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RECORDS OF THE
HAWAII BIOLOGICAL
SURVEY
FOR 2008

PART I: PLANTS

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AND
LUCIUS G. ELDRIDGE, EDITORS



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Cover illustration: *Aira caryophylla* L., silver hairgrass, a naturalized plant in pasture areas and lava flows on O'ahu, Moloka'i, Maui, and Hawai'i. From Wagner, W.L. *et al.* 1999. *Manual of the flowering plants of Hawai'i*. Rev. ed. Univ. Hawai'i Press & Bishop Museum Press, Honolulu.

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BISHOP MUSEUM

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RECORDS OF THE HAWAII BIOLOGICAL SURVEY FOR 2008

Editors' Preface

We are pleased to present the annual compilation of *Records of the Hawaii Biological Survey*; this year for the year 2008. We apologize for the delay in getting these *Records* published. The number and diversity of taxa reported in these issues attest to the continuing value of the *Records* as part of the ongoing effort to accurately inventory the Hawaiian biota. This year we have split the traditional two volumes into plants and animals. This volume contains records pertaining to the plants. The second volume will contain the records for the animals.

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

An intensive and coordinated effort has been made by the Hawaii Biological Survey to make our products, including many of the databases supporting papers published here, available to the widest user-community possible through our web server. Products currently available include taxonomic authority files (species checklists for terrestrial arthropods, flowering plants, nonmarine snails, marine invertebrates, fossil taxa, and vertebrates), bibliographic databases (vascular plants, nonmarine snails, and insects), specimen databases (fungi, fish, invertebrates, portions of the insect collection) and type specimens (entomology; botany—including algae and fungi; and vertebrates), collections data (lists of holdings for select groups of flies as well as Cicadellidae and Pentatomidae), detailed information and/or images on endangered, threatened, and extinct plants and animals; as well as our staff publication lists. Additional reference databases include: the list of insect and spider collections of the world (based on Arnett, Samuelson & Nishida, 1993, *Insect and spider collections of the world*) with links to institutional web pages where known; and the historical world Diptera taxonomists list with names of over 5,000 authors who have described flies.

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The *Records of the Hawaii Biological Survey for 2008* were compiled with the assistance of Clyde Imada (botany), Frank Howarth (entomology) and other anonymous reviewers who helped referee papers; and was partially supported by funds from the John D. and Catherine T. MacArthur Foundation. Many of the new records reported here resulted from curatorial projects funded by the National Science Foundation and field surveys funded by the David and Lucile Packard Foundation, U.S. Geological Survey Biological Resources Division, U.S. Fish & Wildlife Service, and the Hawaii Department of Land and Natural Resources.

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

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or by mail from: Hawaii Biological Survey, Department of Natural Sciences, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.

—*N.L. Evenhuis &*
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New plant records from O‘ahu for 2008¹

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We document 19 new naturalized records, 8 new state records, and 14 new island records in 23 families. In addition to our own collections, we report on records of naturalization noted by other agencies during 2008.

This article documents 10 naturalizing species in the Bromeliaceae, a previously underrepresented group in the naturalized flora of Hawai‘i. Also included are three species in the Orchidaceae. In the past, both families were believed to be less likely to naturalize in Hawai‘i, based upon their general tendency to rely on specialist pollinators not documented as present here. However, it is important to note that both these families contain species that are self-fertile and wind-dispersed. As indicated by the naturalized records documented here, these biological characteristics have imparted an advantage to these species and increased the possibility of their naturalization. For this reason, home growers are encouraged to monitor their plants for signs of naturalization and to avoid species that are known to be, or appear to be, self-compatible and easily dispersed.

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

Acanthaceae

Megaskepasma erythrochlamys Lindau

New naturalized record

Megaskepasma erythrochlamys, a 2.4–4.6 m tall, attractive shrub native to Costa Rica, Nicaragua, El Salvador, and Venezuela, is a popular ornamental in Hawai‘i and other tropical locales. It is cultivated by cuttings and seed and is the only species in its genus. Distinguishing features are ovate leaf blades 30.5–40.6 cm long with deep green upper-sides and prominent veins, short-petiolate. Inflorescence is a terminal conical spike with ovate to ovate-lanceolate, burgundy red bracts 2.5–5.1 cm long, and veined from the base. Flowers have a five-parted calyx with unequal lobes. Corollas are up to 7.6 cm long and tubular, 2-lipped, white, pubescent, and sharply curved at the tip. There are 2 fertile stamens; fruit is ca 1.27 cm long and oblong, containing 4 seeds. This specimen was collected from a roadside gulch in Schofield Barracks, where it made up the majority of the understory.

Material examined. O‘AHU: Schofield Barracks, herb ca 2 m tall, spreading throughout gulch on side of road, making up almost all of understory, growing among *Justicia*, *Spathodea*, fruits immature, green, 29 Apr 2008, OED & J. Beachy 2008042901.

1. Contribution No. 2010-002 to the Hawaii Biological Survey.

2. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai‘i, 96817-207, USA.

Annonaceae***Polyalthia suberosa* (Roxb.) Thwaites****New naturalized record**

Polyalthia suberosa, which is native to India, Sri Lanka, and Southeast Asia, is widely planted throughout the tropics as an ornamental and for its edible fruit (Staples & Herbst 2005). The specimen examined for this new naturalized record was brought to the museum by a woman who found it in her yard in Waipahu, presumably dispersed by birds. *Polyalthia suberosa* is a 1.8–3.7 m tall shrub with thick, corky, ridged bark. Its narrowly obovate to oblong leaves are 2.0–10.8 cm long by 1–3.6 cm wide, sessile, rounded at the apex, and have undulate margins. Flowers are 0.635 cm long and solitary; petals are pale yellow and somewhat downy. The copious purple fruits are 0.635 cm in diameter and borne in clusters (Staples & Herbst 2005).

Material examined. O'AHU: Waipahu, growing in yard with *Carmona retusa*, *Ochna thomasiiana*, *Trema orientalis*, no other plants noted in neighborhood, leaves glossy above, paler below with wavy margins, fruits ripening to dark purple/black, 26 Apr 2008, A. Lau & D. Frohlich 2008042601.

Apocynaceae***Tabernaemontana pandacaqui* Poir.****New naturalized record**

Tabernaemontana pandacaqui, a tree with a broad native range extending west to east from Thailand to the Tuamotu Archipelago, and north to south from Taiwan, Micronesia, and the Philippines to Sydney, Australia, is a commonly seen tree in O'ahu's landscape. Similar to *T. divaricata*, this shrub or treelet, which ranges from 1–14 m tall, is used in Hawai'i as a hedge, feature plant, container specimen, bonsai, or street tree. Leaf petioles are 2.54–20.00 mm; blades are elliptic to narrowly elliptic and 3.2–25.4 cm long by 1–10 cm wide, herbaceous, glabrous, or pubescent, with a wedge-shaped base. Tertiary veins are usually prominent and reticulate. Flowers are faintly scented or odorless, with 1.0–3.8 mm long greenish sepals. Corolla is white or pale yellow with a 7.0–31.8 mm twisted tube, greenish inside, with a yellow throat. Stamens are attached above the middle of the tube. Fruit is orange, red, or yellow, and seed aril is orange or red.

Material examined. O'AHU: Makiki, Birch St (UTM 619919, 2355421), dry lowland suburban setting, shrub ca 2.5 m tall; relatively infrequently planted in the area as a street tree, found sparingly naturalizing in 3 locations, usually growing out of hedges, 16 Sep 2008, OED 2008091601.

Araliaceae***Schefflera arboricola* (Hayata) Merr.****New island record**

Since its introduction to horticulture around 40 years ago, this plant has become very common in Hawai'i's cultivated flora. This species was recently collected as naturalized on Maui (Starr *et al.* 2003) and was previously found growing adventively out of the cracks in a sidewalk on O'ahu (Frohlich & Lau 2008). This collection was from an individual found growing epiphytically on a street tree and represents the first naturalized specimen for O'ahu.

Material examined. O'AHU: Mililani, Kuaie St and Melehu St. (UTM 603402, 2372122), sapling ca 30 cm tall, growing with a *Clusia rosea* sapling in notch of *Ilex cassine* street tree, no flowers or fruit, 7 Feb 2008, A. Lau & D. Frohlich 2008020703.

Schefflera elegantissima* (Veitch ex Mast.)*New naturalized record**

Lowry & Frodin

Native to southeastern New Caledonia, *Schefflera elegantissima* is a commonly seen ornamental in O'ahu's landscape. Although it received a score of 0 (Low) on the

Hawai'i-Pacific Weed Risk Assessment (HPWRA), this species appears capable of reproducing in Hawai'i without human assistance, as evidenced by this new naturalized record. *Schefflera elegantissima* is distinguished by its unbranched, mostly leafy stems to 1.8 m long; dark green, spotted white leaf petioles; 7–11 linear juvenile leaflets 22.9–27.9 cm long, tapering at both ends, with coarsely and more or less deeply toothed margins; and larger, more broadly-toothed to entire-margined mature leaves to 25.4 cm long. Inflorescences are terminal panicles of umbels with 5-parted flowers. The fruit is round and black, and more or less inferior at maturity (Staples & Herbst 2005). Fruit is dispersed by birds in its native range (Daehler 2008). On O'ahu, a sapling was found growing out of a mature *Ligustrum japonicum* hedge.

Material examined. O'AHU: Mililani (UTM 602227, 2372228), gangly sapling ca 2 m tall, growing out of mature *Ligustrum japonicum* hedge on edge of sidewalk area, no flowers or fruit seen, 8 Feb 2008, OED 2008020802.

Arecaceae

Washingtonia filifera (Linden ex André)

New island record

H. Wendl.

California *Washingtonia* was previously collected as naturalized on Maui (Oppenheimer & Bartlett 2002) and is now known to be naturalized on O'ahu as well. It is most frequently encountered in dry, open lowland areas, spreading from large grouped plantings to home gardens, landscaped areas, roadsides, and coral-fill construction areas.

Material examined. O'AHU: Hickam Air Force Base, juvenile ca 1.25 m tall, several individuals growing more than 15 m (50 ft) away from mature plants in lowland coastal area, no flowers or fruit, 24 Jul 2008, D. Frohlich & A. Lau 2008072401.

Washingtonia robusta H. Wendl.

New island record

Mexican *Washingtonia* was previously collected as naturalized on Maui (Oppenheimer & Bartlett 2002) and is now known to be naturalized on O'ahu as well. Much like *W. filifera*, it is sometimes planted in large groupings at entrances to subdivisions or other similar landscaped areas to be featured. Also like *W. filifera*, it readily spreads from these plantings to home gardens, landscaped areas, roadsides, and construction areas.

Material examined. O'AHU: Hickam Air Force Base, juvenile ca 1.25 m tall, sparingly naturalized in a landscaped area, growing out of a *Strelitzia*, no flowers or fruit seen, 23 Jul 2008, D. Frohlich & A. Lau 2008072303.

Bignoniaceae

Tabebuia aurea Benth. & Hook.f. ex S. Moore **New naturalized record**

Tabebuia aurea, native to Brazil, is a commonly cultivated tree along O'ahu roadsides (Staples & Herbst 2005). It can be distinguished by its 5–7 palmately-compound, oblong-elliptic to narrowly elliptic silvery leaflets up to 12.7 cm long, with rounded bases and apices. The inflorescence is a many-flowered panicle lacking an elongate central rachis. Leathery, scaly flower calyxes are bell-shaped, irregularly 2-lipped, and 0.7–1.7 cm long. Corollas are 5–9 cm long and yellow. Fruit is oblong, 9–15 cm long and densely scaly (Staples & Herbst 2005). This new naturalized record was collected along a roadside in the Punchbowl area of O'ahu.

Material examined. O'AHU: Punchbowl area, off Lunalilo St near Ward Ave., lowland residential roadside area, single naturalized individual, wind-dispersed from unknown location, this species noted in several other areas occasionally escaping from plantings, 21 Aug 2008, OED 2008082102.

Tabebuia rosea* (Bertol.) DC.*New naturalized record**

Native from Mexico to Venezuela and coastal Ecuador (Staples & Herbst 2005), *Tabebuia rosea* is a much-used street tree on the island of O‘ahu. This attractive ornamental is distinguished from other species in its genus by its palmately compound leaves with 5 leaflets 7.5–45.5 cm long with a sharply acute to tapering apex. The inflorescence is a many-flowered panicle. Calyxes are leathery, scaly, cup-shaped, 1–2 cm long, and 2-lipped. Lavender to pale magenta corollas have a yellow throat that fades to white. Fruits are 21.5–38.0 cm long and cylindrical (Staples & Herbst 2005). *Tabebuia rosea* has been cited by Staples *et al.* (2000) as one species very likely to become invasive in Hawai‘i. A sapling was found growing in a yard in the Punchbowl area of O‘ahu.

Material examined. O‘AHU: Punchbowl area, on Prospect Pl, single individual in a yard, wind-dispersed to area presumably from planted trees at Stevenson Intermediate School; this species encountered sparingly naturalized in Pauoa as well, 22 Aug 2008, OED 2008082201.

Brassicaceae***Lepidium africanum* (Burm.f.) DC.****New island record**

Described from Kaua‘i, Maui, and the Big Island (Wagner & Herbst 1995; Oppenheimer 2003; Wood 2006), *Lepidium africanum* was first recorded in the Hawaiian Islands as *L. hysopifolium* (Wagner & Herbst 1995). It was recently collected on O‘ahu in a quarry in Schofield Barracks and was reported to be fairly common in the area.

Material examined. O‘AHU: Schofield Barracks, quarry near Kolekole Pass, somewhat woody erect shrub 40–100 cm tall, many seen around area, primarily in open, sunny, disturbed locations, growing among *Panicum maximum*, *Acacia confusa*, *Grevillea robusta*, *Leucaena leucocephala* and a variety of mixed weedy pioneer species, 6 May 2008, K. Kawelo USARMY 91.

Bromeliaceae***Guzmania lindenii* (André) Mez****New state record**

A native of northern Peru, where it grows as a low epiphyte but also terrestrially in shady wet forest between 1000–1500 m elevation, *G. lindenii* is rare in cultivation and in the wild. It is not known to be naturalized anywhere else in the world. It is highly sought after by bromeliad enthusiasts, and notoriously difficult to grow (H. Luther, pers. comm., 2008), possibly due to a poor habitat match in most home gardens compared to the species’ native habitat.

This species grows to ca 1 m tall (3.00–4.35 m when flowering) and is most easily recognized by its spineless, 70 cm long, 7–8 cm wide linear leaves, which are reddish at the base, green toward the apex, and are crossbanded with irregular greenish lines. The scape is stout and erect, and its bracts are imbricate and patterned as the leaves. The inflorescence is compound, 2.00–3.35 m tall, tripinnate at base and bipinnate above, the axes green, striate, and glabrous. The petals are white, the tube exceeding the sepals, the stamens shorter than the petals but exserted from the tube (Smith & Downs 1977). The fruit is a capsule, containing small seeds with a brown plumose appendage, which are easily wind dispersed.

Originally located by the Hawaiian Trail and Mountain Club during a scheduled hike on the Bowman Trail (Kalihi Valley), *G. lindenii* was noted in only one population near the summit ridge at ca 800 m elevation, within about a 20 m radius, in lowland wet ‘ōhi‘a forest. Over 150 plants of all size classes were observed, mostly growing epiphytically, occasionally forming dense coverings on tree branches. Four mature plants were found, all growing on or near ground level, each weighing roughly 20 pounds. It is possible that plants were weighing down branches, ending up on the ground by the time they were

mature. Mature plants in this population were heavily set with fruits, and we estimate one plant can produce greater than 30,000 seeds per inflorescence. This species is likely moth- or nectar-feeding bat-pollinated in its native range but are self-fertile as well. Due to the heavy fruit set it is likely this population is self-fertile (H. Luther, pers. comm., 2008). Because of its potential for further environmental impact in Hawai‘i, as well as its relative rarity in cultivation, this species is a good candidate for addition to the state noxious weed list.

Material examined. O‘AHU: Kalihi Valley, Bowman Trail, 240 m from Pu‘u Kahua‘uli (UTM 621803, 2365128), 2.5 m tall bromeliad growing near soil level, area dominated by 3–4 m tall *Metrosideros polymorpha*, trees loaded with native mosses, ferns, and liverworts, 800 m, 9 Nov 2008, A. Lau & C. Imada 2008110902.

***Guzmania monostachia* (L.) Rusby ex Mez New state record**

Native from southern Florida to northern Brazil and Peru, where it grows epiphytically or terrestrially from near sea level to 2000 m elevation, *G monostachia* was previously uncollected in Hawai‘i, although it has probably been in cultivation (albeit, rarely used) for some time. It can be distinguished by its flat green, spineless leaves and an inflorescence of a single, polystichous-flowered spike with only one flower per node, the fertile floral bracts green with brown longitudinal stripes, the sterile, upper floral bracts red to orange (or rarely white). The fruit is a 2–3 cm long capsule, containing wind-dispersed seeds with a white tuft of hairs (Smith & Downs 1977). This species was found sparingly naturalized in two locations in Nu‘uanu, growing epiphytically on several different tree species, occasionally dominating major and minor branches of large trees up to 12 m tall.

Material examined. O‘AHU: Nu‘uanu Valley on Kā‘ohinani St, 0.5 m dia epiphyte, 14 Oct 2008, D. Frohlich & A. Lau 2008101403.

***Tillandsia balbisiana* Schult.f. New naturalized record**

Native from Florida south to Colombia and Venezuela, where it grows from near sea level to 1500 m, this species is not well documented as naturalized worldwide, and is rare in cultivation in Hawai‘i. It ranges from 13–65 cm in height, and its leaves form a bulbous rosette. It can be distinguished from the similar *T. bulbosa* by its less pronounced, ovoid leaf sheaths that form an ovoid to elliptic pseudobulb (vs. very pronounced, obovoid leaf sheaths and ovoid pseudobulb in *T. bulbosa*), and its inflorescence that generally exceeds the recurved leaves (vs. the usually included inflorescence of *T. bulbosa*). Its inflorescence is usually compound, the floral bracts imbricate and 15–22 mm long. The petals are tubular and erect, 30–45 mm long, violet, with exerted stamens and pistil (Smith & Downs 1977). This epiphyte is apparently self-fertile, produces many easily wind-dispersed seeds and is sparingly naturalized in at least two neighborhoods on O‘ahu on a variety of tree species, occasionally forming a thick mat on branches.

Material examined. O‘AHU: Kahawalu St, Nu‘uanu (UTM 621479, 2360438), epiphyte ca 0.3 m tall, many individuals spreading in *Plumeria* tree, bracts and stalk reddish pink, only dehiscent flowers seen, no fruits, 14 Oct 2008, D. Frohlich & A. Lau 2008101405.

***Tillandsia bulbosa* Hook. New state record**

This epiphyte is known to grow from sea level to 1350 m, and its native range includes much of tropical and subtropical America. It is not well documented as naturalized anywhere else in the world and is rare in cultivation, including in Hawai‘i. Variable in size and color, it ranges from 7–22 cm in height. It typically has 8–15 leaves per plant, which are covered in fine scales. The best character for identifying this species is the dense,

large, ovoid, greenish pseudobulb formed by the orbicular, 2–5 cm long, greatly inflated leaf sheaths, which may form internal chambers that can house ants. The leaf blades are involute-subulate, often appearing round in cross section, contorted, and up to 30 cm long. Its erect inflorescence is usually shorter than the leaves, the floral bracts 13 mm long. The petals are linear, 3–4 cm long, blue or violet, the stamens and pistil exserted. The capsules are 4 cm long (Smith & Downs 1977). This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on *Lagerstroemia*, *Plumeria*, and rock walls.

Material examined. O'AHU: Mānoa Valley (UTM 624203, 2357330), epiphyte with twisted, thick, green-and-maroon leaves, 17 Oct 2008, A. Lau & D. Frohlich 2008101701.

***Tillandsia fasciculata* Sw.**

New state record

This species is native to tropical America from Florida to northern South America, where it grows from sea level to at least 1750 m. It is variable, and several varieties are recognized. None are documented as naturalized, and it is considered rare in its native range. *Tillandsia fasciculata* has not previously been collected in Hawai'i and is rare in cultivation here. This species can be recognized by its many 30–70 cm long leaves formed into a crateriform rosette, the blades narrowly triangular, rigid, 2–3 cm wide, and keeled on the underside. The scape is stout, erect to ascending, the inflorescence either simple or compound (Smith & Downs 1977). The specimen collected here was tentatively given the varietal name *densispica* Mez, which has a compound inflorescence and coriaceous, glabrous floral bracts. This variety has some self-fertile populations, which this collection seems to represent. This species is sparingly naturalized in several neighborhoods on O'ahu, spreading by readily wind-dispersed seeds.

Material examined. O'AHU: Lower Pauoa Valley, Booth Rd (UTM 620817, 2358523), mesic lowland residential area, mature individuals to 40 cm tall, inflorescence bracts yellow, papery and brown after fruiting, 14 Aug 2008, OED 2008081402.

***Tillandsia gardneri* Lindl.**

New state record

A native of northern South America, where it grows from near sea level to 1600 m, this *Tillandsia* is rare in cultivation in Hawai'i. It ranges from 12–25 cm high when flowering, and is most easily recognized by its 10–27 cm long, narrowly triangular leaves covered in coarse, spreading silver scales, the basal leaves often recurving around the supporting branch. Also characteristic is the stout, pendulous, compact, globose, 4–6 cm long inflorescence and rose or pale lavender petals with included stamens and pistil (Smith & Downs 1977). The naturalizing *T. gardneri* on O'ahu are self-fertile and easily wind dispersed and have been observed forming thick coverings on tree branches, tops of fences, and rock walls in several neighborhoods here.

Material examined. O'AHU: Lower Tantalus, silvery rosette ca 30 cm (1 ft) dia, inflorescence a drooping head, fruit a dehiscent capsule, growing primarily in *Plumeria*, spreading to mock orange, *Bucida*, 4 Sep 2008, A. Lau & D. Frohlich 2008090402.

***Tillandsia juncea* (Ruiz & Pav.) Poir.**

New state record

Native from Mexico south to Bolivia, growing from near sea level to 2416 m elevation, this terrestrial or epiphytic species is previously uncollected and rare in cultivation in Hawai'i and elsewhere and has not previously been documented as naturalized. It can be recognized by its often rhizomatous habit, and many leaves arranged in a fasciculate

rosette. The inflorescence may be densely digitate or reduced to a single spike, and is rarely more than 7 cm long. The fruit is a capsule 25–35 mm long containing many small, wind-dispersed seeds (Smith & Downs 1977). It is self-fertile, and was noted sparingly naturalized in a *Plumeria* tree in one neighborhood, although it likely is naturalized in other locations as well.

Material examined. O‘AHU: Mānoa Valley, on Cooper Rd (UTM 622928, 2356978), single naturalized individual at top of *Plumeria* tree, 30 cm tall epiphyte, leaves green with reddish tips, inflorescence red tinged, 3 Nov 2008, OED 2008110301.

***Tillandsia polystachia* (L.) L.**

New state record

Native from Florida south to Brazil and Bolivia, this usually epiphytic plant is known to grow from near sea level to 1800 m elevation. It has likely been in cultivation on O‘ahu for a number of years, and is somewhat rare in cultivation in general. It can be recognized by its many narrowly triangular, usually flat leaves in a dense, spreading rosette that are usually yellow-green, flushing red when exposed to sun. The inflorescence is 30 cm long and can be pinnately or subdigitately compound. The petals are tubular-erect, 3 cm long, and violet, with the stamens and stigma exerted. The fruit is a capsule containing many small, wind-dispersed seeds (Smith & Downs 1977). This species has been observed in several neighborhoods establishing on various surfaces including trees, fences, rock walls, and gravel beds. It may form very dense coverings on branches and trunks, making photosynthesis for the “host” tree impossible anywhere but at the very tips of major branches. This species shows good potential for becoming a problematic species in Hawai‘i.

Material examined. O‘AHU: Lower Pauoa Valley, off Booth Rd, in yard (UTM 620780, 2358473), blanketing main branches on a 20 ft tall cypress, no flowers noted, seeds with long, silky coma, occasional to locally abundant in the neighborhood and producing copious seeds, 14 Aug 2008, D. Frohlich & A. Lau 2008081401.

***Tillandsia recurvata* (L.) L.**

New naturalized record

Native to the southern United States south to Argentina, this epiphyte may grow from near sea level to 3000 m elevation. It is relatively rare in cultivation, and was first collected in Hawai‘i in 2007, where it was noted spreading adventively to nearby plants within the garden. A rather variable species in terms of indument and dimensions of leaf and stem, *T. recurvata* can be recognized by having densely massed stems 1–10 cm long. Its leaves are distichous, 3–17 cm long, and densely scaled. The scape is terminal, to 13 cm long, and only ca 0.5 mm thick, the inflorescence only 1–2-flowered. The fruit is a capsule to 3 cm, consisting of many wind-dispersed seeds.

This species is one of the few tillandsias with documented environmental impacts. It is known for nutritional piracy in areas with poor soil, weakening host trees and breaking branches during wet or windy conditions (Benzing 1990; H. Luther, pers. comm., 2008). This species has been noted as sparingly naturalized in Pauoa Valley and adventively spreading in ‘Aiea, and is likely spreading in other places where it is grown.

Material examined. O‘AHU: Pauoa (UTM 620207, 2357934), abundant in hedge away from nearby houses in area, individuals of various sizes, no flowers seen, wispy seeds coming out of brown, twisted pods, 19 Aug 2008, D. Frohlich & A. Lau 2008081901; ‘Aiea home garden, attached to potted *Bougainvillea*, smaller plantlets spreading to surrounding potted plants by “webbing,” 13 Jul 2007, L. Shiraishi s.n. (BISH 731421).

Tillandsia stricta* Sol.*New state record**

Native to northern South America and Trinidad, where it grows from near sea level to 1680 m, this is another rarely cultivated species of *Tillandsia* spreading from planted sites and is probably self-fertile. It is a very short-stemmed species, flowering to 10–22 cm high, the leaf blades very narrowly triangular and 4–11 mm wide at the base. This species is best recognized by the inflorescence, which is unbranched and polystichous, the floral bracts elliptic, membranous, yellowish white to rose in flower, brown-papery in fruit. The capsule is slenderly cylindrical, and up to 4 cm long (Smith & Downs 1977). The seeds are wind dispersed. This species is very sparingly naturalized in a residential area in upper Mānoa Valley.

Material examined. O'AHU: Lower Mānoa Valley residential area (UTM 624391, 2358288), epiphytic, ball-forming bromeliad growing in notch of cypress tree in front yard, spreading from cultivated individuals, ca 10 in dia, 21 Oct 2008, OED 2008102103.

Commelinaceae***Callisia repens* L.****New naturalized record**

Callisia repens, a mat-forming herb, abundant and weedy in its native range throughout tropical America, can be distinguished from other *Callisia* by its mat-forming habit; reddish, creeping stems rooting at the nodes; ovate leaf blades 7.62–19 mm long, often with red along the margins; erect, terminal or lateral inflorescences with sheathing bracts; tiny green flowers barely protruding from bracts; and tiny, beaked fruit (Staples & Herbst 2005). This species was found sparingly naturalized along a rocky roadcut area in the Punchbowl area of O'ahu.

Material examined. O'AHU: Lower Punchbowl area, Prospect St, rocky road cut area, creeping herb to ca 5 cm tall forming dense mats in patches, no flowers or fruits seen, 21 Aug 2008, OED 2008082102.

Tradescantia spathacea* Sw.*New naturalized record**

Tradescantia spathacea, a bromeliad-like, low-maintenance species popular in cultivation as a ground cover, is native to southern Mexico, Guatemala, and Belize (Staples & Herbst 2005). It has been recorded as naturalized in the West Indies (Staples & Herbst 2005) and Florida, where it has invaded and disrupted native plant communities by forming a dense cover on the forest floor, preventing other plants from growing (Global Invasive Species Database 2005). This species is typified by its unique bromeliad-like habit and stiffly ascending, spirally-arranged, linear-lanceolate leaves with green upper sides and usually purple undersides. Inflorescences are axillary and usually sessile, with many flowers. Bracts are boat-shaped and nearly enclose the flowers, and are 2–4.5 cm x 2.54–5.6 cm. On O'ahu, an individual was collected growing out of a storm drain, and others were seen growing adventively and naturalized on several roadside surveys.

Material examined. O'AHU: Makiki (UTM 620318 2357383), scraggly, etiolated herb ca 0.5 m tall, growing in sewer drain with *Spathodea*, obviously not planted, no flowers or fruit, 4 Sep 2008, OED 2008090401.

Fabaceae***Acacia catechu* (L.f.) Willd.****New naturalized record**

Acacia catechu, or Cutch tree, has been planted in Hawai'i primarily as a forestry tree. According to planting records, over 1500 individuals have been planted in O'ahu's forests alone (Skolmen 1980). An economically important tree used in dyeing, tanning, and in the

preparation of fishing nets, cutch tree can be distinguished from other commonly seen species of *Acacia* by its spines; compound, non-glaucous leaves with 10–30 pairs of pinnae, each pinna comprising 30–50 pairs of leaflets; and cylindrical inflorescences 10–13 cm long (Staples & Herbst 2005).

Material examined. O'AHU: Lower Pearl City/Waiiau, 12 m tall tree, ca 40 large trees growing in concrete-walled ditch, some keiki underneath parents, most leaves looking nutrient-deficient, growing with *Syzygium cumini*, *Leucaena leucocephala*, *Panicum maximum*, *Trema orientalis*, 1 May 2008, A. Lau & D. Frohlich 2008050101a & 2008050101b.

Grossulariaceae

***Brexia madagascariensis* (Lam.) Thouars** **New island record**
ex Ker Gawl.

This plant, which in Hawai'i produces copious amounts of seed, is tolerant of a wide range of soil types and is resistant to disease (Staples & Herbst 2005), was previously found naturalized on Maui (Starr *et al.* 2003). Because of these characteristics, it was listed as one of the species in Hawai'i very likely to become invasive (Staples *et al.* 2000). It was found on O'ahu growing outside the boundaries of Lyon Arboretum and is occasionally found naturalizing within the garden.

Material examined. O'AHU: Lower Mānoa Valley just outside Lyon Arboretum (UTM 624371, 2359857), wet lowland secondary forest; found occasionally naturalizing in Lyon Arboretum, 16 Apr 2008, OISC/OED 2008041601.

Liliaceae

***Asparagus falcatus* L.** **New naturalized record**

Previously uncollected as naturalized in the state, *Asparagus falcatus* is native to Sri Lanka and tropical and southern Africa. It is a rambling, clambering, much-branched shrub with dark green, terete branches; spines are recurved and 2–6 mm long. Cladophylls can be solitary or in fascicles of 2–7, ranging from 2.5–15 cm long by 2–5 cm wide, narrowly ensiform, falcate, flat, and costate, narrowing at the tip. Inflorescence a 2–3 cm long raceme, lax, with 4–12 flowers; peduncle filiform. Bracts are 0.5–1 mm long and curved. Pedicel is 4–8 mm long, very thin, with a joint below the middle. Perianth segments are 3 x 1 mm, spatulate, obtuse, and white. Filaments are ca 2.5 mm long and white. Anthers are gray-brown, ca 0.5 mm long. Ovary is subglobose to turbinate, 3-lobed, light yellowish green; style is ca 0.5 mm long. Berry bright red when ripe; seeds 1–3 per fruit, 5–6 mm across, and globose with black, slightly rough seed coat. In its native range, it can be found in moist, dry, and mesic areas below 1500 m (Dassanayake & Clayton 2000). This specimen was brought into the *Herbarium Pacificum* by county extension agent Ed Mersino of the University of Hawai'i after having volunteered in a landscaped area. It was being considered for a hedge planting.

Material examined. O'AHU: Wahiawā, shrub with reduced flowers, popped up as a volunteer in landscaped area, 25 Jul 2008, D. Frohlich & A. Lau s.n. (BISH 734202).

Melastomataceae

***Medinilla cumingii* Naudin** **New island record**

Listed as one of the species in Hawai'i very likely to become invasive (Staples *et al.* 2000), *Medinilla cumingii* has been documented as naturalized on Maui (Oppenheimer

2004) and Hawai'i (Parker & Parsons 2009), and was listed in a survey of Lyon Arboretum on O'ahu by Daehler & Baker (2006) as "showing signs of naturalization." This collection is from a small population that is establishing in an area north of Lyon Arboretum, which is one of 13 other sites on O'ahu where this species has been noted and is currently being controlled by the O'ahu Invasive Species Committee (OISC). The continued cultivation of this epiphytic, bird-dispersed species is not recommended.

Material examined. O'AHU: Mānoa Valley, north side of Lyon Arboretum (UTM 623722, 2359852), 1.5 m in diameter, growing on fallen tree, 3 other individuals in area, 14 Apr 2008, C. Sousa & J. Fujikawa 20080414.

***Medinilla heterophylla* A. Gray**

New naturalized record

This species, which is a common forest vine in its native range of Fiji, has only been previously collected in Hawai'i from a cultivated specimen at Lyon Arboretum. A small patch of this species was recently found by an OISC field crew on a survey for *Miconia calvescens* above the arboretum, approximately 350 m from the original planting site, suggesting fruit dispersal by birds. This species can be identified by its vining habit, pairs of leaves of markedly different sizes, and flowers with deep pink petals and white calyxes (Parham 1972).

Material examined. O'AHU: Mānoa Valley just outside Lyon Arboretum (UTM 624372, 2359857), sprawling vine forming loose mats on ground level as well as climbing bamboo in dense shade, no flowers or fruit present, sparingly naturalized, ca 10 individuals in immediate area, 16 Apr 2007, OED/OISC 2008041602.

Myrtaceae

***Eugenia uniflora* L.**

New island record

Eugenia uniflora, or Surinam cherry, has been collected as naturalized on Kaua'i, Moloka'i, Maui (Wagner et al. 1999), Lāna'i (Starr et al. 2009), and now on O'ahu. This new record comes as little surprise, given the popularity of this plant in cultivation; its juicy, bird-dispersed fruit; and the facility of its propagation by seed (Staples & Herbst 2005). On O'ahu, it was found making up the greater part of the understory in an *Enterolobium/Casuarina* forest.

Material examined. O'AHU: Pearl City, Waimalu Valley, 2 m tall shrub, 40–50 mature individuals, over 200 seedlings growing among *Enterolobium/Casuarina* overstory, 2 May 2008, A. Lau & D. Frohlich 2008050201.

Oleaceae

Olea europaea* L. subsp. *cuspidata

New island record

(Wall. ex G. Don) Cif.

Olea europaea ssp. *cuspidata*, which is the wild form of the cultivated olive (Staples & Herbst 2005), is a frequently cultivated hedge and feature plant in the O'ahu urban landscape. Already, it has been collected as naturalized on Kaua'i, Lāna'i, Maui, and the Big Island (Lorence & Wagner 1995; Herbst & Wagner 1999; Starr et al. 1999, 2009). Birds are the most likely disperser of this plant, which produces abundant, fleshy fruit (Staples & Herbst 2005).

Material examined. O'AHU: Pālehua Rd at second gate before alphabetical driveways begin, roadside vegetation, 535 m (1760 ft), 14 May 2008, K. Kawelo USARMY 92.

Onagraceae***Oenothera kunthiana*** (Spach) Munz**New island record**

Oenothera kunthiana, an inconspicuous roadside weed sometimes used as a groundcover, was first found on Pu‘u o Kali on Maui in 2002 (Starr *et al.* 2004). On O‘ahu, it was found at a quarry near Kolekole Pass.

Material examined. O‘AHU: Schofield Barracks, quarry near Kolekole Pass, wimpy, non-branching herbs 5–30 cm tall, fruits dry capsules in cups, no flowers seen, growing with *Panicum maximum*, *Acacia confusa*, *Grevillea robusta*, *Leucaena leucocephala*, and a variety of mixed weedy pioneers, 6 May 2008, K. Kawelo & J. Beachy USARMY 88.

Orchidaceae***Dendrobium antennatum*** L.**New naturalized record**

Dendrobium antennatum, a native of New Guinea to northeastern Australia and the Solomon Islands (Kamemoto *et al.* 1999), was recently found in a backyard in Nu‘uanu. This species was first collected as cultivated in Hawai‘i at the National Tropical Botanical Garden on Kaua‘i. No prior collections have been made on O‘ahu; however, “antennatum type” orchids were cited as one of the preferred orchids for O‘ahu orchid growers in a 2003 study (Kuehnlé *et al.* 2003) and the species is widely used in hybridization (Staples & Herbst 2005). *Dendrobium antennatum* is described in Cribb (1986) as follows: “An epiphytic herb. Stems clustered on a short rhizome, 15–75 cm tall, 1–1.5 cm diameter, somewhat fusiform, usually dilated slightly and rhombic in cross section in the lower half. Leaves distichous, coriaceous to fleshy, oblong-lanceolate to ovate-elliptic, unequally bilobed at acute apex, 4–15 x 0–5–4 cm, articulated at base to grey sheaths 2.2–9 cm long. Inflorescences one to several, 15–35 cm long, 3–15-flowered; bracts tubular, 3–4 mm long. Flowers fragrant, white with green or yellow-green petals and a purple- or violet-veined lip; pedicel and ovary 2.2–3.5 cm long, emerging 4–7 mm above the axil of the bract. Dorsal sepal oblong-lanceolate, acute or acuminate, 1.6–2.3 x 0.6–0.7 cm, recurved and often spirally twisted; lateral sepals oblong-lanceolate, acute or acuminate, 1.6–2.5 x 0.7 cm, recurved; mentum narrowly conical, 8–10 mm long. Petals linear, acute, 2.5–5 x 0.2–0.35 cm, once- to twice-twisted. Lip 3-lobed, 1.5–2.3 x 0.9–1.15 cm; side-lobes elliptic, rounded in front; mid-lobe circular to ovate, acute or apiculate, not recurved; callus of 5 longitudinal ridges, slightly dilated towards apex at base of mid-lobe. Column 5–6 mm long.”

Material examined. O‘AHU: Nu‘uanu, backyard at 132 Ragsdale Pl (UTM 621794, 2360591), lowland mesic residential setting, epiphyte, stems growing to 0.5 m, several individuals naturalized in this and adjoining yard, 14 Oct 2008, D. Frohlich & A. Lau 2008101401.

Dendrobium crumenatum Sw.**New naturalized record**

This species, which is native to Sri Lanka, Burma, Indochina, throughout Malesia and the Philippines to Taiwan, was found spreading in the notches of Plumeria and other trees on surveys of Nu‘uanu and Mānoa Valleys. The description of *Dendrobium crumenatum* is as follows: “Stems closely spaced from short rhizome, 40–60 cm long, rigid, apically slender, leafless, middle part leafy, base swollen, forming a pseudobulb. Pseudobulb yellowish green, fusiform, 5–8 cm long, 1.5–2 cm in diameter, internodes 3 or 4, furrowed in age. Leaves distichous, ovate-oblong, stiff, 6 cm long, 2.5 cm wide, apex more or less obliquely 2-lobed, base contracted, articulated with sheath. Racemes 1- or rarely few flowered, from internodes of leafless stem; bracts cylindrical, 6 mm long. Flowers white

or sometimes tinged with pink, fragrant, lasting only 1 or 2 days; dorsal sepal ovate-lanceolate, 17–22 mm long, 5–6 mm wide, apex obtuse, sometimes incurved; lateral sepals lanceolate-triangular, 22–35 mm long, 7–8 mm wide, apex sometimes incurved, base oblique, adnate to foot of column forming conic and curved mentum ca 1.5 cm long; petals ovate-oblong, 12–18 mm long, 6–7 mm wide, apex obtuse, contracted at base; lip obovate-oblong, 20–24 mm long, 13–18 mm wide, 3-lobed, lateral lobes erect, semi-oblong, nearly entire, terminal lobe ovate, 1 cm long, crenulate-denticulate, disc with yellowish crenulate keel; column 2 mm long, 3 mm wide, foot 1.4 cm long, with yellow fan-shaped gland at base; anther cup-like, whitish; pollinia ovate-oblong, 1.5 mm long. Capsule ellipsoid, 2.5 cm long” (eFloras 2008).

Material examined. O’AHU: Mānoa Valley, on Cooper Rd (UTM 622927, 2356977), 0.5 m tall epiphyte when flowering, plants spreading throughout *Plumeria* trees, 30 Oct 2008, A. Lau & D. Frohlich 2008103001.

***Vanda tricolor* Lindl.**

New island record

Vanda tricolor, a native of Java, is a large, rock-dwelling, epiphytic or terrestrial orchid commonly used in horticulture (Staples & Herbst 2005). It was first collected as naturalized on Maui in 2004 (Oppenheimer 2006). This collection from O’ahu was from an individual found growing several feet off the ground in a large tree. Many small clumps of this species can be seen in higher-elevation neighborhoods; however, it was most obvious that this particular individual was not planted in its location.

Material examined. O’AHU: Pālolo Valley (UTM 625527, 2356767), epiphyte growing ca 4 m up in a tree, ca 1.5 m tall with equitant leaves, flowers white, flecked magenta, fruits large dehiscent capsules, many clumps of this species seen growing throughout the neighborhood, 2 Oct 2008, D. Frohlich & A. Lau 2008100201.

Piperaceae

***Piper aduncum* L.**

New island record

First collected in Hawai’i in 1986 and a state noxious weed, this rapidly growing tree is infrequently cultivated in O’ahu as a feature plant in botanical gardens. The Maui collection was from a large population that was observed spreading in open and recently cleared areas in Nāhiku (Starr & Starr 2003). On O’ahu, this species is sparingly naturalized at Waimea Valley on the north shore, and saplings are being controlled by park staff. This species scored an 18 (High) on the Hawai’i Weed Risk Assessment and its continued cultivation is not advised.

Material examined. O’AHU: Waimea Valley Botanical Garden, just makai of 3rd bridge, sapling ca 1.5 m tall on steep rocky lowland slope, found more than 200 m away from the original planting, no flowers or fruit present, 46 m (150 ft), 3 Jul 2008, A. Lau & D. Orr 2008070301.

Poaceae

***Bothriochloa bladhii* (Retz.) S.T.Blake**

New island record

Australian bluestem was previously known from Moloka’i, Hawai’i (Wagner *et al.* 1999) Kaua’i (Herbarium Pacificum Staff 1997) and Maui (Starr *et al.* 2003). A forage grass and colonizer of rangeland pastures, waste areas, and other disturbed sites (Barkworth *et al.* 2003), this species was first collected on O’ahu at the Hawaii Agricultural Experiment Station in 1940.

Material examined. O’AHU: Ridge between Kaimuhole and Alaiheihe, on ridge crest 1300 ft [396 m], K. Kawelo USARMY 79.

***Cortaderia selloana* (Schult. & Schult.f.)** **New naturalized record**

Asch. & Graebn.

Native to southern Brazil, Argentina, and Paraguay, Pampas grass is widely cultivated worldwide as an ornamental. In several areas of introduction, this species has escaped cultivation and become a serious pest (Global Compendium of Weeds 2008). The description from Staples & Herbst (2005) is as follows: “Clumps to 10 feet tall; stems stout. Leaf sheaths glabrous; blades 4–6 feet long, wiry, recurved, glaucous, margins sharp-edged. Inflorescences to 3 feet tall, whitish, cream, pink, to purplish; spikelets ca 0.6 inches long, silvery to pinkish. Floret bracts lanceolate, upper with long bristle.” On O‘ahu, several small individuals were found at the entrance to a trailhead. It is believed that this species has been spreading on Maui as well; however, no specimens or reports have yet been sent to the *Herbarium Pacificum*.

Material examined. O‘AHU: Access road to Kīpapa Trail, right side going mauka between house and trailhead, in *Melaleuca* forested area, sprouting through ‘uluhe, 2 m tall bunchgrass with one dehiscent inflorescence, two other plants in vicinity, 30 Oct 2008, *D. Clark 01*.

Polygonaceae***Persicaria capitata* (Buch.-Ham. ex D. Don)** **New island record**

Masamune

Native to the Himalayan region of Asia, *P. capitata* is widely cultivated in Hawai‘i and previously reported as naturalized on Maui and the Big Island (Herbst & Wagner 1999; Oppenheimer & Bartlett 2002). On Hawai‘i island, it can be seen colonizing open roadsides and lava fields from 600–1770 m. It can be distinguished from other commonly seen members of its genus by its mat-forming habit, globose flowering heads, and distinctive purple V-shaped bands on the leaves (Wagner *et al.* 1999; Staples & Herbst 2005).

Material examined. O‘AHU: Nu‘uanu Valley, on Sherman Park Pl (UTM 619795, 2359724), wet to mesic lowland roadside, prostrate herb with pink-tinged stems and leaves, rooting at nodes, sparingly naturalized in this location, 18 Jul 2008, *OED 200807180*.

Rhamnaceae***Ziziphus mauritiana* (Sw.) Griseb.** **New naturalized record**

Previously uncollected as naturalized in the state, *Ziziphus mauritiana*, or Indian jujube, is an evergreen tree up to 11 m tall. It is characterized by pendulous branches bearing leaves that are dark green on the upper surface and silver-hairy below. Tiny greenish flowers are borne in axillary clusters, and edible fruit is yellowish to red-brown, spherical to ovoid. Indian jujube is tolerant of a variety of soil types and requires no special care. Propagation is from seed (Staples & Herbst 2005). One individual was found in tall grass on an access road on O‘ahu’s north shore.

Material examined. O‘AHU: Kahuku, along Charlie Rd (UTM 608016, 2397732), one individual 1 m tall with stout spines, growing amongst Guinea grass, *Schinus*, *haole koa*, 29 Nov 2007, *D. Frohlich & A. Lau 2007112901*.

Sapindaceae***Cupaniopsis anacardioides* (A. Rich.) Radlk.** **New naturalized record**

Native to Australia, this species was previously uncollected as naturalized in the state. It is an evergreen tree up to 12 m tall, with compound leaves having 8 ovate to obovate, blunt-tipped, leathery leaflets; inconspicuous whitish flowers; and short-stalked fruit,

golden yellow tinged red, 1.30–2.54 cm in diameter, containing brown seeds covered by a yellow to red-orange aril. Although it has been recommended as a street tree by the City and County of Honolulu, this tree has begun to spread in southern Florida by way of its bird-dispersed seeds (Staples & Herbst 2005), and its further cultivation in Hawai‘i should be discouraged. Several individuals were found naturalizing in hedges around Mililani.

Material examined. O‘AHU: Mililani (UTM 2373214, 603010), sapling ca 1.5 m tall, growing in *Breynia disticha* hedge in yard, no flowers or fruit, no mature individuals seen in area, 8 Feb 2008, D. Frohlich & A. Lau 2008020801.

Koelreuteria elegans (Seem.) A.C. Sm.

New island record

subsp. ***formosana*** (Hayata) F.G. Mey.

The native range of *Koelreuteria elegans* subsp. *formosana* is in Taiwan. It was introduced to the mainland U.S. in 1915 and reached Hawai‘i soon afterward. In southern Florida (Staples & Herbst 2005), as well as in Hawai‘i, it has escaped cultivation and become sparingly naturalized. It was previously collected on Maui (Oppenheimer 2003). On O‘ahu, it was found occasionally naturalized in a neighborhood in Makakilo.

Material examined. O‘AHU: Makakilo, 1.5 m tall tree growing out of storm drain, street tree occasionally naturalized in neighborhood, all size classes seen, no flowers or fruit seen, 11 Apr 2008, D. Frohlich & A. Lau 2008041101.

Sterculiaceae

Sterculia foetida L.

New naturalized record

Native to dry regions of the Old World tropics, *Sterculia foetida* is occasionally found cultivated in Hawai‘i as a street tree and featured landscape tree (Staples & Herbst 2005). The foul odor of the flowers, reminiscent of raw sewage, is instantly recognizable. This species has not been previously documented as naturalized in Hawai‘i. On O‘ahu, individuals of various size classes were found spreading in a downtown neighborhood in several locations, including one small seedling on a store roof.

Material examined. O‘AHU: Nu‘uanu, Kukui St area, lowland urban setting, 3 m tall tree, one of several saplings in the area seen growing in hedges, near fenceposts, and on a rooftop, no flowers or fruit seen, 7 Aug 2008, A. Lau & D. Frohlich 2008080701.

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New Hawaiian plant records from *Herbarium Pacificum* for 2008¹

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These previously unpublished Hawaiian plant records report 2 new naturalized records, 13 new island records, 1 adventive species showing signs of naturalization, and nomenclatural changes affecting the flora of Hawai'i. All identifications were made by the authors, except where noted in the acknowledgments, and all supporting voucher specimens are on deposit at BISH.

Apocynaceae

Rauvolfia vomitoria Afzel.

New naturalized record

The following report is paraphrased from Melora K. Purell, Coordinator of the Kohala Watershed Partnership on the Big Island, who sent an email alert to the conservation community in August 2008 reporting on the incipient outbreak of *R. vomitoria*, poison devil's-pepper or swizzle stick, on 800–1200 ha (2000–3000 acres) in North Kohala, Hawai'i Island. First noticed by field workers in North Kohala about ten years ago, swizzle stick has become a growing concern within the past year, as the tree has spread rapidly and invaded pastures, gulches, and closed-canopy alien and mixed alien-‘ōhi‘a forest in North Kohala, where it grows under the canopies of eucalyptus, strawberry guava, common guava, kukui, albizia, and ‘ōhi‘a. The current distribution is from 180–490 m (600–1600 ft) elevation, from Makapala to ‘Iole. It has not yet been reported in the native forest mauka of its current infestation, nor has it been detected in the adjacent Kohala State Forest Reserve or the Pu‘u O Umi Natural Area Reserve, but no surveys have yet been conducted. The source area is unknown but could possibly be a historic medicinal garden in the area.

Rauvolfia vomitoria is a shrub or tree 0.5–20.0 m tall with leaves in whorls of 3–5; the blades are elliptic, sometimes narrowly so, 3.4–27.0 cm long, 2–9 cm wide, apiculate, with 8–17 pairs of arcuate-ascending secondary veins; the petiole is 6–35 mm long. The inflorescence consists of up to 4 whorls of dense, 15–450-flowered cymes, the inflorescence branches puberulent. The flowers are fragrant, 5-parted, greenish white to yellow; the tube 5.8–10.0 mm long, glabrous outside, the corolla lobes 1.1–2.1 mm long. The drupes are bright orange or red, globose to ellipsoid, 8–14 mm long, up to 9 mm in diameter, with usually only one mericarp developing (Omino 2002; Li *et al.* 1995).

Swizzle stick is described as widespread in tropical Africa from Senegal to Sudan and south to Angola in moist forest and forest margins (Omino 2002) and has been collected from sea level to 1750 m (5740 ft) (Missouri Botanical Garden 2008a). The plant is a nitrogen-fixer and contains medicinal alkaloids (World Agroforestry Centre 2008). It is cultivated as a medicinal plant in China, where it is described as a plant with all parts poisonous, the roots and leaves with emetic and cathartic properties, the bark used to remedy fever and indigestion (Li *et al.* 1995).

Thus far, only limited mechanical control—mowing and cutting—have been tried on

1. Contribution No. 2010-003 to the Hawaii Biological Survey.

this invasive tree in North Kohala. Workers have reported “feeling woozy” after cutting the trees, possibly related to the species’ poisonous properties. This fast-growing tree responds vigorously to cutting, with numerous new stems arising from the cut stump. After mowing, resprouts reach a height of 1.0–1.25 m within 2 months. Trees aged 5–8 years are 9 m tall and covered in fruit. The bright red fruit have been noted locally being consumed by mynah birds; in its home range, the seeds are bird-dispersed. It is extremely shade tolerant, and forms thickets even in the understory of dense canopies. The seeds appear to germinate quickly, but seed longevity is unknown. *Rauvolfia vomitoria* represents a severe threat to both agriculture and natural areas in Hawai‘i, and the North Kohala population should be a prime target for a coordinated rapid response.

The Bishop Museum’s *Herbarium Pacificum* (BISH) currently houses just a single Hawaiian voucher of *Rauvolfia vomitoria*, a cultivated specimen collected at the McBryde Garden, National Tropical Botanical Garden, on Kaua‘i in 2002 (*Lorence et al. 8854*). The label notes that the specimen originated from an airtayer taken from a plant growing at Limahuli Garden, Kaua‘i. BISH has no vouchers from anywhere else in the Pacific basin. An unconfirmed living specimen (Acc. #77.399, originally from Uganda) is apparently planted at Ho‘omaluhia Botanical Garden in windward O‘ahu.

Material examined. **HAWAI‘I:** North Kohala, Makapala ahupua‘a, near ‘A‘amakāō Gulch, 277 m (910 ft), 8 Aug 2008, *M. Purell s.n.* (BISH 734216).

Aspleniaceae

Asplenium haleakalense W.H. Wagner

New island record

Described as a new species in 1999 (Wagner *et al.* 1999), this endemic epiphytic fern was previously known only from East Maui (Palmer 2003: 60). Although collected in 1995, this specimen was not determined by D. D. Palmer as *A. haleakalense* until March 2002, and represents a new island record for the Big Island.

Material examined. **HAWAI‘I:** Puna Distr, Pu‘u Maka‘ala Natural Area Reserve, at N end of Amamau Rd (beyond Wright Rd), ‘ōhi‘a/*Cibotium* wet forest, epiphytic on nearly horizontal surface of moss-covered support roots of old *Metrosideros* of ca 1.5 m (5 ft) dbh, ca 1160 m (3800 ft), 24 Feb 1995, *K.A. Wilson, D. Palmer, F. & W.H. Wagner, Jr. 2481*.

Asteraceae

Tagetes erecta L.

New naturalized record

Previously known only in cultivation, an extensive flowering population of African marigold was found in disturbed habitat mixed with *Verbesina encelioides* adjacent to the Makapu‘u Lighthouse parking lot. Flower color ranged from solid yellow to orange and red-brown with bicolored forms present, with numerous ray florets. The species is native to Mexico and Central America (Staples & Herbst 2005). While the collected specimens best fit the characteristics of *Tagetes patula* L. as described in Staples & Herbst (2005), the two species are doubtfully distinct, and *T. patula* has been synonymized with *T. erecta* in several sources (Yarborough & Powell 2006; Missouri Botanical Garden 2008b).

Material examined. **O‘AHU:** Makapu‘u Lighthouse parking lot, 6 Jan 2008, *S.A. James 2008-1*.

Cyperaceae***Carex wahuensis*** C.A. Mey.**New island record**subsp. ***rubiginosa*** (R.W. Krauss) T. Koyama

This endemic subspecies, previously known to occur on Kaua‘i, O‘ahu, Lāna‘i, Maui, and Hawai‘i (Wagner *et al.* 1999: 1392), is now recorded from Moloka‘i, based on the recent (September 2008) redetermination by Dr. Tetsuo Koyama (MBK) of a specimen previously determined as *Carex wahuensis* subsp. *wahuensis*.

Material examined. **MOLOKA‘I:** Kamakou Preserve, Kawela section, upper ‘Ōnini Gulch above bridge on jeep road, ca 853 m (2800 ft), 28 May 1982, *L.W. Cuddihy 1220*.

Rhynchospora chinensis Nees & Meyen**New island record**subsp. ***spiciformis*** (Hillebr.) T. Koyama

Previously recorded from Kaua‘i, Moloka‘i, Maui, and Hawai‘i (Wagner *et al.* 1999: 1429), this indigenous, bog-associated sedge is now recorded from O‘ahu. Gon (1994) first referred to *R. chinensis* ssp. *spiciformis* as a new O‘ahu record in describing a unique bog habitat in the central Ko‘olau Mountains, but a voucher specimen was apparently never deposited in an herbarium. The habitat and species assemblage associated with the recent *Rhynchospora* collection mirrors the bog site described in Gon (1994). The site is located on a set of wide, flat, gently sloping, north-pointing ridges at around 725 m elevation off the main ‘Aiea Ridge Trail. These ridges are windswept and subject to heavy cloud cover and rain, with a substrate of hard rocky shale covered with a thick mossy layer interspersed with dwarfed, bog-associated vegetation. Native dwarfed components include *Metrosideros polymorpha* var. *pumila*, *Scaevola* spp., *Bidens macrocarpa*, *Chamaesyce clusiifolia*, *Dichantheium koolauense*, *Sadleria pallida*, *Sphenomeris chinensis*, and *Dicranopteris linearis*. *Machaerina angustifolia* sedgeland borders the boggy ridge (Imada & LeGrande 2006).

Material examined. **O‘AHU:** Ko‘olau Mountains, ‘Aiea Ridge Trail mauka of Pu‘u Kaiwipo‘o, pseudobog habitat on wide, flat, north-pointing ridge dominated by moss layer and dwarf native vegetation, uncommon, 719 m (2360 ft), 22 May 2008, *C. Imada 2008-1*.

Schoenoplectus tabernaemontani (C.C. Gmel.) **Nomenclatural change**

Palla

[Syn. *S. lacustris* (L.) Palla subsp. *validus* (Vahl) T. Koyama]

Current publications and websites (Smith 2002; Missouri Botanical Garden 2008c; Govaerts *et al.* 2008) favor *S. tabernaemontani* as the accepted name for the indigenous Hawaiian bulrush called *S. lacustris* subsp. *validus* in Wagner *et al.* (1999: 1432). Smith (2002) synonymized *S. validus* Vahl, described from the Caribbean, with *S. tabernaemontani*, described from Europe, into a single variable cosmopolitan species.

Fabaceae***Stylosanthes scabra*** Vogel**New island record**

In a reworking of the genus *Stylosanthes* in Hawai‘i, Herbst *et al.* (2004: 7–8) recognized three species (*S. scabra*, *S. viscosa*, *S. guianensis*), the latter with two varieties (vars. *guianensis* and *intermedia*). *Stylosanthes fruticosa*, the sole treated species in Wagner *et al.* (1999: 708), was designated as a misapplied name for *S. scabra*, whose distribution was documented from O‘ahu, Moloka‘i, Lāna‘i, and Maui. The presence of *S. scabra* on the Big Island has now been confirmed.

Material examined. **HAWAI‘I:** Ka‘ū Distr, Hawaii Volcanoes National Park, at end of jeep road to Kamo‘oali‘i, 300 m (1000 ft), 13 Oct 1994, *L. Pratt 2824*.

Vigna speciosa* (Kunth) Verdc.*New island records**

Snail maunaloa is a vigorous cultivated climber grown for its unusual coiled, lavender pink flowers, sometimes used in lei (Staples & Herbst 2005). First noted naturalizing on O'ahu in 1985 (Herbst 1998: 3), the species is now recorded on Kaua'i and Maui.

Material examined. **KAUAI:** Kōloa Distr, Kalāheo, south end of Papalina Road, near entrance to National Tropical Botanical Garden, naturalized, forming large patch, 140 m (459 ft), 23 May 2003, *D. Lorence 9071*. **MAUI:** East Maui, Nāhiku, near intersection at church, sparingly naturalized, 30 m (100 ft), 24 Nov 2002, *F. Starr, K. Starr & L. Loope 021124-1*.

Hydrocharitaceae***Halophila hawaiiiana* Doty & B.C. Stone****New island record**

This endemic perennial seagrass, occurring in saltwater in sandy or muddy areas of fish ponds and sandy reef flats on Midway Atoll, Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.* 1999: 1443–1444; DeFelice 1999: 2), has also been recorded on Pearl & Hermes Atoll.

Material examined. **PEARL & HERMES ATOLL:** Southeast Island, in shore surf on lagoon side, 20 Sep 2002, *A. Wegmans, NOWRAMP 2002 Expedition 7298*; 7 m (24 ft), 27 Sep 2002, *NOWRAMP 2002 Expedition 7499*.

Myrtaceae***Metrosideros polymorpha* Gaudich.****New island record**

var. *pumila* (A. Heller) J.W. Dawson & Stemmerm.

Previously recorded from Kaua'i, Moloka'i, and Maui (Wagner *et al.* 1999: 969), this middle to higher elevation, bog-associated endemic 'ōhi'a, called *lehua maka noe*, also occurs on O'ahu, as vouchered by these overlooked specimens from 1933. The variety was also associated with the O'ahu-collected *Rhynchospora* record described elsewhere in this paper.

Material examined. **O'AHU:** Ko'olau Mountains, Kīpapa Gulch, wet ridge, 853 m (2800 ft), 6 Aug 1933, *E.Y. Hosaka 1130*; ridge east of Kīpapa Gulch, rain forest, 792 m (2600 ft), 10 Dec 1933, *H. Morley 88*.

Poaceae***Arundo donax* L.****New island record**

Previously recorded from Kaua'i, O'ahu, Maui, and Hawai'i (Wagner *et al.* 1999: 1498–1499), this large, perennial, canelike grass with thick stalks up to 4.5 m (15 ft) tall was noted growing on Lāna'i in scattered, discrete patches in former pineapple land now covered with solid Guinea grass (*Panicum maximum*).

Material examined. **LĀNA'I:** Pālāwai Basin, Moano area, near Lāna'i Company baseyard, former pineapple lands now dominated by *Panicum maximum*, 12 Nov 2008, *C. Imada & S.A. James 2008-2*.

Portulacaceae***Portulaca oleracea* L.****New island record**

Naturalized on Midway Atoll, Pearl and Hermes Atoll, Laysan, French Frigate Shoals, Nihoa, Ka'ula Rock, Lehua, and all of the main Hawaiian Islands (Wagner *et al.* 1999: 1072; Oppenheimer 2006: 13; Wood & LeGrande 2006: 27), pigweed was vouchered on Kure Atoll in 1985 (but overlooked). Presumed to be native to the Old World, this species is naturalized in low elevation, open, disturbed habitats, especially urban and agricultural areas (Wagner *et al.* 1999: 1072).

Material examined. **KURE ATOLL:** Green Island, around the LORAN buildings, especially the foundation of the barracks, 4 Jan 1985, *D.R. Herbst, C. Corn & C.H. Lamoureux 6261.*

Psilotaceae

Psilotum nudum (L.) P. Beauv.

New island record

Indigenous on all the main Hawaiian Islands, this pantropical species (Palmer 2003: 272) was vouchered on Midway Atoll in 1923 (but overlooked until now). This is the first fern ally documented as naturally occurring in the Northwestern Hawaiian Islands.

Material examined. **MIDWAY ATOLL:** Sand Island, sandy plain near lighthouse, ca 10 m, 24 Apr 1923, *E.L. Caum 35.*

Rubiaceae

Resurrection of ***Kadua*** Cham. & Schltdl.

Nomenclatural change

Hillebrand (1888), in his *Flora of the Hawaiian Islands*, treated the genera *Kadua* and *Gouldia* A. Gray (Rubiaceae), the latter separated by its indehiscent fleshy fruit. Fosberg (1937) continued to recognize the genus *Gouldia*, but decided that *Kadua* was taxonomically confused, and “merely a name applied to a rather diverse lot of *Hedyotis* species, the principal common feature of which is that they inhabit the Hawaiian islands” (Fosberg 1943); he thus transferred all members to *Hedyotis*. Wagner *et al.* (1999) continued to recognize *Hedyotis* but lumped all members of *Gouldia* into the single genus. Recently, based on an analysis of seed shape and surface features using scanning electron microscopy, combined with fruit and corolla characters, Terrell *et al.* (2005) resurrected the genus *Kadua* for all 21 native Hawaiian members of *Hedyotis*, as treated in Wagner *et al.* (1999: 1133–1156) and Wagner & Lorence (1998), as well as 7 other Polynesian species. There remain 2 *Hedyotis* species in Hawai‘i, the weedy species *H. callitrichoides* (Griseb.) W.H. Lewis and *H. corymbosa* (L.) Lam., and even these have alternately been placed by some botanists in the genera *Oldenlandiopsis* and *Oldenlandia*, respectively (Terrell *et al.* 2005).

Kadua acuminata Cham. & Schltdl.

Syn. *Hedyotis acuminata* (Cham. & Schltdl.) Steud.

Kadua affinis DC.

Syn. *Hedyotis terminalis* (Hook. & Arn.) W.L. Wagner & D.R. Herbst

Kadua axillaris (Wawra) W.L. Wagner & Lorence

Syn. *Hedyotis hillebrandii* (Fosberg) W.L. Wagner & D.R. Herbst

Kadua centranthoides Hook. & Arn.

Syn. *Hedyotis centranthoides* (Hook. & Arn.) Steud.

Kadua cookiana Cham. & Schltdl.

Syn. *Hedyotis cookiana* (Cham. & Schltdl.) Steud.

Kadua cordata Cham. & Schltdl. subsp. ***cordata***

Syn. *Hedyotis schlechtendahliana* Steud. ssp. *schlechtendahliana*

Kadua cordata Cham. & Schltdl. subsp. ***remyi*** (Hillebr.) W.L. Wagner & Lorence

Syn. *Hedyotis schlechtendahliana* Steud. ssp. *remyi* (Hillebr.) Fosberg

Kadua cordata Cham. & Schltdl. subsp. ***waimeae*** (Wawra) W.L. Wagner & Lorence

Syn. *Hedyotis schlechtendahliana* Steud. ssp. *waimeae* (Wawra) W.L. Wagner & Lorence

Kadua coriacea (Sm.) W.L. Wagner & Lorence

Syn. *Hedyotis coriacea* Sm.

Kadua degeneri (Fosberg) W.L. Wagner & Lorence subsp. ***coprosmifolia*** (Fosberg) W.L.

Wagner & Lorence

- Syn. *Hedyotis degeneri* Fosberg var. *coprosmifolia* Fosberg
Kadua degeneri (Fosberg) W.L. Wagner & Lorence subsp. *degeneri*
 Syn. *Hedyotis degeneri* Fosberg var. *degeneri*
Kadua elatior (H. Mann) W.L. Wagner & Lorence
 Syn. *Hedyotis elatior* (H. Mann) Fosberg
Kadua fluviatilis C.N. Forbes
 Syn. *Hedyotis fluviatilis* (C.N. Forbes) Fosberg
Kadua flynnii (W.L. Wagner & Lorence) W.L. Wagner & Lorence
 Syn. *Hedyotis flynnii* W.L. Wagner & Lorence
Kadua foggiana (Fosberg) W.L. Wagner & Lorence
 Syn. *Hedyotis foggiana* Fosberg
Kadua foliosa Hillebr.
 Syn. *Hedyotis foliosa* (Hillebr.) Fosberg
Kadua formosa Hillebr.
 Syn. *Hedyotis formosa* (Hillebr.) Fosberg
Kadua fosbergii (W.L. Wagner & D.R. Herbst) W.L. Wagner & Lorence
 Syn. *Hedyotis fosbergii* W.L. Wagner & D.R. Herbst
Kadua knudsenii Hillebr.
 Syn. *Hedyotis knudsenii* (Hillebr.) Fosberg
Kadua laxiflora H. Mann
 Syn. *Hedyotis mannii* Fosberg
Kadua littoralis Hillebr.
 Syn. *Hedyotis littoralis* (Hillebr.) Fosberg
Kadua parvula A. Gray
 Syn. *Hedyotis parvula* (A. Gray) Fosberg
Kadua st.-johnii (B.C. Stone & Lane) W.L. Wagner & Lorence
 Syn. *Hedyotis st.-johnii* B.C. Stone & Lane
Kadua tryblium (D.R. Herbst & W.L. Wagner) W.L. Wagner & Lorence
 Syn. *Hedyotis tryblium* D.R. Herbst & W.L. Wagner

Verbenaceae

Phyla nodiflora (L.) Greene

New island records

Often used as a substitute for lawn grass, *Phyla nodiflora* is a mat-forming herb capable of tolerating a diverse range of environmental conditions (Staples & Herbst 2005: 566). It is considered a weed in Australia (Parsons & Cuthbertson 2001:625) and elsewhere (HEAR 2008). Previously recorded only as naturalized on Maui and Midway Atoll (Starr *et al.* 2002: 26), the species is now recorded from naturalized populations on O'ahu and Molokai.

Material examined. O'AHU: Ka'elepulu Pond, growing on exposed mudflat, 24 Apr 1923, *L.M. Crago & C. McGuire 2005-235*. MOLOKA'I: Kamiloloa, along roadside, forming large patches, 14 Jul 2001, *H. Oppenheimer H70121*.

Adventive Species Showing Signs of Naturalization

Martyniaceae

Proboscidea louisianica (Mill.) Thell.

Two individuals of unicorn plant, with its distinctive mucilaginous hairs, odoriferous, tubular blossoms, and 15 cm (6 in) long fruit with curved beak, were found growing adventively in a home garden and were subsequently destroyed. Seed of the species is sold in garden shops, and while Staples & Herbst (2005) were doubtful that the species would persist, the collected individuals were believed to have originated from seed in mulch

from the Hilo Solid Waste Transfer Station. The collected specimen best fits the description for *Proboscidea louisianica* subsp. *louisianica*, having entire unlobed leaves, and pale pink corolla (Bretting 1983).

This species listed as a noxious weed in the United States (USDA NRCS 2008), Australia (Parsons & Cuthbertson 2001), and elsewhere (see HEAR 2008). In Staples & Herbst (2005) this species was placed within the family Pedaliaceae. The family Martyniaceae Stapf, which includes the genus *Proboscidea*, has long been considered a synonym of the family Pedaliaceae R. Br., but is now considered an accepted family name (APG 2003; Mabberley 2008).

Material examined. HAWAII: Mountain View, Hopue Rd, 25 Aug 2008, R.K. Epperson s.n. (BISH 734399).

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***Psychotria greenwelliae* Fosberg – not on O‘ahu!**¹

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In 1996, *Psychotria greenwelliae* Fosberg, hitherto known only from Kaua‘i, was recorded from both the Wai‘anae and Ko‘olau Ranges on O‘ahu (Herbarium Pacificum Staff 1996: 6–7). The reports were based on collections made by the first author of this paper in 1990 (Kiehn *et al.* MK-900722-4/1, Ko‘olau Range, Mānoa Cliff Trail, east-exposed slope, 488 m, 22 Jul 1990; Kiehn *et al.* 900923-1/2 and Kiehn *et al.* 900923-1/5, Wai‘anae Range, Wai‘anae Kai Trail, steep south-exposed slope on way to ridge, 610–732 m, 23 Sep 1990), which were identified by Seymour H. Sohmer as *Psychotria greenwelliae* based on vouchers deposited at the Bishop Museum’s *Herbarium Pacificum* (BISH).

After becoming aware of this publication, the first author expressed his doubts about these identifications in personal communications with Warren L. Wagner, Curator of Pacific Botany at the Smithsonian Institution. Consequently, the report of *Psychotria greenwelliae* for O‘ahu was referred to as “not *P. greenwelliae*” in the revised edition of the *Manual of the Flowering Plants of Hawai‘i* (Wagner *et al.* 1999: 1892).

In order to clarify the situation, Christopher F. Puttock (formerly of BISH) and the authors of this paper attempted to re-identify the vouchers in question (as suggested by Wagner *et al.* 1999: 1892). We also critically examined the available *Psychotria* material collected in the Ko‘olau and Wai‘anae Ranges of O‘ahu and deposited at BISH and the National Tropical Botanical Garden herbarium (PTBG), and revisited the collecting sites of the vouchers identified by S.H. Sohmer as *Psychotria greenwelliae*, making additional collections of all *Psychotria* species in the corresponding regions. The results of these studies are reported here.

***Psychotria* from the Ko‘olau and Wai‘anae Ranges**

The following *Psychotria* taxa are represented by collections at BISH and PTBG:

Ko‘olau Range: *Psychotria fauriei* (H. Lév.) Fosberg; *P. hexandra* H. Mann subsp. *oahuensis* Degener & Fosberg (3 varieties); *P. kaduana* (Cham. & Schltld.) Fosberg; *P. mariniana* (Cham. & Schltld.) Fosberg

Wai‘anae Range *Psychotria hathewayi* Fosberg var. *brevipetiolata* Fosberg; *P. hathewayi* Fosberg var. *hathewayi*; *P. kaduana* (Cham. & Schltld.) Fosberg; *P. mariniana* (Cham. & Schltld.) Fosberg

This list is in accordance with the *Psychotria* species reported for O‘ahu by Wagner *et al.* (1999), with the exception of *P. greenwelliae*.

Re-identification of the vouchers reported to represent *Psychotria greenwelliae*

Re-examination of the vouchers identified by Sohmer as *P. greenwelliae* turned out to be problematic as none of them could be traced or relocated at BISH, despite search efforts by the authors and BISH staff both in 1998 and 2009. However, based on fixations of flowering and fruiting material and on photos of the collections in question taken by the first author, the following identifications could be made: Kiehn *et al.* MK-900722-4/1

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from the Ko'olau Range doubtlessly is *P. mariniana*. The collections Kiehn *et al.* 900923-1/2 and Kiehn *et al.* 900923-1/5 from the Wai'anae Range represent the species *P. hathewayi*. However, based on the material available to the authors, it was not possible to key out the collections to variety.

Re-collecting of *Psychotria* in the original collecting areas in the Ko'olau and Wai'anae Ranges

Additional field work in both mountain ranges was carried out in 1998 and 1999. The following *Psychotria* taxa were documented:

Ko'olau Range: Mānoa Cliff Trail (all collected 23 Aug 1998)

Psychotria kaduana: Kiehn *et al.* MK 980823-4/1 (BISH); Kiehn *et al.* 980823-4/2 (BISH).

Psychotria mariniana: Kiehn *et al.* MK 980823-3/1 (BISH); Kiehn *et al.* MK 980823-3/2 (BISH).

Wai'anae Range:

Psychotria hathewayi var. *brevipetiolata*: Imada *et al.* MK 990906-1/2, Wai'anae Kai Trail, loop trail (right side when seen from below), ca 750 m, 6 Sep 1999 (BISH).

Psychotria hathewayi var. *hathewayi*: Takahama *et al.* MK 990901-4/9, Pāhole Forest Reserve, Mokulē'ia Trail, ca 610 m (2000 ft), 1 Sep 1999 (BISH); Takahama *et al.* MK 990901-4/11, same as above (PTBG); Imada *et al.* MK 990906-1/3, Wai'anae Kai Trail, loop trail (right side when seen from below), ca 750 m, 6 Sep 1999 (BISH); Imada *et al.* MK 990906-2/2, Wai'anae Kai Trail, ridge at powerline towers, ca 800 m, 6 Sep 1999 (BISH; PTBG); Imada *et al.* MK 990906-3/7, Wai'anae Kai Trail, ridge between powerline towers and pinnacle rock, ca 800 m, 6 Sep 1999 (BISH).

Psychotria mariniana: Takahama *et al.* MK 990901-6/3, Pāhole Forest Reserve, Mokulē'ia Trail, dry area after second major gulch, ca 610 m (2000 ft), 1 Sep 1999 (PTBG); Imada *et al.* MK 990906-3/1, Wai'anae Kai Trail, ridge between powerline towers and pinnacle rock, ca 800 m, 6 Sep 1999 (BISH, PTBG); Imada *et al.* MK 990906-3/3, same locality and date (BISH).

These recorded species all are in accord with earlier collections from these regions represented in the BISH and PTBG herbaria.

Conclusion

From the viewpoint of the authors of this paper, these findings clearly indicate that *Psychotria greenwelliae* Fosberg is **not** present on O'ahu.

Acknowledgments

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On the identity of *Gahnia lanaiensis* O. Deg., I. Deg. & J. Kern (Cyperaceae) of Hawai'i¹

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When Degener *et al.* (1964) described *Gahnia lanaiensis* as a new endemic species from the island of Lānaʻi, the authors speculated that its closest taxonomic affinity was with *G. melanocarpa* R. Br. of eastern Australia, based mainly on the similarity of the color and grooved endocarp of the achenes and the spikelets bearing only four glumes. The first two authors (1965) even suggested that *G. lanaiensis* might actually represent plants of *G. melanocarpa* introduced into Lānaʻi by George C. Munro. Wagner *et al.* (1999: 1410) accepted the species, while noting that its endemic status was in question.

Gahnia lanaiensis, however, clearly differs from *G. melanocarpa* in details of the spikelets and achenes. In *G. lanaiensis*, the oblanceolate spikelets are 6–7 mm long and usually bear 5 glumes, of which the outer 3, each bearing a ca 1 mm long awn, much surpass the subtending achene, whereas in *G. melanocarpa* the elliptic spikelets are only 4–5 mm long and invariably bear only 4 glumes, of which the short-awned outer 2 are slightly shorter than or barely overtopping the subtending achene. The achenes of *G. lanaiensis* are 3.5–4.0 mm x 1.5–1.8 mm and have a cuneate base (Fig. 1B), while those of *G. melanocarpa* are 3.0–3.5 mm x 1.7–2.0 mm, with a contracted base (Fig. 1D). Thus, *G. lanaiensis* is clearly not identical with *G. melanocarpa*, but is instead without doubt specifically distinct from the latter.

On the other hand, a close comparison of *G. lanaiensis* and *G. lacera* (A. Rich.) Steud. of New Zealand reveals a complete match between these two entities in the particular features of the spikelets and achenes just discussed above (Fig. 1A, 1B). In addition, the fact that the inner walls of the achene pericarp in *G. lanaiensis* (Fig. 1C) and *G. lacera* (Fig. 1A) are equally rugose with 3–5 wrinkles, and that the leaf sheaths of both species are dark purple-brown, almost blackish, in contrast to the rather light purplish brown leaf sheaths of *G. melanocarpa*, also substantiate the conclusion that these two species are one and the same.

Benl (1940), in his monograph of the genus *Gahnia*, placed *G. lacera* rather remotely from *G. melanocarpa*, stating that the achene pericarps of the former are hardly or indistinctly rugose, in contrast to the conspicuously rugose pericarps of the latter. However, our observations are that the achene pericarps of both *G. melanocarpa* and *G. lacera* are similarly rugose, and Benl's distinction does not hold true. Furthermore, we do not understand why the Degeners and Kern described the spikelets of *G. lanaiensis* as having only 4 glumes, when examination of type material and other named vouchers reveal that the spikelets normally bear 5 glumes. Such circumstantial evidence suggests

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that the Degeners and Kern may thus have been led astray from considering *G. lacera* as the correct identification for the species, instead describing it as a new Hawaiian endemic, *G. lanaiensis*.

Distribution of *Gahnia lacera*

Endemic to New Zealand's North Island, *G. lacera* is adapted to a variety of substrates that may be seasonally waterlogged, though otherwise dry (New Zealand Plant Conservation Network 2008). It is typically found in scrub or open forests near the coast, rarely extending up to 500 m elev in mountain ranges close to the sea (New Zealand Plant Conservation Network 2008; Moore & Edgar 1970: 212), although its elevational range can reach 760 m (Cheeseman 1925: 240).

Various botanists had collected on Lānaʻi in the late 1800s and early 1900s, as described by G.C. Munro in *The Story of Lānaʻi* (Munro 2007: 68–69): “Mann and Brigham botanized there in 1864, Hillebrand and Lydgate in 1870, Rock in 1910, Forbes in 1913. I made three nearly complete collections of the plants, one for the Bishop Museum, one for the Hawaiian Sugar Planters Association, and mounted one for myself. I worked on these until April 1926, when all my collections were disposed of to the Bishop Museum.” Yet, while collections during this time were made of the native *Gahnia beecheyi* H. Mann and *G. gahniiformis* (Gaudich.) A. Heller [= *Morelotia gahniiformis* Gaudich.], no other *Gahnia* species were recorded on Lānaʻi during this time. Even among Munro's extensive Lānaʻi collections, the only *Gahnia* specimens at BISH are of *G. beecheyi* (Munro 127, 159, 503) and *G. gahniiformis* (Munro 129, 160, 261), nor is there mention of any other *Gahnia* species in Munro's field books stored at Bishop Museum's *Herbarium Pacificum* (BISH).

The earliest voucher specimen of *G. lacera* [as *G. lanaiensis*] at BISH was collected in 1938 (*H. St. John & E.Y. Hosaka 18866*) by the summit cabin atop Lānaʻihale, where it was described as “apparently introduced.” Subsequently, *G. lanaiensis* was described in 1964 (Degener *et al.* 1964) from material collected in 1963 by the Degeners. The population was described as consisting of four or five clumps in open scrubby wet forest at ca 915 m elevation on and around the fog belt of Lānaʻihale (Degener & Degener 1965).

Born and raised in New Zealand, Munro was the Resident Manager of Lānaʻi Ranch between 1911 and 1930 (Black 2001: 19). His brother, Hugh S. Munro, collected seed of the native plants of New Zealand for use by Munro on Lānaʻi (Munro 2007: 74), and “Under Munro's environmentally focused stewardship, strenuous efforts were put forth to reforest the island's single volcanic mountain (Lanai Hale)” (Black 2001: 19). Degener & Degener (1965) conceded that “Though a copy of [G.C. Munro's] manuscript of introductions and plant observations in the authors' library does not mention any sedge of this sort, it is possible that a nutlet foreign to our flora may have been introduced inadvertently. We therefore surmise that if *G. lanaiensis* is not endemic to Lanai, it may be found growing native somewhere in Australia or possibly New Zealand.” *Gahnia lacera* likely arrived on Lānaʻi—intentionally or unintentionally—through Munro's environmental reforestation efforts, although no direct evidence has yet come to light to confirm it.

Nomenclature

Gahnia lacera (A. Rich.) Steud., 1855: 164. Hook. f., *Handb.*, 1867: 306. Benl, 1937: 378; 1940: 187, f. 14A.

Lampocarya lacera A. Rich., 1832: 109. Hook. f., 1853: 277.

Gahnia lanaiensis O. Deg., I. Deg., & J.Kern, 1964: 349, f. 1; O. Degener & I. Degener, 1965: *Fam.* 48. Wagner, Herbst & Sohmer, 1999: 1410. **Syn. nov.**

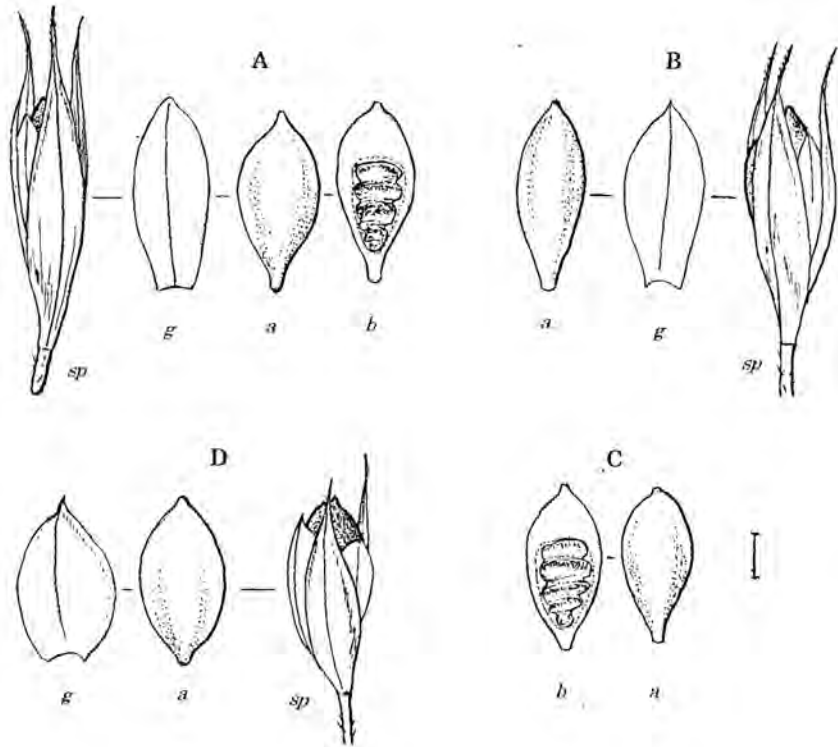


Fig. 1. Comparison of spicular details among *Gahnia lacera*, *G. lanaiensis*, & *G. melanocarpa*. **A.** *Gahnia lacera* from New Zealand, *Melville & Godly 6574* (BISH). **B.** *G. lanaiensis* from Lānaʻi, Hawaiʻi, *St. John & Hosaka 18866* (BISH). **C.** *G. lanaiensis* from Lānaʻi, Hawaiʻi, *Hobdy 389* (BISH). **D.** *G. melanocarpa* from Australia, *Convey et al. 7368* (NSW).—a, achene; b, longitudinal section of achene; g, inner glume subtending achene; sp, spikelet. Scale bar = 1 mm. Drawn by T. Koyama.

Material examined. **LĀNAʻI:** E of Munro Trail and north of Lānaʻihale, in shrubby rainforest, 915 m (3000 ft), 4 Sep 1963, *O. & I. Degener 28431* (L, type); Lānaʻihale, Pālāwai, moist woods, tufts by summit cabin, apparently introduced, 1065 m (3500 ft), 15 Apr 1938, *H. St. John & E.Y. Hosaka 18866* (BISH); growing on the very summit of Lānaʻihale, in a large spreading clump, 1027 m, 8 Nov 1978, *R. Hobdy 389* (BISH); Haʻalepaʻakai, east side of Munro Trail road, one of several clumps known from this area, all populations suspiciously located at trailheads or along road where G.C. Munro was known to plant introduced exotics, 1020 m (3340 ft), 13 Feb 1997, *K.R. Wood 6000* (BISH); Kehewai Gulch headwaters, single clump observed in small headwater drainage, 930 m, 15 Aug 2006, *H. Oppenheimer H80620* (BISH).

Conservation Implications

Because *Gahnia lanaiensis* was considered an endemic sedge known from only 15–16 plants restricted to a small area on a single Hawaiian Islands (Lānaʻi), it was regarded as rare and in danger of extinction due to random environmental perturbations. Thus, in 1991 the U.S. Fish and Wildlife Service officially designated it an endangered species (Herbst

1991). In light of the revelation that *G. lanaiensis* is actually synonymous with the introduced, naturalized *G. lacera*, its endangered status needs to be revoked and the species delisted.

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New Hawaiian plant records from Maui County for 2008

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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, 2 new naturalized records, 25 new island records, and a single range extension are reported. A total of 28 taxa in 23 plant families are discussed. Three species are pteridophytes, 22 are dicotyledonous angiosperms, and 3 are monocots. Four of the taxa are native species. Information regarding the formerly known distribution of flowering plants is based on the *Manual of Flowering Plants of Hawai‘i* (Wagner *et al.* 1999) and information subsequently published in the *Records of the Hawaii Biological Survey*. Distribution and taxonomy of ferns follows *Hawai‘i’s Ferns and Fern Allies* (Palmer 2003).

Voucher specimens are deposited at Bishop Museum's *Herbarium Pacificum* (BISH), Honolulu, with duplicates at the National Tropical Botanical Garden (PTBG), Lāwā‘i, Kaua‘i. A few specimens may be at only one facility; only in these cases is the herbarium acronym cited.

Aizoaceae

Tetragonia tetragonoides (Pall.) Kuntze **New island record**

This succulent annual herb has been documented from Midway Atoll, Nihoa, Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i (Wagner *et al.* 1999: 178; Oppenheimer *et al.* 1999: 7; Starr & Martz 2000: 10; Starr *et al.* 2003: 23, 2006: 31). On Lāna‘i it was found in scattered upland sites in waste areas with other weeds.

Material examined. LĀNA‘I: Lāna‘i City, S of Iwi‘ole Gulch, naturalized in waste areas, 495 m, 27 May 2008, Oppenheimer H50805.

Asclepiadaceae

Stapelia gigantea N.E. Br. **Range extension**

A small, erect succulent that escapes cultivation into dry, rocky areas on O‘ahu, Moloka‘i, and West Maui (Wagner *et al.* 1999: 241; Oppenheimer *et al.* 1999: 7; Wysong *et al.* 2007: 2–3), Zulu-giant was found on leeward East Maui on open ‘a‘ā flows in degraded remnant dry forest.

Material examined. MAUI: East Maui, Palauea ahupua‘a, 207 m, 17 Jun 2008, Oppenheimer & D. Crow H60804.

Asteraceae

Heterotheca grandiflora Nutt. **New island record**

Probably on all of the main islands but not documented from Ni‘ihau and Moloka‘i (Wagner *et al.* 1999: 326), *H. grandiflora* was found on Moloka‘i in a feral goat-ravaged area with very sparse vegetation. It may be unpalatable to these animals.

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Material examined. **MOLOKA'I:** East Kawela, 490 m, 17 Sep 2008, *Oppenheimer & R. Kallstrom H90808.*

Boraginaceae

Cynoglossum amabile Stapf. & J.R. Drumm. **New island record**

In Hawai'i, this biennial herb is naturalized and locally common in grassland and pastures on Hawai'i (Wagner *et al.* 1999: 394) and is now known from Maui as well.

Material examined. **MAUI:** East Maui, Makawao Distr, 'Ulupalakua, 585 m, 28 Jan 2007, *Oppenheimer H10717.*

Brassicaceae

Lepidium virginicum L.

New island record

Naturalized in disturbed sites from sea level to 2,500m on Kure Atoll (Starr *et al.* 2003: 26), Midway Atoll, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999: 409), this peppergrass was later reported from Kaua'i (Lorence *et al.* 1995: 27). It was recently found growing on Lāna'i, also in disturbed areas.

Material examined. **LĀNA'I:** Keōmuku Rd, annual herbs in remnant shrubland, 250 m, 9 Jan 2008, *Oppenheimer H10808* (BISH); Lāna'i Airport, weed in waste area near unpaved parking, 390 m, 25 Mar 2008, *Oppenheimer H30808.*

Caricaceae

Carica papaya L.

New island record

An early introduction to Hawai'i and extensively cultivated for the edible fruit, papaya has been reported as sparingly naturalized on Kaua'i, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999: 497-98; Oppenheimer & Bartlett 2000: 3). On Lāna'i it was found randomly scattered along a gulch bottom.

Material examined. **LĀNA'I:** Maunalei Gulch, naturalized along gulch bottom in *Aleurites* forest, 400 m, 29 May 2008, *Oppenheimer & Perlman H50811.*

Caryophyllaceae

Stellaria media (L.) Vill.

New island record

A weedy herb documented from Kure Atoll, Kaua'i, O'ahu, Lāna'i, Maui, and Hawai'i (Wagner *et al.* 1999: 528), and more recently from Midway Atoll (Starr *et al.* 2003: 26), this chickweed was recently found on Moloka'i.

Material examined. **MOLOKA'I:** Waihānau Stream, locally common in disturbed *Metrosideros/Dicranopteris* forest, in shady intermittent stream bed, among rocks with other weeds such as *Psidium*, *Fraxinus*, *Rubus*, *Solanum*, *Erigeron*, 915 m, 25 Sep 2008, *Oppenheimer H90813.*

Convolvulaceae

Dichondra micrantha Urb.

New island record

Recently reported as a naturalized element of the Hawaiian flora on O'ahu and Maui (Oppenheimer & Bartlett 2002: 6), this low-growing herb is now known from Lāna'i as well.

Material examined. **LĀNA'I:** Lāna'i City, N of Iwi'ole Gulch, naturalized creeping herbs in muddy drainage in grassy area near pasture with other weeds, 505 m, 30 May 2008, *Oppenheimer H50818.*

Cyperaceae***Carex longii* Mack.****New island record**

Naturalized on East Maui and Hawai'i (Strong & Wagner 1997: 37–39), this sedge was collected in a disturbed, wet area on Moloka'i.

Material examined. **MOLOKA'I:** upper S fork of Kaunakakai Gulch, W of Hanalilililo, along Forestry Rd near second culvert, occasional herb in wet, muddy unpaved roadside with other weedy taxa such as *Kyllinga*, *Conyza*, *Persicaria*, *Lotus*, *Paspalum*, *Hedychium*, 1090 m, 26 Sep 2008, *Oppenheimer H90823*.

Elaphoglossaceae***Elaphoglossum paleaceum* (Hook. & Grev.)****New island record**

Sledge

Of the 9 native species of *Elaphoglossum*, this is the only taxon with a distribution outside the Hawaiian Islands. It was reported from all the main islands [excluding Ni'ihau and Kaho'olawe] except Lāna'i at 875–2075 m elevation (Palmer 2003: 158).

Material examined. **LĀNA'I:** Kūnoa Gulch, rare, growing at base of rough-barked *Leptospermum* tree on stream bank, 845 m, 26 Mar 2008, *Oppenheimer & Perlman H30811*.

Euphorbiaceae***Antidesma pulvinatum* Hillebr.****New island record**

Occasional in dry to mesic forest on O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999: 601), this endemic tree is locally common at the head of Maunalei Gulch on Lāna'i, where the upper drainages of Waialala and Kūnoa Gulches plunge and join the main stream corridor. Besides a small stand of *Pittosporum confertiflorum*, it was the only native tree species observed in this area.

Material examined. **LĀNA'I:** Maunalei Gulch, locally common trees to 9 m tall, with yellow-tan fissured bark, 440 m, 29 May 2008, *Oppenheimer & Perlman H50813*.

Fabaceae***Acacia melanoxyton* R. Br. ex Aiton****New island record**

In the generic notes for *Acacia* Mill. (Wagner *et al.* 1999: 640), it was reported that this species had been planted on Kaua'i, O'ahu, Moloka'i, and Maui, and was definitely naturalized on East Maui. Later it was documented from Kaua'i (Lorence *et al.* 1995: 36). On Moloka'i it is naturalized in several areas of Moloka'i Forest Reserve. It spreads via root suckers and also seed, although the production of viable seed in Hawai'i has been a matter of debate. Pat Bily (pers. comm.) has germinated seeds collected on East Maui. This is a polymorphic species in Australia, and several forms have been introduced to Hawai'i. Recently, localized control was initiated by the Division of Forestry and Wildlife, The Nature Conservancy, and Moloka'i Invasive Species Committee staff.

Material examined. **MOLOKA'I:** NE of Pu'u Makali'i ili'i, 1010 m, 16 Jan 2008, *Oppenheimer H10810*; Kikiakalā, headwaters of Waihānau Stream, 940 m, 17 Jan 2008, *Oppenheimer H10812*.

***Desmodium barbatum* (L.) Benth. & Oerst.** **New state record**

This species has not been previously reported from Hawai'i. It is a prostrate, mat-forming species and the inflorescence is conspicuously long-pilose, with purple-lavender corollas. It is widespread from Africa to tropical America, the Indian subcontinent, and elsewhere, with several varieties named. It may have been introduced intentionally as a forage

legume, as it seems so far to be restricted to pastures and adjacent areas on the east end of Molokaʻi, where it grows with *D. incanum* and *D. triflorum*.

Material examined. **MOLOKAʻI:** Moakea, S side of Pāpio Gulch, naturalized in pastures and waste areas, flowers purple, 295 m, 7 Nov 2007, *Oppenheimer H110716* (BISH, MEXU, PTBG); Hālawā Valley, Pōʻāla, locally common, prostrate, in open areas along unpaved contour road on S side of valley, 310 m, 22 Jul 2008, *Oppenheimer, Duvall, Penniman & Holmes H70804*.

Gesneriaceae

Cyrtandra macrocalyx Hillebr.

New island record

Rarely collected and known from along streams and gulches in mesic to wet forest on Molokaʻi (Wagner *et al.* 1999: 769), this understory shrub was collected in similar habitat on the windward slope of Haleakalā, East Maui. Wagner *et al.* (1999b: 35) listed the species as occurring in ʻĀao Valley, West Maui as well, apparently based on Hobdy's specimen, cited below, which was the type of *C. iaoensis* St. John, now reduced to synonymy.

Material examined. **MAUI:** West Maui, ʻĀao Valley, Nākalalōa Stream, ubiquitous in forest understory, 762 m (2500 ft), 16 Oct 1980, *R.W. Hobdy 912* (BISH); East Maui, Hāna Distr., western tributary headwaters of Waiokamilo Stream, occasional, branched shrubs to 1.75 m tall, 1071 m, 23 Oct 2007, *Oppenheimer et al. H100715* (BISH).

Iridaceae

Crocosmia xrococsmiflora

New island record

(Lemoine ex E. Morr.) N.E. Br.

A hybrid of horticultural origin naturalized in Hawaiʻi on Kauaʻi, Oʻahu, Maui, and Hawaiʻi (Wagner *et al.* 1999: 1446), this herb is also sparingly naturalized on Molokaʻi.

Material examined. **MOLOKAʻI:** S rim of Kuhuaʻawi Gulch, near Forestry barracks, 650 m, 6 Jun 2008, *Oppenheimer & Perlman H60802* (BISH).

Lamiaceae

Leonotis nepetifolia (L.) R. Br.

New island record

Introduced as an ornamental and naturalized on Kauaʻi, Oʻahu, Molokaʻi, Maui, and Hawaiʻi (Wagner *et al.* 1999: 803; Oppenheimer 2003: 14), this annual herb is common along much of the lower and drier end of Maunalei Gulch, Lānaʻi.

Material examined. **LĀNAʻI:** Maunalei Gulch, locally abundant in dry, disturbed areas, 85 m, 29 May 2008, *Oppenheimer & Perlman H50808*.

Ocimum basilicum L.

New island record

No naturalized *Ocimum* species have been previously documented from Lānaʻi. The common or sweet basil is known from Niʻihau, Oʻahu, Molokaʻi, Maui, and Hawaiʻi (Wagner *et al.* 1999: 808), and now from Lānaʻi.

Material examined. **LĀNAʻI:** W rim of Maunalei Gulch, few plants scattered on ridgetop in remnant shrubland; leaves aromatic, 620 m, 10 May 2006, *Oppenheimer & J. Penniman H50611*.

Lauraceae

Persea americana Mill.

New island record

Avocado was introduced to Hawaiʻi in 1825 for its edible fruit and is naturalized in disturbed mesic sites on Kauaʻi, Oʻahu, Maui, and Hawaiʻi, but also probably on some of the other main islands (Wagner *et al.* 1999: 848). Now it is known from Lānaʻi, where it occurs under similar conditions.

Material examined. **LĀNA'I:** Maunalei Gulch, sparingly naturalized trees along gulch bottom upstream from old pump station, in *Aleurites* forest, 335 m, 29 May 2008, *Oppenheimer & Perlman H50809*.

Marattiaceae

Angiopteris evecta (G. Forst.) Hoffm.

New island record

Since its introduction to Hawai'i in 1927, mule's-foot fern has spread rapidly and is invasive on Kaua'i, O'ahu, Lāna'i, Maui, and Hawai'i (Palmer 2003: 49; Wood 2006: 18). A single large, fertile plant was recently found (and destroyed) on Moloka'i in a remote area where it was obviously not under cultivation. More plants likely exist in the rough terrain. The Moloka'i Invasive Species Committee was notified.

Material examined. **MOLOKA'I:** Waihānau Stream, large fern to 3 m tall on mossy intermittent stream bank in shady, disturbed *Metrosideros/Dicranopteris* forest, 900 m, 25 Sep 2008, *Oppenheimer H90816*.

Myrtaceae

Lophostemon confertus (R. Br.) Peter G. Wilson

New island record

& J.T. Waterh.

A forestry tree since 1929 planted on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, previously documented as naturalized on O'ahu, Lāna'i, and Maui (Wagner *et al.* 1999: 964; Oppenheimer 2004: 14; Oppenheimer 2007: 28), Brisbane box also occurs on Moloka'i.

Material examined. **MOLOKA'I:** WNW of Pu'u Ka'eo, along 4WD road, sparingly naturalized trees from forestry plantings in disturbed areas along road, in *Metrosideros/Dicranopteris* wet forest, 1020 m, 29 Aug 2008, *Oppenheimer H80830*.

Melaleuca quinquenervia (Cav.) S.T. Blake

New island record

Naturalized on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999: 964), paperbark also occurs on Lāna'i.

Material examined. **LĀNA'I:** between Ha'alelepa'akai & Pu'u Kole, sparingly naturalized trees in degraded *Metrosideros/Dicranopteris* forest, on slopes and near ridge tops, 1000 m, 7 Jan 2008, *Oppenheimer, Wood, Perlman & Bacon H10804*.

Syncarpia glomulifera (Sm.) Nied.

New island record

This species was included as a short note in the Myrtaceae discussion (Wagner *et al.* 1999: 948). Planted on all of the main islands except Ni'ihau and Kaho'olawe, it was reported to have escaped in Kamakou Preserve, Moloka'i. It was previously documented as a naturalized species on Maui (Oppenheimer 2003:16). The following voucher specimen documents this species as definitely naturalized on Moloka'i.

Material examined. **MOLOKA'I:** Kūpā'ia Gulch, emergent trees, naturalized on upper slope in mesic shrubland, 925 m, 26 Sep 2008, *Oppenheimer H90822*.

Ophioglossaceae

Ophioglossum petiolatum Hook.

New island record

This small, indigenous fern is ephemeral, and usually appears after winter rains. It has been documented from all the main islands [excluding Ni'ihau and Kaho'olawe] except Moloka'i, where it was suspected to occur (Palmer 2003: 199). Recently it was collected there at the margin of a small puddle created by rain runoff from the roof of a small building.

Material examined. **MOLOKA'I:** Kaunakakai, Kalaniana'ole Colony, vicinity of Ooloolo Spring, 10 m, 23 July 2008, *Oppenheimer, Duvall, Penniman & Holmes H70806*.

Proteaceae***Macadamia integrifolia* Maiden & Betche New naturalized record**

A second species of *Macadamia* F. Muell. has been found naturalized in the Hawaiian Islands. Previously, *M. tetraphylla* was reported from Maui (Oppenheimer 2004: 16–17). *Macadamia integrifolia* is native to tropical rainforests of Queensland, Australia and was introduced to Hawai‘i prior to 1837; it forms the basis for the mac nut industry in Hawai‘i (Staples & Herbst 2005: 470). It differs from *M. tetraphylla* by having leaves usually in whorls of 3 per node (vs. 4 per node), with entire margins on adult leaves (vs. spiny), rounded leaf apices (vs. pointed), and having a smooth seed coat (vs. rough). The population where the cited specimen was collected is not far from a commercial macadamia nut farm, and the area has populations of feral deer, pigs, and goats, any one or all of which potentially disperse the seeds.

Material examined. **MOLOKA‘I:** Pālā‘au, Pu‘u Lua, occasional on steep slopes in *Casuarina* thickets, trees to 6 m tall, flowers white, fragrant, 480 m, 3 Apr 2007, *Oppenheimer H30703*.

Rubiaceae***Spermacoce latifolia* Blume New island record**

This herb was previously documented from Kaua‘i and Maui (Lorence *et al.* 1995: 51; Oppenheimer 2004: 17; Lorence & Flynn 2006: 4). Its occurrence on Moloka‘i in pastures, waste areas, and open disturbed sites is consistent with observations of this species on Maui.

Material examined. **MOLOKA‘I:** Moakea, S side of Pāpio Gulch, naturalized in pastures and waste areas, locally common, 295 m, 7 Nov 2007, *Oppenheimer H110715*.

Solanaceae***Cestrum nocturnum* L. New island record**

Often referred to locally as night-blooming jasmine, this cultivated species is naturalized on Kaua‘i, O‘ahu, Maui, and Hawai‘i (Wagner *et al.* 1999: 1255; Oppenheimer & Bartlett 2000: 8; Starr *et al.* 2003: 32; Oppenheimer 2007: 31). On Lāna‘i it was found to be locally abundant in scattered sites along the bottom of Maunalei Gulch. Many seedlings were also observed and it is apparently not browsed by deer or mouflon.

Material examined. **LĀNA‘I:** Maunalei Gulch, naturalized shrubs to 2.5 m tall along gulch bottom where Wai‘alalā Gulch enters, in *Aleurites* forest, 440 m, 29 May 2008, *Oppenheimer & Perlman H50812*.

***Nicandra physalodes* (L.) Gaertn. New island record**

Widely cultivated as an ornamental and naturalized in dry to mesic, disturbed habitats on Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i (Wagner *et al.* 1999: 1260), apple of Peru was recently found on Lāna‘i.

Material examined. **LĀNA‘I:** Maunalei Gulch, locally abundant on dry slopes & talus, 40 m, 29 May 2008, *Oppenheimer & Perlman H50807*.

Zingiberaceae***Alpinia zerumbet* (Pers.) B.L. Burt & R.M. Sm. New island record**

A popular ornamental and widely cultivated, shell ginger was recently reported to be naturalized on Kaua‘i (Flynn & Lorence 2002: 16) and West Maui (Oppenheimer 2008: 35). Now it is known from Moloka‘i, where it forms clumps and small dense stands in scattered areas throughout Moloka‘i Forest Reserve. Recently, localized control was initiated

by the Division of Forestry and Wildlife, The Nature Conservancy, and Moloka'i Invasive Species Committee staff.

Material examined. **MOLOKA'I:** Upper Kaunakakai Gulch, NE of Kaulahuki, vicinity of Waikolu Park, naturalized herbs to 2 m+ tall in *Eucalyptus* forest, 1130 m, 16 Jan 2008, *Oppenheimer H10809*.

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New plant records from the Big Island for 2008

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The Big Island Invasive Species Committee (BIISC) implemented its Early Detection program in May of 2008. Roadside surveys were conducted in the Ka‘ū and South Kona Districts from July to October. Here, BIISC Early Detection documents 1 new naturalized record and 7 new island records. A total of 6 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 B.P. Bishop Museum’s *Herbarium Pacificum* (BISH), Honolulu, Hawai‘i.

Crassulaceae

***Bryophyllum daigremontianum* Raym.-Hamet New island record & Perrier**

Native to Madagascar and introduced to horticulture in the early twentieth century, this species has distinctive channeled, rather trowel-shaped leaf blades that are yellow-green with purple-brown markings and produce plantlets in between the marginal teeth (Staples & Herbst 2005). Previously recorded as naturalized on Kaua‘i, Lāna‘i, and Maui (Lorence *et al.* 1995; Oppenheimer & Bartlett 2002; Staples *et al.* 2002; Starr *et al.* 2006), this voucher specimen was collected from a large, non-flowering population on a roadside in Hawaiian Ocean View Estates. This species propagates vigorously from plantlets; in fact, a dried specimen’s plantlets are still producing roots in our filing cabinet, over four months after collection.

Material examined. **HAWAI‘I:** Ka‘ū Distr, Hawaiian Ocean View Estates, Lehua Ln (2113302N, 208139E), significant population growing in disturbed, dry roadside, distinct markings on underside of leaf, plantlets budding from leaf margins, 7 Jul 2008, *J. Parker & R. McGuire BIED2*.

Euphorbiaceae

***Euphorbia cyathophora* Murray New island record**

In Hawai‘i, wild poinsettia is known to be naturalized in low elevation, dry, disturbed sites on Midway Atoll, Kaua‘i, O‘ahu, Moloka‘i, and Maui (Wagner *et al.* 1999). This voucher specimen was collected from a lone, small population in Nā‘ālehu. However, in South Kona there were several larger populations found along roadsides. The source appears to be the fill/gravel that is being used in shoulder reconstructions along Hwy 11 in South Kona.

Material examined. **HAWAI‘I:** Ka‘ū Distr., Discovery Harbor subdivision in Nā‘ālehu (2107818N, 223686E), one small naturalized population flowering in coarse gravel/rock driveway in private property, 17 Jul 2008, *J. Parker & R. McGuire BIED10*.

***Macaranga tanarius* (L.) Müll. Arg.**

New island record

Previously recorded as naturalized on Kaua‘i, O‘ahu, and Maui (Wagner *et al.* 1999; Oppenheimer *et al.* 1999), the following specimen was collected from a large population in the Puna District. In addition, the South Kona District has at least one significant population.

Material examined. **HAWAII:** Puna Distr, Hwy 130, mile marker 12, large population found in open grassy area along roadside, 200–300 m, 11 Jul 2008, *K. Bio, J. Parker & R. McGuire BIED4.*

Lamiaceae

Plectranthus cylindraceus Benth.

New naturalized record

Vick's plant is similar to the more commonly cultivated *P. amboinicus* (False oregano), but differs because of its strong camphor odor and in having smaller, more grayish-hairy leaves that are sessile or nearly so (Staples & Herbst 2005). This specimen represents a new naturalized record for the state. This voucher specimen was collected on a roadside in Hawaiian Ocean View Estates along with *Bryophyllum daigremontianum* and other, more common, Crassulaceae species.

Material examined. **HAWAII:** Ka'ū Distr, Hawaiian Ocean View Estates, Lehua Ln (2113305N, 208138E), numerous populations found along roadside, sprawling, spreading succulent, strong odor of camphor, flowers purple, 7 Jul 2008, *J. Parker & R. McGuire BIED1.*

Marantaceae

Calathea crotalifera S. Watson

New island record

Previously recorded as naturalized in Kāne'ohe, O'ahu (Wagner *et al.* 1999), rattlesnake plant is grown for its dark green foliage and contrasting yellow or bronzy inflorescences, which are sold both fresh and dried in the cut-flower market (Staples & Herbst 2005). The following specimen was collected from a large population in Nānāwale Forest Reserve, near Lava Tree State Park, in the Puna District.

Material examined. **HAWAII:** Puna Distr, Nānāwale For Res, significant population growing under canopy of *Falcataria moluccana*, 200 m, 11 Jul 2008, *K. Bio, J. Parker & R. McGuire BIED6.*

Melastomataceae

Medinilla cumingii Naudin

New island record

Seldom cultivated in Hawai'i, this species has been documented as naturalized on O'ahu (Daehler & Baker 2006; Frohlich & Lau 2010) and Maui (Oppenheimer 2004). This voucher specimen was found spreading into a vacant lot from cultivated specimens in Leilani Estates in the Puna District. This species should be watched closely in Puna because of its bird-dispersed seeds and the availability of suitable habitat.

Material examined. **HAWAII:** Puna Distr, Leilani Estates, single plant found on disturbed roadside near private property, 200–300 m, 11 Jul 2008, *K. Bio, J. Parker & R. McGuire BIED8.*

Medinilla magnifica Lindl.

New island record

Kapa-kapa is one of 80 *Medinilla* species native to the Philippines introduced to horticulture in the mid-1800s. This rainforest epiphyte is one of the most ornamental tropical plants in cultivation (Staples & Herbst 2005), and was recently documented as naturalized on O'ahu (Frohlich & Lau 2007). This voucher specimen was collected from a large population in the Nānāwale Forest Reserve in the Puna District. The sale of this species in Big Island nurseries should be discouraged because of the substantial amount of suitable habitat available on the windward side of the island.

Material examined. **HAWAII:** Puna Distr, Nānāwale For Res, large population growing under canopy of *Falcataria moluccana*, 200 m, 11 Jul 2008, *K. Bio, J. Parker & R. McGuire BIED9.*

Verbenaceae***Clerodendrum buchananii* (Roxb.) Walp. New island record**var. *fallax* (Lindl.) Bakh.

Previously recorded as naturalized on Maui (Starr *et al.* 2006), pagoda flower is cultivated for its showy flowers and is potentially invasive because of its bird-dispersed fruit and clump-forming habit. Also, roots broken off underground continue to produce suckers for years (Staples & Herbst 2005). This flowering specimen was found spreading approximately 40 m from cultivated specimens in Nāʻālehu.

Material examined. HAWAII: Kaʻū Distr., Discovery Harbor subdivision, Nāʻālehu (2106745N, 222849E), single ca 2 m tall naturalized plant found in vacant lot near private property containing cultivated specimens, 21 Jul 2008, *J. Parker & R. McGuire BIED17.*

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***Caladium bicolor* naturalized on the island of Hawai‘i**

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Caladium bicolor (Aiton) Vent. (Araceae) is a neotropical species. According to Madison (1981), the species is found from coastal Brazil to the Andes Mountains and north to the Guianas and Panama. He suggests that the plants of the Antilles are escapes from cultivation. This, however, appears to be an incorrect generalization. *Caladium bicolor* is found in Trinidad, an island very close to the South American mainland, and from the great variation found in the plants (Ressler 2006), the species appears to be native there. The species has become naturalized in other tropical areas throughout the world. This paper reports the presence of *Caladium bicolor* on the island of Hawai‘i, representing a new naturalized record for the state.

Caladium bicolor in Hawai‘i is a perennial, terrestrial, tuberous herb. Description: Tuber subterranean, flattened to subglobose or somewhat cylindrical, yellowish. Leaves 1 to several, ovate to cordiform, peltate; blades 5.5–40.0 cm long, 5–19.5 cm wide, green and spotted with irregularly shaped, grey-green blotches of varying sizes, sometimes glaucous beneath, apex acute, base cordate to emarginate; petioles 9–93 cm long, 2–7 mm in diameter, terete with sheath at base. Sap milky. Inflorescences mostly solitary, rarely 2 or 3 together; peduncle generally shorter than petioles; spathe tube green; spathe limb concave, white, deciduous after antithesis; spadix shorter than spathe. Pollen grains solitary. Fruits not yet observed in Hawai‘i, white berries with several to many seeds.

To date, plants have been observed in Puna and South Hilo Districts. The species appears to be found only in areas where deep, argillaceous soil occurs. None have been observed in areas with thin soil over lava or just lava rock. Sterile specimens of plants found along North Ala Road and surrounding areas near Kurtistown and along a tributary of Maili Stream off Kaiwiki Road have been placed in BISH and Virginia Wesleyan College. A collection made in 1975 by D. Herbst and S. Ishikawa (*Herbst & Ishikawa 5596*) was found in *Herbarium Pacificum* at Bishop Museum. There was no note on the label indicating that this plant was naturalized and not cultivated. It was, therefore, assumed to be cultivated and not included in the *Manual of the Flowering Plants of Hawai‘i* (Wagner *et al.* 1990, 1999).

The plants found on the island appear to be of only one type. All plants observed, both alive and preserved, had leaves with green blades spotted by irregularly shaped, grey-green blotches. This plant fits the description of *C. marmoratum* Mathieu, a species in synonymy with *C. bicolor*; that was collected near Guayaquil, Ecuador. The lack of variation would suggest that all the plants on the island originated from a single introduction. How these plants reproduce is uncertain. They do flower, but the exact length of the reproductive season is uncertain. L. Au (pers. comm.) observed the species flowering near Kurtistown during September. The specimen collected by Herbst and Ishikawa near Mountain View has an inflorescence and was collected in mid-December. No inflorescences were observed in 2007 or 2008 during the month of July. Sexual reproduction in *C. bicolor* is not common nor well understood. In July 2005 on the island of Trinidad, Ressler (2006) found only 12 plants with inflorescences, and only one of those plants

appeared to be producing fruits. In July 2007, two inflorescences were found containing probable pollinators (two species of beetles) and two plants had mature infructescences (Ressler, unpubl.). It is quite possible that sexual reproduction in this species does not occur on the island of Hawai'i. Complete or near complete reliance on asexual reproduction would help explain the lack of variation, but it also raises questions about how the species was dispersed over its present range.

Material examined. HAWAII: Puna Distr, land of 'Ōla'a, along North Kūlani Rd ca ½ mile from Mountain View, flowers white, foliage green with spots, 425 m (1400 ft), 16 Dec 1975, D. Herbst & S. Ishikawa 5596.

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Notes on grasses (Poaceae) in Hawai‘i: 2¹

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This is the second article (Snow 2008) of an anticipated series that reports on the distribution and nomenclature of grass species in Hawai‘i, which continue to arrive steadily into the State and which are still incompletely known (e.g., Catalán *et al.* 2009) (see Imada 2008 and Wagner *et al.* 2005 for more current lists). It may be of interest to botanists and public lands managers that a key to grasses of the Pacific will be available soon (Clayton & Snow, in press).

Reported here for Hawai‘i are 10 extant state records and 3 additional species identified tentatively, 1 historical state record from experimental plots, 1 extirpated state record, 7 island records, 2 name changes, 1 non-native species with the potential to escape cultivation, and a few taxonomic notes and corrections. Keys to species of *Paspalum* and *Andropogon* in Hawai‘i are presented in light of new additions to our flora. Some comments about the native species of *Eragrostis* are included, as for example the overlooked occurrence of short rhizomes on some species. A reminder concluding this article emphasizes the critical importance of sampling the entire grass plant (particularly the base and roots) for making correct identifications. All vouchers were identified by the first author, except where noted, and are housed at the *Herbarium Pacificum* (BISH).

Agrostis hyemalis (Walter)

New state record

Britton, Sterns & Poggenb.

This non-native species is widespread in North America from South Dakota and Texas east through Maine, and south into Central America and the Caribbean (Harvey 2007). This is its first report from the Pacific Basin.

Material examined. O‘AHU: Wai‘anae Range, Mākua rim, on 3 Points trail, towards west Makaleha, ca 400–600 m W Ka‘ala Rd, 3 Apr 2007, *USARMY* 54; outside front gate near Mt Ka‘ala parking area, 3 May 2007, *USARMY* 56.

Andropogon bicornis L.

New state record

Andropogon bicornis is a widespread species native to the neotropics (Campbell 2003). The specimens cited below had been identified previously as *Andropogon glomeratus*, *A. virginicus*, or *Schizachyrium scoparium*. Using various keys (e.g., Pohl 1980; Renvoize 1984; Campbell 2003), and after consulting comparative material of *A. bicornis* at BISH from its native range that has been identified reliably by A. L. Hitchcock or G. Davidse, we believe these specimens compare well to *Andropogon bicornis*. Two character states differ slightly from typical specimens of the species [see Barkworth (2003: 602–608) for terminology and illustrations of spikelet and inflorescence morphology for tribe Andropogoneae]. First, some of our specimens (e.g., *Imada 99-10 et al.*) have a relatively high number of well-developed pedicellate spikelets, which contrasts with the more typical situation wherein only the terminal pedicellate spikelet of a rame is well-devel-

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oped (Pohl 1980: 42). Second, the length of the anthers can be somewhat less than the 1.0–1.4 mm reported by Campbell (2003). However, the lack of awns on the sessile (fertile) spikelets accords well with descriptions of *A. bicornis* in Renvoize (1984: 275), which is atypical for most species of the genus, and other characters of our material generally compare well with the specimens seen by Hitchcock or Davidse. At the time the collections were made, specimens on Kauaʻi were reportedly occasional (Flynn *et al.* 2079 Wagner & Hanford 6278) to common (e.g., Flynn *et al.* 2717, Imada 2001-58), and ranged from ca 30–910 m. Based on our revised analysis, *A. bicornis* has been collected on Kauaʻi near pond margins, along roadsides, disturbed areas in low elevation rainforests, on ridges at ca 450 m, in stunted forests at ca 655 m, and from dry shrubland at ca 910 m. We believe that the additional specimens cited below represent the same taxon. However, we recommend that additional fertile material be collected in duplicate so that it can be sent to other specialists for confirmation.

Material examined: **KAUAI:** Wainiha Valley Road, 18 Sep 1987, *L. Ishii s.n.* (BISH 635082); Hanalei Distr, Limahuli Valley, west side of ridge separating Limahuli and Hanakāpīʻai Valleys, above waterfall, 1600–2060 ft [ca 490–630 m], 10 Dec 1987, *T. Flynn et al.* 2679; Waimea Canyon State Park, Hwy 550 near hunter check-in station, ca mile 7.2, ca 2500 ft [ca 760 m], 27 Jan 1988, *T. Flynn et al.* 2717; along the border of Hanalei and Kawaihau Districts, Forest Reserve lands, summit camp area of the Powerline trail, ca 2150 ft [ca 655 m], 3 Oct 1989, *T. Flynn et al.* 3547; Hanalei District, Hanalei National Wildlife Refuge, above primary taro field, *W.L. Wagner & R. Hanford 6278*, 20 Nov 1989; Waimea Distr, Kahelu Ridge, 22°2′N, 159°43′W, 1400 ft [ca 425 m], 4 Apr 1996, *D.R. Herbst 9773*; Waimea Canyon State Park, Iliu Nature Loop, 22°2′N, 159°39′W, ca 2980 ft [ca 910 m], 7 Mar 1999, *C. Imada et al.* 99-10; Hanalei Distr, Kāhili ahupuaʻa, small excavated pond along feeder stream on east side of Puʻu Ka Ele Reservoir, 22°11′N, 159°23′W, 480 ft [ca 145 m], 27 Sep 2001, *C. Imada 2001-58*.

Andropogon glomeratus (Walter)

Britton, Sterns & Poggenb. var. *pumilus*
(Vasey) L. H. Dewey

Island records and taxonomic note

The specimens of this taxon cited below were annotated for the Oahu Invasive Species Committee by Chris Campbell (1983, 1986, 2003), who has studied the species complex over many years. *Andropogon glomeratus* comprises at least 5 currently recognized varieties in North America (Campbell 2003), but this is the first confirmed identification at the varietal level for Hawaiian material, although it was previously misidentified from Kauaʻi (Herbst & Clayton 1998: 18). In its native range, variety *pumilus* occurs in disturbed and wet sites from the southern United States through Central America into northern South America (Campbell 2003).

Andropogon glomeratus var. *pumilus* is known from Midway, Oʻahu, and Hawaiʻi islands. It was first collected on Midway on 5 January 1979, though it was misidentified as *A. virginicus* (see *A. virginicus* discussion below). According to the specimen label data it had been recently established near the runway. It was first collected in the main islands on Oʻahu in 2002, from Hālawā Valley along the newly constructed H-3 freeway, occasionally growing in dense thickets. After it was originally identified as *Schizachyrium condensatum* an eradication program was started by the Oʻahu Invasive Species Committee (but see note below about confirmed distribution of *S. condensatum* in Hawaiʻi). It was next collected from the Big Island in 2003 in the Kahuku unit of Hawaii Volcanoes National park, where it was a common grass in pastures at 700 m.

In Hawaiʻi, *A. glomeratus* var. *pumilus* grows in a wide range of habitats, such as in ditches and disturbed areas of an atoll, mesic to wet areas of disturbed lowland sites, secondary forests from sea level to 700 m, and the windward Koʻolau Pali on Oʻahu. It has been reported but not confirmed from native forest slopes on the leeward side of the Koʻolau summit.

Material examined: **MIDWAY ATOLL:** Sand Island, inland from West Beach, 28°13'N, 177°26'W, 23 Oct 1998, *J.T. Duncan s.n.* (BISH 661392); Sand Island, west Beach trail-cart path, 28°13'N, 177°26'E, 7 Sep 1999, *F. Starr & K. Martz 990407-1*; edge of runway, 5 Jan 1979, *C. Corn s.n.* (BISH 667024); Sand Island, Jan 1993, *K. McDermond s.n.* (BISH 634271). **O'AHU:** Hālawala Valley, 840 ft [ca 255 m], 28 Sep 2005, *A. Lau OISC 002*; 'Āhuimanu, 1030 ft [ca 315 m], 25 May 2006, *K. Metzler A004*; H-3 Fwy on Honolulu side near entrance, ca 1/3 of way down declining section of road, 21°24'N, 157°50'W, ca 1000 ft [ca 305 m], 8 May 2002, *K. Kawelo s.n.* (BISH 687841); Temple Valley residence, 47-464 Hui Kelu St, 19 Jan 2005, *J. Fisher OISC s.n.* (BISH 718772). **HAWAII:** Hawaii Volcanoes National Park, Kahuku Unit, Ka'ū District, ca 700 m [ca 2295 ft], 21 Jul 2003, *T. Tunison s.n.* (BISH 734261).

***Andropogon virginicus* L. var. *virginicus* Island records and taxonomic notes**

Andropogon virginicus was first collected in Hawai'i on the Big Island in 1924, where it can be abundant and dominate roadsides and disturbed dry to mesic areas, particularly on ridges (Wagner *et al.* 1999). The species also occurs on Kaua'i, O'ahu, Moloka'i, Lāna'i, and Maui, although the varietal status of many collections has not been determined. It was reported previously from Midway Atoll, but all collections at BISH were misidentified. Variety *virginicus* is one of three varieties in the species complex (Campbell 1986). In its native range it occurs from Kansas to southern New England south through Colombia (Campbell 2003). The species also is known to hybridize with *A. glomeratus*. The specimens cited below were annotated by Campbell to the varietal level.

Material examined: **KAUAI:** Kōloa Distr, Līhu'e-Kōloa For Res, Wahiawa Mtns, S. of Kapalāoa, along main Wahiawa Strm, 21°59'00"N, 159°30'30"W, 660 m [ca 2165 ft], 8 Sept 1998, *D.H. Lorence & A. Stone 8384* (dups at PTBG, K, US). **O'AHU:** Peacock Flat, Wai'anae Mtns, 1600 ft [ca 490 m], 6 Sep 1973, *G. Spence 210*; Maunawili, naturalized grass in backyard, 28 Sep 1995, *G. Tam s.n.* (BISH 641686).

Excerpting in part from the key provided by Campbell (2003: 651–652), the 3 species of *Andropogon* in Hawai'i can be separated based as such:

1. Sessile (fertile) spikelet of pair awnless; anthers 3 *A. bicornis*
1. Sessile (fertile) spikelet of pair awned; anthers 1 (rarely 3) (2).
- 2(1). Inflorescence in the field appearing somewhat diffuse, distributed somewhat along the culm but not resembling a broom; leaf blades 11–52 cm long; sheaths smooth, rarely somewhat scabrous; ligules 0.2–1 mm long; keels of the lower glumes usually smooth below mid-length, scabrous distally *A. virginicus* var. *virginicus*
2. Inflorescence in the field appearing dense, located at or near the top of the culms and somewhat resembling a broom; leaf blades 13–109 cm long; sheaths usually scabrous; ligules 0.6–2.2 mm long; keels of the lower glumes sometimes scabrous below midlength *A. glomeratus* var. *pumilus*

To summarize the distributions in Hawai'i of the above three species and 2 others from the morphologically similar genus *Schizachyrium*: 1) *Andropogon bicornis* is known from Kaua'i; 2) *Andropogon glomeratus* var. *pumilis* is newly reported here for Midway, O'ahu and Hawai'i but previously was reported incorrectly from Kaua'i; 3) *Andropogon virginicus* is known from Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i; it was reported incorrectly from Midway; 4) *Schizachyrium condensatum* was reported previously but incorrectly from O'ahu (Herbst & Clayton 1998) but is confirmed from the Big Island (Lorence & Flynn 1995); and 5) *Schizachyrium scoparium* is known from Kaua'i, O'ahu, and Maui.

***Brachiaria decumbens* (Stapf) Webster** **New state record**

This species, also known as *Urochloa decumbens* (Stapf) R.D. Webster, is native to Central Africa and has been introduced in various areas as a pasture grass (see comments below regarding *Brachiaria* and related genera). In the Pacific Basin it is also known from the Solomon Islands (Clayton & Snow, in press). In Clayton & Snow (in press) it keys adjacent to, and resembles closely, *B. brizantha* (Hochst. ex Rich.) Stapf. However, *B. decumbens* differs from *B. brizantha* by its flatter and wider (1.0–1.7 mm) raceme branches and somewhat prostrate to stoloniferous growth form (Sharp & Simon 2002). Several specimens in Hawai‘i formerly treated as *B. brizantha* are re-determined below. Based on current holdings at BISH, *B. brizantha* appears to be limited to a single collection from Maui (Oppenheimer 2008: 31) collected from the Hāna District, apart from an experimental planting from 1940 on O‘ahu (*Hosaka* 2553).

Material examined. **KAUAI:** Kōloa Distr, Kalāheo, roadside bank along Ikala Rd, 21°55'48"N, 159°30'57"W, 249 m [ca 815 ft], 15 Oct 2007, *C. Trauernicht* 208 & *M. Clark*; Kōloa Distr, Kalāheo, vacant lot near junction of Kikala and Wawe roads, 224 m [ca 735 ft], 15 Oct 2007, *T. Flynn* 7371. **MOLOKA‘I:** Hawai‘i Plant Materials Center, extremely vigorous growth, probably introduced as a contaminant from seed shipment from Australia, Apr 1993, *R. Joy s.n.* (BISH 634161). **KAHO‘OLAWA:** Moa‘ulanui, near K1 where it heads into the crater, 5 m mauka of rd. (20°33'N, 156°34'W), 395 m [ca 1295 ft], 7 Jun 2004, *F. Starr & K. Starr* 040607-4. **HAWAII:** South Hilo Distr, Hwy 11 near Hilo, 90 m [ca 295 ft], 17 Jun 2003, *L.W. Pratt* 3341.

***Brachiaria plantaginea* (Link.) Hitchc.** **New island record**

This naturalized species has been known previously on O‘ahu, Moloka‘i, and Maui (Imada 2008).

Material examined. **HAWAII:** Ka‘ū Distr, Hwy 11, 49–50 mile marker, 4 Jun 2001, *K.F. Bio* 01-0028-01.

***Brachiaria* (Trin.) Griseb. and *Urochloa* P. Beauv. Taxonomic note**

Some workers have asked the senior author about the nomenclature and generic relationships of *Brachiaria*, *Urochloa*, and related genera, given that some workers have transferred many species from *Brachiaria* into *Urochloa* or *Moorochloa* Veldkamp (Webster 1987; Morrone & Zuloaga 1992; Veldkamp 1996; Simon & Jacobs 2003; Wipff & Thompson 2003; Reinheimer *et al.* 2005). In brief, the morphological, developmental, and molecular data do provide strong cladistic support for generic boundaries. For example, a recent study focusing on spikelet development over a much wider sampling of the tribe Paniceae (Bess *et al.* 2005, Fig. 1) showed *Urochloa* sensu lato (*i.e.*, including elements of *Brachiaria*, *Eriochloa*, *Melinis* P. Beauv., and *Chaetium* Nees) to be polyphyletic. A similar developmental study uncovered eleven developmental traits that are not discernable on mature inflorescences, which (when better understood) might help understand generic relationships (Reinheimer *et al.* 2005). Studies of DNA sequencing using *ndhF* (Aliscioni *et al.* 2003) and nuclear ribosomal markers (Torres González & Morton 2005) found no support for the generic separation of *Brachiaria*, *Megathyrsus* (as *Urochloa maximum*), *Urochloa*, *Melinis*, and *Eriochloa* Kunth. Although the earlier insights of Webster (1987) and Veldkamp (1996) ultimately may be upheld with additional data such that all members of the “*Urochloa* clade” (Aliscioni *et al.* 2003, Fig. 5) are transferred into an enlarged *Urochloa*, additional studies are warranted. Until then, it seems better to follow Imada (2008), who has maintained Hawaiian species in *Brachiaria*. A more traditional view of these genera can be found in Clayton & Renvoize (1986).

***Digitaria bicornis* (Lam.) Roem. & Schult. New state record**

This species is native from the coastal plain of the southeastern United States to the West Indies and northern South America (Wipff 2003), although it is widespread elsewhere (Sharp & Simon 2002). It is easily distinguished in Hawai'i from congeners by the slightly ciliate, short-pedicellate spikelet of a spikelet pair, which is coupled with a long-pedicellate spikelet having appressed to widely divergent, often wavy hairs that may be 1–2 mm long. The collection label indicates the species was locally common in an old pasture.

Material examined. MAUI: West Maui, Wailuku Distr, Waikapū, Kaunoahua (20.822128°N, 156.517394°W), 590 ft [ca 180 m], 22 Feb 2008, *H. Oppenheimer H20816*.

***Eragrostis deflexa* Hitchc. New island record**

The specimen cited was collected in the understory of scrubby mesic *Metrosideros* forest. Previous reports are from Lāna'i, Maui, and Hawai'i (Imada 2008).

Material examined. MOLOKA'I: Kamakou Preserve, land section Makakupa'ia, confluence of the Kūpā'ia and Kaunakakai streams, 823 m [ca 2700 ft], 13 Jun 1990, *J. Lau & J. Obata 3289* (2 sheets).

***Eragrostis dielsii* Pilger ex Diels & Pritz. New state record**

This species is widespread across the interior of Australia, where it closely resembles another (mostly) inland species, *E. pergracilis* S.T. Blake (Sharp & Simon 2002). In Hawai'i, *E. dielsii* most closely resembles *Eragrostis paupera* Jedw. by virtue of its linear spikelets. The latter is native to the equatorial region of the Pacific (Clayton & Snow, in press) and in Hawai'i occurs in the Northwestern Hawaiian Islands on coral sands or gravel, often as a pioneer species (Wagner *et al.* 1999; Wagner *et al.* 2005). The following key should separate most specimens of *E. dielsii* and *E. paupera*:

Plants annual or perennial; culms prostrate to geniculate or ascending (only sometimes erect), up to 55 cm tall; panicles exerted completely, the apex somewhat to considerably exceeding uppermost leaves; second glume ca 1.5 mm long *E. dielsii*

Plants perennial; culms mostly stiffly erect, up to 20 cm tall; panicles usually partially inserted near the base, the apex shorter than or only slightly exceeding tips of uppermost leaves; second glume ca 2 mm long *E. paupera*

The habit of the specimen of *E. dielsii* from Moloka'i cited below is reported as “flat starburst, not at all upright”, whereas that of *E. paupera* is said to be “strictly erect” (Wagner *et al.* 1999: 1543). According to the collection label the species was growing in sand near the coast and was locally common.

Material examined. MOLOKA'I: Kalama'ula, west of Kaunakakai, 'Ōhi'apilo wetland (N21.10267, W157.05107), ca 5 m [17 ft], 24 Feb 2008, *A. Dibben-Young s.n* (BISH 731529).

***Eragrostis variabilis* (Gaud.) Steud Taxonomic note**

Eragrostis hobdyi H. St. John was overlooked as a synonym for this species in Wagner *et al.* (1999).

***Eragrostis pectinacea* (Michx.) Nees Historical state record and taxonomic note**
var. *miserrima* (E. Fourn.) Reeder

The typical subspecies is known from all the larger islands of Hawai'i. The specimen cited below is the first report of var. *miserrima* for Hawai'i. However, since it appears to be extirpated in Hawai'i, it probably should not be tabulated as an element of our flora unless it is

recollected. More generally, Clayton & Snow (in press) discuss how species lists that include non-native taxa that have been extirpated long ago overinflate true estimates of extant biodiversity.

Material examined. **KAUAI:** Hanapēpē, in pasture, local patch, dry place, 75 m [ca 250 ft], 31 Oct 1936, *E.Y. Hosaka 1647*.

***Eragrostis pilosa* (L.) P. Beauv.**

New island record

This naturalized species has been collected previously from Kauaʻi and Lānaʻi (Imada 2008).

Material examined: **OʻAHU:** Near Weed Junction, Waialua, common along sterile roadside, 22 Jan 1958, *O. & I. Degener 25648*.

***Eragrostis trichophora* Coss. & Durieu**

New state record

This species is native to Africa, where it is said to typically occupy moist, disturbed, or overgrazed areas (Peterson 2003). The specimen is a good match overall to the description provided in Peterson (2003), although some synonymize it under *Eragrostis cylindriflora* Hochst. (D. Clayton, pers. comm., 2008). The species can be distinguished from others in Hawaiʻi by the whorled branches at the base of the panicle and the subtending glandular band, the papillose-based hairs over most of the leaf sheaths, subequal glumes, membranous lemmas with inconspicuous lateral nerves, and the light brown, translucent caryopsis, which has a greenish hue at the base.

Material examined: **MAUI:** Kanahā Pond on causeway, dry hard soil, 17 Jan 1981, *R. Hobdy 976*.

Notes on Hawaiian species of *Eragrostis*

Species boundaries can be difficult to consistently quantify or qualify in *Eragrostis* using morphological characters (*e.g.*, Lazarides 1997). During the recent preparation of a key to *Eragrostis* (Clayton & Snow, in press) several noteworthy pieces of information emerged for the genus in Hawaiʻi. First, the genus is badly in need of revision in Hawaiʻi, particularly with regards to the specific boundaries of the highly polymorphic but widespread (in Hawaiʻi) *Eragrostis variabilis* (Gaudich.) Steud. Second, Wagner *et al.* (1999) explicitly mention rhizomes only for *E. atropioides* Hillebr., but four other Hawaiian species also may have shorter, less prominent rhizomes, including *E. fosbergii* Whitney, *E. grandis* Hillebr., *E. leptophylla* Hitchc., and *E. variabilis*. The rhizomes of the latter two species appear short and knotted on herbarium specimens, and *E. fosbergii* is known only from the type specimen. Third, the specimen (*Hitchcock 14493*, see p. 1727) used to illustrate *E. atropioides* in Wagner *et al.* (1999; pl. 227, p. 1727) is appears to be a specimen of *E. variabilis*. Hitchcock (1922: 129) himself identified the specimen as *E. atropioides*, but it lacks the erose, obtuse lemmatal apices characteristic of that species (Hillebrand 1888: 532; Hitchcock 1922: 129). In contrast, the specimen illustrated for *E. atropioides* in Hitchcock (1922: 128) does have obtuse, erose lemmatal apices and in my view is correctly identified. Fourth, whereas Wagner *et al.* (1999) report 8–12(–14) florets per spikelet for *E. variabilis*, some specimens (as the species is presently construed) have up to 36 florets (*e.g.*, *Hitchcock 14493* [BISH]).

***Eriochloa procera* (Retz.) C.E. Hubb.**

New island record

Oppenheimer (2008) first reported this species for Hawaiʻi from the island of Molokaʻi. The record below represents its first occurrence in the Northwestern Hawaiian Islands. Its native range is from tropical Asia through Australia, although it is also widespread in the western Pacific Basin (Clayton & Snow, in press).

Material examined. **MIDWAY ATOLL:** Sand Island, sector 26, near fuel farm-seal ramp, 20 Jun 1999, *Starr 990620-1 & Martz.*

***Ischaemum ciliare* Retz.**

Name change

This species is known in Hawai‘i from a single collection from Maui and was reported previously (Herbst & Clayton 1998) using the name *I. indicum* (Houtt.) Merr. (e.g., Imada 2008) The species is native to and widespread in tropical Asia. Bixing & Phillips (2006: 611) indicate why the newer name is correct.

***Oplismenus hirtellus* (L.) P. Beauv.**

New state record

subsp. *undulatifolius* U. Scholz

When Scholz (1981) monographed the genus *Oplismenus*, he recognized *O. hirtellus* subsp. *hirtellus* as occurring in Hawai‘i. Although Wagner *et al.* (1999) did not recognize taxa at the infraspecific level, other authors (Zuloaga & Morrone 2003; Morales 2003) have followed Scholz (1981) by recognizing at least some infraspecific taxa. Recent review of Hawaiian material at BISH indicates a majority of collections represent the nominate subspecies; however, subsp. *undulatifolius* is now known from most of the large islands. Subspecies *undulatifolius* is separable from the typical subspecies by the presence of papillose-pilose hairs on the leaf sheaths (check younger sheaths) and (less frequently) the culms. The collections of Remy from the Big Island, and that of Andersson from O‘ahu, suggest that this subspecies has been present in Hawai‘i for over 150 years. The collections from Maui indicate the native name for this plant as *honohono* (or *honohono maoli*), which is used medicinally for cuts.

Material examined. **KAUA‘I:** Kanaele Swamp (Wahiawa Bog), ca 640 m [ca 2100 ft], 27 Aug 1983, *W.L. Wagner et al. 4993*; 3.2 mi. northwest of Wailua Experiment Station, Līhu‘e-Kōloa Forest Reserve, 150 m [ca 500 ft], 20 Aug 1973, *S. Ishikawa & D. Herbst 278*. **O‘AHU:** Lyon Arboretum, sect. 21, 14 Oct 1967, *D. Herbst 654*; without locality or date, *H. Mann & W.T. Brigham 328*; Honolulu, Jul 1852, *Andersson s.n.* (BISH 119697); Waikāne-Schofield Trail, Ko‘olau Mts, 270 m [ca 885 ft], 16 Oct 1932, *F.R. Fosberg & K. Duker 8782*; trail from Maunauna to Kolekole Pass, Wai‘anae Range (150.05W, 21.28N), ca 490 m [ca 1600 ft], 9 July 1964, *M.R. Crosby & W.R. Anderson 1716*; valley bottom, Pu‘u Ka‘ala, Wai‘anae Mts, 425 m [ca 1400 ft], 23 Oct 1932, *E.H. Bryan s.n.* (BISH 19677). **MOLOKA‘I:** Wailau Valley, north coast of east Moloka‘i, 100 m [ca 320 ft.], 3 Jul 1933, *F.R. Fosberg 9632*; bog, upper Monroe Ranch above Kinalu, 1065 m [ca 3500 ft], 5 Sep 1936, *Whitney s.n.* (BISH 119665). **MAUI:** Hāna [without collector or date (BISH 406025) and most likely a duplicate of the next cited specimen]; Hāna, 600 m [ca 1970 ft], Jun 1933, *E.S. Handy 33-15*. **HAWAI‘I:** Koa Kīpuka between Pāhala Road and Cone Peak, 1160 m [ca 3800 ft], 3 Jun 1943, *G.O. Fagerlund & A.L. Mitchell 613*; Hawai‘i [no further data], [Voyage of] *M.J. Remy 104*.

***Panicum virgatum* L.**

Correction

Wagner *et al.* (1999, 2005) list this taxon from one (putatively) naturalized collection from O‘ahu in 1938. The specimen (without collector) is from Poamoho and was almost certainly collected from the Agricultural Experimental Station by that name in Waialua. The label also indicates “Volunteer with *Andropogon furcatis*” further suggesting that the latter was under experimental trials. As such, there is no evidence that this species was ever naturalized in Hawai‘i, and the species probably should not be considered a part our flora (e.g., Clayton & Snow, in press).

***Paspalum* aff. *laxum* Lam.**

Taxonomic note

The specimen cited below was initially identified as *P. paniculatum* L. and reported (Oppenheimer 2007) as a range extension for that species from West to East Maui.

However, the specimen does not match *P. paniculatum* in many respects nor other congeneric species known from Hawai‘i. The specimen appears to most closely resemble a specimen at BISH of *Paspalum laxum* (Hiram s.n. [BISH 126409]) from Puerto Rico. However, the Hiram specimen has not been confirmed against additional specimens of *P. laxum* or confirmed by another specialist. Moreover, it does not compare well in some respects to the species description in *Flora of North America* (Allen & Hall 2003). In some treatments (e.g., Smith *et al.* 1983) the specimen keys most closely to *P. millegrana* Schrad., but it does not compare well with the one specimen of that taxon presently housed at BISH (León & Hiram 4364). Until additional material can be collected and sent out for confirmation by other specialists, it seems best to merely note the affinities of the specimen with *P. laxum*, which otherwise is unknown for Hawai‘i or the Pacific Basin region (Clayton & Snow, in press).

Material examined. MAUI: East Maui, Hāna Distr, Kīpahulu, between Koukouai and Opelu, Ma‘ulili ahupua‘a. 20.660187°N, 156.067674°W, 207 m [ca 680 ft], 16 Oct 2005, H.L. Oppenheimer H1100509.

***Paspalum pilosum* Lam.**

New state record

The native range of this species is Central America to Bolivia and Brazil (Renvoize 1984), and its report here appears to be the first for the Pacific Basin. Among species growing in Hawai‘i it most closely resembles *P. setaceum* Michx. However, it can be distinguished from *P. setaceum* by the triangular first glume present on the lower spikelet of a spikelet pair and the upper spikelet pair bearing only the rudiment of a first glume. The spikelet morphology just mentioned is well illustrated in Pohl (1980: 439), who reports the species as being “rather weedy” in Central America from ca 400–1200 m in savannas, roadsides, disturbed areas, and pastures.

Material examined. MOLOKA‘I: Keōpukaloa, between Honoko‘i and Pāpio Gulches (21.146321°N 156.743091°W), common in pastures and waste areas, 295 m [ca 965 ft], 6 Nov 2007, H.L. Oppenheimer H110708.

***Paspalum* aff. *thunbergii* Kunth ex Steud.**

Taxonomic note

A specimen recently sent from Maui by Hank Oppenheimer led to a re-examination of all material at BISH previously identified as *Paspalum scrobiculatum* L. The *Herbarium Pacificum* has several dozen records of *P. scrobiculatum* from most of the larger Hawaiian islands (Imada 2008: 87) and most material appears to be correctly identified. The earliest collections of *P. scrobiculatum* from the early 1850s were from O‘ahu and made (separately) by Andersson, Remy, and Mann and Brigham.

Apart from the Oppenheimer specimen, the specimens cited below were identified initially as *P. scrobiculatum*. Further analysis reveals that they differ from that species by virtue of their greenish (not brownish) upper floret, pubescence on the nodes and upper and lower surfaces of the leaf blades, and sparse hairs along the margin of the upper glumes. Morphologically, the specimens seem to resemble *P. thunbergii* most closely, although they may have leaf blades up to ca 21 mm wide (e.g., *Hobdy* 2913). The differences between *P. thunbergii* and *P. scrobiculatum* are summarized in Chen & Phillips (2006: 530), the former of which is said to have leaf blades only 5–8 mm wide (Chen & Phillips 2006). Derek Clayton (pers. comm., 2008) indicated that some specimens of *P. thunbergii* from Japan and housed at Kew (K) have leaf blades considerably broader than 8 mm. The specimens cited below, apart from the wider leaf blades, are a fair match for the description provided in Chen & Phillips (2006), and in general resemble the single

specimen at BISH of *P. thunbergii* from its native range in southern Asia (Walken et al. 6288, from Okinawa). The nearest reported occurrence of *P. thunbergii* to Hawai'i is Niue (Sykes 1970), but the senior author has seen no specimens.

Paspalum is a large genus, and the first author has not been able to test the specimens below against recent keys from northern South America, nor been able to compare them to many species native to the neotropics. The most advisable course of action at this time seems to be to simply point out that these specimens resemble *P. thunbergii* closely, so that additional material may be secured and analyzed, but without any formal declaration herein that the species occurs in Hawai'i.

Material examined. O'AHU: Ko'olau Mts, Pūpūkea-Paumalū, Ko'olau Loa, common along open trails through *Casuarina* forests, ca 150 m [ca 500 ft], 6 Dec 1987, K.M. Nagata & W. Takeuchi 3750. MAUI: East Maui, Hāna Distr, Keōpuka, locally common grass with *P. urvillei* along Hāna Hwy, 195 m [ca 640 ft], 23 Aug 2007, H. Oppenheimer H80703; Kūhiwa Road, 28 Jul 1987, R. Hobdy 2913 & 2914; Keōpuka; occasional, scattered patches, 5 Apr 2005, F. Starr et al. 050405-50.

***Paspalum virgatum* L.**

New state record

This introduced species is native to Central and South America. It is well established locally in the Kahuku Training area and the East Range in Schofield Barracks in degraded lowland forests and in roadside vegetation. The culms are tall (to ca 1.5 m) and thick at the base, and the leaves are stiff and sharp on the edges. The spikelets occur in four rows along the flattened panicle branches (racemes), or may occur in two rows with one-half of each spikelet pair being rudimentary. The raceme margins are ciliate with shorter (and more common) stiff hairs and much longer (but less frequent) hairs. Although the species is covered in *Flora of North America* (Allen & Hall 2003), where its description matches well with the specimens cited below, the accompanying illustration therein appears to omit important details of indumentum of the spikelet branches and florets. The specimens cited below all are a good match with the single specimen housed at BISH of this species (*A.H. Curtiss 501*, from Isla de Pinos, West Indies), a duplicate of which exists at Kew (K) and which was annotated as such by Agnes Chase of the Smithsonian Institution (D. Clayton, pers. comm., 2008). The nearest known naturalized occurrences are from the Atherton Tablelands in northeastern Queensland (B. Simon, pers. comm., 2008), but it is otherwise unknown from the Pacific Basin (Clayton & Snow, in press). Relatively recent descriptions of the species (Renvoize 1984; Pohl & Davidse 2001; Sharp & Simon 2002; Allen & Hall 2003; Morales 2003) indicate a caespitose growth form for *P. virgatum*. However, after the initial material was identified, large amounts of additional fresh material were brought to the senior author for further examination after a request to extract as much of the root system as possible. The fresh specimens all had a thick rhizome that equaled or exceeded the diameter of bases of the culms, and which evidently grew downward for several centimeters before adopting a more horizontal growth orientation. Although the descriptions (just cited above) for the species lack any mention of rhizomes, the illustration in *FNA* (Allen & Hall 2003: 582) captures the rhizomatous basal portion of the culm, as evidenced by at least seven greatly shortened internodes below the lowermost leaf sheath. The presence of the deep-seated rhizome suggests this will not be an easy species to eradicate mechanically when it becomes established. Finally, a color plate in Morales (2003: both sides opposite of p. 177) indicates that the spikelets may be dark pink to maroon in fresh material, which may aid in its initial identification in the field.

Material examined. O'AHU: Kahuku Training Area, ridge between 'Ōhi'a and 'Ō'io gulches,

Water Tank Hill landing zone, 275 m [ca 900 ft], 4 Jun 2003, *K. Kawelo s.n.* (BISH 695054); Schofield Barracks East Range (UTM 2377674, 603043), 27 Feb 2008, *K. Kawelo USARMY 83*; Schofield Barracks East Range, 490–550 m [ca 1600–1800 ft], *K. Kawelo s.n.* (BISH 704706).

Updated key to the species of *Paspalum* in the Hawaiian Islands

Some 15 to 17 species of *Paspalum* are now known in Hawai'i, an increase of at least 9 species over that reported in Wagner *et al.* (1999). The following key should separate reliably material in Hawai'i:

1. Glumes both absent *P. malacophyllum*
1. Glumes, or at least the upper, present (2).
- 2(1). Upper glume fringed with a ragged papery wing *P. fimbriatum*
2. Upper glume wingless (3).
- 3(2). Margin of upper glume with a ciliate fringe (4).
3. Margin of upper glume glabrous or with sparse, short, appressed hairs (7).
- 4(3). Upper floret dark brown; plants robust, stoloniferous (easily overlooked unless the complete rootstock is examined) *P. virgatum*
4. Upper floret greenish to straw-colored (5).
- 5(4). Racemes 2, arising opposite; plant stoloniferous *P. conjugatum*
5. Racemes 3–20; plants caespitose (6).
- 6(5). Racemes mostly 3–7; spikelets 2.8–4 mm long *P. dilatatum*
6. Racemes mostly 10–20; spikelets 2–2.8 mm long *P. urvillei*
- 7(3). Mature upper floret brown (8).
7. Mature upper floret yellow, greenish, or straw-colored (9).
- 8(7). Spikelets borne singly in 2 rows (often rust-colored) *P. scrobiculatum*
8. Spikelets borne in 4 rows *P. longifolium*
- 9(7). Spikelets borne singly (10).
9. Spikelets paired (13).
- 10(9). Leaf blades pilose on both sides; plants caespitose; racemes 2–5 *P. aff. thunbergii*
10. Leaf blades glabrous; plants caespitose or rhizomatous; racemes paired or rarely 3–5 (11).
- 11(10). Plant rhizomatous; upper glume and lower lemma cartilaginous, glabrous; spikelets broadly elliptic, plumply plano-convex *P. notatum*
11. Plant stoloniferous; spikelet parts with a thinner texture, hairy or glabrous; spikelets flattened or plump (12).
- 12(11). Spikelets ovate, plump; upper glume obscurely hairy, thinly coriaceous *P. distichum*
12. Spikelets ovate-elliptic, flattened; upper glume glabrous, papery *P. vaginatum*
- 13(9). Upper glumes occurring on each member of spikelet pair highly dimorphic; upper glume of lower spikelet in pair triangular and at least triple the length of upper glume of upper spikelet; upper glume of upper member of spikelet pair much broader than long, less than 1/8 length of spikelet *P. pilosum*
13. Upper glumes of members of spikelet pairs not highly dimorphic (14).
- 14(13). Upper glume glabrous (15).
14. Upper glume hairy (16).
- 15(14). Panicles terminal and axillary, the axillary ones partially to completely inserted in subtending leaf sheath *P. setaceum*
15. Panicles terminal *P. aff. laxum*
- 16(14). Spikelets 1.3–1.4 mm long, suborbicular; racemes (10–)15–60 *P. paniculatum*
16. Spikelets 2.0–2.7 mm long, elliptic; racemes 5–10(–15) *P. macrophyllum*

Rytidosperma biannulare* (Zotov)*Correction**

Connor & Edgar

A proofreading oversight by the senior author of the recent report of this species in Hawai'i (Snow 2008) resulted in contradictory information about its native range. The correct native range for the species is New Zealand (Edgar & Connor 2000). It is introduced in Hawai'i, Australia (Sharpe & Simon 2002), and North America (Darbyshire & Connor 2003).

Sorghum arundinaceum* (Desv.) Stapf*New state record**

This newly naturalized species is native to the paleotropics but widespread elsewhere (Sharp & Simon 2002; Clayton & Snow, in press). The specimens cited were collected at elevation between ca 1000–1250 ft [ca 305–380 m], along roads with other non-native species. It can be distinguished from other species of *Sorghum* in Hawai'i by its relatively thin (*i.e.*, not stout) panicle branches and the absence of rhizomes (see note at end regarding collecting grasses).

Material examined. HAWAII: Puna Distr, Hwy 130, 14–15 mile marker, 19 May 2005, *K.F. Bio 05-0002*; Ka'ū Distr, Hwy 11, 49–50 mile marker, 4 Jun 2001, *K.F. Bio 01-0029-01*.

Sporobolus pyramidatus* (Lam.) Hitchc.*Correction and new island record**

The specimen below was cited previously (Herbst & Clayton 1998) as a new island record for the Big Island under the name *Sporobolus piliferus* (Trin.) Kunth. Thus, the only documented vouchers of *S. piliferus* are from Midway Atoll (Starr *et al.* 2009) and O'ahu (Snow 2008). The range of *S. pyramidatus* now extends from Midway Atoll (Starr *et al.* 2009), Kure Atoll, Laysan, French Frigate Shoals, Kaua'i, O'ahu, Moloka'i (Imada 2008), and Hawai'i.

Material examined. HAWAII: Hāpuna Beach State Park, 25 Feb 1994, *C. Imada et al. 94-3*.

Thysanolaena latifolia* (Roxb. ex Hornem.)*Nomenclatural change and notes**

Honda

Collections of this species have been made on Kaua'i, O'ahu, and Hawai'i, and have been filed at BISH under the name *T. maxima* (Roxb.) Kuntze. However, Baaijens & Veldkamp (1991: 451) outlined the reasons why the correct name is *T. latifolia*. Although it is known along a hiking trail on O'ahu where it was planted long ago. Clyde Imada (pers. comm., 2008) believes the species is not yet truly naturalized, although it is known along a hiking trail where it was evidently planted long ago.

Melinis nerviglumis* (Franch.) Zizka*Cultivated but with potential to naturalize**

This species recently has been observed in cultivation in the Wailupe area, Waipio, and Hawai'i Kai on O'ahu. At the Wailupe and Waipio localities it was reseeding itself in the areas immediately adjacent to where it was found being cultivated. In Hawai'i Kai there was no evidence that it was reseeding itself in the one yard where it was found growing along the sidewalk (Snow, pers. observ, 2009). The species has not been documented elsewhere in the State, but has clearly shown the ability to self-perpetuate from seed, and as such is a potential weed in Hawai'i. Future reports are encouraged to follow the recommendations of terminology recently summarized by Pyšek *et al.* (2004) if further evidence of naturalization is detected. The native distribution of *M. nerviglumis* is southern Africa (South Africa, Lesotho, and Swaziland) and Madagascar, where it can be locally abundant (Gibbs-Russell *et al.* 1990). The species closely resembles the widespread weedy species *M. repens* (Willd.) Zizka, but can be distinguished from that species by its tightly over-

lapping basal leaf sheaths, strongly involute leaves, and awns mostly <2 mm. The panicle among specimens observed on O'ahu are somewhat more contracted than typical among the weedy *M. repens*, although Lyn Fish in Pretoria (pers. comm., 2009) indicates this is a subtle and not always reliable character for separating *M. nerviglumis* and *M. repens*. Vouchers were not pressed for the plants found at Waipio and Hawai'i Kai, but they were an excellent match for the voucher cited below.

Material examined: O'AHU: Wailupe, at 1132 Waianiani, 24 Mar 2009, sparingly adventive, OED 2009032402.

Important note regarding the collection of grass specimens for identification: The base of the culms and at least a part of root system should always be collected, as most dichotomous and interactive keys rely heavily on whether plants are annual or perennial, and whether stolons or rhizomes are present. "Top-snatching", in which the lower portions of the culms and root systems are not collected, should always be avoided. In the opinion of the first author, the best collecting tool to effectively and quickly dig up herbaceous plants with their root systems is a mason's hammer, which is highly effective even in heavy clay soils. When workers know or suspect that they may have a specimen that represents a new island or new state record, and/or one that will be sent to the Herbarium Pacificum for identification, it is requested that adequate material is collected for preparation of 3 or 4 complete herbarium specimens. This will enable the Bishop Museum to send duplicate specimens out for verification by specialists at other herbaria.

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New plant records from the Hawaiian Archipelago

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The following contributions include 19 new plant records for the islands of Kure Atoll (1), Midway Atoll (7), Lāna'i (9), Kaho'olawe (1), and Maui (1). The records are comprised of one new state record and 18 new island records. All but one of the records are non-natives. Images of most of the material examined can be seen at <www.hear.org/starr>. Voucher specimens are housed in the Bishop Museum's *Herbarium Pacificum* (BISH), Honolulu, Hawai'i.

Acanthaceae

Ruellia brevifolia (Pohl) C. Ezcurra **New island record**

Ruellia brevifolia (ruellia) is occasionally cultivated as an ornamental plant and is reported as naturalized on the islands of Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.* 1999; Oppenheimer 2003). It is now also known from Lāna'i, where it was common on the margins of Lāna'i City. This collection represents a new island record for Lāna'i.

Material examined. LĀNA'I: Lāna'i City, Queens St, on side of road, in association with *Eugenia uniflora* and *Lantana montevidensis*, 488 m (1600 ft), 3 Apr 2007, Starr & Starr 070403-03.

Thunbergia alata Bojer ex Sims **New island record**

Thunbergia alata (black-eyed Susan vine) is commonly cultivated and naturalized in tropical areas throughout the world. First collected in the Hawaiian Islands in 1864 and now documented as sparingly naturalized on the islands of Kaua'i, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999; Oppenheimer 2003), this collection represents a new island record for Lāna'i.

Material examined. LĀNA'I: Lāna'i City, Queens St, on side of road, in association with *Olea europaea* subsp. *cuspidata* and *Lantana montevidensis*, 488 m (1600 ft), 3 Apr 2007, Starr & Starr 070403-02.

Thunbergia fragrans Roxb. **New island record**

Thunbergia fragrans (sweet clock vine) is an agricultural weed that was first collected on Kaua'i in 1916 and is now known to be naturalized on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999; Starr *et al.* 2006). On Lāna'i, this species was spreading in residential and scrub areas of Lāna'i City. This collection represents a new island record for Lāna'i.

Material examined. LĀNA'I: Lāna'i City, Queens St, on side of road, in association with *Clusia rosea* and *Sphaeropteris cooperi*, 488 m (1600 ft), 3 Apr 2007, Starr & Starr 070403-02.

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Asteraceae***Centratherum punctatum* Hassl. New island record**subsp. ***punctatum***

Centratherum punctatum subsp. *punctatum* (centratherum) was previously reported from Kauaʻi, Molokaʻi, Maui, and Hawaiʻi (Lorence *et al.* 1995; Oppenheimer 2003; Starr *et al.* 2004; Starr *et al.* 2006). This purple-flowered plant grown as an ornamental is now also known from Lānaʻi, where it was collected in Kapano Gulch, just outside of Lānaʻi City.

Material examined. **LĀNAʻI:** Kapano Gulch, on side of dirt road, in association with *Pittosporum viridiflorum* and *Falcataria moluccana*, 450 m (1476 ft), 2 Apr 2007, Starr & Starr 070402-07.

***Delairea odorata* Lem. New island record**

Delairea odorata (Cape ivy) was previously known to be naturalized on Maui and Hawaiʻi (Wagner *et al.* 1999). On Lānaʻi, this vine was found sprawling about a wooded lot on the corner of Ninth and Queens St, Lānaʻi City. This collection represents a new island record for Lānaʻi.

Material examined. **LĀNAʻI:** Lānaʻi City, corner of Ninth St and Queens St, sprawling along road and up in trees, growing with *Ruellia brevifolia*, *Oxalis corniculata*, and *Araucaria columnaris*, 545 m (1787 ft), 4 Apr 2007, Starr & Starr 070404-01.

***Dyssodia tenuiloba* (DC.) B.L. Rob. New island record**

Dyssodia tenuiloba (dog fennel, lemon drop), a yellow-flowered bedding plant, was first reported in Hawaiʻi as naturalized in 2002 and is now known from the islands of Kauaʻi, Oʻahu, Molokaʻi, Maui, and Kahoʻolawe (Starr *et al.* 2002; Starr *et al.* 2006; Lorence & Flynn 2006). It is here reported as a new island record for Lānaʻi, where it was cultivated in a few yards of Lānaʻi City and locally common and naturalized near the dump along Kaumālapaʻu Rd, where it was collected. Naturalized populations were also observed near the cemetery above Kōʻele and along Keōmuku Rd.

Material examined. **LĀNAʻI:** Kaumālapaʻu Rd, near dump, locally common and naturalized in area of dry scrub in association with *Cenchrus ciliaris* and *Emilia fosbergii*, 262 m (860 ft), 2 Apr 2007, Starr & Starr 070402-01.

***Flaveria trinervia* (Spreng.) C. Mohr New island record**

Flaveria trinervia (flaveria) was previously reported from Kauaʻi, Oʻahu, Maui, and Kahoʻolawe (Lorence *et al.* 1995; Herbst & Wagner 1996; Wagner *et al.* 1999; Oppenheimer 2003). In 2001, it was also observed and collected on Kure Atoll and is here reported as a new island record.

Material examined. **KURE ATOLL:** Common on the runway, near quarters, and the southwest tip of the island, along with *Ciclospermum leptophyllum*, *Lobularia maritima*, *Scaevola taccada*, and *Verbesina encelioides*, 3 m (10 ft), 22 May 2001, Starr & Starr 010522-02.

***Perityle emoryi* Torr. New state record**

Perityle emoryi (rock daisy) is native to the southwestern states of California, Nevada, Utah, and Arizona, and to northern Chile, South America (PLANTS 2008; Belov 2008). In California, rock daisy occurs mostly in desert areas but may also occasionally be found in coastal sage scrub in southern counties (Charters 2008). It is commonly found in crevices of cliffs and rocky dry slopes to 915 m (3000 ft). In Chile, it occurs in similar sites, including coastal areas and mountains up to 1830 m (6000 ft) with an arid climate

characterized by drought for many months of the year and occasional morning frost (Belov 2008). This winter annual can be distinguished by the following characteristics: “Stout, somewhat brittle-branched, glandular-pubescent and sparsely hirsute annual growing to about 16 in tall. The leaves are alternate, to 4 in long, broadly cordate to ovate, petioled, and coarsely-toothed to palmately lobed with the lobes again lacinate-toothed. The flowering heads are radiate and solitary on the ends of short stems. The ray flowers are white and fairly inconspicuous, and are 10–13 in number. The disk flowers are yellow. The hemispheric to bell-shaped involucre is roughly 1/4 in high and has two series of thin-margined, glandular-pubescent phyllaries with ciliate tips. There is a pappus which consists of a crown of very small scales and a single slender bristle or awn. This latter may be absent. Both the ray flowers and the disk flowers have achenes, those of the rays are puberulent on their faces while those of the disk flowers are glabrous.” (Charters 2008). In Hawai‘i, this plant was recently collected from the island of Kaho‘olawe. It was first observed during the UXO cleanup in a gravel pile near the K1 road at Honokanai‘a. From there, it quickly spread locally to rocky areas nearby. Also collected by Ken Wood in 2006 from “LZ Squid.” These collections represent a new state record for Hawai‘i from the island of Kaho‘olawe.

Material examined. **KAHO‘OLAWE:** Honokanai‘a on side of road, just outside of camp, growing in association with *Cenchrus ciliaris* and *Prosopis pallida*, 5 m (15 ft), 29 Apr 2003, *Starr, Starr & Higashino 030429-01*; Honokanai‘a, on dirt bank on south side of beach, spreading locally across road and upslope, in association with *Verbesina encelioides*, 6 m (20 ft), 16 Feb 2004, *Starr, Starr & Higashino 040216-02*; LZ Squid, site for future nursery, construction of building in progress, *Cenchrus ciliaris* grassland with scattered trees of *Prosopis pallida*, herb, 25–35 cm tall with many stems, several plants scattered around construction area, 15 m (50 ft), 14 Jun 2006, *K.R. Wood 11919*.

Cucurbitaceae

Coccinia grandis (L.) Voigt

New island record

Coccinia grandis (ivy gourd), a sprawling plant occasionally grown for food even though it is a Hawai‘i state noxious weed, is naturalized on O‘ahu, Lāna‘i, Maui, and Hawai‘i (Wagner *et al.* 1999; Starr *et al.* 1999; Oppenheimer & Bartlett 2000; Oppenheimer 2007). On Midway Atoll, ivy gourd was first observed in 1999 from a single garden site. Seeds had been brought in from Thailand, and it was being grown as an edible vegetable. Shortly after its discovery during a botanical survey, the U.S. Fish and Wildlife Service (FWS) began an eradication campaign. By 2001, there was no sign of the vine, and the eradication was deemed a success. During a more recent survey in 2008, three separate locations of ivy gourd were observed, and workers revealed that it had been brought in again as seeds from both Thailand and Honolulu. It was being grown in the same garden and other garden locations nearby. While it had started to spread into adjacent lawn areas and numerous fruits and seedlings were observed, no other outlier locations were found. With mynah birds (*Acridotheres tristis*) present on the island, this species could potentially cover much of the island and become a nuisance for native plants and wildlife. Control efforts are again underway by FWS to eradicate all known populations. Persistent diligence and strict prevention rules will be needed to rid the atoll of this aggressive vine and keep it from being re-introduced. This collection represents a new island record for Midway Atoll.

Material examined. **MIDWAY ATOLL:** Sand Island, 4208 Commodore Ave, large vine on fence, spreading into lawn, seedlings observed, growing with other vegetables such as *Solanum torvum*, *Plectranthus amboinicus*, and *Ocimum basilicum*, 3 m (10 ft), 1 Jun 2008, *Starr & Starr 080601-01*.

Fabaceae***Caesalpinia bonduc* (L.) Roxb.****New island record**

Caesalpinia bonduc (*kakalaioa*, *hihikolo*, gray knickers) was previously known in Hawai'i from Laysan, Ni'ihau, Kaua'i, O'ahu, Moloka'i, East Maui, and Hawai'i (Wagner *et al.* 1999). This indigenous species has seeds that can float long distances in seawater for long periods of time and is established on nearly every tropical shore worldwide (Francis n.d.). A single specimen was observed on Midway Atoll during a botanical survey in 2008. The plant appeared to be somewhat of a recent arrival as it was not yet fertile, did not appear to have been planted, and was not known from previous surveys. We speculated that the plant could have arrived from a seabird picking up a seed floating in the ocean, then depositing it on the atoll. This collection represent a new island record for Midway Atoll.

Material examined. **MIDWAY ATOLL:** Sand Island, Roosevelt Ave, 1 large sprawling vine, ca 5 x 5 m, covered in spines, no fertile material, with stipules, near side of old road with surrounding weeds including *Lantana camara*, *Abutilon grandifolium*, and *Leucaena leucocephala*, 3 m (10 ft), 10 Jun 2008, Starr & Starr 080610-13.

Calliandra houstoniana* (Mill.) Standl.**var. ***calothyrsus* (Meisn.) Barneby*New island record**

Calliandra houstoniana var. *calothyrsus* was reported as a new naturalized record by Imada *et al.* (2007) from the island of Lāna'i. These collections represent a new island record for Maui, where it was observed spreading locally in two locations.

Material examined. **MAUI:** East Maui, Ha'ikū, Ulumalu Rd, appears to be spreading in this area, growing in wet lowland forest and roadside scrub with *Chusia rosea* and *Leucaena leucocephala*, 293 m (960 ft), 12 Dec 2006, Starr & Starr 061212-01; East Maui, Pi'iholo, old University of Hawai'i experimental station, some seedlings noted along with planted trees, spreading locally in *Eucalyptus* understory, 655 m (2150 ft), 16 Jan 2004, Starr & Starr 040116-02.

Clitoria ternatea* L.*New island record**

Clitoria ternatea (butterfly pea) is documented as naturalized from O'ahu and Maui (Wagner *et al.* 1999; Oppenheimer & Bartlett 2000). This collection represents a new island record for Lāna'i.

Material examined. **LĀNA'I:** Hulopo'e Rd, in coastal dry scrub along with *Coccinia grandis*, *Cenchrus ciliaris*, *Prosopis pallida*, and *Leucaena leucocephala*, 93 m (304 ft), 2 Apr 2007, Starr & Starr 070402-02.

Indigofera hendecaphylla* Jacq.*New island record**

Indigofera hendecaphylla (creeping indigo) was previously known from Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i (Wagner *et al.* 1999; Herbst & Wagner 1999; Starr *et al.* 2002; Oppenheimer 2003; Herbst *et al.* 2004). It is now also known from Midway Atoll, where a single sprawling patch was found along a road near the cargo pier. This collection represents a new island record for Midway Atoll.

Material examined. **MIDWAY ATOLL:** Sand Island, Nimitz Ave, near incinerator, one patch ca 3 m, flowers and fruit present, growing as a weed on side of road along with *Verbesina encelioides* and *Chloris virgata*, 3 m (10 ft), 4 Jun 2008, Starr & Starr 080604-04.

Moraceae***Ficus macrophylla* Desf. ex Pers.****New island record**

Ficus macrophylla (Moreton Bay fig) was previously reported from Moloka'i, Maui, and Hawai'i (Oppenheimer & Bartlett 2000; Starr *et al.* 2002; Oppenheimer 2006). On

Midway Atoll, Moreton Bay fig was first collected in 1980 (*Herbst & Takeuchi 6331*, BISH). It was also collected in 1999 during a botanical survey (Starr & Martz 1999). No signs of reproduction were observed at the time; however, the pollinator wasp, *Pleistodontes froggatti*, not previously known from Midway Atoll, had been recently collected in 1997 (Nishida 1999). With the wasps present, reproduction could now be possible, and it was suggested that the two large trees be removed to prevent future spread. During a survey in 2008 (Starr *et al.* 2008), it was found that the two parent trees had not been removed and offspring had begun to spread. The first sapling was observed in the town area by the water plant, far from the two known adult trees. The water plant manager (C. Phosri) revealed that the plant was found nine years prior by his nephew (T. Sonchar) on top of the water tanks, which were ca 100 m from the parent trees, likely transported via mynah birds. The small plant was removed from the structure and planted at the water plant. Saplings were also observed near the two parent trees. This collection represents a new island record for Midway Atoll.

Material examined. **MIDWAY ATOLL:** Sand Island, West Beach, 3–4 sterile saplings of small size (<2 m tall) on old ironwood stump near revetment close to 2 large parent trees on either side of the old cart trail, parent trees with wasps in fruit, mostly green fruit, some ripe, growing with *Terminalia catappa*, *Coccoloba uvifera*, and *Hibiscus tiliaceus*, 3 m (10 ft), 8 Jun 2008, Starr & Starr 080608-09.

Myrtaceae

Eugenia uniflora L.

New island record

Eugenia uniflora (Surinam cherry) is cultivated for its edible fruits and recorded as naturalized on the islands of Kauaʻi, Oʻahu, Molokaʻi, and Maui (Wagner *et al.* 1999; Oppenheimer 2003; Frohlich & Lau 2010). On Lānaʻi, it was widely cultivated in Lānaʻi City and occasionally naturalized in scrub areas nearby. This collection represents a new island record for Lānaʻi.

Material examined. **LĀNAʻI:** Lānaʻi City, Queens St, on side of road, in association with *Olea europaea* subsp. *cuspidata*, *Ruellia brevifolia*, and *Lantana montevidensis*, 488 m (1600 ft), 3 Apr 2007, Starr & Starr 070403-04.

Oleaceae

Olea europaea L. subsp. *cuspidata*

New island record

(Wall. ex G. Don) Cif.

Olea europaea subsp. *cuspidata* (African olive) spreads by fruit-eating birds and has been documented as naturalized on Kauaʻi, Oʻahu, Maui, and Hawaiʻi (Wagner *et al.* 1999; Lorence *et al.* 1995; Starr *et al.* 1999; Frohlich & Lau 2010). On Lānaʻi, it is widely cultivated and naturalized near Lānaʻi City. This collection represents a new island record for Lānaʻi.

Material examined. **LĀNAʻI:** Lānaʻi City, Queens St, on side of road, in association with *Eugenia uniflora* and *Lantana montevidensis*, 488 m (1600 ft), 3 Apr 2007, Starr & Starr 070403-03.

Oxalidaceae

Oxalis debilis Kunth var. *corymbosa*

New island record

(DC.) Lourteig

Oxalis debilis var. *corymbosa* (pink wood sorrel) was previously known to be naturalized on the islands of Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi (Wagner *et al.* 1999; Herbst & Wagner 1999). On Midway Atoll, it is occasionally observed in lawns and

gardens in the residential area of Sand Island. This collection represents a new island record for Midway Atoll.

Material examined. **MIDWAY ATOLL:** Sand Island, 4208 Commodore Ave, few plants in and around garden, growing in lawn with *Eleusine indica*, *Lepidium virginicum*, and *Malva parviflora*, 3 m (10 ft), 1 Jun 2008, *Starr & Starr 080601-04*.

Poaceae

***Sporobolus piliferus* (Trin.) Kunth** **New island record**

Sporobolus piliferus (Barundi dropseed) was previously reported as naturalized on O'ahu (Snow 2008). It is now also naturalized on Midway Atoll, where it was found on Sand Island and Eastern Island. These collections represent a new island record for Midway Atoll. The species was originally reported as a new state record from the Big Island by Herbst & Clayton (1998), but that voucher was redetermined by N. Snow as *S. pyramidatus* (Snow & Lau 2010).

Material examined. **MIDWAY ATOLL:** Sand Island, east of Bulky Dump, near shoreline, scattered plants, mixed with other naturalized species including *Oenothera laciniata*, *Lobularia maritima*, and *Cynodon dactylon*, 3 m (10 ft), 2 Jun 2008, *Starr & Starr 080602-01*; Eastern Island, common on abandoned runways, mixed with other runway plants including *Lobularia maritima* and *Boerhavia repens*, 3 m (10 ft), 5 Jun 2008, *Starr & Starr 080605-02*.

***Sporobolus pyramidatus* (Lam.) Hitchc.** **New island record**

Sporobolus pyramidatus (Madagascar dropseed) was previously known to be naturalized on Kure Atoll, Laysan, French Frigate Shoals, Kaua'i, O'ahu, Moloka'i, and Hawai'i (Wagner *et al.* 1999; Wagner & Herbst 1995; Starr *et al.* 2006; Wood 2006; Snow & Lau 2010). It is now also naturalized on Midway Atoll, where it was found to be occasional on Spit Island. This collection represents a new island record for Midway Atoll.

Material examined. **MIDWAY ATOLL:** Spit Island, occasional on the north side of island, in association with *Lobularia maritima*, *Boerhavia repens*, *Tribulus cistooides*, and *Solanum nelsonii*, 1.5 m (5 ft), 3 Jun 2008, *Starr & Starr 080603-01*.

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New islet records of marine benthic algae from offshore islets associated with O‘ahu, Maui, Moloka‘i, and Lāna‘i in the main Hawaiian Islands¹

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Introduction

Reefs around offshore islets of the main Hawaiian Islands can be relatively pristine sites because of their remoteness and limited access to them due to distance and high wave energy. The Hawaii offshore islets are recognized as important marine and terrestrial habitats which prompted the establishment in September 2002 of the Offshore Islet Restoration Committee (OIRC), a multi-agency group, to oversee biological surveys and to restore the biota of selected offshore islets in the Hawaiian Islands.

Coles *et al.* (2008) reported a total of 1,486 marine taxa observed or collected from 10 islets in the main Hawaiian Islands. The list included species names of 81 taxa of marine benthic algae, i.e., 7 cyanobacteria (blue-green algae), 39 red algae, 14 brown algae, and 21 green algae. The main islands and adjacent islets include O‘ahu (Kāohikaipu and Kāpapa Islets), Maui (Kaemi, Hulu, and Molokini Islets), Moloka‘i (Mōkapu, ‘Ōkala and Nāmoku Islets) off Kaulapapa National Historic Park, and Lāna‘i (Pu‘u Pehe and Po‘o Po‘o Islets).

Eight algal species (Table 1) from offshore islets associated with O‘ahu, Maui, Moloka‘i, and Lāna‘i in the main Hawaiian Islands are recorded in past published literature or the database of Bishop Museum’s *Herbarium Pacificum* (BISH). Three of the eight species, i.e., *Neomeris vanbosseae*, *Sphacelaria novae-hollandiae* and *Taenioma perpusillum*, were found in the present collection. Four species, i.e., *Boodleopsis hawaiiensis*, *Chaetomorpha antennina*, *Cladophora hawaiiiana*, and *Caulerpa taxifolia* inhabit the intertidal zone or tidepools, and, therefore, would not be expected to be present among the collections which targeted algae in subtidal waters (4–28 m deep). *Antithamnion percurrens*, a tiny red epiphyte, might have been overlooked.

Moku o Lo‘e (Coconut Island) located in the inshore waters of Kāne‘ohe Bay, O‘ahu is not considered here as a comparable offshore islet. Forty species of marine benthic algae, including both gametophyte and sporophyte of *Asparagopsis taxiformis* (Delile) Trevisan, were listed by Wood *et al.* (2004) from Lehua Islet located 1.2 km north of Ni‘ihau and approximately 31 km west of Kauai’s Mana Point.

The 84 species of marine benthic algae reported here, i.e., 5 cyanobacteria, 53 red algae, 10 brown algae, and 16 green algae, are new records for the individual offshore islets and are based on voucher specimens, databased, and deposited in the *Herbarium Pacificum* at the Bishop Museum, Honolulu, Hawai‘i. This listing differs from the 81 species names reported in Coles *et al.* (2008) since some of their species were only observed in the field, few specimens were mistakenly discarded, and all macroalgal herbarium specimens from Moloka‘i were retained by the Kaulapapa National Historic

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Park. No introduced or cryptogenic algae were found during the survey. Table 2 provides a summary of the number of marine benthic algal species databased from each islet.

Materials and Methods

The islets surveyed were selected in consultation with OIRC to supplement previous surveys and did not target previously studied areas around a selected islet. Algae were photographed with a digital camera and collected for later laboratory identification. Only one site visit to each islet was made in either early summer or late summer, i.e., islets off Lāna‘i and Maui in April and May 2007, respectively, and islets off O‘ahu and Moloka‘i in August and September 2007, respectively. Positions were located with a Garmin 12™ GPS receiver.

Prior to examination, the frozen algae in plastic bags from each station (site) were thawed in tap water. Excess seawater was poured carefully out of the bag and replaced with 4% formalin in seawater. The collections were examined under the dissecting microscope, and epiphytes and turf were separated. The majority of the small specimens were mounted on glass slides, i.e., specimens were decalcified with 10% hydrochloric acid, stained with aniline blue and mounted with 30% karo with phenol. Larger specimens were mounted on segments of herbarium paper.

Specimens were sorted primarily by L.M. Giuseffi who accompanied S.L. Coles on all dives and collected all specimens. The majority of the specimens bear her collection numbers (LMG). Selected epiphytes were also separated from the host macroalgae by J.R. Fisher and mounted on glass slides. All specimens were provided BISH specimen numbers. L.M. Giuseffi served as the intern responsible for algal identification on the project under the tutorship of J.R. Fisher. All specimens were reviewed by either R.T. Tsuda or I.A. Abbott. Descriptions and illustrations of the species reported below can be found in Abbott (1999), Abbott & Huisman (2004) and Huisman *et al.* (2007).

Habitat Description

The habitat descriptions were summarized from Coles *et al.* (2008).

O‘AHU: Kāohikaipu (21°19'10.1" N, 157°39'14.8" W), near Rabbit Islet, leeward (east) side of 4.5 ha islet, strong swell and high rugosity with high basalt platforms and low rubble, few algae, 8–12 m deep, 7 Aug 2007, *L.M. Giuseffi*; Kāpapa (21°28'48.6" N, 157°47'32.9" W), seaward of NE coast of islet, low rugosity, some sandy patches, very diverse and high algal cover, 8–9 m deep, 30 Aug 2007, *L.M. Giuseffi*.

MAUI: Kaemi (20°58'49.1" N, 156°31'32.4" W), NE side of 1.0 ha islet, large boulders with very little sand, 6–12 m deep, 29 May 2007, *L.M. Giuseffi*; Hulu (20°57'26.6" N, 156°31'00.9" W), N coast of 0.6 ha islet, large basalt boulders and adjacent vertical wall, with little sand, 6–15 m deep, 30 May 2007, *L.M. Giuseffi*; Molokini (20°37'153.0, 156°29'36" W), between Kaho‘olawe and Maui, vertical wall outside of crater, backside, strong current, 4–28 m deep, 31 May 2007, *L.M. Giuseffi*.

MOLOKA‘I: Mōkapu (21°11'00.8" N, 156°55'28.9" W), leeward (west) side of 1.5 ha islet, steep basalt wall, 13–22 m deep, 18 Sep 2007, *L.M. Giuseffi*; ‘Ōkala (21°10'28.1" N, 156°55'48.3" W), around and through 0.9 ha islet, low algal cover, 14–19 m deep, 19 Sep 2007, *L.M. Giuseffi*; Nāmoku, (21°12'26.2" N, 156°59'02.2" W) W side of 0.04 ha islet, 11–22 m deep, 20 Sep 2007, *L.M. Giuseffi*.

LĀNA‘I: Pu‘u Pehe (20°44'01.7" N, 156°53'26.5" W), SW side of 0.4 ha islet, high rugosity with sandy grooves, limestone intermixed with sand and rubble, includes a vertical rock wall and ledge, 8–11 m deep, 2 Apr 2007, *L.M. Giuseffi*; Pu‘u Pehe 1st Cathedral (20°43'57.9" N, 156°53'18.1" W), S and E side of cavern, 17–18 m deep, 4 Apr 2007, *L.M. Giuseffi*; Po‘o Po‘o (20°44'06.9" N, 156°55'20.3" W), 0.2 ha, SW side

of islet, rubble with turf on dead coral heads, small patches of sand, some small caves, 8–13 m deep, 3 Apr 2007, *L.M. Giuseffi*; Po‘o Po‘o Pinnacle (20°44'01.7" N, 156°55'24.5" W), N, W and large cave halfway around and through islet, vertical walls descending to 20 m, 4–18 m deep, 3 Apr 2007, *L.M. Giuseffi*.

Catalog of Species

Forty (preceded by asterisks) of the 84 species listed here were not reported by Coles *et al.* (2008).

CYANOPHYCEAE

Chroococcales

Microcystaceae

Aphanothece stagnina* (Sprengel) **New island record

A. Braun *in* Rabenhorst

Material Examined: LĀNA‘I: Po‘o Po‘o, BISH 730537 (*LMG 006*).

Oscillatoriales

Oscillatoriaceae

Lyngbya majuscula (Dillwyn) Harvey **New island record (Moloka‘i)**

Material Examined: MOLOKA‘I: Mōkapu, BISH 730468 (*LMG 161a*). LĀNA‘I: Pu‘u Pehe, BISH 730532 (*LMG 001*).

Phormidiaceae

Phormidium cf. laysanense Lemmermann

Material Examined: O‘AHU: Kāpapa, BISH 730979 (*LMG 155*), BISH 730996 (*LMG 156*). MAUI: Kaemi, BISH 730559 (*LMG 038*). MOLOKA‘I: Mōkapu, BISH 730441 (*LMG 159*); ‘Ōkala, BISH 730466 (*LMG 184*). LĀNA‘I: Pu‘u Pehe, BISH 730533 (*LMG 002*); Pu‘u Pehe Cathedral, BISH 730556 (*LMG 028*).

Pseudanabaenaceae

**Spirocoleus cf. fragilis* (Meneghini) P. Silva

Material Examined: O‘AHU: Kāpapa, BISH 730997 (*LMG 157*).

Nostocales

Nostocaceae

Hormothamnion enteromorphoides Grunow

Material Examined: O‘AHU: Kāohikaipu, BISH 730963 (*LMG 092*).

RHODOPHYCEAE

Nemaliales

Galaxauraceae

Dichotomaria marginata (Ellis & Solander) Lamarck

Material Examined: LĀNA‘I: Po‘o Po‘o, BISH 730551 (*LMG 020*).

Dichotomaria obtusata (Ellis & Solander) **New island record (Maui)**

Lamarck

Material Examined: MAUI: Kaemi, BISH 730928 (*LMG 043*); Hulu, BISH 730945 (*LMG 65*). LĀNA‘I: Po‘o Po‘o, BISH 730545 (*LMG 014*).

Sciniaia furcata Zablackis

New island record

Material Examined: LĀNA‘I: Po‘o Po‘o, BISH 730543 (*LMG 012*).

Scinaia hormoides Setchell**New island record***Material Examined:* LĀNA'I: Po'o Po'o, BISH 730544 (*LMG 013*).**Liagoraceae*****Akalaphycus setchelliae*** (Yamada) Huisman, **New island record**

Abbott & Sherwood

Material Examined: MAUI: Hulu, BISH 730953 (*LMG 073*).**Bonnemaisoniales****Bonnemaisoniaceae*****Asparagopsis taxiformis*** (Delile) Trevisan*Material Examined:* O'AHU: Kāpapa, BISH 730614 (*LMG s.n.*), sporophyte; BISH 730988 (*LMG 120*), gametophyte; BISH 731000 (*LMG 126*), sporophyte. MOLOKA'I: Nāmoku, BISH 730512 (*LMG 225*), sporophyte.**Gigartinales****Hypneaceae*****Hypnea spinella*** (C. Agardh) Kützting*Material Examined:* O'AHU: Kāpapa, BISH 730585 (*LMG 137*), BISH 730999 (*LMG 132*). MOLOKA'I: 'Ōkala, BISH 730522 (*LMG 235*).**Peyssonneliaceae******Peyssonnelia inamoena*** Pilger**New island record***Material Examined:* O'AHU: Kāpapa, BISH 730595 (*LMG 150*).**Corallinales****Corallinaceae******Amphiroa valonioides*** Yendo*Material Examined:* MAUI: Kaemi, BISH 730635 (*LMG s.n.*). MOLOKA'I: Mōkapu, BISH 730478 (*LMG 175*); 'Ōkala, BISH 730520 (*LMG 233*). LĀNA'I: Po'o Po'o, BISH 730549 (*LMG 018*).****Jania adhaerens*** Lamouroux*Material Examined:* O'AHU: Kāpapa, BISH 730586 (*LMG 138*).***Jania pumila*** Lamouroux**New island record (Moloka'i)***Material Examined:* O'AHU: Kāpapa, BISH 730985 (*LMG 117*). MAUI: Kaemi, BISH 730570 (*LMG 049*), BISH 730634 (*LMG s.n.*). MOLOKA'I: Mōkapu, BISH 730528 (*LMG 241*); 'Ōkala, BISH 730492 (*LMG 189b*), BISH 730519 (*LMG 232*); Nāmoku, BISH 730456 (*LMG 208*).**Rhodymeniales****Champiaceae******Champia parvula*** (C. Agardh) Harvey*Material Examined:* O'AHU: Kāpapa, BISH 730611 (*LMG s.n.*). MOLOKA'I: Mōkapu, BISH 730531 (*LMG 243*); Nāmoku, BISH 730502 (*LMG 215*).**Lomentariaceae******Gelidiopsis intricata*** (C. Agardh) Vickers*Material Examined:* MOLOKA'I: Mōkapu, BISH 730461 (*LMG 182*).

Rhodymeniaceae***Botryocladia skottsbergii*** (Børgesen) Levring

Material Examined: MAUI: Nāmoku, BISH 730458 (LMG 210).

Ceramiales**Ceramiaceae******Aglaothamnion boergesenii*** (Aponte & Ballantine) L'Hardy-Halos & Rueness

Material Examined: O'AHU: Kāpapa, BISH 730590 (LMG 143).

****Antithamnionella breviramosa*** (Dawson) Wollaston

Material Examined: O'AHU: Kāpapa, BISH 730622 (LMG s.n.). MOLOKA'I: Nāmoku, BISH 730508 (LMG 221). LĀNA'I: Po'o Po'o, BISH 730627 (LMG s.n.).

****Centroceras clavulatum*** (C. Agardh) Montagne

Material Examined: O'AHU: Kāpapa, BISH 730609 (LMG s.n.). LĀNA'I: Po'o Po'o Pinnacle, BISH 730565 (LMG 024).

Ceramium borneense Weber-van Bosse

Material Examined: MOLOKA'I: Mōkapu, BISH 730480 (LMG 178).

****Ceramium cingulum*** Meneses

Material Examined: O'AHU: Kāpapa, BISH 730607 (LMG s.n.).

****Ceramium clarionensis*** Setchell & Gardner **New island record**

Material Examined: MOLOKA'I: Mōkapu, BISH 730484 (LMG 179b); 'Ōkala, BISH 730523 (LMG 236).

Ceramium dumosertum R.E. Norris & Abbott

Material Examined: O'AHU: Kāpapa, BISH 730601 (LMG 124). MAUI: Hulu, BISH 730637 (LMG s.n.).

****Ceramium macilentum*** J. Agardh

Material Examined: O'AHU: Kāpapa, BISH 730618 (LMG s.n.). LĀNA'I: Pu'u Pehe, BISH 730642 (LMG s.n.).

****Corallophila apiculata*** (Yamada) R.E. Norris **New island record (Lāna'i)**

Material Examined: MOLOKA'I: Mōkapu, BISH 730483 (LMG 179a). LĀNA'I: Po'o Po'o Pinnacle, BISH 730566 (LMG 024).

****Corallophila huysmansii*** (Weber-van Bosse) **New island record**

R.E. Norris

Material Examined: LĀNA'I: Pu'u Pehe, BISH 740644 (LMG s.n.).

****Crouania mageshimensis*** Itono

Material Examined: O'AHU: Kāpapa, BISH 730320 (LMG 127). MOLOKA'I: 'Ōkala, BISH 730490 (LMG 188b).

****Crouania minutissima*** Yamada

Material Examined: O'AHU: Kāhōhikaipu, BISH 730317 (LMG 100); Kāpapa, BISH 730604 (LMG s.n.).

****Diplothamnion jolyi*** van den Hoek

Material Examined: O'AHU: Kāpapa, BISH 730608 (*LMG s.n.*). MAUI: Hulu, BISH 730641 (*LMG s.n.*). MOLOKA'I: Mōkapu, BISH 730485 (*LMG 179c*); Nāmoku, BISH 730509 (*LMG 222*). LĀNA'I: Pu'u Pehe, BISH 730645 (*LMG s.n.*); Po'o Po'o, BISH 730628 (*LMG s.n.*).

Gayliella fimbriata (Setchell & Gardner) T.O. Cho & S.M. Boo

[= *Ceramium fimbriatum* Setchell & Gardner]

Material Examined: O'AHU: Kāpapa, BISH 730605 (*LMG s.n.*). MAUI: Hulu, BISH 730577 (*LMG 080*). See Cho *et al.* (2008) for circumscription of the new genus *Gayliella*.

Gayliella flaccida (Kützinger) T.O. Cho & L. McIvor

[= *Ceramium flaccidum* (Kützinger) Ardissonne]

Material Examined: O'AHU: Kāpapa, BISH 730588 (*LMG 140*). MAUI: Hulu, BISH 730638 (*LMG s.n.*). MOLOKA'I: 'Ōkala, BISH 730518 (*LMG 231*).

Griffithsia heteromorpha Kützinger

Material Examined: O'AHU: Kāpapa, BISH 730621 (*LMG s.n.*), BISH 730625 (*LMG s.n.*). MOLOKA'I: Nāmoku, BISH 730515 (*LMG 228*).

Haloplegma duperryi Montagne

Material Examined: O'AHU: Kāpapa, BISH 730986 (*LMG 118*). MOLOKA'I: Nāmoku, BISH 730501 (*LMG 214*). LĀNA'I: Po'o Po'o, BISH 730547 (*LMG 016*).

****Monosporus indicus*** Børgesen

Material Examined: O'AHU: Kāpapa, BISH 730602 (*LMG s.n.*).

****Pleonosporium intricatum*** R.E. Norris

Material Examined: O'AHU: Kāpapa, BISH 730612 (*LMG s.n.*). MAUI: Kaemi, BISH 730632 (*LMG s.n.*).

****Ptilothamnion cf. cladophorae*** (Yamada & Tanaka) Feldmann-Mazoyer

Material Examined: MAUI: Kaemi, BISH 730631 (*LMG s.n.*). MOLOKA'I: 'Ōkala, BISH 730521 (*LMG 234*).

****Wrangelia dumontii*** (Dawson) Abbott **New island record**

Material Examined: O'AHU: Kāpapa, BISH 730603 (*LMG s.n.*).

Dasyaceae***Dasya iridescens*** (Schlecht)**New island record (Lāna'i)**

A. Millar & Abbott

Material Examined: O'AHU: Kāpapa, BISH 730584 (*LMG 136*). MAUI: Molokini, BISH 730941 (*LMG 061*). LĀNA'I: Po'o Po'o, BISH 730550 (*LMG 019*).

****Heterosiphonia crispella*** (C. Agardh)**New island record (Lāna'i)**

Wynne

Material Examined: O'AHU: Kāpapa, BISH 730610 (*LMG s.n.*), BISH 731005 (*LMG 118b*). MOLOKA'I: Nāmoku, BISH 730503 (*LMG 215*), BISH 730510 (*LMG 223*). LĀNA'I: Po'o Po'o, BISH 730626 (*LMG s.n.*).

Delesseriaceae****Hypoglossum minimum*** Yamada

Material Examined: O'AHU: Kāpapa, BISH 730616 (*LMG s.n.*)

****Hypoglossum simulans*** Wynne, Price
& Ballantine**New island record (Lāna'i)**

Material Examined: MAUI: Hulu, BISH 730575 (*LMG 078*). MOLOKA'I: Mōkapu, BISH 730486 (*LMG 179d*); Nāmoku, BISH 730500 (*LMG 213*). LĀNA'I: Pu'u Pehe, BISH 730643 (*LMG s.n.*).

****Martensia fragilis*** Harvey

Material Examined: MOLOKA'I: Mōkapu, BISH 730476 (*LMG 173*).

Taenioma perpusillum (J.Agardh) J. Agardh

Material Examined: O'AHU: Kāpapa, BISH 730617 (*LMG s.n.*). MOLOKA'I: Nāmoku, BISH 730504 (*LMG 217*).

Rhodomelaceae***Acanthophora pacifica*** (Setchell) Kraft

Material Examined: LĀNA'I: Po'o Po'o, BISH 730540 (*LMG 009*).

****Chondria minutula*** Weber-van Bosse**New island record (Lāna'i)**

Material Examined: LĀNA'I: Po'o Po'o, BISH 730629 (*LMG s.n.*).

****Chondria polyrhiza*** Collins & Hervey

Material Examined: MOLOKA'I: 'Ōkala, BISH 730517 (*LMG 230*); Nāmoku, BISH 730511 (*LMG 224*).

****Chondria simpliciuscula*** Weber-van Bosse

Material Examined: O'AHU: Kāpapa, BISH 730592 (*LMG 145*), BISH 730598 (*LMG 153*). MAUI: Hulu, BISH 730581 (*LMG 084*).

****Herposiphonia cf. obscura*** Hollenberg

Material Examined: MOLOKA'I: Nāmoku, BISH 730513 (*LMG 226*).

Herposiphonia parca Hollenberg

Material Examined: O'AHU: Kāhōikaipu, BISH 730318 (*LMG 101*). MAUI: Kaemi, BISH 730573 (*LMG 052*); Hulu, BISH 730640 (*LMG s.n.*).

Herposiphonia secunda (C. Agardh) Ambronn

Material Examined: O'AHU: Kāpapa, BISH 733590 (*LMG 141*). MOLOKA'I: Nāmoku, BISH 730506 (*LMG 219*).

****Laurencia majuscula*** (Harvey) Lucas

Material Examined: O'AHU: Kāpapa, BISH 730983 (*LMG 115*). MOLOKA'I: Mōkapu, BISH 730482 (*LMG 179*). LANA'i: Po'o Po'o, BISH 730548 (*LMG 017*).

Polysiphonia flaccidissima Hollenberg**New island record (Maui)**

Material Examined: O'AHU: Kāpapa, BISH 730600 (*LMG 125*). MAUI: Kaemi, BISH 730572 (*LMG 051*), BISH 730636 (*LMG s.n.*). MOLOKA'I: Mōkapu, BISH 730481 (*LMG 179a*); 'Ōkala, BISH 730491 (*LMG 189a*); Nāmoku, BISH 730516 (*LMG 229*).

***Polysiphonia homoia** Setchell & Gardner **New island record (Maui)**

Material Examined: O'AHU: Kāpapa, BISH 730594 (LMG 149). MAUI: Kaemi, BISH 730574 (LMG 053). MOLOKA'I: Mōkapu, BISH 730479 (LMG 177).

Tolypocladia glomerulata (C. Agardh) F. Schmitz

Material Examined: O'AHU: Kāhikaipu, BISH 730319 (LMG 102); Kāpapa, BISH 730321 (LMG 128). MAUI: Hulu, BISH 730578 (LMG 081). MOLOKA'I: Mōkapu, BISH 730477 (LMG 174); 'Ōkala, BISH 730488 (LMG 188a); Nāmoku, BISH 730499 (LMG 212). LĀNA'I: Po'o Po'o, BISH 730630 (LMG s.n.)

Sarcomeniaceae**Dotyella hawaiiensis** (Doty & Wainwright) Womersley & Shepley

Material Examined: O'AHU: Kāpapa, BISH 730591 (LMG 144). MAUI: Kaemi, BISH 730571 (LMG 050); Hulu, BISH 730580 (LMG 083). MOLOKA'I: Mōkapu, BISH 730526 (LMG 239).

PHAEOPHYCEAE**Sphacelariales****Sphacelariaceae*****Sphacelaria novaehollandiae** Sonder

Material Examined: MOLOKA'I: Nāmoku, BISH 733591 (LMG 192).

Dictyotales**Dictyotaceae*****Dictyopteris plagiogramma** (Montagne) Vickers

Material Examined: MAUI: Hulu, BISH 730579 (LMG 082), immature.

Dictyota bartayresiana Lamouroux

Material Examined: MAUI: Hulu, BISH 730960 (LMG 088). MOLOKA'I: Mōkapu, BISH 730529 (LMG 242). LĀNA'I: Pu'u Pehe, BISH 730561 (LMG 036).

Dictyota ceylanica Kützinger

Material Examined: O'AHU: Kāpapa, BISH 730615 (LMG s.n.). MOLOKA'I: Mōkapu, BISH 730527 (LMG 240); Nāmoku, BISH 730498 (LMG 206). LĀNA'I: Pu'u Pehe, BISH 730646 (LMG s.n.).

Dictyota friabilis Setchell

Material Examined: MOLOKA'I: 'Ōkala, BISH 730530 (LMG 187).

Distromium flabellatum Womersley **New island record**

Material Examined: MOLOKA'I: Nāmoku, BISH 730451 (LMG 200).

Lobophora variegata Womersley ex Oliviera

Material Examined: MOLOKA'I: Mōkapu, BISH 730443 (LMG 166); Nāmoku, BISH 730452 (LMG 201).

Padina boryana Thivy**New island record (Maui)**

Material Examined: O'AHU: Kāpapa, BISH 730597 (LMG 152). MAUI: Kaemi, BISH 730936 (LMG 056), "vaughaniella stage"; Hulu, BISH 730583 (LMG 090). MOLOKA'I: Nāmoku, BISH 730465 (LMG 203), BISH 730497 (LMG 205).

Padina thivyae* Doty & Newhouse** **New island recordMaterial Examined:* MAUI: Kaemi, BISH 730937 (LMG 057).**Sporochneales****Sporochnaceae*****Sporochnus dotyi* Brostoff** **New island record***Material Examined:* MOLOKA'I: Nāmoku, BISH 730454 (LMG 204).**CHLOROPHYCEAE****Cladophorales****Anadyomenaceae*****Microdictyon setchellianum* Howe***Material Examined:* MOLOKA'I: Nāmoku, BISH 730494 (LMG 197).***Microdictyon umbilicatum* Decaisne** **New island records***Material Examined:* MOLOKA'I: Mōkapu, BISH 730474 (LMG 167). LĀNA'I: Pu'u Pehe, BISH 730562 (LMG 035).***Phyllocladion anastomosans* (Harvey) Kraft & Wynne***Material Examined:* O'AHU: Kāpapa, BISH 730322 (LMG 129), BISH 730599 (LMG 154). MOLOKA'I: Mōkapu, BISH 730472 (LMG 164)**Cladophoraceae******Cladophora laetevirens* (Dillwyn) Kützing***Material Examined:* MOLOKA'I: Mōkapu, BISH 730473 (LMG 165); 'Ōkala, BISH 730487 (LMG 186).****Cladophora luxurians* (Gilbert)** **New island record (Lānai)**

Abbott & Huisman

Material Examined: MAUI: Kaemi, BISH 730568 (LMG 041). MOLOKAI: Nāmoku, BISH 730495 (LMG 198). LĀNA'I: Po'o Po'o Pinnacle, BISH 730564 (LMG 023).****Cladophora vagabunda* (Linnaeus) Hoek***Material Examined:* MOLOKA'I: Nāmoku, BISH 730507 (LMG 220).****Rhizoclonium riparium* (Roth) Harvey** **New island record***Material Examined:* MOLOKA'I: 'Ōkala, BISH 730524 (LMG 237).**Siphonocladaceae******Cladophoropsis sundanensis* Reinbold***Material Examined:* MOLOKA'I: Nāmoku, BISH 730514 (LMG 227).**Bryopsidales****Caulerpaceae*****Caulerpa nummularia* Harvey ex J. Agardh** **New island record***Material Examined:* MOLOKA'I: Mōkapu, BISH 730442 (LMG 163).****Caulerpa webbiana* Montagne** **New island record***Material Examined:* LĀNAI: Pu'u Pehe Cathedral, BISH 730555 (LMG 027).

Derbesiaceae***Derbesia cf. fastigiata*** Taylor

Material Examined: MAUI: Kaemi, BISH 730567 (LMG 040), sterile.

Halimediaceae***Halimeda distorta*** (Yamada) L. H. Colinvaux

Material Examined: LĀNAI: Po'ō Po'ō, BISH 730535 (LMG 004).

Halimeda opuntia (Linnaeus) Lamouroux

Material Examined: O'AHU: Kāpapa, BISH 730974 (LMG 107).

Dasycladales**Dasycladaceae*****Neomeris annulata*** Dickie

Material Examined: MOLOKA'I: 'Ōkala, BISH 730467 (LMG 185).

Neomeris vanbosseae Howe

Material Examined: MOLOKA'I: Nāmoku, BISH 730448 (LMG 194).

Polyphysaceae***Parvocaulis parvula*** (Solms-Laubach)**New island record (Moloka'i)**

Berger *et al.*

Material Examined: MOLOKA'I: Mōkapu, BISH 730475 (LMG 168). LĀNA'I: Po'ō Po'ō Pinnacle, BISH 730554 (LMG 026).

Acknowledgements

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Table 1. Species reported previously from islets off O'ahu, Maui, Moloka'i and Lāna'i.

Island	Islet	Species	Reference*
O'ahu	Kapapa	<i>Boodleopsis hawaiiensis</i> Gilbert	A&H 2004
	Mokoli'i (Chinaman's Hat)	<i>Neomeris vanbosseae</i> Howe	E 1952
Maui	Molokini	<i>Antithamnion percurrans</i> Dawson	A 1999
Moloka'i	Unnamed islets off Kalaupapa	<i>Chaetomorpha antennina</i> (Bory)	
		Kützing	A&H 2004
		<i>Cladophora hawaiiiana</i> Tilden	A&H 2004
		<i>Sphacelaria novae-hollandiae</i> Sonder	A&H 2004
		<i>Taenioma perpusillum</i> (J. Agardh) J. Agardh	A 1999
Lāna'i	Pu'u Pehe 2nd Cathedral	<i>Caulerpa taxifolia</i> (Vahl) C. Agardh	A&H 2004

* E 1952 (Egerod 1952), A 1999 (Abbott 1999), A&H 2004 (Abbott & Huisman 2004).

Table 2. Number of marine benthic algal species with voucher specimens from each of the 10 islets and two adjacent sites (Pu'u Pehe Cathedral and Po'o Po'o Pinnacle).

Islets	Number of Species				Total
	Cyanobacteria	Red	Brown	Green	
O'AHU					
Kāohikaipu	1	3	0	0	4
Kāpapa	2	33	2	2	39
MAUI					
Kaemi	1	9	2	2	14
Hulu	0	11	3	0	14
Molokini	0	1	0	0	1
MOLOKA'I					
Mōkapu	2	15	3	5	25
ʻŌkala	1	10	1	3	15
Nāmoku	0	16	6	5	27
LĀNA'I					
Pu'u Pehe	2	4	2	1	9
Pu'u Pehe Cathedral	1	0	0	1	2
Po'o Po'o	1	14	0	1	16
Po'o Po'o Pinnacle	0	2	0	2	4

Records of the Hawaii Biological Survey for 2008

Part I: Plants

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