

## New Hawaiian plant records from *Herbarium Pacificum* for 2008<sup>1</sup>

BARBARA H. KENNEDY, SHELLEY A. JAMES, & CLYDE T. IMADA (Hawaii Biological Survey,  
Bishop Museum, 1525 Bernice St, Honolulu, Hawai'i 96817-2704, USA;  
emails: bkennedy@bishopmuseum.org, sajames@bishopmuseum.org, cimada@bishopmuseum.org)

These previously unpublished Hawaiian plant records report 2 new naturalized records, 13 new island records, 1 adventive species showing signs of naturalization, and nomenclatural changes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

### Apocynaceae

#### *Rauvolfia vomitoria* Afzel.

#### New naturalized record

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

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

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

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

---

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

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

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

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

### **Aspleniaceae**

*Asplenium haleakalense* W.H. Wagner

**New island record**

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

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

### **Asteraceae**

*Tagetes erecta* L.

**New naturalized record**

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

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

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

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

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

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

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

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

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

Palla

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### Psilotaceae

***Psilotum nudum*** (L.) P. Beauv.

#### New island record

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

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

### Rubiaceae

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

#### Nomenclatural change

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

***Kadua acuminata*** Cham. & Schltdl.

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

***Kadua affinis*** DC.

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

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

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

***Kadua centranthoides*** Hook. & Arn.

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

***Kadua cookiana*** Cham. & Schltdl.

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

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

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

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

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

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

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

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

Syn. *Hedyotis coriacea* Sm.

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

Wagner & Lorence

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

## Verbenaceae

***Phyla nodiflora*** (L.) Greene

### New island records

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

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

## Adventive Species Showing Signs of Naturalization

### Martyniaceae

***Proboscidea louisianica*** (Mill.) Thell.

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

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

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

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

### Acknowledgments

We thank Drs. Derral Herbst (BISH), Tetsuo Koyama (MBK), Dan Palmer, and George Staples (SING) for specimen identification; the Lāna‘i Company Conservation crew led by B. Plunkett for field logistics; M. Purell for providing the bulk of the data for the *Rauvolfia vomitoria* report; and field collectors L.M. Crago, R.K. Epperson, L. Loope, D. Lorence, C. McGuire, H. Oppenheimer, D. Palmer, L. Pratt, M. Purell, F. Starr, K. Starr, F. & W.H. Wagner Jr., A. Wegmans, and K.A. Wilson.

### Literature Cited

- The Angiosperm Phylogeny Group (APG).** 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* **141**: 399–436.
- Bretting, P.K.** 1983. The taxonomic relationship between *Proboscidea louisianica* and *Proboscidea fragrans* (Martyniaceae). *The Southwestern Naturalist* **28**(4): 445–449.
- DeFelice, R.C.** 1999. A new distributional record for *Halophila hawaiiiana* Doty & B. Stone (Hydrocharitaceae) in Hawai‘i. *Bishop Museum Occasional Papers* **59**: 2–3.
- Fosberg, F.R.** 1937. The genus *Gouldia* (Rubiaceae). *Bernice P. Bishop Museum Bulletin* **147**: 1–82.
- . 1943. The Polynesian species of *Hedyotis* (Rubiaceae). *Bernice P. Bishop Museum Bulletin* **174**: 1–102.
- Gon, S.M.** 1994. A Hawaiian bog in the Ko‘olau Mountains of O‘ahu? Evidence from community structure and diagnostic species. *Newsletter of the Hawaiian Botanical Society* **33**(4): 89–96.
- Govaerts, R., Simpson, D.A., Goetghebeur, P., Wilson, K., Egorova, T. & Bruhl, J.** 2008. *World checklist of Cyperaceae*. The Board of Trustees of the Royal Botanic Gardens, Kew. Available at: [http://apps.kew.org/wcsp/namedetail.do?accepted\\_id=263102&rep\\_Synonym\\_id=264982&name\\_id=263102&status=true](http://apps.kew.org/wcsp/namedetail.do?accepted_id=263102&rep_Synonym_id=264982&name_id=263102&status=true), accessed 20 November 2008.
- Hawaii Ecosystems at Risk (HEAR).** 2008. *Global compendium of weeds*. [http://www.hear.org/gcw/species/proboscidea\\_louisianica/](http://www.hear.org/gcw/species/proboscidea_louisianica/), accessed 12 November 2008.
- Herbst, D.R.** 1998. New records for Hawaiian plants. I. *Bishop Museum Occasional Papers* **56**: 2–4.
- , **Staples, G.W. & Imada, C.T.** 2004. New Hawaiian plant records for 2002–2003. *Bishop Museum Occasional Papers* **78**: 3–12.
- Hillebrand, W.** 1888. *Flora of the Hawaiian Islands: a description of their phanerogams and vascular cryptogams*. Carl Winter, Heidelberg, Germany; Williams & Norgate, London; B. Westermann & Co., New York; C. Winter, Heidelberg. xcvi + 673 pp.

- Imada, C.T. & LeGrande, M.** 2006. Botanical inventory of Kalauao Valley. Report to City & County of Honolulu, O'ahu. Bishop Museum, Honolulu. 33 pp.
- Li, P.-t., Leeuwenberg, A.J.M. & Middleton, D.J.** 1995. Apocynaceae, pp. 143–188 in: Flora of China Editorial Committee, *Flora of China*, vol. 16, *Gentianaceae through Boraginaceae*, Science Press, Beijing & Missouri Botanical Garden, St. Louis. 479 pp.
- Mabberley, D.J.** 2008. *Mabberley's plant-book: a portable dictionary of plants, their classification and uses*. Cambridge University Press, Cambridge, UK.
- Missouri Botanical Garden.** 2008a. *Tropicos.org*. Available at: <http://www.tropicos.org/NameSpecimens.aspx?nameid=1805350>, accessed 25 Nov 2008.
- . 2008b. *Tropicos.org*. Available at: <http://www.tropicos.org/Name/2711174>. Accessed 13 Nov 2008.
- . 2008c. *Tropicos.org*. Available at: <http://www.tropicos.org/name/9906131>. Accessed 20 Nov 2008.
- Omino, E.A.** 2002. Apocynaceae (Part 1). *Flora of Tropical East Africa* **36**: 1–320.
- Oppenheimer, H.L.** 2006. New Hawai'i plant records for 2004. *Bishop Museum Occasional Papers* **88**: 10–15.
- Palmer, D.D.** 2003. *Hawai'i's ferns and fern allies*. University of Hawai'i Press. Honolulu. 324 pp.
- Parsons, W.T. & Cuthbertson, E.G.** 2001. *Noxious weeds of Australia*. 2nd ed. CSIRO Publishing, Melbourne.
- Smith, S.G.** 2002. *Schoenoplectus*, pp. 44–60 in: Flora of North America Editorial Committee (eds.), *Flora of North America*. vol. 23. Magnoliophyta: Commelinidae (in part): Cyperaceae. i–xxiv + 608 pp.
- Staples, G.W. & Herbst, D.R.** 2005. *A tropical garden flora*. Bishop Museum Press, Honolulu. 908 pp.
- Terrell, E.E., Robinson, H.E., Wagner, W.L. & Lorence, D.H.** 2005. Resurrection of genus *Kadua* for Hawaiian Hedyotidinae (Rubiaceae), with emphasis on seed and fruit characters and notes on South Pacific species. *Systematic Botany* **30**(4): 818–833.
- USDA NRCS.** 2008. *The PLANTS database*. National Plant Data Center, Baton Rouge, Louisiana. Available at: <http://plants.usda.gov>. Accessed 12 November 2008.
- Wagner, W.H., Wagner, F.S., Palmer, D.D. & Hobdy, R.H.** 1999. Taxonomic notes on the pteridophytes of Hawaii—II. *Contributions from the University of Michigan Herbarium* **22**: 135–187.
- Wagner, W.L., Herbst, D.R. & Sohmer, S.H.** 1999. *Manual of the flowering plants of Hawai'i*. Rev. ed. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu. 1919 pp.
- . & Lorence, D.H. 1998. A new, dioecious species of *Hedyotis* (Rubiaceae) from Kaua'i, Hawaiian Islands, and the taxonomy of Kaua'i *Hedyotis schlechtendahlana* resolved. *Novon* **8**: 311–317.
- Wood, K.R. & LeGrande, M.** 2006. An annotated checklist and new island records of flowering plants from Lehua Islet, Ni'ihau, Hawai'i. *Bishop Museum Occasional Papers* **87**: 19–29.
- World Agroforestry Centre.** 2008. *Agroforestry tree database*. <http://www.worldagroforestrycentre.org/sea/Products/AFDbases/AF/asp/SpeciesInfo.asp?SPID=1768>. Accessed 25 November 2008.
- Yarborough, S.C. & Powell, A.M.** 2006. *Flaveria*, pp. 247–250. In: Flora of North America Editorial Committee (eds.), *Flora of North America*. Vol. 21. Magnoliophyta: Asteridae, part 8: Asteraceae, part 3. i– xxii + 616 pp.