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Misapplied names in the Hawaiian introduced flora

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The following names were found to be misapplied or used for two closely related taxa in the Hawaiian flora: *Asparagus densiflorus, Cardamine flexuosa, Cyperus stoloniferus, Epipremnum pinnatum, Erigeron bonariensis,* and *Hypertelis cerviana*. The misapplication of these names is hereby corrected, resolving some idiosyncrasies in the Hawaiian flora. Many of these misapplied names were brought to the attention of the author via the citizen science website iNaturalist through conversations with naturalists from outside of Hawai'i where the names are correctly applied. All identifications were made by the authors, unless otherwise stated. All voucher specimens cited for this paper have been deposited at the Herbarium Pacificum (BISH), unless otherwise noted.

Araceae

Epipremnum aureum (Linden & André) G.S.Bunting

Nomenclatural note

In the *Manual* (Wagner *et al*. 1990:1359) *Epipremnum aureum* was synonymized with *E. pinnatum* (L.) Engl. with little discussion. However, this synonymy is no longer widely accepted, as most modern authors now recognize these two as separate species (Boyce 2004; Moodley *et al*. 2017; POWO 2024). Both *E. pinnatum* and *E. aureum* are naturalized in Hawai'i but with *E. aureum* being a very common weed in disturbed lowland sites and *E. pinnatum* being generally uncommon. *Epipremnum aureum* is known to be naturalized on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. Despite being a widespread weed across Hawai'i and exhaustively searching all herbaria with substantial Hawaiian holdings, no vouchers had ever been made of *E. aureum* on Kaua'i before 2023. This is likely due to this plant's inability to flower and the tendency of botanists to only voucher fertile material.

The two species can be separated by the following key adapted from Boyce (2004):

1. Leaves usually golden-variegated; pre-adult leaves ovate-lanceolate; remains of leaf sheaths not netted; adult leaves irregularly pinnate; aerial roots formed which dangle to the ground and root; flowers effectively never found ..... *E. aureum*

1′. Leaves never golden-variegated; pre-adult leaves lanceolate to elliptic; remains of leaf sheaths netted; adult leaves regularly pinnate; aerial roots not hanging down and rooting; flowers frequent ..... *E. pinnatum*

Material examined. **KAUA'I**: Kalāheo, Kukuiolono, 22 Nov 2023, *D. Lorence 10992* (PTBG). **O'AHU**: Nu'uanu Pali Dr. above where the housing development ends, roadside, shaded, moist, 21.346078, -157.825683, 29 May 2021, *K. Faccenda 1925*; Mānoa, common on walls, hillsides, etc., climbing into trees, leaves become much larger and variegated yellow and white, 02 Oct 1932, *T.G.*

Yuncker 3145 (US). **MOLOKA‘I**: Hālawa Valley, climbing or sprawling with variegated leaves, 20 ft [6 m], 19 Aug 2005, *H. Oppenheimer H80513*. **MAUI**: Wailuku Distr., West Maui Forest Reserve, between Wailuku and ‘Īao Valley parking lot, along road, climbing into trees, 06 Mar 1988, *W. Wagner 5829*. **HAWAI‘I**: Puna Distr., ahupua‘a of Halepua‘a, growing on Puna Trail near experimental planting area, 100 ft [30 m], 10 May 1979, *R. Kubo 33*; South Kona, above Ho‘okena, vine prostrate and climbing into trees near roadside, white streaks on leaves, 1000 ft [305 m], 22 Aug 1987, *L.W. Cuddihy 2070*; Puna Distr., between Kapoho and Pohoiki, near coast, 20 Sep 1987, *L.W. Cuddihy 2078*.

Epipremnum pinnatum (L.) Engl. **Correction**

After *Epipremnum pinnatum* has been split from *Epipremnum aureum* (see above note), *E. pinnatum* is no longer known to be naturalized on Moloka‘i, Maui, or Hawai‘i, although it is likely cultivated on some of these islands. It is known to be naturalized in limited populations on Kaua‘i and O‘ahu.

Material examined. **KAUA‘I**: Līhu‘e Distr., Hā‘iku Rd, approx. ¼ mile [0.4 km] from junction with Hulemalu Road, east fork of Hā‘iku Rd towards power plant, secondary vegetation, high climbing vine to 30–40 ft [9–12 m] in trees, also covering banks of road, 120 ft [36 m], 02 Apr 2004, *T. Flynn 7188*; Hanalei Distr., just east of Hā‘ena along Hwy 56, vacant lot, secondary forest, 5 m, 26 Apr 1992, *D.H. Lorence & J. Black 7201* (PTBG). **O‘AHU**: Makiki Valley Loop Trail, near start of trail, disturbed moist forest, abundant along with *E. aureum*, 21.317106, -157.826525, 14 Jul 2021, *K. Faccenda 2050*; Honolulu, Makiki Heights area, 2377 Makiki Heights Drive, root climber on walls and tree trunks, or trailing on ground, spathe cream, spadix medium green, in partial shade, 03 Mar 1983, *J. Lau & C. Cory 2072*.

Asparagaceae

Asparagus aethiopicus L. **Nomenclatural note**

Asparagus densiflorus (Kunth) Jessop was first noted as naturalizing in Hawai‘i by Lorence & Flynn (1999); however, this name has been misapplied in Hawai‘i for wild plants. All examined specimens of wild plants formerly published using this name best represent *Asparagus aethiopicus*. The two species can be distinguished by the key in Jessop (1966) and differ primarily by how they hold their stems and the density of the cladodes [the photosynthetic stems in this genus that resemble leaves]: *A. densiflorus* holds its stems upright and has tightly arranged cladodes; *A. aethiopicus* is weak and sprawling and with cladodes arranged loosely. No naturalized vouchers of true *A. densiflorus* have been found, although *A. densiflorus* is frequently cultivated in Hawai‘i. *Asparagus aethiopicus* is naturalized on Kaua‘i, O‘ahu, Lāna‘i, Maui, and Hawai‘i islands (Imada 2019).

Asteraceae

Erigeron bonariensis L. **Correction**

Erigeron bonariensis (= *Conyza bonariensis* (L.) Cronquist) is no longer known from Ni‘ihau or Kaho‘olawe, as all specimens have been reidentified as *E. sumatrensis* (see discussion below). As most specimens of *E. bonariensis* in Hawai‘i were misidentified as *E. sumatrensis*, new specimen citations are only given for the earliest record on each island.

Material examined. **KURE**: 13 Sep 1961, *C. Lamoureux 1909*. **MIDWAY**: Dec 1931, *D.R. Chisholm s.n*. (BISH 75131) **LAYSAN**: Sandy substratum on southwest side of island, 05 Jul 1963, *R. Walker 503*. **FRENCH FRIGATE SHOALS**: Tern Island, abundant, 02 Sep 1961, *C. Lamoureux 1655*. **KAUA‘I**: Hanalei Distr., Kīlauea Point National Wildlife Refuge, east below Crater Hill, 102 m, 21 Jan 2013, *N. Tangalin 3425* (PTBG). **O‘AHU**: Koko Head, 16 Feb 1917, *C.N. Forbes 2418.O*. **MOLOKA‘I**: Airport, 11 Nov 2004, *M.L. Wysong 407*. **LĀNA‘I**: Mahana, Oct 1913, *G.C. Munro 177*. **MAUI**: Lualaʻilua, S slope of Haleakalā, 17 Mar 1920, *C.N. Forbes 1983.M*. **HAWAI‘I**: Pu‘u Wa‘awa‘a, 09 Jun 1911, *C.N. Forbes 54.H*.

Erigeron sumatrensis Retz. **New state record**

Erigeron sumatrensis has long been naturalized in Hawai‘i, being first collected in 1895, but has also long been identified as *Erigeron bonariensis*, despite these being distinct species. These species have historically been confused in many regions across the world, owing to their close morphological similarities and confusion in older literature (Milović 2004; Nesom 2018).

Despite its name, *E. sumatrensis* is native to Central and South America, and has become naturalized across much of Africa, Europe, India, and Southeast Asia (POWO 2024). It is noted as an agricultural weed across the world (Florentine *et al*. 2021), as well as by the author (KF) in Hawai‘i, where it becomes dominant in pastures. In more wild contexts, *E. sumatrensis* does not tend to become dominant, but instead tends to occur at low densities in widespread locations across the islands due to its wind-dispersed fruits. *Erigeron sumatrensis* appears to be the most common of these two species around the Hawaiian Islands, with 96 specimens at BISH and 97 iNaturalist observations, compared to 57 specimens and 67 iNaturalist observations for *E. bonariensis*. The key below details the morphological differences between these species, but they also differ in habit, with *E. sumatrensis* generally preferring moister areas (Figure 1). *Erigeron sumatrensis* is now known to be naturalized on Midway and all the main islands, including Ni‘ihau.

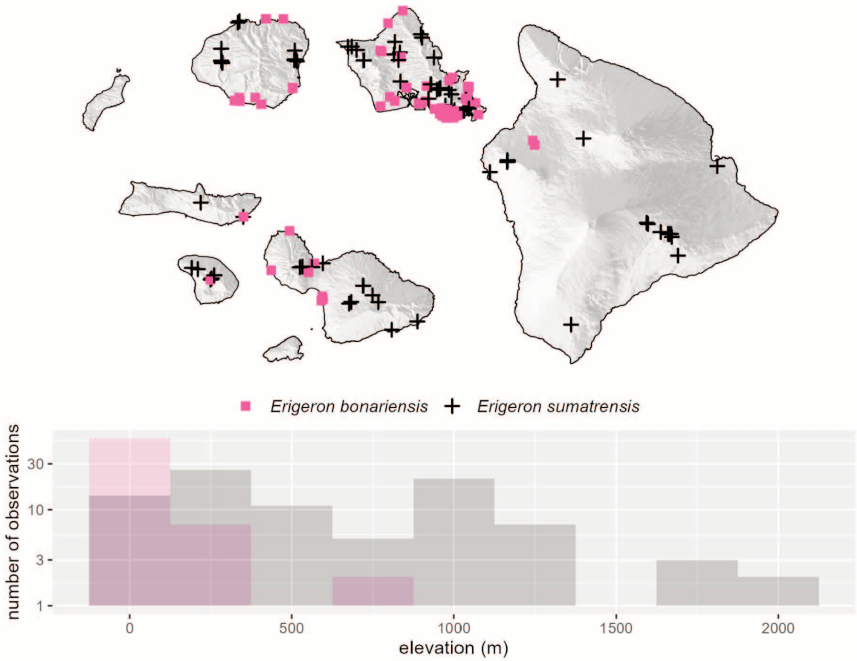

Figure 1. Distribution of *Erigeron bonariensis* and *E. sumatrensis* in Hawai‘i based on iNaturalist data. Upper panel shows geographic distribution, whereas the lower shows the elevational distribution. Note the log scale of the y axis.

KEY TO DISTINGUISH *ERIGERON SUMATRENSIS* AND *E. BONARIENSIS* [BASED ON ZHENGYI *ET AL*. (2011), NESOM (2018), LIENDO *ET AL*. (2021), AND WEAKLEY (2020)]:

1. Plant 30–200 cm tall; inflorescence broad and profusely branched; stem leaves lanceolate, toothed, 5–20 mm wide; phyllaries loosely strigose, with narrow-based hairs; dry to moist areas ..... *E. sumatrensis*
1′. Plant <60 cm tall; inflorescence spiciform with short side branches; stem leaves linear to lanceolate, <4 mm wide; phyllaries rather densely hispid-hirsute, with broad-based hairs; typically found in dry areas ..... *E. bonariensis*

Material examined. **MIDWAY**: 16 Apr 1962, *H.W. Frings 13*. **NI'IHAU**: South half of island, Jan 1912, *J.F.G Stokes s.n.* (BISH 75134). **KAUA'I**: Kahōluamanoa, above Waimea, 10 Sep 1895, *A.A. Heller 1819*. **O'AHU**: Moanalua, R.R. track, 13 Dec 1903, *W.A. Bryan s.n*. (BISH 75128). **MOLOKA'I**: Pālā'au, in pineapple field on west side of Moloka'i Airport, dry exposed, windy, 400 ft [120 m] 11 Nov 1974, *D. Herbst & G. Spence 5093*. **LĀNA'I**: Miki, 22 Mar 1916, *G.C. Munro 529*. **MAUI**: Waihe'e Valley Rd at junction with Wailuku Sugar Rd, on banks of fallow cane field, 29 Nov 1973, *S. Ishikawa 322*. **KAHO'OLAWE**: Northwestern part of island above Maka'alae Point, 200 ft [60 m], 21 Apr 1980, *L.W. Cuddihy & W.P. Char 330*. **HAWAI'I**: Pu'u Hualālai, Ka'ūpūlehu, 8000 ft [2440 m], *H. St. John et al. 11420*.

Brassicaceae

Cardamine occulta Hornem. **Nomenclatural note**

[syn. *Cardamine konaensis* H. St.John]

The name *Cardamine flexuosa* With. has been widely misapplied across the world (Šlenker *et al*. 2018; Weakley 2020) and Hawai'i is no exception; after examination of all specimens at BISH, all Hawaiian material formerly referred to as *C. flexuosa* is actually *Cardamine occulta*. *Cardamine occulta* is identified by its lack of a basal rosette of leaves at flowering time as well as the lack of hairs on the upper portion of the stem whereas *C. flexuosa* has a basal rosette and hairs on the upper portion of its stem (Šlenker *et al*. 2018). Note that *Cardamine hirsuta* L. is also naturalized in Hawai'i and this species does have a basal rosette. Thank you to iNaturalist user @ajwright for bringing this misidentification to my attention. *Cardamine occulta* is a common weed and is found on Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i (Imada 2019). The name *Cardamine konaensis* H.St.John had historically been used for these plants in Hawai'i and must also be considered a synonym of *C. occulta*.

Cyperaceae

Cyperus stoloniferus Retz. **Correction; nomenclatural note**

Cyperus stoloniferus was published as occurring in Hawai'i by Imada & Kennedy (2020) based on material from upcountry Maui and the Kahuku Unit of Hawai'i Volcanoes National Park. However, conversations on iNaturalist revealed that this name was also misapplied after users from the species' native range noted that it is a coastal species. The plants found in Hawai'i occur above 2000 ft [609 m] and the inflorescence structures and color differ between the Hawaiian and *C. stoloniferous* plants from its native range.

Searching for an alternative identification, all specimens at BISH identified as *Cyperus* "*stoloniferus*" keyed to *C. rigidifolius* Steud. in *Flora of Tropical East Africa* (Hoenselaar *et al*. 2010). A specimen at US (*F. Starr & K. Martz 000910-1*) from East Maui and photos of fruiting spikelets and achenes from F. Starr were compared by the second author (MS) to

material of *C. rigidifolius* at US. This included an isotype (*Schimper 991*) from Eritrea and a specimen from Uganda with fruiting spikelets (*Dummer 3627*) cited by Kükenthal (1925). The etuberous rhizomes, abaxially lighter green to stramineous leaf blades, congested inflorescence, narrowly lanceolate-elliptic spikelets, narrowly ovate scales with purple-black sides, and trigonous, ellipsoid to ellipsoid-obovoid nutlets ranging from 1.5–1.6 × 0.6–0.8 mm were all a good match to the material at US.

This is the first time *C. rigidifolius* has been reported outside of its native range of the Arabian peninsula south through East and Central Africa to South Africa. It occurs at 1500–2800 m elevation (Kükenthal 1925; Hoenselaar *et al*. 2010) in grasslands, cultivated areas, and along roadsides (Simpson & Inglis 2001), and is noted as a troublesome weed in cultivated areas of Kenya, Uganda, and South Africa (DluDlu 2007). It is unclear how it arrived in Hawai‘i.

Molluginaceae

Mollugo cerviana (L.) Ser. **Correction; nomenclatural note**

All material at BISH previously identified as *Mollugo cerviana* has been reidentified as *M. verticillata* L. based on seed morphology and comparisons to material of *M. verticillata* from the mainland United States. Thank you to iNaturalist user @aspidoscelis for bringing this misidentification to my attention.

A naturalization record of *Hypertelis cerviana* (L.) Thulin (= *Mollugo cerviana*) was published for Maui by Oppenheimer (2016), but this was a misidentification of *Spergularia marina* (L.) Besser. As no other specimens exist from Maui, this island record must be deleted. *Mollugo verticillata* is now known to be naturalized on O‘ahu, Moloka‘i, Lāna‘i, and Hawai‘i (Imada 2019; Faccenda & Daehler 2024).

Verbenaceae

Lantana camara L. **Note**

The name *Lantana camara* is likely misapplied in Hawai‘i, as comparisons of the lectotype of *L. camara* do not match the material widely naturalized across the tropics and usually referred to as *Lantana camara* (Sanders 2006). The name *Lantana* × *strigocamara* R.W.Sanders was published by Sanders (2006) to encompass the horticultural plant, which has widely naturalized across the tropics and largely called *L. camara* by previous authors. *Lantana* × *strigocamara* is a hybrid derived from *L. camara* L., *L. nivea* Vent., *L. scabrida* Sol., *L. splendenti* Medik., and *L. hirsuta* M. Martens & Galeotti by European horticulturalists (Sanders 2006). Weakley (2006) accepts *L.* × *strigocamara* as the only naturalized *Lantana* in the southeastern United States and notes that the name *L. camara* was formerly applied to these plants.

However, when attempting to apply the species concepts of Sanders (2012) to the naturalized *Lantana* in Hawai‘i, names could not be straightforwardly applied. Sanders’ taxonomy includes numerous hybrids and backcrosses; for example, over 35 putative hybrids with many species of *Lantana* sect. *Lantana* are reported among the 6 subspecies of *L. camara* (Sanders 2012). Sanders (2012) examined 3 specimens from Hawai‘i, which were identified as follows:

1. *Lantana camara* subsp. *aculeata* (L.) R.W.Sanders × *L. nivea* Vent. subsp. *mutabilis* (Hook.) R.W.Sanders (*Degener 11467*, SMU) [with note that this identification is uncertain]. Note that *L. nivea* does not occur in Hawai‘i making this ID dubious.

2. *Lantana camara* subsp. *aculeata* × *L.* ×*strigocamara* (*Krauss 1013*, SMU). Note that *L. camara* subsp. *aculeata* is a backcross between *L. camara* and *L.* ×*strigocamara*, making this specimen supposedly a F2 backcross, this ID is unlikely to be accurate as *L. camara s.s.* does not grow wild in Hawai‘i.
3. *Lantana nivea* subsp. *nivea* × *L.* ×*strigocamara* (*Topping 3009*, NY). Note that *L. nivea* does not occur in Hawai‘i making this ID dubious.

While it is clear that the Hawaiian plants called *Lantana camara* do belong to the strigose clade and do not represent *L. camara* s.s. (per the lectotype), the correct name to apply is unclear, as arguments could be made for either a broad concept of *L.* ×*strigocamara* L., a complicated taxonomy with numerous hybrids, such as those proposed by Sanders (2012), or a *L. camara sensu lato* concept. Given the taxonomic difficulties in this group and the questionable taxonomy surrounding the work of Sanders (2012), a *L. camara sensu lato* concept is the most appropriate to apply in Hawai‘i pending further molecular and cytogenic studies (Urban *et al*. 2011; Goyal & Sharma 2015).

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