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# New Hawaiian plant records from *Herbarium Pacificum* for 2019

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Reducing the backlog of unprocessed historical collections in Bishop Museum's *Herbarium Pacificum*, combined with a sweep through the Hawaiian vascular plant database, has revealed a number of new plant records for the Hawaiian Islands. Among these are four new state records (naturalized taxa previously unrecorded in Hawai'i), four new naturalized records (naturalized taxa previously known only in cultivation in Hawai'i), numerous new island records (naturalized taxa now reported on a new island), and one cultivated species showing signs of adventive naturalization. Among the 51 taxa included in this paper, all are introduced except for 4 native taxa (*Cyperus hillebrandii* var. *hillebrandii, Microlepia strigosa* var. *mauiensis, Peperomia cookiana, Panicum fauriei* var. *carteri*). All identifications of taxa included in this paper were made by staff of Bishop Museum's Department of Natural Sciences/Botany, except where noted in the acknowledgments, and all supporting voucher specimens are on deposit at *Herbarium Pacificum* (BISH), except as otherwise noted.

Readers of the *Records of the Hawaii Biological Survey* should note that *Herbarium Pacificum* subscribes to the taxonomic constructs recommended by the Angiosperm Phylogeny Group (1998, 2003, 2009, 2016) and Pteridophyte Phylogeny Group (2016). As such, some genera are placed in families that may be unfamiliar to those who are intimately familiar with Wagner *et al.* (1990, 1999) and Palmer (2003) (*e.g., Atriplex* in Amaranthaceae, not Chenopodiaceae; *Lemna* in Araceae, not Lemnaceae; *Cuscuta* in Convolvulaceae, not Cuscutaceae; *Azolla* in Salviniaceae, not Azollaceae). A review of recent taxonomic and nomenclatural changes affecting naturalized taxa in Hawai'i can be found in Imada (2019; see Appendix A for updated synonymy listing); also included is an alphabetical listing of all families and genera of naturalized taxa in Hawai'i, dating back to Wagner *et al.* (1990) and Palmer (2003), along with their current dispositions.

**Acanthaceae**

***Justicia secunda*** Vahl **New state record**

*Justicia* is a large genus of ca. 700 species (Mabberley 2017) mostly distributed throughout tropical regions of the world. It is separable from many other cultivated acanth genera in Hawai'i by its distinctly 2-lipped (as opposed to more openly spreading) corollas with 2 fertile stamens. Up to now, four species of *Justicia* have been documented as naturalizing in the Hawaiian Islands: *J. betonica* L. (white shrimp plant), *J. carnea* Lindl. (flamingo flower), *J. spicigera* Schltdl. (see Imada 2019 for details), and, most recently, *J. gendarussa* Burm. f. (Frohlich & Lau 2020). A new naturalizing species of *Justicia* was

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first observed and collected in 2018 by Talbert Takahama, biologist with the Hawai‘i State Department of Land and Natural Resources–Division of Fish and Wildlife, along Poamoho Stream in central O‘ahu. Exploring the streambank between 1,000 and 1,200 feet (305–365 m) elevation, he observed that the plant was the predominant understory species, in association with an alien overstory of *Psidium cattleyanum*, *Ardisia elliptica*, *Citharexylum caudatum*, *Eucalyptus* spp., and *Falcataria moluccana*. Field photos were sent to Tom Daniel (California Academy of Sciences), who thought they matched *J. secunda* Vahl, a species whose native range includes the West Indies, Panama, and Colombia (Durkee 1978). Subsequent study of the *Justicia* key and description in the Acanthaceae treatment of the *Flora of Panama* (Durkee 1978) by *Herbarium Pacificum* staff confirmed its identification. The following plant characters are extracted from Durkee's description:

> "Herb to ca. 2 m tall. Leaves ovate to lanceolate, to 16.5 cm long and 6.5 cm wide, apically acuminate, basally acute or obtuse, the cystoliths numerous and prominent to ca. 2 mm long, the margins entire to crenulate; petioles to 3 cm long. Inflorescences thyrsoid to paniculate, mostly terminal, 5–15 cm long, 7 cm broad; rachis with the peduncle and the pedicel pilose; bracts linear to subulate, to ca. 6 mm long and 0.5 mm wide, keeled, ciliolate. Flowers with the calyx 5-merous, the segments elliptic oblong, equal, to 9 mm long, 2 mm wide, apex acuminate; corolla red or purplish red, bilabiate, 2.5–4.3 cm long, the tube short, ca. 1 cm long, 3 mm wide at base, 5 mm wide at the throat, the upper lip to 32 mm long and 8 mm wide with two small 1 mm wide, acute lobes at the apex, the lower lip slightly longer, to 35 mm long and 6.5 mm wide with 3 small, ca. 2 mm long, semiorbicular lobes at the apex, the middle lobe 2 mm wide, the lateral lobes 1.5 mm wide; stamens extending about as far as the upper lip and mostly within it, the anthers usually exposed at maturity, the cells subparallel, attached unequally by a connective 0.5–0.75 mm wide, filaments glabrous, flattened; style held within the upper lip, extending just beyond the stamens, increasingly puberulous toward the tip, the stigma subcapitate. Capsule clavate, ca. 1 cm long, 5 mm wide, the apex acute."

*Justicia secunda* apparently has no prior recorded history of cultivation in Hawai‘i, and its weediness in other countries is undocumented. Three of the already-naturalized *Justicia* species (*J. betonica, J. carnea, J spicigera*) have received high-risk scores for invasiveness potential in Hawai‘i (Hawaii-Pacific Weed Risk Assessment 2009b). The leaves are used in folkloric medicine for anemia, wound-healing, and abdominal pain in tropical countries ranging from Barbados (where it is called blood root) to Venezuela (called sanguinaria) and Nigeria, Congo and Côte-de-Ivoire in Africa, and laboratory studies have confirmed its anti-inflammatory, antinociceptive (blocking the sensation of pain), and antioxidant properties (Onoja *et al.* 2017). The following is a key to the five species of *Justicia* now documented as naturalized in the state (derived from Leonard 1958; Durkee 1978, 1986; Staples & Herbst 2005; Hu & Daniel 2011).

1. Infl bracts conspicuous, white netted with green veins … *J. betonica*
1. Infl bracts green or inconspicuous (2).
2(1). Leaves narrowly lanceolate, 6–10 cm long, 1–1.5 cm wide; flowers creamy white … *J. gendarussa*
2. Leaves ovate to oblong or lanceolate, but not narrowly lanceolate, up to 25 cm long, 9 cm wide; flowers red, purplish red, pink, or orange (3).

3(2). Inflorescence a dense terminal panicle; flowers pink (sometimes rose or white) … *J. carnea*
3. Inflorescence more open, a thyrse, panicle, or raceme, terminal or axillary; flowers red to purplish red or orange (4).
4(3). Flowers orange; leaf bases decurrent along petiole … *J. spicigera*
4. Flowers red to purplish red; leaf bases acute to obtuse, petiole distinct ... *J. secunda*

*Material examined*. **O'AHU**: Poamoho Stream north of Whitmore Village, sometimes dominant along stream trail in alien forest, Lat 21.52645661, Long -158.00334133, 1,050 ft [320 m], 18 Dec 2018, *T. Takahama s.n.* (BISH 775085).

***Ruellia squarrosa*** (Fenzl) Cufod. **New naturalized record**

A genus of ca. 350 species, *Ruellia* naturally occurs in the tropics and temperate North America and includes a number of cultivated ornamental species (Mabberley 2017); six of them are treated in *A Tropical Garden Flora* (Staples & Herbst 2005), and three of the six—*R. brevifolia, R. brittoniana, R. devosiana*—were previously documented as escaping from cultivation and naturalizing (Imada 2019). Now a fourth species—*R. squarrosa*, fringe-leaf ruellia—has been documented as naturalizing, likely an escape from cultivation on O'ahu, where it was noted as a common groundcover on the banks of a windward O'ahu stream channel growing with *Sphagneticola trilobata*, *Hiptage benghalensis*, and *Pilea microphylla*. The species has been profiled as displaying high risk characters for invasiveness (Hawaii-Pacific Weed Risk Assessment 2009c), and this native of Veracruz, Mexico has been documented as naturalizing in Reunion Island, Australia, and Okinawa. Its ecological preferences in Sydney, Australia, along shaded creekside areas (Hawaii-Pacific Weed Risk Assessment 2009c), mirror those at the O'ahu collection site. Besides producing numerous seeds (each capsule contains 12 seeds), the species is easily propagated by cuttings or division of clumps (Staples & Herbst 2005). *Ruellia squarrosa* has been cultivated in Hawai'i at least since 1960, when it was collected in Honolulu's Foster Botanical Garden (*C. Potter s.n.,* BISH 20089). The species is an herb 3–4.5 dm tall, softly hairy on all parts; leaf blades opposite, lanceolate, 3–8 cm long; and flowers solitary, axillary, purple or bluish purple, ca. 6 cm long (Staples & Herbst 2005). The following is a key to the six species of *Ruellia* now documented as naturalized in the state.

1. Leaves green, whitish along veins on upper side, ± purplish on underside ... *R. devosiana*
1. Leaves uniformly green on both sides (2).
2(1). Erect herb; flowers in terminal, cymose panicles (3).
2. Prostrate herb or low groundcover; flowers solitary in leaf axils (5).
3(2). Flowers in spikes; bracts imbricate ... *R. blechum*
3. Flowers in panicles, or solitary; bracts not imbricate (4).
4(3). Flowers lavender; leaves narrowly linear-lanceolate ... *R. brittoniana*
4. Flowers red; leaves ovate ... *R. brevifolia*
5(2). Prostrate herb, often rooting at nodes; floral bracts 15–23 mm long; flowers 2.4–3.2 cm long, corolla violet blue to nearly white ... *R. prostrata*
5. Low groundcover up to 4.5 cm tall; floral bracts 8 mm long; flowers 5.5 cm long, corolla purple or bluish purple ... *R. squarrosa*

*Material examined*. **O'AHU**: Kāne'ohe, Kea'ahala Stream, just below Wailele Bridge overpass, common trailing herb on damp, rocky streamside banks under heavy canopy of *Ficus microphylla, Syzygium cumini, Schefflera actinophylla,* ca 50 ft [15 m], 12 Jun 2001, *C. Imada, R. Englund & D. Preston 2001-48*.

**Amaranthaceae**

***Amaranthus spinosus*** L. **New island record**

This widespread, troublesome weed was recorded in Wagner *et al.* (1990, 1999: 188–189) as naturalized on Kure Atoll and all of the main Hawaiian Islands except Niʻihau and Lānaʻi, and subsequently recorded from Midway Atoll (Starr *et al.* 2002: 17) and Lānaʻi (Oppenheimer 2003:5). On Lehua, a tuff cone remnant off the coast of Niʻihau, 70 naturalizing mature and 10 immature plants were pulled and bagged. Spiny amaranth has been characterized as being one of the 18 most serious agricultural weeds in the world (Holm *et al.* 1977).

*Material examined.* **LEHUA**: East of weatherport on ridge above restoration plantings, sparse non-native scrubland with *Pluchea indica* dominant in gulches and open areas of lithified ash with non-native grasses, 41 m, 22 Feb 2007, *N. Tangalin 1657*.

***Atriplex muelleri*** Benth. **New state records**

*Atriplex* is a genus of ca. 300 species mostly found in temperate and subtropical parts of the world (Mabberley 2017). Many species are halophytic, as its common name saltbush suggests. It can be mistaken for species of *Chenopodium*, except that *Atriplex* has usually unisexual flowers, and the female flowers are subtended by two distinctive fleshy or hardened bracts at maturity, while in *Chenopodium* the flowers are usually perfect and devoid of subtending bracts. Wagner *et al.* (1990) treated four naturalized species (*A. eardleyae*, *A. lentiformis*, *A. semibaccata*, *A. suberecta*). Subsequently, *A. maximowicziana* (Wagner *et al.* 1997: 55) and *A. canescens* (Staples *et al.* 2003: 10) were both added as new records, both restricted to the island of Hawaiʻi. Now a seventh naturalized species, *A. muelleri*, has been documented on Oʻahu and Maui. In Wagner *et al.* (1990: 535), *A. muelleri* was treated as a name misapplied to *A. suberecta*. The species are similar, differing by characters of the fruiting bracts (teeth large, deltate in *suberecta*; short, rounded in *muelleri*) and leaf apices (rounded in *suberecta*, truncate in *muelleri*). In Australia, where both species are native, they are differentiated primarily by these key characters (Wilson 1984; Jacobs 1990). Confirmation of identification was received by botanists at the Western Australian Herbarium (M. Hislop) and University of Adelaide (J. McDonald). To the first author, the plump bracteoles resemble tiny Chinese dim sum potstickers. Hawaiian material is described as a sprawling or semi-erect subshrub, and was sometimes collected in coastal salty substrates, sometimes in inland waste areas. The following key separates the naturalized *Atriplex* species in Hawaiʻi.

1. Perennial shrubs, stems ascending or sprawling, 8–30 dm long (2).
1. Annual or perennial herbs, stems ascending or prostrate, 2–15 dm long (3).
2(1). Pistillate flowers in dense terminal panicles; fruiting bracts orbicular-ovate; leaves oblong to ovate-deltate, 1.5–4 cm long, 5–25 mm wide ... *A. lentiformis*
2. Pistillate flowers in reduced terminal panicles; fruiting bracts forming 4 wings; leaves linear to oblanceolate, 0.8–5 cm long, 3–8 mm wide ... *A. canescens*
3(1). Stems prostrate; fruiting bracts fleshy, reddish-tinged to red ... *A. semibaccata*
3. Stems procumbent to ascending; fruiting bracts not as above (4).
4(3). Fruiting bracts fan-shaped ... *A. eardleyae*
4. Fruiting bracts rhombic (5).
5(4). Inflorescences in terminal spikes ... *A. maximowicziana*
5. Inflorescences in axillary clusters (6).

6(5). Bracteoles swollen, rounded, apex obtuse with all teeth ± equal in length; leaf apex obtuse ... *A. muelleri*
6. Bracteoles compressed, rhomboid to deltoid, apex acute with one tooth more prominent; leaf apex acute to obtuse ... *A. suberecta*

*Material examined*. **O'AHU**: Wai'anae Mts., upper Makakilo, adjacent to subdivision at end of Pueonani St., common curbside weed, 700 ft [215 m], 09 Mar 2004, *C. Imada & L.M. Crago 2004-25*; Waipahu, Pouhala Marsh, above water mark and salt line in drier red soil, in full sun, 24 Jan 2005, *L.M. Crago & T. Erickson 2005-027*; Wheeler Army Airfield, growing in soil pile containing several plants not frequently found on base, 5 plants seen, seedlings present, 820 ft [250 m], 13 Feb 2017, *J. Beachy & J. Gustine-Lee USARMY 461*. **MAUI**: Kanahā, naturalized small shrub in sand on beach east of treatment plant and west of drainage, sea level, 25 Mar 2000, *F. Starr & K. Martz 000325-1.*

**Araceae**

***Lemna obscura*** (Austin) Daubs **New island record**

Species of *Lemna*, duckweed, are among the world's smallest flowering plants, making them difficult to identify. They are also among the fastest-multiplying of vascular plants, due to their ready ability to propagate vegetatively by budding, and can completely cover slow-moving bodies of water in short order (Staples & Herbst 2005). Wagner *et al.* (1990: 1457–58) treated a single species in Hawai'i, *L. perpusilla* Torr., which was regarded as possibly naturalized or indigenous, due to the ease with which it may have been transported naturally to the Islands via migrating water birds. Wagner *et al.* (1997: 58) later corrected the identity of the known *Lemna* species to *L. aequinoctialis* Welw., based on taxonomic work by Landolt (1986), and also documented a new state record for *L. obscura* on O'ahu and Hawai'i. At that time, it was reported that the new Hawaiian records represented the only known distribution of *L. obscura* outside of its native range in southeastern North America (Wagner *et al.* 1997). Landolt (2000) extends the natural range of the species to central Mexico, Colombia, and Ecuador, and provides key characters for distinguishing the taxa: *L. aequinoctialis* with root sheath winged at the base, root tip usually sharp pointed, roots to 3(–3.5) cm long, and fronds without a reddish color or spots of anthocyanin; *L. obscura* with root sheath not winged, root tip mostly rounded, roots often longer than 3 cm, and fronds often with a reddish tinge or spots of anthocyanin. A naturally occurring collection on Kaua'i now extends its Hawaiian distribution.

*Material examined*. **KAUA'I**: Līhu'e Distr., near mouth of Wailua River, west side of Hwy 56 (south side of river) at extreme west end of Smith's Tropical Paradise Botanical Garden, homogeneous populations in ponds of *Hibiscus tiliaceus* marsh, 6 m, 20 Aug 1999, *W.P. Armstrong & E.M. Collins 1338.*

***Pistia stratiotes*** L. **New island record**

Previously documented as naturalized on Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.* 1990, 1999: 1359), this highly invasive weed of waterways has also been documented on the Big Island.

*Material examined*. **HAWAI'I**: Ka'ū , in a pond behind Punalu'u Beach, covering entire pond, along with patches of water hyacinth and water lilies, sea level, 04 May 2006, *B.H. Gagne 3154*.

**Asteraceae**

***Emilia sonchifolia*** (L.) DC.
var. ***javanica*** (Burm. f.) Mattf. **New island records**

Previously recorded as naturalized from Kauaʻi and Oʻahu (Wagner *et al.* 1990, 1999: 312), East Maui (Wagner *et al.* 1997: 52), and Lānaʻi (Oppenheimer 2008: 24), recently identified decades-old specimens from 1948 (Molokaʻi) and 1979 (Hawaiʻi) extend the known Hawaiian range for *E. sonchifolia* var. *javanica*.

*Material examined*. **MOLOKAʻI**: Kualapuʻu, common in ravine sides, roadsides, etc., in pineapple field, 21 Feb 1948, *F.R. Fosberg 29545*. **HAWAIʻI**: Puna District, Halepuaʻa Forest Reserve, experimental tree planting area, 100 ft [30 m], 15 Aug 1979, *ESP Field Crew s.n.* (BISH 656177, 656178).

***Gamochaeta purpurea*** (L.) Cabrera **New island record**

Originally recorded as naturalized (as *Gnaphalium purpureum*) on all of the main Hawaiian Islands except for Niʻihau (Wagner *et al.* 1990, 1999: 321), Wagner *et al.* (1997: 54) reported that the genus had been transferred to *Gamochaeta*. Alford (2012) updated the taxonomy for Hawaiian plants, and reported that there were four additional naturalized species of *Gamochaeta* in the islands. In the shuffle of specimens, all *G. purpurea* vouchers from Lehua, Kauaʻi, Lānaʻi, and Kahoʻolawe were renamed, and the known distribution of *G. purpurea* was reduced to Oʻahu, Molokaʻi, Maui, and Hawaiʻi. The following voucher confirms that the species does occur on Kauaʻi.

*Material examined*. **KAUAʻI**: Nāpali coast, Nualolo Kai, on weedy talus slopes toward back wall of valley, 15 m, 30 Apr 2010, *N. Tangalin 2295.*

***Tridax procumbens*** L. **New island record**

Coat buttons is a common weed of low elevation, dry, disturbed habitats, which Wagner *et al.* (1990, 1999: 370) recorded from Midway Atoll and all of the main Hawaiian Islands except for Niʻihau. It has now been documented from nearby Lehua islet.

*Material examined*. **LEHUA**: Western crescent arm, growing on islet crest on open, dry, windswept, sparsely vegetated habitat on lithified ash, 107 m, 28 Oct 2008, *N. Tangalin, J. Carbone, C. Trauernicht, & E. Griffin-Noyes 1823*.

**Basellaceae**

***Basella alba*** L. **New island records**

Previously documented as naturalized only on Oʻahu (Nagata 1995: 11) and Midway Atoll (Wagner *et al.* 2012: 17), vouchers dating back to the 1990s of this cultivated twiner, called Malabar nightshade or Ceylon spinach, from Kauaʻi and Hawaiʻi, suggest that it is naturalized on those islands as well.

*Material examined*. **KAUAʻI**: North shore of Hanamāʻulu Bay, on banks above high water line, well naturalized, 22 May 1991, *L. Hume & R. Levine 515*. **HAWAIʻI**: ʻUpolu Point, population of approximately 25 on strand, ca 30–46 m, Oct 1997, *V. Caraway 152*.

**Brassicaceae**

***Lepidium didymum*** L. **New island record**

Reported from all the main islands as well as Midway and Pearl & Hermes Atolls of Papahānaumokuākea (Wagner *et al.* 1990, 1999: 403), the range of swinecress was extended to Laysan (Staples *et al.* 2003: 9), and now Kure Atoll, based on this 1979 collection. Formerly known in the literature as *Coronopus didymus* (L.) Sm., the genus was sunk into *Lepidium* based on molecular evidence (Al-Shehbaz *et al.* 2002).

*Material examined*. **KURE ATOLL**: Green Island, around LORAN buildings and roadsides in that area, 04 Jan 1979, *D.R. Herbst, C.H. Lamoureux & C. Corn 6252*.

**Cactaceae**

***Selenicereus setaceus*** (Salm-Dyck ex DC.) A. Berger ex Werderm. **New naturalized record**

Collections of this climbing cactus, made 20 years or more ago in Kōloa District on Kauaʻi, are still extant (D. Lorence, pers. comm., March 2020) and are now formally included in the Hawaiian naturalized plant ensemble. *Selenicereus setaceus* occurs in the same part of Kauaʻi in which other cacti have been reported as naturalizing, among them *Acanthocereus tetragonus, Harrisia bonplandii,* and *Selenicereus macdonaldiae* (all reported in Lorence *et al.* 1995), as well as *Cereus uruguayanus* and *Harrisia martinii* (reported in Wagner *et al.* 1990, which notes that many cacti species in that area were reportedly introduced by the Moir family). [Note: The *Selenicereus macdonaldiae* record was originally misidentified as *S. grandiflorus* (L.) Britton & Rose, a change reported in Herbst & Wagner 1999: 16]

Species of *Selenicereus* and *Hylocereus* (such as the well-known night-blooming cereus, *H. undatus* (Haw.) Britton & Rose) are very similar with their climbing, scrambling habit and spectacular, usually white, night-blooming flowers. In fact, recent phylogenetic work by Korotkova *et al.* (2017) found that *Hylocereus* was a monophyletic genus but was nested within a grade formed by species of *Selenicereus*. Strong evidence pointed to the two genera sharing a common origin, necessitating a merger of the genera. D.R. Hunt (2017) formally proposed synonymization of *Hylocereus* under *Selenicereus* and the necessary new combinations were made by Hunt (2017) and Korotkova *et al.* (2017). For Hawaiian material, this means that there are now four species of naturalized *Selenicereus—S. pteranthus* (Link ex A. Dietr.) Britton & Rose forma *macdonaldeae* (Hook) Ralf Bauer [Syn. *Hylocereus macdonaldiae* (Hook.) Britton & Rose]; *S. setaceus* (as treated here); *S.* cf. *trigonus* (Haw.) S. Arias & N. Korotkova [Syn. *Hylocereus trigonus* (Haw.) Safford]; and *S. undatus* (Haw.) D.R. Hunt [Syn. *Hylocereus undatus* (Haw.) Britton & Rose]. [Note: the new record for *Hylocereus costaricensis*, based on *Flynn 3571* (Lorence *et al.* 1995: 28) was redetermined by B. Leuenberger (Berlin-Dahlem) as *H.* cf. *trigonus* in 2000]. A diagnostic description of *Selenicereus setaceus* is provided in *The European Garden Flora* (Hunt 1989): "Stems usually 3-, sometimes 4–5-angled, 2–4 (rarely to 8) cm in diameter. Areoles 2–3 cm apart, with 1–2 conical brown spines 1–2 mm long. Flowers 25–30 cm long; pericarpel with felted and spiny areoles, tube with scales naked in their axils. Fruit ovoid, tuberculate and bristly, red. Brazil to N Argentina."

*Material examined*. **KAUAʻI**: Kōloa District, Poʻipū area, along Poʻipū Rd., between turnoffs to Sheraton Kauaʻi Hotel (Kapili Rd.) and Poʻipū Beach, dry secondary shrubland, ca 10 m, 23 Apr 1995, *D.H. Lorence 7664*; Kōloa District, Poʻipū area, along Poʻipū Rd. just north of Sheraton Hotel, secondary shrubland, ca 10–15 m, 15 May 2000, *D.H. Lorence 8671*.

**Convolvulaceae**

***Cuscuta campestris*** Yunck. **New island record**

Recorded as naturalized on Oʻahu and Hawaiʻi (Wagner *et al.* 1990, 1999: 582), Lānaʻi (Oppenheimer 2011: 7), East Maui (Starr *et al.* 2004: 22), and West Maui (Oppenheimer 2003: 10), this parasitic groundcover is now confirmed as naturalized on Kauaʻi. Native

and widespread in North America, this species is also considered to be the most widespread *Cuscuta* weed species, now recorded in Africa, Asia, Australia, Europe, and South America (Costea *et al.* 2006).

*Material examined*. **KAUA‘I**: Kawaihau Distr., Princeville, Church of the Pacific parking lot, localized on bed of wedelia groundcover, 114 m, 13 Jun 2013, *D.H. Lorence & K. Blackmer 10397;* Kōloa Distr., Kalāheo, upper Pu‘uwai Rd. near junction with Pu‘ulima Road, across from county water tank, parasitic on *Sphagneticola*, 341 m, 15 Nov 2013, *T. Flynn 7696*.

***Cuscuta pentagona*** Engelm. **New state records**

*Cuscuta* is a parasitic genus of ca. 200 species of leafless annual herbs with worldwide distribution. Some species (*e.g., C. campestris*, treated above) are recognized pests of agriculture (CABI 2020c). In Hawai‘i, Wagner *et al.* (1990: 582) treated one endemic species (*C. sandwichiana*) and one widespread weed native to North America (*C. campestris*, western field dodder). As documented above, *C. campestris* is now known from all of the main islands except for Ni‘ihau, Moloka‘i, and Kaho‘olawe. In February 2007, Dan Austin (author of the Convolvulaceae treatment in *Manual of the Flowering Plants of Hawai‘i*), annotated several vouchers from O‘ahu, West Maui, and Hawai‘i as *C. pentagona*, all previously called *C. campestris*. In light of the fact that *Cuscuta* identification is made notoriously difficult by the need to distinguish small differences between minute flowers on already dried voucher specimens, it is understandable that misidentifications would occur. Costea *et al.* (2006) noted that *C. pentagona*, with the same North American native range as *C. campestris*, was not as common and had not yet been reported from outside of North America. Identification of fresh flowering material might make clearer whether *C. pentagona* is more prevalent than thought in the Islands.

The following updated key to *Cuscuta* in Hawai‘i is modified from Wagner *et al.* (1990), Costea *et al.* (2006), and Spaulding (2013).

1. Stems yellow to yellowish orange; flowers 3–4(–5) mm long; petals erect to slightly spreading; scales below stamens absent or reduced and forked or triangular; seeds ca. 2 mm long ... *C. sandwichiana*
1. Stems pale yellow; flowers 1.5–3 mm long; petals spreading; scales below stamens conspicuous, oblong-ovate to spathulate, the margins fringed; seeds ca. 1 mm long (2).
2(1). Calyx lobes strongly overlapping at base, forming 4–5 strong angles at sinuses of mature flowers; corolla lobes lance-acuminate; mature flowers ca. 1.5–2 mm long ... *C. pentagona*
2. Calyx lobes not strongly overlapping at base of mature flowers, not distinctly 5-angled; corolla lobes deltoid-ovate; mature flowers ca. 2–3 mm long ... *C. campestris*

*Material examined*. **O‘AHU**: Honolulu, Wa‘ahila Ridge, St. Louis Heights, private residence on Frank Street, climbing on cultivated *Vitex* hedge, 120 ft [35 m], 10 Feb 1975, *K.M. Nagata 1244;* Lanikai, in vacant lot near intersection of Mokulua and Mokumanu Streets, growing over *Asystasia* and grasses, 06 Nov 1985, *J. Jacobson & S. Jacobson s.n.* (BISH 502244). **MAUI**: West Maui, Wailuku Distr., Wailuku, growing roadside on *Asystasia gangetica*, 180 ft [55 m], 17 May 2001, *H. Oppenheimer H50115*. **HAWAI‘I**: Saddle Road between Hilo and Kona, roadside, 22 Feb 1955, *W.H. Welch 16704.*

**Crassulaceae**

***Kalanchoe rotundifolia*** (Haw.) Haw. **New island record**

Recently documented from East Maui as a new escape from cultivation (Starr & Starr 2016: 14), an older collection from O‘ahu documents that it is escaping there as well.

*Material examined*. **O‘AHU**: Kīpapa Gulch, off Kamehameha Hwy., numerous plants found growing along roadside over asphalt, 400 ft [120 m], 11 Oct 2007, *R. Chang HDOA 1*.

**Cyperaceae**

***Cyperus difformis*** L. **New island record**

This obligate wetland sedge was previously documented by Wagner *et al.* (1990, 1999: 1395) as naturalized on Kaua‘i and O‘ahu, and subsequently collected on West Maui (Starr *et al.* 2002: 19) and East Maui (Starr *et al.* 2006: 35). The following voucher documents its presence in the Kohala District of the Big Island.

*Material examined*. **HAWAI‘I**: Morgan Toledo taro farm, Waipi‘o Valley, growing on banks of taro lo‘i, just at water’s edge, 19 Mar 2005, *L.M. Crago, C. Imada, T. Erickson & C. Puttock 2005-093.*

***Cyperus hillebrandii*** Boeckeler

var. ***hillebrandii*** **New island record**

Recorded as endemic on O‘ahu, Lāna‘i, East Maui, and Hawai‘i (Wagner *et al.* 1990, 1999: 1418, as *Mariscus hillebrandii* subsp. *hillebrandii*), this overlooked voucher confirms the presence of *Cyperus hillebrandii* var. *hillebrandii* throughout the higher islands of Maui Nui.

*Material examined*. **MOLOKA‘I**: Kapa‘akea Ridge, on ridge near forest reserve boundary, 10 Aug 1989, *R.W. Hobdy 3068.*

***Cyperus stoloniferus*** Retz. **New state records**

This new state record was identified in a serendipitous way that points to the continued need to maintain herbarium collections. In 2014, *Herbarium Pacificum* received a sedge voucher from East Maui (*Oppenheimer & Bustamente H41416*) that was difficult to match but came closest to another East Maui collection (*Starr & Starr 000910-1*) that had been annotated in 2001 by sedge specialist Mark Strong (Smithsonian) as an aberrant form of *Cyperus rotundus*. In 2018, 17 years after his annotation, Strong was emailed jpgs of both vouchers to see if he agreed that the newer collection should also be called *C. rotundus*. Strong in turn enlisted the advice of *Cyperus* specialist Gordon Tucker, who immediately responded that, yes, he knew the species, which he called *C. stoloniferus*. He remembered it from working on the *Flora of China* treatment of *Cyperus*, and noted diagnostic characters of erect inflorescence bracts and dark purple spikelets. He noted that the species was widespread in the Pacific and East Asia. Now it is also known from the Hawaiian Islands. Besides East Maui, another voucher from the Big Island (*Duvall s.n.*) was also pulled from the *C. rotundus* folders. The following description is extracted from *Flora of China* (Dai *et al.* 2010).

> “Perennials. Rhizomes long, ± thick, ± hardened, base of shoot with ellipsoid to ovoid tubers. Culms solitary, 8–22 cm tall, 3-angled, smooth, basal sheaths usually disintegrating into fibers. Leaves usually shorter than culm to rarely longer; leaf blade medium green, 2–4 mm wide, usually folded, rarely flat. Involucral bracts 2 or 3, ± erect, leaflike, basal 2 longer than inflorescence. Inflorescence a simple anthela; rays 3 or 4, 0.5–3 cm, each with 3–8 congested spikelets. Spikelets narrowly oblong-ovoid to narrowly ovoid, 6–12 × 2–3 mm, slightly thickened, 10–18-flowered; rachilla narrowly winged. Glumes yellow to brownish yellow on both surfaces variegated with brownish blood-red but middle green, densely imbricate, broadly ovate, ca. 3 mm, papery, 5–7-veined, keel obtuse, margin broadly white hyaline, apex acute to subobtuse. Nutlet dark brown when mature, ellipsoid to subobovoid, ca. 2/3 as long as subtending glume, 3-sided.”

Bryson & Carter (2008) listed *C. stoloniferus* as a vegetative colonizer of coastal sands, with a range that includes Pakistan, India to China and northern Australia, Mauritius, and Madagascar.

*Material examined*. **MAUI**: East Maui, near Olinda, in pasture near Po‘okela Church, up to 50 cm tall, large patches in pasture visible due to dark glumes, 1,800 ft [550 m], 10 Sep 2000, *F. Starr & K. Martz 000910-1*; East Maui, Makawao Distr., Pi‘iholo, naturalized in lawn used as a helicopter landing zone, adjacent to Maui Invasive Species Committee baseyard, 2,100 ft [635 m], 23 Apr 2014, *H. Oppenheimer & K. Bustamente H41416*. **HAWAI‘I:** Kahuku Ranch, 1 mile [1.6 km] E of Hawaiian Ocean View Estates, pasture with ‘ōhi‘a-koa remnants, 4,500 ft [1,370 m], 30 Nov 2006, *F. Duvall s.n.* (BISH 664566).

***Eleocharis geniculata*** (L.) Roem. & Schult. **New island record**

Wagner *et al.* (1990, 1999: 1402) documented this wetland species as naturalized on Kaua‘i, O‘ahu, and Moloka‘i; subsequently, it was reported by Oppenheimer (2003: 10) on West Maui and Imada *et al.* (2008: 12) on Lāna‘i. The following vouchers document its presence on the Big Island back to 1979.

*Material examined*. **HAWAI‘I**: Pi‘ihonua, Hilo Forest Reserve, site 34 OS, 4,900 ft [1,495 m], 02 Jul 1979, *K. Adee s.n*. (BISH 581614); South Hilo District, Hilo Forest Reserve, within a large bog south of the Wailuku River, 3,620 ft [1,105 m], 20 May 1981, *G. Clarke 601*; Nīnole, Ka‘ū, in muck of drying freshwater pond next to ocean, 16 May 1983, *O. Degener & I. Degener 35792.*

***Fimbristylis littoralis*** Gaudich. **New island record**

This wetland sedge was first collected around taro patches in Hanalei Valley, Kaua‘i in 1977. Strong and Wagner (1997: 45) reported on this new state record under the name *F. miliacea* (L.) Vahl. Subsequently it was reported from the Waipi‘o Valley on the Big Island (Imada *et al.* 2000: 12) and Ke‘anae, East Maui (Oppenheimer 2003: 11). The species, now known as *F. littoralis* (see Imada 2007: 35 for details) has now been documented from O‘ahu in its obligate wetland habitat.

*Material examined*. **O‘AHU**: Kahuku, James Campbell National Wildlife Refuge, Ki‘i Unit, Pond C Makai, growing intermixed with *Cyperus polystachyos*, most prevalent in lee areas behind bulrush, in dry ground, but moist soil adhering to roots, several patches observed, 19 Jul 2007, *M. Silbernagle & D. DesRochers s.n.* (BISH 726217).

**Dennstaedtiaceae**

***Microlepia strigosa*** (Thunb.) C. Presl

var. ***mauiensis*** (W.H. Wagner) D.D. Palmer **New island record**

*Microlepia mauiensis* was originally described in 1993 by W.H. Wagner, Jr. as a rare, new endemic Hawaiian fern, restricted and localized to extremely wet habitats above 1,200 m elevation on West Maui, East Maui, and Hawai‘i (Wagner Jr. 1993). Characters that helped distinguish it from the abundant, indigenous *M. strigosa* included its densely hairy fronds (vs. sparsely hairy in *strigosa*) and flexuous rachises and costae (vs. non-flexuous in *strigosa*). After study of Hawaiian *Microlepia* in the field and herbarium, it became apparent to Dan Palmer that he was seeing a continuum of intermediate forms from nearly completely glabrous to very hairy, suggesting a variable species with, as one extreme manifestation, a very hairy variety with a slightly zigzag rachis (*M. mauiensis*); for this he published the new combination *M. strigosa* var. *mauiensis* (Palmer 2002). In 2016, this taxon was Federally listed as Endangered (Pacific Islands Fish and Wildlife Office 2016), consisting of fewer than 100 known wild individuals on O‘ahu (lowland mesic forest),

Maui (montane wet forest), and Hawai‘i (montane mesic and wet forest). This record acknowledges the presence of this endangered fern on O‘ahu.

*Material examined*. **O‘AHU**: Wai‘anae Mts., West Makaleha Valley, *Metrosideros-Dicranopteris* forest, ca 20 plants, 03 Mar 2011, *S. Perlman, S. Ching, & J. Lau 22455.*

**Fabaceae**

***Macroptilium lathyroides*** (L.) Urb. **New island record**

Wild bean or cow pea is widely naturalized in pastures and disturbed lowland areas throughout the main islands (Wagner *et al.* (1990, 1999: 683; Shannon & Wagner 1996: 13; Herbarium Pacificum Staff 1996: 4) and on Midway Atoll (Starr & Starr 2017: 5). It has now been documented from Lehua islet, adjacent to Ni‘ihau.

*Material examined*. **LEHUA**: Ridge between Pritchardia Gulch and Weatherport Gulch, coastal dry shrubland*,* 20 m, 07 May 2012, *N. Tangalin 3195*.

***Vigna vexillata*** (L.) A. Rich. **New island record**

This species of *Vigna* was first collected in Lāwa‘i, Kaua‘i in 2003 (*Lorence 9071*, PTBG) and described as an herbaceous, twining vine forming a large patch along the edge of an abandoned coffee field near the entrance of National Tropical Botanical Garden, growing in weedy secondary vegetation. It was identified by J.A. Lackey (Smithsonian) in 2004 as *V. vexillata*, making it a new state record (Wagner *et al.* 2012: 43). Now it has been documented as naturalizing along the Kona coast on Hawai‘i. The species is widely distributed naturally in the tropics and subtropics, but its weedy range is undocumented. The following description is modified from Wu & Thulin (2010):

> “Perennial herbs, twining. Stems with spreading brown bristly hairs, glabrescent. Stipules ovate to ovate-lanceolate, 3–5 mm, cordate or auriculate at base, ciliate; petiole 1–11 cm; leaflets membranous, variable in shape, ovate to lanceolate, 4–9(–15) × 2–5(–8) cm, brown or gray pubescent on both surfaces, base rounded to cuneate, margin entire, sometimes slightly 3-lobed, apex acute or acuminate. Racemes axillary, 2–6-flowered, subumbellate; peduncles 5–20 cm. Bracteoles subulate, ca. 3 mm, caducous. Calyx with brown or white bristly hairs, rarely glabrescent; tube 5–7 mm; lobes linear or linear-lanceolate, 2–5 mm, upper 2 connate at base. Standard pink, purple, or partly yellow, sometimes with yellow or purple spots inside at base, 2–3.5 × 2–4 cm, emarginate; keel whitish or purplish, falcate, with beak incurved through 180°. Legumes erect, linear-terete, 4–14 cm × 2.5–4 mm, bristly. Seeds 10–18, yellowish, black, or brown to scarlet with black spots, oblong or oblong-reniform, 2–4.5 mm.”

The following key is extracted from the key to *Vigna* in the *Flora of China* (Wu & Thulin 2010) that includes the three documented naturalized species in the state (*V. hosei, V. luteola, V. vexillata*) and the most common native species (*V. marina*).

1. Corolla keel prolonged into a conspicuous beak incurved through 180° ... *V. vexillata*
1. Corolla keel without a conspicuous incurved beak (2).
2(1). Corolla 0.5–1 cm long ; legumes l–2 cm long ... *V. hosei*
2. Corolla 1.2–3 cm long; legumes 3.5–8 cm long (3).
3(2). Leaflets rounded or obtuse at apex; mature pods glabrous ... *V. marina*
3. Leaflets acute or acuminate at apex; mature pods pubescent ... *V. luteola*

*Material examined*. **HAWAI‘I**: Captain Cook, Amy Greenwell Botanical Garden, volunteer plant twining in the garden, 448 m, 26 Nov 2016, *E.J. Judziewicz & P. Van Dyke s.n*. (BISH 767688); *loc. cit.,* collector has noted seeing this plant at several places in Kona for several years, 03 Dec 2016, *K. Kimball s.n*. (BISH 767743, 767748).

**Juncaceae**

***Juncus polyanthemos*** Buchenau **New island record**

Previously recorded as naturalized only on East Maui (Wagner *et al.* 1990, 1999: 1454; the single cited Oʻahu record was collected in a Haleʻiwa pond in cultivation with *Nymphaea* [*H. Clay s.n.,* 19 Jul 1972, BISH 78196]), *Juncus polyanthemos* is now confirmed as naturalized on Hawaiʻi Island. This obligate wetland rush can be mistaken for the more common *J. effusus*, but the latter has a solid pith (vs. interrupted in *polyanthemos*) and a perianth that is equal in length or longer than the capsule (vs. distinctly shorter than the capsule in *polyanthemos*).

*Material examined*. **HAWAIʻI**: South Kohala Distr., Waimea town, weed in gutter of strip mall building, growing in saturated peat, 2,675 ft [815 m], 29 Dec 1988, *P. Zika 13703;* Āhualoa, on moist, sandy soil on bank of coffee farm irrigation pond, 781 m, 24 Sep 2005, *K. Uyehara s.n.* (BISH 718799).

**Malvaceae**

***Malvastrum americanum*** (L.) Torr. **New island record**

First recorded as naturalized in 1985 along the Kaiwi coast in southeastern Oʻahu (Wagner *et al.* 1990, 1999: 894), where it is fairly common in the Kaloko (Queen's Beach) area, Starr *et al.* (2008: 47) recorded it from the Moʻomomi dunes on Molokaʻi in 2005. The following specimen from South Kona on the Big Island records its presence there since at least 1986.

*Material examined*. **HAWAIʻI**: South Kona, Kapua Bay, below kiawe forest, 07 Oct 1986, *L. Stemmermann 7127.*

**Orchidaceae**

***Habenaria rodeiensis*** Barb. Rodr. **New island record**

Wagner *et al.* (1990: 1468) noted this taxon as a single unidentified 1983 collection from a Kula, East Maui pasture (*Hobdy 1829*). The voucher was identified in 1992 by E.A. Christenson (New York Botanical Garden) as *Habenaria rodeiensis* (Herbst & Wagner 1999: 24), a ground orchid native to Brazil, Paraguay, and Peru (Batista *et al.* 2011). Subsequently, the species has been reported on West Maui in 2003 (Oppenheimer 2006:12) and Oʻahu in 2009 (Lau & Frohlich 2012: 19). The habitat data on the BISH specimens suggest that it has an affinity for open, disturbed, dry to mesic trailsides above 300 m elevation. This first record for Kauaʻi was collected in 2015, but for the first time as an epiphyte rather than a ground orchid. Very little information is readily available about this species. *A Global Compendium of Weeds* (Randall 2017: 1701) lists *H. rodeiensis* as a tropical orchid grown as an ornamental and dispersed by humans, and the five references it cites all refer to the Hawaiian collections.

*Material examined*. **KAUAʻI**: Līhuʻe District, banks of north fork of Wailua River, adjacent to trail that leads to Blue Hole, epiphytic in moss on branch of *Metrosideros polymorpha*, 378 m, 28 Jan 2015, *A.M. Williams, T. Flynn, & J. Shevock AMW118*.

**Piperaceae**

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

Recorded as endemic on Kauaʻi, Molokaʻi, Maui, and Hawaiʻi (Wagner *et al.* 1990, 1999: 1022), a recent collection from Mount Kaʻala on Oʻahu extends the range of this species. Closely allied to *P. blanda* (Jacq.) Kunth var. *floribunda* (Miq.) H. Huber (occurring on all main islands except Kahoʻolawe) and *P. remyi* C. DC. (all main islands except for

Ni‘ihau and Kaho‘olawe), the specimen most closely matches the key characters provided for *P. cookiana* in Wagner *et al.* (1990, 1999: 1021), and its native wet forest habitat aligns with the habitat preference of the species.

*Material examined*. **O‘AHU**: Wai‘anae Mts., summit of Mt. Ka‘ala, NE-facing slope in *Metrosideros* wet forest, 1,216 m, 16 Jan 2013, *S. Perlman & J. Lau 23240.*

**Poaceae** [Note: Grasses can be notoriously difficult to identify, and the majority of the grass taxa treated below were not keyed out in *Manual of the Flowering Plants of Hawai‘i* (Wagner *et al.* 1990). In fact, over 100 newly naturalized grass taxa have been reported for the Hawaiian Islands since the *Manual* was published (see Imada 2019). We recommend *A Key to Pacific Grasses* (Clayton & Snow 2010) as the most current source for keying out native and naturalized grasses in Hawai‘i.]

***Bromus diandrus*** Roth **New island record**

Recorded as naturalized on Kaua‘i and Hawai‘i under the now synonymized name *Bromus rigidus* (Wagner *et al.* 1990, 1999: 1508), ripgut grass has since been recorded on East Maui (Herbarium Pacificum Staff 1999: 7, as *B. rigidus*) and Lāna‘i (Oppenheimer 2008: 32, as *B. diandrus*). Snow (2008: 38) explains the reasoning behind the name change to *B. diandrus*. The species was collected at a helicopter landing zone where the alien-dominated vegetation included *Acacia confusa* and *Schinus terebinthifolius*.

*Material examined*. **O‘AHU**: Wai‘anae Mts., Kea‘au LZ on ridge between ‘Ōhikilolo cabin and *Sanicula mariversa* fence, 14 Apr 2016, *N. Kai USARMY 440.*

***Bromus rubens*** L. **New island records**

Wagner *et al.* (1990, 1999: 1507) listed this species as adventive on Moloka‘i and Hawai‘i; subsequently, Herbst & Wagner (1999: 25) confirmed its naturalized status on both islands. Here, its naturalization on Kaua‘i and West Maui are confirmed.

*Material examined*. **KAUA‘I**: Waimea Canyon, Kukui Trail, degraded *Grevillea*-dominant mesic forest, 782 m, 04 Jun 2009, *N. Tangalin, E. Griffin-Noyes & M. Demotta 2027.* **MAUI**: West Maui, Līhau, lowland dry shrubland, 2,600 ft [790 m], 13 Jul 1991, *P. Welton & B. Haus 1114*; *loc. cit.,* lowland dry forest, 1,400 ft [425 m], 09 Jan 1992, *P. Welton & B. Haus 1483*; West Maui, south rim of cinder cone southwest of westernmost reservoir above Lahaina, 14 Feb 2008, *W.A. Whistler s.n.* (BISH 731920).

***Bromus sterilis*** L. **New island record**

Wagner *et al.* (1990: 1507) noted that *Bromus sterilis* was known from two collections from Big Island (Hāmākua) pastures made in 1936 and 1938, but not vouchered since; thus it was not considered part of the naturalized flora. Collections made in 2007 on Moloka‘i and Maui (Oppenheimer 2008: 32) confirmed its naturalized status in the state. An overlooked Big Island collection made by P.K. Higashino on Mauna Loa Strip Road in 1983, and identified by W.D. Clayton as *B. sterilis* in 1994, confirms its naturalized status on the island of Hawai‘i. CABI (2020a) reports that the species is native to Africa, Europe, and Asia, and is a noxious agricultural and horticultural weed in the Mediterranean region. It is weedy throughout North America, and often found in wastelands and roadsides, but also with an affinity to arable habitats where shallow cultivation is practiced. It can handle all major soil types (clays, loams, and sands; acid, neutral, and alkaline) and tolerates drought and strong winds but not salt exposure.

*Material examined*. **HAWAI‘I**: Mauna Loa Strip Road, Hawai‘i Volcanoes National Park, open *Metrosideros* and native shrubs and ‘a‘ā, 5,650 ft [1,720 m], 05 May 1983, *P.K. Higashino 10019*.

***Bromus tectorum*** L. **New naturalized record**

Treated by O’Connor (1990: 1507) as adventive on East Maui since at least 1871, scattered collections of *Bromus tectorum* have been made in Haleakalā Crater between 1933 and 1969. In 2000, Gene Weller of Brigham Young University-Idaho collected numerous vouchers in Haleakalā ranging from 1,950–3,055 m elevation, confirming that it is widely distributed and naturalizing in the crater. CABI (2020b) describes this species, native mostly to central Asia and eastern Europe and called downy brome or cheatgrass, as an opportunistic, widespread, invasive annual grass. In the semi-arid to arid environments of western North America similar to central Asia where it originally evolved, *B. tectorum* dominates millions of hectares of degraded rangelands in the intermountain area between the Sierra-Cascade and Rocky Mountains. When this largely self-pollinated species is introduced to a site where it fits well genotypically, combined with its phenotypic plasticity, it can populate the site with stable duplicates of itself through self fertilization.

*Material examined*. **MAUI**: East Maui, Haleakalā Crater floor, near Bubble Cave, ash bed, 2,230 m, 22 Aug 1933, *F.R. Fosberg 9936*; Haleakalā Crater, west base of Hanakauhi, weed in cinders on basalt a‘ā floor, 7,000 ft [2,135 m], 01 Sep 1945, *H. St. John & A.L. Mitchell 21257*; Haleakalā, Halemau‘u Trail, weed along the trail, 7,000 ft [2,135 m], 05 Jul 1948, *R.L. Wilbur & G.L. Webster 1009*; Haleakalā National Park, growing in floor of crater near Kapalaoa Cabin, infrequent, 7,200 ft [2,190 m], 14 Jun 1969, *J. Henrickson & R. Vogl 3477*; *loc. cit.,* near Waikeke‘ehia, few individuals, 1,950 m, Jul 2000, *G. Weller s.n.* (BISH 713676); *loc. cit.,* near Silversword Loop, few individuals, 2,194 m, Jul 2000, *G. Weller s.n.* (BISH 713675); *loc. cit.,* near Kalu‘uoka‘ō‘ō, few individuals, 2,194 m, Jul 2000, *G. Weller s.n.* (BISH 713674); *loc. cit.,* in front of Kapalaoa Cabin, common in *Deschampsia* grassland, 2,218 m, Jul 2000, *G. Weller s.n.* (BISH 713679); *loc. cit.,* near Kawilinau (Bottomless Pit), few individuals, 2,255 m, Jul 2000, *G. Weller s.n.* (BISH 713677); *loc. cit.,* near Pu‘unaue, few individuals, 2,255 m, Jul 2000, *G. Weller s.n.* (BISH 713683); *loc. cit.,* near Kamoa o Pele, common, 2,255 m, Jul 2000, *G. Weller s.n.* (BISH 713682); *loc. cit.,* Sliding Sands Trail, common along trail’s edge, 2,852 m, Jul 2000, *G. Weller s.n.* (BISH 713681); *loc. cit.,* near horse loading facilities, Sliding Sands trailhead, common, 2,980 m, Jul 2000, *G. Weller s.n.* (BISH 713678); *loc. cit.,* Red Hill Overlook, few individuals, 3,055 m, Jul 2000, *G. Weller s.n.* (BISH 713680); *loc. cit.,* Sliding Sands Trail west of Kapalaoa Cabin, locally common in cinder and ash substrate, 7,250 ft [2,210 m], 16 May 2011, *H.L. Oppenheimer, P. Welton, K. Bustamente, & S. Gabriel H51108*.

***Cynodon nlemfuensis*** Vanderyst **New island record**

A larger version of Bermuda grass (*Cynodon dactylon*), *C. nlemfuensis* was considered to be at least adventive on Moloka‘i and Hawai‘i (Wagner *et al.* 1990, 1999: 1520). Reevaluated in 1999, the status on both islands was changed to naturalized (Herbst & Wagner 1999: 25). In 2001, it was reported as naturalized in Wailuku, West Maui (Oppenheimer 2003: 20). It is now documented from O‘ahu, based on identification of a 2005 collection by Thomas Cope of the Royal Botanic Gardens, Kew. This stoloniferous grass, native from eastern and central Africa, is naturalized at least in southern Texas in the U.S. (Barkworth 2003).

*Material examined*. **O‘AHU**: Pearl Harbor National Wildlife Refuge, at back of refuge, growing roadside in drier area, 13 ft [4 m], 23 Feb 2005, *L.M. Crago, C. Imada, & M. Silbernagle 2005-068.*

***Digitaria abyssinica*** (Hochst. ex A. Rich.) Stapf **New island record**

First recorded in the Hawaiian Islands from Kaua‘i and East Maui (Herbst & Clayton 1998: 23), this grass has now been recorded on O‘ahu. This species is considered a high-risk weed (Hawaii-Pacific Weed Risk Assessment 2009a).

*Material examined*. **O‘AHU**: Kawailoa, Drum Rd., mesic roadside setting, 09 Mar 2016, *J. Hawkins & P. Rellenos USARMY 427*; Kawailoa Drum Rd., near mile marker 11 after side dirt road meets with Drum Rd., patch estimate 500 ft² [45 m²], 1,100 ft [335 m], 05 May 2016, *J. Hawkins & J. Rellamas USARMY 442*.

***Digitaria bicornis*** (Lam.) Roem. & Schult. **New island record; range extension**

First recorded as naturalized in Hawai‘i based on a 2008 collection (*Oppenheimer H20816*) from a pasture in Waikapū, West Maui (Snow & Lau 2010: 50), additional records have come to light following a review of Hawaiian specimens of *D. ciliaris* at *Herbarium Pacificum* by J.F. Veldkamp (Leiden) in 2011. Reidentification of vouchers from Midway and East Maui as *D. bicornis* now extend the range of the species in the state. The *Digitaria* key in Clayton & Snow (2010: 70) separates the two similar species by the following characters: *D. bicornis* with ribbed equidistant veins on the lower lemma of the sessile spikelet, and usually 2 stiff racemes; *D. ciliaris* without ribs, the veins usually unequally spaced on the lower lemma of the sessile spikelet, and 2–12 stiff or flexible racemes.

*Material examined*. **MIDWAY ATOLL**: no locality, Aug 1959, *Mr. Cornelison s.n.* (BISH 118698). **MAUI**: East Maui, along Haleakalā Hwy, on mowed road shoulder, 07 May 1982, *R.W. Hobdy 1385.*

***Digitaria radicosa*** (J. Presl) Miq. **New island records**

Documented in Wagner *et al.* (1990, 1999: 1530) as adventive in lawns and gardens on O‘ahu, reexamination of *Digitaria* vouchers at BISH by W.D. Clayton (Kew) and J.F. Veldkamp (Leiden) resulted in the reidentification of several *D. ciliaris* specimens as *D. radicosa* on O‘ahu. Thus its year of first collection on O‘ahu (and the state) is pushed back to 1909 (*Faurie 1297*) from the previously recorded 1938 (*Pukui s.n.,* BISH 118592), and its establishment as a naturalized grass on O‘ahu is confirmed. The species is also documented as naturalized on Kaua‘i (Herbst & Clayton 1998: 23), Hawai‘i (Staples *et al.* 2003: 18), and now on East Maui.

*Material examined*. **O‘AHU**: Honolulu, 1909, *U. Faurie 1297*; Nu‘uanu, 42 Coelho Way, weedy grass in garden beds, 25 Jul 1957, *M.C. Neal s.n.* (BISH 118716); Lanikai, Mokulua (North Island), 07 Feb 1978, *D. Herbst 6002*; Kahana, Mokoli‘i Island, 19 Apr 2005, *F. Starr et al. 050419-60*; Kahuku Training Area, Opana Road, 31 Jan 2018, *K. Kawelo & J. Beachy USARMY 477*. **MAUI**: East Maui, Kokomo, in decumbent patches, 1,400 ft [425 m], 16 Oct 2005, *R.W. Hobdy 4225.*

***Eragrostis brownii*** (Kunth) Nees ex Steud. **New island record**

This Australian grass, first collected in Hawai‘i on the Big Island in 1916 by A.S. Hitchcock, was recorded as naturalized on Moloka‘i, Maui, and Hawai‘i by Wagner *et al.* (1990, 1999: 1540–41), and later documented on Kaua‘i (Lorence & Flynn 1999: 5). Now sheepgrass has been recorded on O‘ahu as a roadside weed in a military training area.

*Material examined*. **O‘AHU**: Kahuku Training Area, RS-KTA-04, roadside, naturalized, 600 ft [185 m], 30 Jan 2018, *K. Kawelo & K. Cloward USARMY 473*.

***Eragrostis leptostachya*** (R. Br.) Steud. **New island records**

This species has an interesting history in the Hawaiian Islands. The first collection was made in 1937 on an arid, windswept slope at Puu Nānā, Mauna Loa, Molokaʻi, elevation 1,300 feet [395 m] (*E.Y. Hosaka 1848*). Botanist Otto Degener described it as a new endemic grass, *E. hosakai* O. Deg., in 1940 (Degener 1940). Since it remained the only collection of the species, Wagner *et al.* (1990: 1542) considered it to be extinct. Study of the Hosaka type specimen by Lazarides (1997), however, revealed that it was identical to *E. leptostachya*, an Australian species already naturalized in England, Belgium (a contaminant with wool imported from Australia), and Easter Island (Clayton & Herbst 1998: 27). While it has still not been recollected on Molokaʻi, *E. leptostachya* has since been recorded on West Maui (Staples *et al.* 2002: 14), and additional records are recorded here for Oʻahu, East Maui, and Kahoʻolawe. We thank former Bishop Museum botanist Neil Snow for the determinations.

*Material examined*. **OʻAHU**: Dillingham Military Reserve, collected from a naturalized population of about 20 plants in the immediate area, growing with *Sida ciliaris, Euphorbia hirta*, 06 Jan 2016, *S. Heintzman USARMY 403*. **MAUI**: East Maui, Ulupalakua, adjacent to Tedeschi Winery, NW of Puʻu Mahoe, occasional bunchgrass on open mesic slope in alien vegetation, 2100 ft [640 m], 16 Jul 2002, *C. Imada, C. Puttock, P. Bily, A. Lyons, & J. Brown 2002-24*; Makawao Distr., Pāʻia, volunteer in sidewalk crack, 40 ft [12 m], 20 Jan 2010, *H. Oppenheimer H11009*. **KAHOʻOLAWE**: Honokanaiʻa, at base camp, occasional, 20 ft [6 m], 20 Jan 2004, *H. Oppenheimer & G. Hansen H10404*.

***Eragrostis parviflora*** (R. Br.) Trin. **New island record**

This species was first recorded as naturalized on Kauaʻi based on a 1996 collection (*T. Flynn 2925*) from the Port Allen area in Hanapēpē (Flynn & Lorence 1998: 5), identified by Derek Clayton (Kew) in 1997. Subsequently, in 2002 Clayton identified an earlier collection of *E. parviflora* from 1989 (*Flynn et al. 3287*) on Kauaʻi further southwest at the Russian Fort Elizabeth State Historical Park in the town of Waimea, originally called *E. pectinacea*. A 2018 collection extends its coastal range to western Oʻahu, where it was associated with alien vegetation, including *Syzygium cumini, Prosopis pallida, Schinus terebinthifolius*, and *Megathyrsus maximus* [=*Urochloa maxima*].

*Material examined*. **OʻAHU**: Waiʻanae Mts., Dillingham Airfield, near westernmost gate, 25 plants, sea level, 16 Jan 2018, *K. Tschannen et al. USARMY 469.*

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

First recorded as naturalized on Molokaʻi at Kaunakakai Wharf in 2006 (Oppenheimer 2008: 32) and later on Midway Atoll (Snow & Lau 2010: 52; Starr & Starr 2011: 30), J.F. Veldkamp (Leiden) in 2011 identified this naturalizing grass for the first time on Oʻahu from a 1996 collection.

*Material examined*. **OʻAHU**: Kāneʻohe, Marine Corps Base Hawaiʻi, junction of Nuʻupia Ponds causeway and old Hawaiian wall, sea level, 29 May 1996, *D.R. Herbst 9769.*

***Panicum fauriei*** Hitchc.

var. ***carteri*** (Hosaka) Davidse **Retraction of new island record**

Federally listed as Endangered, *Panicum fauriei* var. *carteri* was recorded from Oʻahu, Molokaʻi, and Maui in Wagner *et al.* (1990, 1999: 1568). A new record from Lānaʻi was later added, based on a 1993 collection (Herbst & Clayton 1998: 30). Reexamination of the specimen by M. LeGrande in 2002 resulted in its reidentification as *P. fauriei* var.

*latius* (H. St. John) Davidse, a variety already well established on the island. The varieties are separated by spikelet morphology and pubescence: var. *latius* with acute to acuminate spikelets 2–4.2 mm long, short-pubescent with short to long tufts of hairs at glume apices; var. *carteri* with acute spikelets 1.8–2.3 mm long, short-pubescent (Wagner *et al.* (1990, 1999: 1568).

*Material examined*. **LĀNA‘I**: Kukui Point, near sea level, 07 Mar 1993, *R.W. Hobdy et al. 3581*.

***Panicum* sp. A** identified as ***P. antidotale*** Retz.

A 1986 grass collection from Mo‘omomi, Moloka‘i (*Takeuchi & Imada 2970)* was identified as the first naturalized record of *Panicum coloratum* (blue panic grass) from that island. In the *Manual* (Wagner *et al.* 1990: 1567), this collection and one from Maui (*Hosaka 2448*) were recorded as proof that this species was naturalized in the state. Subsequently, Herbst & Clayton (1998: 30) published a correction stating that the Hosaka voucher was actually collected in a Hawaii Agricultural Experimental Station plot in Makawao, Maui, not as an escaped weed, and that the *Takeuchi & Imada* voucher was not *P. coloratum*, but a yet-to-be-identified species of *Panicum*. Thus, *P. coloratum* was removed as a confirmed naturalized member of the Hawaiian grass flora. The unidentified *Panicum*, subsequently referred to as *Panicum* sp. A, was identified in 2010 by Gerrit Davidse of Missouri Botanical Garden as *P. antidotale* Retz. (giant panic grass), a species already recorded from Moloka‘i, as well as O‘ahu and Hawai‘i (Wagner *et al.* (1990, 1999: 1567). Starr *et al.* (2003: 30) extended its range to include both East and West Maui. The two species are quite similar; in the *Manual* (Wagner *et al.* 1990, 1999: 1566), they are distinguished by glume and lemma characters: margins of second glume and first lemma hyaline in *antidotale*, herbaceous in *coloratum*; first glume 1/2–2/3 as long as the spikelet in *antidotale*, 1/4–1/3 as long in *coloratum*.

*Material examined*. **MOLOKA‘I**: Mo‘omomi, proposed sand-mining tract, *Prosopis* overstory, 30 Oct 1986, *W. Takeuchi & C. Imada 2970.*

***Paspalum notatum*** Flüggé **New island record**

First documented on Kaua‘i (Lorence & Flynn 1999: 6), Bahia grass has since been recorded as naturalized on East and West Maui (Oppenheimer 2007: 29; Oppenheimer noted that the species did not yet appear to be aggressive but needed to be watched), and Moloka‘i (Oppenheimer 2008: 33). Now a record from the herbarium backlog has been identified as *P. notatum*, not only extending its Hawaiian range to the island of Hawai‘i, but also pushing back its date of first collection to 1981, 16 years earlier than the 1997 Kaua‘i collection. This Central and South American grass has been rated by Hawaii-Pacific Weed Risk Assessment (n.d.) as a high-risk species.

*Material examined*. **HAWAI‘I**: Kapāpala Ranch, Ka‘ū District, growing in pasture beside jeep trail, ca 4,000 ft [1,220 m], 20 Oct 1981, *L.W. Cuddihy 917*.

***Paspalum paniculatum*** L. **New island record**

Considered an adventive species on O‘ahu and Hawai‘i by O’Connor (1990: 1575), upon reevaluation Herbst and Wagner (1999: 28) determined that *Paspalum paniculatum* was naturalized on both islands. It has since been documented on West Maui (Oppenheimer 2004: 16). The following specimen, collected in 2005 on Kaua‘i, represents the first naturalized record of the species on that island. In CABI (2020d), this

weedy grass, native to tropical America, is listed as invasive in Hawai‘i, Cuba, Trinidad and Tobago, Samoa, Northern Marianas Islands, Micronesia, Fiji, French Polynesia, New Caledonia, Niue, Palau, and the Solomon Islands, where it invades primarily disturbed sites, forest margins, and secondary forests.

*Material examined*. **KAUA‘I**: Hanalei National Wildlife Refuge, growing on upper bank of irrigation ditch ca 0.25 mi [0.4 km] up the road from the NWR gates, 02 Aug 2005, *L.M. Crago & C. Imada 2005-159*.

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

West Indian dropseed, also known as smutgrass, was originally documented on Midway Atoll, Kaua‘i, O‘ahu, Lāna‘i, Maui, and Hawai‘i (Wagner *et al.* 1990, 1999: 1597), and soon after on Kaho‘olawe (Warren 1993: 43). Upon reevaluation, the Maui and Kaho‘olawe records were reidentified as the very similar *Sporobolus africanus* (Herbst & Clayton 1998: 36). Three subsequent collections from Maui, made between 1999 and 2005 on both East and West Maui, now reestablish that *S. indicus* is naturalized on Maui.

*Material examined*. **MAUI**: West Maui, west of Kahakuloa on Hwy 340, coastal bluff, 50 m, 17 Feb 1999, *C.R. Annable & L. Nelson 3920*; East Maui, Hāna Ranch pasture land mauka of Hāna Ranch Store, open pasture land with *Digitaria ciliaris, Eragrostis pectinacea, Mimosa pudica, Sida rhombifolia, Chamaesyce prostrata, Elephantopus spicatus,* dominant bunchgrass in the pasture, ca 400 ft [120 m], 07 Nov 2002, *C. Imada, C. Puttock, T. Kelley, M. LeGrande, & R. Ganske 2002-71*; East Maui, ‘Ālau, rare, one plant, first collected during this survey, 05 Apr 2005, *F. Starr, K. Starr, & K. Wood 050405-27.*

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

Treated as a note in the *Sporobolus* treatment for *Manual of the Flowering Plants of Hawai‘i*, O’Connor (1990: 1596) considered whorled dropseed to be an adventive weed in coastal sites on Kure Atoll, French Frigate Shoals, and O‘ahu. Wagner and Herbst (1995: 24) confirmed the naturalized status of *S. pyramidatus* on those islands, in addition to Laysan, citing that label data on *Herbarium Pacificum* specimens clearly made a case for this species to be fairly widely naturalized in the archipelago. Since then, in quick succession, the species has been recorded on Moloka‘i (Starr *et al.* 2006: 40), Kaua‘i (Wood 2006: 18), Hawai‘i (Snow & Lau 2010: 56), Midway Atoll (Starr *et al.* 2010: 66), and Kaho‘olawe (Starr & Starr 2011: 31). Now a 2009 voucher by Robert Hobdy, recently unearthed from backlog and identified in 2019, confirms the presence of *S. pyramidatus* in Kīhei on East Maui. Native to North and South America and the Caribbean, CABI (2020e) notes that it is weedy within this geographic range in coastal areas, a variety of well-drained sandy soils inland, and roadsides and other disturbed places, and attributes its competitive ability to its allelopathic qualities. The Hawaii-Pacific Weed Risk Assessment (2009d) has rated this grass as a high-risk species.

*Material examined*. **MAUI**: East Maui, Kīhei, spreading on disturbed ground on Lower Piikea St., 06 Mar 2009, *R.W. Hobdy 4305.*

***Urochloa brizantha*** (Hochst. ex A. Rich.) R.D. Webster **New island record**

First recorded as naturalized in the Hawaiian Islands on Kaho‘olawe (Starr *et al.* 2006: 39), and later on East Maui (Oppenheimer 2008: 31) under the name *Brachiaria brizantha*, Snow & Lau (2010: 49) removed the Kaho‘olawe record after reidentifying that island record as *B. decumbens* [= *Urochloa decumbens*]. Now a recently unearthed 1966

collection by Derral Herbst adds a new island record of this species for O‘ahu. The name change from *Brachiaria* to *Urochloa* follows Zuloaga *et al.* (2003: 630).

*Material examined*. **O‘AHU**: Ko‘olauloa Distr., Ka‘a‘awa, Bill Hoe’s beach house, growing with *Urochloa mutica*, culms decumbent, 7–8 ft [2–2.5 m] long, forming dense mats 3 ft [1 m] high, 12 Jun 1966, *D.R. Herbst 144.*

***Urochloa distachya*** (L.) T.Q. Nguyen **New island record**

In O’Connor (1990: 1503), what merges into this species starts out as a note discussing two *Brachiaria* species of uncertain naturalization status, *B. distachya* (known from a single Kaua‘i collection from 1946) and *B. subquadripara* (possibly naturalizing on O‘ahu, Moloka‘i, and Maui in pastures and along roadsides). Lorence *et al.* (1995: 44) reported the first authentic naturalized record for *B. subquadripara* from Kaua‘i. Then, in 2003, *Herbarium Pacificum* chose to follow Zuloaga *et al.* (2003: 631) in adopting the sinking of *Brachiaria* into *Urochloa*, as well as the synonymization of *B. subquadripara* into *Urochloa distachya*. Subsequently, new island records for *U. distachya* have been recorded on O‘ahu (Frohlich & Lau 2014: 13) and Lāna‘i (Oppenheimer & Bogner 2019: 23). The following vouchers also confirm its naturalized presence on both East and West Maui. The updated distribution of *U. distachya* in Hawai‘i: recorded on Kaua‘i, O‘ahu, Lāna‘i, and East and West Maui, but no vouchers at BISH from Moloka‘i.

*Material examined*. **MAUI**: East Maui, HC&S field, sprawling, rooting at nodes, mat-forming, May 1967, *T. Yamada O-82*; East Maui, HC&S cane fields, weed along cane roads, forming dense, decumbent patches, 31 Jan 1984, *R. Hobdy 1931*; West Maui, mauka of Lahainaluna School, along cane field road, a common weed in West Maui canefields during the last decade, 800 ft [245 m], 12 Feb 1986, *R. Hobdy 2500*; West Maui, Lahaina Distr., ‘Alaeloa, vicinity of Pu‘ukalauliko, at edge of dirt road in pineapple field, 500 ft [150 m], 24 Oct 2000, *H. Oppenheimer H100038*; central plains southwest of Kahului, mat-forming grass growing in sandy soil, 100 ft [30 m], 17 Jun 2004, *R. Hobdy 4192*; East Maui, Hāna Distr., Pu‘uhaoa, edge of pasture, 350 ft [105 m], 17 Dec 2005, *H. Oppenheimer H120507.*

**Rubiaceae**

***Spermacoce latifolia*** Aubl. **New island record**

*Spermacoce latifolia,* native to tropical South America and the West Indies and now a common weed in many tropical regions, was first recorded as a naturalized species in the state from collections made in a southern Kaua‘i sugarcane field in 1990 (Lorence *et al.* 1995: 51–52). It was subsequently documented from East Maui (Oppenheimer 2004: 17) and Moloka‘i (Oppenheimer 2010: 38). Recently, it was collected for the first time on O‘ahu, in the lowlands of the northern Ko‘olau Mountains, growing in a lush patch 0.5 m tall and several meters wide, stems upright but delicate and sprawling. The collector speculated that the patch represented either one massive clone or hundreds of individuals. The inflorescence was noted to have a faint, pleasant scent. The associated vegetation was largely alien. There is apparent disagreement among Rubiaceae specialists about the taxonomic placement of this species. Several recent floras have included *S. latifolia* as a synonym under *S. alata* Aubl. (*e.g.,* Tao & Taylor 2011; Adams & Taylor 2012; Taylor & Hammel 2014). Wiersema *et al.* (2017) take an opposing view in recognizing both species.

*Material examined*. **O‘AHU**: northern Ko‘olau Mts., Kahuku Training Area, dense patch in shaded, damp area on ridge between Kea‘aulu and Lamaloa Gulches, 450 ft [135 m], 25 Mar 2019, *J. Beachy, A. Woods, & J. Dedrick USARMY 512.*

**Salviniaceae**

***Azolla caroliniana*** Willd. **New naturalized records**

*Azolla* is a genus of 5–7 species found throughout tropical and temperate regions of the world (Lumpkin 1993; Mabberley 2017). These tiny water ferns are well known for their association with nitrogen-fixing blue-green algae, leading to their economic use as a green fertilizer. They have also been exported horticulturally as water plants, leading to their spread as invasive weeds of slow-moving waterways. *Azolla filiculoides* and *A. caroliniana* are among three North American species that have become naturalized in Europe and South Africa, and introduced horticulturally into Hawai‘i and agriculturally into Asia (Lumpkin 1993). In Hawai‘i it can often be found covering the water surface in taro paddies. While *A. filiculoides* has a long history of presence in Hawai‘i, with *Herbarium Pacificum* vouchers dating back to 1937, *A. caroliniana* was apparently relatively recently introduced, represented in the herbarium by only two Hawaiian vouchers collected in 1985 (O‘ahu) and 1994 (Moloka‘i), both identified in 1994 by Alan R. Smith (UC-Berkeley). The two naturalized *Azolla* species in the state are distinguished by the following difficult-to-observe characters: *filiculoides* with the largest hairs on upper leaf lobe unicellular, and the megaspores warty with raised angular bumps; *caroliniana* with the largest hairs on upper leaf lobe 2- or more-celled, and the megaspores without raised angular bumps (Lumpkin 1993).

*Material examined*. **O‘AHU**: Honolulu, Kānewai area, Dole St., floating plant carpeting the surface of a sparsely planted taro patch, 06 Nov 1985, *J. Lau 1616*. **MOLOKA‘I**: Near Smith-Bronte Landing site, floating in water in taro patch, 05 Jun 1994, *K.A. Wilson, D.D. Palmer, & J. Aidem 2447*.

**Thelypteridaceae**

***Christella dentata*** (Forssk.)
Brownsey & Jermy **New island record**

Only the fifth naturalized fern documented from Kaho‘olawe [*Nephrolepis brownii*, *Adiantum hispidulum*, *Pityrogramma austroamericana*, and *P. calomelanos* are the others; see Imada 2019], *Christella dentata* was collected as a single specimen in 1980 in a shaded gully. As 40 years have passed since it was collected, its current status needs to be verified. The species has now been collected on all eight main islands (Palmer 2003: 88; Imada 2007: 39). Its generic placement has flip-flopped between *Christella*, *Cyclosorus*, and *Thelypteris*; here we follow the Pteridophyte Phylogeny Group (2016) and Ranker *et al.* (2019) in accepting its placement in *Christella*.

*Material examined*. **KAHO‘OLAWE**: Northeast part of island near Wa‘aiki Gulch, single fern growing near bottom of gully in shade of *Prosopis pallida* and *Nicotiana glauca* trees, ca 1,100 ft [335 m], 24 Apr 1980, *L.W. Cuddihy & G. Clarke 405*.

## TAXA SHOWING SIGNS OF NATURALIZATION

**Malvaceae**

***Corchorus olitorius*** L.

Easily grown and with a variety of culinary uses (Philippine okra and Filipino spinach are among its local common names), *Corchorus olitorius* is popular with local growers. The species is native to India and is widely cultivated in northern Africa, the Middle East, and Asia, both as a food and fiber source; however it sometimes escapes from cultivation and can become weedy (Staples & Herbst 2005: 548). Wagner *et al.* (1990: 1291) noted the

historical eradication of a naturalized population in Lāwa‘i Valley, Kaua‘i, and an undocumented report of escaping plants along lotus pond banks at Hale‘iwa, O‘ahu. The following vouchers suggest that it may again be escaping from cultivation on Kaua‘i, as well as on Maui. Given its popularity among local growers and its propensity to become weedy, we recommend that invasive species and natural resources field staff be on the lookout for this species. With its yellow-petaled flowers and cylindrical capsules, *Corchorus olitorius* superficially resembles *Ludwigia octovalvis* in wetland habitats; a description of *Corchorus* can be found in Staples & Herbst (2005: 548).

*Material examined*. **KAUA‘I**: Hanalei National Wildlife Refuge, 2017, *K. Uyehara s.n.* (BISH 775086). **MAUI**: central Maui, southern coast of isthmus, Keālia Pond National Wildlife Refuge, west of Keālia Pond, 5 ft [1.5 m], 07 Oct 1998, *C. Imada & K. Evans 98-31*; East Maui, Kula, Ka‘ono‘ulu, highly disturbed site 150 ft [45 m] below Pi‘ilani Hwy., ca 5 plants, 35 ft [11 m], 23 Jan 2014, *R.W. Hobdy 4349*.

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