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PART II: PLANTS

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Cover photo: *Hibiscadelphus woodii* Lorence & W.L. Wagner, one of eleven new plant extinctions reported for the Hawaiian Islands. See page 91 for more details. Photo: K.R. Wood.

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New records of *Gamochaeta* (Asteraceae) in the Hawaiian Archipelago

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Specimens of *Gamochaeta* (Asteraceae/Compositae) in the *Herbarium Pacificum* (BISH) of the Bishop Museum were examined in July 2011, and three previously overlooked species and one species commonly subsumed in a broader circumscription were observed. Additional specimens were observed at MO, PTBG, and UC by electronic correspondence and photos, and duplicates were inferred at US via an internet database (Wagner *et al.*, 2005 onwards).

Gamochaeta is a genus of about 50–80 species that are native primarily to South America, but several species are naturalized weeds in North America, Europe, Australia, New Zealand, and elsewhere (Nesom, 2004b, 2006). Once placed in a broadly circumscribed *Gnaphalium*, *Gamochaeta* is most easily differentiated by having heads arranged in spiciform arrays and pappus that is deciduous as a single unit due to the fusion of bristles into a basal ring (Nesom, 2006).

The *Manual of the flowering plants of Hawai'i* (Wagner *et al.*, 1999) included one species, *Gnaphalium purpureum* L., that is currently recognized in the genus *Gamochaeta*. This taxonomic change to *Gamochaeta* was noted by Wagner *et al.* (1997), and a key was provided to all of the taxa formerly placed in *Gnaphalium*. Wagner *et al.* (1999) included *Gnaphalium peregrinum* Fernald [= *Gamochaeta pensylvanica* (Willd.) Cabrera] in synonymy, considering it conspecific with *Gnaphalium purpureum*, as did many older treatments (*e.g.*, Gleason & Cronquist, 1991). More recently, the narrower circumscriptions of Nesom (2006) have been followed and are followed here, especially because the species are delimited by unique combinations of putatively non-linked morphological characters (*e.g.*, features of vestiture, leaf shape, phyllary shape and color, and cypselae). Nesom's (2006) treatment was followed by preliminary genetic work, and all six of the tested species have unique genetic markers (Cameron, 2010; Alford & Cameron, unpubl. data).

Five species of *Gamochaeta* are recognized for the Hawaiian Archipelago: *G. americana*, *G. argyrinea*, *G. pensylvanica*, *G. purpurea*, and *G. simplicicaulis*. Two species, *G. purpurea* and *G. pensylvanica*, have been present for more than 100 years. They occur on several islands and in a wide variety of habitats. *Gamochaeta argyrinea* was first collected after World War II but now occurs on three islands. The other two species, *G. americana* and *G. simplicicaulis*, are known from only one collection each, both collected in the last 30 years.

Only seven specimens collected after 1991 were observed. Continued accession of specimens and additional collecting is likely to augment these records. In addition to the species reported below, one specimen was observed which could not be identified with certainty due to size and immaturity of the inflorescence (MAUI: Lihau, 9 Jul 1991, *Welton & Haus* 897 [BISH]).

Asteraceae***Gamochaeta purpurea*** (L.) Cabrera**New circumscription**

Gamochaeta purpurea is found on the islands of Hawai'i, Maui, Mokuau Islet (Moloka'i), Moloka'i, and O'ahu. Habitats include dry, disturbed forest, dry shrubland, pasture, grasslands, and lava flows at elevations of (65–)465–2440 m. The species is presumably native to North America but is also known from Central and South America and the West Indies (Nesom, 2006). Hillebrand (1888: 201) reports this species from near Diamond Hill, O'ahu, as early as 1871, but specimens at BISH date only from 1920. Although Hillebrand (1888) could have been referring to any of the species reported here, his detailed description clearly matches *G. purpurea*. A diagnostic feature of *G. purpurea* is the presence of glass-like (or sand-like or cystolith-like) trichome base remnants on the adaxial surface of the leaves. This feature is rather obvious in well-preserved, clean plants, but may be obscured in specimens with dirty leaves (*i.e.*, where sand and trichome bases could be confused) or poorly preserved leaves where the adaxial surface is neither flat nor easy to examine. *Gamochaeta purpurea* was reported for Lehua Islet, Ni'ihau (Wood & LeGrande, 2006), but that collection is here circumscribed under *G. pensylvanica*. The illustration labeled as *Gnaphalium purpureum* in Wagner *et al.* (1999: Plate 27) actually represents *G. pensylvanica*.

Material examined. **HAWAII:** Ka'u, Hilini Pali, 9 May 1966, *Degener & Degener 31589* (BISH, MO [photo]). Kohala Mountains, trail from Waimea to Upper Hamakua Ditch, 3 Sep 1933, *Fosberg 10198* (BISH). Ka'u, Hawai'i Volcanoes National Park, along Hwy 11, 58 km from Hilo towards Kona, 20 Jun 1974, *Herat et al. 670* (BISH). Humu'ula Sheep Station, 13 Jun 1938, *Hosaka 2320* (BISH). Kilauea Crater, May 1932, *Meebold s.n.* (BISH). Humu'ula, lava flow at base of Pu'u Huluhulu, 6 Aug 1935, *Neal & Hartt 674a* (BISH). ¼ mile east of Humu'ula, 7 Aug 1935, *Neal & Hartt 709* (BISH). Kilauea Volcano, Aug 1928, *Neal s.n.* (BISH). Hawai'i Volcanoes National Park, 200 m on Hilina Pali Road from Chain of Craters Road, 15 Aug 1966, *Newell 407* and *409* (BISH). Hawai'i Volcanoes National Park, 1.5 miles on Hilina Pali Switchback Trail from end of Hilina Pali Road, 18 Aug 1966, *Newell 427* (BISH); 22 Jun 1967, *Newell 953* (BISH). Hawai'i Volcanoes National Park, 200 m west of rain shelter at end of Hilina Pali Road, 22 Jun 1967, *Newell 959* and *962* (BISH). Hawai'i Volcanoes National Park, near roadside on Mauna Loa Strip Road, about 3 miles from intersection with Kona-Hilo highway, 23 Jun 1967, *Newell 972* (BISH). Hawai'i National Park, on the floor of Kilauea Crater, not far from steam crack, 18 Jul 1931, *von Loben Sels 596* (UC). **MAUI:** Near Ko'olau Gap, Haleakalā, 27 Jun 1927, *Degener 27272* (BISH). Olowalu Valley, 10 May 1920, *Forbes 2298M* (BISH). Waihoi [*sic*, perhaps Waihou] Valley, 28 Sep 1972, *Harrison 35* (BISH). Ko'olau Forest Reserve, along rim of Haleakalā crater, 9 Nov 1973, *Harrison 518* (BISH). Hana, Nu'u, Haleakalā National Park, Kaupo Gap, 27 May 1980, *Higashino & Holt 9014* (BISH). Hana, Kahikinui, south slope of Haleakalā, north of Manawainui Gulch, 19 Jun 1980, *Higashino & Holt 9220* (BISH). Wailuku, east slope of Hana'ula, near pu'u, north of Pohakea Gulch, 6 Mar 2001, *Oppenheimer H30108* (BISH). **MOKAPU ISLET:** occasional along northeast section, coastal dry shrubland, 8 Mar 2000, *Wood et al. 8323* (PTBG). **MOLOKA'I:** Upper Maunahui Camp, 7 Oct 1938, *Cranwell et al. 2551* (BISH). Overlooking Waikolu Valley, 8 Apr 1928, *Degener 18452* (BISH, MO [photo]). Peninsula east of Wailau Valley, 4 Jul 1933, *Fosberg 9647* (BISH). **O'AHU:** Near Koko Head, along crest of Mauna O Ahi Ridge, 20 Jun 1937, *Egler 37-39* (BISH, US [not seen]). Honouliuli, Wai'anae Mountains near summit of Palikea, 30 Jun 1935, *Fosberg & Dunn 10948* (BISH). Kanehoa subpeak, 12 May 1946, *Kondo s.n.* (BISH). Mokuē'ia, 22 Jun 1954, *Pearsall s.n.* (BISH). Honolulu, Apr 1909, *Rock 927* (BISH).

Gamochaeta americana (Mill.) Weddell**New naturalized record**

Gamochaeta americana is known from a single collection from Maui along a streambed at 1340 m. The species can be recognized by having subclasping to decurrent lower to mid-cauline leaves, a glabrous to glabrate adaxial leaf surface, and shiny, brownish,

glabrous involucre (Nesom, 2004a). *Gamochaeta americana* is probably native to Mexico to South America and the West Indies (Nesom, 2004a).

Material examined. **MAUI:** Kipahulu Valley, Haleakalā National Park, along Koukouai [*sic*, Kaukaui] streambed, 10 Jul 1983, *Medeiros 462* (BISH).

***Gamochaeta argyrinea* G.L.Nesom New naturalized record**

Gamochaeta argyrinea is found on the islands of Hawai‘i, Maui, and O‘ahu. Habitats include grassy slopes, dry ridges, and dry *Sophora chrysophylla* woodland over ash at 760–2410 m. *Gamochaeta argyrinea* is perhaps native to the eastern United States and was first collected in the Hawai‘ian Archipelago, based on these specimens, in 1948. This species can be recognized by its small involucre (3.0–3.5 mm high) and persistent basal rosette of leaves that are yellowish-green and sparsely pubescent adaxially.

Material examined. **HAWAI‘I:** Pu‘u La‘au, near hunter’s cabin, 18 Jan 1975, *Herbst 5186* (BISH). Hāmākua, Ka‘ohe, western slope of Mauna Kea, north of Ahumoa, Pu‘u ‘Ula‘ula, Pu‘u Manao, 21 Jan 1981, *Warshauer & McEldowney 3142* (BISH). **MAUI:** Hana, Kahikinui, south slope of Haleakalā, trail 0.5 km south of Skyline Drive, 19 Jun 1980, *Warshauer & McEldowney 2669* (BISH). Rim of Ukumehame, 25 Aug 1991, *Wood & Periman 1174* (MO [photo], PTBG [not seen]). **O‘AHU:** Wai‘anae Mountains, east facing knoll on Kamaileuna [?] Ridge, 16 Apr 1972, *Gagne 623* (BISH). Wai‘anae Range, South Kaaikukai Gulch, 26 Mar 1948, *Wilbur 536* (BISH).

***Gamochaeta pensylvanica* (Willd.) Cabrera New naturalized record**

[syn. *Gnaphalium peregrinum* Fernald]

Gamochaeta pensylvanica is found on the islands of Hawai‘i, Kaho‘olawe, Kaua‘i, Lāna‘i, Lehua Islet (Ni‘ihau), Maui, Mokapu Islet (Moloka‘i), Moloka‘i, Molokini Islet (Maui), and O‘ahu. Habitats include gardens, pasture, roadsides, along railroad tracks, and dry scrub at sea level to 1190(–1710) m. *Gamochaeta pensylvanica* is possibly native to South America but is found as a weed in many parts of the world (Nesom, 2004b). It was first collected in the Hawaiian Archipelago, based on these specimens, in 1895. *Gamochaeta pensylvanica* can be distinguished from the other species by its leaves, which are softly pubescent on both surfaces and are usually obovate to spatulate. Harold St. John recognized the presence of this species in the Hawaiian Archipelago in 1983 and annotated a number of specimens as *Gnaphalium pensylvanicum* (some with H.St.J. and others with no name but identical handwriting), but his identification/circumscription was not adopted by Wagner *et al.* (1999). The illustration in Wagner *et al.* (1999: Plate 27) actually represents *G. pensylvanica*, although it is labeled *G. purpurea*.

Material examined. **HAWAI‘I:** Hawai‘i National Park, CCC Camp, 2 Nov 1942, *Fagerlund & Mitchell 73* (BISH). South Kohala District, east of Queen Ka‘ahumanu Highway between Mauna Lani Drive and Puako turn-off, 4 Feb 1991, *Funk s.n.* (BISH). Pu‘u Wa‘awa‘a, base of cliffs below Pu‘u Huluhulu, 2 May 1975, *Herbst 5295* (BISH). By visitor center and main ruins of Pu‘uhonua o Hōnaunau National Historical Park, 8 Apr 1984, *Higashino et al. 10326* (BISH). Pu‘u Papapa pad-dock, Waiki‘i, South Kohala, 24 May 1938, *Hosaka 2080* (BISH). North Kohala, below Kohala Ranch house, 11 Jun 1929, *Hosaka 2301* (BISH). Kaluamakani, slopes of Mauna Kea, 1 Jul 1909, *Rock 3133* (BISH). Paauhau 3, Parker Ranch, 6 Jul 1909, *Rock 4619* (BISH). Holokaiea Gulch, 9 Jul 1909, *Rock 4621* (BISH). South Kona, Kealakekua, Tr 60(35), western slopes of Mauna Loa, 3–4 km south of Kipuka Mamani and Waiio Kipuka, 4 Aug 1978, *Warshauer & McEldowney 2052* (BISH). **KAHO‘OLAWA:** Grassland on way to Moa‘ula, 21 Nov 1978, *Char 78.015* (BISH). Along the coast from Maka‘alae to Honoko‘a Bay, 21 Apr 1980, *Clarke & Corn 366* (BISH). Northwestern part of island above Maka‘alae Point, 21 Apr 1980, *Cuddihy & Char 326* (BISH). Lua ‘O Kealialalo, 22 Apr 1980, *Cuddihy & Char 353* (BISH) and *355* (BISH, 2). **KAUA‘I:** Nā Pali Coast, along trail between

Kalalau and Hanakoa Valleys, 9 Apr 1980, *Corn ESP 177* (BISH). Pacific Tropical Botanical Garden, Limahuli Valley, 12 Mar 1984, *Flynn 791* (BISH). Limahuli Garden, 0.4 mi from end of Hwy 56, 21 Dec 1983, *Wagner et al. 5157* (BISH). **LĀNA'I**: Lāna'i City, 21 Aug 1963, *Degener & Degener 28408* (BISH). Kiei Islet on north slope, 6 Apr 2006, *Starr 060406-15* (BISH). **LEHUA ISLET**: Weathered cinder cone, common herb, 10 Jan 1992, *Flynn et al. 4852* (BISH [not seen], PTBG). **MAUI**: 'Ulupalakua, 13 Apr 1937, *Hosaka 1797* (BISH). Lāhainā District, Olowalu, 21 Jan 2002, *Oppenheimer et al. H10211* (BISH). **MOKAPU ISLET**: North side of islet in open, sunny areas, locally common, 3 Apr 2009, *Oppenheimer & Penniman H40918* (PTBG). **MOLOKA'I**: Kualapu'u, 22 Feb 1948, *Fosberg 29561* (BISH). Mauna Loa, Pu'u Nana, 16 Apr 1937, *Hosaka 1847* (BISH). **MOLOKINI ISLET**: 14 Feb 1982, *Hobdy 1239* (BISH). Molokini, center of the islet, 5 Apr 2006, *Starr 060405-09* (BISH). **O'AHU**: Honolulu, University of Hawai'i campus, 21 Mar 1927, *Degener 18446* (BISH, US [not seen]). Puuiki, locally common along railroad tracks, 24 Mar 1937, *Degener & Topping 11119* (UC, US [not seen]). Honolulu, Kaimukī, Wilhelmina Rise, and Waiālae Ave, 24 Mar 1937, *Egler 37-55* (BISH). Round Top on Tantalus Road, 7 Apr 1937, *Egler 37-241* (BISH). Honouliuli, Wai'ānae Mountains, Pohakea Pass, 12 May 1933, *Fosberg 9475* (BISH). Mokapu Peninsula, Pyramid Rock, Hesia Flats, Heleloa, 25 Mar 1933, *Fosberg 10562* (BISH). Kailua, Mokulua, north islet, 16 Feb 1936, *Fosberg 12939* (BISH). At the base of Punchbowl, 25 Mar 1895, *Heller 2002* (UC, US [not seen]). Along Punahou Street, 7 Apr 1975, *Herbst & Ishikawa 5269* (BISH). Koko Crater, Maunaloa, 28 Feb 1930, *St. John 10406* (BISH). Honolulu, University of Hawai'i, Mānoa Campus, 4 Jan 1976, *Swarbrick H-17* (BISH). Honolulu, Kaimukī, Mar 1925, *Topping 3071* (UC, US [not seen]). **Unclear locality**: (Mau'i or Hawai'i) *Hosaka s.n.* (BISH). 9 Mar 1945, *Van Zwaluwenburg s.n.* (BISH). [Scribble] Annotated as "C.N. Forbes's handwriting, before 1920" (BISH 75342).

Gamochaeta simplicicaulis (Willd. ex Spreng.) Cabrera **New naturalized record**

Gamochaeta simplicicaulis is known from a single collection from Moloka'i. It was collected on a weedy, windswept slope at 300 m. *Gamochaeta simplicicaulis* is native to South America, but it has naturalized in the eastern United States, Australia, New Zealand, and Java (Nesom, 2004b, 2006) Based on this collection, it was first collected in the Hawaiian Archipelago in 1987. *Gamochaeta simplicicaulis* can be distinguished from the other species by its large size and basal leaves; it is typically 50-85 cm tall and the basal and proximal leaves are withered at anthesis.

Material examined. **MOLOKA'I**: Manuahi Ridge west and above Pelekunu Valley on windward side, 2 Aug 1987, *Wagner & Lorence 5754* (BISH, US [not seen]).

Key to the Species of *Gamochaeta* in the Hawaiian Archipelago

1. Leaves weakly bicolorized, both surfaces pubescent and grayish-green, the abaxial surface only weakly or moderately more pubescent and grayer, obovate to spatulate; proximal bracts of the inflorescence axis extending beyond the heads, also typically obovate to spatulate; cypselae smooth with scattered papillate hairs (visible at 40×) *G. pennsylvanica*

1. Leaves strongly bicolorized, the adaxial surface conspicuously greener than the abaxial surface, adaxial surface grayish-green, green, or yellowish-green, sparsely arachnose to glabrous, abaxial surface gray or white, pannose; proximal bracts of the inflorescence axis extending beyond the heads or not, linear-lanceolate to oblanceolate-obovate (infrequently spatulate); cypselae with alveolate (honey-combed) surface, also with scattered papillate hairs (visible at 40×)

2. Plants (30–)50–85 cm tall; clusters of small leaves present in the lower leaf axils; inner phyllaries linear or narrowly oblong; apices of inner phyllaries acute-acuminate *G. simplicicaulis*

2. Plants 10–50 cm tall; clusters of small leaves absent in the leaf axils; inner phyllaries narrowly elliptic to oblong; apices of inner phyllaries acute, obtuse, or rounded, often apiculate
 3. Basal leaves (rosette) usually persistent and healthy at anthesis; involucre 3.0–3.5 mm high *G. argyrinea*
 3. Basal leaves often withered at anthesis, rosette sometimes not obvious; involucre 4.0–4.5 mm tall
 4. Lower and midcauline leaves subclasping or decurrent; adaxial surface of the leaves usually glabrous to glabrate, lacking bumpy remnants of trichome bases *G. americana*
 4. Leaves not subclasping or decurrent; adaxial surface of the leaves grayish-green, with remnants of trichome bases that resemble cystoliths, small pieces of sand, or glassy bumps *G. purpurea*

Acknowledgments

Many thanks to Guy L. Nesom for ongoing discussions about the taxonomy of *Gamochaeta*, for first suggesting *G. americana* and *G. simplicicaulis* based on specimen photos, for retrieving information from the UC herbarium, and for providing feedback on a draft of this paper. Thanks also to the staff at BISH, especially Amanda Napua Harbottle and Clyde Imada, who showed warm hospitality and made my quickly arranged visit useful, to John Pruski for providing photos and comments about the specimens in the Missouri Botanical Garden (MO) herbarium, to Tim Flynn for providing photos of specimens at PTBG, to Peter Fraissinet (BH) and Nancy Kahn (US) for providing help with the literature, and to Carl E. Lewis (FTG) and the Fairchild Tropical Botanical Garden, without whom the serendipitous visit to the Bishop Museum would not have been possible.

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New plant records from O‘ahu for 2009¹

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O‘ahu Early Detection here documents 31 new naturalized records, 6 new state records, and 12 new island records. In addition to our own collections, we report on records of naturalization noted by other agencies during 2009. A total of 34 plant families are discussed. The majority of these records are the result of surveys of public roadside areas and therefore often document naturalization of ornamental plants escaping cultivation. Several others however are collections made by natural resource management agencies doing surveys well away from general cultivation, and represent escapes from plant introductions for the purposes of forestry as well as escaped ornamentals. A few accidental introductions are also noted.

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.

Apocynaceae

Carissa macrocarpa (Eckl.) A. DC.

New naturalized record

Carissa macrocarpa, a commonly cultivated plant in Hawai‘i first collected in the early 1990s, is a multiple-stemmed shrub from 3–18 ft tall with y-shaped thorns, leaf petioles 0.25–0.38 cm long; blades broadly to narrowly ovate or subcircular, 2.54–7.00 cm by 1.65–5.08 cm, thick, shiny, and glabrous. Inflorescence is one to few-flowered; flowers are jasmine-scented, sepals triangular, corolla white, with pinwheel-shaped limb. Fruit is ellipsoid and red (Staples & Herbst 2005). One individual of this species was found in a *Leucaena*-dominated coastal habitat, having possibly spread from a nearby neighborhood.

Material examined. O‘AHU: Marine Corps Base Hawai‘i. Dry coastal zone habitat. 4 ft tall sprawling sapling in dense *Leucaena* overstory; no flowers or fruits seen - one individual. This species is common in cultivation and produces viable seed, 5 Aug 2009, OED 2009080502.

Stemmadenia litoralis (Kunth) L. Allorge

New naturalized record

Also known as Lechoso, this species is native from Mexico to Colombia and is occasional to common in cultivation in Hawai‘i. First collected in Hawai‘i in 1940, introduced as an ornamental shade and street tree, it is a small tree to 20 ft tall with usually glabrous, elliptic, 2.0–10.5" by 0.8–4.5" leaves; 1–10-flowered inflorescences; fragrant white flowers to about 3" with a yellow throat. The fruit is a paired, curved-ellipsoid, thick walled, orange to yellow capsule containing seeds which are embedded in a pulpy red aril. It is usually propagated by seed (Staples & Herbst 2005). This species is not well documented as naturalized anywhere else in the world but here was noted naturalizing in roadside

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mesic secondary forest in the Tantalus area of O'ahu, where individuals of all size classes were scattered in a somewhat localized area, growing in shady understory as well as more exposed roadside locations, spreading by apparently bird dispersed seed. It is unclear whether it had originally been planted in the area or if it had spread from cultivated trees in home gardens downslope from the naturalization site. Parker & Parsons (this volume) report this species as naturalized on Hawai'i Island.

Material examined. O'AHU: Tantalus (UTM 2359020, 622051). Tree about 8 ft tall with milky white sap, no flowers; fruit orange, dehiscent, seeds covered in red aril. One mature, many smaller individuals of varying sizes in the understory, 8 Jan 2009, OED 2009010802.

Araliaceae

Tetrapanax papyrifer (Hook.) K. Koch

New naturalized record

Rice-paper plant is native to Taiwan and possibly China, though it is widely cultivated throughout Asia both for its white stem pith to produce such things as artificial flowers and for its ornamental value. First collected in Hawai'i in 1927, this species is a clump-forming shrub with upright stems to 20 ft tall arising from rhizomes. The large, 5–11 lobed, petiolate, soft leaves are dull green above and whitish hairy below, the central lobe and midvein Y-forked at the apex. The brownish hairy inflorescences are 3–4 branched with small umbels of 4- or 5-parted flowers (Staples & Herbst 2005). *Tetrapanax papyrifer* was observed occasionally in the Tantalus area of O'ahu near trailheads, roadside locations, home gardens with mixed ornamentals and naturalized secondary forest species, and as very small individuals sprouting out of gravel driveways. Parker & Parsons (this volume) report this species as naturalized on Hawai'i Island.

Material examined. O'AHU: Tantalus on Round Top Drive (UTM 2358758, 622883). Wet lowland residential area, 0.4 m tall sapling, producing suckers at base. No flowers or fruit. Several saplings growing out of gravel driveway, as well as across the street along roadside. Occasional in neighborhood, 9 Jan 2009, OED 2009010901.

Arecaceae

Licuala spinosa Wurm

New naturalized record

This species, native to Indonesia, is a clump-forming fan palm to 10 feet tall with fronds more or less circular in outline. It looks similar to the more common *Licuala grandis* but differs in having its fronds divided nearly to the base. This species was first collected in Hawai'i from Foster Botanical Garden in 1949. It was noted here very sparingly naturalized sprouting from a hedged row of adventive and naturalized *Tabebuia heterophylla* saplings, as well as other naturalized species and garden escapes near Foster Botanical Garden (Henderson 2009; Hodel 2009).

Material examined. O'AHU: Vineyard Blvd, across from Foster Garden. Growing in mixed *Tabebuia* hedge in lowland urban setting. Juvenile about 2 ft tall, no flowers or fruit, 8 Aug 2008, OED 2008080801.

Asclepiadaceae

Cryptostegia grandiflora Roxb. ex R. Br.

New naturalized record

This species is endemic to the dry southwestern portion of Madagascar and was first collected in Hawai'i in 1930. A related species more common in cultivation in Hawai'i, *Cryptostegia madagascariensis*, had long been misidentified in Hawai'i as *C. grandiflora*. True *C. grandiflora* differs in having smaller, more numerous lenticels, larger corollas from 2.0–2.5" long, distinctive 2 lobed corona filaments, and larger fruit from 4.00–6.25"

long (Staples & Herbst 2005). This species is rarely cultivated on O‘ahu. It is considered one of Australia’s worst weeds and invades native ecosystems, riparian areas and pastures, forming impenetrable thickets and smothering vegetation. It was noted as well distributed and established in dry lowland kiawe forest and shrubland in Kalaeloa, O‘ahu. Its seeds are easily wind and water-dispersed in riparian areas.

Material examined. O‘AHU: Kalaeloa (UTM 0596880, 2355735), dry coastal mixed alien shrubland. Vine, sprawling over *Leucaena* up to 12 ft tall. Corollas whitish pink inside, striated medium lavender outside, corona filaments bilobed. No scent. Seen naturalized widely in area, 16 Jun 2009, OED 2009061601.

Asteraceae

Centratherum punctatum Cass.

subsp. *punctatum*

New island record

This garden escape has been collected on most of the main islands, including Kaua‘i, Moloka‘i, Lāna‘i, Maui, Hawai‘i, and now O‘ahu. It was found growing between cracks in a sidewalk in a well-populated urban setting. Due to its ornamental nature, this species likely is more commonly naturalized and tolerated where it spreads.

Material examined. O‘AHU: Wai‘alae Iki, lowland residential area. One individual growing out of crack in sidewalk. Semi-woody herb about 0.5 m tall with bright purple flowers. Many fruiting heads seen, with small, dark brown achenes, 19 Mar 2009, OED 2009031901.

Delairea odorata Lem.

New island record

Delairea odorata is a popular ornamental vine native to South America which has escaped cultivation in many parts of the world, including California, New Zealand, Australia, and Hawai‘i. In the Hawaiian Islands, it was previously collected on Maui, Lāna‘i, and Hawai‘i. It was recently found on O‘ahu spreading down a residential road in the understory of a dense lowland secondary forest. Efforts to control this population are underway.

Material examined. O‘AHU: Pālehua, UTM 2365720, 593333. Climbing up nearby shrub in mixed naturalized *Plectranthus verticillatus* groundcover. Vine patch 10 × 10 ft. Flowers yellow, in axillary and terminal cymes. Copious seeds, 12 May 2009, OED 2009051206.

Vernonia elliptica DC.

New naturalized record

Vernonia elliptica, a vining plant native to India, Myanmar, and Thailand, is occasionally cultivated in Hawai‘i. Although a local newspaper article in the 1970s suggested this plant be cultivated along roads and highways as a privacy screen, it is unclear how many plantings of this species occurred here as a result (Staples & Herbst 2005). This species can be distinguished by its straggling, vining habit, silvery leaves, and axillary clusters of sweetly scented discoid flower heads (Peng 2004; Staples & Herbst 2005). It was found spreading from its original planting on a side road close to a main highway.

Material examined. O‘AHU: Keolu, UTM 2363599, 631210. Climbing over *Leucaena* in lowland residential setting. Vine 10 × 20 ft, numerous small achenes, 6 May 2009, OED 2009050605.

Bignoniaceae

Catalpa longissima (Jacq.) Dum. Cours.

New naturalized record

The species’ ease of cultivation, fast growth, and adaptability make it a popular species in many parts of the world, including Hawai‘i (Staples & Herbst 2005). This is the first naturalized collection of this species in the state, where it was found sparingly naturalized in roadside areas, having spread from abundant street tree plantings in the area. Dis-

tinguishing features of *Catalpa longissima* include elliptic-lanceolate leaves arranged opposite each other or in whorls of three and few-flowered inflorescences with bell-shaped, inch long flowers with yellow and sometimes purple markings in the throat.

Material examined. O'AHU: Kaimuki neighborhood, near 12th and Harding Avenue, UTM 2353760, 624445. Dry lowland residential area. Growing under a water heater within a narrow fenced area near restaurant. Tree about 6 m tall, flowers white with purple streaks in inner corolla, petals ruffled. Fruit about 12 in long, tapered at tip. This species is used as a street tree in the neighborhood and is occasionally seen naturalized here, 5 Mar 2009, OED 2009030501.

***Mansoa hymenaea* (DC.) A.H. Gentry**

New naturalized record

Mansoa hymenaea, a plant native to Central and South America, is a moderately popular species in cultivation in Hawai'i (first collected in 1938). This plant can be distinguished by its strong garlic odor (which gives it the common name "Garlic vine"), compound leaves with two leaflets, three-forked tendrils, and lavender to magenta corollas (Staples & Herbst 2005). Several seedlings were found naturalized near an abandoned homesite.

Material examined. O'AHU: 'Ewa Beach, UTM 2359503, 599362. In weedy abandoned field with *Spathodea*, *Mangifera*, *Bougainvillea*. Seedling about 0.5 m tall. Flowers magenta, bell-shaped, terminal. No fruits. Several scattered seedlings, one medium-sized individual in area, 19 Jun 2009, OED 2009061901.

Blechnaceae

***Blechnum orientale* L.**

New state record

This fern, which is native to tropical Asia, Australia, and some Pacific Islands, was found in two separate locations on the island of O'ahu. This species was previously unknown from Hawai'i, either naturalized or in cultivation. It is unclear how it may have arrived here, although some gardening sites have mentioned its cultivation in the Philippines and other tropical locales (Dave's Garden 2005; Carter 2010). It is documented here as sparingly naturalized in mostly open but also partially shaded areas of a lowland mesic windward O'ahu ridge in mixed native and nonnative vegetation. The description of this species, taken from the *Flora of Taiwan*:

"Caudex short, erect, densely covered with linear-lanceolate, dark brown scales. Stipes tufted, shorter than laminae, 30–60 cm long, scaly at base when young; fronds pinnate; pinnae linear-lanceolate, wide spreading, glabrous; median pinnae 10 to 40 cm long, to 1.8 cm wide, base of pinnae adnate on lower side, free on upper side; veins free, parallel, simple or forking from near costa. Sori costal, linear, reaching from base nearly to apex; indusia very narrow" (Peng 2004).

Material examined. O'AHU: Kahalu'u- 'Āhuimanu dividing ridge. Along ridge crest trail about 50 ft above a dilapidated hogwire fence. The surrounding vegetation: *Sphenomeris chinensis*, *Wikstroemia oahuensis*, *Rhodomyrtus tomentosa*, and *Psidium cattleianum*, 1 Jan 2009, K. Kawelo US Army 104.

Boraginaceae

***Cordia alliodora* (Ruiz & Pav.) Oken**

New naturalized record

Cordia alliodora, a plant native to Central America, is valued as a tree crop in many areas for its dark, easy-to-work wood (Burns & Honkala 1990). However, on many of the Pacific islands where this species was introduced, it has become a serious invasive pest (Bakeo & Qarani 2003). As their report from Vanuatu stated:

“The introduction of this Central American tree is a classic example of an aid programme gone wrong, especially now that there is no lucrative market to sell the 800 hectares of stock planted. *Cordia alliodora* was introduced with the best intentions, but failed to live up to expectations for various reasons, probably linked to climatic differences between Central America and Vanuatu. It is becoming a nuisance as it slowly penetrates natural forests. It is a species that is multiplying at a faster rate than it is being harvested. Communities on a number of islands, particularly, Eromango and Maewo, have made formal complaints. *Cordia alliodora* is widely distributed, meaning that if unchecked it could trigger an immense biodiversity problem” (Bakeo & Qarani 2003).

This collection of *Cordia alliodora* represents the first record of naturalization for this species in the state. It is unclear how the species was introduced to the area. It was locally common within a 200 m radius. Individuals of varying sizes were seen, many established in deep shade, growing in riparian areas including in the bed of a seasonal stream, valley floors and slopes, as well as seedlings and saplings growing among the stones of a maintained heiau. It is also reported to be naturalized in Waimea Botanical Garden. *Cordia alliodora* can be distinguished by its oblong or lanceolate to elliptic leaf blades, 10–20 × 3–8 cm, stellate-pilose or glabrate on both surfaces; loosely-branched inflorescences, 10–30 cm across; cylindric, densely stellate-tomentose calyx, 4–6 mm long with 10 prominent ribs; white (drying to brown and persisting) corolla with lobes 5–7 mm long; and cylindrical fruit about 5 mm long, enveloped by the persistent corolla and calyx tube (Smith 1991).

Material examined. O‘AHU: Mākaha Valley, along road to Kāne‘ākī Heiau, UTM 584242, 2376748. Mesic lowland secondary forest. Tree about 15 ft tall, branch nodes swollen and hollow, ant domatia. Fruits within a dry, persistent corolla which is both wind dispersed and buoyant. Species is very common within about 200 m radius, there may be more further up the valley. Individuals of various sizes seen; grows to a height of 50–70 ft. Has been planted as a forestry species in Hawai‘i (from Skolman.), 10 Feb 2009, OED 2009021001.

Bromeliaceae

Werauhia sanguinolenta (Cogn. & Marchal) J.R. Grant **New state record**

Werauhia sanguinolenta (a name which is sometimes considered to be a synonym of *Vriesea sanguinolenta* Cogn. & Marchal) grows from around sea level to 1200 m in its native range, which extends from Costa Rica to Ecuador and the Greater Antilles. One individual of this epiphytic species, which has never been collected (either naturalized or cultivated) in the state, was found growing in a *Citharexylum caudatum* thicket several hundred meters from the nearest home site. In addition, several individuals (2–5 matures, and 6–10 immature) were found apparently reproducing and spreading in a yard down the road from the naturalization site. The description for this species, from Flora Neotropica, is as follows:

“Plant flowering 1–2 m high. Leaves about 10 in a dense rosette, suberect, 6–7 dm long, green, usually with large irregular spots of deep red especially near the base, obscurely punctulate-lepidote; sheaths ovate-elliptic, the same color as the blades but slightly broader; blades ligulate, acute or subrounded with a long apiculus, 8–10 cm wide. Scape erect, greatly exceeding the leaves, well over 1 cm in diameter at the summit, glabrous; scape-bracts erect, imbricate, very broadly ovate, acute or the lower ones triangular-laminate, glabrous, even, thick, coriaceous. Inflorescence simple or few-branched, to 4 dm long; primary bracts suberect, like the upper scape-bracts, covering only the sterile bases of the branches; branches suberect, secundly 11–15-flowered, the lateral ones 25 cm long with 1 or 2 sterile bracts at the base, the terminal one nearly 4 dm long with a sterile base as long

as the fertile part and appearing like a continuation of the scape; rhachis to 10 mm in diameter, flexuous, strongly 4-angled, glabrous, dark, its internodes narrowly obconical. Floral bracts becoming secund with the flowers, broadly elliptic to suborbicular, abruptly acute, to 5 cm long, some and usually all more than twice as long as the internodes, glabrous, even, rigid, coriaceous, green, drying to light brown, incurved and carinate toward apex; flowers spreading and downwardly secund; pedicels very stout, to 12 mm long. Sepals very broadly elliptic or ovate, obtuse or broadly acute, 30–45 mm long, rigid, coriaceous, even and glabrous outside, striate and punctulate-lepidote within; petals white, slightly exceeding the stamens, bearing 2 scales at base” (Smith & Downs 1977).

Material examined. O‘AHU: Ka‘alaea Valley, left side. Mesic streamside. Primary vegetation: *Citharexylum caudatum* and *Hibiscus tiliaceus*. Epiphytic bromeliad growing on *Citharexylum caudatum* about 5 ft from ground level. Rosette about 1.5 m across and tall. Blades burgundy red, becoming greenish at ligulate base. Apex apiculate, the tip curling to form a “spine.” Single individual in this area, among a dense *Citharexylum caudatum* thicket, several hundred m from nearest house. This species was also seen reproducing/spreading (2–5 matures, 6–10 immatures) in a yard at the end of Kamakoi Road, where it may have been originally planted, 17 Jul 2009, OED s.n. (BISH 741558).

Campanulaceae

Platycodon grandiflorus (Jacq.) A. DC.

New naturalized record

Platycodon grandiflorus, a native of northeastern Asia, has been a popular ornamental since its introduction to horticulture in the late 1700s (Staples & Herbst 2005). Despite its long-time cultivation elsewhere, the first collection of this species from Hawai‘i was in 1951. Distinguishing features for this species include thick, fleshy rhizomes, erect solitary flowers on long stalks with greatly inflated purple, blue, pink, or white buds (lending this species its common name of “Balloon flower”) and capsule fruit which opens at the apex by 5 valves (Staples & Herbst 2005).

Material examined. O‘AHU: Mānoa, UTM 2357198, 622786. Growing with *Vinca* out of rock wall near drainage pipe. Herb about 25 cm tall. Flowers campanulate, open, bright purple, fruit a beaked capsule, 31 Oct 2008, OED 2008103101.

Capparaceae

Capparis mollicella Standl.

New naturalized record

Capparis mollicella, an attractive tree native to Mexico and Central America (Zamora *et al.* 2000), is known to have been planted at two sites on O‘ahu- at Schofield Barracks, between buildings 672 and 673 (Staples & Ching 1179, 15 Apr 1999, BISH) and at the foot of Diamond Head, near Kapi‘olani Park (Neal 1239, 7 Aug 1947, BISH). This collection was from a sparingly naturalized population of around 18 individuals of various size classes found outside the fence bordering Wheeler Air Force Base. *Capparis mollicella* is a tree species that reaches 5–8 m high. Branches are glabrous; leaves are simple, alternate, and glabrous, usually rounded-ovate, (6–) 12–30 by (2.5–) 5.5–27.5 cm, leaf apices are acute to apiculate, bases are cordate, truncate or obtuse, and petioles vary in size from 1 to 25 cm long. Terminal inflorescences are corymbose, with 12 to 20 flowers. Flowers are pink to purple, large, on pedicels from 7.0–10.5 cm long, stamens numerous. Fruits are a pendulous berry, from 4 to 12 cm long (Zamora *et al.* 2000).

Material examined. O‘AHU: Kunia Rd, UTM 2357198, 622786. Growing in weedy hillside along outside of Wheeler AFB fence. Tree about 18 ft tall. Flowers with thick white petals, lavender in center, citrusy scent. Fruits seemingly immature, smell like body odor. Several individuals (about 19) of varying size classes in localized area, 1 Oct 2009, OED 2009100101.

Chrysobalanaceae***Chrysobalanus icaco* L.****New naturalized record**

Chrysobalanus icaco, or Coco-plum, is native to coastal areas of southern Florida and the Bahamas throughout the Caribbean, as well as Mexico, Central America, and northern South America (Francis 2011). It has become a serious invader in the Seychelles, where it was planted for erosion control (Meyer 2000). It is reported to form dense thickets that prevent native plant regeneration (Smith 1991). It is unclear how popular this plant is in cultivation in Hawai'i, but its further use in horticulture should be discouraged. Distinguishing characters for this species include alternate leaves, inflorescences in a panicle with 5-parted flowers, with a basal style. The fruit is a fleshy drupe with a hard pit.

Material examined. O'AHU: Lower Lā'ie Falls Trail, on eroded slope mauka of *Casuarina* forestry planting. Dry lowland eroded red dirt slope, nonnative secondary forest. Shrub about a meter tall. Fruits round, green, maturing from white to bluish pink. Sparingly naturalized in area, spreading downslope in wash areas from presumed erosion control plantings. About 50 individuals of various sizes in area, 15 Dec 2009, OED 2009121501.

Convolvulaceae***Argyria nervosa* (Burm. f.) Bojer****New island record**

This expansive vining climber, with its distinctive densely pubescent leaves, is occasional in cultivation in Hawai'i. It has been previously collected as naturalized on both Kaua'i and Maui. On O'ahu, it was found along a roadside in the understory of a mixed nonnative forest in a residential area. This species is often seen growing along roadsides where its planting status is unclear, so the extent of its naturalized range on O'ahu is also unclear.

Material examined. O'AHU: Keolu, UTM 2363799, 630103. Lowland mixed forest. Vine seedling about 0.25 m tall, no flowers or fruit, 6 May 2009, OED 2009050603.

Ipomoea carnea* Jacq. subsp. *fistulosa

(Mart. ex Choisy) D.F. Austin

New naturalized record

This shrubby member of the Morning glory family, popular in cultivation worldwide for its large, showy flowers and ease of cultivation (Staples & Herbst 2005), has become a problem species in many places it has been introduced. In India it has become a pest of littoral areas, ponds, and other aquatic sites (Chaudhury *et al.* 1994). *Ipomoea carnea* subsp. *fistulosa* is adaptable to a variety of soil types and is resistant to neglect and drought (Staples and Herbst 2005). All plant parts have been observed to be poisonous to livestock (de Balogh *et al.* 1999; Staples & Herbst 2005). Distinguishing features of this subspecies include its shrubby habit, hollow, erect stems, and deep pink to rose purple, funnel-shaped corollas (Herbst *et al.* 2004). It was found naturalizing in several locations in a dry lowland residential area on O'ahu and collected growing out of a crack in a sidewalk.

Material examined. O'AHU: Kaimukī, UTM 2353659, 623809. Dry lowland residential area. Growing out of crack in driveway- repeatedly cut back to base. Shrub about a meter tall, sparingly branched, corollas lavender, darker towards the center. Species is occasional in the neighborhood, presumably both cultivated and naturalized, 6 Mar 2009, OED 2009030601.

Crassulaceae***Crassula multicava* Lem.****New island record**

Crassula multicava, an attractive plant used as a groundcover, grows better in Hawai'i at higher elevations. It was first collected as cultivated in Hawai'i in 1940 and was first

found naturalizing in Waimea Canyon State Park on Kaua‘i in 1994. On O‘ahu, it was found spreading down a road in the understory of an upcountry residential area.

Material examined. O‘AHU: Pālehua Road, 2400 ft. Primary groundcover in *Eucalyptus* forest. Low-growing herb, about 10–20 cm, immature flowers with pink buds. Fruits not yet present. Potential escaped yard plant across the road from cabin, 16 Mar 2009, *J. Beachy US Army 134*.

***Kalanchoe beharensis* Drake**

New naturalized record

Kalanchoe beharensis, which is grown as a specimen plant for its unusual, felt-like woolly-hairy foliage and long-lasting flowers (Staples & Herbst 2005) does not appear to have been collected as naturalized anywhere else in the world (Randall 2007). Nonetheless, this species is easily propagated by cuttings, and fallen leaves root easily (Staples & Herbst 2005). It is very likely this collection of a naturalized individual came from discarded yard clippings tossed onto a dry hillside. Several individuals of varying size classes were seen. Distinguishing characteristics of this species include woolly leaves, knobby trunk, and triangular, strongly concave leaves.

Material examined. O‘AHU: Pālolo Valley, near intersection of Ka‘au St and Mokuna Pl. Lowland mesic/dry residential setting. 1.5 m shrub, no flowers or fruit on specimen. Several individuals growing on dry, rocky slope, 3 Oct 2008, *D. Frohlich and A. Lau OED 2008100301*.

Cupressaceae

***Callitris endlicheri* (Parl.) F.M. Bailey**

New naturalized record

Callitris endlicheri, or Black cypress, a gymnosperm that grows widely in shallow soils on rocky sites in its native range of southeastern Australia (McCarthy 1998), has begun to spread in central O‘ahu. Though it was planted on Kaua‘i, Maui, and Hawai‘i Island for forestry, there are no records of O‘ahu plantings of this species between 1910 and 1960 (Skolmen 1980). *Callitris endlicheri* has been collected from large monotypic patches in the Schofield Barracks West Range; one collection came from the south ridge of Mohiākea Gulch and the other from near a firebreak in the vicinity of the gulch (collected in January 2012 and not accessioned.) Distinguishing features for this tree include strongly keeled leaves and female cones with a small dorsal point near the apex (McCarthy 1998).

Material examined. O‘AHU: Schofield Barracks West Range, South Ridge of Mohiākea. Mixed alien koa forest. Evergreen tree about 10 m tall. Actively spreading in the area, forming dense patches and excluding other species. New naturalized record, 28 Jan 2009, *J. Rohrer US Army 107*.

Fabaceae

***Albizia niopoides* (Benth.) Burkart**

New naturalized record

Albizia niopoides is a rarely planted, introduced species in Hawai‘i, known only from two locations on O‘ahu. It was first collected in 1999 from Schofield Barracks, although the tree height at the time was estimated to be 80 ft, so the date of introduction would have been much earlier. It is also known from Makiki Heights, perhaps originally planted and now spreading, forming a dense thicket under the largest tree where saplings grow in dense shade. Smaller trees were also located in the area. It may grow to a large size (30 m), often with very light grey bark. It is further characterized by bipinnately compound leaves with 6 or more pairs of pinnae. The leaflets are closely spaced, 7–9 mm long by 1 (up to 2) mm wide. The leaf rachis is channeled, with a nectary at the distal end. Stipules are 6–7 mm long, setiform, and deciduous. Young twigs are greenish or yellowish with sparse lenticels (Flores 2002).

Material examined. O'AHU: Makiki Heights on left side of road heading up to DOFAW base-yard. Lowland mesic secondary forest, growing with forestry species. 12–14 m tall tree. Hundreds of saplings growing in dense shade, forming a dense thicket, 25 Aug 2009, OED 2000082501.

Albizia saponaria (Lour.) Blume ex Miq.

New island record

Albizia saponaria is a rarely cultivated tree, first collected in Hawai'i in 1915, grown primarily on large estates in Honolulu. It was also planted in the Waimānalo Forest Reserve on O'ahu (Skolmen 1980). It has been collected as naturalized on Kaua'i in one location, where about 100 plants were found spread over several acres (Lorence & Wagner 1995). On O'ahu, a population covering a 30 × 50 m area was found in Schofield Barracks.

Material examined. O'AHU: Schofield Barracks East Range at Pineapple Gate, north side of gate. Tree about 5–7 m tall. Whitish trunk about 15 cm dia. Root suckers forming as a result of weed whacker damage. About 50 × 30 m infestation, 26 May 2009, J. Beachy & K. Kawelo US Army 157.

Erythrina crista-galli L.

New naturalized record

A native of South America, *Erythrina crista-galli* has been widely planted throughout the tropics and subtropics worldwide, often as a shade or street tree. It was introduced to Hawai'i by 1913, and is now a commonly planted tree on O'ahu. It can be distinguished from other *Erythrina* species in Hawai'i by its glabrous leaves with usually spiny petioles, its terminal, drooping inflorescences that appear with the leaves, and dark red corollas (Staples & Herbst 2005). It is commonly cultivated and is becoming widely naturalized in riparian areas in New South Wales (Harden 1991). It was found very sparingly naturalized in a dry lowland gulch in Wai'ālae Iki. Because this tree is so common in cultivation, it should be monitored for signs of further spread, particularly into natural areas. In this Parker & Parsons (this volume) report this species as naturalized on Hawai'i Island.

Material examined. O'AHU: Wai'ālae Iki, UTM 628569, 2353925, 2.5 m tall sapling growing in a dry stream bed just before a concrete drainage ditch. Seen this species in several roadside growing situations where planting status unclear. 19 Mar 2009, OED 2009031903.

Glycine microphylla Tindale

New state record

This species is native to Australia, where it has been given the appropriate common name Small-leaf glycine. It can be distinguished from other species of *Glycine* in Hawai'i, as well as many other vining members of the Fabaceae family in Hawai'i, by the following characters: "a scrambling habit; stems stoloniferous, ± glabrous or hairy with weak white or light brown hairs; leaves weakly pinnately 3-foliolate, leaflets of upper leaves narrow-lanceolate to lanceolate, 1.5–5.0 cm long, 1–6 mm wide; leaflets of lower leaves ± obovate to ± elliptic, 0.4–5.0 cm long, mostly 2–9 mm wide; hairy with short, white, appressed hairs; stipels present on terminal petiolule; racemes 5–13-flowered, 2.0–2.5 times as long as leaves; calyx glabrous or sparsely hairy, 3 lower sepals shorter than the tube; standard 4.5–8.0 mm long, usually pinkish to purple; pod straight, ± linear, 1.5–2.7 cm long, 2.5–3.5 mm wide, without purple flecks, sparsely strigose; seeds 3–6" (Harden 1992). Plants in the field were particularly small statured, climbing no higher than a half meter, and usually forming mats along the ground in partially shaded areas. However, floras do not describe the variability in height or stem length.

Small-leaf glycine does not appear to have been purposefully or even accidentally introduced anywhere outside its native range prior to the collection referred to here. It was found sparingly naturalized, forming a small patch at the revegetated site at Castle Junction near Kailua, O'ahu. The most likely means of introduction seems to be acciden-

tal, where seeds of this species got into shipments of hydromulch (sourced from Australia) used for revegetating the slope.

Material examined. O'AHU: Castle Junction along Kalaniana'ole Hwy, on east side of revegetated hill. Mesic lowland roadside. Open, revegetated area. Prostrate vine with trifoliate leaves. This possibly arrived as hydromulch contaminant when area was recently landscaped/revegetated. Seed mix came from Australia, 7 Nov 2008, *B. Azama s.n.* (BISH 736233).

Kummerowia striata (Thunb.) Schindl.

New island record

This species from China, a low growing (up to 18") herb, was first collected on the Big Island in a Parker Ranch pasture in 1923. It escaped notice, or at least collection, until being found again on Maui in 2000 (Oppenheimer 2003). It is documented here as sparingly naturalized in a roadside lawn area on Schofield Barracks, O'ahu.

Material examined. O'AHU: Schofield Barracks, herb about 6 in tall. Flower standard pink, striated, keel white with pink tip. Pods about 2 mm long, with one seed, 25 Aug 2009, *OED 2009082501*.

Piscidia piscipula (L.) Sarg.

New naturalized record

This tree is native to parts of Central America and the Caribbean, where its bark has traditionally been used to stun fish, earning it the common name Fish-poison tree. It was first collected in Hawai'i in 1918, in Honolulu, where it is occasional to rare in cultivation. A total of 83 have been planted in the Waimānalo Forest reserve (Skolmen 1980). It can be distinguished from other papilionoid trees in Hawai'i by its 7–9 odd-pinnately-compound leaflets, with lavender-white to reddish tinged, 0.5" long corollas combined with pale green, 0.75–3.50" long pods that have 4 large, lengthwise papery wings (Staples & Herbst 2005). This species was found sparingly naturalized in dry lowland scrub near the base of Koko Crater, probably spreading from nearby plantings.

Material examined. O'AHU: Along road on side of Koko Crater, UTM 635685, 2353749. Dry lowland scrub dominated by *Prosopis*. Tree about 3 m tall. Keel pinkish, banner mostly white with green stripe running vertically down middle. Several individuals of various sizes seen, 9 Apr 2009, *OED 2009060904*.

Senna siamea (Lam.) H.S. Irwin & Barneby

New naturalized record

Also known as Kassod tree, this species from areas of Southeast Asia has been introduced throughout the tropics worldwide for use as a reforestation tree, windbreak, shade tree for coffee, and as an ornamental. It has commonly become naturalized in areas where it has been introduced (Staples & Herbst 2005). It has been in Hawai'i since the 1870s, and has been planted both for forestry and as a street tree. In total, 1,461 were planted in forest reserves throughout the state (Skolmen 1980). *Senna siamea* can be distinguished from other species of *Senna* in Hawai'i by the following characters: tree growing to 60 ft with leaves to 1 ft long which lack petiolar glands; leaves symmetrical at base; inflorescences to about 1 ft long, racemose to pyramidal; and flattened fruits 8–12" long, with leathery valves. It fruits heavily in Hawai'i, and fruits persist a long time on the tree (Staples & Herbst 2005).

Senna siamea was seen sparingly naturalized on Wheeler Air Force Base, growing in small gulches of mixed nonnative secondary forest and scrub. It was a common street tree in the surrounding area, but not the immediate vicinity.

Material examined. O'AHU: Wheeler AFB, near corner of Wright Ave and Airdrome Rd. 6 m tall tree, flowering profusely. Commonly planted in Schofield/Wheeler roadside areas and sparingly naturalized on base, 4 Sep 2009, *OED 2009090403*.

***Senna spectabilis* (DC.) H.S. Irwin & Barneby** **New naturalized record**

Senna spectabilis is a tropical American shrub or tree to 50 ft tall, which is rarely planted in Hawai'i. It can be distinguished from other *Senna* in Hawai'i by the combination of the following characters: Leaves without petiolar glands, flowers irregularly symmetrical where 1 petal is folded in over the stamens, 7 stamens per flower, and more or less cylindrical fruits (Staples & Herbst 2005). It is documented here as sparingly naturalized, spreading from planting sites into mesic gulches and roadside residential areas at Schofield Barracks.

Material examined: O'AHU: Schofield Barracks, UTM 597310, 2377278. Seedlings of various sizes in *Falcataria* understory, sapling about 15 ft tall, no flowers seen. Fruits cylindrical, 18 Aug 2009, OED 2009081801.

Tamarindus indica* L.*New island record**

Commonly cultivated worldwide, and long cultivated in Hawai'i, Tamarind has been collected as naturalized in Kalaupapa, Moloka'i, spreading from planted sites. It is documented here as sparingly naturalized on O'ahu, in Lualualei, also spreading from plantings. It has been noted occasionally spreading in other dry areas of the island as well.

Material examined: O'AHU: Lualualei watershed, off Hakimo road. UTM 2366948, 588143. Dry lowland residential/agricultural roadside. 8-ft tall tree with many fruits. This species is rarely to occasionally naturalized in the area spreading from cultivated trees which are common here, 17 Feb 2009, OED 2009021701.

Flacourtiaceae***Flacourtia indica* (Burm. f.) Merr.****New naturalized record**

The taxonomy of *Flacourtia indica*, or Governor's plum, is complex. Many sources describe this species as a cultigen since its place of origin is unknown, and it is widely cultivated throughout the Old World tropics and into Polynesia (Staples & Herbst 2005). This species is highly variable, broadly defined, and includes several synonymous names previously described as distinct taxa (Staples & Herbst 2005). *Flacourtia indica* thrives in seasonally dry, sunny areas, in all soil types. This species was found on O'ahu in the understory of a *Casuarina*-dominated lowland secondary forest in sandy soil. The description for this species (taken from the Flora of China) is as follows:

“Shrubs or small trees, 2–4 m tall, deciduous; bark gray-yellow, fissured, flaky; old branches usually not spiny; young branches with axillary, simple spines; branchlets puberulous or subglabrous. Petiole red, short, 3–5 mm, puberulous; leaf blade greenish abaxially, deep green adaxially, rose red when young, obovate to oblong-obovate, 2–4 × 1.5–3 cm, thickly papery, abaxially glabrous or sparsely pubescent, hairs spreading and short, adaxially glabrous, midvein raised abaxially, flat adaxially, lateral veins 5–7 pairs, reticulate veins conspicuous, base mostly acute to obtuse, margin serrulate above middle, apex rounded, sometimes retuse. Inflorescences axillary or terminating short lateral twigs, racemose, short; rachis 0.5–2 cm, puberulous. Pedicels 3–5 mm, puberulous, hairs spreading. Sepals 5 or 6, ovate, ca. 1.5 mm, outside glabrous or with a few scattered short hairs, inside sparsely to densely pubescent, margin white ciliate in dried material, apex obtuse. Staminate flowers: stamen filaments 2–2.5 mm, pubescent or less often glabrous. Pistillate flowers: ovary globose, placentas 5 or 6; styles 5 or 6, united only at base, radiating, 1–2 mm, slender. Fruit dull to blackish red, globose, 8–10 mm in diam., longitudinally 5- or 6-angled, styles persistent. Seeds 5 or 6” (Yang & Zmarzty 2007).

Material examined: O'AHU: Bellows AFB, around campsite near golf area, mauka side of Tinker Road. UTM 2363960, 633402. 15 or more individuals scattered in coastal lowland secondary

forest dominated by *Casuarina*. 2-m tall shrub with reddish-brown lenticillate bark. New leaves pink-tinged, new stems reddish. Older plants with few noticeable spines, younger plants spiny. Fruits ripening red, 24 Sep 2009, *OED 2009092401*.

Lamiaceae

Plectranthus neochilus Schltr.

New naturalized record

Plectranthus neochilus, a plant native to southern Africa, is occasionally planted as an ornamental, both for its attractiveness and for its purported ability to repel deer, snakes, and dogs (owing to its unpleasant odor). This description of the species comes from the *Flora of New South Wales*:

“Unpleasantly aromatic, decumbent to erect, perennial herb 12–50 cm high; branches succulent, finely and minutely hairy, or sparsely to densely covered with short and long hairs and scattered orange-red sessile glands. Leaves with lamina succulent, viscid, obovate to elliptic-ovate, 2–5 cm long, 1.5–3.5 cm wide; apex obtuse to rounded; base cuneate to attenuate; margins obscurely crenate with 4–6 pairs of teeth; both surfaces sparsely to densely hairy with shortly appressed hairs, especially on veins below, with orange sessile glands below; petiole 0.5–1.5 cm long. Calyx c. 3 mm long, to 6 mm long in fruit. Corolla 12–20 mm long, mauve-purple, rarely whitish, the upper lip paler and bluish, slightly hairy; tube slightly decurved; lobes with scattered sessile glands” (Harden 1992).

This species has spread from planted areas in other regions and is documented here as very sparingly naturalized in a lowland residential roadside area of O‘ahu, also spreading from planted individuals.

Material examined. O‘AHU: Keolu, on Uluhaku Rd. In roadside lawn habitat, growing against utility pole. Herb about 40 cm tall, flowers purple, zygomorphic. Malodorous, sometimes used to repel dogs, 6 May 2009, *OED 2009050602*.

Liliaceae

Dianella caerulea Sims

New naturalized record

This species of *Dianella* is cultivated occasionally as an ornamental and is a native of Australia. The species *D. caerulea* was first collected on O‘ahu from Wahiawā Botanical Garden in 1986. This collection documented here is from the understory of a *Psidium cattleianum* and *Acacia koa* forest in Pālehua. The taxon collected here was identified as *D. caerulea* var. *asserata* R.J.F. Hend. The description for this variety (taken from the *Flora of Australia*) is as follows:

“Plant tufted, solitary, to 1.8 m tall. Stems elongating, with scales for most (sometimes all) of their length, touching or up to 30 cm apart, arching or ascending; extravaginal branching rapidly developing. Leaf sheaths +/- completely occluded distally. Inflorescence from narrowly conical to narrowly cylindrical in outline, continuous or interrupted; cymules open or contracted, few-flowered. Perianth pale blue to mid-blue with green streaking externally” (Henderson 1987).

Material examined. O‘AHU: Pālehua. In strawberry guava, *Acacia koa* understory. Climbing herb, 1.0–1.5 m tall. Flowers small, purple, zygomorphic. Fruits small, green (immature), 0.5 cm diameter. Leaves with serrate margins, equitant on stems of varying heights, 13 May 2009, *J. Beachy US Army 152*.

Melastomataceae

Tibouchina granulosa (Desr.) Cogn.

New naturalized record

Tibouchina granulosa, a species not frequently cultivated as an ornamental in Hawai‘i and

not previously collected as naturalized in the state, has now been spotted spreading 20–30 m from a planted tree. The original planting had been uprooted, and then cut into logs, which were resprouting. Several saplings and seedlings of various sizes were seen growing uphill from the original planting. This species can be distinguished from other commonly seen *Tibouchina* species by its 4-winged branchlets, leathery, elliptic to ovate-lanceolate leaves, evenly purple flowers, woolly filaments, and floral bracts and calyx lobes with broad, smooth marginal bands (Staples & Herbst 2005)

Material examined. **O'AHU:** Mānoa Valley, mauka of currently managed portions of Lyon Arboretum. UTM 623840, 2359941. 1 m tall sapling, no fruits or flowers seen. Sapling was found about 50 m from an uprooted, resprouting tree that had apparently been cut into pieces, which were also sprouting. Seedlings of this species less than 20 cm tall were found on a ridge nearby, about 20–30 m from original tree. 2 Sep 2008, *OED 2008090201*; Mānoa Valley, mauka of currently managed portions of Lyon Arboretum. UTM 623840, 2359941. Lowland mesic secondary forest, 20 cm tall seedlings. This species widely believed not to reproduce by seedlings in Hawai'i. Four other naturalized saplings and small trees noted in the area, about 40 m from the original planted area, 5 Nov 2008, *OED 2008110501*.

Meliaceae

Azadirachta indica A. Juss.

New naturalized record

Azadirachta indica, or Neem, has been promoted as an ornamental and as a source for Neem oil for Hawaiian gardens for several years (Staples & Herbst 2005). Neem is an evergreen tree from 30 to 50 feet tall that has odd-pinnately compound leaves with 9–18 narrowly ovate, curved, toothed leaflets. Fruits are a yellow drupe with thin flesh. This species is easily propagated by cuttings or by seed (Staples & Herbst 2005) and was found sparingly naturalized over a large area in Mā'ili, on the leeward coast of O'ahu.

Material examined. **O'AHU:** Mā'ili, off Kulaaupuni St. UTM 2369684, 585396. Dry lowland residential roadside area. 8 ft tall sapling, no flowers or fruit present. Spreading from apparently planted individuals in area. This species is occasionally noted naturalizing in roadside areas and large gardens, 13 Feb 2009, *OED 2009021302*.

Moraceae

Artocarpus heterophyllus Lam.

New naturalized record

Artocarpus heterophyllus, or Jackfruit, is occasional in cultivation in Hawai'i, where it produces very large (12–40 in long) fruits with large, 1.25 in long seeds. Characteristics that distinguish it from other *Artocarpus* species grown in Hawai'i include simple adult leaves and cauliflorous inflorescences (Staples & Herbst 2005). It was noted as very sparingly naturalized in Mānoa Valley, where four seedlings were noted scattered along a trail in dense shade. No mature trees were seen in the vicinity. Parker & Parsons (this volume) report this species as naturalized on Hawai'i Island.

Material examined. **O'AHU:** Mānoa Valley, Waiakeakua. Wet secondary forest. 1.5 m tall, sparingly branched sapling with whit viscous sap, thickened taproot about 30 cm long. No flowers or fruit, not a root sucker. Four small seedlings noted along trail, no matures seen, 4 Nov 2008, *A. Lau 2008110401*.

Orchidaceae

Habenaria rodeiensis Barb. Rodr.

New island record

Habenaria rodeiensis, an orchid previously only known from West and East Maui (Wagner *et al.* 1999; Oppenheimer 2006), was collected on O'ahu along the Mānana Trail,

located in the Ko‘olau Mountain Range. This geophytic orchid does not appear to be common in general cultivation, and it is unclear how it was introduced to Hawai‘i. Cultivation of this species in Hawai‘i is inadvisable.

Material examined. O‘AHU: Mānana Trail, just on north side of trail UTM 611039, 2370601. Trailside, growing with *Psidium*, *Eucalyptus*, and *Psydrax odorata*. Herbaceous, erect ground orchid, 24 Dec 2009, K. Kawelo & J. Rohrer US Army 102.

Podocarpaceae

Podocarpus elatus R. Br. ex Endl.

New naturalized record

This species is commonly planted in Hawai‘i, usually as an ornamental tree, which can grow to a very large size (up to 125 ft). It is native to Australia and is widely cultivated throughout the rest of the tropics and subtropics (Staples & Herbst 2005). This species can be distinguished from other *Podocarpus* in Hawai‘i by its leaf apices usually having a small, spine-tipped mucro, leaf margins usually not revolute, and pollen cones less than 2 mm wide (De Laubenfels 1985). Material in BISH is variable in these characters, and species documented here may easily be confused. This species is documented here as naturalized in usually open areas of windward lowland ridges of O‘ahu, occasionally forming dense stands. This species has a fleshy receptacle associated with the seed, an adaptation to dispersal by birds (Staples *et al.* 2000). It is likely naturalized in other areas as well, and further work could be done to document the extent of the naturalized range of this species on O‘ahu. It occurs on a ridge that is nearby a population of *Podocarpus macrophyllus* in ‘Āhuimanu (see below).

Material examined: O‘AHU: Ridge north of Ioleka‘a. Along and off trail, females with many seedlings in several groups, with *Ardisia*, guava, *Rhodomyrtus*, *Schefflera*, silver oak, and *hala*. Female plant, tallest c. 18 ft tall, naturalized, 9 Feb 2000, B. Waters *s.n.* (BISH 662413, 662414); Kahalu‘u and ‘Āhuimanu ridge. Trees to 40 ft tall, many *keiki* under mother plant. Also growing in *uluhe* and *pala‘ā*, 23 Apr 2008, K. Metzler 20080423 *Podocar.*

Podocarpus macrophyllus (Thunb.) Sweet

New naturalized record

Also known as Kusa-maki, this species is probably native to from southern Japan, though also known from Southern China to Taiwan where it is possibly an escape from cultivation (Staples & Herbst 2005). It is at least occasional in cultivation in Hawai‘i where it is grown as a street tree, specimen, or hedge plant. It can be distinguished from other *Podocarpus* in Hawai‘i by its linear leaves with usually revolute margins, the apices variable but usually lacking a sharp mucro, the leaves more than 6 mm wide, and less than 10 times as long as wide, and pollen cones usually greater than 2.5 mm in width (De Laubenfels 1985). It is documented here naturalized along a trail in the ‘Āhuimanu area, nearby a ridge where there is a population of *Podocarpus elatus*.

Material examined: O‘AHU: ‘Āhuimanu valley. Along trailside, in *uluhe*. Tree, 4–5 m. UTM 620226, 2370343, 27 Jan 2007, K. Kawelo US Army 37.

Polygonaceae

Triplaris weigeltiana (Rchb.) Kuntze

New naturalized record

This species is from Central and South America, where it (and other species in the genus) are known by the common name Hormigo, probably in reference to the trees ability to harbor stinging and biting ants in its hollow stems (“hormiga” means “ant” in Spanish). They

are rarely cultivated as ornamental street and shade trees, or in botanical gardens. The species was first collected in Hawai‘i in 1945 and is rare in cultivation, at least on O‘ahu. It is distinguished from other Polygonaceae in Hawai‘i primarily by its habit as a large tree, and also by peeling bark forming patchy, multicolored trunks, and its fruits enclosed in a papery perianth, with 3 white to scarlet, winglike, extended lobes (Staples & Herbst 2005). This species is dioecious and may be planted in pairs to encourage the ornamental, wind dispersed fruits to be formed. It is listed as moderately invasive in Tahiti (Meyer 2000). It is here documented as naturalized in Hawai‘i, on O‘ahu spreading locally from a planting of a male and a female tree in Makiki, makai of the DOFAW O‘ahu branch baseyard. Naturalized plants were scattered sparingly across several acres, the saplings occasionally growing in dense shade.

Material examined. O‘AHU: Makiki valley, past first two gates on road to DOFAW baseyard (UTM 2357461, 621473) Wet/mesic lowland secondary roadside forest. 3 m tall sparingly branched sapling with peeling grey/tan bark. Growing in shaded understory, 12 Jan 2009, OED 2209011203.

Polypodiaceae

Pyrrhosia piloselloides (L.) M.G. Price

New state record

Native from northeastern India east to Hainan, China, and throughout Malesia, this species has not been previously documented in Hawai‘i, although it is reported to be grown in a botanical garden in Waimea, O‘ahu. In its native range it grows epiphytically and is common to very common where found, in primary and secondary forest, from sea level to 1000 m. It is one of the most common epiphytes in the lowlands of Malesia, and is capable of smothering entire trees, sometimes causing tree death (Hovencamp *et al.* 1998). It was found in an upper residential area of Mānoa Valley, growing to the tops of several species of trees, occasional to common within an area of about 2 to 3 acres, with some small outlier plants, apparently spreading both vegetatively and by spores. This species may best be distinguished from other ferns in Hawai‘i by its rhizomatous, colony forming habit, dimorphic fronds where the sterile fronds are entire, succulent, and 1–7 × 1–2 cm, at the collection site noted as circular in shape; fertile fronds linear, 4–16 × 0.3–1.5 cm. It also has spreading, peltate scales on the rhizome. The sori are apical or extending to the base of the frond submarginally (De Wilde *et al.* 1998).

Material examined. O‘AHU: Mānoa Valley, at the end of Woodlawn Terrace Place. UTM 624810, 2357826; Lowland mesic cultivated setting. Epiphytic succulent fern, entirely covering trunk and branches of large tree and surrounding vegetation. Origin is SE Asia. According to Dr. Smith, this species is “very likely to further escape and spread in Hawai‘i”, 17 Oct 2008, OED 2008101703.

Pteridaceae

Adiantum ‘Edwinii’

New island record

Adiantum ‘Edwinii’ is probably a cultivar of *A. raddianum*, or possibly a hybrid or cultivar of *A. concinnum*. It was first collected on Maui in 1981, and known from Lāna‘i, and now from O‘ahu, where it was found on a slope of Palikea Gulch. This plant can be distinguished from other *Adiantum* seen in Hawai‘i by its U-shaped sori, fronds up to 100 cm long and 60 cm wide, and the pinnules closest to the rachis overlapping the rachis on the side toward the frond tip (Palmer 2003).

Material examined. O‘AHU: Palikea Gulch, 1000 ft. On a lower slope in closed canopy. Smaller than one meter, but veins end in small marginal sinuses, 7 Jan 2009, J. Gustine US Army 105.

Rutaceae***Triphasia trifolia*** (Burm. f.) P. Wilson**New naturalized record**

Probably native to the Malay Peninsula, and also known as Limeberry, this species has been introduced in many tropical areas as an ornamental hedge plant, potted plant, or bonsai species. It was first collected in Hawai'i in 1926, although it does not seem to be widely used at least on O'ahu. It can be distinguished from other nonnative Rutaceae in Hawai'i by its shrubby habit, trifoliate leaves with paired axillary spines, and fleshy, dull red, single seeded fruits containing sweet, edible, mucilaginous sap (Staples & Herbst 2005). Limeberry has escaped cultivation and become naturalized in many areas where it has been introduced, occasionally forming thickets in understory, especially on limestone soils in coastal areas of Pacific islands. It was collected as naturalized on O'ahu in that habitat, locally and sparingly naturalized in the understory of *Prosopis pallida* near the coast. It is likely to continue spreading and may become more abundant without intervention.

Material examined. O'AHU: Kāne'ōhe MCBH, next to Zombie's beach. Dry coastal zone habitat. 4 ft tall shrub, leaves glossy green above, pale below. Fruit green ripening red, skin thin, containing clear, mucilaginous citrus smelling pulp. Single seed very sticky. About 21 plants of various sizes (from about 2–8 ft tall) seen in dense shade of *Prosopis pallida* understory, 5 Aug 2009, OED 2009080501.

Scrophulariaceae***Veronica serpyllifolia*** L.**New island record**

This nonnative herbaceous species has been collected previously on Kaua'i, Moloka'i, Lāna'i, Maui, and Hawai'i islands, but this is its first report for O'ahu. Although it may be tolerated where it grows, it does not appear to be intentionally cultivated in Hawai'i. It was found spreading in mesic forest in the northern Wai'anae range. This genus is filed under Scrophulariaceae at BISH, although many specialists now include the genus in Plantaginaceae.

Material examined: O'AHU: Kapuna Gulch, Pahole Natural Area Reserve, along Mokuē'ia trail, 31 Mar 2009, M. Elmore US Army 139.

Sterculiaceae***Sterculia apetala*** (Jacq.) H. Karst.**New island record**

A large specimen tree growing to 30 m, this species was first collected in Hawai'i in 1915. A particularly large tree planted at Queen's Hospital may have been planted by Dr. W. Hillebrand around 1851 (Staples & Herbst 2005). Previously documented as naturalized, spreading from a planted specimen on Maui, this rarely planted tree was found spreading locally near Queen's Hospital, where scattered saplings were found growing in dense shade. A medium-sized but mature tree of questionable planting status also occurs on the hospital grounds. This species' further spread from this location has probably been limited by intensive landscape maintenance; however, long distance dispersal may be aided by its fruits with large seeds overhanging busy roadways.

Material examined. O'AHU: Near Beretania and Punchbowl streets (UTM 618693, 2356737). Lowland urban landscaped area. 0.5 m tall sapling. Several naturalized saplings in the area, 4 Feb 2009, OED 2009020401.

Tiliaceae***Grewia micrantha*** Bojer**New state record**

This species from tropical Africa does not appear to have been introduced into general

cultivation very widely, if at all. In its native range it grows in an ecotype characterized in part by an extended dry season as well as dominance by species of *Brachystegia* (Fabaceae), or in mixed shrubland. A description from *Flora Zambesiaca* reads:

“Shrub or small tree up to 8 m. tall; young branchlets ferruginously tomentose, becoming grey or brownish with paler lenticels. Leaf-lamina 2.5–9 × 1.2–4.8 cm., ovate-oblong or elliptic, apex rounded or acute, margins serrate, rounded or asymmetrically cordate at the base, sparsely stellate-pubescent above or glabrous, finely reticulate-rugose...closely appressed-whitish-tomentose between the nerves below... petiole up to 7 mm long, ferruginously pubescent; stipules c. 5 mm. long.... Inflorescences all axillary...pedicels normally 3 per peduncle... coarsely brown-hairy...Sepals up to 0.8 cm. long, linear-oblong, coarsely stellately hairy outside, yellow and glabrous within. Petals yellow, about half the length of the sepals, oblong to obovate, often 2-dentate at the apex, basal claw either with circumvillous nectary within, or often absent and replaced by a small tuft of hairs at the cuneate petal base...style c. 5 mm. long, glabrous; stigma with about 4 broad lobes. Fruit yellowish, deeply 2-lobed or 1-lobed by abortion, each lobe c. 7 mm. in diam., pubescent” (Royal Botanic Gardens- Kew 2011).

No prior collections of this species have been made in the state. It is possible this species was intentionally introduced near the collection site as an ornamental. It was seen here scattered in a dry lowland area dominated by *Prosopis pallida* and nonnative grasses, scattered locally with an abundance of approximately 10 or 12 plants of multiple size classes.

Material examined. **O’AHU:** Along road to Koko Crater trail (UTM 635687, 2353745). Dry lowland area dominated by *Prosopis*. Tree about 2.5 m tall. No flowers. Fruits small, fuzzy, green, drying to brown, 9 Apr 2009, *OED 2009040903*; Along road to Koko Crater trail (UTM 635687, 2353745) dry lowland area, near baseball diamond. Sprawling shrub about 5 m dia, 3 m tall. Flowers bright yellow with lobed stigmas. New growth reddish. Several individuals of various sizes in area, 30 Jun 2009, *OED 2009063001*.

Verbenaceae

Vitex trifolia L.

New island record

This species is very commonly planted in Hawai‘i as a hedge plant, wind break, and ornamental. It has been documented as naturalized in Kalaupapa, Moloka‘i, spreading into dry rocky areas. It was found sparingly naturalized in Kalaeloa, O‘ahu in dry, mixed alien scrubland along a road. Because of the adaptability of this species to dry lowland areas with poor soils (Staples & Herbst 2005) it likely persists at sites of former cultivation, making planting status of populations near roadsides in natural areas unclear. Because of this its naturalized status on O‘ahu may well be much more extensive than the population documented here.

Material examined: **O’AHU:** Kalaeloa. Mixed alien scrubland, growing against a telephone pole. Shrub about 1 m, cut back, 18 Jun 2009, *OED 2009061802*.

Vitaceae

Cissus repens Lam.

New state record

This species, which is native to Asia and Australia, has been collected from two locations in the Hawaiian Islands; at the “Makiki Forestry Nursery” in 1978, and in Mākaha Valley, along the road to Kāne‘aki Heiau. Both locales are on O‘ahu. It is uncertain why this species was brought to Hawai‘i, since there is no clear evidence of it being used in horticulture (Chimera 2010). In any case, the use of this species in cultivation should be discouraged, as it is a shade-tolerant, bird-dispersed, smothering vine. The description of this species, taken from the *Flora of China*, is as follows:

“Vines, herbaceous. Branchlets terete, with longitudinal ridges, usually glaucous, glabrous; tendrils bifurcate. Leaves simple; stipules brownish, oblong, 5–6 × 2–3 mm, membranous, glabrous; petiole 2.5–7 cm, glabrous; leaf blade cordate-oval, 5–13 × 4–9 cm, glabrous, basal veins 3–5, lateral veins 3 or 4 pairs, veinlets inconspicuous, base cordate, margin with 9–12 sharp teeth on each side, apex acute or acuminate. Inflorescence umbelliform, terminal or leaf-opposed; peduncle 1–3 cm, glabrous. Pedicel 2–4 mm, nearly glabrous. Buds oval, ca. 4 mm, apex obtuse. Calyx entire or undulate. Petals triangular-ovate, ca. 3 mm, glabrous. Anthers ovoid-elliptic. Lower part of ovary adnate to disk; style conical; stigma slightly expanded. Berry 0.8–1.2 cm × 4–8 mm, 1-seeded. Seed surface smooth, with sparse ribs.”(Ren & Jun 2007)

Material examined. O‘AHU: Mākaha Valley, along road to Kāne‘aki Heiau, UTM 584134, 2376668, 600 ft. Mesic lowland secondary forest. Vine with long stems to several meters, fruits ripening black, soft, fleshy. 2 individuals noted in the area. Long-time land manager unaware of its origin, 10 Feb 2009, *OED 2009021002*.

Zygophyllaceae

Guaiaacum officinale L.

New naturalized record

Lignum-vitae is native to tropical America and the Caribbean, where it typically grows in dry habitats. It has been introduced as an ornamental throughout the tropics, and is occasional in cultivation in Hawai‘i where it was first collected in 1909. It can be distinguished by the following description: Tree to 25 ft tall, leaves 2–5 in long with 4 (–6) broadly obovate to orbicular leaflets, which are rounded at the apex; petals blue purple to nearly white, the upper surface hairy; fruits showy, obcordate, the lobes yellowish, splitting at maturity; seeds are brownish, enclosed in a showy reddish aril (Staples & Herbst 2005). Despite being planted in so many other places, it has apparently not been clearly documented as naturalized elsewhere. Though not thoroughly established, it is documented here as very sparingly naturalized along a roadside in dry open grassland in Kalaeloa, presumably having spread from a planted individual though none were seen in the immediate area. It has also been noted in West Loch, similarly growing along a roadside in dry kiawe forest.

Material examined: O‘AHU: Kalaeloa, UTM 595313, 2358058. Dry lowland weedy shrubland. Sapling about 3 ft tall, corolla lobes persistent as young fruits develop, 12 Jun 2009, *OED 2009061201*.

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New plant records for the Hawaiian Islands 2010–2011¹

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O'ahu Early Detection here documents 26 new naturalized records, 8 new state records, 31 new island records, 1 range extension, and 2 corrections found by us and other individuals and agencies. In addition, several species showing signs of naturalization are mentioned. A total of 42 plant families are discussed.

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

Acanthaceae

Megaskepasma erythroclamys Lindau

New island record

This species, which was previously found naturalizing on O'ahu, can be distinguished by its 1–2" long showy burgundy bracts and white, tubular, 2-lipped corollas with 2 fertile stamens (Staples & Herbst 2005). Parker & Parsons (this volume) report this species as naturalized on Hawai'i Island.

Material examined. KAUA'I: Hā'ena, in neighborhood *makai* of highway, near Tunnels Beach, UTM 442390, 2457621. Coastal residential setting; sparingly-branched shrub to 6 ft tall, growing out of a hedge. Inflorescence bracts magenta. Species is planted as an ornamental and sparingly naturalized in the area, 9 Mar 2010, OED 2010030904.

Aizoaceae

Sesuvium verrucosum Raf.

New state record

Sesuvium verrucosum is native to North and South America, and prefers coastal habitats as well as reservoir margins and ephemeral desert ponds (Ferren 2003). This species was first collected on Maui, in Kīhei. It had been misidentified as *S. portulacastrum*. The species was then collected in a dry limestone coastal flat just above the intertidal zone at Maunaloa Bay, O'ahu. This species has also been reported from O'ahu (but so far not collected) from Kalaeloa to Pearl Harbor. It was then collected from Moloka'i, in a residential coastal area. It is variable in its native range, and it is unclear whether or not it is hybridizing with the native *S. portulacastrum* where these species co-occur in Hawai'i. Description of this species from *Flora of North America*:

"Plants perennial, papillate with crystalline globules abundant, glabrous. Stems prostrate, to 1 m, forming mats to 2 m diam., branched from base, finely verrucose; not rooting at nodes. Leaves: blade linear to widely spatulate, to 4 cm, base tapered or flared and clasping. Inflorescences: flowers solitary; pedicel absent or to 2 mm. Flowers: calyx lobes rose or orange adaxially, ovate-lanceolate, 2–10 mm, margins scarious, apex hooded or beaked, papillate abaxially; stamens 30; filaments connate in proximal 1/2, reddish; pistil 5-carpellate; ovary 5-loculed; styles 5. Capsules ovoid-globose, 4–5 mm. Seeds 20–40, dark brown to black, 0.8–1 mm, shiny, smooth" (Ferren 2003).

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It is unclear whether this species was intentionally or accidentally introduced, although it does not appear to be widely cultivated.

Material examined. **O'AHU:** Shoreline of Maunalua Bay. Dry rocky (limestone) setting near the intertidal zone. Low groundcover. Stems creeping along ground with stems upright to about 20 cm off the ground. No rooting at nodes seen. Leaves glaucous, flowers magenta above, stamens many, pistils usually five. Only 2 plants seen in immediate area, but has been seen by collectors elsewhere on O'ahu, 16 Apr 2009, *OED 2009041601*. **MOLOKA'I:** Pu'uhala, Kanoa Pond. 21.069°, -156.964°. Mat-forming herb, no rooting at nodes. Corollas pink. New island record, 13 Jun 2011, *A. Dibben-Young s.n. 748342*. **MAUI:** East Maui, Kīhei (Waiohuli), *makai* side of South Kīhei Rd, 200 m N of McDonalds. Roadside, crawling on *Bassia hyssopifolia*, plant not abundant, 22 Aug 1999, *F. Starr & K. Martz 990822-2*.

Araliaceae

Schefflera arboricola (Hayata) Merr.

New island record

This species has previously been collected as naturalized on Maui and O'ahu (where it has subsequently been seen naturalizing widely throughout a forest bordering a botanical garden.) On Kaua'i, it was seen naturalizing along the roadside and into pastures in a residential neighborhood. Elsewhere in this issue, Parker & Parsons report this species as naturalized on Hawai'i island.

Material examined. **KAUAI:** Kapahi. 21°56'16.4"N, 159°31'07.1"W. Large shrub of 7 m, up to 20 cm basal dia. Fruiting profusely, fruit orange turning dark red when ripe. Naturalizing in pastures and hedgerows along road, 11 Oct 2008, *C. Trauernicht & T. Portner 582*.

Schefflera heptaphylla (L.) Frodin

Correction and new naturalized record

This species is very rarely grown on O'ahu, perhaps only occurring in botanical gardens. It was first collected in 1992 at Ho'omaluhia Botanical Garden by Derral Herbst who at that time noted it "escapes all over the garden and is becoming weedy." This species is capable of establishing in dense shade as well as open areas. The currently-known distribution is in or near the garden, so it may be a good candidate for garden staff to control where found. Additionally, a specimen collected as "showing signs of naturalization" at Lyon Arboretum in 2005 and identified as *Schefflera taiwaniana* by Daehler & Baker (2006) more closely fits the species concept of *S. heptaphylla*. Consequently, *Schefflera taiwaniana* should not currently be considered a naturalized or adventive species in the state. Description of this species from *Flora of China* (Xiang & Lowry 2007):

"Trees, to 15 m tall, andromonoecious. Petiole (5-)10-30 cm; petiolules 1.5-5 cm; leaflets 6-9(-11), elliptic to oblong-elliptic or obovate-elliptic, 7-18 × 3-5 cm, papery to leathery, densely stellate pubescent when young, glabrescent except on midvein and in axils of veins, secondary veins 7-10 pairs, tertiary veins inconspicuous, base attenuate or cuneate to obtuse or rounded, margin entire, often serrate or pinnately lobed on young plants, apex abruptly acute to acuminate. Inflorescence a terminal panicle of umbels, densely stellate tomentose, glabrescent; primary axis to 35 cm; secondary axes 25(-35) cm, with a terminal umbel of bisexual flowers and several to many lateral umbels of bisexual or more often male flowers, usually also with 1 to several bisexual flowers borne just below apical umbel; pedicels 4-5 mm. Calyx pubescent at first, entire or 5- or 6-toothed. Ovary 5-9(or 10)-carpellate; styles united into a thick column less than 1.5 mm. Fruit globose, ca. 5 mm in diam., inconspicuously angled when dry; styles persistent, to ca. 1.5 mm."

Material examined. **O'AHU:** Kāne'ohe, Ho'omaluhia Botanical Garden, 21.53°N, 157.48°W. This species escapes all over the garden and is becoming weedy. Malaysian Section. Tree: 40' tall with 10" diameter d.b.h. Trees just flowering; petals greenish white. 27 Dec 1992. *D. Herbst 9604*; Lyon Arboretum. Naturalized sapling 1.5 m tall growing in thicket at edge of main road leading to the waterfall, 24 May 2005. *C. Daehler 1202*; Kāne'ohe, near Ho'omaluhia Botanical Garden. 21.387575°N, 157.811049°W, 240 ft. This species is established over at least several acres, with 10–20 matures and 100+ saplings over 1 m tall. UTM 623251, 2365509. Tree about 12 m tall w/straight bole growing at a slight angle. Younger infl somewhat contained within leaves at end of branch. Lft margins undulate. Leaves of saplings pinnately lobed and variable, with purple midvein and fewer stellate hairs on the axils. Lowland mesic to wet secondary forest, growing with *Hibicus tiliaceus*, *Schefflera actinophylla*, 27 Oct 2011 *OED 2011102701*

***Schefflera insularum* (Seem.) Harms**

New naturalized record

This *Schefflera* species, which is native to the Philippines (Seemann 1865: 80) and is extremely rare in cultivation in Hawai'i and elsewhere, was seen naturalizing in scattered localities within Ho'omaluhia Botanical Garden in Kāne'ohe. Description of this species (translated from Latin): "Leaflets 5–7, elliptical pointed teeth; tufted tomentum caducous; petals linear, free; stamens 7; 7-locular ovary." (Seemann 1865).

Material examined. **O'AHU:** Kāne'ohe, adjacent to main road at Ho'omaluhia Botanical Garden. 21.3885962°N, 157.809835°W, 240 ft. Sparingly naturalized in this location. Species is scattered elsewhere in the garden as well. UTM 623376, 2365623. Scrambling shrubby habit, up to 8 ft tall. Leaves glossy green. Infl on short side branches. Lowland mesic to wet secondary forest, growing among *Bridelia insularana*, *Clerodendrum chinense*, 10 Oct 2011, *OED 2011101001*.

Areaceae

Coccothrinax barbadensis

(Lodd. ex Mart.) Becc.

New naturalized record

Silver thatch palm is native to the Caribbean and was first collected in Hawai'i in 1961, though it was likely grown here before that time. It is a solitary-trunked fan palm ranging from 16–50 ft in height, distinguished by the woven, burlap-like fibers surrounding the upper trunk, petioles which are biconvex in cross section, triangular hastulas surrounded by a yellow halo, and fronds which are glossy green above and silvery below (Staples & Herbst 2005). This species is occasional to common in cultivation in Hawai'i. On O'ahu, it was noted occasionally naturalized and well-distributed in a dry lowland residential area. On Kaua'i, a sparingly naturalized population was found in a less densely-populated dryland area, growing in the shaded understory of *Leucaena leucocephala*.

Material examined. **O'AHU:** Kailua, Lanikai (UTM 633696, 2365199). Growing in mock orange hedge, palm about 3 m tall. 2 individuals naturalized next to fence in yard, species is occasionally seen spreading in neighborhood. D. Hodel says ID likely, but this species also has a propensity to hybridize, 4 Jun 2009, *OED 2009040602*. **KAUAI:** Niimalu off Hulemalu Rd UTM 462212, 2427083. Lowland dry to mesic secondary forest, growing with *Leucaena leucocephala*. Palm about 3.5 m tall. Fruits mostly unhealthy, old, dry. Sparingly naturalized population; smaller plants growing in understory of *Leucaena*. See BISH #583884, 22 Apr 2010, *OED 2010042201*.

Asclepiadaceae

***Cynanchum gerardii* (Harv.) Liede**

New naturalized record

Cynanchum gerardii, a plant native to Ethiopia, South Africa, Madagascar, the Comores, Saudi Arabia, and Yemen, and only known to be cultivated on O'ahu at Koko Crater

Botanical Garden, was found in two separate locations. The first sighting was by a member of the OISC field crew, who found a small patch climbing up the side of Koko Crater above the botanical garden's *Erythrina* grove. The second location for this species was along the Koko Head Trail, a popular hiking trail that follows the rim of the expired volcano. The population covered approximately 15 square ft, smothering a *Leucaena leucocephala* patch (J. Atwood 2011, pers. comm.). The description of this species from *Flora of Somalia*:

“Climber, 0.5–3 m high; stems semisucculent, finely striate, obscurely glaucous, glabrescent, basally corky, with thin, yellowish bark. Leaves scale-like, often not exactly opposite, 0.8–1.2 × 0.5–0.8 mm, acute. Inflorescences 4–7-flowered; peduncle 0–2.5 mm long; pedicels 2–4.5 mm long. Flowers sweetly scented; corolla-lobes c. 3 × 1–1.5 mm, deflexed, ovate, acuminate, green to greenish white. Corona white, cup-shaped, c. 1.5 mm long, slightly exceeding the gynostegium, tube more than 3/4 of corona length, staminal parts triangular, apically erect to inflexed, with straight margins, connate to the filament. Gynostegium sessile, 1.5 × 1.2 mm; anther wings 0.4 mm long; connective appendages 0.4 × 0.5 mm, ovate to triangular, narrower than the anthers, strongly inflexed; stigmatic head white, 0.8 × 0.2, flat to depressed-conical. Follicles 1(–2) per flower, 8–12 cm long, with shortly beaked tip. Seeds 5–6 × 2–3 mm, pear-shaped, densely pubescent, not winged, with tuft of c. 2 cm long hairs.” (Liede-Schumann 2006)

Material examined. O'AHU: Koko Crater Botanical Garden, UTM 636719, 2354330. New naturalized record. Climbing up side of crater above *Erythrina* grove in mixed alien vegetation. Also found growing thickly in a 5 meter × 5 m area along the Koko Head trail in a *Leucaena leucocephala*/*Hylocereus undatus* thicket. Sprawling leafless vine. Flowers minute, fruits a dehiscent pod, 4 Apr 2011, OISC 2011040401.

Asteraceae

Chromolaena odorata (L.) R.M. King & H. Rob. **New state record**

Chromolaena odorata, a sprawling shrub native to Central and South America, was recently found by O'ahu Army Natural Resource Program field crew members on an annual road survey of Army training grounds in Kahuku. This species was not previously known to be in the state, but has proven itself to be a serious weed in many parts of the world, including Australia, South Africa, India, Philippines, Micronesia, Palau, and Guam (McFadyen & Skarratt 1996). It received a score of 28 on the Hawai'i-Pacific Weed Risk Assessment (Hawaii Pacific Weed Risk Assessment 2011), which suggests that it has a high potential to be invasive in Hawai'i. While *C. odorata* thrives in open, sunny areas, it also can grow in shade, and at Kahuku has been observed growing beneath *Casuarina* sp. stands (OANRP Staff December 2011). This species' ability to tolerate drought and fire, reproduce rapidly and prolifically both from seed and vegetatively, and to produce compounds toxic to grazing animals as well as humans, makes it a species of utmost priority for removal from the area (Hawaii Pacific Weed Risk Assessment 2011). Unfortunately, the infestation area is heavily used for military training during the week and for motocross on the weekends, which makes the likelihood of this species spreading to other parts of the island quite high. The currently-known occupied range covers over 3,390,000 square meters, and 1500 plants in total (immature and mature) have been counted so far. Several organizations on the island are involved in the control of this species, including the O'ahu Invasive Species Committee, the Hawai'i Department of Agriculture, O'ahu Early Detection, Marine Corps Base Hawai'i, Department of Fish and Wildlife, the Fish and Wildlife Service, and the Hawai'i Motorsports Association (OANRP Staff December 2011).

Description of *Chromolaena odorata* from *Flora of North America*:

“Perennials or shrubs, mostly 80–250 cm. Stems erect or sprawling to subscandent, hispidulous to coarsely short-pilose. Petioles 5–20 mm. Leaf blades (3-nerved) narrowly lanceolate to deltate-lanceolate or ovate-lanceolate, 3–10 × 1–4 cm, margins coarsely dentate to subentire. Heads usually 5–50+ in (terminal or lateral) corymbiform arrays. Involucres cylindrical, (7–)8–10 mm. Phyllaries in 4–6(–8) series, apices of the inner appressed, rounded to truncate (sometimes slightly white-petaloid or expanded). Corollas purplish to light blue to nearly white or slightly pinkish.” (Nesom 2006)

Material examined. **O‘AHU:** Kahuku Training Area off Bravo Rd, near Opana radar tracking station. Found on an OANRP road survey. Further surveys revealed a mostly scattered, occasional population over many acres, with one particularly dense infestation in a nearby small gulch. Species appears to be growing with and occasionally outcompeting *Psidium*. Sprawling, climbing vine to 2.5 m high in *S. terebinthifolius* thicket. Flowers white to pale lavender. Achenes brown-grey, 3–4 ridged with pappus of equal length. Dry to mesic lowland flattened ridge top, secondary forest growing among *Schinus terebinthifolius*, 11 Jan 2011, *H. Pali USARMY 199*.

Bignoniaceae

Podranea ricasoliana (Tanfani) Sprague

New island record

This attractive vining species which has previously been described as naturalized on Maui, was found on Kaua‘i spreading into a roadside secondary forest. Parker & Parsons (this volume) report this species as naturalized on Hawai‘i Island.

Material examined. **KAUA‘I:** Kōloa Distr, Kalāheo. Weedy wet secondary forest. Collected along upper end of Pu‘uwai Rd. Liana; flowers large, delicate with whitish pink corolla. Growing thickly throughout tree canopies. Naturalized, 15 Oct 2007, *C. Trauernicht & M. Clark 206*.

Pyrostegia venusta (Ker Gawl.) Miers

New naturalized record

Pyrostegia venusta, or Orange trumpet vine, a colorful, often expansive vine native to Brazil and Paraguay and frequently cultivated worldwide (Staples & Herbst 2005), was found naturalizing along a streamside in Kaua‘i, thickly covering nearby trees and ground over a 100 × 50 ft area. On O‘ahu, it was seen smothering a grove of trees on a military base, away from landscaped areas. Although fruit is seldom produced, this species is occasionally found growing well beyond planted sites. The description of this species from *A Tropical Garden Flora* is as follows:

“Vine. Leaflets usually two, ovate, 1.5–2.5 inches long, base rounded, apex acute; tendrils sometimes present, 3-forked. Inflorescence a more or less dense terminal panicle. Flower calyx cup-shaped, margin densely ciliate; corolla red-orange with narrow, valvate, conspicuously whitish-margined lobes, stamens projecting. Fruit linear, strongly compressed, 8–12 inches long.” (Staples & Herbst 2005)

Material examined. **O‘AHU:** Schofield Barracks off Beaver Road, across from Range Control. 1000 ft. Growing amongst *Schinus terebinthifolius*, *Urochloa maxima*. Woody vine; very long, rambling, up to 40 ft into trees. Large orange tubular flowers, 26 Jan 2010, *US Army 179*. **KAUA‘I:** Along Kaunauli‘i Highway, over Wahiawā Stream, UTM 443526, 2424257. Lowland roadside area. Large vine blanketing canopy of nearby trees sprawling along ground over an area of maybe 100 × 50 ft. Flowering heavily, corollas bright orange. No fruits seen. Perhaps originally planted in the area, this species has now spread significantly beyond its planting site in at least this area of the island. It is believed to fruit only rarely in Hawai‘i, but occasionally is found growing well beyond planting sites, 18 Feb 2010, *OED 2010021801*.

Tabebuia pallida (Lindl.) Miers

New naturalized record

Tabebuia pallida can be found in dry and wet forests in its native range of Central and South America and the Caribbean. It has shown to be invasive in the Seychelles, where it

establishes in disturbed sites, forming dense thickets that shade out more desirable native plants (Weber 2003). Individuals of this species were found spreading from cultivation on both O‘ahu and Kaua‘i. This plant has been treated as a synonym of *T. heterophylla* (DC.) Britton (Missouri Botanical Garden 2011), with which it is said to differ primarily by number of leaflets. Populations of the species on Kaua‘i were seen with a range of leaflets spanning the variability of both species. The taxonomic boundaries of these species need further study; the Bishop Museum currently recognizes both species as distinct. The description of this species from Weber (2003):

“A tree of 5–35 m height with a grayish deeply fissured bark. Leaves are 8–15 cm long and palmately compound with 3–5 spreading leaflets. Petioles are 5–25 cm long. The leaflets are broadly elliptic, 5–22 cm long and 2–11 cm wide. Inflorescences are terminal panicles and consist of many pink rose or white flowers with corollas of 5–7 cm length. Fruits are cylindrical and dehiscent capsules of 10–20 cm length and c. 15 mm width, containing numerous winged seeds.”

Material examined. O‘AHU: Hālawā Valley, mauka portion of H3 access road. Lowland mesic roadside. Growing on rock/concrete embankment with mixed alien species. Sapling 2 m tall, branches upright; leaves glossy to flat green, leaves all simple, aside from one very shallowly-lobed leaf. Flower bud yellowish green. There were several individuals of this species of various size classes growing on the same embankment. There were no simple-leaved parent trees in the immediate area, though this species is efficiently wind-dispersed, 29 Sep 2009, OED 2009092902. KAUA‘I: Po‘ipū, Lukika Pl. Growing in hibiscus hedge. Tree about 2.5 m tall, almost all leaves simple, flowers pink. New island record- occasionally naturalized in neighborhood, 14 May 2010, OED 2010051401.

Caryophyllaceae

Petrorhagia velutina (Guss.) P.W. Ball

& Heywood

New island record

This slender herbaceous plant, previously collected from Maui and Hawai‘i (Wagner *et al.* 1999), was found on O‘ahu in a mowed field in Schofield Barracks.

Material examined. O‘AHU: Schofield Barracks West range; Area X, Dragon X landing zone. Herbaceous plant growing in a large mowed field. From 10 to 25 cm tall, often single inflorescence (but occasionally branched.) Pink, distinctive 2-lobed petals; fruits a papery husk. Perhaps reached O‘ahu from military vehicles, 15 Apr 2010, *US Army 184*.

Celastraceae

Catha edulis (Vahl) Endl.

New naturalized record

Catha edulis, or Khat, as it is known in East African countries where it is consumed as a stimulant, is not known to be cultivated in Hawai‘i outside of botanical gardens. On O‘ahu, it was found very sparingly naturalized, spreading to a dry plateau overlooking Waimea Botanical Garden. The description for this species from *Flora of China*:

“Evergreen shrubs, 1–5 m tall; young branches with white, fine lenticels. Petiole 3–8 mm; leaf blade elliptic or narrowly elliptic, 4–7 × 2–4 cm, leathery, base narrowly attenuate, slightly decurrent, margin obtusely serrate, apex obtusely shortly acuminate. Cymes single, small, 1.5–2 × as wide; peduncle 5–10 mm, 2–4-branched, branches short, less than 3 mm; pedicel 1–3 mm, up to 5 mm in fruit. Flowers 3–5 mm in diam.; sepals 5, triangular-ovate, ca. 1 mm; petals 5, white, narrowly ovate or narrowly oblong. Stamens 5, filamentous, shorter than corolla. Ovary free, surrounded by disk; stigma 3-lobed. Capsule orange-red, cylindrical, ca. 8 × 3–4 mm, dehiscent from above, loculicidally in 3 valves, usually only 1 seed maturing per valve. Seeds black-brown, narrowly ovoid, 3–4 mm, with membranous basal wing.” (Ma & Funston 2008)

Material examined. O'AHU: Elehāhā drainage, upper Waimea, 700 ft. Small tree ca. 2 m tall. Roadside vegetation, 9 Dec 2003, K. Kawelo *s.n.* (BISH #704780).

Clethraceae

Clethra lanata M. Martens & Galeotti

New naturalized record

Clethra lanata, or Nance macho, as it is sometimes called in its native range of Central America, is only known to be grown in botanical gardens in Hawai'i. It was seen very sparingly naturalized, spreading outside the boundaries of the National Tropical Botanical Garden on Kaua'i. Description of this species from *Flora of Panama*:

“Trees or sometimes shrubby, 2–30 m tall, sometimes buttressed at base; young branches, petioles, and bases of peduncles densely rusty-brown lanate. Leaves grouped toward the tips of branchlets with smaller young leaves at the apices; blades of mature leaves obovate, elliptic-obovate or oblong-obovate, 7–18 cm long, 3–9 cm wide, chartaceous to subcoriaceous, obtuse or acute at apex, narrowed at the base, the margin entire to slightly denticulate due to the emergence of the veins from the leaf blade, the midrib prominent below, scattered stellate or simple pubescence above, denser in vein furrows, below somewhat paler with two! types of pubescence, one short, stellate, and forming a layer covering entire lower surface, the other long, simple or stellate, and confined to the veins and veinlets, either layer may be absent on some individuals; petioles stout, up to 2 cm long. Inflorescences many flowered, 4–10 simple or branched fasciculate racemes, 8–26 cm long, the upper part of peduncle and pedicels pale, densely tomentose, the pedicels 2.5–7 mm long. Flowers white, very sweetly aromatic; sepals 5, ovate, 3–5 mm long, puberulent-tomentose within, tomentose without; petals 5, obovate, short-fimbriate, slightly longer than the sepals, pilose within, glabrous without; stamens 5, filaments subulate, glabrous, the anthers sagittate; ovary transversely-elliptic, densely pilose, the style 1.5–2.5 mm long, the stigma 3-lobed, lobes spreading. Capsule transversely-elliptic, pilose to tomentose, to 6 mm in diam; seeds 3, compressed.” (Robertson 1967)

Material examined. KAUA'I: Upper Limahuli Valley. *Meterosideros/Dicranopteris* disturbed ridgetop with large *Andropogon* and *Clidemia* patches. Collected just off the ridge from the Wainiha Pali to the top of Limahuli Falls, future site of fence line. Tree just N of the ridge about 10 ft down steep waterfall side. With *Syzygium sandwicensis*, *Psychotria mariniana*, *Ilex anomala*, *Bobea*, *Alyxia*. Small tree, sterile, w/one old empty peduncle up high. Tree about 12 ft tall. Leaf abaxially w/ brown pubescence and raised veins, dark green adaxially w/ impressed veins. Petioles pubescent, 6 Jan 2009, N. Tangalin & E. Griffin-Noyes 1876.

Commelinaceae

Tradescantia spathacea Sw.

New island record

Tradescantia spathacea, or Oyster plant, a sturdy plant commonly seen grown as a groundcover, was first collected as naturalized on O'ahu. On Kaua'i, several populations were seen growing out of a fallen log and scattered in the understory of a *Casuarina* grove.

Material examined. KAUA'I: Kalāheo, on Papalina Rd near Pālama St. Lowland dry/mesic roadside area, growing on fallen log. Herb with purple undersides to leaves. No planted individuals in area. Scattered populations along road in dense *Casuarina* stand, 19 Feb 2010, OED 2010021906.

Costaceae

Costus scaber Ruiz & Pav.

New naturalized record

This species, native to Mexico, the West Indies, Central America, and tropical South America (Staples & Herbst 2005), was found on Kaua'i in a pasture off Kahuna Rd in Kapa'a. *Costus scaber* can be distinguished by a line of short hairs along the midrib of the

upper surface of the leaves, ovoid to cylindrical inflorescences 1.4–4.0" long that are terminal on leafy stems. Inflorescences have red-orange bracts with shredded, fibrous margins. Calyxes are up to 0.25" long, and the red-orange inch-long stamens are about as long or longer than the yellow labellum (Staples & Herbst 2005).

Material examined. **KAUAI:** Kapa'a Homesteads, off Kahuna Rd. UTM 462427, 2444371. In pasture near fence with *Sphagneticola trilobata*, *Macroptilium atropurpureum*, 31 Mar 2010, *OED 2010033102*.

Crassulaceae

Bryophyllum laxiflorum (Baker) Govaerts **New naturalized record**

This succulent decumbent herb, which has only two specimens in the *Herbarium Pacificum* and is not known to be a popular ornamental in Hawai'i, was found spreading locally down a dry, rocky slope within a 40 × 8 ft area. It was colonizing small patches of soil between rocks, a niche also being occupied by native *Peperomia* species. Distinguishing features of this species include decumbent stems with pale green leaves more or less evenly spaced on the stem; circular or ovate to oblong leaf blades with blunt teeth along the margin, leaf bases truncate with very small to large upturned auricles. The inflorescence is a small, loose corymb, flowers are few, pendent; calyx tube 1.2–1.3 cm, lobes 6.0–6.5 × 4.5 mm. Anther and styles project from the corolla tube; filaments are fused for 6.0–9.5 mm (European Garden Flora Editorial Committee 1995)

Material examined. **O'AHU:** Ko'olau Mountains on Mau'umae Trail, lower portion. UTM 626174, 2355842. Dry lowland ridge, growing among rocky dry cliffs and along trail in small rock cracks. Low-growing succulent herb with erect stems. Stems, leaves, and inflorescence with pink cast. Leaves otherwise glaucous green with scalloped margins, the lower portion/lobes of larger leaves upturned. Flowers pendulous, corolla lobes reddish. Locally abundant naturalized herb growing among native *Peperomia* spp. in the same niche habitat, 2 Nov 2010, *OED 2010110201*.

Cupressaceae

Callitris columellaris F. Muell. **New island record**

Some 407 individuals of this species were planted in forest reserves on O'ahu between 1910 and 1960 (Skolmen 1980), which may help to explain its spread. This gymnosperm, previously found naturalizing on Maui, was collected on O'ahu in a couple of lowland roadside areas in Schofield Barracks. Many individuals of varying size were seen.

Material examined. **O'AHU:** Schofield Barracks East Range in area along Higgins Rd. In vegetation off-road around buildings and in forested areas. Guava and *Eucalyptus*-dominated forest. Individuals of varying size (3–7 m) in area. Cones round, split open when dry, 2–3 cm across. New island record, 26 May 2009, *J. Beachy & K. Kawelo US Army 158*; Schofield Barracks East range along Centerline Road. Mesic lowland roadside area. Tree about 5 m tall. Male and female cones present; seed cones open in star shape. Lots of plants in the general area of various sizes; seedlings and immatures present and common. Naturalizing, 7 Jan 2010, *US Army 176*.

Cupressus lusitanica Mill. **New naturalized record**

Cupressus lusitanica, a tree native from Mexico to Central America, has been planted widely in Hawai'i, both as a forestry species (939 individuals were planted on O'ahu alone [Skolmen 1980]) and as an ornamental, particularly by early Portuguese settlers (Staples & Herbst 2005). Distinguishing features of this species include sharply pointed leaves all the same shape and size, ovoid seed cones that are glaucous when young that open at maturity, and reddish-brown seeds (Staples & Herbst 2005).

Material examined. O'AHU: Kuaokalā Road. Young fruits glaucous, seeds reddish-brown, thin. New naturalized record, 19 Jan 2009, *K. Kawelo US Army 115*; Schofield Barracks East Range, at fill disposal site off Centerline Rd, 920 ft. Disturbed dry/mesic lowland area. Growing with mixed alien vegetation. Approximately 4 m tall tree with branches low to ground, bushy habit. Male "cones" yellow, at tips of branches. Female cones on lower branches, young ones glaucous. Not many small trees seen, but many trees on area, and do not look planted, 7 Jan 2010, *US Army 177*.

Euphorbiaceae

***Euphorbia lactea* Haw.**

New naturalized record

Although this species is not known to flower in cultivation, it has been reported as naturalized from the Caribbean and Florida. Naturalization events must therefore occur vegetatively (Staples & Herbst 2005). On O'ahu, *Euphorbia lactea* was collected spreading in dry roadside alien scrub vegetation. Individuals of varying size classes were seen. The population on Kaua'i was spreading by vegetative means along a streamside cliff. *Euphorbia lactea* is a candelabra-shaped succulent shrub 10–25 ft tall, with dense stems, 3- or 4-angled dark green with mottled white branches, paired spines to 0.2" long, grayish, straight. The leaves are quickly deciduous, leaf blades are ovate, spatulate to rounded, and 0.25–0.50" long. Flowers are unknown (Staples & Herbst 2005).

Material examined. O'AHU: Koko Crater, near road to Hanauma Bay. UTM 635595, 2353210. Mixed alien scrub, several individuals of varying sizes in area. Spiny shrub about 2 m tall. No fruits or flowers. 30 Jun 2009, *OED 2009063002*; KAUA'I: Hanapēpē, along Hanapēpē Stream, growing on cliff sides. Dry lowland rocky cliffs. Cactus-like *Euphorbia* with shrubby habit, to about 2 m tall. Stems green on edges/outside half, with white coloration near middle. No flowers or fruit present. Spreading by vegetative means along cliff sides, 22 Jun 2010, *OED 2010062201*.

***Euphorbia leucocephala* Lotsy**

New naturalized record

Euphorbia leucocephala, or Puno-puno, an attractive shrub commonly seen grown as a hedge or specimen plants in Hawai'i gardens, was found on Kaua'i growing out of a *Eugenia uniflora* hedge in a lowland residential area. It was also seen in non-cultivated situations in other parts of the same neighborhood. Description of this species from *A Tropical Garden Flora* is as follows:

"Evergreen shrub 4–8 feet tall, crown rounded; branches green tinged reddish. Leaves whorled, 4 to 12 per node; petioles 0.25 to 1.25 inches long; blades more or less elliptic, 1 to 2.5 inch long by 0.25 to 1 inch wide, dull to dark green, underside paler, apex with tiny mucro. Inflorescence in showy panicles; blades oblanceolate to spatula-shaped. 0.5 to 0.75 inches by 0.15 to 0.2 inches, white with green veins. Cyathea inconspicuous, whitish, glands pale green. Fruit not seen." (Staples & Herbst 2005)

Material examined. KAUA'I: Līhu'e. Small individual poking out of dense *Eugenia uniflora* hedge. No mature individuals seen in local vicinity. Shrub about 2.5 ft tall, 2 Apr 2010, *OED 2010040201*.

***Homalanthus populneus* (Geiseler) Pax**

New naturalized record

Homalanthus populneus, a species known in Hawai'i from one specimen taken from Ho'omaluhia Botanical Garden, was found spreading near an untended side road close to the garden. The description of this species taken from H-J Esser's "Revision of *Homalanthus* (Euphorbiaceae) in Malesia" (now *Homalanthus* nom. cons.):

"Tree up to 10 meters tall, dbh 18 cm, with slender, terete, crooked to straight trunk, numerous spreading, flexible branches, and a flattish but spreading crown; without but-

tresses. Glabrous. Bark pale brown to grey, non-fissured but lenticelled and mottled with pale patches, with greyish lenticels, yellow on the inside, very thin, soft.... Stipules 0.8 to 2 cm long. Leaves: petiole 1 to 15 cm long, glandless; lamina orbiculate to ovate to lanceolate, 3 to 22 by 1.5 to 20 cm, base rounded to slightly emarginate to, rarely, cuneate, not or indistinctly (up to 1 mm) peltate, very base often attenuate, apex acuminate, lower surface usually whitish with larger veins of different color, rarely not whitish at all, side veins in 9 to 15 pairs below the apex, angle of divergence 50 to 60 (up to 80) degrees, partially to completely joined towards the margin, tertiary veins percurrent, quaternary veins reticulate and usually indistinct, adaxially without any prominent gland, but often with 2 glandular auricles up to 0.6 mm long, abaxially with 1 to 3 glands on each half of blade, 0.2 to 0.5 mm in diameter, and close to the margin, basal ones sometimes enlarged, and close to or touching the midvein if not absent. Inflorescences 3 to 30 cm long, usually bisexual, occasionally wholly staminate, staminate part 6 to 9 mm in diameter. Bracts of staminate cymules 0.75 to 1.5 mm long, with a pair of large undivided glands 0.5 to 1.5 mm long and only slightly (0.2 to 0.3 mm) overtopped by the bract. Staminate flowers (1–) 3 per cymule; pedicel 0.6 to 3 mm long; sepals 2, about 0.6 mm long; stamens (6–) 8 to 10 per flower with filaments about 0.4 mm long and anthers about 0.3 mm long. Pistillate flowers 0 to 4 (–21) per thyrse; pedicel 3 to 12 mm long; sepals 2, soon caducous; ovary about 2 mm long, bicarpellate, papillate, style about 0.6 to 1.5 mm long, stigma 1.5 to 3 (–6) by 0.6 to 0.7 mm, apically undivided to slightly emarginate to short-ly divided, glandular over its whole length or only the apical or basal 0.5 mm glandless. Fruits 2 to 4 (–8) per infructescence; bract persistent; pedicel sulcate, not carinate, style 0.3 to 1 mm long, the stigma 1.5 to 3 by 0.6 mm; regularly opened fruits not uncommon, opening primarily loculicidally, pericarp about 0.2 to 0.3 mm thick, remaining columella slightly alate.” (Esser 1997)

Material examined. O’AHU: On road towards Board of Water Supply building, 21.3886709221213, -157.810172089729. Shrub/tree with spreading crown. ~7 ft tall, leaning over. Flowers minute, with basal glands. In mixed alien botanical garden setting. Associated vegetation: *Clerodendrum chinense*, *Falcataria*, *Bridelia insularum*, 20 Oct 2011, OED 2011102001.

Manihot esculenta Crantz

New naturalized record

Manihot esculenta, or Tapioca, is a prominent crop worldwide and a popular source of starch for many cultures in Hawai’i. It was found naturalized in two separate locations on Kaua’i, and along the Hālawā access road on O’ahu. *M. esculenta* can be either a shrub or an herb 3–10 ft tall, with brittle, knobby stems and swollen, elongate roots. Leaf petioles are 2–7 in long and can be green or reddish; leaf blades are usually divided, or the upper portion can occasionally be entire. Leaves have 3–7 lobes which are narrowly elliptic to narrowly oblanceolate, 4–8 in × 0.66–1.50 in, undersides are white and margins are smooth. Inflorescences are axillary, flowers are green or yellowish, more or less flushed red, 0.33–0.50 in long. Fruit is 0.50–0.75 in long and often winged. Seeds are oblong and mottled tan to brown (Staples & Herbst 2005).

Material examined. O’AHU: H3 Hālawā- UTM 2367484, 617550. New naturalized record. Semiwoody tree with brittle stems, petioles crimson. No flowers or fruit seen. Patch of 6–10 plants growing in thick Guinea grass understory, 15 Oct 2009, OED 2009101501. KAUA’I: UTM 464691, 2443006. Lowland mesic residential setting. Sprawling shrub/thicket about 8–10 feet tall, occasionally climbing trees to 20 ft high. Large naturalized patch covering about 0.25 acres, forming a monoculture/thicket. Downslope from a cultivated patch. 10 Mar 2010, OED 2010031001; Hoary Head Range, E of Omoe, 210 m. Appears naturalized, but fairly local. Along cane road. Shrub ca 2.5 m tall. 6 Apr 1988, W. L. Wagner & C. Imada 6005.

Pedilanthus tithymaloides* (L.) Poit. subsp.**padifolius* (L.) Dressler****New naturalized record**

This easily-cultivated species which is used as an ornamental as well as a medicinal plant in many tropical regions of the world (Staples & Herbst 2005), has escaped cultivation on O‘ahu. *Pedilanthus tithymaloides* subsp. *padifolius* is a distinctive shrub 1–10 ft tall, with succulent branches, and inflorescences in flat-topped clusters. The cyathia involucre are slipper-shaped and tubular with a basal spur protruding from the back; the subspecies is characterized by its obovate or elliptic leaves that are widest above the middle (Staples & Herbst 2005).

Material examined. **O‘AHU:** Kamilo Iki. UTM 634558, 2355049. 200 ft. Growing with *Leucaena* in rocky hillside near residential lawn area. Herb about 0.5 m tall. Flowers crimson, slipper-shaped. Fruits numerous. See also Bishop coll #726000. 3 Apr 2009, *OED 2009040301*; Waipi‘o Peninsula, within area controlled by Navy, along coastal road, UTM 605651, 2361445, 15 ft. Small, localized, naturalized population with unknown initial introduction history. Somewhat commonly cultivated on island but no obvious cultivation near collection site. Succulent shrub to 2 ft. Lowland coastal non-native vegetation dominated by *Prosopis pallida* and *Cenchrus ciliaris*, 9 Dec 2010, *OED 2010120901*.

Fabaceae***Acacia mangium* Willd.****New island record**

Acacia mangium, an easy-to-grow forestry species that was widely planted in the Pacific and elsewhere as a forestry tree, frequently naturalizes where grown and is known to spread from plantings. It tolerates degraded areas and seems to prefer moist to wet sites. It has been previously collected as naturalized on O‘ahu, and was found on Kaua‘i growing out of a pile of debris in a pasture in Lumaha‘i Valley, and also spreading fairly extensively from a forestry planting in Wailua. Parker & Parsons (this volume) report this species as naturalized on Hawai‘i Island.

Material examined. **KAUA‘I:** Lower Lumaha‘i Valley, in pasture near highway, UTM 445357, 2456701. Coastal mesic pasture. Sapling/tree to 8 ft tall, no flowers or fruit present. 2 naturalized individuals growing in rockpile in middle of an *Ageratum conyzoides*-dominated portion of a pasture. This species was also noted as naturalized in upper Wailua on Loop Rd, probably spreading from experimental tree planting sites, 11 Mar 2010, *OED 2010031101*.

Bauhinia glauca* (Benth.) Benth. subsp.**tenuiflora* (C.B. Clarke) K. Larsen & S.S. Larsen****New naturalized record**

Bauhinia glauca, a species native to Southeast Asia and India (Chen *et al.* 2010), but not known to be cultivated in Hawai‘i outside botanical gardens, was found on O‘ahu, smothering the canopy of *Aleurites moluccana*. Description of the species (with subspecies characters in brackets):

“Climbers, with tendrils. Young branches reddish pubescent, later glabrous. Stipules linear, ca. 4 mm; petiole sparsely pubescent, [1–2(–3) cm]; leaves relatively large, 7–9 cm, primary veins 9–11, apex bifid to only 1/5, ... tip of lobes rounded. Flowers in short dense corymbs; bracts linear, ca. 5 mm; bracteoles similar, inserted near middle of pedicel. Pedicel slender, 10–20 mm. Flower buds ovoid, [hairy]. Receptacle striate, tubular, [receptacle 25–30 mm (longer than pedicel)], subglabrous. Calyx splitting into 2 or 3 reflexed segments. Petals white, subequal, broadly obovate, 8–12 mm including claw 2–3 mm. Fertile stamens 3; filaments glabrous, ca. as long as petals; anthers red, ellipsoid, ca. 2 mm. Staminodes 7, 2 in between stamens, ca. 3 mm, 5 short, subulate, connate at base.

Ovary ca. 8 mm, glabrous, shortly stalked; style very short; stigma obliquely peltate. Legume flat, 18–25 × 3–5 cm, thinly valved, indehiscent. Seeds flat, ovoid, 5–8 mm.” (Chen *et al.* 2010b)

Material examined. O‘AHU: Ho‘omaluhia Botanical Garden, near BWS pumping station fence. UTM 623222, 2365401. Sprawling over *Aleurites moluccana* in mixed alien lowland forest. Large, extensively sprawling vine with trunk ~7 in dia at base. Covering large area, dense blanketing growth in parts. Flowers white, about 1 in across. Pods dark brown, flat. New naturalized record, 21 Oct 2011, OED 2011102102.

Calliandra houstoniana (Mill.) Standl.

var. *calothyrsa* (Meisn.) Barneby

New island record

Calliandra houstoniana var. *calothyrsa*, a nitrogen-fixing species native to Central America and northern South America, is frequently cultivated in Asia as a forestry species (CAB International 2005). It has been collected as naturalized on Maui and Lāna‘i, and now on Kaua‘i, where a small population was spotted spreading along a roadside and into a nearby field. Parker & Parsons (this volume) report this species as naturalized on Hawai‘i Island.

Material examined. KAUA‘I: Kaumuali‘i Hwy near Halfway Bridge UTM 453515, 2428694. Lowland mesic roadside area. Tree/shrub about 15 ft tall. Probably planted somewhere in the general area, but now spreading to at least roadside and open areas, 7 Jun 2010, OED 2010060702.

Desmodium cajanifolium (Kunth) DC.

New island record

Desmodium cajanifolium, a weedy species previously found naturalized along roadsides and in open forests on the Big Island, was seen on Kaua‘i growing in *Leucaena*-dominated secondary vegetation.

Material examined. KAUA‘I: Kōloa, road to Kāhili Mt. Park, 0.4 mi from Hwy 50, at 720'. 8–10' herb; spindly, sparingly branched; leaves matte green olive green above, below paler, dull, raised yellow green veins; standard and keel pale lilac, wings darker pink. Secondary vegetation; *Panicum maximum*, *Leucaena*, 18 Nov 2004, T. Flynn 7159.

Peltophorum pterocarpum (DC.) K. Heyne

New naturalized record

Peltophorum pterocarpum, or Yellow poinciana, a native to Southeast Asia and northern Australia, is occasionally planted as a street tree in the Hawaiian Islands. This species is easily cultivated from seed, which it produces in abundance. It was found on Kaua‘i scattered throughout a residential area. The description for this species from *Flora of China* is as follows:

“Trees, 4–15 m tall. Young shoots, petioles, and inflorescences ferruginous hairy; old branches with yellowish, small lenticels. Leaves 30–42 cm; petiole robust; rachis 25–35 cm; pinnae 7–15 pairs, opposite, 8–12 cm; leaflets (7–)10–21 pairs, crowded together, oblong-obovate, 1.2–1.7 cm × 5–7 mm, leathery, abaxially pale green, adaxially deep green, base oblique, margin entire, apex rounded, mucronate. Panicles terminal or axillary, densely ferruginous puberulent; bracts caducous, 5–8 mm. Pedicels ca. 5 mm, ca. as long as flower buds, 5–7 mm from one another. Flower buds globose, 5–8 mm in diam. Sepals ovate, 5–8 × 4–7 mm, outside ferruginous tomentose. Petals obovate, 1.5–1.7 cm × 8–10 mm, densely ferruginous pubescent at middle of both surfaces, long clawed. Filaments ca. 1.2 cm, hirsute at base; anthers ca. 3 mm, sagittate at base. Ovary stalked, hairy, 3- or 4-ovuled; style filiform, much longer than ovary, smooth; stigma discoid, 3-lobed. Legume winged, compressed, fusiform, narrowed to both ends, longitudinally veined at middle part; wings 4–5 mm wide. Seeds 2–4.” (Chen *et al.* 2010a)

Material examined. **KAUA'I:** Kapa'a, Kaehulua Rd, near intersection with Ka'apuni Rd. UTM 465781, 2441964. Lowland residential and secondary vegetation. Tree about 10 ft tall, pods brown. Scattered individuals throughout this neighborhood, 10 Mar 2010, *OED 2010031003*.

Pueraria montana* (Lour.) Merr. var. *lobata
(Willd.) Sanjappa & Pradeep

New island record

Kudzu, a vining species notorious in many tropical and subtropical areas for its ability to smother surrounding vegetation, has been previously described as naturalized on O'ahu, Maui, and the Big Island. On Kaua'i, it was collected in the Hanalei National Wildlife Refuge, growing along a streambank.

Material examined. **KAUA'I:** Hanalei NWR, valley along river 10'. Liana; leaves dull medium green, raised white veins above, greenish gray, pale green raised veins below; calyx lobes pale yellow; standard purple, basal pale yellow green spot; wings purple, keel slightly paler, 8 Oct 1991, *T. Flynn 4748*.

***Stylosanthes scabra* Vogel**

New island record

This species, occasionally used as a marginal forage for livestock (Skerman *et al.* 1988), has been found naturalizing on the islands of O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i. It was recently collected from a pastured area on Kaua'i.

Material examined. **KAUA'I:** Kōloa District, Ala Kalanikaumaka Rd. ca 100 m from junction with Koloa Rd, 21.54°N, 159.28°W, 73 m. Locally common. Woody herb to 3 ft; leaves red-green above, grey-green below; corolla: keel yellow, standard yellow fading white. Ruderal vegetation with *Desmodium*, *Panicum*, *Chamaecrista* and *Stylosanthes*, 26 Mar 2009, *T. Flynn 7438*.

***Vigna luteola* (Jacq.) Benth.**

New island record

Vigna luteola, a forage species naturalized throughout the tropics and subtropics and previously collected as naturalized on O'ahu, was found on Kaua'i growing in a coastal species restoration site. It is unclear how this species came to be growing in that location.

Material examined. **KAUA'I:** Kōloa District, Lāwai Bay, 21°53'22"N, 159°30'12"W, 3 m. Vine twining in and around *Scaevola*; stems pale green, leaves dark glossy green above w/ obvious reticulate venation, below glossy, paler w/ obvious venation; peduncle erect, pale green; calyx pale green; standard greenish yellow w/in, yellow green w/out. Coastal, growing in "Native coastal restoration" site fronting Allerton Estate. *Scaevola*, *Wedelia*, *Vigna* spp., *Stenotaphrum*, *Ipomoea*, 6 Oct 2008, *T. Flynn 7401*.

Iridaceae

***Dietes iridioides* (L.) Sweet**

New naturalized record

Dietes iridioides, a species used often as an accent plant in landscaping, has been found naturalizing on a ridgetop on O'ahu. The description of this species from *A Tropical Garden Flora*:

"Plant 1 to 2 feet tall; leaf blades linear to sword-shaped, 10 to 16 inches by 0.25 to 0.6 inches, veins not obvious. Inflorescence scape bracts not obviously paired, 1 to 1.25 inches long, brownish. Flowers 1.5 to 2 (–4) inches, white with yellow blotch and beard on outer tepal, inner tepal white, tepal claws often orange-dotted; style branches bluish. Fruit ovoid-cylindrical, 0.8 to 1.2 inches long, rough-walled, furrowed, apex beaked." (Staples & Herbst 2005)

Material examined. **O'AHU:** Wai'anae Mountains, Manuwai along eastern fenceline of Manuwai fence, 2100 ft. Naturalized, forming a patch. Plant was sterile at field collection site—collected and grown

until flowering at residence in Kahalu'u. Clumping herb, leaves less than 0.5 m long. Outer tepals white with yellow-brown markings, inner tepals purple. Growing with *Metrosideros polymorpha*, *Grevillea robusta*, *Dodonaea viscosa*, *Clidemia hirta*, 15 Jun 2011, *J. Beachy US Army 214*.

Juncaceae

Juncus effusus L.

New island record

Juncus effusus, which has the common name Japanese mat rush, is believed to have been brought to Hawai'i in the early 1900s to be used as a source of matting material (Wagner *et al.* 1999). It is widely naturalized on the islands of O'ahu, Moloka'i, Maui, and Hawai'i, and now on Kaua'i, where it was collected in Kōke'e State Park.

Material examined. **KAUA'I:** Kōke'e State Park, between Pihea trail and Pihea peak. *Metrosideros*-dominated wet forest with *Cheirodendron*, *Vaccinium*, *Sadleria*, and *Clermontia*. Erect herb; stems glossy green, whitish green at base; spikelets whitish. Pith appears to be solid, 21 May 2008, *T. Flynn 7395*.

Lamiaceae

Ocimum basilicum L.

New island record

Ocimum basilicum, or Sweet basil, is widely cultivated and naturalized in Hawai'i and worldwide. It has been previously collected on Ni'ihau, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i. On Kaua'i, it was found sparingly naturalized on a residential roadside bordering pastureland.

Material examined. **KAUA'I:** Mauka of Kapa'a town on Hau'iki Rd, UTM 462767, 2442577. Lowland roadside area. Herb to 1 ft tall. Very sparingly naturalized in roadside area with pastureland on one side and residences on the other, 31 Mar 2010, *OED 2010033104*.

Myricaceae

Morella cerifera (L.) Small

New island record

This species has previously been documented as naturalized on Maui. It is documented here as established on Hawai'i Island, where two populations are known in the Hilo area, along Mohouli St and along Stainback Hwy near Pana'ewa Zoo. It was known to exist on the island in the literature (Kurten *et al.* 2008), but apparently not citing an herbarium specimen. This species is not listed as planted on Big Island Forest reserves in Skolmen (1980), although it may have been planted there at some point. The Mohouli Street population is an extensive, dense thicket, and significant control work has been performed in that area (J. Parker 2011, pers. comm.). This species is also documented here as at least adventive on Kaua'i, where it was seen in a coastal residential area spreading significantly throughout one resident's yard, perhaps only by root suckers. It is unclear whether it was originally planted in this location.

Material examined. **KAUA'I:** Hā'ena, on Hā'ena Place. Coastal residential setting. 2–3 m tall shrub. Adventively spreading locally. Only male plants noted, though only a few individuals were inspected, 9 Mar 2010, *A. Lau & D. Frohlich 2010030902*. **HAWAI'I:** Sunrise Ridge subdivision on Mohouli St extension between Komohana St and Kaumana Dr. Growing with *Melastoma septemnerium*, *Melochia*, other weedy species on thin soil on roadside. Distribution of the plant in the area is unknown but it is common just above Komohana St for about 1 km on Mohouli St. Appears to occupy at least 70 acres, 19 Mar 2003, *s.n.*; Several large trees 7–8 m tall and a few (not many) apparent seedlings along Stainback Hwy between Pana'ewa Zoo and Hawaii Belt Hwy, 26 Apr 1985, *R.L. Stemmermann 6936*.

Myrsinaceae***Ardisia crenata* Sims****New island record**

Known in Hawai'i as Hilo holly, this ornamental plant has escaped cultivation to become an occasional to common element of mesic and wet lowland forests, where it commonly grows in densely shady understory. It has been documented as naturalized on O'ahu, Maui, and Hawai'i islands. It is documented here as very sparingly naturalized along a roadside on Kaua'i. It is not unlikely that this species is also established in forested areas of Kaua'i, although surveys of these areas have not been done by the collectors mentioned here.

Material examined. **KAUA'I:** Lāwa'i, off Piko Rd. 1 m tall columnar shrub. No flowers seen; fruits abundant, red. Single naturalized plant coming out of cultivated hedge. Very sparingly naturalized in immediate area, 24 Feb 2010, *D. Frohlich & A. Lau 2010022401*.

Myrtaceae***Pimenta dioica* (L.) Merr.****New island record**

Also known as Allspice, this species has previously been collected as naturalized on Kaua'i and Maui. The collection below is from a population on O'ahu, in Makiki, known to the authors to extend above Maunalaha Trail where it occupies more than an acre in various densities, occasionally forming dense thickets. Parker & Parsons (this volume) report this species as naturalized on Hawai'i Island.

Material examined. **O'AHU:** E side of Maunalaha Trail, behind Hawai'i Nature Center, Makiki, Honolulu. About 200 m. Vegetation: mostly *Eucalyptus* with other alien species. Small tree 2.5 m tall. Flowers white, no fruit present. Many trees, most in bud, 16 Jul 2002, *F. Kraus FK 06*.

Pimenta racemosa* (Mill.) J.W. Moore*New naturalized record**

Also known as Bay Rum tree, this native to the Caribbean is somewhat rare in cultivation on O'ahu. It can be distinguished the other species of *Pimenta* naturalized in Hawai'i by more obtuse to subcircular leaves (vs. oblong-elliptic to elliptic-lanceolate in *P. dioica*), the apex usually rounded (vs. obtuse to acute), and by flowers with 5 sepals and 5 petals (vs. 4 sepals and 4 petals) (Staples & Herbst 2005). It is naturalized in Moanalua Valley on O'ahu, probably as an escape from cultivation in the area. It is well scattered over many acres. No extensive dense stands were seen, but thorough surveys off-trail were not performed.

Material examined. **O'AHU:** Moanalua Valley, along trail. Lowland mesic, predominantly non-native secondary forest, in valley floor. Probably planted in some areas but now naturalized and occasional to common along lower portion of trail. Usually scattered, but occasionally forming small dense patches (3 × 3 m), 26 May 2011, *A. Lau 2011052601*.

Ochnaceae***Ochna thomasiana* Engl. & Gilg****New island record**

This species has previously been documented as naturalized on O'ahu, Lāna'i, and Maui. It is now known to be very sparingly naturalized on Kaua'i as well, where it was seen escaping cultivation in a somewhat dry lowland residential area.

Material examined. **KAUA'I:** Kalāheo, off Pu'u Rd, on Ai Rd. Dry/mesic lowland residential roadside area, in an herbicided field. Very sparingly naturalized in the area. Cultivated elsewhere on island, 19 Feb 2010, *A. Lau & D. Frohlich 2010021902*.

Orchidaceae***Dendrobium mirbelianum* Gaudich.****New state record**

This species is native to the Moluccas, New Guinea, the Bismarck archipelago, north-eastern Australia, and the Solomon Islands, where it grows as an epiphyte in mangroves

and forests more or less near sea level. It is known to have populations with cleistogamous flowers, which means that it can produce self-pollinating flowers that remain closed. It is reported to be commonly cultivated in some regions and to form natural hybrids (Cribb 1986). Although this species had not been collected from cultivation, it is most likely an escape from a garden or nursery. It appears established as naturalized, occurring in scattered localities along the Schofield-Waikāne trail. Sterile individuals closely resembling the vouchered material were also noted in Kahana Valley by the collectors, as low as about 300 m. This *Dendrobium* belongs to section *Spatulata* (Cribb 1986), and can be distinguished from other members of this section primarily by floral characters, which include: flowers greenish yellow to olive brown, veined with purple brown on the lip; callus white, marked with purple or violet; petals spatulate, acute to subacute, not twisted; lip 3-lobed, side lobes elliptic, mid-lobe recurved, ovate, acute, margins erose and undulate; callus of five erose ridges, the central one longest and slightly dilated towards apex at middle of mid-lobe (Cribb 1986).

Material examined. O'AHU: Schofield-Waikāne trail, 2000 ft. Epiphyte. Naturalized in area, 13 May 2009, K. Kawelo *s.n.* (BISH# 736798); Waikāne trail, near summit ridge, growing near trail about 0.15 mi from Pu'uka'aumakua. 1800 ft. Native 'ōhi'a forest, epiphytic on *Metrosideros polymorpha*. Plant was sterile but was grown till flowering at a residence in Kahalu'u, 31 Dec 2010, J. Rohrer US Army 202.

***Dendrobium rhombeum* Lindl.**

New state record

This species is endemic to the Phillipines, and although it is listed as a synonym of *D. heterocarpum* Wall. ex Lindl. by some sources, it is believed to be a distinct taxon and a valid name by a taxonomic expert of the region (J. Cootes 2011, pers. comm.). It was seen forming a small, locally naturalized population in 'ōhi'a/uluhe forest in the central Ko'olau of O'ahu. It is likely an escape from cultivation, though no previous vouchers of this species in Hawai'i have been deposited at BISH. This species flowered when leafless, on a very short (1.0–1.5 cm) peduncle. It is differentiated from the related *D. heterocarpum* in labellum characters including overall shape, as well as arrangement of labellum hairs (J. Cootes 2011, pers. comm.). In our specimen the labellum apex is somewhat acute, and hairs are somewhat whitish.

Material examined. O'AHU: Ko'olau Mountains, Kīpapa trail. Epiphytic on *Psychotria mariana*. A few stems from base, up to 30 cm tall. Corolla lobes cream colored, throat yellow with maroon markings. Collected in wild and grown to maturity at Mānoa residence, 12 Oct 2010, J. Lau *s.n.* (BISH# 749851).

***Epidendrum nocturnum* Jacq.**

New state record

This species is native to Florida, the West Indies, and Central and South America. One listed common name is Night-smelling epidendrum, which refers to its flowers which are fragrant at night. *E. nocturnum* is known to have cleistogamous flowers (Hågsater 2002). This ability to self pollinate may aid in its ability to spread outside its native range. This species was found very sparingly naturalized in the Wai'anae Mountain range near Pu'u Kaua, perhaps an escape from cultivation somewhere on island. It can be distinguished from other species of *Epidendrum* by its caespitose habit; relatively short (3 cm) inflorescence rachis; long (6 cm), linear-lanceolate, yellowish sepals and petals; and ellipsoid, 3 cm long capsules. A full description of the species can be found in the *Flora of North America*, which is currently available online (*Flora of North America* website 2011).

Material examined. O'AHU: 'Ēkahanui, near Pu'u Kaua, ca 3000 ft elevation. Epiphyte, 1 Nov 2009, K. Kawelo US Army 172.

Phytolacaceae***Phytolacca dioica* L.****New naturalized record**

This species is native to tropical South America, where it has been planted as a shade tree and given the common name Bella Sombra. It is capable of storing large quantities of water, and therefore is resistant to drought and fire (Staples & Herbst 2005). It is a fast-growing tree which can grow in nutrient-poor soils, thriving in dry, hot conditions (Staples & Herbst 2005). It is dioecious, and can be distinguished from other species of *Phytolacca* in Hawai'i by its tree habit. Although usually encountered in Hawai'i as a smaller tree, it may grow up to 18–20 m, and has a thickened trunk which may fan out at the base. The leaves are elliptic to ovate, more or less fleshy; the inflorescences are pendant racemes. Flowers of both male and female plants are greenish white (Staples & Herbst 2005). It was seen spreading locally and sparingly naturalized in Lualualei, where it was escaping from experimental planting sites nearby. Individuals of all size classes were seen.

Material examined. O'AHU: Lualualei NavMag, 580 ft. Dry lowland valley floor, nonnative scrubland dominated by *Leucaena leucocephala* and *Cenchrus ciliaris*. Female and male trees to 20 ft tall, both collected from a small naturalized population, 8 Dec 2010, A. Lau, D. Frohlich & A. Hebshi 2010120801.

Pinaceae***Pinus elliotii* Engelm.****New island record**

This species has previously been documented as naturalized on Moloka'i. It was extensively planted in forestry plots in the Pu'u Ka Pele Forest Reserve on Kaua'i and is now firmly established as naturalized, spreading from these plantings. A sparingly naturalized population is also now known from O'ahu, on Mau'umae ridge.

Material examined. KAUA'I: Waimea, Kōke'e, Mākaha Ridge rd, 1.75 mi W of Hwy 550. 12 m × 25 cm tree; canopy broadly conical; leaves in fascicles of 2; young female cones glaucous green, purple scale tips. Abundantly naturalized along road and ridge top, 28 Apr 2006, D. Lorence & T. Flynn 9515; Kōke'e, along contour road between Kauhao and Kā'aweiki ridges. 3200 ft. Mesic secondary forest. Species was heavily planted in the area and has also thoroughly established naturalized populations surrounding and at significant distances from planted sites, 23 Jun 2010, A. Lau & D. Frohlich 2010062301. O'AHU: Mau'umae trail, at ca 1300 ft growing among *uluhe*, *koa*, and *'ili-ahi*. This species is occasional along a section of this trail, 12 Jun 2008, A. Lau 2008061201.

Pittosporaceae***Pittosporum pentandrum* (Blanco) Merr.****New island record**

This species has previously been documented as naturalized on O'ahu and Hawai'i islands, where it escapes from planted sites. It is documented here as spreading on Kaua'i as well, also escaping cultivation to become sparingly naturalized.

Material examined. KAUA'I: Princeville area, near *mauka* intersection of Kāpi'olani Lp and Kamāmalu Lp. Lowland residential setting. 10 ft tall tree. Sparingly naturalized in the area. Also noted as sparingly naturalized in Wailua residential roadside areas, 11 Mar 2010, D. Frohlich & A. Lau 2010031103.

Pittosporum viridiflorum* Sims*New island record**

This species has previously been documented as naturalized on Lāna'i, Maui, and Hawai'i islands. It is documented here naturalized on O'ahu as well, where it was spreading from planted individuals in Kāne'ohe. One other BISH specimen indicates spread and naturalization as well; a single, apparently naturalized tree in Waimānalo near a trail. The material

from Kāneʻohe was cultivated and naturalized, and was introduced under the name *P. ripicolum*, which is currently considered a synonym of *P. viridiflorum*. Interestingly, plants of these populations displayed consistently undulate leaf margins, while the vast majority of specimens were flat margined. This character may well fit within the current concept of *P. viridiflorum*, which is stated to be a highly variable plant (Staples & Herbst 2005).

Material examined. OʻAHU: Hoʻomaluhia BG, near African section lawn. Growing in unmanaged area, among *Citharexylum caudatum*, *Ardisia elliptica*, and *Medinilla cumingii*. Species is spreading through other unmanaged areas as well. Tree about 10 ft tall, 7 Apr 2011, D. Frohlich & A. Lau 2011040701.

Plumbaginaceae

Plumbago auriculata Lam.

New island record

Also known as Blue plumbago, this species has previously been documented as naturalized on Maui. It is documented here as sparingly naturalized on both Kauaʻi and Oʻahu islands, where it was spreading from cultivation in dry sites. The Oʻahu population was on the dry rocky slopes of Punchbowl crater, among *Cenchrus ciliaris*, *Hylocereus undatus*, and other secondary vegetation. Because of the attractive and vigorous nature of this ornamental hedge plant (Staples & Herbst 2005) it is likely this species escapes often in lowland residential areas, only to be tolerated and maintained.

Material examined. KAUAʻI: Poʻipū. In mixed alien lowland vegetation. Shrub about 3 ft tall, flowers lavender, 17 May 2010, OED 2010051701. OʻAHU: Punchbowl area, on Prospect St. Vining shrub to about 1.5 m, flowers lavender. At least locally naturalized on Punchbowl slope, growing along road cut area as well as through a *Hylocereus* thicket above road cut, across road from the probable planting site. 21 Aug 2008, D. Frohlich & A. Lau 2008082101.

Poaceae

Entolasia marginata (R. Br.) Hughes

New island record

This Australian species has previously been collected as naturalized on Hawaiʻi Island. It is now known from Oʻahu as well, where it was found naturalized in mesic, mostly non-native forest in Pālehua. More information including keys and full descriptions can be found in the *Flora of New South Wales* (Harden 1990). The information in this flora is currently available online as part of the New South Wales Flora Online project (The Royal Botanic Gardens and Domain Trust).

Material examined. OʻAHU: Pālehua, Upper gulch off road by HUA 13 & 14. *Elepaio* territory. 2000 ft. Weedy forestry plants with remnant native stands, 10 Oct 2011, K. Kawelo US Army 233.

Leptochloa panicea (Retz.) Ohwi subsp.

brachiata (Steud.) N. Snow

New state record

This species has a very broad natural distribution. Within the species, there are 3 subspecies recognized, and so far all material seen has been identified as *L.p.* subsp. *brachiata*. This subspecies is native to the tropical and subtropical regions of the Americas. It is regarded as a weed in its native range, as it grows successfully in agricultural areas, warranting control work (Harris 2010). It has also naturalized in Australia (Snow 2004). It is documented here as sparingly naturalized in Waimānalo, at a large nursery, where it was growing along margins of maintained areas as well as coming up in potted plants. It is likely this plant arrived as an accidental introduction, perhaps as seed in ordered nursery stock or materials. It can be distinguished from other species of *Leptochloa* by its race-

mose panicle branches, erose to ciliate ligules, and hairy sheaths. A full description of the species can be found in the *Flora of North America* (Snow 2003).

Material examined. O'AHU: Waimānalo, Leilani nursery. Rural nursery lowland nursery setting. 40–50 plants total, most growing out of pots. Grass about 1 m tall, 24 Aug 2011, *J. Ho 20110801*.

Miscanthus floridulus (Labill.) Warb.

ex K. Schum. & Lauterb.

New state record

This species is native to temperate and tropical regions, in China, Japan, and some Pacific islands. It has become naturalized on Guam (Space & Falanruw 2000). In both its native and naturalized range it commonly forms thickets, and this species is adapted to and resprouts readily from fire (Bassler & Aguon 2006). It is documented here as sparingly naturalized, where it was seen as only a few well scattered mature individuals in a dry lowland military training area. It is possible it arrived here as an accidental introduction through military training activities. Due to its limited known population size and the likelihood of it expanding its range and contributing to fire hazard, it is likely this population will receive control work, in an effort to remove it from the island. The genus is closely related to *Saccharum*, from which it can be differentiated by its spikelet pairs being unequally pedicillate (as opposed to sessile-pedicillate pairs in both *Saccharum* as well as most other andropogonoid grasses), as well as having non-disarticulating inflorescence branches (Wagner & Lorence 2002). The plant is a large, clump-forming grass, its culms growing from 1.5–4.0 m. The leaves are cauline, blades with a prominent midrib, the blade margins scabrous; the inflorescence is oblong elliptic in outline, the main axis 25–45 cm; racemes are numerous, 10–30 cm long, and are appressed to ascending; the spikelets are awned, with white, spreading callus hairs which are 4–6 mm long (Chen & Renvoize 2006).

Material examined. O'AHU: Northern Ko'olau range, Kahuku training area, near Pahi-pahi'ālua gulch. Dry to mesic lowland slope. Mixed forestry trees with *Osteomeles* understory, 2–3 m tall bunchgrass, about 2.5 m in diameter. Single naturalized individual, but others scattered in the area, 14 Mar 2011, *A. Lau 2011031401*.

Schizachyrium condensatum (Kunth) Nees

New island record

This commonly misidentified species has previously been documented from Hawai'i Island, where it is an invasive species and fire threat, particularly in Hawai'i Volcanoes National Park (Stone *et al.* 1992). It is documented here as well-established on Kaua'i as well, where it was seen forming thickets or mixed in with other vegetation in pastures, along roadsides and in other open areas, primarily in the Kōloa and Līhu'e districts.

Material examined. KAUA'I: Lāwa'i, off Lauoho Rd. Mesic Lowland secondary vegetation, on slope near property. Clump forming grass to about 1.5 m, sending up many upright culms. Inflorescences bushy topped. Naturalized. Seen occasional to common in roadsides and pastures in the area, 17 Feb 2010, *A. Lau & D. Frohlich 2010021701*.

Rubiaceae

Galium aparine L.

Correction and new island record

The specimen cited below had previously been reported as a new island record for Moloka'i, under the name *Sherardia arvensis* L. (Oppenheimer 2008). It was incorrectly identified, and has been determined as *Galium aparine* L. This represents a new island record for *G. aparine* on Moloka'i. This species has been found to be capable of autogamy, which means it is capable of self fertilization (Chen & Ehrendorfer 2011). It has

previously been documented from Maui (Starr & Starr 2011). Although there are currently no specimens at BISH to document the presence of *S. arvensis* on Moloka'i, it may occur there. *Galium* can be distinguished from *Sherardia* by the following characters: well-developed calyx, capitate inflorescences (*Sherardia*), vs. indistinct calyx, lax inflorescences (*Galium*). *Galium aparine* can be distinguished from other *Galium* species currently documented in Hawai'i by its longer, wider leaves (10–60 mm long \times 3–10 mm wide) (Chen & Ehrendorfer 2011; Wagner *et al.* 1999). A full description of the species can be found in the Flora of China (Chen & Ehrendorfer 2011).

Material examined. **MOLOKA'I:** Kawela, Pu'u Kolekole Cabin, naturalized sprawling herbs around cabin in wet forest, 1200 m, 4 Apr 2007, *Oppenheimer, Perlman & Tangalin H30706*.

Rutaceae

Melicope elleryana (F. Muell.) T.G. Hartley **New naturalized record**

Also known sometimes as Pink Euodia, this species from Australia is occasionally cultivated elsewhere. It is rare in cultivation in Hawai'i. It is documented here as sparingly naturalized where two large trees of this bird-dispersed plant were seen at long distances from the assumed parent plant, spreading into non-native dominated wet secondary forest, as well as 'ōhi'a/uluhe forest in windward O'ahu. This species, with pellucid glands noticeable with a hand lens, can be distinguished from other Rutaceae in Hawai'i by the following combination of characters: larger tree to 25 m tall, leaves opposite, trifoliate; leaflets elliptic, ovate, or obovate, 5.5–20.0 cm long; inflorescences usually ramiflorous, the axis to 5 cm long, showy; petals pink (The Royal Botanic Gardens and Domain Trust 2011). No evidence of natural hybridization in this species has been found by weed risk assessment specialists (Hawaii Pacific Weed Risk Assessment 2011) so it is unclear whether this species represents a hybridization threat to native species of *Melicope*.

Material examined. **O'AHU:** Kāne'ohe, near Likeke Trail, mauka of H3 Fwy. Lowland mesic to wet secondary forest, growing with *Arthrostemma ciliatum*, *Psidium guajava*. About a 12 m tall tree, lower branches horizontal. Inflorescences ramiflorous, immature fruits green. At least sparingly naturalized in the area, 27 Oct 2011, *D. Frohlich & A. Lau 2011102702*.

Murraya paniculata (L.) Jack **New island record**

Also known in Hawai'i as Mock Orange, this species was seen spreading from planted individuals along Pu'u road in the Kalāheo area of Kaua'i. It has previously been documented as naturalized on O'ahu and Maui.

Material examined. **KAUA'I:** Kalāheo, on Pu'u Rd. UTM 444804, 2423874. Mesic lowland roadside, mixed alien vegetation. Upright shrub to about 8 ft, growing among *Schinus terebinthifolius*. One of many scattered naturalized individuals of this species in the area. Also commonly planted in the area, 19 Feb 2010, *D. Frohlich & A. Lau 2010021903*.

Sapindaceae

Filicium decipiens (Wight & Arn.) Thwaites **New island record**

Also known as Fern tree, this species has been previously documented as naturalized on O'ahu, Maui, and Hawai'i islands. It was seen sparingly naturalized in a residential area of Kapa'a, apparently spreading from planted trees in the area.

Material examined. **KAUA'I:** Kapa'a, in ditch along Kawaihau Rd near Bettencourt Ln. Mesic lowland residential and agricultural area. Sapling about 10 ft tall, one of several in the area, 29 Mar 2010, *D. Frohlich & A. Lau 2010032901*.

Schizaeaceae***Lygodium japonicum*** (Thunb.) Sw.**Range extension**

Lygodium japonicum is a vining fern species known to be particularly problematic in Florida, where it infests both intact native ecosystems and disturbed sites (Center for Aquatic and Invasive Plants 2011). It was previously found on O‘ahu in grassy hills above He‘eia State Park, and is now known to be growing in Nu‘uanu, Kāne‘ohe, and in Hālawā in a native plant restoration site.

Material examined. **O‘AHU:** Hālawā Valley, in restoration area along access road at 840 ft. Vine-like fern in a 2 × 2 ft patch. Native/mixed alien restoration area along the H3 Hwy. June 2011, *A. Beebe OISC 20110601*.

Simaroubaceae***Ailanthus altissima*** (Mill.) Swingle**New state record**

Also known as Tree of Heaven and native to Asia, this species has become a notorious invasive species in many areas of the continental U.S. (as well as elsewhere worldwide) following its introduction in 1784 as a medicinal and ornamental tree (Invasive Species Specialist Group 2011). A small population was found within a 1 acre residence in Kōke‘e, Kaua‘i. Because this species is able to produce very long underground runners, it is unclear just how many individuals make up this population. At this point it is uncertain whether any seedlings were ever found at the site. A control program was immediately initiated after the population was found. The field crew located and controlled 4 mature individuals, and pulled at least 57 smaller, sapling-sized plants, which may have all been root suckers. The population continues to re-sprout, but the numbers are decreasing with each visit, and it currently seems likely the population will be eradicated from the site. This species is recorded as planted in some of Hawaii’s state forest reserves (Skolmen 1980), and therefore should be searched for as it represents a threat to Hawaii’s agriculture and native ecosystems. It can be distinguished from other members of the order Sapindales in Hawai‘i by its pubescent, pinnately-compound leaves, the leaflets with at least one glandular tooth at the base, the crushed leaves with a moderate to strong odor (described by the collectors as a “burnt peanut” smell at time of collection), and fruits being samaras (Peng & Thomas 2008). Further information about its identification can be found in the *Flora of China* (Peng & Thomas 2008). Much more information about its invasiveness is available online.

Material examined. **KAUAI:** Kōke‘e, along residential side road, about 1 km *makai* of Kōke‘e lodge. Rural residential setting among mixed secondary and native mesic forest. Small tree/sapling about 6 ft tall, new growth often reddish. Leaves smelling musty, like burnt peanut butter, not necessary to crush leaves to get strong odor, 25 Jun 2010, *A. Lau & D. Frohlich 2010062501*.

Solanaceae***Solanum melongena*** L.**New naturalized record**

Also known as Eggplant, this species is very common in cultivation in Hawai‘i as well as other tropical and subtropical areas of the world. Many cultivars of this plant exist, which display variation in fruit size, shape, and color. Domesticated forms often lack spines (Staples & Herbst 2005). A small naturalized population was seen in windward O‘ahu, where individuals of this species with occasional spines were seen scattered in a pasture area.

Material examined. **O‘AHU:** Mālaekahana, in pasture with *Solanum torvum*. Shrub about 0.5 m tall. Fruits bright orange-yellow, pulp white. Flowers lavender. Some spines, but not particularly

spiny. Several individuals scattered in pasture, 5 Nov 2009, *D. Frohlich & A. Lau 2009110501*; Ko'olauloa, Mālaekahana. 40 ft elev. In pasture. 60–100 cm tall, spininess and flowers like *S. lineanum*; fruits golden yellow 4–5 cm diam. Leaves with shape and pubescence like *S. torvum* (common nearby), 16 Apr 2005, *R.W. Hobdy 4201*.

***Solanum torvum* Sw.**

New island record

This weedy, bird-dispersed shrub is established as naturalized in some lowland areas of Kaua'i, particularly in agricultural areas, occasionally forming thickets. It had previously been documented from O'ahu, Maui, and Hawai'i islands.

Material examined. **KAUAI:** Wailua, on Koki Rd. Lowland disturbed roadside area. 8 ft tall shrub, flowers white, fruits green ripening to black. Locally naturalized along road and in adjacent pastures, 5 Apr 2010, *D. Frohlich & A. Lau 2010040502*.

Sterculiaceae

***Melochia umbellata* (Houtt.) Stapf**

New island record

Previously documented as naturalized on Hawai'i, Maui, and O'ahu islands, this species is also naturalized on Kaua'i, at least in the Kalāheo area and apparently also in Nu'alolo Valley. The population in Kalāheo was not extensive, where several mature trees were seen scattered along a short section of road, in mesic secondary forest.

Material examined. **KAUAI:** Kalāheo, on Pu'u Road, *makai* of Kukuiohono Park. UTM 444965, 2423067. Sparingly branched tree to about 20 ft tall, copious immature fruit developing. One of about 4 individuals in the area, growing in different size classes, 19 Feb 2010, *A. Lau & D. Frohlich 2010021901*; Nu'alolo 'Āina Valley, Na Pali Coast. Growing near stream bed in area dominated by exotic plant species. Small shrubby tree. No flowers or fruit present, 18 Jul 1979, *G. Clarke, L.W. Cuddihy, L. Yoshida & C. Corn ESP 340*.

Verbenaceae

***Clerodendrum glabrum* E. Mey.**

New naturalized record

A plant with medicinal uses (Staples & Herbst 2005), this species has been known to grow in natural areas in the Kē'ē area, where it is believed it is persisting from planted trees. A small naturalized population was noted along a roadside area in Hā'ena, consisting of a few mature trees and several saplings. This population was growing in dense shade, in wet to mesic lowland secondary vegetation. It can be distinguished from other *Clerodendrum* in Hawai'i by its habit being a small tree or shrub, whorled or opposite leaves, relatively short corolla tubes, and corollas being white or yellowish (Staples & Herbst 2005).

Material examined. **KAUAI:** Hā'ena, along highway just west of Hā'ena beach park. Lowland wet to mesic secondary forest and roadside vegetation with some nearby residential areas. Tree to about 10 ft tall, sparsely branched, fruiting. Though believed to be intentionally introduced to the Kē'ē area, reproducing by seed in this area at significant distance from Kē'ē, 9 Mar 2010, *D. Frohlich & A. Lau 2010030903*.

Vitaceae

***Cissus verticillata* (L.) Nicolson & C.E. Jarvis** **New naturalized record**

Also known as Princess vine, this species, which is native to tropical America, the Caribbean, the Galapagos, and Africa, was first collected in Hawai'i in 1973. The label data for this first collection suggests it had already naturalized at that time. It has been collected several times since then in clearly naturalized situations but was never written up in the *HBS Records*. It is occasional to rare in cultivation here. This species is now thor-

oughly established on O‘ahu in lowland roadsides and secondary forest including the Makiki-Tantalus area, Waimānalo, and Waimea. It has also established populations in the Kōloa Distr of Kaua‘i. The Kaua‘i populations may still be possible to remove, although this will require significant work. This invasive, bird-dispersed vine can blanket tree canopies and may form masses of long hanging aerial roots. It can be distinguished from other *Cissus* in Hawai‘i by its simple, fleshy, acute-apexed leaves, forked tendrils, and more or less flat-topped, yellow-green inflorescence branches. The fruits ripen to black (Staples & Herbst 2005).

Material examined. O‘AHU: Vine growing on *Leucaena* shrubs near junction of Round Top Dr and Maunalaha Rd. Also found with *Amaranthus*, grasses. Leaves simple. Fruit black, 9 Oct 1973, *S. Ishikawa 310*; Hale‘iwa, Waimea Audubon Center. Garden planting, accession # 86c244. Planting removed from collection, but become widely naturalized in the area, Oct 2005, *D. Orr s.n* (BISH# 726216); Waimānalo, Waikupanaha St along side of road, growing over *Haole koa*, lowland mesic forest, agricultural land. Vine, up to canopy at about 7 m. Inconspicuous white flowers, fruits black berries. Many individuals with copious fruit, covering large area along side of road, 10 Aug 2006, *D. Frohlich, A. Lau, K. Starr & F. Starr 0608101*. KAUA‘I: Kōloa Distr, Kōloa. Weedy roadside scrub of mostly *Haole koa* on Hapa Rd. Vine, yellow inflorescence, tendrils. 10 Oct 2007, *C. Trauernicht & M. Clark 192*; Lāwa‘i, on Lauoho Rd just west of Lāwa‘i Cannery. UTM 447537, 2423734. Smothering vine up to 40 ft in trees, 23 Feb 2010, *A. Lau & D. Frohlich 2010022305*.

***Tetragium pubinerve* Merr. & Chun**

New island record

This species is somewhat rare in cultivation in Hawai‘i. It was previously documented as naturalized on Maui, where a particular infestation was noted to occur over about 4 acres (Oppenheimer & Bartlett 2000). It was noted along a dry to mesic roadside area on Kaua‘i, thickly covering the canopy of small trees for a stretch of about 80 yards.

Material examined. KAUA‘I: Vine sprawling over 80-yd long area. Growing over *Leucaena leucocephala*. Kapa‘a. UTM 465656, 2442097, 31 Mar 2010, *D. Frohlich & A. Lau 2010033101*.

Species showing signs of naturalization

Aizoaceae

***Aptenia cordifolia* (L. f.) Schwantes**

Aptenia cordifolia, or “Hearts and flowers” as it is commonly called in the nursery trade, is a species frequently used in Hawai‘i as a groundcover, bedding plant, or potted specimen. It is easily grown by rooting tip cuttings and is salt and drought-tolerant. It has recently begun to spread into natural areas in Central and Southern California, overwhelming surrounding vegetation (Cal-IPC 2011). On Kaua‘i, this species was found persisting in a yard waste dumpsite over a lithified dune ecosystem.

Material examined. KAUA‘I: Līhu‘e, Māhā‘ulepū, 21°53'78"N, 159°24'342"W 130 ft. Creeping herb; succulent leaves pale green tinged pink, glaucous below with pinkish midvein; young stems succulent reddish; tepals numerous, cream to pale yellow green, more yellow at base; filament s reddish. In dump over lithified dunes; *Leucaena*, *Prosopis*, *Bontia*, *Sida*, 8 Oct 2002, *T. Flynn & R. Culbertson 7110*.

Apocynaceae

***Allamanda schottii* Pohl**

Allamanda schottii, an ornamental species used frequently in landscaping in Hawai‘i, was found spreading locally on a roadside survey of Kaua‘i. The description of this species from *A tropical garden flora*:

“Shrub 5 to 8 feet high; branchlets glabrous; sap slightly milky and later clear. Leaves in whorls of 3 to 5, petioles 0.1 to 0.25 inches long. blades obovate to narrowly elliptic, 2.6 to 5.25 inches by 0.65 to 1.4 inches, underside shortly pilose on midvein. Flower sepals narrowly elliptic, 0.4 to 0.5 inches by 0.1 to 0.15 inches; corolla narrowly funnel-shaped to more or less cylindrical, 1.5 to 2 inches long, limb to 2.2 inches, yellow, throat inside red-lined, outside streaked lengthwise. Fruit formed but often aborted.” (Staples & Herbst 2005).

Material examined. **KAUAI:** Kapahi. 21°5'21"N, 159°19'9"W. Collected on roadbank. Growing beneath Christmasberry, *haole koa*, and *Bougainvillea*. Vine spreading across roadbank. Yellow bell-shaped flower. Appears to be naturalizing along bank, 25 Oct 2007, C. Trauernicht & M. Clark 222.

Araliaceae

Polyscias filicifolia (C. Moore ex E. Fourn.) L.H. Bailey

Polyscias filicifolia, a cultigen (a plant whose origin is primarily due to intentional human activity) (Spencer & Cross 2007) or series of cultigens that probably originated in Malesia or the western Pacific and is believed to have abortive seeds in Hawai'i, was observed by a local ecologist and gardener popping up from seed near a fence in an urban community garden plot on O'ahu.

Material examined. **O'AHU:** Ala Wai Community Garden, Honolulu. Landscaped urban corridor along path at stream. 1 m tall and 0.5 m wide shrub- not planted. Collector observed plant growing over 2 years. Flowered and grew after recent rain. Jan 2011, P. Clifford *s.n.* (BISH# 747744).

Bromeliaceae

Werauhia gladioliflora (H. Wendl.) J.R. Grant

Both a terrestrial and epiphytic bromeliad in its home range from southern Mexico to French Guiana, *Werauhia gladioliflora* [a name sometimes considered to be a synonym of *Vriesea gladioliflora* (H. Wendl.) Antoine] is able to grow at elevations extending from sea level up to 1300 m. On O'ahu, it has begun to colonize localized areas around a botanical garden.

Material examined. **O'AHU:** Lyon Arboretum, Economic Section H33. UTM 623946, 2359844. In lowland wet/mesic secondary forest. Growing in *Dimocarpus longan* tree, forming dense covering over trunk/branches in more or less dense shade. Epiphyte to about 0.5 m tall; leaves purple on underside, green above; fruiting bracts dried brown on live plants; seeds with silky hairs, many per capsule. Spreading adventively by seed about 30 ft away from planted individuals, 16 April 2010, OED 2010041601.

Moraceae

Ficus pumila L.

Also known as Creeping fig, this species is a very commonly cultivated climbing vine in Hawai'i. It has not previously been documented to spread and become naturalized either by seed dispersal or vegetative means in Hawai'i. Here we document the finding of a 10 × 10 m patch found off trail in mixed native/nonnative mesic forest on O'ahu, in Honouliuli, where it was seen trailing across the ground as well as climbing trees. It is unclear how this plant came to be here, though it is possible it spread here by vegetative means. To our knowledge is the only known plant/population seen outside of cultivation. This species' figs should be monitored for the presence of a pollinating wasp and/or viable seeds.

Material examined. **O'AHU:** Honouliuli Preserve, 'Ēkahanui gulch. UTM 593810, 2372094. Scrambling, climbing vine established in varying densities over about a 10 × 10 m footprint. Established in the area, at a significant distance from a trail, 25 May 2010, K. Kawelo US Army 188.

***Maclura tinctoria* (L.) D. Don ex Steud.**

This species was seen spreading at least adventively in a lowland dry roadside area on O‘ahu, adjacent to both residential and agricultural areas. Its planting status is unclear at the site, and further surveys could possibly reveal that it is part of a naturalized population.

Material examined. O‘AHU: Waimalu, end of Kilinoe St, adjacent to Waimalu Str. 4 to 5 m tall trees with milky sap, both male and female trees present. Thorns variable in size or non-existent. Adventive or perhaps naturalized in the area. Multiple size classes in immediate area, 3 Sep 2010, *D. Frohlich & A. Lau 2010090301*.

Pinaceae***Pinus taeda* L.**

This species has previously been documented as naturalized on Lāna‘i. It was collected on Kaua‘i near where it was planted, where label data suggests it is at least adventive, but may very well have become naturalized. Further surveys or follow up may reveal a naturalized population here. Parker & Parsons (this volume) report this species as naturalized on Hawai‘i Island.

Material examined. KAUA‘I: Nā Pali-Kona Forest Reserve, Mākaha Valley N of Mākaha Ridge Rd and Kokio-ke‘oke‘o picnic area. Planted on ridgetop, becoming naturalized locally. Mixed mesophytic forest with *Acacia koa* dominant, also *Metrosideros*, *Pelea*, *Antidesma*, *Nestegis*, and *Hedyotis*, 15 May 1987, *D. Lorence, T.Flynn & R.DeLappe 5219*.

Solanaceae***Solanum mammosum* L.**

Three individuals of this species were seen in a parking lot area in lowland windward O‘ahu with unclear planting status, though appearing naturalized. This species is rare to occasional in cultivation here, usually found in garden collections rather than as part of a landscape plan for shopping center parking lots.

Material examined. O‘AHU: Kāne‘ohe, shopping center parking lot near Long’s, near Ha‘ikū Rd and Kamehameha Hwy. Lowland semi-landscaped area. Shrub, multistemmed from base, stems more or less brittle. Pruned back, but about 4 ft tall. Fruit immature. Patch of 3 individuals, apparently naturalized, 22 Mar 2010, *D. Frohlich & A. Lau 2010032201*.

Verbenaceae***Clerodendrum myricoides* (Hochst.) Vatke**

This species is occasionally grown in Hawai‘i and was noted in a pasture area on Kaua‘i where several individuals appeared naturalized along a fenceline. This species apparently forms fruit in Hawai‘i (Staples 2005) and is likely dispersed by birds. It is very likely this population represents a sparingly naturalized one, though this status was not clearly stated by the collectors.

Material examined. KAUA‘I: Kōloa Distr, Kalāheo. Collected at pasture edge on Po‘ohiwi Rd. Small, purple, butterfly shaped flowers. Several individuals appeared to be naturalized along pasture fenceline, 15 Oct 2007, *C. Trauernicht & M. Clark 207*.

Vitaceae***Vitis vinifera* L.**

Specimens of this species have been collected on Hawai‘i island which mention adventive status or growing in areas well away from cultivation. A specimen identified as either *V. vinifera* or a hybrid involving that species (as *V. vinifera* vel. *aff.*) was also found growing along a roadside, well away from cultivated settings, in Kōke‘e, Kaua‘i.

Material examined. **KAUAI:** Along Halemanu stream, near Waipo'o Falls trail. Sprawling to 15 ft over top of *Corynocarpus laevigatus* in mixed alien roadside vegetation. Fruits immature, 25 Jun 2010, *D. Frohlich & A. Lau 2010062503*. **HAWAII:** Kona-Ka'u Boundary, adventive at roadside, 25 Jul 1926, *O. Degener 30,255*; Kīlauea Iki trail. A grape-like vine growing near the bottom east side, Kīlauea Iki. 3 Aug 1943, *A.L.M. Mitchell 704*.

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New plant records from the Big Island for 2009

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The Big Island Invasive Species Committee (BIISC) implemented its Early Detection program in May of 2008. Roadside Surveys were conducted on major, secondary, tertiary, and residential roads in the Ka'ū, South Kona, North Kona, South Kohala, and Puna Districts. Here, BIISC Early Detection documents 17 new naturalized records and 14 new island records.

A total of 20 plant families are discussed. Information regarding the formerly known distribution of flowering plants is based on the *Manual of the flowering plants of Hawai'i* (Wagner *et al.* 1999), *A tropical garden flora* (Staples & Herbst 2005) and information subsequently published in the *Records of the Hawaii Biological Survey*. Voucher specimens are deposited at Bishop Museum's *Herbarium Pacificum* (BISH), Honolulu, Hawai'i.

Acanthaceae

Megaskepasma erythrochlamys Lindau **New island record**

First collected as naturalized on O'ahu in 2008 (Frohlich & Lau 2010: 3), this popular ornamental has been seen successfully naturalizing at several locations throughout the dry side of the island. At this location, a large population dominated the understory on both sides of the highway with plants spreading over 100 m above the highway. This species is also reported naturalizing on Kaua'i (Frohlich & Lau this volume).

Material examined. **HAWAII:** South Kona Distr. Hwy 11, mile marker 104, Captain Cook, 2150821N, 197526E. Inflorescence a red spike with white flowers, up to 10 ft tall. Spreading on both sides of highway under avocado and African tulip, 29 Sep 2008, *J. Parker & R. Parsons BIED40*.

Sanchezia parvibracteata Sprague & Hutch. **New naturalized record**

This popular hedge plant is common throughout the island, especially the wet side, and is often seen spreading from cultivation. This specimen was naturalizing in a drainage area off the highway under avocado and African tulip trees. Two *Sanchezia* species are grown in Hawai'i, *S. speciosa* and *S. parvibracteata* (Staples & Herbst 2005). *Sanchezia parvibracteata* differs in having a yellow midvein and joined bracts that are shorter than the calyx.

Material examined. **HAWAII:** South Hilo Distr. Hwy 19, mile marker 6, Pauka'a. Red spikes with yellow flowers and prominent pale yellow midvein, 10 Nov 2008, *J. Parker & R. Parsons BIED47*.

Apocynaceae

Nerium oleander L. **New naturalized record**

This plant was found naturalizing between Pāhala and Nā'ālehu on Ka'alāiki Rd in the Ka'ū Distr. This 9-ft tall, single specimen was growing on a hillside overgrown with tall Guinea grass. This species is popular in highway plantings (Staples & Herbst 2005) but that does not explain how this plant arrived as it was around 20 m off of a rural road that would not warrant highway plantings. Since identification, this specimen has been removed by an unknown entity. This is the only time this species was seen so obviously naturalized.

Material examined. **HAWAII:** Ka'ū Distr. Ka'alāiki Rd, 2110174N, 228036E. Growing uphill 20 m off of road. There were no homes or other oleanders in the area; this specimen was 3 m tall with pink flowers, 18 Aug 2008, *J. Parker & R. McGuire BIED23.*

***Stemmadenia litoralis* (Kunth) L. Allorge** **New naturalized record**

This popular ornamental shade and street tree is rarely seen spreading from cultivation on the island. However, this large population was dominated by a 10-m tall heavily fruiting tree with around 50 saplings growing underneath the canopy, many of them flowering and fruiting. This spread is unlikely to be attributed to root suckers as saplings were spreading a short way downhill into a coffee plantation. Only in a few other locations in the Kona districts was this success observed. Most other trees occurred in well-groomed properties, where seedling growth is most likely discouraged. This species is also reported naturalizing on O'ahu (Frohlich & Lau this volume).

Material examined. **HAWAII:** South Kona Distr. St. John's Rd, Kealakekua, 2159078N, 194079E. Heavily flowering 10m tall tree near coffee farm, with over 50 seedlings and saplings surrounding, many saplings going to fruit. White, fragrant flowers with milky latex; bright orange follicles. Ants seen visiting flowers and possibly building nests on leaves, 20 Aug 2008, *J. Parker & R. McGuire BIED27.*

Araliaceae

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

This plant is popular in cultivation in all areas of the island and large, dense hedges are frequently seen flowering and fruiting. This specimen was seen growing epiphytically in the crotch of an 'ōhi'a tree near Glenwood, representing the first naturalized specimen of this species on the Big Island. Large, heavily fruiting populations have been observed in the Kohala Mountains near Hāwī. This species has previously been recorded as naturalized on O'ahu and Maui (Frohlich & Lau 2010: 4; Starr *et al.* 2003: 24), and on Kaua'i (Frohlich & Lau this volume).

Material examined. **HAWAII:** Puna Distr. Eden Roc subdivision, 2153406N, 280313E. Flowering specimen rooted halfway up an 'ōhi'a tree 5 ft off the ground, roots extending down the trunk to ground, possibly strangling 'ōhi'a, 1 Dec 2008, *J. Parker & R. Parsons BIED51.*

***Tetrapanax papyrifer* (Hook.) K. Koch** **New naturalized record**

Rice-paper plant is widely grown in warm-temperate and tropical montane regions and sparingly naturalized elsewhere. This clump-forming, evergreen shrub may reach 20' in height; each erect stem arises from the underground rhizome and possesses a terminal cluster of palmately 5–11-lobed, softly textured leaves with dull green upper sides and whitish-hairy undersides (Staples & Herbst 2005). Seen here naturalizing in a high elevation site in North Kona. Many seedlings were found along roadside apparently spreading from several large, flowering and fruiting cultivated plants. This species also successfully naturalizes at sea level, as in Ke'anae, Maui (Starr: *Plants of Hawaii* photos/correspondence). This species is also reported naturalizing on O'ahu (Lau & Frohlich this volume).

Material examined. **HAWAII:** North Kona Distr. Kaloko Mauka, 2182287N, 190707E. Large-leaved tree found naturalized near cultivated specimens, many *keiki* along roadside, none flowering, 23 Mar 2009, *J. Parker & R. Parsons BIED80.*

Asclepiadaceae

***Calotropis procera* (Aiton) W.T. Aiton** **New island record**

Small crownflower differs from its more abundant relative *C. gigantea* in being a smaller shrub (up to 8 ft tall), having smaller flowers and larger fruit. It also readily sets fruit, and

with its seeds easily dispersed by their silky parachutes, this species has the potential to become a noxious weed in Hawai'i, as it has elsewhere (Staples & Herbst 2005). Previously reported from Lehua, Kaua'i, and Lāna'i (Wood & LeGrande 2006: 19; Wood 2006: 15; Oppenheimer 2008: 23), and reported from East Maui, West Maui, and Kaho'olawe (Starr & Starr this volume), this species readily naturalizes on the dry side of the Big Island and its use for landscape plantings should be discouraged. It also has been suggested as a possible hydrocarbon source for biofuels (Mabberley 2008).

Material examined. **HAWAII:** North Kona Distr. Kona Acres subdivision, 2182317N, 185805E. Flowering specimen around 4 ft tall found growing in vacant lot. Flowers with white corolla, purple center, 12 Aug 2009, *J. Parker & R. Parsons, J. Franklin BIED97.*

***Cryptostegia madagascariensis* Bojer ex Decne. New island record**

Previously reported from O'ahu and Moloka'i (Frohlich & Lau 2008: 3; Staples *et al.* 2006: 6), on the Big Island this plant was first found naturalizing between Pāhala and Nā'ālehu on Highway 11 in the Ka'ū District. It is cultivated throughout the dry side of the island and sparingly naturalized from Ho'okena Beach to Kawaihae. This species is being recommended for control and some control efforts have already taken place in Kekaha Kai State Park and around Kailua-Kona.

Material examined. **HAWAII:** Ka'ū Distr. Hwy 11, near Whittington's Beach Park, 2112776N, 231810E. Found overgrown on rusty, abandoned building on the *mauka* side of the highway. Milky, free-flowing latex; pink-purple flower, 5 Aug 2008, *J. Parker & R. McGuire BIED21.*

***Stapelia gigantea* N.E. Br.**

New island record

Seldom cultivated on the island of Hawai'i, this plant is well suited to the dry climate of the Kona side and has been observed naturalizing a handful of times. The wind-dispersed seeds and ease of vegetative spread make *S. gigantea* a potentially invasive weed (Staples & Herbst 2005). The species was previously reported as naturalized on O'ahu, Moloka'i, West Maui, and East Maui (Wagner *et al.* 1999: 241; Wysong *et al.* 2007: 2; Oppenheimer *et al.* 1999: 7; Oppenheimer 2010: 33).

Material examined. **HAWAII:** North Kona Distr. Sea View Estates, 2171084N, 188894E. Large population on corner of vacant lot. Stems 6-12in high, large flowers smelling of carrion with maggots inside, 16 Jun 2009, *J. Parker & R. Parsons BIED84.*

Asteraceae

***Pseudogynoxys chenopodioides* (Kunth) Cabrera New naturalized record**

Mexican flame vine has long been known as *Senecio confusus* in the horticultural literature, even though the name *P. chenopodioides* has been applied to this species since 1950 (Staples & Herbst 2005). With its orange to red ray flowers, this attractive vine often escapes cultivation and spreads extensively over all vegetation, thriving in full sun and dry climates. This specimen was growing in a hedge of *Thevetia peruviana*. On our surveys this plant was seen naturalized more often than cultivated.

Material examined. **HAWAII:** North Kona Distr. Kaloko Mauka, 2180451N 188663E. Orange-red ray flowers with yellow-orange disc flowers 6cm in diameter. Climber with semi-woody stems, 4 Feb 2009, *J. Parker & R. Parsons BIED71.*

Bignoniaceae

***Podranea ricasoliana* (Tanfani) Sprague**

New island record

Pink trumpet vine has been previously recorded as naturalized on Maui (Starr *et al.* 2004: 21). This species is reported as naturalizing on Kaua'i (Frohlich & Lau this volume). On the Big Island, this species is not common in cultivation but is naturalized throughout many parts of the island.

Material examined. **HAWAII:** Hāmākua Distr. Mānienie Gulch Rd, Paʻauilo. Pink-flowered vine growing in gulch over *Eriobotrya japonica*, 7 Nov 2008, *J. Parker & R. Parsons BIED46*.

Boraginaceae

***Cordia lutea* Lam.**

New island record

The yellow-flowered Geiger tree is not well known from the Hawaiian Islands but reportedly grows in the living collections at the Koko Crater Botanical Garden on Oʻahu and the National Tropical Botanical Garden on Kauaʻi (C. Imada, pers. comm.). On the Big Island, this shrub was found naturalizing in a new subdivision on a hill in lava rock substrate. This species has only been observed once in our surveys and was found heavily fruiting and naturalizing downslope from a planting. This species is likely to gain in popularity with its ever-blooming habit and sandpapery leaves.

Material examined. **HAWAII:** North Kona Distr. Hualālai Rd, 2173109N 189218E. Shrub with yellow flowers and scabrous leaves. Fruit a white, fleshy drupe. Growing on a rocky hillside, 27 May 2009, *J. Parker & R. Parsons BIED82*.

Combretaceae

***Conocarpus erectus* L.**

New island record

Button mangrove is very popular as a street and shade tree on the island, but we rarely see it naturalizing in cultivation as male trees are preferred in large plantings because they generate less litter than female trees (Staples & Herbst 2005). This specimen was brought to our attention by J.B. Friday and his son Nathan Friday who collected it on a shoreline in Keaukaha. The plant was a resprout from a large stump and had no flowers or fruit, but it was positively identified by Bishop Museum. This is the first record of this species naturalizing on the island. It was previously known from Kauaʻi (Lorence & Flynn 1997: 10), Oʻahu, Lānaʻi, and Maui (Wagner *et al.* 1999: 547).

Material examined. **HAWAII:** South Hilo Distr. 4 mile beach, Keaukaha. Located adjacent to shoreline. No fruit or flowers. Growing next to *Casuarina* trees. Collection is a resprout, 1.5 m tall, from a trunk 8 cm in dia, 5 Jul 2009, *N. Friday BIED92*.

***Terminalia melanocarpa* F. Muell.**

New naturalized record

This large flowering tree was found growing with two younger flowering trees adjacent to an overgrown macadamia nut orchard. Also suitable for coastal gardens exposed to salt spray and trade winds (Staples & Herbst 2005), this tree was found thriving at ca 900 ft.

Material examined. **HAWAII:** North Kona Distr. Makalani subdivision off Walua Rd, 2169211N, 190358E. Flowering tree on edge of macadamia nut orchard, approximately 20 ft tall. Large, spreading crown. Leaves with entire margins, no smell, no sap, 19 May 2009, *J. Parker & R. Parsons BIED81*.

Convolvulaceae

***Poranopsis paniculata* (Roxb.) Roberty**

New island record

Bridal veil creeper is rarely cultivated on the island of Hawaiʻi, but several naturalized populations have been found. This species has been previously recorded as naturalized from Maui (Starr *et al.* 2004: 21). It has been noted that fruit is not produced in Hawaiʻi (Staples & Herbst 2005), but further study into this is warranted based primarily on the large scale of these localized infestations.

Material examined. **HAWAII:** South Kona Distr. Hwy 11, Kealakekua, 2146988N, 197626E. White-flowered vine with heart-shaped leaves with silky, pale-white undersides. Large population covering approx. 3 acres. Could have spread from cultivation at abandoned homesite, 23 Sep 2008, *J. Parker & R. Parsons BIED36*.

Euphorbiaceae***Euphorbia tirucalli* L.****New island record**

Previously documented as naturalized on Kaua'i (Lorence *et al.* 1995: 35), pencil tree is widely cultivated in Hawai'i and this specimen represents a new island record. This dense flowering population is located right off of Ali'i Dr just south of Kailua and represents a hazard to pedestrians. Due to the ease of vegetative spread and poisonous nature of this plant, its use as a landscape tree should be discouraged.

Material examined. HAWAII: North Kona Distr. Ali'i Dr, 2168362N, 188405E. Large, flowering population with trunks up to 10 in dia and 15–20 ft tall trees. Milky latex abundant, 17 Jun 2009, J. Parker & R. Parsons, J. Franklin BIED86.

Jatropha curcas* L.*New island record**

Physic nut has a long history of naturalizing in tropical regions and has already been documented as naturalized on Maui (Wagner *et al.* 1999: 623). Its use as a biofuel is being heavily promoted by private and government entities. This specimen was located within a large naturalized population in scrubland dominated by *Leucaena leucocephala*.

Material examined. HAWAII: North Kona Distr. Queen Ka'ahumanu Hwy, near mile marker 121, Kailua, 2173695N 187698E. Many naturalized shrubs up to 13ft tall. Sap sticky, clear-white, cloudy. Fruits globose, green, 1in diameter, 6 Aug 2009, J. Parker & R. Parsons BIED94.

Jatropha multifida* L.*New naturalized record**

Coral plant is sparingly cultivated throughout the island and was observed naturalizing at only one location in our surveys. This small population of seedlings was growing in the proximity of a larger stump with suckering *J. multifida* sprouts. The seedlings were sufficiently spread out so as to suggest they sprouted from seed rather than suckering from roots.

Material examined. HAWAII: North Kona Distr. Kealakehe, 2178897N, 187119E. Naturalized specimen found growing near large stump of possibly cultivated tree with many other *keiki*. No flowering specimens but clearly naturalizing, 6 Aug 2009, J. Parker & R. Parsons BIED96.

Jatropha podagrica* Hook.*New naturalized record**

Gout stalk is a commonly cultivated caudiciform and has been observed spreading from cultivation more often than not. This population of mature plants was growing in vacant land of poor, degraded rocky substrate across the street from cultivated specimens. This species is most often seen laden with fruit and it is recommended that the seeds be collected prior to maturation due to its seed viability and effective seed dispersal. A diplochorous dispersal system, in which autochory (ballistic discharge of seeds from explosively dehiscent capsules) is followed by myrmecochory (transport by ants), is a common feature in many euphorbs, particularly among Neotropical species (Leal, Wirth *et al.* 2007).

Material examined. HAWAII: North Kona Dist. Kona Heights, 2174279N, 187933E. Several plants growing in vacant lot in subdivision. Collection with fruit and flowers, 27 May 2009, J. Parker & R. Parsons BIED83.

Phyllanthus acidus* (L.) Skeels*New naturalized record**

This small fruiting tree is often cultivated by Filipinos and Southeast Asians, who use the tart fruit in cooking (Staples & Herbst 2005). This specimen was found on the roadside in an area unlikely to be planted. After speaking with the neighbors, it was confirmed that this tree spread from a larger planting in a private property across the street. The tree was around 15 ft tall and heavily fruiting.

Material examined. **HAWAI'I:** South Kona Distr. Hwy 11 and Onouli Rd, Kealakekua, 2159435N, 193467E. Compound, alternate leaflets with pale yellow, 6–8 ridged berries growing from main stems and trunk. Tree was 20 ft tall, in between road and fence on easement, 22 Oct 2008, *J. Parker & R. Parsons BIED44.*

Fabaceae

Derris elliptica (Wall.) Benth.

New naturalized record

Poison-vine is infrequently cultivated and sparingly naturalized on the dry side of the island (much more frequent in the vicinity of Hilo). Perhaps cultivated for its use in supplying the compound rotenone, which acts as insecticide or fish poison, poison-vine tends to become naturalized wherever it is planted (Staples & Herbst 2005). This specimen was growing in an abandoned property over tall mango and jackfruit trees flowering heavily in February and March. No fruit was found though the population was visited numerous times.

Material examined. **HAWAI'I:** South Kona Distr. Hwy 11, mile marker 108, 2155655N, 196581E. Thick liana with compound leaves and leafless shoots 1–2 m long. Climbing over coffee and avocado trees. Inflorescence of large purple pea-like flowers. Fuzzy golden-brown hairs over buds and keel of flowers, 20 Oct 2008, *J. Parker & R. Parsons BIED42.*

Grossulariaceae

Escallonia rubra (Ruiz & Pav.) Pers.

var. *macrantha* (Hook. & Arn.) Reiche

New naturalized record

This species is a 4–10 ft tall shrub with hairy, glandular shoots and inflorescence axes; broadly elliptic to obovate leaves 1–3 in long and up to 1.75 in wide, the margins serrate, the upper side glossy green, the underside gland-dotted; and racemes or panicles of bright rose red flowers 0.63" dia (Staples & Herbst 2005). A good indicator for this species is the persistent style. *Escallonia* is a garden escapee in New Zealand and is known to successfully colonize coastal cliffs (C. Buddenhagen, pers. comm.). In Hawai'i, *escallonias* thrive only at elevations above 2500 ft (Staples & Herbst 2005). References indicate that hummingbirds are its primary pollinator. Therefore, seed set in cultivation may be limited unless our native and/or introduced birds are visiting and pollinating it (C. Chimera, pers. comm.).

Material examined. **HAWAI'I:** Puna Distr. Road A, Volcano Village, 2152012N, 265559E. Sprawling, stiff-serrate leaf shrub covering shrubs and trees up to 20 ft. Climbing on top of *uluhe* fern in vacant lot. Pink flower with persistent style, 17 Dec 2008, *J. Parker & R. Parsons BIED64.*

Lythraceae

Cuphea subuligera Kochne

New naturalized record

This represents the fourth species of *Cuphea* naturalized in the Hawaiian Islands. This species is rare in cultivation and sparingly naturalized in the Volcano area. Its tubular, pale purple flowers are borne on terminal racemes and its leaves have a purple midvein extending most of the way through the leaf.

Material examined. **HAWAI'I:** Puna District. Jungle King Rd, Fern Forest subdivision, 2153217N, 279751E. Tubular, pale purple flower borne on terminal racemes. Purple midvein extending most of the way through leaf, juvenile leaves have hairs on margins, 10 Dec 2008, *J. Parker & R. Parsons BIED59.*

Papaveraceae

Hunnemania fumariifolia Sweet

New island record

Previously recorded as naturalized only on Maui (Wagner *et al.* 1999: 1007), this naturalized population was colonizing a disturbed roadside area in the dry southern portion of the island near Manukā State Park.

Material examined. **HAWAII:** South Kona Distr. Southbound road near Manukā State Park, 2121915N, 198762E. Growing on both sides of the road near Macadamia nut orchard in rocky substrate, 19 Oct 2009, *J. Parker & R. Parsons BIED100.*

Rosaceae

Rosa laevigata Michx.

New island record

Cherokee rose is a rampant climber with canes many yards in length, bearing stout, hooked prickles and leaves with 3 leaflets and sharp-serrate margins (Staples & Herbst 2005). Previously recorded as naturalized on Lānaʻi (Nagata 1995: 12), this population was one of several naturalizing in the Glenwood/Volcano area, climbing over *uluhe* and ʻōhiʻa trees.

Material examined. **HAWAII:** Puna Distr. Fern Forest subdivision, 2154739N, 275399E. Thick vine, armed with recurved spines, bearing fragrant white flowers with bristly hypanthium. Spreading ca 20 m off of Captain's Dr over *uluhe* and ʻōhiʻa trees, 10 Dec 2008, *J. Parker & R. Parsons BIED58.*

Sapindaceae

Majidea zanquebarica J. Kirk ex Oliv.

New naturalized record

Mgambo, or velvet-seed, is a small, fast-growing tree that is cultivated sparingly on the Big Island for its attractive black, velvety seeds. This specimen was naturalizing in the Kealakehe area, near Kailua-Kona. Several seedlings and saplings, many flowering, were sprouting up near a large, fruiting cultivated tree.

Material examined. **HAWAII:** North Kona Distr. Kealakehe, 2178898N, 187120E. Naturalized specimen found growing near large cultivated tree with many other *keiki* across a fence. This flowering specimen was approximately 4 ft tall, 6 Aug 2009, *J. Parker & R. Parsons BIED95.*

Scrophulariaceae

Otacanthus azureus (Linden) Ronse

New naturalized record

This attractive groundcover, Amazon blue, is popular in the Volcano vicinity, and has become naturalized in the Puna District. With its rapid growth, tiny seeds, and ease of vegetative propagation, we expect this species to successfully colonize the ample suitable habitat in the district.

Material examined. **HAWAII:** Puna Distr. Eden Roc subdivision, 2157595N, 279148E. Blue-purple flower, across road from cultivated specimen, 4 Dec 2008, *J. Parker & R. Parsons BIED51.*

Paulownia tomentosa (Thunb.) Steud.

New naturalized record

This well-known invasive tree is sometimes grown for its lightweight timber in the Hawaiian Islands. Plantations of *Paulownia* have been observed on the north shores of Oʻahu and Kauaʻi, though it is not known exactly which species was being grown (A. Lau, pers. comm.). Similar plantings have not been observed on the Big Island, and this specimen was the first and only time this tree was observed on our surveys. It has since been removed with approval by the landowner.

Material examined. **HAWAII:** South Kohala Distr. Mānā Rd, Kamuela, 2215918N, 225864E. Observed 10 trees naturalizing in open pasture. Landowner planted 3 trees years ago. Whitish-purple flower with purple dots inside and large fruit with many windborne seeds, 1 Dec 2009, *J. Parker & R. Parsons BIED107.*

Solanaceae

Streptosolen jamesonii (Benth.) Miers

New island record

Marmalade bush is sparingly cultivated in the Volcano area and was recently found naturalizing there. This species has previously been documented as naturalized on Kauaʻi (Lorence & Flynn 1997:12).

Material examined. **HAWAI'I:** Puna Distr. Royal Hawaiian Estates, 2150530N, 269948E. Yellow, orange and red flowers. Found across road from cultivated specimen, 29 Jan 2009, *J. Parker & R. Parsons BIED69*.

Urticaceae

Boehmeria nivea (L.) Gaudich.

New naturalized record

This species is the source of the stem fiber called ramie, used in clothing and other fabrics. Ramie was attempted in Hawai'i as a commercial crop, but it proved to be economically unfeasible (Staples & Herbst 2005). A couple of populations in the same area in North Kona were found naturalizing between coffee plantations. Though the plant has economic uses, these populations did not appear to be part of any formal planting.

Material examined. **HAWAI'I:** North Kona Distr. Hōlualoa Rd, 2168619N, 190970E. Scalloped margins, white undersides. Growing near coffee farm, 20–30 m off road. Fruits numerous small balls with many brown seeds, 2 Mar 2009, *J. Parker & R. Parsons BIED78*.

Vitaceae

Cissus rotundifolia (Forssk.) Vahl

New island record

Previously reported as naturalized on Kaua'i, O'ahu, and East Maui (Lorence & Flynn 1997: 12; Herbst 1998: 4; Starr *et al.* 2002: 26), this *Cissus* is ideally suited to the dry, sun-drenched leeward sides of our islands (Staples & Herbst 2005). This large population was climbing over *Leucaena leucocephala* in a dry, disturbed vacant lot in Kailua-Kona. The bird-dispersed seeds could easily be spread to the ample suitable habitat in the region.

Material examined. **HAWAI'I:** North Kona Distr. He'enalua Dr off Ali'i Dr, 2170735N, 187896E. Succulent vine with serrated margins. Inflorescence an umbel with green, fleshy fruit, 25 Jun 2009, *J. Parker & R. Parsons BIED89*.

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New Plant Records from the Big Island for 2010–2011

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The Big Island Invasive Species Committee (BIISC) implemented its Early Detection program in May of 2008. Roadside Surveys were conducted on major, secondary, tertiary, and residential roads in the Puna, South Hilo, North Hilo, Hāmākua, and North Kohala Districts. Here, BIISC Early Detection documents 1 new state record, 11 new naturalized records, 1 potential naturalization, and 17 new island records.

Plants from 16 plant families are discussed. Information regarding the formerly known distribution of flowering plants is based on the *Manual of the flowering plants of Hawai'i* (Wagner *et al.* 1999), *A tropical garden flora* (Staples & Herbst 2005) and information subsequently published in the *Records of the Hawaii Biological Survey*. Voucher specimens are deposited at Bishop Museum's *Herbarium Pacificum* (BISH), Honolulu.

Acanthaceae

Justicia carnea Lindl.

New island record

This popular ornamental from Brazil has previously been collected as naturalized from Maui (Oppenheimer 2004: 8). This collection was from the Mountain View area at an elevation of 1600 ft. Naturalized populations of this plant have also been observed in the North Kohala district near Kapa'au.

Material examined. HAWAII: Puna Distr. Hwy 11, Mountain View, 2162719N, 278357E. 6 ft tall shrub found on roadside with large simple leaves with purple undersides and bright pink inflorescence, 11 Oct 2010, J. Parker & R. Parsons BIED143.

Sanchezia speciosa Leonard

New island record

This commonly cultivated hedge plant has been seen naturalizing in a few locations around the island. It has previously been recorded as naturalized from Kaua'i (Lorence *et al.* 1995: 20).

Material examined. HAWAII: North Hilo Distr. Laupāhoehoe Point, 2211916N, 265217E. Growing on disturbed roadside in large thicket, 24 Aug 2010, J. Parker & R. Parsons BIED134.

Apocynaceae

Beaumontia multiflora Teijsm. & Binn.

Potential naturalization

Easter-lily vine, native to Malaysia, Sumatra, Java, and Bali, is a large climber with 20 ft long stems and heavy foliage, which requires a spacious garden and sunny, well-watered location; "... in the wild, it produces paired, cucumber shaped pods containing 100–250 wind-dispersed seeds ... but does not set fruit or seed in Hawai'i" (Staples & Herbst 2005). No fruit was observed at this location but the Early Detection team will continue to monitor this population for seed set.

Material examined. HAWAII: North Kohala Distr. Akoni Pule Hwy, 2238538N, 210823E. Vine with large leaves and milky latex climbing 30 ft high over avocado, banyan, and mango trees. Large, white, showy flower with sweet, spicy fragrance, petals fused with pink-white calyx, 9 Feb 2010, J. Parker & R. Parsons BIED110.

Arecaceae***Arenga pinnata*** (Wurmb) Merr.**New naturalized record**

Sugar palm is a popular ornamental in the Hawaiian Islands and in its home range the male spadices are tapped for their sugary syrup which is made into a palm wine upon distillation (Mabberley 2008). This species has spread from 100+ year-old plantings in the Bond Historic Distr into the lower section of Waianaia Gulch, where mature flowering and fruiting trees were observed with many saplings. Naturalized specimens of this plant have been collected on O'ahu (Daehler & Baker 2006: 5).

Material examined. **HAWAII:** North Kohala Distr. Bond Historic Distr, Waianaia Gulch, 2236772N, 207675E. Large palm with fronds up to 9 m found in gulch in 'Iole *ahupua'a*. Large, flowering and fruiting population with black hairs and long spines on trunks, 6 Apr 2010, *J. Parker & R. Parsons BIED115*.

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

This palm, native to Java and Sumatra, is popular in cultivation for its distinct inflorescence. It was previously collected as naturalized from the area around Lyon Arboretum on O'ahu (Daehler & Baker 2006: 5). A dense fruiting population was observed on a hillside in O'ōkala Gulch.

Material examined. **HAWAII:** North Hilo Distr. O'ōkala Gulch, 2214514N, 260809E. Tall clumping palms naturalizing on hillside of deep gulch. Flowers white, fruits white turning black at maturity, stems of inflorescence bright red, 31 Aug 2010, *J. Parker & R. Parsons BIED136*.

Bignoniaceae***Tabebuia heterophylla*** (DC.) Britton**New island record**

Pink trumpet tree is widely cultivated around the island and has previously been recorded as naturalized from Maui and O'ahu (Oppenheimer 2003: 8; 2004: 10). At this location, there are numerous, mature, naturalized trees spread around Kīlau Gulch.

Material examined. **HAWAII:** North Hilo Distr. Hwy 19, Laupāhoehoe, 2211534N 265485E. Pink-flowered trees naturalizing in Kīlau Gulch near cultivated specimens. Flowers visited by bees, 23 Sep 2010, *J. Parker & R. Parsons BIED139*.

Cactaceae***Pereskia aculeata*** Mill.**New naturalized record**

Barbados gooseberry is a leafy cactus with a vining habit that is native to the Caribbean and South America. Popular in botanical gardens as a specimen planting of a primitive cactus. It is also cultivated for its edible fruit and use as a living fence for cattle in South Africa. It was declared a noxious weed in South Africa in 1979 (Morton, 1987) and is capable of invading intact native forest there (I. Paterson, pers. comm.). An apparently naturalizing sterile specimen strongly resembling *Pereskia aculeata* was collected from Hālawā Valley on Moloka'i (*T. Lau s.n.*, 28 Sep 2001, BISH #683117). A fertile specimen needs to be collected from that population to confirm its identity. *P. aculeata* is described as a shrub or vine, clambering, 3–10 m. Stems to 3 cm dia, spiny; areoles to 15 mm dia, largest on basal portion of stem. Leaves lanceolate to ovate or oblong, 4.5–11.0 × 1.5–5.0 cm. Spines of 2 kinds; primary spines 2 per areole, recurved, clawlike, 4–8mm long; secondary spines to 25 per older areole, straight, 10–35 mm long. Flowers to 70 in terminal or lateral inflorescences, fragrant, 3.0 × 2.5–5.0 cm; pedicels 5–15 mm long; tepals perigynous; scales and areoles on prominent to inconspicuous tubercles; perianth whitish to light pink. Fruits yellow to orange, spheric, not angled, 40 × 15–25 mm, never proliferating. Seeds lenticular, 4.5–5.0 mm dia, glossy (Hawkes 2003). This species was recommended for control to the BIISC plant crew, and initial control has begun.

Material examined. **HAWAII:** North Kohala Distr. Akoni Pule Hwy, Hawi, 2240213N, 205473E. Two small populations of vining cactus near elementary school. Stipular, paired, recurved thorns with fleshy leaves lacking venation. Flowers and fruit observed, 2 Feb 2010, *J. Parker & R. Parsons BIED109*;

Elaeocarpaceae

Elaeocarpus angustifolius Blume

New island record

Blue-marble tree ranges widely from India throughout Southeast Asia, Indonesia, and Melanesia to tropical Australia. The species often grows along riverbanks or in seasonally flooded watercourses in the wild (Staples & Herbst 2005). It was previously collected as naturalized from the area around Lyon Arboretum on O‘ahu (Daehler & Baker 2006: 7).

Material examined. **HAWAII:** North Kohala Distr. Bond Historic Distr, Waianaia Gulch, 2238675N, 208575E. Extensive population of tall, stately trees with hundreds of seeds and saplings throughout gulch on riverbanks and growing directly out of the water, 30 Mar 2010, *J. Parker & R. Parsons BIED113*.

Euphorbiaceae

Breynia disticha J.R. Forst. & G. Forst.

New island record

This species is very popular in cultivation and has been found naturalizing near old homesites in Pololū Valley. It has previously been collected as naturalized from Maui (Lorence *et al.* 1995: 35).

Material examined. **HAWAII:** North Kohala Distr. Pololū Valley, 2236127N, 214288E. Large, naturalized population with small green axillary flowers, 27 Apr 2010, *J. Parker & R. Parsons BIED119*.

Phyllanthus reticulatus Poir.

New naturalized record

This species has a large native range from Tropical and South Africa to India, China, SE Asia, Indonesia, and Malesia. It is described as usually a much-branched semi-scandent shrub, rarely a small tree. Leaves ovate-oblong to elliptic, produced on short lateral branchlets, giving the impression of compound leaves. Flowers in clusters on short axillary branchlets, small, yellowish, sexes separate on the same plant, flowering before or with the new leaves. The flowering shoots and pedicels are covered in short, velvety hairs. Fruit berry-like, blackish when ripe (Pickering & Roe 2009). The plants in Nīnole were thorny to the touch, most likely due to the stipules which become hard-spiny when dry and brown (Li & Gilbert 2008). The flowers emit a distinct smell that has been described as mashed potatoes in Africa, but likened more to soy sauce by people living near the Nīnole population, and may be responsible for the local legend that a Shoyu delivery truck crashed on the sharp turn near the population.

Material examined. **HAWAII:** North Hilo Distr. South of Maulua Gulch, Nīnole, 2207931N, 270676E. Large population of thorny sprawling shrubs with small, pink, drooping flowers, 23 Sep 2010, *J. Parker & R. Parsons BIED141*; Maulua Gulch, Nīnole. A shrub about 6 ft high, leafy branches in 1 plane. It could be an escape from cultivation, No date, *A. Kawasaki s.n.* (BISH #50402).

Fabaceae

Acacia mangium Willd.

New island record

Native to Queensland, Australia, the Molucca islands and Papua New Guinea, *A. mangium* has been planted around the island for hardwood and biomass potential. Now spreading in ‘Uma‘uma, Pepe‘ekeo, Hawaiian Paradise Park, Hawaiian Acres, and Hawaiian Beaches subdivisions. It has previously been collected as naturalized on O‘ahu (Frohlich & Lau

2008:6). This species is reported as naturalizing on Kaua'i (Frohlich & Lau this volume).

Material examined. **HAWAII:** North Hilo Distr. Uma'uma, 2201741N 273807E. Naturalized trees in eucalyptus grove mauka Hwy 19 and spreading downhill along Kama'e'e Homesteads Rd, 13 Sep 2010, *J. Parker & R. Parsons BIED137*.

Calliandra houstoniana (Mill.) Standl.

var. *calothyrsa* (Meisn.) Barneby

New island record

Planted around the island as forage and firewood, this species has been seen spreading from cultivation frequently, and this collection was from grazed pastureland alongside *Gliricidia sepium*. Previously collected as naturalized from Lāna'i and Maui (Imada *et al.* 2008: 13; Starr *et al.* 2010: 64). This species is reported as naturalizing on Kaua'i (Frohlich & Lau this volume).

Material examined. **HAWAII:** Hāmākua Distr. Pa'auilo Makai, 2219437N, 249863E. Large shrubs with bipinnately compound leaves with red, terminal inflorescences, and numerous dry seed-pods which split open when mature, 14 Jun 2010, *J. Parker & R. Parsons BIED125*.

Enterolobium cyclocarpum (Jacq.) Griseb.

New naturalized record

Earpod tree is native to Central America and Northern South America and is described by Wagner as often cultivated and may be adventive (Wagner *et al.* 1999: 630). Seedlings observed on roadside and large trees naturalized in gulch probably spread from the small planting in O'ōkala town near the old cane overpass. The species is described as a large-trunked tree <25 m tall with widely spreading branches. Petioles 2–6 cm long, usually with sessile gland below the middle; pinnae 4–15 pairs, leaflets 20–30 pairs, linear-oblong, 8–15 mm long, apex acute, paler beneath. Inflorescence axillary, peduncle 1.5–4.0 cm long, heads many-flowered; calyx puberulent, 2.5 mm long; corolla tube glabrate to puberulent, <5 mm long, teeth ciliate; staminal tube included, filaments white. Legume compressed, 3–4 cm wide, curved into a nearly complete circle 8–10 cm dia, shiny, seeds ellipsoidal, flat, with conspicuous pleurogram (Howard 1988: 357). Growth of naturalized trees in O'ōkala resembling *Falcataria moluccana* in stature and trunk.

Material examined. **HAWAII:** North Hilo Distr. O'ōkala Gulch, 2214377N, 260854E. Large trees over 100 ft tall spreading from planting into gulch with seeds sprouting on side of road. White, mimosoid flowers and ear-shaped, fleshy, brown pods, 28 Jun 2010, *J. Parker & R. Parsons BIED128*.

Erythrina crista-galli L.

New naturalized record

The cock's spur coral tree, native to South America is planted widely around the island and was found naturalizing in a dry gulch in North Kohala. It is described as an evergreen tree 20–30 ft tall; bark thick, corky, branches with stout spines. Leaf petiole to 8 in long, often spiny; leaflets 3, ovate-oblong to broadly elliptic, leathery, glabrous. Inflorescence appearing with leaves, in terminal drooping racemes to 2 ft long, or axillary clusters of 2 or 3. Flower calyx bell-shaped, to 0.8 in long, entire; corolla upper petal (standard) reflexed, elliptic to broadly elliptic, crimson to blood red, base darker; wings and keel darker red, to 2 in long. Fruit cylindrical, curved, 3–8 in long, seeds 0.63 in long, dark brown (Staples & Herbst 2005). This species is reported as naturalizing on O'ahu (Frohlich & Lau this volume).

Material examined. **HAWAII:** North Kohala Distr. Kohala Ranch subdivision, 2223688N, 204750E. Naturalized population in dry gulch near grazed land. Fruits dark brown, 10 cm pod. Flowers red, numerous. Stems thorny, 19 Jan 2011, *J. Parker & R. Parsons BIED149*.

Flemingia macrophylla (Willd.) Merr.**New naturalized record**

Flemingia macrophylla is native to tropical and subtropical Asia and Indonesia. It is described as a perennial, deep-rooting, leafy shrub, up to 3 m high. Growth habit ranges from prostrate to erect with numerous stems arising from the base. Leaves digitately trifoliolate, leaflets elliptic-lanceolate and 5–15 cm long, 2–8 cm wide, silky or hairless, papery when old. Inflorescences mostly axillary, in dense racemes, 5–30 cm long, with 15–40 papilionoid flowers. Calyx densely silky, 6–13 mm long with 5 lanceolate lobes; greenish standard with distinct red blotches or stripes and purple apex. Pods oblong, 11–15 mm long, 5–7 mm wide, dark brown and slightly silky, dehiscent, 2-seeded. Seeds globular, mottled brown or shiny black, 2–3 mm dia (Verdcourt 1979). Found naturalizing near agricultural land, it most likely spread from a planting for some agricultural use, such as a cover crop for nitrogen-enrichment. It has also been seen naturalizing in a vacant lot in Hakalau, and cultivated at a botanical garden in ‘Uma‘uma, but it is unknown how frequently this plant is cultivated.

Material examined. **HAWAII:** North Hilo District. Nīnole, 2207000N, 270347E. 8ft tall herbaceous shrub with winged petioles and spikes of pink leguminous flowers. Fruit an inflated pod that pops open at maturity. Found growing on upper edge of gulch, 30 Aug 2010, *J. Parker & R. Parsons BIED135*.

Gliricidia sepium (Jacq.) Walp.**New naturalized record**

Madre de cacao trees, in their native range of Mexico and Central America, are planted to shelter young coffee and cacao plantations (Staples & Herbst 2005). This species was seen rarely in surveys but sometimes in massive plantings of over 100 trees. These naturalized plants were most likely spread from an agricultural planting.

Material examined. **HAWAII:** Hāmākua District. Pa‘auilo, 2219436N 249862E. 15ft tall woody shrub seen naturalizing in pasture land. Flowering and fruiting when leafless. Long panicles of pink-lavender flowers and long, fleshy seedpods, 14 Jun 2010, *J. Parker & R. Parsons BIED125*.

Inga feuilleei DC.**New naturalized record**

This commonly cultivated tree has been seen naturalizing successfully on the windward side of the island. Ice-cream bean tree, or pacay, is native to Peru and Bolivia and is described as having 1×-pinnately compound leaves with 3–4 pairs of leathery, tapering-elliptic leaflets arranged oppositely along a winged axis (central stem). The white, mimosa-type, 1.25–1.50 in long flowers are borne in heads at the apexes of brownish-fuzzy stalks. The green pods are flattened, 8–24 in long and 2–3 in wide, and 4-angled by virtue of their distinctly raised margins (Staples & Herbst 2005).

Material examined. **HAWAII:** North Hilo Distr. Hwy 19, O‘ōkala, 2214290N 261272E. Group of small trees, ~20 ft tall, naturalized in pasture with *Panicum maximum*. White mimosoid flowers with 4-angled, thick, green pods. Compound dark-green leaves with winged petioles, 24 Aug 2010, *J. Parker & R. Parsons BIED133*.

Senna alata (L.) Roxb.**New island record**

Candle bush is frequently cultivated and readily naturalizes where planted. It is previously recorded as naturalized from all of the major Hawaiian Islands except Ni‘ihau and Kaho‘olawe.

Material examined. **HAWAII:** South Hilo Distr. Hakalau, 2201461N, 277313E. Large naturalized population in vacant lot in residential area. Bright yellow flowers with large, dark-brown pods, 28 Sep 2010, *J. Parker & R. Parsons BIED142*.

Magnoliaceae***Liriodendron tulipifera* L.****New naturalized record**

Valued for its economically important timber in its native range of eastern North America, a large planting of tulip poplar was observed spreading on Tree Planting Rd off the Stainback Hwy. Rare in Hawai'i, this tree may be encountered at higher elevations on the Big Island and Maui (Staples & Herbst 2005). This was the only instance this tree was encountered and when assessed it scored a 2 (Evaluate) on the Hawai'i Weed Risk Assessment, however with its wind-dispersed seeds and persistent seed bank (Hicks 1998), cultivated specimens of tulip poplar should be watched for signs of naturalization.

Material examined. **HAWAI'I:** South Hilo Distr. Tree Planting Rd off Stainback Hwy, 2169329N, 266686E. Large, naturalizing population, possibly from planting. Most trees 80 ft tall with many naturalized saplings, 26 Oct 2010, *J. Parker & R. Parsons BIED144.*

Moraceae***Artocarpus heterophyllus* Lam.****New naturalized record**

Jackfruit is cultivated in most parts of the island for its abundant edible fruit and it was found naturalizing in the fertile valleys of the Bond Historic District in North Kohala. This species is reported as naturalizing on O'ahu (Frohlich & Lau this volume).

Material examined. **HAWAI'I:** North Kohala Distr. Bond Historic District, Waianaia Gulch, 2236905N, 207666E. 8-10 large fruiting adults with many saplings throughout gulch with large leaves with scabrous undersides and milky latex, 6 Apr 2010, *J. Parker & R. Parsons BIED116.*

Ficus religiosa* L.*New island record**

Bodhi tree is popular in cultivation around the island and has previously been collected as naturalized on O'ahu (Frohlich & Lau 2008: 7). Due to its specific pollinator fig wasp, *Blastophaga quadraticeps* Mayr, being present in Hawai'i, it is likely that this tree will continue to naturalize across the islands.

Material examined. **HAWAI'I:** Hāmākua Distr. Hwy 19, mile marker 31, 2214536N, 259750E. Growing out of concrete supports on Kupapaulua Bridge. One 2.5ft tall sapling observed, 9 Aug 2010, *J. Parker & R. Parsons BIED129.*

Myrtaceae***Eugenia brasiliensis* Lam.****New island record**

Brazilian cherry can be found in cultivation over many parts of the island, especially from Hilo to Waimea. It has previously been recorded as naturalized from Maui (Starr *et al.* 2011: 29). Although not often seen spreading from cultivation, this shrub was seen colonizing the side of a gulch in the Bond Historic District in North Kohala.

Material examined. **HAWAI'I:** North Kohala Distr. Bond Historic Distr, Waianaia Gulch, 2236888N, 207681E. Small population of naturalized shrubs observed on hillside. Orange, flaky bark, with whorled leaves and white 4-petal flowers with persistent bracts, 22 Mar 2010, *J. Parker & R. Parsons BIED111.*

Pimenta dioica* (L.) Merr.*New island record**

Allspice is commonly cultivated around the island and has previously been collected as naturalized from Kaua'i and Maui (Lorence *et al.*, 1995; Starr *et al.* 2003: 28). This tree has appeared naturalized numerous times, and was collected here from North Kohala. This species is reported as naturalizing on O'ahu (Frohlich & Lau this volume).

Material examined. **HAWAI'I:** North Kohala Distr. Honomaka'u Rd, Hāwī, 2240118N, 205543E. One large 15ft tall tree seen naturalized and flowering on roadside, 22 Mar 2010, *J. Parker & R. Parsons BIED117.*

Oleaceae***Jasminum multiflorum* (Burm. f.) Andrews New naturalized record**

Star jasmine is native to tropical Asia and has been prized and cultivated in India and southern China for centuries. Its flowers are used for the extraction of jasmine scent and, like *J. sambac*, are dried for scenting tea (Staples & Herbst 2005). It is described as an evergreen scrambler or weak climber, pubescent. Leaves opposite, simple; petiole to 0.3 in long; blades broadly ovate, usually 1.4–2.0 in × 1.0–1.4 in, underside without small pits in axils of secondary veins and midvein, base truncate to cordate. Inflorescence terminal on branch tip and axils of upper leaves, more or less umbellate or clustered, 9 to many flowered. Flowers 1.0–1.8 in long, white fragrant or odorless; calyx lobes threadlike, 0.3–0.5 in long, pubescent; corolla tube 0.5–1.0 in long, lobes usually 7 or 8 (6–9), elliptic. Fruit rarely produced (Staples & Herbst 2005). One of the more common jasmines in cultivation, this collection represents the third species of jasmine to be found naturalized in Hawai‘i.

Material examined. **HAWAII:** Hāmākua Distr. Haina, Honoka‘a, 2223213N, 242008E. Large vining jasmine seen naturalized in invaded area near perimeter of county park. Flowers without scent and opposite leaves, 18 May 2010, *J. Parker & R. Parsons BIED124*.

Pinaceae***Pinus taeda* L.****New island record**

Loblolly pine, native to the eastern and southern United States, has been found naturalizing at this high elevation site (7100 ft) on the slopes of Mauna Kea, where it was planted. It has previously been collected as naturalized on Lāna‘i (Oppenheimer 2008: 31) and is recorded as potentially naturalizing on Kaua‘i (Frohlich & Lau this volume). Loblolly pine is fairly common throughout the island and has been seen possibly naturalizing in other higher elevation areas, i.e. Glenwood and Volcano.

Material examined. **HAWAII:** North Hilo Distr. Mauna Kea access road, 2181881N, 243646E. 60–80 ft tall grove of trees with cones strongly attached to stem, spreading from a planting, 18 Aug 2010, *J. Parker & R. Parsons BIED132*.

Piperaceae***Piper auritum* Kunth****New island record**

False ‘awa has previously been collected as naturalized on the islands of Kaua‘i and O‘ahu (Staples *et al.* 2006: 8), and East Maui (Starr & Starr 2011: 29). This shrub is native to tropical America and is used as a spice there. In Hawai‘i, it is grown for its use as a spice and because it is falsely believed to be true ‘awa, *Piper methysticum*. This collection was from a large, mature population covering about half an acre of land on one side of a gulch near Hilo. The shrubs were approximately 10 ft high.

Material examined. **HAWAII:** South Hilo Distr. Wainaku, 2183465N, 280644E. Large naturalized population on side of gulch. Large leaves with licorice scent and uneven leaf bases. White inflorescence, 2 Feb 2011, *J. Parker & R. Parsons BIED151*.

Polygonaceae***Emex australis* Steinh.****New state record**

Emex australis, or three-corner jack, is native to South Africa and was first collected from the island of Hawai‘i in 1931 in Makahālanu on Parker Ranch lands. It is known to occur from west Kamuela down to the Saddle Road junction, and Saddle Road up to 6400 ft elevation. We have also seen it naturalized on roadsides up to the scenic overlook on Kohala Mountain Road. This plant had been misidentified as *E. spinosa* in collections until 2006, when the expert Karen L. Wilson of the National Herbarium of New South Wales (NSW)

reidentified the BISH specimens. *Emex spinosa* is now known to occur only on O‘ahu, Moloka‘i, and East Maui, while *E. australis* is known only from the Big Island. *Emex australis* can be differentiated from *E. spinosa* because it is more prostrate (average 56 cm vs. 80 cm tall), has fewer seeds per rosette (average 4.7 vs. 8.8), per node (average 2.2 vs. 6.2), and per plant (average 346 vs. 987) and the achenes are longer (average 8 mm vs. 5.5 mm) and wider (average 9.5 mm vs. 5.2 mm) than *E. spinosa* (Weiss and Julien, 1975). This collection was from the recently constructed bypass road in Kamuela, which we inspected after a partner got numerous calls about a weed popping bicycle tires. Both species of *Emex* are on the USDA/APHIS Federal Noxious Weed List, and *E. australis* appears to be a more serious threat to agriculture and livestock production than *E. spinosa*, based on experience in other parts of the world (Freeman 2005). Both species of *Emex* were targets for successful biocontrol releases between 1950 and 1966, where one species of weevil, *Perapion antiquum* successfully established on Maui and Hawai‘i, but failed to establish on Moloka‘i. Two other weevils, *P. neofallax* and *P. violaceum* were also released but did not establish (P. Conant, pers. comm.).

Material examined. **HAWAII:** South Kohala Distr. New bypass road, Kamuela, 2215327N, 221036E. Sprawling, prostrate herb with spiny 3-spiked fruit and large taproot, 30 Nov 2010, *J. Parker & R. Parsons BIED148*; Makahāluu, Parker Ranch. Weed, Oct 1931, *R.A. Goff s.n.* (BISH #63678); 6 mi W of Pōhakuloa Park Stn, along Saddle Rd ~6400 ft roadside with *Chenopodium*. Decumbent, prostrate herb. Stems red or streaked with red. Leaves and petioles green. Tepals green, anther cream. Fruit green, tips of spines purple. Monoecious, 4 Mar 1979, *H. Kennedy & S. Ishikawa 3910*.

Rosaceae

Cotoneaster pannosus Franch.

New island record

Previously documented as naturalized on Kaua‘i and Maui (Lorence *et al.* 1995: 49; Herbarium Pacificum Staff 1999: 8), *Cotoneaster pannosus* grows vigorously at high elevation sites. A large naturalized population has been found near ‘Umikoa Village in the Hāmākua Distr.

Material examined. **HAWAII:** Hāmākua Distr. ‘Umikoa Village Rd, 2211318N, 252407E. Densely clustered shrubs with alternate, silvery leaves, white flowers and orange berries, no thorns. Spreading from gulch, 22 Jun 2010, *J. Parker & R. Parsons BIED127*.

Eriobotrya japonica (Thunb.) Lindl.

New island record

Loquat has previously been documented as naturalized on Kaua‘i, O‘ahu, Lāna‘i, and Maui (Lorence *et al.* 1995: 49; Herbarium Pacificum Staff 1999: 8; Oppenheimer 2007: 31; Frohlich & Lau 2008: 8) and is a common, weedy shrub across the island.

Material examined. **HAWAII:** South Hilo Distr. Hwy 19, Pepe‘ekeeo, 2198851N, 279188E. Small tree naturalized on roadside. White flowers on hairy brown inflorescence with yellow fruit. Green serrate leaves with white hairy undersides, 27 Oct 2010, *J. Parker & R. Parsons BIED146*.

Rubus sieboldii Blume

New island record

Molucca raspberry is native to Japan, southern China, and Okinawa and was previously known from large infestations on Kaua‘i (Wagner, Herbst *et al.* 1999). Three small naturalized populations of this species were found within a half-mile of each other in Mountain View near Pszyk Rd. This species is on the State of Hawaii Noxious Weed List and will be recommended to the BIISC plant crew for control.

Material examined. **HAWAII:** Puna Distr. Pszyk Rd, Mountain View, 2162495N, 278628E. Large, stiff-leaved, thorny sprawler with white flowers. No fruit observed, naturalized near small drainage, 31 Jan 2011, *J. Parker & R. Parsons BIED152*.

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New Plant Records from Hawai'i Island

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The following plant records from the island of Hawai'i include 2 new state records, 6 new island records, 3 new records of naturalized species previously known to be present on the island, and 1 range extension of an orchid recently reported as naturalized. All cited voucher specimens are deposited at BISH.

Asteraceae

Leucanthemum ×*superbum* (Bergmans ex J.W. Ingram) **New naturalized record**

D.H. Kent

Leucanthemum ×*superbum* (Shasta daisy) is a cultivated plant of hybrid origin from two European species (Staples & Herbst 2005). Although not currently recognized as naturalized in the Hawaiian Islands (Wagner *et al.* 1999), this hybrid plant has apparently persisted more than 50 years without cultivation in Hawai'i Volcanoes National Park since the 1940s, when it was reported as “escaping from gardens into the forest near the Park residential area” (Fagerlund 1947). The following specimen is the first record of the species in a disjunct location and indicates that the Shasta daisy is now becoming naturalized on Hawai'i Island.

Material examined. **HAWAI'I:** Hawai'i Volcanoes National Park, Crater Rim Rd between entrance and Headquarters, Ka'ū Distr, elevation ca 1200 m, in disturbed area near road through developed area, 23 Jul 2001, *L.W. Pratt & K. Bio* 3259; Hawai'i National Park residence area, 22 September 1942, *G.O. Fagerlund & A.L. Mitchell* 94.

Cornaceae

Cornus kousa F. Buerger ex Hance

New state record

An ornamental tree, *Cornus kousa* (Japanese dogwood, kousa dogwood), was not previously known to be present in the Hawaiian Islands, either as a naturalized plant (Wagner *et al.* 1999) or a cultivated species (Staples & Herbst 2005). There are no other vouchers of this species in the Bishop Museum *Herbarium Pacificum*. In 2011, Mark Wasser of the Natural Resources Management Division of Hawai'i Volcanoes National Park collected a flowering specimen of this species from a group of young trees established near the western boundary of the Park's Kahuku Unit, where they had probably originated from a forestry planting in an enclosure downslope within sight of the boundary fence. *Cornus kousa* is native to mountains of Japan, Korea, and China (Ohwi 1965). The tree is considered a desirable ornamental in mainland North America, and it produces a red fruit, edible to humans and attractive to birds (Gilman & Watson 1993). The species is apparently naturalized in New York State (U.S. Department of Agriculture 2011a). The following specimen documents the Japanese or kousa dogwood as a naturalized species on Hawai'i Island.

Material examined. **HAWAI'I:** Hawai'i Volcanoes National Park, Kahuku Unit just above

boundary in northwest corner, Ka'ū Distr, elevation ca 2175 m, four trees spreading into Park from planted enclosure below boundary, in *Sophora/Myoporum* woodland with grass, small tree ca. 3 m tall, flower bracts cream tinged with red, 27 Jul 2011, *M. Wasser 107*.

Fabaceae

Crotalaria sagittalis L.

New state record

Crotalaria sagittalis (arrowhead rattlebox) is native to the eastern and central United States, where it is found in 31 states (U.S. Department of Agriculture 2011b). An annual or perennial subshrub, this rattlebox is covered with golden hairs and has the following characteristics: simple ovate leaves, prominent stipules that are decurrent on the stem and arrowhead-shaped above, flowers pale yellow and less than 1.2 cm long, and glabrous, inflated fruits, black at maturity and up to 2.5 cm long (Britton & Brown 1970). This species was not recognized as part of the Hawaiian flora by Wagner *et al.* (1990, 1999). *Crotalaria sagittalis* is now documented from a single site in Hawai'i Volcanoes National Park, along a boundary fence adjacent to Kapāpala Ranch, where it was found in 1994.

Material examined. **HAWAI'I:** Hawai'i Volcanoes National Park, Ka'ū District, along fence-line with Kapāpala Ranch near Halfway House in native shrubland with scattered *Metrosideros polymorpha* trees, elevation ca 885 m, 31 May 1994, *L.W. Pratt 2779*.

Lathyrus latifolius L.

New island record

The vine *Lathyrus latifolius* (everlasting sweet pea) was first collected as a naturalized component of the Hawaiian flora at Olinda on East Maui in 1985 (Wagner *et al.* 1999). Subsequently, the species was collected at an additional site near Kula on Maui (Starr *et al.* 2002). It is now known to occur on Hawai'i Island within Hawai'i Volcanoes National Park at 'Āinahou, a former ranch. The vine has persisted in this place since 1984, when a collection was made at the same locality (*Dina Kageler 1984-48*, January 1984, Hawai'i Volcanoes National Park Natural History Collection). Both *L. latifolius* and *L. odoratus* L. are cultivated in cool regions of Hawai'i, Maui, and Kaua'i (Staples & Herbst 2005).

Material examined. **HAWAI'I:** Hawai'i Volcanoes National Park, 'Āinahou Ranch house, near abandoned nursery south of house, elevation 913 m, one or few vines in grassy area near old plant nursery, climbing vine with rose-pink flowers, no pods, 8 Apr 2011, *L.W. Pratt 3749*.

Lupinus angustifolius L.

New naturalized record

Only one *Lupinus* was previously known to be naturalized in the Hawaiian Islands; this was *Lupinus hybridus* collected once at Volcano on Hawai'i Island (Wagner *et al.* 1999). *Lupinus angustifolius* (narrowleaf lupine, blue lupine) is an annual herb native to the Mediterranean region that is rarely cultivated at higher elevations in the Hawaiian Islands (Staples & Herbst 2005). This lupine is now naturalized in Hawai'i Volcanoes National Park, where it was collected in 2005 growing along a jeep road following a powerline near the boundary with Kapāpala Ranch. *Herbarium Pacificum* contains one other specimen annotated as "*Lupinus* probably *angustifolius*" by S.M. Saufferer in 1996. This was collected by E.Y. Hosaka in 1939 on Kapāpala Ranch at slightly lower elevation than the site of the 2005 naturalized collection. This lupine species appears to have moved into the Park from the adjacent ranch where it was present, perhaps introduced as a forage plant, more than 70 years ago.

Material examined. **HAWAI'I:** Hawai'i Volcanoes National Park, Mauna Loa Powerline Rd, near boundary of Park and Kapāpala Ranch, Ka'ū Distr, elevation ca 1370 m, on side of jeep road through *Acacia koa* forest with alien grasses, herb with hairy leaves, ca 1 m tall, flowers blue and white, fruit green and yellow, 15 Dec 2005, *J. Makaie & P. Keliihoomalu s.n.*; Ka'ū, 'Ōhaikea, Kapāpala, elevation [1220 m], a local patch, flowers blue, 18 Apr 1939, *E.Y. Hosaka 2484*.

Sophora tomentosa* L.*New naturalized record**

Sophora tomentosa (yellow necklacepod, silverbush) is a pantropical strand plant (Raulerson & Rinehart 1991), which is widespread in the Pacific (Fosberg *et al.* 1979). The shrubby legume is also native to North America, where it is distributed on the shores of Texas and Florida (U.S. Department of Agriculture 2011c). This species appears to be naturalized on Hawai'i Island on the coastline between Nīnole and Punalu'u, Ka'ū District. *Sophora tomentosa* was recently (2011) collected growing in thick coastal shrubland of *Scaevola taccada* in the same area that Otto and Isa Degener collected the plant in 1983. The site of the 2011 collection is far from any residences or landscaped areas of the Punalu'u Beach Park. The invasive potential of this *Sophora* is likely low in Hawai'i; the species is not recognized as invasive in the Hawai'i Weed Risk Assessment, which rated it as -3, a low value (Daehler & Denslow 2011).

Material examined. **HAWAI'I:** Coastline between Punalu'u and Nīnole, Ka'ū Distr, near sea level, 3 shrubs mixed with thick *Scaevola taccada* about 10 m from the rocky shore, low shrub 1.5 m tall with green and brown legumes, 8 May 2011, *D. Foote s.n.*; Punalu'u, Ka'ū, Hawai'i in black lava sand near beach, 9 Apr 1983, *O. Degener & I. Degener 35,763.*

Stylosanthes viscosa* Sw.*New island record**

This species, an introduced pasture legume, is known to be naturalized on both O'ahu and West Maui (Herbst *et al.* 2004), but it has not been previously collected on Hawai'i Island (Imada 2008). Recently (2011), this small shrubby legume was observed at one site on the side of the Crater Rim Rd in Hawai'i Volcanoes National Park. Another *Stylosanthes*, *S. scabra* Vogel, was previously documented from the Park (Kennedy *et al.* 2010). The two species may be distinguished by the length and shape of the beak on the fruit, but specimens without fruiting material cannot be identified (Herbst *et al.* 2004). It is likely that both *Stylosanthes* species now known from Hawai'i Island spread into Hawai'i Volcanoes National Park from adjacent ranchlands.

Material examined. **HAWAI'I:** Hawai'i Volcanoes National Park, Crater Rim Rd between Keanakāko'i and Chain of Craters Rd intersection, Ka'ū Distr, elevation ca 1120 m, disturbed area on roadside through montane wet *Metrosideros polymorpha* forest, low shrub with red-streaked flowers and tiny fruit, 18 May 2011, *L.W. Pratt & J. Seide 3766.*

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

A vine cultivated in tropical countries, *Vigna hosei* was first reported naturalized in the Hawaiian Islands on O'ahu, in a pineapple field near Poamoho Experiment Farm (Staples *et al.* 2006). The species also occurs on Hawai'i Island, where the following specimen was collected in a Hilo field in 2006.

Material examined. **HAWAI'I:** Hilo, in field at low elevation (below 150 m), growing in disturbed area of field, thin vine with grayish green foliage and pale yellow flowers, 19 Jun 2006, *L. Yoshida s.n.*

Onagraceae***Oenothera biennis* L.****New island record**

A biennial herb native to North America and Canada, *Oenothera biennis* (common evening primrose) was recently documented as a naturalized species on East Maui, where it was found growing on a roadside in Kula (Starr *et al.* 2008). The species has now been collected on Hawai'i Island, where it was established on a roadside in Volcano Golf Course Subdivision in a patch measuring 5 × 10 m with plants of different sizes. Plants have persisted in this roadside site for more than 3 years, and the species appears to be naturalized in Volcano.

Material examined. **HAWAII:** Volcano Golf Course Subdivision adjacent to Hawai'i Volcanoes National Park, on side of Pukeawe Circle, Ka'ū Distr, elevation ca. 1200 m, disturbed area on side of road, patch has persisted in place for more than 3 years, herb with bright yellow flowers, stem with red pustular hairs, plants of different sizes seen in patch 5 × 10 m, 11 May 2011, *L.W. Pratt & T.K. Pratt 3756*.

Orchidaceae

Cymbidium dayanum Rchb. f.

Range extension

Recently, Ackerman *et al.* (2011) published a new record of the widespread Asian orchid *Cymbidium dayanum* as a naturalized species on Hawai'i Island; they collected the orchid at Kalopā State Recreation Area near Honoka'a in Hāmākua Distr, where it was growing on *Eucalyptus* trees and logs. We found this orchid also naturalized at several sites in Ka'ū District, where the following specimens were collected. The orchid is established in Hawai'i Volcanoes National Park near Kīpuka Nēnē, where it grows as an epiphyte on dead *Metrosideros polymorpha* trees in open *Metrosideros* woodland. *Cymbidium dayanum* has also been collected on Keauhou Ranch east and north of the Park. The elevations of these two collections range from 850 to 1400 m. The speed with which this orchid has established on the island and the wide range of habitats occupied indicate that the species may have invasive tendencies.

Material examined. **HAWAII:** Hawai'i Volcanoes National Park near Kīpuka Nēnē, ca. 1 km from Hilina Road, Ka'ū Distr, elevation ca 850 m, common on dead trees in *Metrosideros polymorpha* woodland near fuel break/jeep road, epiphytic orchid with flowers white and purple striped and fruits green, 11 Aug 2011, *L.W. Pratt & C.M. D'Antonio 3779*; Keauhou Ranch east and north of Hawai'i Volcanoes National Park, Ka'ū District, elevation ca 1400 m, rare in pasture with scattered *Acacia koa* and *Metrosideros polymorpha* trees, epiphytic on dead *koa* tree, apparently naturalized, flowers white with red-purple stripes, 12 Nov 2008, *A. Christie 20081*.

Rosaceae

Pyracantha angustifolia (Franch.) C.K. Schneid.

New island record

When Wagner *et al.* (1990) published the *Manual of the flowering plants of Hawai'i*, *Pyracantha angustifolia* (firethorn) was listed as naturalized on both Kaua'i and Hawai'i, where it was said to be present near the Volcano dump. Subsequently, it was realized that there were actually three species of *Pyracantha* present in the Hawaiian Islands, and *P. angustifolia* was thought to be limited to Kaua'i (*Herbarium Pacificum* Staff 1999). A new island record of *P. angustifolia* for Maui was reported by Starr *et al.* (2008) on East Maui, where the shrub was scattered in a pasture in Kula. Now this species of firethorn has also been collected on Hawai'i Island along Hwy 11 not far from Volcano Village. With the collection of the following specimen, there are now three species of *Pyracantha* known from Hawai'i Island: *P. angustifolia*, *P. crenatoserrata*, and *P. koidzumii*. Based on recent weed surveys (L. Pratt, pers. observ.), *P. crenatoserrata* appears to be the most common *Pyracantha* species in the Volcano area and within Hawai'i Volcanoes National Park. *Pyracantha angustifolia* may have invasive potential on the island; the Hawai'i Weed Risk Assessment rated the species as 13 H, likely to be invasive in Hawai'i (Daehler & Denslow 2011). Several *Pyracantha* species are frequently cultivated in Hawai'i and may become weeds because of their bird-dispersed fruit (Staples & Herbst 2005).

Material examined. **HAWAII:** Hwy 11 near Volcano Village, mile marker 27, east of Hawai'i Volcanoes National Park, Puna Distr, elevation ca 1120 m, rare on side of road in disturbed vegetation, thorny shrub with orange berries, 9 Sep 2005, *L.W. Pratt & K. Bio 3520*.

Rubiaceae***Richardia scabra* L.****New island record**

Richardia scabra, a weedy herb with no common name, was first reported as a new state record in 1995 from collections made on the island of Kaua'i (Lorence *et al.* 1995). Subsequently, the species was documented from Maui (Oppenheimer 2003). After review of specimens identified as *R. brasiliensis* in the Bishop Museum *Herbarium Pacificum*, several vouchered specimens were reassigned to *R. scabra* (Imada *et al.* 2008), and *Richardia scabra* was recognized as present on O'ahu and Moloka'i, as well as Kaua'i and Maui. The species is now known also from Hawai'i Island, where the following specimen was collected in a disturbed area near buildings at the Kahuku Unit of Hawai'i Volcanoes National Park in 2005.

Material examined. **HAWAII:** Hawai'i Volcanoes National Park, Kahuku Unit, in grounds of ranch house, Ka'u Distr, elevation ca 700 m, uncommon between house and jeep road, prostrate weed, 11 Oct 2005, *L.W. Pratt 3556*.

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Freshwater algae associated with taro cultivation in the Hawaiian Islands¹

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As part of the Hawaiian Freshwater Algae Biodiversity Survey (2009–2012) we have been documenting algae (with a focus on macroalgae) associated with taro fields on the accessible main Hawaiian Islands. Taro fields provide a very different environment from streams, where most of our other collections originate, in that they have much lower (or absent) water flow and temperatures that can be substantially higher (measured as high as 37.0 °C in our field sites). This paper provides an updated taxonomic checklist for taro field-associated algae in Hawai'i and compares our identifications to historical literature records for this interesting habitat.

Although several past authors have recorded collections of freshwater algae from taro fields, the only researchers to explicitly discuss algae collecting in these fields were Tilden (1901, 1902) and MacCaughey (1917, 1918a, b). Josephine E. Tilden spent several months collecting algae from almost every conceivable habitat in Hawai'i in the year 1900. In an informal account of her expedition to the islands of O'ahu, Hawai'i and Kaua'i (Tilden 1901) she mentions the following collections from Hawai'i: "In a taro patch was found *Anabaena variabilis*, some *Chara* and diatoms" (Tilden 1901: 168). MacCaughey made extensive collections from taro fields on a number of islands and compiled these records in his summary manuscripts (MacCaughey 1917, 1918a, b). Abbott (1992) noted that *limu* were sometimes gathered from upland *lo'i*, and Aiona (2003) documented names of *limu* from taro fields along with their Latin names (*limu kala wai* – *Spirogyra* spp.; *lī pālāwai* – *Pithophora* sp., *Stigeoclonium amoenum*, *Hydrodictyon reticulatum* and *Spirogyra* spp.; *hulu 'ilio* – *S. amoenum*; *limu nehe* – *Spirogyra* spp.) based on ethnobotanical interviews with native Hawaiian peoples. Given that Hawaiian names exist for some species of freshwater algae and the recorded history of these algae being collected from taro fields, the freshwater algae of taro fields must have also played a role in the diet of some native Hawaiians, either directly or indirectly.

Collections for this study were made by the authors and other members of the Freshwater Algal Biodiversity group (Dr. Rex Lowe, Bowling Green State University; Dr. Pat Kocielek and Carrie Graeff, University of Colorado; Dr. Jeff Johansen and Melissa Vaccarino, John Carroll University) between July 2009 and January 2011, with several additional collections made by the senior author dating back to 2001. Samples were collected from the sediment surface, free-floating, or attached in taro fields on the islands of Kaua'i, O'ahu, Moloka'i, Maui and Hawai'i. Identifications were made using taxonomic literature sources most pertinent for each lineage (see Sherwood 2006 for taxonomic references). Catalog numbers are Bishop Museum (BISH) *Herbarium Pacificum* numbers for representative microscope slides deposited of each taxon. Sherwood Lab accession numbers (ARS) are also given to enable supplementary data for each sample to be accessed via the Hawaiian Freshwater Algae Database (<http://algae.manoa.hawaii.edu/hfwadb/>).

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Table 1. Checklist of freshwater algae associated with taro fields in the Hawaiian Islands.

Algal taxon	Source	Representative accession
Cyanobacteria		
<i>Anabaena confervoides</i> Reinsch	Tilden (1902), MacCaughy (1918b)	
<i>Anabaena</i> sp.	MacCaughy (1918a), this study	BISH 749534; (ARS 07431-00002)
<i>Aphanothece stagnina</i> (Sprengel)		
A. Braun	MacCaughy (1918b)	
<i>Aphanothece</i> sp.	MacCaughy (1918a)	
<i>Calothrix fusca</i> (Kützing) Bornet & Flahault		
<i>Calothrix</i> sp.	MacCaughy (1918b)	
	MacCaughy (1918a), this study	BISH 749535; (ARS 04236-00001)
<i>Chamaesiphon confervicola</i>		
A. Braun	MacCaughy (1918b)	
<i>C. elongatus</i> (Nordstedt) Kann	MacCaughy (1918b)	
<i>Chamaesiphon</i> sp.	MacCaughy (1918a)	
<i>Chroococcus</i> sp.	MacCaughy (1918a)	
<i>Cylindrospermum muscicola</i>		
Kützing ex Bornet & Flahault	this study	BISH 749536; (ARS 04236-00002)
<i>Cylindrospermum</i> sp.	this study	BISH 749668; (ARS 07513-00005)
<i>Gloeocapsa</i> sp.	MacCaughy (1918a)	
<i>Gloeotheca fusco-lutea</i> Nägeli	MacCaughy (1918b)	
<i>Gloeotheca</i> sp.	MacCaughy (1918a)	
<i>Gloeotrichia natans</i> (Hedwig)		
Rabenhorst ex Bornet & Flahault	MacCaughy (1918b)	
<i>Leptolyngbya rivulariarum</i>		
(Gomont) Anagnostidis & Komárek	MacCaughy (1918b)	
<i>Lyngbya aestuarii</i> (Mertens)		
Liebman ex Gomont	MacCaughy (1918b)	
<i>L. aestuarii</i> f. <i>natans</i> Gomont	MacCaughy (1918b)	
<i>Lyngbya</i> sp.	MacCaughy (1918a), this study	BISH 749669; (ARS 07032-00001)
<i>Merismopedia glauca</i> (Ehrenberg)		
Kützing	MacCaughy (1918b)	
<i>Merismopedia</i> sp.	MacCaughy (1918a)	
<i>Nostoc linckia</i> (Roth) Bornet ex Bornet & Flahault	MacCaughy (1918b)	
<i>N. piscinale</i> Kützing ex Bornet & Flahault	MacCaughy (1918b)	
<i>N. punctiforme</i> (Kützing) Hariot	MacCaughy (1918b)	
<i>N. spongiaeforme</i> C. Agardh ex Bornet & Flahault	MacCaughy (1918b)	
<i>Nostoc</i> sp.	MacCaughy (1918a)	
<i>Nostochopsis</i> sp.	this study	BISH 749670; (ARS 04320-00003)
<i>Oscillatoria aeruginosa</i> C. Agardh ex Gomont	MacCaughy (1918b)	
<i>O. princeps</i> Vaucher ex Gomont	this study	BISH 749671; (ARS 07509-00002)
<i>Oscillatoria</i> sp.	this study	BISH 749672; (ARS 06981-00001)
<i>Phormidium retzii</i> (C. Agardh) Kützing ex Gomont	this study	BISH 749673; (ARS 04149-00001)
<i>Rivularia</i> sp.	MacCaughy (1918a)	
<i>Scytonema crispum</i> (C. Agardh) Bornet	MacCaughy (1918b)	
<i>Scytonema</i> sp.	MacCaughy (1918a), this study	BISH 749674; (ARS 04320-00004)
<i>Stigonema</i> sp.	MacCaughy (1918a)	
<i>Trichormus catenula</i> (Kützing ex Bornet & Flahault) Komárek & Anagnostidis	MacCaughy (1918b)	
<i>T. variabilis</i> (Kützing ex Bornet & Flahault) Komárek & Anagnostidis	Tilden (1901), MacCaughy (1918b)	

Table 1. (continued)

Algal taxon	Source	Representative accession
Cyanobacteria (continued)		
<i>Xenotholos kernerii</i> (Hansgirg) M.Gold-Morgan, G.Montejano & J.Komárek	MacCaughey (1918b)	
<i>Xenococcus</i> sp.	MacCaughey (1918a)	
Chlorophyta		
<i>Ankistrodesmus</i> sp.	this study	BISH 749675; (ARS 06762-00002)
<i>Bulbochaete</i> sp.	MacCaughey (1918a)	
<i>Chara braunii</i> C.C.Gmelin	this study	BISH 749677; (ARS 07513-00001)
<i>Chara</i> sp.	Tilden (1901), MacCaughey (1918a)	
<i>Cladophora glomerata</i> (Linnaeus) Kützing	this study	BISH 749678; (ARS 04135-00001)
<i>C. lehmanniana</i> (Lindenberg) Kützing	MacCaughey (1918b)	
<i>Cloniophora spicata</i> (Schmidle) Islam	this study	BISH 749676, 749679; (ARS 06769-00001)
<i>Coleochaete</i> sp.	MacCaughey (1918a)	
<i>Conferva</i> sp.	MacCaughey (1918a)	
<i>Cosmarium</i> sp.	this study	BISH 749680; (ARS 06764-00008)
<i>Desmidiium</i> sp.	this study	BISH 749681; (ARS 06756-00001)
<i>Draparnaldia</i> sp.	MacCaughey (1918a)	
<i>Gonium</i> sp.	MacCaughey (1918a)	
<i>Hyalotheca dissiliens</i> Brébisson ex Ralfs	this study	BISH749682; (ARS 07514-00003)
<i>Hydrodictyon reticulatum</i> (Linnaeus) Bory de Saint-Vincent	MacCaughey (1918b), this study	BISH 749683; (ARS 07444-00001)
<i>Hydrodictyon</i> sp.	MacCaughey (1918a)	
<i>Klebsormidium subtile</i> (Kützing) Tracanna ex Tell	MacCaughey (1918b)	
<i>Mougeotia</i> sp.	MacCaughey (1918a), this study	BISH 749684; (ARS 06652-00002)
<i>Netrium</i> sp.	this study	BISH 749685; (ARS 06733-00002)
<i>Nitella</i> sp.	MacCaughey (1918a), this study	BISH 749686; (ARS 07510-00001)
<i>Oedogonium</i> sp.	MacCaughey (1918a), this study	BISH 749687; (ARS 07028-00005)
<i>Pithophora</i> sp.	this study	BISH 749688; (ARS 07024-00001)
<i>Raphidium</i> sp.	MacCaughey (1918a)	
<i>Rhizoclonium hieroglyphicum</i> (C.Agardh) Kützing	this study	BISH 749689; (ARS 07511-00004)
<i>Rhizoclonium</i> sp.	this study	BISH 749690; (ARS 07025-00002)
<i>Scenedesmus</i> sp.	MacCaughey (1918a), this study	BISH 749691; (ARS 06733-00004)
<i>Sirogonium</i> sp.	this study	BISH 749692; (ARS 07516-00001)
<i>Spirogyra</i> spp.	MacCaughey (1918a), this study	BISH 749693; (ARS 06988-00001)
<i>Stigeoclonium</i> sp.	this study	BISH 749694; (ARS 06753-00011)
<i>Tetraabaena socialis</i> (Dujardin) H.Nozaki & M.Itoh	MacCaughey (1918b)	
<i>Ulothrix minulata</i> Kützing	MacCaughey (1918b)	
<i>Ulothrix</i> sp.	MacCaughey (1918a)	
<i>Zygnema spontaneum</i> Nordstedt	MacCaughey (1918b)	
<i>Zygnema</i> sp.	MacCaughey (1918a), this study	BISH 749695; (ARS 06760-00002)
Rhodophyta		
<i>Chantransia</i> sp.	this study	BISH 749696; (ARS 06986-00001)
<i>Compsopogon caeruleus</i> (Balbis ex C. Agardh) Montagne	this study	BISH 749697; (ARS 06757-00001)

Table 1. (continued)

Algal taxon	Source	Representative accession
Chrysophyceae		
<i>Dinobryon sertularia</i> Ehrenberg	MacCaughey (1918b)	
Tribophyceae		
<i>Vaucheria</i> sp.	this study	BISH 749698; (ARS 06760-00004)
Bacillariophyceae		
<i>Hydrosera</i> sp.	this study	BISH 749699; (ARS 07449-00003)
<i>Pleurosira laevis</i> (Ehrenberg) Compère	this study	BISH 749700; (ARS 07443-00002)
Euglenophyta		
<i>Euglena</i> sp.	this study	BISH 749701; (ARS 04141-00002)
<i>Lepocinclis spirogyroides</i> Marin & Melkonian	MacCaughey (1918b)	
<i>Monomorphina pyrum</i> (Ehrenberg) Mereschkowski	MacCaughey (1918b)	
<i>Phacus pleuronectes</i> (O.F.Müller) Nitzsch ex Dujardin	MacCaughey (1918b)	
<i>Salpingoeca pyxidium</i> Kent	MacCaughey (1918b)	
<i>Trachelomonas hispida</i> (Perty) F.Stein	MacCaughey (1918b)	
<i>T. oblonga</i> var. <i>truncata</i> Lemmermann	MacCaughey (1918b)	
<i>T. volvocina</i> var. <i>minuta</i> Lemmermann	MacCaughey (1918b)	

All the major taxonomic groups of freshwater macroalgae found in the Hawaiian Islands are represented in taro fields (e.g. cyanobacteria, red and green algae, diatoms, yellow-green algae), but some taxa differ in their degree of specialization to the taro field habitat. For example, some genotypes of *Spirogyra* (which likely represent distinct species) are known exclusively from taro fields, while others are found in multiple habitat types (Neumann 2011; Neumann & Sherwood, in prep.). Forty cyanobacteria, 34 green algae, two red algae, one chrysophyte, one tribophyte, eight euglenoids, and two diatoms are reported in total (Table 1); these 88 taxonomic records include those from our own collections and others from the literature. Records from only the literature comprised 58% of the total, while 28% were from our collections only, and 14% were shared.

Freshwater algae have been a component of Hawaiian taro fields for hundreds of years, and those species specialized to this habitat may have been introduced with taro plants or soil from other tropical Pacific regions. Future research into the freshwater algal community composition of taro fields in other regions of the Pacific, especially those with documented human migrations to the Hawaiian Islands, will allow further insights into the biogeographic origins and degree of endemism of the Hawaiian taro field algal flora.

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New Plant Records from Maui and Kaho‘olawe¹

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The following contributions include new naturalized, island, and range extension records from Maui and Kaho‘olawe. All records are for nonindigenous species. Images of most of the material examined can be seen at <www.hear.org/starr>. Voucher specimens and collections mentioned in the text are housed in Bishop Museum’s *Herbarium Pacificum* (BISH), Honolulu, Hawai‘i.

Apiaceae

Torilis arvensis (Huds.) Link

New island record

Previously collected on the Kalalau Trail on Kaua‘i in 1989 (Staples *et al.* 2002: 5), *Torilis arvensis* (spreading hedge parsley) is now known from Maui, where it was found on the summit of Haleakalā.

Material examined: MAUI: E. Maui, Haleakalā National Park, HVC (Haleakalā Visitor Center) parking lot, growing in crack in sidewalk, in association with *Dubautia menziesii* and *Plantago lanceolata*, 9750 ft [2971 m], 18 Oct 2011, *Starr 111018-1*.

Asclepiadaceae

Calotropis procera (Aiton) W.T. Aiton

New island records and correction

Calotropis procera (purple crown flower) was previously reported from Kaua‘i, Lāna‘i, and Hawai‘i (Wagner *et al.* 1999: 238; Wood & LeGrande 2006: 19; Wood 2006: 15; Oppenheimer 2008: 23), and is here reported from Kaho‘olawe where this garden escape with wind dispersed seeds has become established and is spreading near the summit, and from Maui where it was collected by the authors and others in dry lowland areas of East and West Maui. Parker & Parson (this volume) report this species from the Big Island. Before the distinction between *C. procera* and *C. gigantea* was known to Hawaiian botanists, specimens of *C. procera* were identified as *C. gigantea*. Revisiting the collections reveals two specimens from Maui (*Starr & Martz 010503-2*; *Starr & Martz 010701-1*) and one from Kaua‘i (*Starr & Starr 020226-3*) to be *C. procera*, resulting in *C. gigantea* no longer documented as naturalized on Kaua‘i or West Maui, and *C. procera* now documented as naturalized on Maui.

Material examined: KAHO‘OLAWA: Pu‘u Mōiwi, along the main road (K1), in association with *Heteropogon contortus* and *Cenchrus ciliaris*, scattered plants in area, collected with James Bruch (KIRC), 1115 ft [340 m], 28 Dec 2010, *Starr 101228-1*. Kanapou Headwaters, growing in bare hard pan, in association with *Heteropogon contortus*, *Cenchrus ciliaris*, and *Prosopis pallida*, dozens of plants, collected with James Bruch (KIRC), 1246 ft [380 m], 29 Dec 2010, *Starr 101229-1*. MAUI: E. Maui, Kīhei, just mauka of the Maui Research and Technology Park, on mauka side of gate, coming up in pasture area recently disturbed to install a culvert, 250 ft [75 m], 3 May 2001, *Starr & Martz 010503-2*. W. Maui, Kahului, in abandoned sugar cane field, 100 ft [30 m], *Starr & Martz 010701-1*. W. Maui, Kahului, west of Kuihelani Hwy, between mile markers 3 & 5, in sandy soil, 120 ft [37 m], 19 Aug 2004, H. Oppenheimer & G. Hansen H80405. KAUA‘I: Kekaha, Kekaha Beach Park, on sand near coast, 10 ft [3 m], 26 Feb 2002, *Starr & Starr 020226-3*.

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Asteraceae***Senecio madagascariensis* Poir.****Range extension**

Documented from all the main Hawaiian island except Ni'ihau and Moloka'i (Lorence *et al.* 1995: 24; Starr *et al.* 1999: 11; Oppenheimer & Bartlett 2002: 4; Herbst *et al.* 2004: 4; Starr *et al.* 2006: 33), and previously collected at an elevation of 4800 ft (1463 m) in Kohala, Hawai'i (Flynn 4302; Wagner 4780), this prolific yellow flowered plant is here reported from an elevation of 10,000 ft (3048 m), where it is sparingly found in bare cinders on the summit of Haleakalā on East Maui.

Material examined: MAUI: E. Maui, Pu'u Kolekole, Haleakalā Observatories Science City, one plant in bare cinders near Faulkes Telescope, in association with *Erodium cicutarium*, *Plantago lanceolata*, and *Tetramolopium humile*, 10,000 ft [3048 m], 12 Apr 2011, Starr 110412-1.

Caryophyllaceae***Silene armeria* L.****New state record**

Not previously reported from the state, *Silene armeria* (Sweet William catchfly) was found on the side of a gravel road in Olinda, Maui. Native to Europe (Jepson Herbarium 2011), and naturalized over much of North America (USDA 2011), this catchfly can be distinguished from other *Silene* in Hawai'i by the annual / biennial habit, glabrous foliage and flowers, and pink to purple flowers.

Material examined: MAUI: E. Maui, Olinda, Hawea Pl, side of gravel road in unmaintained area. Erect, glabrous, pink flowers. Growing with *Conyza bonariensis* and *Pennisetum clandestinum*, 2700 ft [822 m], 20 Jun 2011, Starr 110620-1.

Chenopodiaceae***Salsola tragus* L.****Range extension**

Known from all the main Hawaiian islands except Ni'ihau, Kaua'i, and Lāna'i (Wagner *et al.* 1999: 540; Wagner *et al.* 1997: 55; Herbst & Wagner 1999: 19; Oppenheimer & Bartlett 2002: 5; Herbst *et al.* 2004: 5; Starr *et al.* 2006: 34), *Salsola tragus* (tumbleweed) was previously known from East Maui, where it is well established from Pāi'a to Kēōkea, and is now known from Kahana on West Maui. An attempt is being made to eradicate this isolated population, but a persistent seedbank remains.

Material examined: MAUI: W. Maui, Kahana, side of dirt road in abandoned pineapple fields. Hundreds of plants of all life stages. Growing with *Amaranthus spinosus* and *Urochloa maxima*, 120 ft [37 m], 12 Apr 2011, Starr 110412-1.

Clusiaceae***Hypericum mutilum* L. subsp. *mutilum*****Range extension**

Previously known from Kaua'i, Moloka'i, Hawai'i and East Maui (Wagner *et al.* 1999: 544; Lorence *et al.* 1995: 32; Wagner & Herbst 1995: 18), *Hypericum mutilum* (dwarf St. John's wort) has been collected multiple times since 1981 in moist areas near the Hāna Hwy on East Maui, and is now known from West Maui, where it grows in waterlogged trailsides in Waihe'e Ridge and Hana'ula.

Material examined: MAUI: W. Maui, Waihe'e Ridge Trail, lining side of trail, growing in waterlogged mud with *Tibouchina herbacea* and *Paspalum conjugatum*, 2150 ft [655 m], 27 Aug 2011, Starr 110827-1. Hana'ula, side of trail, small patches growing in waterlogged mud with *Cibotium*, *Melicope*, and *Myrsine*, 4000 ft [1219 m], 28 Sep 2011, Starr 110928-1.

Myrtaceae***Melaleuca armillaris* (Sol. ex Gaertn.) Sm. New naturalized record**

Reported as used in forestry plantings but apparently not naturalized (Wagner *et al.* 1999: 964), *Melaleuca armillaris* (bracelet honey myrtle) is here reported as naturalized, where it was filling light gaps and spreading from abandoned plantings in Kula, Maui.

Material examined: MAUI: E. Maui, Kula, abandoned farm off Crater Rd.. Old plantings, some of which have fallen over, with seedlings filling the light gaps and spreading to nearby areas. Growing in association with *Acacia mearnsii* and *Sicyos*, 3500 ft [1066 m], 31 Mar 2011, *Starr 110331-2*.

Onagraceae***Oenothera laciniata* Hill****Range extension**

Known from Maui and Hawai'i (Wagner *et al.* 1999: 1000), and collected at elevations up to 4500 ft (1371 m) (*Nagata 3544*), *Oenothera laciniata* (cutleaved evening primrose) is now documented from 9725 ft (2964 m) on East Maui, where it was collected in the Haleakalā Summit Visitor Center parking lot.

Material examined: MAUI: E. Maui, Haleakalā National Park, HVC Parking Lot, dozens of plants in a patch near the Sliding Sands Trailhead, in association with *Erodium cicutarium*, *Deschampsia nubigena*, and *Dubautia menziesii*, 9725 ft [2964 m], 12 Apr 2011, *Starr 110412-1*.

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Possible Extinctions, Rediscoveries, and New Plant Records within the Hawaiian Islands¹

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Eleven possible new extinctions are reported for the Hawaiian flora, in addition to 5 island records, 3 range rediscoveries, 1 rediscovery, and 1 new naturalized record. The remarkable range rediscoveries of *Ctenitis squamigera* (Dryopteridaceae) and *Lysimachia filifolia* (Primulaceae) give hope toward their future conservation, as both are federally listed as endangered and were undocumented on Kaua'i for ca 100 years. Yet there is great concern over numerous possible plant extinctions in Hawai'i. Two extinctions were recently reported from Kaua'i (i.e., *Dubautia kenwoodii* and *Cyanea kuhihewa*) (Wood 2007), and an additional 11 are now reported to have no known living individuals in the wild. Species abundance will naturally fluctuate, yet for very rare taxa there is little room for decline. The ongoing decline of native pollinators (Kearns *et al.* 1998) and seed dispersers (Milberg & Tyrberg 1993), in combination with other primary extrinsic factors such as invasive nonnative plants, predation by introduced vertebrates, loss and fragmentation of natural habitats, and devastation by severe storms, are leading to an increase in extinctions throughout the islands of Oceania (Sakai *et al.* 2002; Wood 2007; Kingsford *et al.* 2009). The assertion of extinction is potentially fallible and can only be inferred from absence of sighting or collection records (Solow & Roberts 2003). Although extensive field surveys have failed to produce evidence that these possibly extinct taxa still occur in the wild, there is still suitable habitat and future field surveys are being planned and funded. Because of the enormity of Hawai'i's conservation dilemma, it is urgent that we have the most current information possible (Wagner *et al.* 1999). This paper is a call for biologists and conservation agencies to make concerted efforts to familiarize, re-find, and attempt to acquire conservation collections of these elusive species, many of which are hard to recognize, especially when they are not in flower or fruit.

Campanulaceae

Clermontia grandiflora Gaudich.

subsp. *maxima* Lammers

Rediscovery

Lammers (1991) described *Clermontia grandiflora* subsp. *maxima* from a single collection made in 1973 on the windward slopes of Haleakalā in montane cloud forest (i.e., Gagné & Montgomery 386), with no other collections reported since then. Lammers notes the new taxon differs from all other specimens of *C. grandiflora* by its much larger flowers and he indicates that *C. grandiflora* has seldom been collected above 1275 m. Collections that fit Lammers diagnosis of *C. grandiflora* subsp. *maxima*, especially filaments 8.0–8.6 cm long, were made at ca. 1700 m elev. in Hanawī, just west of the

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Helele'ike'ōhā headwaters. Evidently trees of *C. grandiflora* in this region have various floral structures that range in their linear measurements to fit both *C. grandiflora* subsp. *munroi* and *C. g.* subsp. *maxima*, dependent on floral anthesis. Further research is needed to better understand the quantitative differences that may separate these two taxa.

Material examined. MAUI: East Maui, Hanawā, above State Camp, just west of Helele'ike'ōhā headwaters, *Metrosideros-Cheirodendron* montane wet forest associated with *Kadua axillaris*, *Broussaisia arguta*, *Melicope clusiifolia*, rich in pteridophytes, 20+ trees along 1700 m (5600 ft) contour trail, 3 m tall, moderately branched, in flower and fruit, observed with *C. arborescens* and *C. tuberculata*, 4 Oct 1997, *Wood 6788* (PTBG, US); *loc. cit.*, 5 Oct 1997, *Wood 6798* (PTBG); *loc. cit.*, 5 Oct 1997, *Wood 6799* (NY, PTBG).

***Cyanea eleeleensis* (H. St. John) Lammers Possibly extinct**

Harold St. John (1987) originally described this species as a *Delissea*, and Lammers (1992) subsequently transferred it over to *Cyanea*. Wagner *et al.* (1999) noted this species to be endangered and the USFWS (2010) has recently listed it as endangered. Only known from Wainiha Valley, Kaua'i, where Charles Christensen made the holotype collection, no living individuals of this species are currently known.

Material examined. KAUA'I: Wainiha Valley, on side of intermittent stream below Pali 'Ele'ele, shaded gulch in wet forest, 700 ft elev., 19 Jul 1977, *Christensen 261* (holotype, BISH).

***Cyanea kolekoleensis* (H. St. John) Lammers Possibly extinct and taxonomic note**

Originally placed in *Delissea* by Harold St. John (1987), and later transferred to *Cyanea* by Lammers (1992), *Cyanea kolekoleensis* has always been considered rare and restricted to the Wahiawa Mountains of southern Kaua'i where biologists monitored four sites totaling less than ten individuals. Last observed in a gulch to the northeast of Hulua peak in 1996, there are currently no living individuals known of this Kaua'i endemic.

Cyanea kolekoleensis was previously thought to be an unbranched shrub, and its berries and seeds were unknown. Three additional herbarium collections deposited at PTBG after Lammers (1992) made the new combination allow for a more expanded circumscription. Seed size and non-rugose testa morphology support its placement within *Cyanea*.

Cyanea kolekoleensis (H. St. John) Lammers, *Novon* 2: 130. 1992. Basionym: *Delissea kolekoleensis* H. St. John, *Phytologia* 63: 344. 1987. TYPE: U. S. A. Hawaiian Islands. Kaua'i: Wahiawa Valley, 765 m, 23 Sep 1979, *S. Perlman 498* (holotype, BISH; isotypes, BISH — 2 sheets).

Shrub, single stemmed or few branched, 1.5–2 m tall, glabrous. Lamina narrowly elliptic, 15.5–30 cm long, 2.7–5.7 cm wide, upper surface green, glabrous, lower surface greenish white, glabrous or the midrib minutely and sparsely pubescent, margin minutely serrulate, apex acuminate, base cuneate, petiole terete, 3.5–10 cm long, 4 mm diam., glabrous. Inflorescence 4–8-flowered, glabrous, peduncle deflexed, 10.5–20 cm long, 2–4 mm diam., rachis 3–6.5 cm long, pedicels sharply recurved, 18–27 mm long, reduced in length toward apex of rachis; hypanthium obconic or obovoid, 6–13 mm long, 6–11 mm diam., densely short-pubescent; calyx lobes narrowly triangular or deltoid, 1.5–3 mm long, 1.5–3.5 mm wide, the apex acute; corolla bilabiate, white shading to purple on the lobes, 50–52 mm long, densely short-pubescent, tube curved, 30–39 mm long, 5.5–9 mm diam., cleft dorsally for ½ its length, dorsal lobes linear, 13–19 mm long, 1.5–3 mm wide, acute at apex; ventral lobes linear, 10–15 mm long, 1.5–3 mm wide, acute at apex; staminal column exerted; filaments 3.7–4.9 cm long, purple, glabrous; anther tube dark purple, 9–11 mm long, 2.5–4.0 mm diam., the lower 2 anthers with tufts of white hairs at apex. Berry (slightly immature) globose, 7 mm long, yellow-green with persistent calyx lobes. Seeds (immature), testa tan-brown, striate-verruculate, 0.5–0.7 mm long × 0.3–0.5 mm diam.

Material examined. **KAUAI:** Kōloa Distr, Līhu'e-Kōloa Forest Reserve, northwest of Wahiawa Bog, along tributary of Wahiawa Stream, northwest of stream and southeast of Hulua, wet forest dominated by *Metrosideros*, *Antidesma*, *Cyrtandra* spp., and *Athyrium*, with *Diplazium* and *Deparia*, single stemmed shrub of 5 ft, along edge of stream, leaves dark, semi-glossy green above with whitish-green midrib, below silvery, whitish-green with yellow-green midrib, inflorescence pendulous, fruit erect, 650–730 m elev., 7 Dec 1988, *Flynn & Wood 3229* (PTBG); Wahiawa, south of Kapalaoa, below and along west ridge, *Metrosideros* wet forest with *Psychotria hexandra*, *Kadua affinis*, *Perrottetia sandwicensis*, *Broussaisia arguta*, *Cibotium glaucum*, *Diplazium sandwichianum*, *Diplopterygium*, *Psidium cattleianum*, *Rubus rosifolius*, *Pritchardia flynnii*, *Labordia lydgatei*, *Myrsine linearifolia*, *Dubautia imbricata*, *Cyrtandra pickeringii*, *Platydesma rostrata*, 2 meter tall, branching 2–3 times, leaves dull green above, pale below, petiole and costa yellow-green, peduncle light green, corolla white with purple stripes, 805 m elev., 8 Sep 1998, *Wood et al. 7470* (PTBG); Wahiawa drainage, side drainage below rope trail, *Metrosideros-Dicranopteris* lowland wet forest with *Cheirodendron*, *Kadua affinis*, *Broussaisia*, *Ilex anomala*, *Pittosporum glabrum*, wind swept forest and shrublands along upper ridges, threats include pigs, *Rubus rosifolius*, *Psidium cattleianum*, 3 clumps multi-trunked, up first side gulch north of main stream, east side of gulch. 760 m elev., 26 Mar 1993, *Wood 2119* (PTBG); Wahiawa Mts., northeast of Hulua, near Waimea-Kōloa District boundary, *Metrosideros-Cheirodendron* spp. lowland wet forest with *Broussaisia*, *Melicope*, *Kadua*, *Freycinetia*, *Pritchardia*, *Antidesma*, *Psychotria*, *Elaphoglossum*, *Viola helenae*, *Cyrtandra*, *Hesperomannia*, *Dubautia imbricata*, *Dicranopteris*, 1 plant observed in gulch with 2 seedlings, plant 6 ft, with flowers, 2420 ft elev., 6 Sep 1991, *Perlman et al. 12235* (F, PTBG, US); Wahiawa Mts., Kapalaoa Peak, gulch south of peak, *Metrosideros-Dicranopteris linearis* wet forest with *Cheirodendron*, *Broussaisia*, *Machaerina angustifolia*, *Dubautia laxa*, *Polyscias*, *Embelia*, *Myrsine*, *Scaevola*, *Psychotria*, *Labordia waialealae*, *Syzygium sandwicensis*, *Sadleria*, *Rubus rosifolius*, *Dubautia imbricata*, *Perrottetia*, 2440 ft. elev., 4 Oct 1996, *Perlman et al. 15606* (PTBG).

Convolvulaceae

Merremia

Two species of *Merremia* were recorded by Wagner *et al.* (1990: 563) as being naturalized in the Hawaiian Islands, namely *M. aegyptia* (L.) Urb. and *M. tuberosa* (L.) Rendle. Imada *et al.* (2000: 11) report a third species, *M. umbellata* (L.) Hallier f. as being fully naturalized on windward O'ahu and *Merremia peltata* (L.) Merr. is now recorded for the first time as being naturalized in the archipelago. The four *Merremia* species in Hawai'i can be separated by characters given in the following key.

Key to *Merremia* in the Hawaiian Islands

1. Leaves palmately lobed to palmately compound (2).
1. Leaves neither palmately lobed nor compound (3).
 - 2(1). Leaves palmately compound; plants usually reddish hirsute ... *M. aegyptia*
 2. Leaves palmately lobed but not compound; plants glabrous ... *M. tuberosa*
 - 3(1). Leaves peltate (except rarely on distal leaves), rounded at base ... *M. peltata*
 3. Leaves not peltate, truncate to cordate or hastate at base ... *M. umbellata*

Merremia peltata (L.) Merr.

New naturalized record

This twining vine with broadly ovate-orbicular, peltately attached leaves has not been previously recorded as naturalized in the Hawaiian Islands. It is currently reported in two locations ½ mile apart in Wainiha Valley, Kaua'i, where it is a rampant climber covering numerous acres and quickly smothering vegetation. Fosberg & Sachet (1977) describe its distribution as Indo-Pacific, from Africa to Tahiti [Society Islands]. My observation of this species in Micronesia leads me to believe that *Merremia peltata* is a very serious invasive species that should be closely watched and managed here in Hawai'i.

Material examined. **KAUAI:** Wainiha Valley, south side of river, between power house and Maunahina, sterile, 152 m elev., 27 Oct 1999, *Keith Robinson s.n.* (BISH, PTBG).

Dryopteridaceae

Ctenitis squamigera (Hook. & Arn.) Copel. **Range rediscovery**

Ctenitis squamigera was historically recorded from Kaua'i, O'ahu, Moloka'i, Lana'i, and Maui (HBMP 2011), but considered possibly extinct on Kaua'i (Palmer 2003: 102). Amos Heller made the only collection on Kaua'i in 1896 above Waimea at 2000 ft elev. He notes that the plant was on the face of a perpendicular rock in gulch and exposed directly to the afternoon sun. Heller also indicates that *C. squamigera* was not observed in other locations during his research on Kaua'i (Heller 1897). After 115 years of not being observed on Kaua'i, recent field research within mesophytic forests of Kōke'e has unveiled two new locations for this federally listed endangered fern, namely Nu'ololo and Awa'awapuhi Valleys. The following collections represent this exciting rediscovery.

Material examined. **KAUAI:** Nu'ololo, north facing slopes above drainage, *Metrosideros-Acacia* montane mesic forest, 70–80% canopy cover, ca. 80% understory, 35–40 degree slope, 40 degree north aspect, up to 20 m tall canopy, with *Pouteria*, *Xylosma hawaiiensis*, *Claoxylon*, *Wikstroemia furcata*, *Dodonaea*, *Kadua affinis*, *Melicope ovata*, *Pleomele*, *Polyscias kavaensis*, *Psychotria greenwelliae* & *P. mariniana*, *Zanthoxylum dipetalum*, *Nestegis*, *Diplazium*, immediate area has 20% *Myrsine lanaiensis*, 5% *Pittosporum kauaiensis*, some *Alphitonia ponderosa*, *Carex meyenii*, *Dianella sandwicensis*, threatened by deer, rats, 10% cover of *Lantana camara*, with *Rubus argutus*, *Hedychium gardnerianum*, *Kalanchoë pinnata*, *Sphaeropteris cooperi*, *Adiantum hispidulum*, *Psidium cattleianum*, rhizome terrestrial sub-erect with abundant staminate scales which continue up stipe and rachis, 5 fronds, protected on steep slope with boulder outcrops, adjacent *Dryopteris sandwicensis*, *Doodia*, *Microlepia strigosa*, single plant, 1006 m (3300 ft), 19 Feb 2011, *Wood & Query 14524* (BISH, PTBG); Awa'awapuhi, north facing slopes, *Metrosideros-Acacia* montane mesic forest, with *Pouteria*, *Xylosma hawaiiensis*, *Antidesma*, *Diospyros sandwicensis*, *Wikstroemia furcata*, *Leptecophylla tameiameia*, *Kadua affinis*, *Melicope ovata*, *M. barbiger*, *Euphorbia atrococca*, *Pleomele*, *Polyscias kavaensis*, *Psychotria greenwelliae*, *Zanthoxylum dipetalum*, *Nestegis*, rhizome terrestrial, 4 cm wide × 7 cm long, 7 healthy fronds with skirt of old fronds, under 90% forest cover, with *Microlepia strigosa*, *Hillebrandia sandwicensis*, *Lepidium serra*, *Melicope pallida*, *Remya kauaiensis*, *Pritchardia minor*, 1 plant on steep rock outcrop with soil pockets, large 12 m tall *Alphitonia ponderosa* near-by, with adjacent *Psychotria mariniana*, *Dodonaea viscosa*, *Myrsine lanaiensis*, single plant, threatened by pig, deer, rats, *Erigeron karvinskianus*, *Psidium cattleianum*, *Lantana camara*, *Rubus argutus*, *R. rosifolius*, *Adiantum hispidulum*, *Blechnum appendiculatum*, *Hedychium gardnerianum*, *Kalanchoë pinnata*, *Sphaeropteris cooperi*, 951 m (3120 ft), 5 May 2011, *Wood & Query 14639* (PTBG).

Euphorbiaceae

Euphorbia prostrata Aiton

New island record

Previously recorded on Midway, Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, Kaho'olawe, and the Big Island of Hawai'i (Wagner, Herbst *et al.* 1999; Hughes 1995), the prostrate sedge is now documented on Ni'ihau's offshore islet of Lehua.

Material examined. **NIHAU:** Lehua Islet, West Horn, *Sida fallax* shrubland with *Tribulus cistoides*, *Waltheria indica*, *Jacquemontia ovalifolia* subsp. *sandwicensis*, several native grasses such as *Panicum torridum*, *Panicum fauriei* var. *latius*, and *Panicum pellitum*, relatively bare with ca 75% of the ground being exposed barren tuff along with many hundreds of naturally hallowed burrows, decumbent stems pink or green-purple, leaves green or green-red, cyathial gland white, uncommon, island record, 30 m elev., 2 May 2009, *Wood 13714* (BISH, PTBG, US).

Lamiaceae***Phyllostegia knudsenii*** Hillebr.**Possibly extinct**

Previously known only from the type collection made in the woods of Waimea (*Knudsen 190, B*) and listed as extinct by Wagner *et al.* (1990: 819), *Phyllostegia knudsenii* was rediscovered May 1993 (Lorence *et al.* 1995) in Koai'e Canyon and subsequently found in upper Kawai Iki Valley on 25 Sep 2001. Unfortunately, both wild populations have since died, and there are no cultivated plants of this Kaua'i endemic mint.

Material examined. **KAUA'I:** Waimea Distr, Koai'e Canyon, upper canyon, in forest 21 m (70 ft) above stream, north-facing slope, 692 m (2270 ft) elev., 24 May 1993, *Wood & Perlman 2583* (PTBG); *loc. cit.*, 31 Aug 1994, *Perlman & Wood 14365* (PTBG); Kawai Iki, upper drainage above twin falls of Koai'e Canyon, *Metrosideros polymorpha* mixed mesic forest with *Gahnia beecheyi*, *Dianella sandwicensis*, *Dubautia laevigata*, *Kadua affinis*, *Cheirodendron trigynum*, *Psychotria mariniana*, *Poa sandwicensis*, *Bidens cosmoides*, *Peperomia membranacea*, *Peperomia latifolia*, and *Peperomia kokeana*, threats include goats, pigs, rats, *Rubus argutus*, *Kalanchoë pinnatum*, *Psidium cattleianum*, *Grevillea robusta*, *Myrica faya*, *Cyperus meyenianus*, *Passiflora mollissima*, *Lantana camara*, and *Setaria parviflora*, shrub 1 m tall, young plant with old inflorescence, 4 immature plants observed in general area, 330 deg aspect, 20 deg slope, in side-gulch bottom near main drainage, 1015 m elev. (3330 ft), 25 Sep 2001, *Wood 9115* (PTBG).

Lycopodiaceae***Huperzia filiformis*** (Sw.) Holub**New island record**

This delicately pendulous fern is considered indigenous to Hawai'i and Central and South America to Bolivia (Mickel & Smith 2004). In Hawai'i *Huperzia filiformis* was previously thought to be restricted to O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i (Palmer 2003). Further field research now indicates that *H. filiformis* is also present on Kaua'i, yet quite rare, within the headwater drainages of Wainiha and Wailua.

Material examined. **KAUA'I:** Hanalei Distr, headwaters of Wainiha River, northeast fork, just southwest of Mahinakehau Ridge, lowland wet forest with *Metrosideros polymorpha* dominant, also *Antidesma*, *Syzygium*, *Broussaia*, *Boehmeria*, & *Perrottetia*, with understory of pteridophytes, *Cyrtandra*, & *Cyanea*, epiphyte on *Perrottetia* tree 1.5 m above ground in moderate shade, stems pendulous, light green, very rare, a single plant seen at 825 m elev., 30 Jan 1993, *Lorence et al. 7346* (PTBG); Blue Hole, headwaters of Wailua River, below Wai'ale'ale and Kawaikini, near south facing cliffs below Blue Hole proper, ridge running 300 degrees down to stream, *Metrosideros* lowland wet forest with *Psychotria mariniana*, *Antidesma platyphyllum* var. *hillebrandii*, *Dianella sandwicensis*, *Polyscias oahuensis*, *Freycinetia arborea*, *Diplazium sandwichianum*, *Microlepia strigosa*, and *Sadleria pallida*, threatened by pigs, *Rubus rosifolius*, *Psidium guajava*, *Paspalum urvillei*, and *Mariscus meyenianus*, epiphytic rhizome on *Melicope paniculata*, stems pendulous, leaves medium green, sporangia yellow-white, rare, 610 m elev., 10 Dec 1998, *Wood 7631* (PTBG).

Malvaceae***Hibiscadelphus woodii*** Lorence &

W.L. Wagner (Fig. 1)

Possibly extinct

Four shrubs of *Hibiscadelphus woodii* were discovered in March 1991 clustered on a vertical cliff in Kalalau Valley, Kaua'i, increasing the total number of species for the endemic *Hibiscadelphus* to seven (Wood 1992; Lorence & Wagner 1995). Subsequent efforts to propagate *H. woodii* by air layering, cuttings, and grafting trials onto con-generic cultivated individuals had failed. Tests for *H. woodii* pollen viability proved negative, and cross pollination trials from *H. distans* showed no success. Micropropagation attempts at *in vitro* protocol development for apical and lateral meristem culture, callus culture uti-



Figure 1. *Hibiscadelphus woodii*. Kalalau cliffs, Kauaʻi. Photo: K.R. Wood.

lizing leaf and internode explants, and propagation by tip and stem cuttings had also failed. Although no fruit set was ever observed, flowering was documented during the months of March, April, July, and September. Flower visitations by birds include the native 'amakihi (*Hemignathus virens*). Introduced Japanese white eye (*Zosterops japonicus*) regularly pierced the corollas of *H. woodii* above the calyx, presumably robbing nectar. Three individuals of *H. woodii* were apparently crushed by a large fallen boulder and died between 1995 and 1998. On 17 August 2011, the last remaining *H. woodii* was observed dead. Previously, the final wild *H. hualalaiensis* died on the Big Island in 1992 (Wood & Perlman, pers. observ.). A total of six species of *Hibiscadelphus* are now extinct in the wild, two of which are maintained through cultivation (i.e., *H. giffardianus* and *H. hualalaiensis*). Only one species of *Hibiscadelphus* still survives in the wild, being *H. distans* from the dry to mesic canyon cliffs of Koai'e, Kauaʻi.

Material examined. **KAUAʻI:** Hanalei Distr, Kalalau Rim, north of Kahuama'a Flat, lowland mesic cliffs, 990–1020 m, 3 March 1991, Wood, Query & Montgomery 629 (holotype, PTBG, a flower also in spirit collection; isotypes, BISH, K, MO, NY, US).

Piperaceae

Peperomia subpetiolata Yunck.

Possibly extinct

Peperomia subpetiolata is an East Maui narrow endemic species known only from around the Kula Pipeline of lower Waikamoi (Yuncker 1933; Wagner *et al.* 1990). In the early 1990s it was estimated that around 40 individuals occurred in that region, both above and below the road. A putative hybrid between *P. subpetiolata* and *P. cookiana* was also documented in that area. The dense invasion of *Hedychium gardnerianum* below a nonnative forest canopy of *Eucalyptus* has left little open soil for herbaceous terrestrial species such as *P. subpetiolata* to survive. Recent field research has failed to locate any individuals of

P. subpetiolata and only hybrid individuals were observed (Wood 2001, 2009a; Oppenheimer & Perlman pers. observ.).

Material examined. MAUI: East Maui, Kula pipeline, Waikamoi, 5–6 Sep 1919, *Forbes 1283-M* (holotype, BISH); Kula pipeline, woods, 4500 ft elev., 11 Feb 1930, *St. John 10299* (BISH).

Poaceae

Dichantheium cynodon (Reichardt) C.A.

Clark & Gould

New island record

Gon (1994) describes a true bog on O‘ahu where several island plant records were observed (Kennedy *et al.* 2010: 21), including two endemic species of *Dichantheium*, both of which were documented during the discovery of the bog in February 1993. *Dichantheium cynodon* was previously recorded from Kaua‘i, Moloka‘i, and Maui (Wagner *et al.* 1990), and now reported on O‘ahu in association with *D. hillebrandianum*.

Material examined. O‘AHU: Ko‘olau Mountains, just below summit ridge, north of Pe‘ahināi‘a and south of Castle Trail, *Metrosideros-Rhynchospora* lowland bog with *Lobelia gaudichaudii* subsp. *koolauensis*, *Viola oahuensis*, *Dichantheium hillebrandianum*, *D. koolauense*, *Vaccinium dentatum* & *V. reticulatum*, *Metrosideros rugosa*, threatened by pigs, *Clidemia hirta*, *Axonopus fissifolius*, *Pterolepis glomerata*, *Juncus planifolius*, growing in tussocks within bog with *D. hillebrandianum*, common in bog, 25 Feb 1993, *Wood & Lau 2428* (PTBG, MO).

Dichantheium hillebrandianum (Hitcch.)

C.A. Clark & Gould

New island record

Dichantheium hillebrandianum was previously recorded from Kaua‘i, Moloka‘i, Maui, and Hawai‘i (Wagner *et al.* 1990) and is now documented on O‘ahu.

Material examined. O‘AHU: Ko‘olau Mountains, just below summit ridge, north of Pe‘ahināi‘a and south of Castle Trail, *Metrosideros-Rhynchospora* lowland bog with *Dichantheium hillebrandianum*, growing in tussocks within bog, east aspect, common only in bog, 25 Feb 1993, *Wood & Lau 2421* (PTBG, US).

Primulaceae

Lysimachia filifolia C.N. Forbes & Lydgate

Range rediscovery

Previously recorded on O‘ahu and Kaua‘i, yet not seen on Kaua‘i since 1912 when Lydgate made the holotype collection in upper Olokele below the Kawaikini summit (Wagner *et al.* 1990; Marr & Bohm 1997), *Lysimachia filifolia* was recently rediscovered below Kamanu ridge, eastern Kaua‘i, in the headwater region of Waikoko. Plants of this federally listed endangered species are being cultivated by the National Tropical Botanical Garden (NTBG). Wagner *et al.* (1990) report collections of *L. filifolia* from the Blue Hole region of Wailua, Kaua‘i, but these plants were subsequently described as a new species (i.e., *L. pendens* Marr). *Lysimachia filifolia* can be distinguished from *L. pendens* by its narrower leaves and non-tomentose stems, pedicels, and leaves (Marr & Bohm 1997). It is worth noting that plants of *L. filifolia* on Kaua‘i can be erect up to 1.5 m tall as compared to the O‘ahu plants which are smaller, more delicate, and only known to be pendulous. Further studies are needed to better understand their relationship.

Material examined. KAUA‘I: upper Olokele Valley, Jan 1912, *Lydgate 2* (holotype, BISH); Waikoko headwaters, below Kamanu ridge, S of Wailua River and above Wailua ditch, associated with *Cheirodendron*, *Pipturus* spp., *Dubautia*, *Cyrtandra*, *Kadua centranthoides*, *K. elatior*, *K. foggiana*, *Psychotria*, *Melicope*, *Machaerina*, *Isachne*, with ferns of *Microlepia*, *Asplenium*, *Cyclosorus*, *Deparia*, terrestrial in *Diplazium* with *Boehmeria grandis*, 1.5 m tall with erect stems brown-red, pendent corolla light purple, terrestrial near land slide and on wet cliff, ca 30 plants, threats include pigs, landslides, *Buddleia asiatica*, *Erigeron karvinskianus*, 732 m elev., 12 Jan 2008, *Wood 12774* (BISH, PTBG).

***Lysimachia venosa* (Wawra) H. St. John** **Possibly extinct**

Lysimachia venosa was originally discovered by Heinrich W. Wawra in 1870 on the summit of Mt Wai'ale'ale. This species was not observed again until 1911 when Joseph Rock also made a collection around Mt. Wai'ale'ale summit. In 1991 a small branch representing this taxon was found after a storm at the bottom of a 1000 m tall cliff (i.e., Blue Hole, below Wai'ale'ale, at the headwaters of Wailua River), with no indication of where the living plant might be located. *Lysimachia venosa* is presently considered possibly extinct since no living individuals are known.

Material examined. **KAUAI:** Summit of Mt Wai'ale'ale, 1600 m elev., Mar 1870, *Wawra 2165* (holotype, W; isotypes, W, BISH); Summit of Mt Wai'ale'ale, 1911, *Rock 8881* (BISH, GH); Wailua headwaters, north fork, Blue Hole, small branch found after storm at bottom of 1000 m tall cliff, 600 m elev., 7 May 1991, *Wood 784* (PTBG).

Rosaceae***Acaena exigua* A. Gray** **Possibly extinct**

After not being observed since 1957 a single plant of *Acaena exigua* was rediscovered in a West Maui bog in 1997 (Meidell *et al.* 1998; Oppenheimer *et al.* 2002; Wood 2005). During the period of 1997 to 2000, attempts at propagation failed and in early 2000 the only known plant died. Historically, *A. exigua* occurred in bogs on West Maui where its Hawaiian name is *liliwai*, and also on the island of Kaua'i where it was known as *nani* Wai'ale'ale. Numerous surveys have since been conducted around the West Maui bogs and throughout most of the summit bogs of Alaka'i and Nāmoloakama, Kaua'i, yet no other individuals of *A. exigua* have been documented (Wood 2006). Heinrich Wawra was the last one to observe it on Kaua'i in 1870. The extremely small size of *A. exigua*, with stems 1–4 cm long (Wagner *et al.* 1990) make it extremely difficult to locate. Although there is excellent bog habitat being protected on the summits of Kaua'i and West Maui indicating that there could be more individuals waiting to be discovered, *A. exigua* is now considered possibly extinct with no known living plants extant.

Material examined. **MAUI:** Lahaina Distr, Honokōhau, 1719 m elev., among bryophytes in mixed 'ōhi'a montane bog, 19 Mar 1997, *Meidell & Oppenheimer 194* (BISH).

Rubiaceae***Kadua haupuensis* Lorence & W.L. Wagner** **Possibly extinct**

Recently described and known only from a single location on the north side of Mt Ha'upu, Kaua'i, *Kadua haupuensis* was last observed in the wild when discovered in 1998 (Lorence *et al.* 2010). Plants from the holotype region of the mountain were evidently destroyed by a small rock slide and numerous attempts to locate additional plants of this species have failed. With no known wild individuals remaining, *K. haupuensis* is now considered possibly extinct. The quality of its habitat is rapidly declining due to animal disturbance such as rats, pigs, and goats, and invasive alien plant species including *Caesalpinia decapetala*, *Rhodomlyrtus tomentosa*, and *Passiflora laurifolia*. At the time of discovery, seeds were collected and plants are being cultivated at the NTBGS.

Material examined. **KAUAI:** Kōloa Distr, Ha'upu Range, north facing mesic forest, just below and along cliffs w of summit, 366 m, 23 Sep 1998, *Wood 7492* (BISH, MO, NY, PTBG, US).

Rutaceae***Melicope macropus* (Hillebr.) T.G. Hartley
& B.C. Stone** **Possibly extinct**

A Kaua'i endemic, *Melicope macropus* was historically known from the Kahōluamano

region of Waimea where Heller made a collection in 1885 and Faurie in 1910 (Stone 1969). Most recently it was observed in Kalalau in 1987, Honopū in 1991, and the upper Nu'ololo stream region in 1995. This taxon is poorly understood (Wagner *et al.* 1990) and the type designated by Hillebrand (i.e., *Knudsen 189*) was destroyed in Berlin (Stone 1969). Wagner *et al.* (1990) considered *M. macropus* to be rare and related to *M. kavaiensis* from which it differs in its puberulent exocarp, less overall pubescence and predominantly smaller leaves (Stone 1969). No living individuals of this species are known at this time.

Material examined. **KAUAI:** Hanalei Distr, Nā Pali-Kōna Forest Reserve, Kalalau Valley, steep, southwest slope between Kalalau and Pu'u O Kila lookouts, diverse forest of *Metrosideros*, *Xylosma*, *Nestegis* and *Cryptocarya*, elev. 3900–4100 ft, sprawling shrub of 4 ft, with *Cibotium*, *Dubautia*, and *Rubus*, 20 Mar 1987, Flynn *et al.* 2116 (PTBG); Hanalei District, Honopū, south of Kalalau lookout, by stream on west side of road, *Metrosideros* diverse montane mesic forest with *Labordia*, *Dubautia*, *Kadua*, *Nothocestrum peltatum*, and *Myrsine*, scandent shrub, in fruit, attractive and vigorous, threatened by pigs, *Rubus rosifolius*, *Hedychium gardnerianum*, 1200 m elev., 29 Aug 1991, Wood & Perlman 1182 (PTBG, US); Waimea Distr, upper Nu'ololo Stream, north branch, *Acacia-Metrosideros* montane mesic forest with *Psychotria grandiflora*, *Xylosma crenatum*, *Poa siphonoglossa* & *P. sandvicensis*, *Myrsine knudsenii*, *Nothocestrum peltatum*, *Dubautia latifolia*, *Bobea brevipes*, *Melicope macropus*, *Lobelia yuccoides*, *Alyxia stellata*, threats include pigs, deer, *Rubus argutus*, *Hedychium gardnerianum*, *Kalanchoë pinnata*, 3700–3800 ft, 1 m tall, diffusely branched shrub, sprawling stems 1 m long, stems dark-brown, petiole brown, leaves shiny, dark-green above, paler below, peduncle yellow-green, immature flower brown-red, branches with tan or white pubescence at apical tips, det. W.L. Wagner, 23 Nov 1995, Wood & Davis 4806 (PTBG).

Melicope nealae (B.C. Stone) T.G. Hartley

& B.C. Stone

Possibly extinct

Considered rare by Wagner *et al.* (1990), *Melicope nealae* was known from the Kahōluamano and Kumuwela regions of Kaua'i. Last observed in 1960 around Kumuwela, no living individuals are known of this taxon. *Melicope nealae* differs from *M. puberula* in its shrubby stature, glabrous endocarp, larger capsules, and predominantly obovate leaves (Stone 1969). Wagner *et al.* (1990) relate it to the *M. kavaiensis* complex, differing by its combination of puberulent exocarp, glabrous endocarp, and carpels connate ca. ½ their length.

Material examined. **KAUAI:** Kahōluamano, behind Waimea, Sep 1909, Forbes 341 (BISH); Kōke'e Plateau, level forested area north of Kumuwela Lookout, under *Psychotria*, *Zanthoxylum*, and *Platydesma*, a subscented low shrub with green pubescent capsules and pubescent leaves, elev. 3500 ft, 12 Apr 1960, B. C. Stone *et al.* 3359 (BISH, L, US).

Melicope quadrangularis (H. St. John &

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

Possibly extinct

Melicope quadrangularis is a Kaua'i endemic known from the holotype collection made in 1909, and rediscovered in the same general region of Wahiawa in May 1991 (Lorence *et al.* 1995). The rediscovered population was subsequently destroyed by Hurricane Iniki in September 1992 (Wood 2009b, 2011). *Melicope quadrangularis* is easily distinguished on Kaua'i by its large 12–14 mm long × 19–22 mm wide, cube-shaped capsules with central depression at apex. Numerous surveys in the Wahiawa region have failed to relocate any living individuals of this species.

Material examined. **KAUAI:** Vicinity of Wahiawa Swamp, Aug 1909, C. N. Forbes 273.K (holotype, BISH); Līhu'e Distr, Wahiawa, drainage between Hulua and Kapalaoa, *Metrosideros-Dicranopteris* lowland wet forest with *Syzygium*, *Polyscias oahuensis* & *P. waialealae*, *Labordia*, *Perrottetia*, area rich with bryophytes, threats include severe storms, pigs, rats, *Psidium cattleianum*

& *P. rosifolius*, *Melastoma candidum*, 820 m, 2 m tall, branches ascending, collected below *M. quadrangularis* population of 9 trees, 4 trees in immediate area, 20 May 1991, *Wood et al. 0859* (PTBG); *loc. cit.*, with *Broussaïsaia*, *Eurya*, *Cyanea coriacea*, *Labordia hirtella*, *Syzygium*, 850 m, 4 m tall tree, single tree in fruit, 13 cm diameter at base, vigorous, east aspect, 20 May 1991, *Wood et al. 0858* (PTBG).

Thelypteridaceae

Cyclosorus pendens (D.D. Palmer) N. Snow

[Syn. *Pneumatopteris pendens* D.D. Palmer]

Range rediscovery

Recently described by Palmer (2005), yet historically known from the islands of Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, *Cyclosorus pendens* has been taxonomically confused with *C. sandwicensis* by numerous collectors and botanists. The genus *Pneumatopteris* was recently merged into *Cyclosorus* (Snow *et al.* 2011). Collections date back to 1909 when it was first documented by C. N. Forbes in Olokele Valley, Kaua'i. Palmer considered *C. pendens* to be extinct on Kaua'i and only cited recent collections on O'ahu, Moloka'i, Maui, and Hawai'i (Palmer 2005). The following collection made around the falls of Hanakāpī'ai indicates that it is still extant on Kaua'i.

Material examined. **KAUAI:** Na Pali coast, Hanakāpī'ai falls, base of wet cliff, to left of falls along narrow ledge, growing with *Selaginella arbuscula*, *Deparia petersenii*, *Blechnum appendiculatum*, very small plants of *Tectaria gaudichaudii*, also *Christella cyatheoides* and a native *Deparia* sp. in the area, det. A. Smith, 6 Apr 2007, *A. R. Smith 2918* (PTBG, UC).

Zingiberaceae

Curcuma longa L.

New island record

An Indian perennial herb, semi-wild populations of turmeric ('ōlena) have been previously recorded from Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1990). Recent research around the remote headwater region of Wainiha has documented *Curcuma longa* growing adjacent to ancient rock walls. Rhizomes have been collected and are being cultivated at the NTBG.

Material examined. **KAUAI:** Wainiha Valley, around confluence of upper east and west fork, *Metrosideros* 40-60% closed forest with 12-15 m tall canopy, understory of *Perrottetia*, *Psychotria* spp, *Dubautia* spp, *Labordia* spp, *Polyscias kavaïensis*, *P. oahuensis*, rich fern and bryophyte understory, 472 m elev., 18 Jun 2008, *Wood et al. 13135* (BISH, PTBG).

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