glabrous or pilose at margin and mouth; leaf blades flat or rolled, stiffly erect, 20–100 × 0.8–2 cm, culm blades 1–3 cm, adaxial surface puberulous, margins scabrid, base straight or narrowed, apex long acuminate; ligule 1–2 mm. Panicle cylindrical, copiously hairy, 6–20 cm, lowermost branches sometimes loose. Spikelets 2.5–6 mm; callus with 12–16 mm silky hairs; glumes 5–9-veined, back with long silky hairs ca. 3 times glume length, apex slightly obtuse or acuminate; lower lemma ovate-lanceolate, 2/3 length of glumes, ciliate, acute or denticulate; upper lemma ovate, 1/2 length of glumes, denticulate, ciliate, palea equal to lemma. Anthers 2, 2–4 mm. Stigmas purplish black. Fl. and fr. Apr–Aug. 2n = 20.”

Material examined. **HAWAI‘I:** Kea‘au, Hawaiian Paradise Park, naturalized, tall grass growing up to 6 ft [1.8 m] tall, white, fluffy cylindrical seed heads present only on grass that had been mowed, leaf blades stick straight up, end in a point and have an off-center white midrib, 27 Dec 2021, *J. Parker BIED216*.

Figure 1. *Imperata cylindrica* as seen at HPP. **A,** Drone view of population. **B,** inflorescence.

Scrophulariaceae

Digitalis purpurea L. **New naturalized record**

Foxglove is an erect biennial or short-lived perennial up to 1.8 m tall with racemes of large, showy, tubular, purple, pink or white flowers with dark spots. All plant parts contain cardiac glycosides and are extremely toxic to humans and livestock when ingested (DiTomaso & Healy 2007) The site where the plants were found was a recently disturbed area off of Stainback Highway. The source of the infestation is unclear, but it has been observed in Hawai‘i that certain seed packets (such as those labeled as “pollinator” or “wildflowers”) sometimes contain *D. purpurea* seeds. Historically, there are two cultivated vouchers at BISH from this island collected in 1948 and 1964. When flowering, foxglove is easily distinguished from surrounding vegetation in Hawai‘i, but in vegetative form it resembles common mullein (*Verbascum thapsus* L.). However, mullein leaves are densely covered in star-shaped (stellate) hairs and the margins have unevenly rounded teeth (DiTomaso & Healy 2007). This species was selected as an eradication target by the BIISC Steering Committee in April 2021. Thank you to Dave Lorence (NTBG) for identifying this.

Material examined. **HAWAI‘I:** South Hilo Distr, Kūlani Prison entrance, Stainback Hwy, forb with basal rosette of simple, tomentose leaves to 15 in [38 cm] long, many tubular flowers borne on 5 ft [1.5 m] tall flowering stalk, branched at base, flowers white with purple dots in throat, fruit a fleshy green capsule, 2163600N 258723E, 26 Jun 2019, *J. Parker, R. Parsons & M. Murphy BIED210.*

Urticaceae

Phenax hirtus Wedd. **New state record**

Phenax is a genus made up of 12 species from tropical America (Mabberley 2008). Identification of this collection took some time, as it resembles native genera such as *Pipturus* and *Boehmeria*, while also having characteristics of Old World genera like *Pouzolzia*. Warren Wagner at the Smithsonian Institution sent photos of the collection to colleagues Alexandre Monro, Ib Friis, and Melanie Thomas in Europe, who decided on the determination. This is the first record of a *Phenax* species being present in Hawai‘i. It

was collected along a trail in the Honua‘ula Forest Reserve north of Kailua-Kona. The infestation at that site is dense and well-established and the population limits extend north to Makalei Golf Course and south to Palani Ranch. There is evidence that this species has been spreading from this area for 30 years, based on a collection from 1990. *Phenax hirtus* has not been observed in any other district on the island, as of October 2021.

Phenax can be distinguished from the native māmaki (*Pipturus albidus*) in having lanceolate leaves, while māmaki leaves are more ovate to cordate (Figure 2a, c), and the inflorescences of *Phenax* are dry, brown balls, instead of the fleshy, white fruits of māmaki (Figure 2b, d). BIISC is working to contain this species to the forest reserve by treating it along corridors at the population limits.

Material examined. **HAWAI‘I:** North Kona Distr, Pipeline Trail, Makā‘ula O‘oma section, Honua‘ula Forest Reserve, sprawling shrub to 5 m tall, forming thickets, abundant along wide trail, growing in full sun and shade, near many outplantings of native flora, leaves alternate, small and variable, 1–5 in [2.5–12.7 cm], with crenate margins, 2183156N 190115E, 27 Feb 2017, *J. Parker, L. Perry, R. Parsons & T. Sullivan BIED206*; Honua‘ula Ahupua‘a, Honua‘ula Forest Reserve–Makā‘ula O‘oma section, North Kona, growing along road between Makalei Golf Course and forest reserve boundary, 2,600 ft [790 m], 30 Oct 2019*, J. VanDeMark 780636*; North Kona Distr, along Mamalahoa Hwy near Huehue Ranch, dense shrub 8 ft [2.4 m] tall, 1,600 ft [490 m], 14 Feb 1990, *K.M. Nagata 4067*.

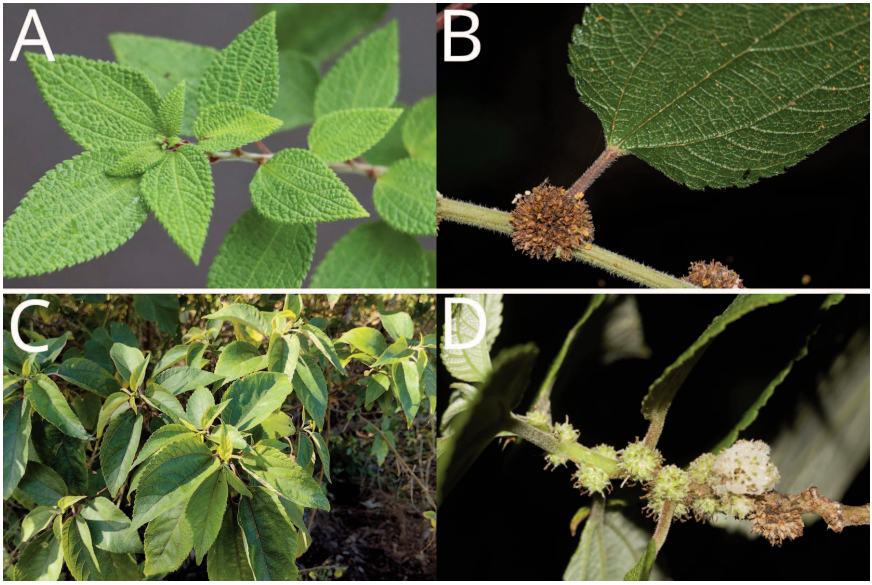

Figure 2. Comparison of *Phenax hirtus* with māmaki (*Pipturus albidus*). **A–B**, *Phenax hirtus* leaves and fruits. **C–D**, Māmaki leaves, flowers, and fruits.

Vitaceae

Leea indica (Burm. f.) Merr. **New naturalized record**

Bandicoot berry is a sprawling shrub to treelet, 6–35 ft [1.8–10.7 m] tall, with greenish white flowers and blue-black fruit (Staples & Herbst 2005). It was introduced to Hawai‘i (O‘ahu?) by Joseph Rock under the name *Leea sambucina,* prior to 1917, but is rarely grown in Hawai‘i (Staples & Herbst 2005). This collection is from a naturalized population in ‘Akaka Falls State Park. It has also been collected as “adventive” from O‘ahu near the Lyon Arboretum. This species has been selected as an eradication target by the BIISC Steering Committee in August 2021. Thank you to Dave Lorence (NTBG) for identifying this.

Material examined. **HAWAI‘I:** South Hilo Distr, ‘Akaka Falls State Park, scrambling, vining shrub with stiff aerial roots that sprout when branch is horizontal, leaves compound with digipinnate formation, many small green flowers on compact umbel, fruit a green berry, 3–4 seeds, 2196858N 274591E, 26 Sep 2019, *J. Parker & R. Parsons BIED211*.

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Twenty additions to the naturalized flora of Lānaʻi

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Between June 18 and 23, 2023, roadside surveys were conducted across the island of Lānaʻi with the goal of early detection of new invasive species, as well as mapping the distribution of existing invasive species. The island was covered by surveys on foot around Lānaʻi City, on an e-bike along the paved roads, and via truck along dirt roads. Stops were made approximately every kilometer to survey the roadside on foot for several hundred meters, or when an unusual plant was spotted (Fig 1).

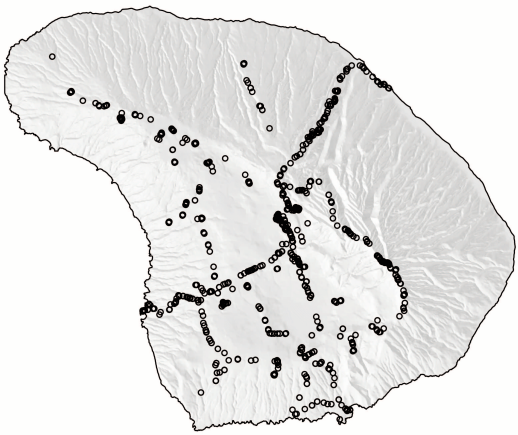

Figure 1. Map of areas visited on Lānaʻi during this survey. Each circle represents an area where data was recorded.

Weather conditions leading up to the fieldwork were suboptimal, as most of the island below 300 m [1000 ft] elevation was incredibly dry and the vegetation was dormant. However, the basins, city, and former plantation land had recently received rain and most plants were flowering. Therefore, surveys were focused on these greener areas, and future surveys below 300 m may find species that were overlooked during this work.

The grass flora of Lānaʻi is generally similar to that on the other islands. From 0–240 m [0–800 ft] the grass communities largely consisted of *Cenchrus ciliaris* monocultures on the leeward sides of the island, and *Bothriochloa pertusa* monocultures on the

windward side. Large populations of the native pili (*Heteropogon contortus*) were also observed on both sides of the island. In some areas along Keōmoku Road, pili was the dominant species.

At higher elevations, such as that of the former plantation lands, the grass flora was dominated by Guinea grass (*Megathyrsus maximus*), but a large amount of *Hyparrhenia hirta* was also found, much more than was seen on any other island. There were large areas entirely dominated by *Hyparrhenia* to the exclusion of all other grasses. On no other islands was *Hyparrhenia hirta* as dominant as it is on Lānaʻi. Sourgrass (*Digitaria insularis*) was also found as a dominant species in this zone.

On Lānaʻihale the grass density was surprisingly low, even in the fenced units with low deer density. Narrowleaf carpetgrass (*Axonopus fissifolius*) was common along the road, but few grasses were seen away from the road. *Paspalum urvillei* and *Andropogon virginicus* were the only significant grasses seen growing away from the roadside, and they were not common.

There have been no dedicated weed surveys around the island in the recent past, so many new naturalizations were found during this work that have surely been established for many decades, although opportunistic reports have been published such as Oppenheimer & Bogner 2020. In total, 18 new island records were found, along with 2 confirmations of naturalization of species previously reported only as questionably naturalized. All identifications were made by the first author. Voucher collections mentioned are housed in Bishop Museum's Herbarium Pacificum (BISH), Honolulu, Hawaiʻi.

Amaranthaceae

Atriplex muelleri Benth. **New island record**

Atriplex muelleri was found during roadside surveys naturalized at the Young Brothers shipping terminal, where about 50–100 plants were found growing from open sunny areas around equipment. Given that this species was only found at the port and had not yet spread, its introduction mechanism is clear. This species was recommended to the Pūlama Lānaʻi Conservation Department for eradication. *Atriplex muelleri* is now known to be naturalized on Oʻahu, Lānaʻi, and Maui (Imada & Kennedy 2020), although it also occurs on Molokaʻi and Hawaiʻi but has not yet been collected or published.

Material examined. **LĀNAʻI**: Kaumalapau Harbor, Young Brothers shipping terminal, open, partially shaded area next to structure, dry, about 50 plants seen, only seen at this spot, 16 m, 20.787374, -156.991107, 19 Jun 2023, *K. Faccenda 3120*.

Crassulaceae

Kalanchoe* ×*houghtonii D.B.Ward **New island record**

Hundreds of plants of *Kalanchoe ×houghtonii* were seen at the Lānaʻi Cemetery, where it has surely spread from cultivation. The plants seen were only reproducing vegetatively through plantlets, and none in the area were seen surpassing 10 cm height. *Kalanchoe ×houghtonii* is now known to be naturalized on Kauaʻi, Oʻahu, Lānaʻi, and Maui (Faccenda 2024).

Material examined. **LĀNAʻI**: Lānaʻi Cemetery, in partly shady, dry area growing under Cook pines, 613 m, 20.845473, -156.921296, 23 Jun 2023, *K. Faccenda & J. Sprague 3221*.

Euphorbiaceae

Euphorbia ophthalmica Pers. **New island record**

Hundreds of plants of *Euphorbia ophthalmica* were found naturalized on roadsides and flowerbeds around Lānaʻi City. It is almost certain that this species was introduced with nursery stock, given that the majority of these plants were found in flowerbeds and plants were often found in nurseries on Oʻahu (Faccenda 2024). *Euphorbia ophthalmica* is now known to be naturalized on Kauaʻi, Oʻahu, Lānaʻi, and Maui (Faccenda 2024).

Material examined. **LĀNAʻI**: Lānaʻi City, Adventure Center, along roadside in disturbed areas as well as flowerbeds, common weed in landscaping beds, 546 m, 20.835424, -156.913657, 19 Jun 2023, *K. Faccenda 3134*.

Malvaceae

Sida cordifolia L. **Note**

Sida cordifolia, commonly called false ʻuhaloa, was not observed during roadside surveys on any other island in Hawaiʻi, despite being listed as naturalized on all major islands except Niʻihau and Kahoʻolawe (Imada 2019). On Lānaʻi, *Sida cordifolia* was incredibly dominant across the landscape in both disturbed areas (e.g., roadsides) as well as rather undisturbed areas on western Lānaʻi or in abandoned agricultural land in the Pālāwai and Miki basins. Tens to hundreds of thousands of plants were observed on Lānaʻi, where it was often a dominant member of the community. This note is published to bring attention to the aggressive nature of this species on Lānaʻi, and the surprising fact that it does not display the same nature on other islands. It is unclear why this is the case, but it is likely that its spread on Lānaʻi is aided by wild axis deer, which very likely disperse the mericarps (armed with barbed awns) in their fur.

Poaceae

Aira caryophyllea L. **New island record**

Aira caryophyllea was found growing from crushed stone at the base of a radio tower on Lānaʻihale. Approximately 10 plants were observed at the site and no other populations were seen. *Aira caryophyllea* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **LĀNAʻI**: Lānaʻihale, radio infrastructure, from gravel in sunny, moist area under antenna, rare, 970 m, 20.803149, -156.864101, 23 Jun 2023, *K. Faccenda & J. Sprague 3211*.

Andropogon virginicus L. var. ***virginicus*** **New island record**

Hundreds of plants of *Andropogon virginicus* (broomsedge) were found naturalized across Lānaʻihale above 860 m [2800 ft] elevation. *Andropogon virginicus* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Snow & Lau 2010; Faccenda 2022).

Material examined. **LĀNAʻI**: Lānaʻihale, southern part, edge of dirt road, sunny, dry, common along road at higher elevations and going into moister areas, hundreds of plants seen along road, 868 m, 20.794941, -156.860987, 23 Jun 2023, *K. Faccenda & J. Sprague 3210*.

Bothriochloa macra (Steud.) S.T.Blake **New island record**

Thousands of plants of *Bothriochloa macra* were found growing across most of the island between 350 and 534 m (1150–1750 ft), but were generally uncommon. Most plants were found on disturbed roadsides, but were also found growing from hardpan areas on the

western part of Lānaʻi otherwise dominated by *Bothriochloa pertusa*. In the hardpan habitat these plants were rare. *Bothriochloa macra* is now known to be naturalized on Niʻihau, Oʻahu, Molokaʻi, Maui, Lānaʻi, Kahoʻolawe, and Hawaiʻi (Faccenda 2023).

Material examined. **LĀNAʻI**: Lānaʻi City, beginning of Keōmoku Rd near the Sensei resort, roadside, sunny, moist, occasionally mowed area, 527 m, 20.835027, -156.918655, 19 Jun 2023, *K. Faccenda 3130*; Mānele gravel construction road, about 3 km mauka of Mānele, roadside, dry sunny area, about 10 plant seen, rare in area, 371 m, 20.767933, -156.912632, 20 Jun 2023, *K. Faccenda 3141*.

Dichanthium annulatum (Forssk.)
Stapf var. ***annulatum*** **New island record**

Hundreds of plants of *Dichanthium annulatum* var. *annulatum* were found along mowed roadsides between 370 and 500 m [1200–1600 ft] elevation around Lānaʻi City, the basins, and Keōmoku Road. *Dichanthium annulatum* var. *annulatum* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, Kahoʻolawe, and Hawaiʻi (Faccenda 2023).

Material examined. **LĀNAʻI**: Airport road (Rt 440) about 3 km makai of Lānaʻi City, roadside, sunny, rather dry, mowed annually, uncommon, this patch about 5 m wide, 460 m, 20.806193, -156.937910, 19 Jun 2023, *K. Faccenda 3126*; Keōmoku Rd, about 5 km from ocean, roadside, dry sunny area, rare on roadside, only about 10 plants seen, 542 m, 20.860490, -156.912664, 20 Jun 2023, *K. Faccenda 3156*.

Digitaria radicosa (J.Presl) Miq. **New island record**

Digitaria radicosa, a common garden weed, was found naturalized on Lānaʻi in gardens and roadsides in Lānaʻi City, where hundreds of plants were found. *Digitaria radicosa* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019; Imada & Kennedy 2022; Faccenda 2023).

Material examined. **LĀNAʻI**: Lānaʻi City, weed in garden bed, uncommon, about 5 plants seen, also in other gardens throughout the city, 495 m, 21 Jun 2023, *K. Faccenda 3166a*.

Eragrostis barrelieri Daveau **New island record**

Many tens of thousands (potentially hundreds of thousands!) of plants of *Eragrostis barrelieri* were observed on Keōmoku Road, where it was codominant with *Cenchrus ciliaris* and filled in gaps between the *C. ciliaris* plants. In other areas with no other grasses, it formed a uniform carpet across shallow rocky soil from 0–400 m [0–1200 ft] elevation. Plants were also seen in both Pālāwai and Miki basins, Mānele, and the Young Brothers terminal. *Eragrostis barrelieri* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Kahoʻolawe (Faccenda 2022; Faccenda 2023). It very likely also occurs on Hawaiʻi Island but has yet to be collected.

Material examined. **LĀNAʻI**: Rt 440, outside gate of landfill, roadside, mowed area, full sun, dry, about 50 plants seen, more found makai from this spot, 283 m, 20.793662, -156.967604, 19 Jun 2023, *K. Faccenda 3123*; Keōmoku Rd, about 500 m from ocean, extremely dry, sunny, rocky soil along road and also seen in less disturbed areas, dominant in certain areas where the soil was shallow and *Bothriochloa pertusa* was not growing, tens of thousands of plants seen in area, 56 m, 20.899047, -156.889521, 20 Jun 2023, *K. Faccenda 3150*.

Eragrostis pilosa (L.) P.Beauv. var. ***pilosa*** **New island record**

Eragrostis pilosa, an easily overlooked annual weed, was found growing on mowed roadsides along the road to Mānele in the Pālāwai Basin, where hundreds of plants were found. *Eragrostis pilosa* var. *pilosa* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019; Faccenda 2023). It was previously reported on Lānaʻi by Herbst & Clayton (1998), but this was found to be a misidentification and was withdrawn (Faccenda 2022).

Material examined. **LĀNAʻI**: Keōmoku Rd, about 1 km N of Lānaʻi City, roadside, moist, sunny soil recently disturbed by construction, uncommon on roadside in this area but common on roadsides near Pālāwai Basin, 536 m, 20.839320, -156.919439, 20 Jun 2023, *K. Faccenda 3159*.

Lolium multiflorum Lam. **New island record**

Lolium multiflorum was found growing along Mānele Road, 500 m south of Lānaʻi City, where one plant was seen on the roadside. *Lolium multiflorum* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019).

Material examined. **LĀNAʻI**: Mānele Rd about 500 m S of intersection with Kaumalapau Hwy, roadside, moist, sunny, occasionally mowed area, rare, only this one plant seen on entire island, 446 m, 20.812735, -156.915546, 20 Jun 2023, *K. Faccenda 3147.5*.

Lolium perenne L. **New island record**

Two plants of *Lolium perenne* were found naturalized on roadsides in the vicinity of Lānaʻi City. *Lolium perenne* is now known to be naturalized on Kauaʻi, Oʻahu, Lānaʻi, Maui, and Hawaiʻi (Imada 2019; Faccenda 2023).

Material examined. **LĀNAʻI**: Lānaʻi City, near Sensei resort and Adventure Center, roadside, sunny, moist, often mowed area, rare, only 2 plants seen in area, 538 m, 20.835602, -156.914809, 19 Jun 2023, *K. Faccenda 3133*.

Microlaena stipoides (Labill.) R.Br. **New island record**

A small colony of several hundred plants of *Microlaena stipoides* (syn. *Ehrharta stipoides*) was found at the northern part of Lānaʻihale, about 1 km S of Keōmoku Road. *Microlaena stipoides* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019; Faccenda 2023)

Material examined. **LĀNAʻI**: Lānaʻihale, northern part about 1 km from Keōmoku Rd, roadside, shady, dry, small patch of about 200 plants only seen at this one spot, 585 m, 20.843623, -156.913621, 23 Jun 2023, *K. Faccenda & J. Sprague 3215*.

Panicum coloratum L. **New island record**

Panicum coloratum was found to be widely naturalized on Lānaʻi along roadsides and abandoned agricultural land, especially in the vicinity of the Pālāwai Basin. Thousands of plants were observed. *Panicum coloratum* was imported approximately 30 years ago for use as a forage grass and for hay production (Zane Dela Cruz, pers. comm.). *Panicum coloratum* is now known to be naturalized on Lānaʻi and Hawaiʻi (Faccenda 2022; Faccenda 2023).

Material examined. **LĀNAʻI**: Airport road (Rt 440) about 1.5 km makai of Lānaʻi City, roadside, sunny, rather dry, mowed annually, uncommon, several patches about 50 m long, but overall a minimal component of the vegetation, leaves glaucous, 448 m, 20.808766, -156.931434, 19 Jun 2023, *K. Faccenda 3127*.

Paspalum notatum Flüggé **New island record**

Paspalum notatum was found growing on roadsides and pastures on Lānaʻi, where it was widely distributed across the island above 440 m [1460 ft]. The population size was difficult to determine given the clonal nature of this species, but at a minimum several hundred colonies were seen. *Paspalum notatum* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Imada 2019; Imada & Kennedy 2020; Faccenda 2022).

Material examined. **LĀNAʻI**: Lānaʻi City, near Sensei resort and Adventure Center, roadside, sunny, moist, often mowed area, common on roadside in this area, also seen in nearby pasture where it was dominant and was likely planted, 526 m, 20.834309, -156.915790, 19 Jun 2023, *K. Faccenda 3132*.

Pentapogon micranthus (Cav.) P.M.Peterson, Romasch. & Soreng **Confirmation of naturalization**

Pentapogon micranthus (syn. *Dichelachne micrantha*) was previously reported as adventive on Lānaʻi based on a single specimen from 1938 (O'Connor 1990), but is certainly established as about 20 plants were found on the northern end of Lānaʻihale. *Pentapogon micranthus* is now known to be naturalized on Kauaʻi, Lānaʻi, and Maui (Imada 2019; Faccenda 2022).

Material examined. **LĀNAʻI**: Lānaʻihale, northern part about 2 km from Keōmoku Rd, roadside, sunny, dry, growing from eroded soil on slope, patch of about 20 plants seen only in this area, 535 m, 20.847848, -156.907514, 23 Jun 2023, *K. Faccenda & J. Sprague 3217*.

Sporobolus elongatus R.Br. **Confirmation of naturalization**

Sporobolus elongatus was previously reported as a questionable naturalization on Lānaʻi based on a single specimen from 1925 (Herbst & Clayton 1998). This species has persisted on the island, as it was found to be rather common in Lānaʻi City and plants were also found in Mānele. *Sporobolus elongatus* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Snow 2008; Faccenda *et al.* 2024).

Material examined. **LĀNAʻI**: Lānaʻihale, northern part about 2 km from Keōmoku Rd, from sunny, open hardpan soil in eroded area, uncommon, with *Bothriochloa pertusa*, 535 m, 20.847844, -156.907497, 23 Jun 2023, *K. Faccenda & J. Sprague 3218*; Mānele Harbor, edge of parking lot, dry, sunny, about 40 plants in area, 3 m, 20.741425, -156.889259, 20 Jun 2023, *K. Faccenda 3140*; Keōmoku Rd, about 1 km N of Lānaʻi City, roadside, unmowed area with tall herbs, sunny, moist, uncommon, <20 plants seen, 532 m, 20.837963, -156.918796, 20 Jun 2023, *K. Faccenda 3162*.

Sporobolus fertilis (Steud.) Clayton **New island record**

Sporobolus fertilis was found naturalized on Lānaʻi in the vicinity of Lānaʻi City, where it was rather rare. *Sporobolus fertilis* is now known to be naturalized on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Faccenda *et al.* 2024).

Material examined. **LĀNAʻI**: Keōmoku Rd, about 1 km N of Lānaʻi City, roadside, unmowed area with tall herbs, sunny, moist, uncommon, <20 plants seen, 532 m, 20.837967, -156.918799, 20 Jun 2023, *K. Faccenda 3161*; Lānaʻi City, Dole Park, frequently mowed turf grass in partial shade of Cook pines, uncommon in this area and also across entire island, 495 m, 20.825452, -156.919697, 22 Jun 2023, *K. Faccenda 3196*.

Zoysia matrella (L.) Merr. **Questionable new island record**

Populations of *Zoysia matrella* were found at two pull-off areas along the Munro Trail on Lānaʻihale between 856 and 1000 m [2800–3280 ft] elevation. It is assumed that each patch represents a single plant spreading clonally. It is unclear if these plants are reproducing sexually, and as such are reported as a questionable naturalization. *Zoysia matrella* was previously reported as naturalized on Kauaʻi and Oʻahu (Faccenda 2023), where it was found in coastal areas. The difference in habitat is rather surprising and could suggest that this population was founded by rhizome fragments stuck to vehicle undercarriages, rather than seed dispersal as observed in the coastal areas.

Material examined. **LĀNAʻI**: Lānaʻihale, along Munro Trail, from compressed soil in open, sunny, moist area where cars pull off the road to park, covering <1 square meter, one larger patch also seen further down the road, almost certainly spread with vehicle tires given that it was only found in pull-off areas, 1007 m, 20.810022, -156.868899, 23 Jun 2023, *K. Faccenda & J. Sprague 3213*.

Pteridaceae

Pteris cf. ***tremula*** R.Br. **New island record**

A single plant of *Pteris tremula* was found growing from the edge of the road about 1 km mauka of the Young Brothers terminal, where it appeared to be naturally irrigated by water running off the road. This fern likely dispersed naturally to Lānaʻi via the trade winds from the naturalized populations on Maui. As the plant found was sterile, the identification is not 100% certain. Thank you to Miles Thomas (BISH) for help with identification of this plant. *Pteris tremula* is now known to be naturalized on Lānaʻi and Maui (Oppenheimer 2007).

Material examined. **LĀNAʻI**: Rt 440, 1 km mauka of Young Brothers terminal, 164 m, 20.788104, -156.977862, 19 Jun 2023, *K. Faccenda 3122*.

Scrophulariaceae

Verbascum thapsus L. **Note**

A single, immature plant of *Verbascum thapsus* was found growing under the stairs of the Pūlama Lānaʻi natural resource management building. During roadside surveys no other plants were found. It is likely that this plant was brought over on the boots of somebody returning to Lānaʻi from Hawaiʻi. However, a note is made in the unlikely chance that a population exists on Lānaʻi but was undetected.

Material examined. **LĀNAʻI**: Lānaʻi City, Pūlama Lānaʻi natural resource management office, under staircase in shady, moist area, 469 m, 20.818701, -156.919532, 20 Jun 2023, *K. Faccenda 3163a*.

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A new species of *Tylparua* Edwards (Diptera: Keroplatidae) from the Big Island of Hawai‘i[1]

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Abstract. A new species of *Tylparua*, *T. troglodytes* **n. sp.,** is described and illustrated and marks possibly the first cave-adapted species of *Tylparua* from the Hawaiian Islands.

The keroplatid genus *Tylparua* is one of the more speciose mycetophiloid genera in Hawai‘i, with an estimated 70 species (mostly awaiting description). A recent review has begun on these endemic Hawaiian flies (Evenhuis 2022) in which four subgenera have been newly recognized. A species collected in a cave on the Big Island of Hawai‘i as part of an Environmental Impact Statement (PBR Hawaii 2009) and vouchered in the Bishop Museum is found to be a new species of the subgenus *Hardyplatyura* Evenhuis: *Tylparua* (*Hardyplatyura*) *troglodytes* Evenhuis, **n. sp.** and is here described and illustrated. It marks the first possible example of a cave-adapted species of *Tylparua* and is easily identified by its general lack of coloration.

MATERIAL AND METHODS

The specimen derives from vouchered material held in the entomology collection of the Bishop Museum. Morphological terminology follows Cumming & Wood (2017).

TAXONOMY

Genus *Tylparua* Edwards
Subgenus *Hardyplatyura* Evenhuis

Tylparua (Hardyplatyura) troglodytes Evenhuis, **new species**
(Figs. 1–2)

Types. *Holotype* ♂ (BPBMENT0000081269) from HAWAIIAN ISLANDS: **Hawai‘i**: North Kona, ‘O‘oma Homesteads, 250 m, 19°43′N 156°00′W, Cave 1, 22 May 2006, N. McDowell & K. White. Holotype (preserved in fluid) in the Bishop Museum.

Diagnosis. Easily separated from the congeners by the lack of coloration on the thorax and abdomen. It is not teneral as it has melanistic characters on both the thorax and terminal abdominal segments and internal structures.

1. Contribution No. 2024-003 to the Hawaii Biological Survey.

Figure 1. *Tylparua troglodytes* Evenhuis, n. sp., male habitaus lateral.

Description. Lengths: Body: 2.8 mm; wing; 3.0 mm. **Male** (Fig. 1). Generally white throughout. *Head*. Occiput and vertex brown. Antennae with flagellum segment 1 longer than wide; segments 2–14 squarish, each successive segment reduced in width apically as antennae slightly tapers to rounded apex. Flagellomeres white.

Thorax. Disc of mesonotum with pale yellowish brown, white laterally posteriorly and anterolaterally, with minute black setulae, setulae thickest on postalar calli. Propleuron brown with patch of minute setulae, bare. Mediotergite with minute setulae apically. Laterotergite bare. Halter stem and knob white with minute black setae.

Legs. Legs pale yellowish to white. Coxa I with row of short black setulae. Coxa III with smudge of brown posteriorly. Tibiae with setulae in regular rows. Hind tibial spurs subequal in length. Claws minute.

Wing (Fig. 2). Hyaline with veins brown to pale yellowish, without infuscation apically. M_4 not effaced basally.

Abdomen. Generally white, pale brown medially and laterally on tergites I–IV, with black setulae distributed evenly on dorsum; tergites V–VI brown. Sternites with same pattern as tergites.

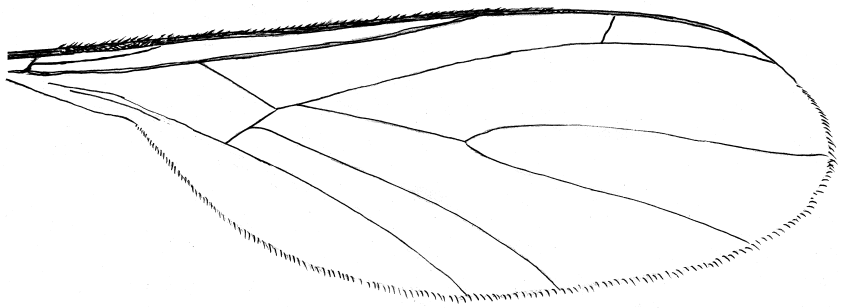

Figure 2. *Tylparua troglodytes* Evenhuis, n. sp., wing.

Hypopygium. Not dissected. Epandrium spherical, as high as wide, pale yellowish white.

Remarks. This species marks the first record of a *Tylparua* from a cave environment and the loss of pigment shows evidence of cave adaptation, albinism being a typical character found in cave arthropods (Porter & Crandall 2003). Because the eyes are not reduced and non-optic sensory organs remain normally-sized, it may not be a case of true troglomorphy.

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The *Campsicnemus macula* Parent complex in Hawai‘i (Diptera: Dolichopodidae): examples of volcanoes acting as islands?[1]

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Abstract. The *Campsicnemus macula* complex in the Hawaiian Islands is reviewed and found to contain seven species including *Campsicnemus conanti*, **n. sp**. from the island of Hawai‘i, which is described and illustrated here. Distributions in Hawai‘i are plotted revealing cases of one-species per volcano in the complex.

INTRODUCTION

The long-legged fly genus *Campsicnemus* Haliday is one of the most speciose Diptera genera in Hawaii with an estimated 250–300 species. Goodman *et al.* (2014) conducted a molecular analysis of 70 species of *Campsicnemus* from the Hawaiian Islands and included another 14 from French Polynesia, Europe, and North America. The resulting phylogeny showed support for a number of clades of endemic Hawaiian species and is a useful template for further taxonomic and systematic studies on the group in the Pacific. One group that was not studied in detail I am calling the *macula* complex, in which species are characterized by having a cluster of setae on the male mid tibia, an infuscated crossvein dm-m, and sometimes a hyaline area posterior to this crossvein. Only one species was included in the Goodman *et al.* (2014) analysis (*C. halonae* Evenhuis from O‘ahu). Wing Interference Patterns were examined and corroborate the placement of species in this complex that possess conspicuous infuscation as well as those species where the infuscation on dm-m is not as discernable by showing that all species possess a blue streak or blue patch directly posterior to crossvein dm-m. In examining species fitting these characters, one new species was discovered, *Campsicnemus conanti* n. sp., which is described and illustrated. Plotting distributions against volcanoes on the various islands, it was found that there is at least one species per volcano (Table 1) and may be predictive of where other species in the complex may be found with future surveys (e.g., no species of the *macula* complex are yet known from Kaua‘i, the Ko‘olau Volcano on O‘ahu, Lāna‘i, West Maui, or from the Kohala volcano on Hawai‘i Island). In addition to describing and illustrating each species, a key is given to identify the species in this complex.

MATERIAL AND METHODS

Material derives from collections deposited in the Bishop Museum, Honolulu, Hawai‘i, USA (BPBM). Morphological terminology follows Evenhuis (2016) with wing venation following Grichanov & Brooks (2017). Confocal images were accomplished by using a Leica M165C stereo dissecting scope via the Leica Microsystems LAS Multifocus soft-

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ware (v. 5.0.1.2) and using Zerene Stacker® software (v. 1.04) (Zerene Systems, LLC, Richmond, Washington, USA) to align and stack-focus each final image. Minor enhancement of Wing Interference Patterns were accomplished in Photoshop CC by increasing contrast and saturation to better visualize color patterns.

TAXONOMY

Campsicnemus Haliday

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

Campsicnemus macula group

The group is characterized by the presence of a cluster or row of hairs and/or stiff setae on a swollen or bowed area in the subbasal or medial portion of the male mid tibia in combination with infuscation of crossvein dm-m and (often) a hyaline area immediately posterior to crossvein dm-m. In cases where the crossvein dm-m infumation is not clear, a characteristic blue to blue-green patch or streak posterior to the crossvein can be seen in Wing Interference Pattern images. With the new species described herein, seven species are currently recognized in this complex.

Included species (types seen of all nominal species): *Campsicnemus bicrenatus* Hardy & Kohn, 1964 (Molokaʻi); *C. biseta* Hardy & Kohn, 1964 (Molokaʻi); *C. conanti* Evenhuis, **n. sp**. (Hawaiʻi); *C. fusticulus* Hardy & Kohn, 1964 (W. Hawaiʻi); *C. halonae* Evenhuis, 1996 (Oʻahu); *C. macula* Parent, 1940 (E. Maui); *C. mediofloccus* Hardy & Kohn, 1964 (E. Maui).

KEY TO SPECIES IN THE *C. MACULA* COMPLEX IN THE HAWAIIAN ISLANDS
(based primarily on males)

1. Cluster of setae on male mid tibia on swollen area at basal one-third (Figs. 2, 4, 5) ... **2**
-. Cluster of setae on male mid tibia not as above **4**

2. Wing with hyaline spot posterior to crossvein dm-m (Figs. 10, 11) **3**
-. Wing without hyaline spot posterior to crossvein dm-m ... (Molokaʻi) .....
..... ***biseta*** Hardy & Kohn

3. Mid tibia cluster with stiff erect setae (Fig. 5); Wing Interference Pattern generally magenta with blue and indigo in cell r2+3 (Fig. 17) ... (Oʻahu) .... ***halonae*** Evenhuis
-. Mid tibia cluster with downcurved finer setae (Fig. 4); Wing Interference Pattern yellowish bronze with orange and magenta in cell r2+3 (Fig. 16) ... (West Hawaiʻi) ...
..... ***fusticulus*** Hardy & Kohn

4. Cluster of setae on male mid tibia restricted to small patch at or below middle (Figs. 1, 7); wing without hyaline spot posterior to crossvein dm-m **5**
-. Cluster of setae on male mid tibia a long row extending from upper fourth to just below middle (Figs. 3, 6); wing with hyaline spot posterior to crossvein dm-m **6**

5. Cluster of setae black, thick, curved (Fig. 1) ... (Molokaʻi) ... ***bicrenatus*** Hardy & Kohn
-. Cluster of setae brown, finer, wooly-like (Fig. 7) ... (Maui) ... ***mediofloccus*** Hardy & Kohn

6. Outer surface of male mid tibia with row of minute setae between mesal row and anterior row (Fig. 3); male mid femur with two rows of ventral setae; wing with R_{4+5} upcurved at wing margin (Fig. 9); WIP with cell r2+3 bronze-colored (Fig. 15) ... (Hawai‘i) ..... ***conanti*** Evenhuis, **n. sp**.

-. Outer surface of male mid tibia with bare area between mesal and anterior rows of setae (Fig. 6); male mid femur with single row of ventral setae; wing with R_{4+5} slightly downcurved toward wing margin (Fig. 13); WIP with cell r2+3 yellowish orange (Fig. 16) ... (East Maui) ..... ***macula*** Parent

Campsicnemus bicrenatus Hardy & Kohn
(Figs. 1, 13)

Campsicnemus bicrenatus Hardy & Kohn, 1964: 45.

Types. Holotype ♂ (BPBM 0000004087) from HAWAIIAN ISLANDS: **Moloka‘i:** Pu‘u Ali‘i, Jul 1953, M. Tamashiro (BPBM). *Other material examined*: **Moloka‘i**: 1♀, Pu‘u Ali‘i, Jul 1953, D.E. Hardy (= “allotype” of *C. biseta*) (BPBM).

Diagnosis. Most similar to *C. medioffloccus* in both having a small patch of setae on the male mid tibia and the wing not having a hyaline area posterior to crossvein dm-m, but can be separated from it by the cluster of setae being thick, black and curved (these setae brown, finer and wooly-like in *C. medioffloccus*). The WIP of the two also differ slightly with *C. bicrenatus* having cell r2+3 predominantly yellowish bronze (cell r2+3 is magenta basally, yellowish orange medially and blueish apically in *C. medioffloccus*).

Description

Male. Body length: 1.65 mm. Wing length: 2.2 mm. *Head*. Black, face gray pollinose, subshining in some portions; oc and vt black, about one-half length of antennal arista; face constricted at middle, almost holoptic, eyes separated below antennae by width of 1–2 ommatidia; palp small, brown; proboscis brown, extending below eye in lateral view; antennal segments yellow; arista subequal to head height.

Thorax. Mesoscutum, scutellum, and pleura dark brown throughout; thoracic setae black: 3 + 1 dc; 2 np; 2 ph; 1 pa; 1 sc; ac absent.

Legs. CI white, smoky brownish basally; CII and CII brown; F and Ti yellowish except as noted, remainder of legs brownish; FI with small brownish patch of color dorsally in middle; FIII with dark brown band subapically. foreleg without MSSC; FII with row of ventral setae; FIII with single strong black seta subapically; TiII (Fig. 1) with large slightly swollen area on apical two-thirds bearing cluster of strong black apically curved setae (MSSC), 3 erect black setae on basal one-third; remainder of mid and hind legs normal, without MSSC.

Wing. subhyaline to pale smoky; faint infuscation on crossvein dm-m; WIP (Fig. 13) with cell r1 blue-green basally grading to indigo apically; yellowish bronze color in cell r2+3; cell r4+5 predominantly blue-green; cell m2 blue-green with streak of blue posterior to crossvein dm-m; anal lobe with magenta basally, surrounded by orange-bronze grading to blue-green along wing margin.

Abdomen. Dark brown to black with short black hairs dorsally on each tergite, a few longer hairs laterally. Hypopygium brown with paler brown cerci, not dissected.

Female. As in male except for lack of MSSC; legs normal, without modifications.

Figures 1–7.*Campsicnemus* male mid tibiae. **1**. *C. bicrenatus*; **2**. *C. biseta*; **3**. *C. conanti*, n. sp.; **4**. *C. fusticulus*; **5**. *C. halonae*; **6**. *C. macula*; **7**. *C. mediofloccus*.

Etymology. Hardy & Kohn (1964) do not give an etymology, but the name appears to be based on the illustration in Hardy & Kohn (1964: fig. 3a) that shows the mid tibia having two rounded projections, thus *bi* (two) + *crenatus* (rounded projections). The illustration however is misleading in a number of points: (1) the orientation gives the impression that the clusters of setae are on the mesal or posterior surface (they are in fact on the anterior (outer) surface); (2) there is actually no upper rounded projection; and (3) the setae in this area are actually 3 long, stiff, and erect (as opposed to a cluster of numerous shorter down-curved setae on a small rounded projection in the illustration).

Remarks. The allotype of *C. biseta* Hardy & Kohn was re-examined and found to have the same WIP as the male holotype of *C. bicrenatus* and is here transferred to that species. It is odd that Hardy & Kohn (1964) thought the female was not *C. bicrenatus*, since the "allotype" female of *C. biseta* and the holotype male of *C. bicrenatus* were collected at the same place and time, just different collectors.

Campsicnemus biseta Hardy & Kohn
(Figs. 2, 14)

Campsicnemus biseta Hardy & Kohn, 1964: 46.

Types. Holotype m (BPBM 0000004088) from HAWAIIAN ISLANDS: **Moloka'i:** Hanalilolilo, 4,000 ft. [1,219 m], 1 Aug 1953, D.E. Hardy.

Diagnosis. Easily separated from other species in the complex by the presence of a cluster of setae on a swollen area on the upper third of the male mid tibia combined with the lack of a hyaline in cell m2 posterior to crossvein dm-m.

Description

Male. Body length: 1.5 mm. Wing length: 2.0 mm. *Head*. Gray-brown pollinose; oc and vt black, about one-half length of antennal arista; face constricted at middle; palp small, dark brown; proboscis brown, slightly extending below eye in lateral view; antennae with scape and pedicel yellow, postpedicel brown, conical with blunt apex, length about equal to greatest width; arista slightly longer than head height.

Thorax. Dorsum of mesoscutum and scutellum gray brown pollinose; upper pleura concolorous with mesoscutum, lower pleura subshining brown; thoracic setae long, strong, black: 3 dc; 2 np; 1 ph; 1 pa; 1 sc; ac absent; halter stem and knob yellowish.

Legs. CI yellow, CII and CIII brown, CI with 3–4 strong black setae apically; remainder of legs yellow; FI with 4–5 strong setae basoventrally; TiII (Fig. 2) with slightly swollen area at basal two-fifths bearing cluster of erect setae (MSSC), with mesal row of sparse erect setae; TiIII with two stiff erect black setae, otherwise hindleg unmodified, without MSSC; IIt_1 long, ca. 2× length of IIt_2; remainder of tarsi without MSSC.

Wing. Subhyaline to pale smoky; slight infuscation on crossvein dm-m, without hyaline area immediately posterior to crossvein dm-m; WIP (Fig. 14) with cell r1 blue-green basally, grading to deep blue on apical two-thirds; orange-bronze color in cell r2+3,cell r4+5 predominantly blue-green; cell m2 blue-green with streak of blue posterior to crossvein dm-m, grading to broad area of blue-green apically; anal lobe yellowish basally and blue-green apically, with thin blue apically along wing margin.

Abdomen. Tergites I–IV concolorous with mesonotum; sternites brown. Hypopygium gray brown, not dissected.

Female. Unknown.

Figure 8. *Campsicnemus conanti*, n. sp. male habitus, lateral view.

Remarks. The "allotype" female of this nominal species from Pu'u Ali'i was re-examined and the Wing Interference Pattern shows it to belong to *C. bicrenatus* and not *C. biseta.* It is transferred here to *C. bicrenatus*.

Etymology. This species is named for the two erect setae on the hind tibia.

Campsicnemus conanti Evenhuis, **new species**
(Figs. 3, 8, 9, 15)

Campsicnemus n. sp. nr. *macula* Parent: Preston *et al*. 2004: 22.

Types. *Holotype* ♂ (BPBM ENT 2008008976) and 3♂,4♀ *paratypes* from HAWAIIAN ISLANDS: **Hawai'i**: Keanakolu Gulch, 2,000 ft [610 m], 29 Oct 1952, C.P. Hoyt. *Other paratypes*: HAWAIIAN ISLANDS: **Hawai'i:** 1♂,1♀, Mauna loa Summit Trail, 7,000 ft [2,134 m], 24 Oct 1971, W.C. Gagné, *pyrethrum* sample #71-51; 1♂, nr. Humu'ula, 3 Aug 1946, E.C. Zimmerman; 1♂, Humu'ula, 30 Jul 1935, R.L. Usinger; 1♂, Kona Hema TNC, 14 Apr 2006, R. Peck, Malaise #5; 1♂, Mauna Loa Kipuka Mosaic NAR, Pu'u Huluhulu, 19°14′11.14″N 155°27′58.85″W, 5 Apr 2004, D.J. Preston, M.K.K. McShane, fogging mossy fallen koa. Holotype and paratypes in in BPBM.

Diagnosis. This species is most similar to *Campsicnemus macula* from Maui, but can be separated from it by the presence of a row of minute setae on the male mid tibia between the outer and mesal rows (bare area in *C. macula*) and the bronze color in cell r2+3 in the WIP (yellowish orange in *C. macula*).

Description

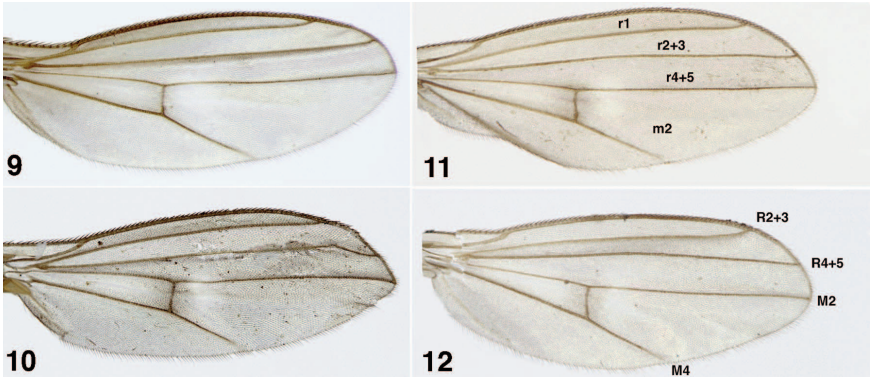
Male (Fig. 8). Body length: 1.7 mm. Wing length: 2.0 mm. *Head*. Gray-brown pollinose; oc and vt black, about one-half length of antennal arista; face constricted at middle; palp small, dark brown; proboscis brown, slightly extending below eye in lateral view; antennae brown; postpedicel acute conical with rounded apex, length about equal to greatest width; arista slightly longer than head height.

Thorax. Dorsum of mesoscutum and scutellum gray brown pollinose; upper pleura concolorous with mesoscutum, lower pleura subshining brown; thoracic setae long, strong, black: 3 dc; 2 np; 1 ph; 1 pa; 1 sc; ac absent; halter stem and knob yellowish brown.

Legs. CI yellow, CII and CIII brown, CI with 3–4 strong black setae apically; remainder of legs yellow; FI with 4–5 strong setae basoventrally; hindleg unmodified, without MSSC; FII yellow with yellowish brown on apical one-fourth, with two rows of ventral setae: one row of 6 strong setae and one row of 6 shorter setae; TiII (Fig. 3) with anterior surface bearing elongated row of long thick setae, curved apically (MSSC), outer surface with medial row of minute setae in between anterior and mesal rows of minute setae; IIt_1 long, ca. 2× length of IIt_2; remainder of tarsi without MSSC.

Wing (Fig. 9). Subhyaline to pale smoky; infuscation on crossvein dm-m and hyaline area immediately posterior to crossvein dm-m; WIP (Fig. 15) with cell r1 deep blue; yellowish bronze color in cell r2+3, cell r4+5 predominantly blue-green; cell m2 blue-green with large spot of blue posterior to crossvein dm-m, continuing as a thin streak medially, then broadening to encompass most of cell apically; anal lobe predominantly blue-green, thin blue basally along wing margin.

Abdomen. Tergites I–IV concolorous with mesonotum, with blue-green metallic highlights, tergites V–VI brown, each tergites with short stiff curved black hairs dorsally; sternites brown. Hypopygium gray brown, not dissected.



Figures 9–12. *Campsicnemus* wings. **9**. *C., conanti*, n. sp.; **10**. *C. fusticulus*; **11**. *C. halonae*; **12**. *C. macula*.

Female. As in male but no MSSC; WIP paler in color.

Etymology. The specific name honors the memory of Patrick Conant, long-time colleague and forest neighbor, for his friendship over the years, and his firm devotion to conserving native plants. For many years he had a mossy overgrown welcome mat on the stoop at his Volcano home and we sometimes both sat on the steps above it, sipped beers, and watched *Campsicnemus* frolicking, courting, and mating in the moss with Pentax Papilio II close-up binoculars. Good times. He left us way to soon.

Campsicnemus fusticulus Hardy & Kohn
(Figs. 4, 10, 16)

Campsicnemus fusticulus Hardy & Kohn, 1964: 94.

Types. *Holotype* ♂ (BPBM ENT 0000004115) and 8♂,1♀ *paratypes* from HAWAIIAN ISLANDS: **Hawai'i**: north slope, Hualālai, 4,000–6,000 ft [1,219–1,829 m], Jul 1953, D.E. Hardy. Other paratypes: HAWAIIAN ISLANDS: **Hawai'i**: 1♂, Kīlauea, Kīpuka Ki, 4,250 ft [1,295 m], forest floor, 31 Jan 1945, F.X. Williams; 1♂, Kīlauea, Kīpuka Nene, 3,000 ft [914 m], on ground, 31 Jan 1945, F.X. Williams.

Diagnosis. Most similar to *C. halonae* due to both having a cluster of setae on a swollen area in the upper third of the male mid tibia and the presence of a hyaline spot in the wing in cell m2 immediately posterior to crossvein dm-m, but can be easily separate from it by the cluster of hairs consisting of fine downcurved hairs (these setae more thick, erect, and stiff in *C. halonae*) and the Wing Interference Pattern with yellowish bronze color in ell r2+3(this cell generally magenta with blue and indigo in *C. halonae*).

Description

Male. Body length: 1.7 mm. Wing length: 2.0 mm. *Head*. Dark gray-brown pollinose; oc and vt black, about one-half length of antennal arista; face constricted at middle; palp small, dark brown; proboscis brown, slightly extending below eye in lateral view; anten-

nal scape and pedicel yellow, postpedicel yellowish brown, conical with acute apex, length about 1.3× greatest width; arista slightly longer than head height.

Thorax. Dorsum of mesoscutum and scutellum gray brown pollinose; upper pleura concolorous with mesoscutum, lower pleura subshining brown; thoracic setae long, strong, black: 3 dc; 2 np; 1 ph; 1 pa; 1 sc; ac absent; halter stem and knob yellow.

Legs. Coxae brown basally, yellow apically; remainder of legs yellow; CI without basal setae; FI with 4–5 strong setae basoventrally; hindleg unmodified, without MSSC; FIII yellow with yellowish brown on apical one-fourth, with one row of 5–6 strong ventral setae; TiII (Fig. 4) with swollen area on basal one-third, bearing long thick downcurved setae on outer surface and smaller setae on inner surface, with 2 stiff setae on outer surface above swollen area (MSSC); IIt_1 long, ca. 1.5× length of IIt_2; remainder of tarsi without MSSC.

Wing (Fig. 10). Subhyaline to pale smoky; infuscation on crossvein dm-m and hyaline area immediately posterior to crossvein dm-m; vein R_{4+5} downcurved at wing margin; vein M_4 not reaching wing margin WIP (Fig. 16) with cell r1 magenta at extreme base, then green medially grading to blue apically; cell r2+3 deep indigo basally grading to orange and yellow apically; cell r4+5 predominantly yellow; cell m2 bronze-green with large spot of blue posterior to crossvein dm-m; anal lobe predominantly bronze-yellow, narrow magenta basally along M_4, thin blue along apical margin.

Abdomen. Black; sternites brown. Hypopygium gray brown, not dissected.

Female. As in male but no MSSC.

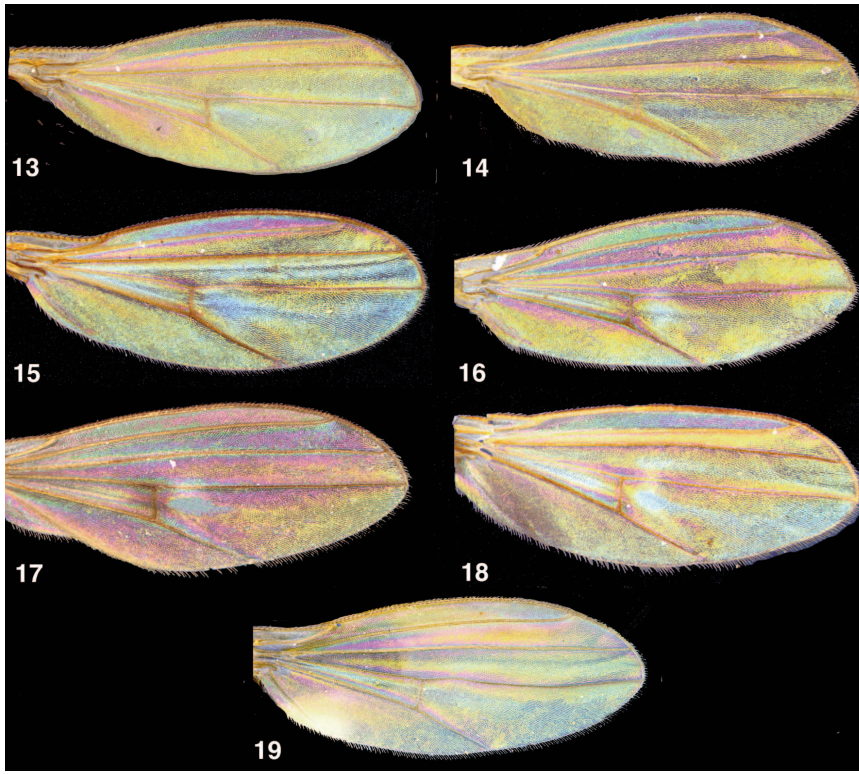
Etymology. This species is derived from the Latin diminutive, *fusticulus*, = 'small club'; referring to the swollen area of the male mid tibia.

Campsicnemus halonae Evenhuis
(Figs. 5, 11, 17)

Campsicnemus halonae Evenhuis, 1996: 55.

Types. *Holotype* ♂ (BPBM ENT0000015717) from HAWAIIAN ISLANDS: **O'ahu**: Waianae Mts., Lualualei Naval Magazine, Halona Valley, 450 m, 22 Nov 1995, N.L. Evenhuis, yellow pans. *Paratypes*: 10♂♀, same data except, 9 May 1994, F.G. Howarth, at light; 10, 23 May 1994, G.M. Nishida; 1♂, 7 Dec 1995, D.J. Preston; 2♂, 3 Jan 1996, D.J. Preston & G.M. Nishida, Malaise trap; 4♂♀, 1,420 ft [432 m], 18–19 Jan 1996, D.J. Preston & G.M. Nishida, yellow pans; 1♂, 1,620 ft [493 m], 18–19 Jan 1996, D.J. Preston & G.M. Nishida; 15♂♀, Palikea Peak, 3,100 ft [945 m], 3 May 1995, D.A. Polhemus, running on leaves; 8♂♀, Pu'u Kaua summit, 3,100 ft [945 m], 4 May 1995,D.A. Polhemus, sweeping understory. *Other material examined*: HAWAIIAN ISLANDS: **O'ahu**: 1♂,2♀, Mana Kapu, 29 Mar 1968, J.A. Tenorio & D. Ashdown; 4♂♀, Halona Valley, *Sapindus* grove, 16 Mar–19 Apr 1996; 1♂, Halona Valley, Pohakea Spring, 14 Mar 1996, G.M. Nishida, G.A. Samuelson; 1♂, Pu'u Hāpapa, 2600 ft [792 m], 24 Feb 2010, K.N. Magnacca (all in BPBM).

Diagnosis. Most similar to *C. fusticulus* due to both having a cluster of setae on a swollen area in the upper third of the male mid tibia and the presence of a hyaline spot in the wing in cell m2 immediately posterior to crossvein dm-m, but can be easily separate from it by the thick, stiff, erect cluster of setae (these setae finer and downcurved in *C. fusticulus*) and the Wing Interference Pattern generally magenta with blue and indigo in cell r2+3 (this cell with yellowish bronze color in *C. fusticulus*).



Figures 13–19. *Campsicnemus* Wing Interference Patterns. **13**. *C. bicrenatus*; **14**. *C. biseta*; **15**. *C. conanti*, n. sp.; **16**. *C. fusticulus*; **17**. *C. halonae*; **18**. *C. macula*; **19**. *C. mediofloccus*

Description

Male. Body length: 1.68–1.76 mm. Wing length: 1.84–2.0 mm. *Head*. Black, face gray pollinose, subshining in some portions; oc and vt black, about one-half length of antennal arista; face constricted at middle, almost holoptic, eyes separated below antennae by width of 1–2 ommatidia; palp small, brown; antennal segments yellow; arista subequal to head height.

Thorax. Mesoscutum, scutellum, and pleura dark brown throughout; thoracic setae black: 3 + 1 dc; 2 np; 2 ph; 1 pa; 1 sc; ac absent.

Legs. CI white, smoky brownish black on basal 1/5; CII brown, slightly paler than surrounding pleura; CIII yellowish; F and Ti yellowish except as noted, remainder of legs brownish; FI with small brownish patch of color dorsally in middle; FIII with dark brown band subapically. foreleg without MSSC; FII with long black seta on apical 1/3, 4–5 smaller black setae apically (MSSC); FIII with single strong black seta subapically; TiII (Fig. 5) with small bulbous swollen area subbasally bearing 4–5 strong black apically curved setae (MSSC), smaller black setae and hairs along entire length, 2 strong black

setae near middle and single apical black seta; remainder of mid and hind legs normal, without MSSC.

Wing (Fig. 11) subhyaline to pale smoky; spot of smoky black color on crossvein dm-m; hyaline area just distal to crossvein dm-m; WIP (Fig. 17) generally magenta colored; cell r1 with dark blue-green subbasally, light magenta apically; cell r2+3 indigo; cell r4+5 magenta and orage colored; cell m2 dark magenta basally with blue spot immediately posterior to crossvein dm-m, magenta color grading to blue-green and bronze-yellow apically; anal lobe magenta with orange along wing margin.

Abdomen. Dark brown with short black hairs dorsally on each tergite, a few longer hairs laterally; tergal interstices white. Hypopygium brown with paler brown cerci, not dissected.

Female. As in male except for lack of MSSC; legs normal, without modifications.

Remarks. This species has been observed running on leaves on low-growing vegetation and on leaf litter on open ground.

Etymology. This species is named for the Wai‘anae valley where it was first discovered.

Campsicnemus macula Parent
(Figs. 6, 12, 18)

Campsicnemus macula Parent, 1940: 229.

Types. Lectotype ♂ (BPBM ENT 0000004060) from HAWAIIAN ISLANDS: **Maui** (**E**): Haleakalā, 3,500 ft [1,067 m], 20 Dec 1936, F.X. Williams (lectotype designated by Evenhuis (2007: 28) (all in BPBM). *Other material examined*. HAWAIIAN ISLANDS. **Maui** (**E**): 2♂, Manawainui Valley, 1,908 m, 19 Jul 2006, R. Peck; 2♂,1♀, same data except 1,795 m, 7 Jun 2006; 4♂,4♀, same data except 2,115 m, 29 Jun 2006 (all in BPBM).

Diagnosis. This species is most similar to *Campsicnemus conanti,* n. sp. from Hawai‘i Island, but can be separated from it by the absence of a row of minute setae on the male mid tibia between the outer and mesal rows (present in *C. conanti,* n. sp); the single row of ventral setae on the male mid femur (two rows in *C. conanti,* n. sp), and the yellowish orange color in cell r2+3 in the WIP (bronze in *C. conanti,* n. sp).

Description

Male. Body length: 1.7 mm. Wing length: 2.0 mm. *Head*. Gray-brown pollinose; oc and vt black, about one-half length of antennal arista; face constricted at middle; palp small, dark brown; proboscis brown, slightly extending below eye in lateral view; antennae with scape and pedicel yellowish; postpedicel brown, conical with blunt apex, length about equal to greatest width; arista slightly longer than head height.

Thorax. Dorsum of mesoscutum and scutellum coppery, gray pollinose; pleura subshining brown; thoracic setae long, strong, black: 3 dc; 2 np; 1 ph; 1 pa; 1 sc; ac absent; halter stem and knob yellowish.

Legs. CI and CIII dark brown, CII brown basally, yellowish apically; remainder of legs yellow; FII with row of 6 ventral setae; TiII (Fig. 6) with anterior surface bearing elongated row of long thick setae, curved apically (MSSC), outer surface bare, without medial row of minute setae in between anterior and mesal rows of minute setae; IIt_1 long, ca. 2× length of IIt_2; remainder of tarsi without MSSC.

Wing (Fig. 12). Subhyaline to pale smoky; infuscation on crossvein dm-m and hyaline area immediately posterior to crossvein dm-m; WIP (Fig. 18) with cell r1 blue-green basally grading to indigo apically; golden yellow color in cell r2+3,cell r4+5 predominantly blue-green with elongated spot of blue medially; cell m2 with large spot of blue posterior to crossvein dm-m, continuing as a broad streak medially, then broadening to encompass most of cell apically, cell with orange-bronze color above and below blue spot; anal lobe magenta basally, yellowish and blue-green apically, thin blue basally along wing margin.

Abdomen. Black; sternites dark brown. Hypopygium gray brown, not dissected.

Female. As in male but no MSSC; WIP paler in color.

Remarks. Parent's type series consisted of an unspecified number of males from Palikea in the Waiʻanae mountains of Oʻahu collected on 15 November and from Haleakalā on Maui collected at 2,000 feet [610 m] elevation on 20 December 1936. Two specimens labeled as cotypes from Haleakalā were found in MNHN; one male from Haleakalā was located in BPBM (transferred from the HSPA collection). Hardy & Kohn (1964: 116) stated "Type in the Hawaiian Sugar Planters' Association collection". Evenhuis (2007) described the condition of the lectotype as" missing the head and the fore leg beyond the tibia; the right wing is torn at the humeral crossvein".

Etymology. This species name derived from the Latin *macula* = spot or mark; referring to the dark infuscation on the dm-m crossvein and the hyaline area posterior to it.

Campsicnemus mediofloccus Hardy & Kohn
(Figs. 7, 19)

Campsicnemus mediofloccus Hardy & Kohn, 1964: 117.

Types. Holotype ♂ (BPBM 0000004129) from Hawaiian Islands: **Maui**: Haleakalā Crater: Palikū, Jun 1952, D.E. Hardy.

Diagnosis. Most similar to *C. bicrenatus* in both having a small patch of setae on the male mid tibia and the wing not having a hyaline area posterior to crossvein dm-m, but can be separated from it by the cluster of setae being brown, fine and wooly-like (these setae thick, black and curved in *C. bicrenatus*). The WIP of the two also differ slightly with *C. bicrenatus* having cell r2+3 magenta basally, yellowish orange medially and blueish apically (cell r2+3 is predominantly yellowish bronze in *C. bicrenatus*).

Description

Male. Body length: 1.7 mm. Wing length: 2.0 mm. *Head*. Gray-brown pollinose; oc and vt black, about one-half length of antennal arista; face constricted at middle; palp small, dark brown; proboscis brown, slightly extending below eye in lateral view; antennal scape and pedicel yellow; postpedicel brown, conical with blunt apex, length about equal to greatest width; arista slightly longer than head height.

Thorax. Dorsum of mesoscutum and scutellum gray brown pollinose; upper pleura concolorous with mesoscutum, lower pleura subshining brown; thoracic setae long, strong, black: 3 dc; 2 np; 1 ph; 1 pa; 1 sc; ac absent; halter stem and knob yellowish brown.

Legs. CI yellow, CII and CIII brown, CI with 3–4 strong black setae apically; remainder of legs yellow; FI with 4–5 strong setae basoventrally; hindleg unmodified, without

MSSC; FII yellow with yellowish brown on apical one-fourth, with two rows of ventral setae: one row of 6 strong setae and one row of 6 shorter setae; TiII (Fig. 7) with anterior surface bearing elongated row of long thick setae, curved apically (MSSC), outer surface with medial row of minute setae in between anterior and mesal rows of minute setae; IIt_1 long, ca. 2× length of IIt_2; remainder of tarsi without MSSC.

Wing. Subhyaline to pale smoky; infuscation on crossvein dm-m and hyaline area immediately posterior to crossvein dm-m; WIP (Fig. 19) with cell r1 deep blue; yellowish bronze color in cell r2+3,cell r4+5 predominantly blue-green; cell m2 blue-green with large spot of blue posterior to crossvein dm-m, continuing as a thin streak medially, then broadening to encompass most of cell apically; anal lobe predominantly blue-green, thin blue basally along wing margin.

Abdomen. Tergites I–IV concolorous with mesonotum, with blue-green metallic highlights, tergites V–VI brown, each tergites with short stiff curved black hairs dorsally; sternites brown. Hypopygium gray brown, not dissected.

Female. Unknown.

Etymology. This species names derives from the Latin *medio* = middle, + *floccus* = tuft or lock of wool; referring to the dense fluffy-looking patch of hairs on the middle of the male mid tibia.

VOLCANOES ACTING AS ISLANDS

Plotting distributions of each species in the *C. macula* complex (see Table 1) shows that there is at least one species per volcano, where the volcanoes are acting like an "island", where species are possibly showing signs of allopatry in some cases. Table 1 show the current distribution of species in the *macula* complex against a list of the volcanoes in the main Hawaiian Islands, in chronological order with the oldest volcano (Kauaʻi) on the left and younger volcanoes to the right. All the species except *C. conanti* and *C. fusticulus* are found on one volcano only.

Table 1. Volcanic Distribution of Species in the *C. macula* complex.
[Volcano ages from Clague & Dalrymple (1989)]

Species	Kauai	Waianae	Koolau	West Molokai	East Molokai	Lānai	West Maui	East Maui	Kohala	Mauna Kea	Mauna Loa	Hualalai	Kilauea
Age (Ma)	5.1	3.7	2.6	1.9	1.76	1.3	1.32	0.75	0.43	0.47	0.4	0.35	0.1
bicrenatus					x								
biseta					x								
conanti										x	x		x
fusticulus												x	
halonae		x											
macula								x					
mediffloccus								x					

To maintain the single-volcano hypothesis for species in this group some species occurrences need some clarification: *Campsicnemus conanti,* n. sp. (Mauna Loa, Mauna Kea and Kīlauea) and *C. fusticulus* (Hualālai and Kīlauea) are found on more than one volcano. It is assumed due to the relatively young age of these volcanoes (the youngest emerged volcanoes in the Hawaiian Islands), these two species have had no obstacles over their relatively young age in the *macula* complex to prevent them from spreading. Over time, it hypothesized here that populations would settle into occupying a single volcano.

Given what appears to be a single volcano for most species, it is possible that we can predict that other species should be found within the current island range of the species group. Since no species in the *macula* complex have been found on Kauaʻi, it may be that *C. halonae* (found only in the Waiʻanae volcano on West Oʻahu) is the founding member of this lineage. The phylogenetic study in Goodman *et al.* (2014) estimated the age of the lineage containing *C. halonae* to be 1.5 Ma, yet the Waiʻanae volcano is 3.7 Ma, so *C. halonae* appeared more than 2 million years after the Waiʻanae volcano emerged. Other younger volcanos that provide similar habitats, vegetation, and temperature regimes thus could be predicted to harbor additional species of this complex. [Note: the West Molokai volcano (Mauna Loa*) has eroded considerably and all of West Molokaʻi has undergone degradation of habitat from overgrazing and agriculture activity; thus, it would not be able to support any members of this complex; and no species of *Campsicnemus* have ever been collected from this arid western half of Molokaʻi.] Further collecting in the Koʻolaus on Oʻahu, Lānaʻi, West Maui, and the Kohalas on Hawaiʻi Island may discover further species of this complex.

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Many thanks to Dan Polhemus, Robert Peck, Karl Magnacca, Ronald Englund and others for their continued efforts in collecting new species of *Campsicnemus* in Hawaiʻi and making their collection available for study. Dan Bickel kindly reviewed the paper and made corrections and suggestions that helped improve it.

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Misapplied names in the Hawaiian introduced flora

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The following names were found to be misapplied or used for two closely related taxa in the Hawaiian flora: *Asparagus densiflorus, Cardamine flexuosa, Cyperus stoloniferus, Epipremnum pinnatum, Erigeron bonariensis,* and *Hypertelis cerviana*. The misapplication of these names is hereby corrected, resolving some idiosyncrasies in the Hawaiian flora. Many of these misapplied names were brought to the attention of the author via the citizen science website iNaturalist through conversations with naturalists from outside of Hawai'i where the names are correctly applied. All identifications were made by the authors, unless otherwise stated. All voucher specimens cited for this paper have been deposited at the Herbarium Pacificum (BISH), unless otherwise noted.

Araceae

Epipremnum aureum (Linden & André) G.S.Bunting

Nomenclatural note

In the *Manual* (Wagner *et al*. 1990:1359) *Epipremnum aureum* was synonymized with *E. pinnatum* (L.) Engl. with little discussion. However, this synonymy is no longer widely accepted, as most modern authors now recognize these two as separate species (Boyce 2004; Moodley *et al*. 2017; POWO 2024). Both *E. pinnatum* and *E. aureum* are naturalized in Hawai'i but with *E. aureum* being a very common weed in disturbed lowland sites and *E. pinnatum* being generally uncommon. *Epipremnum aureum* is known to be naturalized on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. Despite being a widespread weed across Hawai'i and exhaustively searching all herbaria with substantial Hawaiian holdings, no vouchers had ever been made of *E. aureum* on Kaua'i before 2023. This is likely due to this plant's inability to flower and the tendency of botanists to only voucher fertile material.

The two species can be separated by the following key adapted from Boyce (2004):

1. Leaves usually golden-variegated; pre-adult leaves ovate-lanceolate; remains of leaf sheaths not netted; adult leaves irregularly pinnate; aerial roots formed which dangle to the ground and root; flowers effectively never found ..... *E. aureum*

1′. Leaves never golden-variegated; pre-adult leaves lanceolate to elliptic; remains of leaf sheaths netted; adult leaves regularly pinnate; aerial roots not hanging down and rooting; flowers frequent ..... *E. pinnatum*

Material examined. **KAUA'I**: Kalāheo, Kukuiolono, 22 Nov 2023, *D. Lorence 10992* (PTBG). **O'AHU**: Nu'uanu Pali Dr. above where the housing development ends, roadside, shaded, moist, 21.346078, -157.825683, 29 May 2021, *K. Faccenda 1925*; Mānoa, common on walls, hillsides, etc., climbing into trees, leaves become much larger and variegated yellow and white, 02 Oct 1932, *T.G.*

Yuncker 3145 (US). **MOLOKA‘I**: Hālawa Valley, climbing or sprawling with variegated leaves, 20 ft [6 m], 19 Aug 2005, *H. Oppenheimer H80513*. **MAUI**: Wailuku Distr., West Maui Forest Reserve, between Wailuku and ‘Īao Valley parking lot, along road, climbing into trees, 06 Mar 1988, *W. Wagner 5829*. **HAWAI‘I**: Puna Distr., ahupua‘a of Halepua‘a, growing on Puna Trail near experimental planting area, 100 ft [30 m], 10 May 1979, *R. Kubo 33*; South Kona, above Ho‘okena, vine prostrate and climbing into trees near roadside, white streaks on leaves, 1000 ft [305 m], 22 Aug 1987, *L.W. Cuddihy 2070*; Puna Distr., between Kapoho and Pohoiki, near coast, 20 Sep 1987, *L.W. Cuddihy 2078*.

Epipremnum pinnatum (L.) Engl. **Correction**

After *Epipremnum pinnatum* has been split from *Epipremnum aureum* (see above note), *E. pinnatum* is no longer known to be naturalized on Moloka‘i, Maui, or Hawai‘i, although it is likely cultivated on some of these islands. It is known to be naturalized in limited populations on Kaua‘i and O‘ahu.

Material examined. **KAUA‘I**: Līhu‘e Distr., Hā‘iku Rd, approx. ¼ mile [0.4 km] from junction with Hulemalu Road, east fork of Hā‘iku Rd towards power plant, secondary vegetation, high climbing vine to 30–40 ft [9–12 m] in trees, also covering banks of road, 120 ft [36 m], 02 Apr 2004, *T. Flynn 7188*; Hanalei Distr., just east of Hā‘ena along Hwy 56, vacant lot, secondary forest, 5 m, 26 Apr 1992, *D.H. Lorence & J. Black 7201* (PTBG). **O‘AHU**: Makiki Valley Loop Trail, near start of trail, disturbed moist forest, abundant along with *E. aureum*, 21.317106, -157.826525, 14 Jul 2021, *K. Faccenda 2050*; Honolulu, Makiki Heights area, 2377 Makiki Heights Drive, root climber on walls and tree trunks, or trailing on ground, spathe cream, spadix medium green, in partial shade, 03 Mar 1983, *J. Lau & C. Cory 2072*.

Asparagaceae

Asparagus aethiopicus L. **Nomenclatural note**

Asparagus densiflorus (Kunth) Jessop was first noted as naturalizing in Hawai‘i by Lorence & Flynn (1999); however, this name has been misapplied in Hawai‘i for wild plants. All examined specimens of wild plants formerly published using this name best represent *Asparagus aethiopicus*. The two species can be distinguished by the key in Jessop (1966) and differ primarily by how they hold their stems and the density of the cladodes [the photosynthetic stems in this genus that resemble leaves]: *A. densiflorus* holds its stems upright and has tightly arranged cladodes; *A. aethiopicus* is weak and sprawling and with cladodes arranged loosely. No naturalized vouchers of true *A. densiflorus* have been found, although *A. densiflorus* is frequently cultivated in Hawai‘i. *Asparagus aethiopicus* is naturalized on Kaua‘i, O‘ahu, Lāna‘i, Maui, and Hawai‘i islands (Imada 2019).

Asteraceae

Erigeron bonariensis L. **Correction**

Erigeron bonariensis (= *Conyza bonariensis* (L.) Cronquist) is no longer known from Ni‘ihau or Kaho‘olawe, as all specimens have been reidentified as *E. sumatrensis* (see discussion below). As most specimens of *E. bonariensis* in Hawai‘i were misidentified as *E. sumatrensis*, new specimen citations are only given for the earliest record on each island.

Material examined. **KURE**: 13 Sep 1961, *C. Lamoureux 1909*. **MIDWAY**: Dec 1931, *D.R. Chisholm s.n*. (BISH 75131) **LAYSAN**: Sandy substratum on southwest side of island, 05 Jul 1963, *R. Walker 503*. **FRENCH FRIGATE SHOALS**: Tern Island, abundant, 02 Sep 1961, *C. Lamoureux 1655*. **KAUA‘I**: Hanalei Distr., Kīlauea Point National Wildlife Refuge, east below Crater Hill, 102 m, 21 Jan 2013, *N. Tangalin 3425* (PTBG). **O‘AHU**: Koko Head, 16 Feb 1917, *C.N. Forbes 2418.O*. **MOLOKA‘I**: Airport, 11 Nov 2004, *M.L. Wysong 407*. **LĀNA‘I**: Mahana, Oct 1913, *G.C. Munro 177*. **MAUI**: Lualaʻilua, S slope of Haleakalā, 17 Mar 1920, *C.N. Forbes 1983.M*. **HAWAI‘I**: Pu‘u Wa‘awa‘a, 09 Jun 1911, *C.N. Forbes 54.H*.

Erigeron sumatrensis Retz. **New state record**

Erigeron sumatrensis has long been naturalized in Hawai‘i, being first collected in 1895, but has also long been identified as *Erigeron bonariensis*, despite these being distinct species. These species have historically been confused in many regions across the world, owing to their close morphological similarities and confusion in older literature (Milović 2004; Nesom 2018).

Despite its name, *E. sumatrensis* is native to Central and South America, and has become naturalized across much of Africa, Europe, India, and Southeast Asia (POWO 2024). It is noted as an agricultural weed across the world (Florentine *et al*. 2021), as well as by the author (KF) in Hawai‘i, where it becomes dominant in pastures. In more wild contexts, *E. sumatrensis* does not tend to become dominant, but instead tends to occur at low densities in widespread locations across the islands due to its wind-dispersed fruits. *Erigeron sumatrensis* appears to be the most common of these two species around the Hawaiian Islands, with 96 specimens at BISH and 97 iNaturalist observations, compared to 57 specimens and 67 iNaturalist observations for *E. bonariensis*. The key below details the morphological differences between these species, but they also differ in habit, with *E. sumatrensis* generally preferring moister areas (Figure 1). *Erigeron sumatrensis* is now known to be naturalized on Midway and all the main islands, including Ni‘ihau.

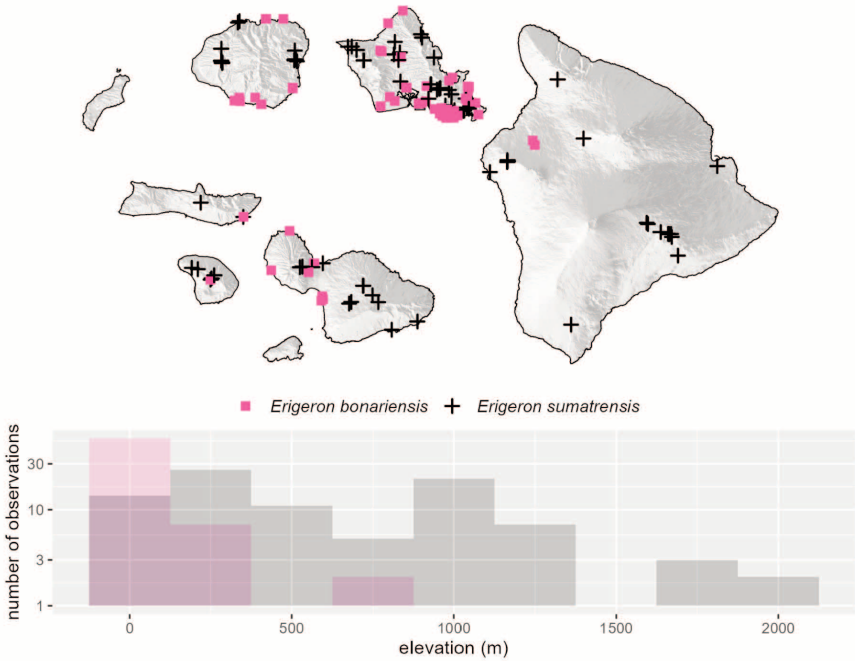

Figure 1. Distribution of *Erigeron bonariensis* and *E. sumatrensis* in Hawai‘i based on iNaturalist data. Upper panel shows geographic distribution, whereas the lower shows the elevational distribution. Note the log scale of the y axis.

KEY TO DISTINGUISH *ERIGERON SUMATRENSIS* AND *E. BONARIENSIS* [BASED ON ZHENGYI *ET AL*. (2011), NESOM (2018), LIENDO *ET AL*. (2021), AND WEAKLEY (2020)]:

1. Plant 30–200 cm tall; inflorescence broad and profusely branched; stem leaves lanceolate, toothed, 5–20 mm wide; phyllaries loosely strigose, with narrow-based hairs; dry to moist areas ..... *E. sumatrensis*
1′. Plant <60 cm tall; inflorescence spiciform with short side branches; stem leaves linear to lanceolate, <4 mm wide; phyllaries rather densely hispid-hirsute, with broad-based hairs; typically found in dry areas ..... *E. bonariensis*

Material examined. **MIDWAY**: 16 Apr 1962, *H.W. Frings 13*. **NI'IHAU**: South half of island, Jan 1912, *J.F.G Stokes s.n.* (BISH 75134). **KAUA'I**: Kahōluamanoa, above Waimea, 10 Sep 1895, *A.A. Heller 1819*. **O'AHU**: Moanalua, R.R. track, 13 Dec 1903, *W.A. Bryan s.n*. (BISH 75128). **MOLOKA'I**: Pālā'au, in pineapple field on west side of Moloka'i Airport, dry exposed, windy, 400 ft [120 m] 11 Nov 1974, *D. Herbst & G. Spence 5093*. **LĀNA'I**: Miki, 22 Mar 1916, *G.C. Munro 529*. **MAUI**: Waihe'e Valley Rd at junction with Wailuku Sugar Rd, on banks of fallow cane field, 29 Nov 1973, *S. Ishikawa 322*. **KAHO'OLAWE**: Northwestern part of island above Maka'alae Point, 200 ft [60 m], 21 Apr 1980, *L.W. Cuddihy & W.P. Char 330*. **HAWAI'I**: Pu'u Hualālai, Ka'ūpūlehu, 8000 ft [2440 m], *H. St. John et al. 11420*.

Brassicaceae

Cardamine occulta Hornem. **Nomenclatural note**

[syn. *Cardamine konaensis* H. St.John]

The name *Cardamine flexuosa* With. has been widely misapplied across the world (Šlenker *et al*. 2018; Weakley 2020) and Hawai'i is no exception; after examination of all specimens at BISH, all Hawaiian material formerly referred to as *C. flexuosa* is actually *Cardamine occulta*. *Cardamine occulta* is identified by its lack of a basal rosette of leaves at flowering time as well as the lack of hairs on the upper portion of the stem whereas *C. flexuosa* has a basal rosette and hairs on the upper portion of its stem (Šlenker *et al*. 2018). Note that *Cardamine hirsuta* L. is also naturalized in Hawai'i and this species does have a basal rosette. Thank you to iNaturalist user @ajwright for bringing this misidentification to my attention. *Cardamine occulta* is a common weed and is found on Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i (Imada 2019). The name *Cardamine konaensis* H.St.John had historically been used for these plants in Hawai'i and must also be considered a synonym of *C. occulta*.

Cyperaceae

Cyperus stoloniferus Retz. **Correction; nomenclatural note**

Cyperus stoloniferus was published as occurring in Hawai'i by Imada & Kennedy (2020) based on material from upcountry Maui and the Kahuku Unit of Hawai'i Volcanoes National Park. However, conversations on iNaturalist revealed that this name was also misapplied after users from the species' native range noted that it is a coastal species. The plants found in Hawai'i occur above 2000 ft [609 m] and the inflorescence structures and color differ between the Hawaiian and *C. stoloniferous* plants from its native range.

Searching for an alternative identification, all specimens at BISH identified as *Cyperus* "*stoloniferus*" keyed to *C. rigidifolius* Steud. in *Flora of Tropical East Africa* (Hoenselaar *et al*. 2010). A specimen at US (*F. Starr & K. Martz 000910-1*) from East Maui and photos of fruiting spikelets and achenes from F. Starr were compared by the second author (MS) to

material of *C. rigidifolius* at US. This included an isotype (*Schimper 991*) from Eritrea and a specimen from Uganda with fruiting spikelets (*Dummer 3627*) cited by Kükenthal (1925). The etuberous rhizomes, abaxially lighter green to stramineous leaf blades, congested inflorescence, narrowly lanceolate-elliptic spikelets, narrowly ovate scales with purple-black sides, and trigonous, ellipsoid to ellipsoid-obovoid nutlets ranging from 1.5–1.6 × 0.6–0.8 mm were all a good match to the material at US.

This is the first time *C. rigidifolius* has been reported outside of its native range of the Arabian peninsula south through East and Central Africa to South Africa. It occurs at 1500–2800 m elevation (Kükenthal 1925; Hoenselaar *et al*. 2010) in grasslands, cultivated areas, and along roadsides (Simpson & Inglis 2001), and is noted as a troublesome weed in cultivated areas of Kenya, Uganda, and South Africa (DluDlu 2007). It is unclear how it arrived in Hawai‘i.

Molluginaceae

Mollugo cerviana (L.) Ser. **Correction; nomenclatural note**

All material at BISH previously identified as *Mollugo cerviana* has been reidentified as *M. verticillata* L. based on seed morphology and comparisons to material of *M. verticillata* from the mainland United States. Thank you to iNaturalist user @aspidoscelis for bringing this misidentification to my attention.

A naturalization record of *Hypertelis cerviana* (L.) Thulin (= *Mollugo cerviana*) was published for Maui by Oppenheimer (2016), but this was a misidentification of *Spergularia marina* (L.) Besser. As no other specimens exist from Maui, this island record must be deleted. *Mollugo verticillata* is now known to be naturalized on O‘ahu, Moloka‘i, Lāna‘i, and Hawai‘i (Imada 2019; Faccenda & Daehler 2024).

Verbenaceae

Lantana camara L. **Note**

The name *Lantana camara* is likely misapplied in Hawai‘i, as comparisons of the lectotype of *L. camara* do not match the material widely naturalized across the tropics and usually referred to as *Lantana camara* (Sanders 2006). The name *Lantana* ×*strigocamara* R.W.Sanders was published by Sanders (2006) to encompass the horticultural plant, which has widely naturalized across the tropics and largely called *L. camara* by previous authors. *Lantana* ×*strigocamara* is a hybrid derived from *L. camara* L., *L. nivea* Vent., *L. scabrida* Sol., *L. splendenti* Medik., and *L. hirsuta* M. Martens & Galeotti by European horticulturalists (Sanders 2006). Weakley (2006) accepts *L.* ×*strigocamara* as the only naturalized *Lantana* in the southeastern United States and notes that the name *L. camara* was formerly applied to these plants.

However, when attempting to apply the species concepts of Sanders (2012) to the naturalized *Lantana* in Hawai‘i, names could not be straightforwardly applied. Sanders’ taxonomy includes numerous hybrids and backcrosses; for example, over 35 putative hybrids with many species of *Lantana* sect. *Lantana* are reported among the 6 subspecies of *L. camara* (Sanders 2012). Sanders (2012) examined 3 specimens from Hawai‘i, which were identified as follows:

1. *Lantana camara* subsp. *aculeata* (L.) R.W.Sanders × *L. nivea* Vent. subsp. *mutabilis* (Hook.) R.W.Sanders (*Degener 11467*, SMU) [with note that this identification is uncertain]. Note that *L. nivea* does not occur in Hawai‘i making this ID dubious.

2. *Lantana camara* subsp. *aculeata* × *L.* ×*strigocamara* (*Krauss 1013*, SMU). Note that *L. camara* subsp. *aculeata* is a backcross between *L. camara* and *L.* ×*strigocamara*, making this specimen supposedly a F2 backcross, this ID is unlikely to be accurate as *L. camara s.s.* does not grow wild in Hawai‘i.
3. *Lantana nivea* subsp. *nivea* × *L.* ×*strigocamara* (*Topping 3009*, NY). Note that *L. nivea* does not occur in Hawai‘i making this ID dubious.

While it is clear that the Hawaiian plants called *Lantana camara* do belong to the strigose clade and do not represent *L. camara* s.s. (per the lectotype), the correct name to apply is unclear, as arguments could be made for either a broad concept of *L.* ×*strigocamara* L., a complicated taxonomy with numerous hybrids, such as those proposed by Sanders (2012), or a *L. camara sensu lato* concept. Given the taxonomic difficulties in this group and the questionable taxonomy surrounding the work of Sanders (2012), a *L. camara sensu lato* concept is the most appropriate to apply in Hawai‘i pending further molecular and cytogenic studies (Urban *et al*. 2011; Goyal & Sharma 2015).

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A synopsis of *Spermacoce* (Rubiaceae) and related genera naturalized in the Hawaiian Islands, with a key

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Spermacoce L. (Rubiaceae) is a taxonomically complex genus of ca. 250 species of herbs and shrubs whose differentiating features are often found in minute but consistently reliable characters of calyx lobes and mature seeds, especially details of the dorsal seed face (Terrell & Wunderlin 2002; Adams & Taylor 2012). A good dissecting scope, preferably equipped with a micrometer, is essential to measure and differentiate these characters for accurate identification of the plants, as well as mature seeds. As noted by Oppenheimer (2003: 23), misidentifications are common. For example, a specimen from Hawai'i Island *(Wagner & Mill Arey 6390*, US, PTBG) initially identified as *S. ovalifolia* is actually *S. prostrata*. A number of *Spermacoce* species, especially *S. ocymifolia* and *S. remota,* are troublesome crop and garden weeds in the Hawaiian Islands, as well as potentially invasive species in native ecosystems. Furthermore, several other herbaceous genera belonging to the tribe Spermacoceae characterized by opposite leaves and small, axillary and/or terminal, sessile flowers and fruits, i.e., *Hexasepalum* Bartl. ex DC., *Mitracarpus* Zucc., and *Richardia* L. superficially resemble and may be confused with *Spermacoce*. These are also included in the key below for identification purposes. *Galianthe brasiliensis* (Spreng.) E.L. Cabral & Bacigalupo, also a member of tribe Spermacoceae, has been documented as naturalized on O'ahu and Hawai'i (Faccenda 2024). It can be separated from other members of the tribe by its low shrubby habit; narrowly winged stems; small, elliptic to obovate, pseudoverticillate leaves; and flowers arranged in thyrsoid spikes along branch ends.

For these reasons a revised key to the Spermacoceae genera and species naturalized in the Hawaiian Islands is provided below to replace and supplement the keys in Lorence & Flynn (2006), Wagner *et al.* (1990), and Wagner *et al.* (2023–). Note: in the key, seed surface refers to the abaxial (dorsal) surface, except where otherwise stated. See Figures 1–3 for fruit and seed images. In this article we report 3 new state records, 2 nomenclatural notes, 2 corrections with nomenclatural notes, and several notes.

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KEY TO NATURALIZED SPERMACOCEAE IN THE HAWAIIAN ISLANDS

1. Inflorescences pedunculate, in axillary cymules of 2–4 flowers on peduncles (0)2–4 mm long, or flowers sometimes solitary on pedicels 2–7 mm long; fruits with ca. 20–40 seeds per locule ..... *Oldenlandia corymbosa*
1. Inflorescences sessile, in terminal and/or axillary clusters; fruits with 1 seed per locule (2).

2(1). Flowers in terminal, head-like clusters subtended by 2(4) involucral leaves; calyx and corolla 6-lobed; ovary 3-celled; fruit of (2)3(–6) mericarps (*Richardia* spp.) (3).
2. Flowers in both terminal and axillary clusters; calyx and corolla 4-lobed; ovary 2-celled; fruit a 2-valved capsule, or of 2 dimorphic mericarps (4).

3(2). Adaxial surface of mericarps broad with a median keel, the abaxial surface papillose and strigose ..... *Richardia brasiliensis*
3. Adaxial surface of mericarps closed to a narrow groove, the abaxial surface densely papillose and typically strigillose ..... *Richardia scabra*

4(2). Fruit a circumscissile capsule, the top separating like a lid at maturity; seeds with an x-shaped groove on the adaxial surface ..... *Mitracarpus hirtus*
4. Fruit either a 2-valved capsule opening via a longitudinal slit along the inner surface, or of 2 dimorphic mericarps separating at maturity, one dehiscent, the other indehiscent; seeds with a linear longitudinal groove on the adaxial surface (5).

5(4). Fruits schizocarps, both mericarps indehiscent or tardily dehiscent, seeds usually enclosed and not visible (*Hexasepalum* spp.) (6).
5. Fruits capsular, 2-valved, both cocci dehiscent or one indehiscent, 1 or both seeds usually released at maturity (*Spermacoce* spp.) (7).

6(5). Stems scandent; leaf blade 1–2.5 cm wide, apex acute, tip not apiculate; corolla tube 1.5–3 mm long; calyx lobes (2–)4 ..... *Hexasepalum sarmentosum*
6. Stems erect to prostrate; leaf blade 0.1–0.5 cm wide, apex apiculate with long, slender tip; corolla tube 6–14 mm long; calyx lobes 4 ..... *Hexasepalum apiculatum*

7(5). Mature seed surface transversely sulcate with 7–12 conspicuous dorsal grooves that completely encircle the seed, the surface between the grooves pitted (8).
7. Mature seed surface variously sculptured but not transversely grooved (10).

8(7). Leafy stems with only lateral inflorescences; seeds occasionally with several shallow transverse depressions on dorsal surface ..... *Spermacoce ocymifolia*
8. Leafy stems with terminal and lateral inflorescences; seeds with 7–12 conspicuous dorsal grooves that completely encircle it (9).

9(8). Terminal inflorescences 1–2.5 cm in diameter; calyx lobes 1–1.3 mm long, bicolorous with green midrib and broad pale margins; leaves often appearing clustered at the nodes due to short shoots in axils of leaf pairs, the internodes hirsutulous with trichomes to 1 mm long ..... *Spermacoce brownii*
9. Terminal inflorescences 0.3–0.8 cm in diameter; calyx lobes 0.5–1 mm long, uniformly green or purple-tinged green in color; leaf pairs well separated by internodes, the internodes glabrous or hirtellous with trichomes to 0.2 mm long ..... *Spermacoce remota*

10(7). Calyx lobes consistently 2 ..... *Spermacoce exilis*
10. Calyx lobes 4 (occasionally 2–3 in some flowers of *S. alata* and *S. prostrata*) (11).

11(10). Seed surface papillose with raised protuberances ..... *Spermacoce* sp. A (Moloka‘i)
11. Seed surface nearly smooth, shallowly or deeply pitted (12).

12(11). Leaves sessile or the lower ones with petioles 1–3(–5) mm long; corolla tube ca. 0.5 mm long; seeds 0.7–0.9 mm long with deep pits organized into less than 8 vertical rows. ..... *Spermacoce prostrata*
12. Leaves, at least the lower ones, distinctly petiolate with petioles 5–10 mm long; corolla tube 2.5–5 mm long; seeds 1.7–3 mm long with numerous minute pits not organized into rows (13).

13(12). Calyx lobes (2)4; corolla tube ca. 4–5 mm long; seeds light brown, 1.7–2.6 × 1.2–1.5 mm, surface finely pitted; annual herbs to ca. 50 cm tall; apices of leafy stems determinate, usually with terminal inflorescences ..... *Spermacoce alata*
13. Calyx lobes 4, often unequal; corolla tube 2.5–4 mm long; seeds dark reddish- or purplish-brown, 2–3 × 0.8–0.9 mm, surface finely pitted and also with several very shallow transverse dorsal depressions; perennial herbs or shrubs to ca. 70 cm tall; apices of leafy stems indeterminate, usually without terminal inflorescences ..... *Spermacoce ocymifolia*

Hexasepalum apiculatum (Willd.) Delprete & J.H. Kirkbr. **Nomenclatural note**

(Fig. 1A)

[Syn. *Spermacoce apiculata* Willd.; *Diodella apiculata* (Willd.) Delprete; *Diodia apiculata* (Willd.) K. Schum.; *Diodia rigida* (Willd. ex Roem. & J.A. Schultes) Cham. & Schltdl.]

The record for *Hexasepalum apiculatum* (as *Diodia apiculata*) in Hawai‘i was first published by Imada *et al.* (2000), and this species and is now found on O‘ahu (Imada 2019). Native to Mexico, Central and South America, West Indies, naturalized in Java, Angola (POWO 2024). Imada *et al.* (2000) recorded this as weedy at a single locality on O‘ahu [Ko‘olau Mts, Pūpūkea-Paumalu, Ko‘olauloa, 400 ft [120 m], 6 Dec 1987, *Nagata & Takeuchi 3748* (BISH)], but unknown if it is truly naturalized or occurs elsewhere.

Hexasepalum sarmentosum (Sw.) Delprete & J.H. Kirkbr. **New state record**

(Fig. 1B)

[Syn. *Diodia sarmentosa* Sw.; *Diodella sarmentosa* (Sw.) Bacigalupo & E.L. Cabral ex Borhidi]

Native from southern Mexico through Central and South America, also in tropical East Africa (POWO 2024). This species is recorded from a single collection on Moloka‘i, but unknown if truly naturalized. The *Herbst 9823* collection (Fig. 1B) has puberulent fruits with stiff white hairs and 4 calyx lobes, matching the pubescence of some collections of this species from Mexico (e.g., Puebla and Veracruz) housed at PTBG. The following description is from Verdcourt (1976: 336, as *Diodia sarmentosa* Sw.):

> “Straggling, scrambling or procumbent herb 1–3.6 m. long, often with many lateral branches from the main stem; stems 4-angular, pubescent on the angles but at length glabrous. Leaf-blades often rather yellowish green, elliptic, 1.8–6.3 cm. long, 0.7–2.8 cm. wide, acute at the apex, narrowed to the base, scabrid above with dense very short to longer tubercle-based hairs, pubescent beneath; petiole 1–5 mm. long; stipule-bases 1–2 mm. long with lines of hairs, bearing 5–7 setae 1–7 mm. long. Flowers usually few in axillary clusters at most nodes, the inflorescences up to 1.2 cm. in diameter in fruiting stage. Calyx-tube glabrous, obconic, 1.5–2 mm. long; lobes 4, often unequal, oblong-lanceolate

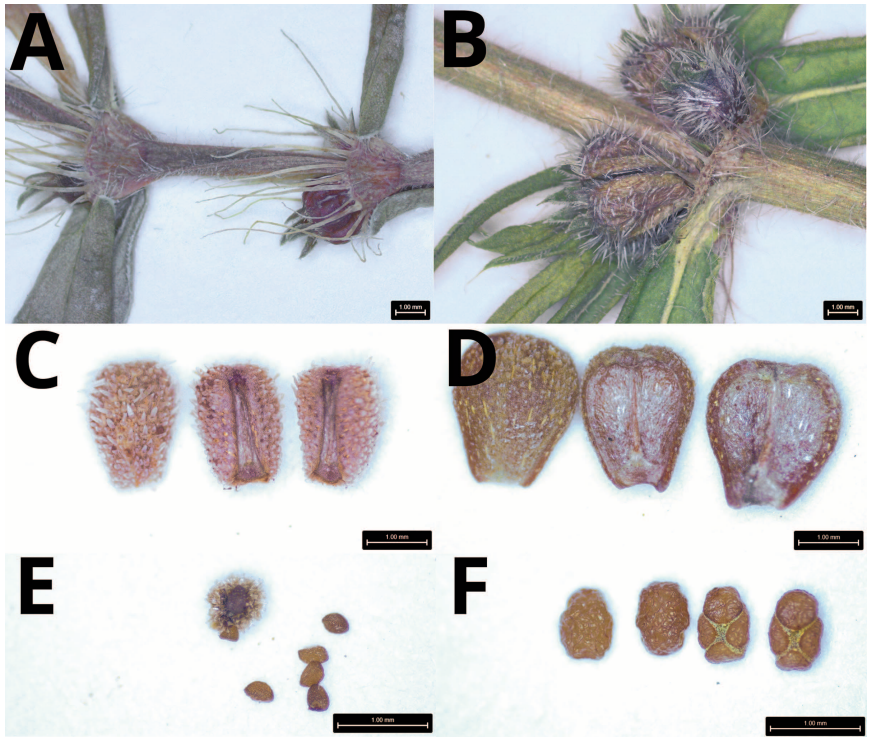

Figure 1. Fruits and seeds of Spermacoceae, all photographs taken of specimens housed at BISH. Note the various magnifications between genera. **A,** Nodes showing stipules and glabrate fruits of *Hexasepalum apiculatum* (*Nagata & Takeuchi 3748*); **B,** Node showing stipules and pubescent fruits of *Hexasepalum sarmentosum* (*Herbst 9823*); **C,** Mericarp fruits of *Richardia scabra* showing narrow median groove (*K. Faccenda & C. Daehler 2908*); **D,** Mericarp fruits of *Richardia brasiliensis* showing broad median keel (*D. Lorence & T. Flynn 5539*); **E,** Seeds of *Oldenlandia corymbosa* (*D. Lorence 6611*) with placenta (upper left); **F,** Seeds of *Mitracarpus hirtus* showing x-shaped adaxial groove (*K. Faccenda 3265*).

or narrowly triangular, 1.5–3 mm. long, 0.8 mm. wide, ciliate. Corolla mauve or white; tube glabrous, funnel-shaped, 1.8 mm. long; lobes triangular, 1 mm. long, 1 mm. wide, with a few hairs outside. Filaments exserted 0.5 mm. Style exserted 1.5 mm., minutely papillate. Cocci 1/2-oblong-ellipsoid, 3.5–5 mm. long, 2.5 mm. wide, 1.2 mm. thick or sometimes more globose, quite definitely not readily dehiscent. Seeds dark blackish red, compressed ellipsoid, 2–4 mm. long, 1.5 mm. wide, 0.8 mm. thick, with a broad ventral groove, finely rugulose."

Material examined: **MOLOKA'I**: Kaluako'i Distr, along Hwy 46 at Mahana, 750 ft [230 m], 17 Apr 1997, *D. R. Herbst 9823* (BISH).

Mitracarpus hirtus (L.) DC. **Note**
(Fig. 1F)
[Syn. *Spermacoce hirta* L.; *Mitracarpus villosus* (Sw.) DC.; *Spermacoce villosa* Sw.]
Mitracarpus hirtus was first published in Hawai‘i by Wagner *et al.* (1990), and this species is now found on East Maui (Kaupō, Ke‘anae) and Hawai‘i (Ka‘ū, Puna, North Kona, and South Hilo Districts) (Imada 2019). Native to the Neotropics and becoming widespread at an early date (POWO 2024). Easily recognized by its circumscissile capsules and seeds with an x-shaped groove on the adaxial surface.

Oldenlandia corymbosa L. **Note**
(Fig. 1E)
[Syn. *Hedyotis corymbosa* (L.) Lam.]
Oldenlandia corymbosa was first published in Hawai‘i by Wagner *et al.* (1990), and this species is now found on Kaua‘i, O‘ahu, Maui, Kaho‘olawe, and Hawai‘i (Imada 2019). Native to Africa and tropical and subtropical Asia, but widely naturalized in tropical and subtropical America, Australia, and on many Pacific islands (POWO 2024). Easily recognized by its creeping habit with prostrate stems, lanceolate leaves, and capsules with numerous very small seeds 0.2–0.3 mm long.

Richardia brasiliensis Gomes **Note**
(Fig. 1D)
Richardia brasiliensis was first published in Hawai‘i by Wagner *et al.* (1990), and this species and is now found on Kaua‘i, O‘ahu, Lāna‘i, West Maui, and Hawai‘i (Imada 2019). Native to central South America, now widely naturalized in the southern United States, Mexico, Jamaica, Africa, Mauritius, India, Sri Lanka, Southeast Asia, China, Australia, New Guinea, and the Hawaiian Islands (POWO 2024).

Richardia scabra L. **Note**
(Fig. 1C)
Richardia scabra was first published in Hawai‘i by Lorence *et al.* (1995), and this species is now found on Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i (Imada 2019). Native in South and Central America, Mexico, the southern United States, the West Indies, and now widely naturalized in Africa, India, Sri Lanka, Southeast Asia, China, the Philippines, and the Hawaiian Islands (POWO 2024).

Spermacoce alata Aubl. **Correction; nomenclatural note**
(Fig. 2B)
[Syn. *Borreria alata* (Aubl.) DC.; *B. latifolia* (Aubl.) K. Schum.; *Spermacoce latifolia* Aubl.]
Spermacoce alata was first published as naturalized in Hawai‘i under the name *S. latifolia* by Lorence *et al.* (1995), and this species is now found on Kaua‘i and O‘ahu (Imada 2019). Native from southern Mexico to Paraguay and naturalized in Florida, tropical Africa, tropical Asia, Malaysia, Indonesia, Polynesia (Hawaiian Islands), Micronesia (FSM and Palau), and Australia (POWO 2024). The stems and leaves usually dry with a distinctive yellowish green color. The specimens from East Maui cited by Oppenheimer (2004) were misidentified and are actually *S. remota*. Consequently, the distribution record for *S. alata* in Maui should be removed, as well as the record for Moloka‘i, which is *Spermacoce* sp. (see below).

Figure 2. Seeds of genus *Spermacoce*, all photographs taken of specimens housed at BISH at 20×. **A,** *S. remota* (*J. Lau 1475*); **B,** *S. alata* (*Tschannen US ARMY 455*); **C,** *S. ocymifolia*. (*K.R. Wood 15257*); **D,** *S. brownii* (*P.M. Bunch L104*).

The names *Spermacoce alata* and *S. latifolia* (or *Borreria alata* and *B. latifolia*) have been treated as distinct species by many authors but synonymized by others, variously under each of these names. There now appears to be only one species here, which takes the name *S. alata* (Adams & Taylor 2012). Aublet's names were published simultaneously. Although the names *B. latifolia* and *S. latifolia* have been more often used, these species were apparently first synonymized by Hara and Gould (1979) under the name *B. alata*.

Spermacoce brownii Rusby **New state record**
(Fig. 2D)
[Syn. *Borreria tonalensis* Brandegee; *B. vegeta* Standl. & Steyerm.; *Spermacoce tonalensis* (Brandegee) Govaerts]
Annual herb or subshrub native from southern Mexico to Argentina (POWO 2024). This species resembles *Spermacoce remota* but differs by the characters noted in the key. It is known from three collections on Hawai‘i Island. Apparently naturalized, but additional collections should be made to assess its current status and distribution. The following description is from Burger & Taylor (1993: 320, as *Borreria vegata*):

> "Annual herbs, erect, 10-30 cm tall, leafy stems 1–5 mm diam., longitudinal ribs obscure in early growth, sparsely to densely puberulent with crooked whitish hairs 0.2–0.5 mm long; stipule sheath 3–8 mm long, 6–23 mm broad, often marked with reddish spots, with

7–13 subequal awns to 9 mm long. Leaves opposite or more often pseudoverticillate with smaller axillary leaves, petioles 3–10 mm long, with broad lateral margins; leaf blades 25–90 mm long, 6–40 mm broad, elliptic-lanceolate to ovate-elliptic or lanceolate, apex tapering gradually and attenuate-acuminate, base abruptly narrowed and obtuse or cuneate, decurrent on the winged petiole, drying chartaceous, grayish green or yellowish green above (paler grayish beneath), glabrous or with short scabrous hairs above, sparsely to densely puberulent with thin whitish hairs 0.2–0.5 mm long beneath, 2° veins 4–7/side. Inflorescences terminal or axillary, hemispheric or verticillate, to 15 mm high and 25 mm broad, subtended by the leaves and enlarged stipular sheath, flowers densely congested. Flowers with 4 calyx lobes, 0.5–1.3 mm long, ca. 1 mm broad at base, ovate or suborbicular to broadly triangular, rounded to obtuse at the apex, ciliolate; corolla white, ca. 2.5 mm long, anthers ca. 0.4 mm long. Fruits ca. 3 mm long, villose to glabrous; seeds 2–2.2 mm long, 0.8–0.9 mm broad, narrowly oblong, with prominent transverse sulci, dark reddish brown."

Material examined: **HAWAI'I**: North Kohala Distr, Parker Ranch, stock ponds in vicinity of Kehena Reservoir, emergent vegetation along the shore and standing water, growing in upland, dry, grassy area, 2400 ft [730 m], 20°10′N, 155°48′W, 08 Jun 1992, *A. Engilis Jr. & F.A. Reid 92-04* (BISH); North Kohala Distr, Surety Ranch LLC Stock Ponds, growing on sloping wet banks of stock pond, stiffly upright herb 1.5–2 ft [0.5–0.6 m] tall, 20°11.481′N, 155°47.276′W, 1755 ft [535 m], 20 Mar 2005, *Crago 2005-118 & C. Imada* (BISH, PTBG); North Kohala Distr, Ka'ala'ala ahupua'a, Lāhikiola cinder cone, growing on shallow soil pockets on southwest facing exposed rock, uncommon, 3000–3300 ft [915–1005 m], 13 Mar 1989, *P.M. Bunch L104* (BISH).

Spermacoce exilis (L.O. Williams) C.D. Adams ex W.C. Burger & C.M. Taylor **Note**

(Fig. 3A)

[Syn. *Borreria exilis* L.O. Williams; *Spermacoce mauritiana* Gideon]

Spermacoce exilis was first published in Hawai'i by Wagner *et al.* (1990) as *Spermacoce mauritiana* and is now found on Maui and Hawai'i (Imada 2019). Native from southern Mexico and the Antilles to Brazil and Bolivia, now widely naturalized in tropical Africa, Madagascar, tropical Asia, Malaysia, Indonesia, New Guinea, the Indian Ocean islands, Polynesia (Hawaiian Islands and Samoa), and Micronesia (FSM and Palau) (POWO 2024).

Spermacoce ocymifolia Willd. **New state record**

(Fig. 2C)

[Syn. *Borreria ocymifolia* (Willd.) Bacigalupo & E.L. Cabral; *Diodia ocymifolia* (Willd.) Bremek.; *Hemidiodia ocymifolia* (Willd.) K. Schum.]

A perennial herb or subshrub native from southern Mexico through much of Tropical America. Introduced in Sri Lanka, Southeast Asia, Indonesia, Malaysia, and New Guinea (POWO 2024). In the Hawaiian Islands naturalized in areas of windward Kaua'i, where it forms extensive and dense stands in formerly cultivated areas, secondary vegetation, and also in native wet forest vegetation up to ca. 780 m elevation. Some specimens were initially misidentified as *S. latifolia* and distributed by PTBG under that name. The following description is from Burger & Taylor (1993: 317):

"Herbs or subshrubs, 30-90(–150) cm tall, branches erect or spreading and decumbent, distal branches simple or less often branched, leafy stems 0.5–3 mm thick, with 4 obscure longitudinal ribs and becoming terete, usually sparsely pubescent with thin whitish hairs 0.1–0.3 mm long; stipular sheath 2–6 mm long, 2–6 mm broad, conical (often difficult to

see beneath the inflorescences), pubescent, with (3–)5–11 unequal erect or spreading awns on each side, 2–8 mm long. Leaves opposite, petioles 0–12 mm long, 0.4–2 mm wide, sometimes with winged margins continuous with the leaf margins; leaf blades 2–8(–11) mm long, 0.6–2(–3) cm broad, narrowly elliptic, narrowly elliptic-oblong or elliptic-lanceolate, apex tapering gradually and acute or acuminate, base, attenuate, and decurrent on petiole, the margins becoming revolute, leaves drying stiffly chartaceous, slightly scabrous above and glabrous or sparsely puberulent, glabrous or scabrous beneath with short (0.1–0.2 mm) stiff hairs, 2° veins 3–6/side, strongly ascending. Inflorescences axillary and verticillate, 6–14 mm broad and 4–8 mm high, subtended by the petiolar sheath and its linear awns, the flowers densely crowded and sessile or subsessile. Flowers with hypanthium 1–2 mm long, narrowly oblongoid, with short stiff hairs, calyx lobes 0.3–0.5 mm long and ca. 0.4 mm broad; corolla white, funnelform, tube 1.3–2.5 mm long, ca. 0.6 mm diam. at the base and 1 mm at the mouth, glabrous externally, with short hairs at the mouth within, lobes 3–4, 1–2 mm long and ca. 0.5 mm broad, oblong-lanceolate; stamens 3–4, filaments 0.6–2 mm long, anthers 0.6–0.9 mm long, oblong; style ca. 2.5 mm long. Fruits 2.5–4 mm long, 1.5–2 mm broad, oblong-turbinate to obovoid-oblong, glabrous near the base and with thin erect hairs 0.2–0.3 mm long distally, persisting calyx 0.3 mm long, splitting into 2 mericarps; seeds 2–3 mm long, 0.6–1.3 mm thick, narrowly oblong, smooth or with obscure transverse depressions abaxially (×10) and minutely pitted surface (×40), dark reddish brown."

Material examined: **KAUA'I**. Līhu'e Distr, former Līhu'e Plantation land due N of Kilohana Crater along S fork of Wailua River, 22.033333, -159.416667, 11 Jan 2004, *D.H. Lorence et al. 9182* (BISH, PTBG, US); Kōloa Distr, Līhu'e-Kōloa Forest Reserve, N of water tank for Kāhili Mountain Park, 21.964333, -159.484417, 23 Jun 2005, *W.L. Wagner et al. 7043* (PTBG, US); Kōloa Distr, Hā'upu summit region, 14 Jul 2006, *K.R. Wood & M. Wood 11987* (BISH, PTBG, US); Līhu'e Distr, 'Iole Ridge, 22 Sep 2012, *K.R. Wood & M. Query 15257* (BISH, PTBG); Līhu'e Distr, 'Ili'ili'ula Valley, along drainage below northern falls, 22.0487350, -159.487350, 27 Jun 2013*, K.R. Wood et al. 15548* (PTBG); Līhu'e Distr, Kamo'oloa, northern branch, 22.003482, -159.491856, 11 Jul 2018, *K.R. Wood et al. 17881* (BISH, PTBG, US).

Spermacoce prostrata Aubl. **Note**

(Fig. 3C)

[Syn. *Borreria prostrata* (Aubl.) Miq.; *Spermacoce ovalifolia* misapplied, non (M. Martens & Galeotti) Hemsl.]

Spermacoce prostrata was first published in Hawai'i by Wagner *et al.* (1990), and this species is now found on O'ahu, Maui, and Hawai'i (Imada 2019). Native from southern Mexico to Argentina, Florida, and the Antilles, naturalized in the Cape Verde Islands, Sri Lanka, Southeast Asia, Indonesia, and Polynesia (Hawaiian Islands) (POWO 2024). Formerly misidentified as *S. ovalifolia* (M. Martens & Galeotti) Hemsl., which does not occur in the Hawaiian Islands (Oppenheimer 2003; Imada 2019).

Spermacoce remota Lam. **Nomenclatural note**

(Fig. 2A)

[Syn. *Borreria remota* (Lam.) Bacigalupo & E.L. Cabral; *Borreria assurgens* (Ruiz & Pav.) Griseb.; *Spermacoce assurgens* Ruiz & Pav.; *Borreria laevis* sensu auctt., non (Lam.) Griseb.]

This is the most common and weedy member of the genus in Hawai'i. *Spermacoce remota* was first published in Hawai'i by Wagner *et al.* (1990) as *S. assurgens,* and this species is now found on Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i (Imada 2019). Native from the southeastern USA and the West Indies and Mexico south to Brazil and Paraguay,

Figure 3. Seeds of genus *Spermacoce*, all photographs taken of specimens housed at BISH at 20×. **A,** *S. exilis* (*R. Hobdy 2561*); **B,** *Spermacoce* sp. A showing papillose surface (*H. Oppenheimer H110715*); **C,** *S. prostrata* (*D. Herbst 9583*).

naturalized in tropical East Africa, tropical Asia, Malesia, Indonesia, Australia, New Guinea, and many Pacific islands, including Polynesia (Hawai‘i and Samoa) and Micronesia (FSM, Palau) (POWO 2024).

Spermacoce sp. A **Correction; nomenclatural note**
(Fig. 3B)

Known from a single collection from Moloka‘i, where it was noted to be naturalized "… in pastures, waste areas, and open disturbed sites…." (Oppenheimer 2008). The collection was identified as *S. latifolia* (a synonym of *S. alata*) but doesn't correspond with *S. alata,* and consequently the occurrence of that species on Moloka‘i should be removed.

Seeds of *H. Oppenheimer H110715* are dark brown or mottled, narrowly ellipsoid, and have a distinctive papillose surface with raised protuberances (Fig. 3B), although the layer covering the testa appears to disintegrate with age, revealing pitting underneath (Fig. 3B, second seed from left). In contrast, seeds of *S. alata* (Fig. 2B) are light brown or tan, broadly ellipsoid, and the surface is finely pitted, not papillose. No other *Spermacoce* species currently known from the Hawaiian Islands has comparable papillose seeds, nor does *H. Oppenheimer H110715* correspond with any neotropical *Spermacoce* species seen by the first author. Additional collections should be made to assess its identity, current status, and distribution. A description of this unknown species follows:

Herb of unknown life span, stems erect to sprawling, indeterminate with most inflorescences axillary, stems square with low ridges, pilose on the margins, stipular sheath truncate, puberulent, ca. 1 mm long with 3–4 setae 1–4 mm long, these sparsely ciliate; stems and leaves drying yellowish green; leaves sessile, the blade coriaceous, elliptic, 2–3 × 0.7–1 cm, adaxial surface scabrid, abaxial surface pilose, lateral veins 3–5 on each side, deeply sunken adaxially, prominulous and pilose abaxially. Inflorescences mostly axillary, 0.8–1.2 cm wide; flowers with hypanthium puberulent, calyx lobes 4, subequal, narrowly deltoid-lanceolate, 0.7–1.5 mm long, ciliate, corolla white, tube 1.5 mm long, lobes 0.5 mm long, apex puberulent. Capsules ca. 2 mm long and wide, both cocci dehiscent; seeds dull dark brown, sometimes mottled with paler brown dorsally, narrowly ellipsoid, 1.6–2 × 0.7–0.9 mm, abaxial surface papillose with raised protuberances.

Material examined: **MOLOKA‘I**: Moakea, south of Pāpio Gulch, in pastures and waste areas, naturalized, erect to sprawling, locally common, 968 ft (295 m), 21.141407°N, 156.743386°W, 7 Nov 2007, *H. Oppenheimer H110715* (PTBG, BISH).

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New island records of *Werauhia* (Bromeliaceae) on Kaua‘i and Maui

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We report range extensions for two *Werauhia* (Bromeliaceae) species in Hawai‘i: *W. gladioliflora* on Kaua‘i and *W. sanguinolenta* on Maui. *Werauhia gladioliflora* was discovered naturalizing in a disturbed forest area on the Kuilau Ridge Trail in the Līhue-Kōloa Forest Reserve, Kaua‘i. Herbarium vouchers were acquired on a return visit after ascending host trees with climbing gear, providing the first documentation for the species on Kaua‘i. *Werauhia sanguinolenta* was documented as naturalized in East Maui in two separate locations, also a new island record for that species. The taxonomy and ecological implications for these species is briefly discussed. Online public observations of visually similar bromeliads on iNaturalist suggests that there are many additional populations of this genus naturalizing on all main islands, and we hope to encourage further collection and documentation.

Bromeliaceae

Werauhia gladioliflora Grant **New island record; confirmation of naturalization**

In January 2023 a colony of epiphytic bromeliads was observed to be naturalizing by one of the authors in non-native trees along both sides of the Kuilau Ridge Trail in the Līhu‘e-Kōloa Forest Reserve, East Kaua‘i. A population of thousands, ranging from seedlings to fully mature plants, was observed in the mid- to upper canopy of the secondary forest dominated by 40 m tall albizia trees (*Falcataria moluccana*), with only seedlings and immature plants accessible from the ground. Returning to the site in June 2023, an appropriate tree was selected and climbed to a height of approximately 40 ft (12 m) using rope and harness. Three mature specimens were collected for identification and herbarium records (one with infructescence [*A. M. Williams & J. Jablonski AMW 799*, PTBG], two with inflorescence [*J. Jablonski 12*, PTBG], and seedling establishment was observed on lower tree trunk sections along the trail and on mossy trunks throughout the tree canopies. The species was identified as *Werauhia gladioliflora* using the key in the *Manual de Plantas de Costa Rica* (Morales 2003). *Werauhia* (subf. Tillandsioideae) has a center of diversity in mountainous habitats of Costa Rica to western Panama, though the broader range extends from southern Mexico

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through Central America to the West Indies, Peru, and northeastern Brazil (Morales 2003). The genus has synapomorphies that include plants with mostly nocturnal anthesis and a lack of brilliant coloration, fleshy floral bracts, dactyloid petal appendages, a cupulate stigma, and stout, dark-colored capsules (Grant 1997). Seeds are adapted for wind dispersal, with long chalazal appendages and absent micropylar appendages (Leme *et al.* 2020). *Werauhia gladioliflora* is epiphytic or terrestrial, and has dark green, thin, waxy leaves up to 67 cm long, forming a funnelform rosette. The inflorescence is simple, erect to 65 cm tall, with broadly ovate floral bracts and broadly elliptic and obtuse sepals. It is morphologically similar to some other species in the genus (*W. barrii*, *W. tonduziana, W. viridiflora*, etc.) but is differentiated from these allied species by its overall size, floral bracts that are rugose to rugulose, a simple cylindrical inflorescence, and its ecological preference in its native range for humid lowlands. It is the most common *Werauhia* species at lower elevations in Costa Rica (Morales 2003).

On Kauaʻi, *W. gladioliflora* was observed at elevations ranging from 600–700 ft (182–213 m) above sea level. Plants were recorded growing epiphytically on a variety of trees, primarily on *Falcataria moluccana*, but also seen on *Persea americana*, *Psidium cattleyanum*, *Eucalyptus* sp. (only on the lower trunk sections with rough bark and abundant moss), and *Sphaeropteris cooperi*. Consultation with two South American Bromeliaceae specialists, Dr. Elton Martinez Carvalho Leme and Dr. Juan Francisco Morales, proved congruous identification after reviewing photographs of the fresh plant material (E. Leme and J. F. Morales, pers. comm., Jan 2024).

Werauhia gladioliflora was first documented naturalizing on Oʻahu in 2010 at the Lyon Arboretum (Frohlich & Lau 2012). It was described as adventive, establishing on branches of a longan tree 30 ft (9 m) from planted individuals.

Material examined. **KAUAʻI**: Līhuʻe Distr, Līhue-Kōloa Forest Reserve, along Kuilau Trail, disturbed lowland wet forest, epiphytic on albizia, 1.2 m tall (incl. infructescence), leaves medium green top and bottom, inflorescence green, single mature flower observed at anthesis barely poking out past floral bract, petals and sepals green, mature-looking fruits (undehisced) hard, bright reddish purple, oriented slightly downward, 182–213 m, 20 Jun 2023, *A. M. Williams & J. Jablonski AMW 799* (PTBG); same location and date, epiphytic bromeliad growing on many different species with suitable substrate, 1.5 m tall (incl. inflorescence), 4 ft (1.2 m) diam, inflorescence goopy, leaking clear slime, *J. Jablonski 12* (PTBG).

Werauhia sanguinolenta Grant **New island record**

In January 2023, two separate specimens of *W. sanguinolenta* were collected on East Maui, one with green leaves and another with purple leaves (see Figure 3). It was unclear at the time if the green-leaved plants were of the same species as the purple-leaved plants, as they both seemed identical in all other characteristics when fruiting. No flowers were observed. They may be two cultivars, or a reversion to phenotype due to feralization. Their naturalized ranges in Hana District, East Maui, overlap from east of Keʻanae Valley to at least Nāhiku, which seems to be the densest occurrence. Neither form appears to have a host species preference and are found epiphytically on both native (e.g., *Metrosideros polymorpha*), Polynesian-introduced (e.g., *Aleurites moluccana*), and invasive (e.g., *Spathodea campanulata*) trees. Plants have been observed on mossy tree trunks as well as precariously perched on secondary branches wherever there is an appropriate substrate, such as bryophytes or accumulated leaf litter and soil. Seeds were sown from the specimens cited but the two leaf-color forms were not separated. Germination began

Figure 1. *Werauhia gladioliflora*. **A**, population growing epiphytically in *Falcataria moluccana* on Kaua‘i. **B**, mature fruiting plant size for comparison. **C**, leaves and inflorescence of mature plant.

in approximately 30 days. The species was identified as *Werauhia sanguinolenta* using the key in the *Manual de Plantas de Costa Rica* (Morales 2003), and photographs of the fresh material were reviewed and the species determination confirmed by Dr. Elton Martinez Carvalho Leme (E. Leme, pers. comm., 9 Apr 2024). *Werauhia sanguinolenta* was first documented naturalizing in East O‘ahu in 2009, where it was collected growing epiphytically on streamside vegetation several hundred meters from the nearest homesite (Lau & Frohlich 2012). That specimen was also described as having burgundy red leaves.

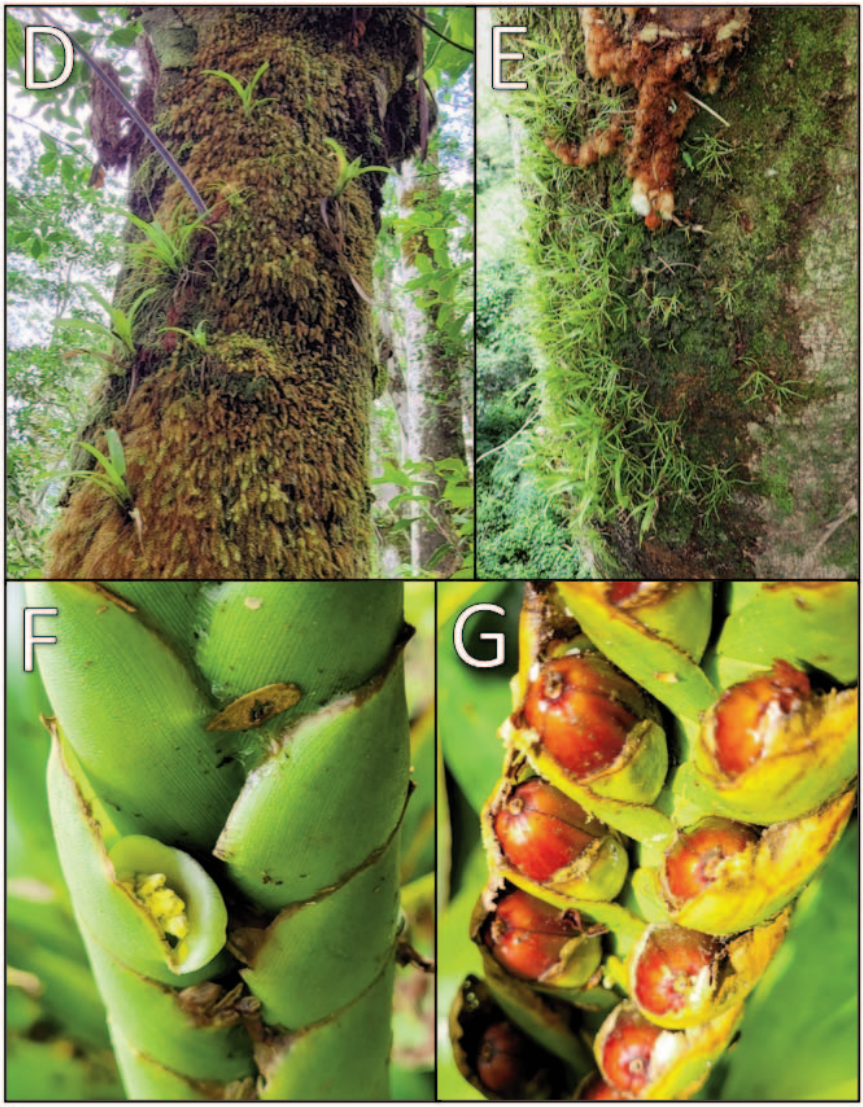

Figure 2. *Werauhia gladioliflora*. **D**, seedlings visible from the ground in moss on lower tree trunks. **E**, seedlings present at voucher location, ca. 40 ft. off the ground in *Falcataria moluccana* canopy. **F**, inflorescence with flower. **G**, infructescence with maturing fruit.

Material examined. **MAUI**: East Maui, Hanawī Stream, on makai side of Hana Hwy, degraded lowland *Metrosideros-Acacia-Dicranopteris* wet forest, 317 m, naturalized, epiphytic, 7 m high in *Spathodea campanulata*, leaves light green, similar to *Asplenium nidus*, shiny, fibrous, fleshy but not succulent, 04 Jan 2023, *Oppenheimer & K. Bustamente H12302* (BISH, PTBG); East Maui, Kapā‘ula

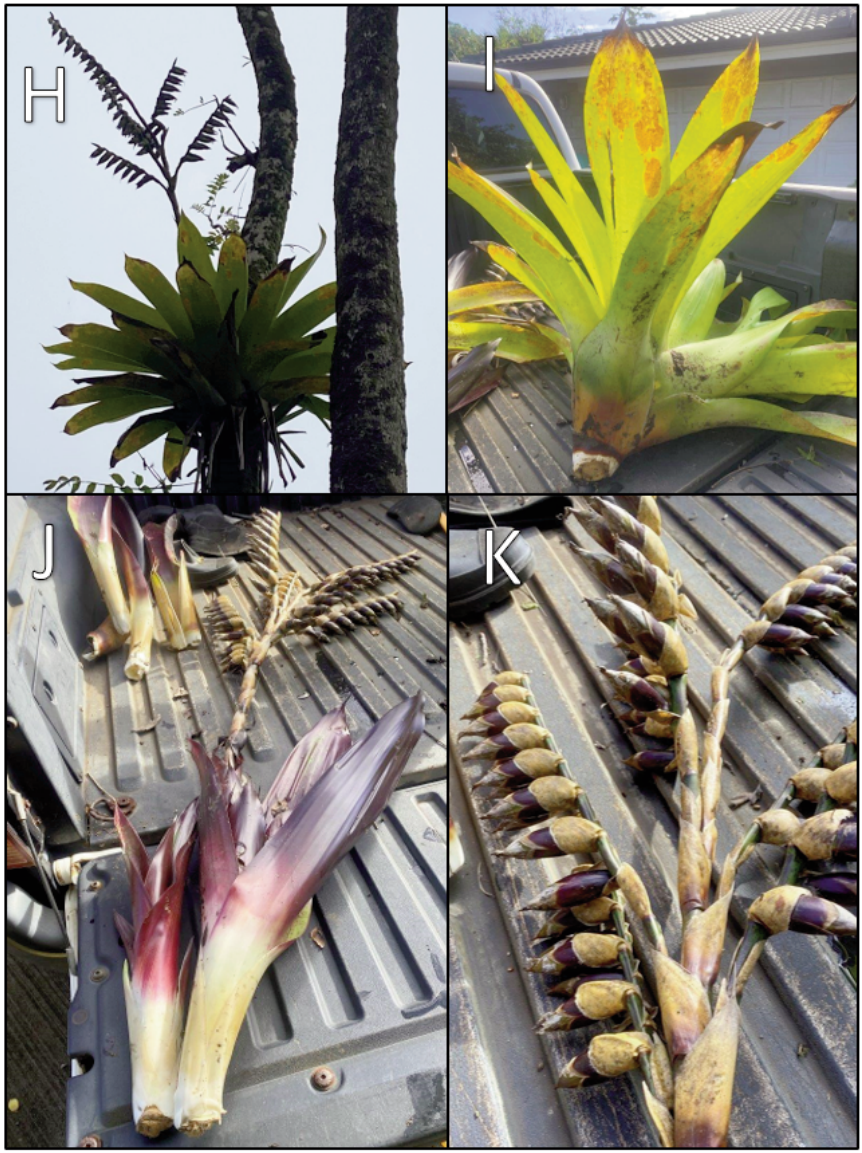

Figure 3. *Werauhia sanguinolenta*. **H**, fruiting specimen growing epiphytically in *Spathodea campanulata*, Maui. **I**, green variant. **J**, infructescence on purple variant. **K**, infructescence with maturing fruit.

Stream, on makai side of Hana Hwy, degraded lowland *Metrosideros-Acacia-Dicranopteris* wet forest, naturalized, epiphytic, 3 m high in *Metrosideros polymorpha*, leaves purple, shiny, fibrous, fleshy but not succulent, 04 Jan 2023, *Oppenheimer & K. Bustamente H12304* (BISH, PTBG).

In its native range, *Werauhia gladioliflora* has a pollination method associated with bats (Tschapka & Helverson 2007). However, there is evidence that despite adaptations to chiropterophily, *W. gladioliflora* has a flexible breeding system, with both autogamy and cross-pollination occurring. Cascante-Marín *et al*. (2004) report up to 90% fruit set following spontaneous-selfing tests, with no significant difference in the number of seeds compared to naturally pollinated fruits. Estimated seed output for the sampled population was nearly one million seeds in a given reproductive season. Interestingly, at one premontane Costa Rican study site, a florivorous eurytomid wasp (*Eurytoma werauhia*) reduced fruit set in *W. gladioliflora* by as much as 70% (Cascante-Marín *et al*. 2009). Although naturalized populations of *W. gladioliflora* in Hawai‘i are lacking bat pollinators, they are likely also missing parasites or predators that could potentially check their population growth.

Werauhia belongs to a group of bromeliads often referred to as “tank” bromeliads. This is due to their capacity to retain considerable amounts of water within a rosette of overlapping leaves. The additional weight on tree limbs from mature, water-retaining tank bromeliads may exacerbate damage to infrastructure and property, especially in stands of invasive albizia trees (*Falcataria moluccana*), a species already infamous for sudden limb shear (Watson 2018). Additional negative effects of *Werauhia* establishment across the landscape could include an increase in breeding habitat for invasive animal species, like coqui frogs (*Eleutherodactylus coqui*) (Hara & Niino-DuPonte 2016), and arthropods such as mosquitos. One study on Kaua‘i (Yang *et al*. 2003) documented *Vriesea* aff. *regina*, a tank bromeliad in a genus closely allied to *Werauhia*, to be a significant breeding site for three noxious mosquito species: *Wyeomyia mitchellii* (Theobald), *Aedes albopictus* (Skuse), and *Culex quinquefasciatus* (Say). One of these mosquitos, *C. quinquefasciatus*, is considered to be a grave threat to Hawaiian forest birds as a vector of avian malaria, which is already menacing the last surviving endemic honeycreeper populations of several species on both Kaua‘i and Maui (Glad & Crampton 2015; Pratt *et al*. 2009). Given that the native range of these bromeliads includes observations well over 1200 m above sea level, we suspect no elevational barrier for their proliferation on Kaua‘i, and that only diminishing rainfall may inhibit their spread into the uppermost forests of Maui.

As of May 2024, online observations on the citizen science platform iNaturalist indicate wild populations of *Werauhia* spp. on the islands of Hawai‘i, Maui, O‘ahu, and Kaua‘i (iNaturalist 2024). Given the documented life history traits of *Werauhia* spp. in their native range and the observed quantity of propagules on Kaua‘i, we expect that *Werauhia* spp. are likely to continue range expansion into natural areas across the state, including both degraded and native forests. We strongly encourage all botanists and nature enthusiasts to report naturalized instances of these species, and especially to make herbarium records for confirmation and proper documentation of these troubling invasive pests that are so quickly establishing across the archipelago. These are, unfortunately, just two more examples in a long line of intentional horticultural introductions accidentally escaping to become part of the growing non-native flora, with untold impacts on the many threatened endemic species of Hawai‘i.

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New moss record on Kaua‘i Island: *Calymperes fasciculatum*

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In an ongoing project, the National Tropical Botanical Garden is undertaking surveys of bryophytes and lichens from under-explored areas on Kaua‘i to increase our knowledge of their distribution, diversity and abundance. To date one new island record has been identified and is reported here. *Calymperes fasciculatum* has now been collected from the Kawaihau District on the island of Kaua‘i.

Calymperaceae

Calymperes fasciculatum Dozy & Molk. **New Island Record**

According to Staples *et al.* (2004), this indigenous species was previously only known from the island of O‘ahu. As described by Bartram (1939), the distinguishing features of this species that separate it from the only other member of the genus in Hawai‘i, *Calymperes tenerum,* include size of the plants (robust vs. small for *C. tenerum*), the size of the leaves (almost twice as long as in *C. tenerum*), length of the costa, the absence of taeniolae, slightly serrated margins (vs. entire), and incrassate cells. This plant was observed forming a dense cushion (Fig. 1a). Additionally, gemmae were present on the plants, which is common for species of this family (Fig. 1b).

C. fasciculatum was collected from two populations located in the basin of Makaleha Valley on Kaua‘i, in wet, shaded riparian areas in predominantly secondary forest. Both populations were found on large, smooth, volcanic boulders, each about 9 m² in size (Fig. 2). Although this area is a local hiking spot, this trail is unmaintained and challenging to navigate. It is not unreasonable to consider this a natural range extension, especially when considering the relative proximity of Kaua‘i and O‘ahu. California Academy of Sciences’ moss specialist, James Shevock has expressed the opinion many times that species currently known only from O‘ahu should be looked for and expected to be found on Kaua‘i (pers. comm.). Considering the secondary nature of the forest in this area, relatively few collections have been made as most botanists prefer to focus on native dominated habitats. The collection of *C. fasciculatum* on Kaua‘i only enforces the need for better, more concerted collecting efforts for bryophytes and lichens from all habitats and elevational ranges throughout the islands.

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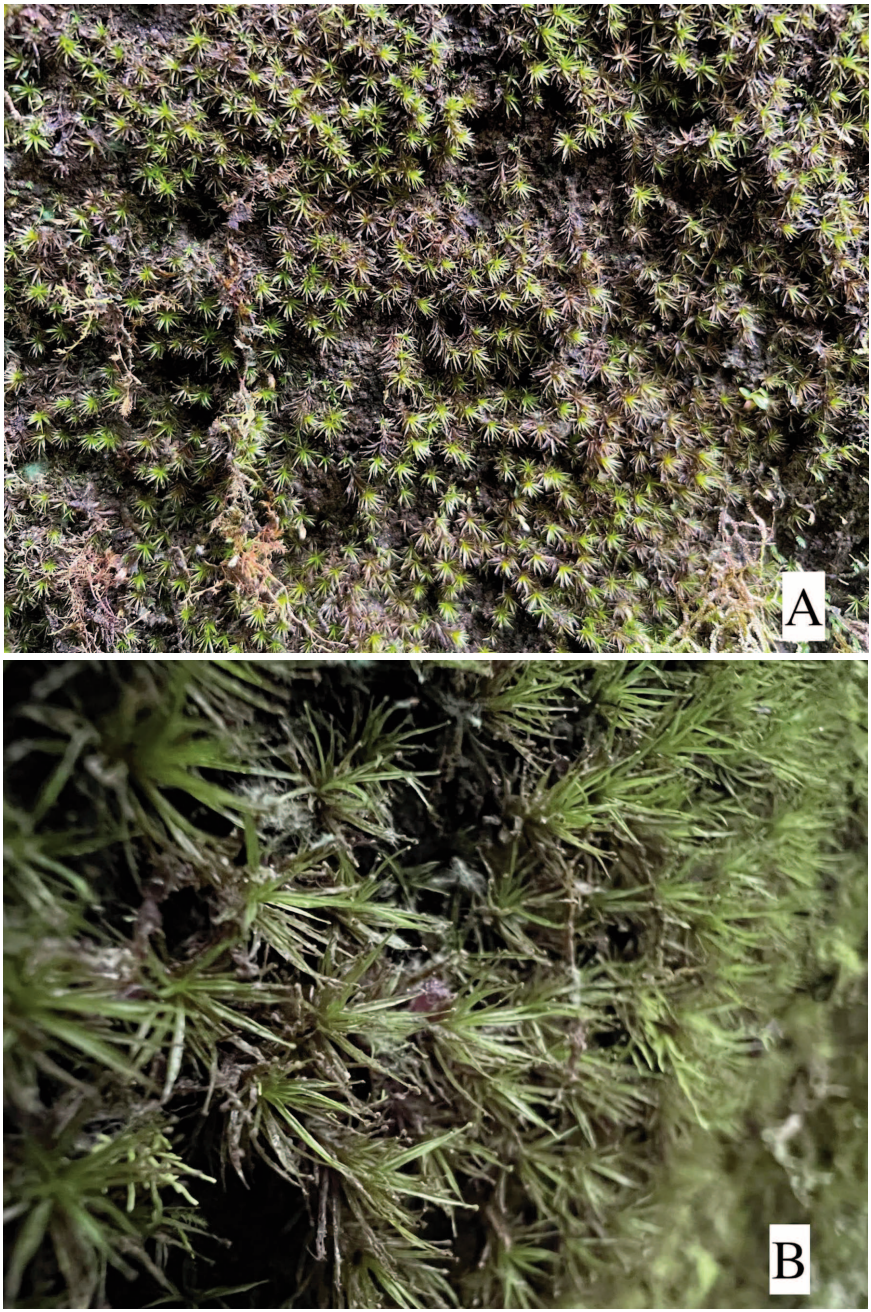

Figure 1. A. *Calymperes fasciculatum* cushion on volcanic rock. **B.** *C. fasciculatum* up close with gemmae present on tips of leaves.

Figure 2. Habitat of *Calymperes fasciculatum*.

Material examined. **KAUA'I**: Kawaihau District, Makaleha Mountains, riparian area along trail on large smooth volcanic rock, *Hibiscus tiliaceus* dominated forest, 212 m, 02 Dec 2022, *Jensen & Flynn KLJ199* (PTBG)*;* loc. cit. 334 m, 04 Jul 2023, *Jensen et al. KLJ392* (PTBG)

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First record of the spider egg predator *Phalacrotophora epeirae* Brues (Diptera: Phoridae) in Hawai‘i[1]

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Abstract. The spider egg predator, the phorid *Phalacrotophora epeirae* Brues, 1902, is recorded from Kaua‘i and marks the first record of the genus in the Hawaiian Islands.

In 2014, unidentified phorids were collected while emerging from the egg sac of the spider *Gasteracantha cancriformis* (Araneidae) on Kaua‘i but were mishandled, and consequently destroyed. A second and third collection of the same phorids were made in April and May 2023 and tentative morphological identification of *Phalacrotophora epeirae* Brues, 1902 was rendered by JNM. Additional material was collected by K.N. Magnacca from Hawai‘i Island. Further surveys may show it to be found on the other main Hawaiian Islands as well.

To help confirm the identity of this unidentified spider egg predator, adult flies were sent to MM and AK for molecular analysis. One entire adult specimen was subject to CTAB extraction (Li *et al*. 2008) and extracted nucleic acids were used as a template for PCR. A portion of the COI gene was amplified using universal invertebrate COI primers LCO1490 5′-GGTCAACAAATCATAAAGATATTGG-3′ and HCO2198 5′-TAAACTTCAGGGTGACCAAAAAATCA-3′ developed by Folmer (1994). The PCR conditions were as follows: 5 mins at 95 °C followed by 35 cycles of 95 °C for 40 secs, 51 °C for 40 seconds, 72 °C for 1 min with a final extension at 72 °C for 7 mins. The resulting 654bp product then underwent Sanger sequencing. The resulting specimen sequence (BOLD record HIAAD001-24) was queried through the Barcode of Life Database (BOLD) Animal Identification Engine (https://boldsystems.org/index.php/IDS_OpenIdEngine). The BOLD identification engine results via Tree Based Identification indicated that the insect was *Phalacrotophora epeirae* with 100% probability of placement and most closely related to record JSDIR890-11 (GenBank accession number: KR663566) collected from Ontario, Canada in 2010, sharing 100% nucleotide identity.

* Corresponding author

1. Contribution No. 2024-006 to the Hawaii Biological Survey,

Figure 1. Habitus of *Phalacrotophora epeirae* Brues.

Diptera: Phoridae
***Phalacrotophora epeirae* Brues, 1902** **New state record**
(Fig. 1)

This species was originally described from Texas and occurs naturally throughout most of eastern North America from Quebec to northern Mexico (cf. Evenhuis & Pape 2024). They are easily distinguished from other phorids in Hawai‘i by their distinctive abdominal coloration and pattern (Fig. 1). A study in Florida by Muma & Stone (1971) showed that 43.7% of 216 *Gasteracantha cancriformis* egg cases collected from more than 20 citrus groves contained various stages of predation by *Phalacrotophora epeirae*, even with hyperparasitism by a *Tetrastichus* sp.

While fortuitous biocontrol of the pestiferous spider *Gasteracantha cancriformis* by *Phalacrotophora epeirae* is welcome in Hawai‘i, *P. epeirae* is a recorded natural enemy of

Figure 2. Image of *Gasteracantha cancriformis* egg sac and pupae of *P. epeirae* Brues.

several different spider genera in various families (Gillung & Borkent 2017) including *Gasteracantha* and *Larinoides* (Araneidae: some species previously in *Gasteracantha* were misidentified and are now in *Thelecantha*, like *T. brevispina*) (Brues 1902, 1903; Auten 1925; Muma & Stone 1971), *Pityohyphantes* (Linyphiidae) (Manuel 1984), *Mimetus* (Mimetidae) (Guarisco 2001), and *Phidippus* (Salticidae) (Jones 1940; Manuel 1984). This broad host range and wide distribution across climates is of concern for Hawai‘i’s diverse spider fauna, including over 184 endemic species in sixteen families.

Material examined. HAWAIIAN ISLANDS. **Kaua‘i**: 8♂♀, Līhu‘e, HDOA Plant Quarantine Branch office, 21.97278, -159.37522, 21 April 2023, L. Ishii (from egg sac of *Gasteracantha cancriformis*) [Fig. 2] on vehicle) (vouchers in Bishop Museum Entomology collection and Hawai‘i Department of Agriculture); 16♂♀, Kīlauea, 21.19582, -159.35652, 3 May 2023, L. Ishii and C. Kishimoto (from egg sacs of *Gasteracantha cancriformis* on wall) (vouchers in Hawai‘i Department of Agriculture collection), det. A. Kong via COI molecular analysis, BOLD HIAAD001-24. **Hawai‘i**: 1♂, Kapāpala Canoe Management Area, 1460 m, 19.3607, -155.4654, 10 Apr 2023, on *Myrsine lessertiana*, K.N. Magnacca, H23041008-01.

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