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New records of freshwater macroalgae and diatoms from the Hawaiian Islands

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The following new records were compiled from surveys and ecological stream studies conducted by the author from 2001–2002 on the islands of Kaua‘i, O‘ahu, Maui, and Hawai‘i. Some additional collections provided by members of the U.S. Fish & Wildlife Service from the Northwestern Hawaiian Islands are also included, since very few records of freshwater algae exist for these islands. The determination of new records was based on a compiled bibliographic checklist of Hawaiian nonmarine algae (Sherwood, 2004). Revised taxonomic information was verified using the AlgaeBase electronic database (Guiry & Nic Dhonncha, 2003).

CYANOPHYTA (blue-green algae)

Oscillatoriales: Phormideaceae

*Hydrocoleum meneghinianum* Kütz. New state record

This is the first record of the species *Hydrocoleum meneghinianum* in the Hawaiian islands. A generic record of *Hydrocoleum* was previously reported by Nordstedt (1876). The species is known from India and Croatia.

*Material examined.* HAWAI‘I: attached to rock in small stream at the 2.3 mi point along the Onomea Scenic Route, from Onomea, 10 Apr 2002, A. Sherwood, Sherwood 307 (BISH).

*Leptolyngbya foveolarum* (Mont. ex Gomont) [syn. *Phormidium foveolarum* Mont. ex Gomont] New state record

Anagnostidis et Komárk

This is the first record of the species in Hawai‘i. It is widespread, with a previously recorded distribution including the British Isles, India, China, and Japan.


1. All notes in this issue constitute Contribution No. 2004-011 to the Hawaii Biological Survey.
**Phormidium ambiguum** Gomont  
*New state record*

The previously recorded distribution of this species includes the British Isles, the Indian Ocean region, the North American Laurentian Great Lakes region, and Cuba.


**Phormidium stagnina** C.B.Rao  
*New state record*

This species of *Phormidium* was described from India. This is the first record of the species in the Hawaiian Islands.


**Phormidium subincrustatum** Fritsch et Rich  
*New state record*

This is the first record of this species of *Phormidium* in Hawai‘i; it was previously known from India.


**Phormidium tinctorium** Kütz.  
*New state record*

This is the first record of this species of *Phormidium* in Hawai‘i, although it has been reported from the Fijian islands of Vitu Levu and Taveuni (Sheath & Cole, 1996).


**Nostocales:** *Nostocaceae*

**Nostoc pruniforme** (C.Agardh) Bornet et Flahault  
*New state record*

This is an extremely widespread species of blue-green algae and is known from the British Isles, North America, India, Australia, and Europe.


**Tolypothrix nodosa** Bharadw.  
*New state record*

This is the first record of this species in Hawai‘i, it was described from collections in India and appears to be fairly limited in distribution.


**CHLOROPHYTA** (*green algae*)

**Cladophorales:** *Cladophoraceae*

**Rhizoclonium crassipellitum** W.West et G.S.West  
*New state record*

This species of *Rhizoclonium* is known from several disjunct locations, including Barbados, North America, and India, suggesting that it may be overlooked in other regions.


**Chaetophorales:** *Chaetophoraceae*

**Stigeoclonium fasciculare** Kütz.  
*New state record*

This species has been reported from locations worldwide, including New Zealand, Africa, Asia, North and South America, and Europe.

**Stigeoclonium pachydermum** Prescott  
**New state record**  
This species of *Stigeoclonium* has previously been reported from a number of regions, including North America, New Zealand, Europe, and possibly from the British Isles (doubtful record).  


**Tetrasporales: Gloeocystaceae**  
**Tetrasporidium javanicum** Möbius  
**New state record**  
This species is well known from tropical areas of the world and has been previously reported from Australia, Java, China, and Bangladesh. Although it has not been identified from collections from the main Hawaiian Islands, it was collected from two of the Northwestern Hawaiian Islands.  

Material examined: **NIHOA**: East Palm Valley, 5 Sep 2002, A. Wegmann (USFWS), Sherwood 364 (BISH); Miller Valley, 7 Sep 2002, A. Wegmann (USFWS), Sherwood 366 (BISH).  
**GARDNER PINNACLES**: West side of Main Pinnacle, 14 Sep 2002, A. Wegmann (USFWS), Sherwood 368 (BISH).

**Ulotrichales: Ulotrichaceae**  
**Klebsormidium fluitans** (Gay) Lokhorst  
[syn. *K. rivulare* (Kütz.) Morison et Sheath]  
**New state record**  
This is a commonly reported species of *Klebsormidium* and is known from the British Isles, North America, Malaysia, and Europe. Most literature reports refer to the entity as *K. rivulare*, since it was only recently recognized as a synonym of *K. fluitans*.  

Material examined: **HAWAI‘I**: on rocks in stream crossing the trail back to parking lot at ‘Akaka Falls State Park, 11 Apr 2002, A. Sherwood, Sherwood 335 (BISH).

**Klebsormidium subtile** (Kütz.) Tracanna ex Tell  
**New island record**  
Although this alga has been previously reported from O‘ahu and Moloka‘i (Lemmermann, 1905; MacCaughey, 1917, 1918), this is the first record of a collection from the Northwestern Hawaiian Islands. Other locations where it has been previously reported include the British Isles, North America, and Brazil.  


**Zygnematales: Zygnemataceae**  
**Spirogyra dictyospora** C.C.Jao  
**New state record**  
Like all species of *Spirogyra*, collections of this alga need to be sexually reproducing in order to provide identifications to the specific taxonomic level. Reproductive collections of several *Spirogyra* species were made over the last several years, most of which are new records for the state and are listed here. *Spirogyra dictyospora* was previously known from China, India, and Europe.  

**Spirogyra dubia** Kütz.  
This species of *Spirogyra* was previously known from the British Isles, North America, Africa, India, and Europe.  

**Spirogyra elegantissima** Ling et Zheng  
This species of *Spirogyra* was previously known from China and Europe.  

**Spirogyra fallax** (Hansg.) Wille  
*Spirogyra fallax* appears to be a North American species. This is the first record of the species from the state of Hawai‘i.  

**CHROMOPHYTA** (**BACILLARIOPHYCEAE**—diatoms)  
**Macroalgae Centrales**  
**Pleurosigma laevis** (Ehrenb.) Compère  
*Pleurosigma laevis* (Ehrenb.) Compère (includes *Biddulphia* sp. #1 as Sherwood 300 in BISH)  
This centric diatom frequently forms large chains, which can be found in Hawaiian stream habitats growing attached to rocks. It was previously reported from North America, Europe, Africa, and South America.  

**Periphyton**  
A number of new records of diatom taxa were identified from streams along windward O‘ahu, as part of an algal survey of these habitats. The results were presented in an unpublished technical report (Sherwood, 2002).

**Pennales**  
**Achnanthes laevis** Østrup  
This species was previously reported from Europe and Antarctica.  

**Achnanthes lanceolata** subsp. *frequentissima* LangeBert.  
This taxon was previously known from European freshwater habitats.  

**Achnanthes marginulata** Grunov  
This species was previously known from Europe, North America, and Antarctica.  
Achnanthes subatomoides (Hust.) LangeBert.  New state record
Archibald
This species was previously known from Europe, Asia, and Antarctica.


Achnanthidium biasolettianum (Grunov) L.Bukht.  New state record
This species was previously known from Europe, Japan, and North America,


Amphora inariensis Krammer  New state record
This is a European species of Amphora and represents the first record of the species in the Hawaiian Islands.


Cocconeis placentula var. pseudolineata Geitler  New state record
This is a European taxon of Cocconeis and represents the first record of the variety in the Hawaiian Islands.


Eunotia curvata var. linearis (Okuno) H.Kobay., Ando et Nagumo  New state record
This is a European taxon of Eunotia and represents the first record of the variety in the Hawaiian Islands.


Eunotia soleirolii (Kütz.) Rabenh.  New state record
This is a European species of Eunotia and represents the first record of the species in the Hawaiian Islands.


Fragilaria capucina var. mesolepta (Rabenh.) Rabenh.  New state record
This variety of Fragilaria capucina was previously known from Europe and North America.

Fragilaria fasciculata (C.Agardh) LangeBert. **New state record**  
This species of *Fragilaria* was previously known from Europe and Africa.


Gomphonema mexicanum Grunov **New state record**  
This is a fairly common species of *Gomphonema* and was previously known from freshwater habitats in Europe, North America, and South America.


Gomphonema vibrio var. intricatum (Kütz.) R.Ross **New state record**  
This is a European variety of *Gomphonema vibrio*, and this represents the first record of the variety in the Hawaiian Islands.


Gyrosigma scalproides (Rabenh.) Cleve **New state record**  
This species of *Gyrosigma* was previously known from Europe and South America.


Luticola mutica (Kütz.) D.G.Mann **New state record**  
This species of *Luticola* is widely distributed and was previously known from Europe, South America, Asia, Africa, and Antarctica.


Navicula decussis Østrup **New state record**  
This species of *Navicula* was previously known from Europe, South America, and North America.


Navicula erifuga LangeBert. **New state record**  
This is a European species of *Navicula* and represents the first record of the taxon in the Hawaiian Islands.


Navicula gregaria Donkin **New state record**  
This is a widely distributed species of *Navicula*. It was previously known from Europe, North America, Japan, and Antarctica.

Navicula veneta Kütz. New state record
This is a widely distributed species of Navicula, with previous records from North America, South America, Europe, and Asia.


Navicula ventralis Krasske New state record
This species of Navicula was previously known from Europe and North America.


CHROMOPHYTA (TRIBOPHYCEAE)
Vaucherialae: Vaucheriaceae
Vaucheria spp. New state record
This common genus of tribophyte algae is probably cosmopolitan in distribution (Johnson, 2002) and has most likely been overlooked in the Hawaiian Islands until now. The sexual reproductive structures of the alga are needed to confirm species-level identifications, and since these were not present on these collections, the record includes only the genus.


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Literature Cited


New Hawaiian plant records for 2003

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Ongoing surveys, collections, and research continue to reveal a significant number of new records for the Hawaiian flora. In this paper 12 new state or naturalized records, 26 new island records, and 6 range extensions are documented. Additionally, a notable rediscovery of a single species is reported. A total of 44 taxa in 30 plant families are discussed. Information regarding the previously known distribution of flowering plants is based on the Manual of flowering plants of Hawai‘i (Wagner et al., 1999) and information subsequently published in the Records of the Hawai‘i Biological Survey (Evenhuis & Miller, 1995, 1996, 1997, 1998; Evenhuis & Eldredge, 1999, 2000, 2003). Distribution and taxonomy of ferns follows Hawai‘i’s ferns and fern allies (Palmer, 2003), the first comprehensive review of Hawaiian pteridophytes in over 100 years. Collections were made on the islands of Kaua‘i, O‘ahu, Lāna‘i, Maui, and Hawai‘i. Voucher specimens are deposited at the Bishop Museum Herbarium Pacificum (BISH), with duplicates at the National Tropical Botanical Garden (PTBG), Lawa‘i, Kaua‘i. In a few cases a specimen may be at only one facility; only in these cases is the herbarium acronym cited.

**Acanthaceae**

**Dicliptera chinensis** (L.) Juss.  
**Range extension**
Naturalized on Kaua‘i, O‘ahu (Wagner et al., 1999: 171), West Maui (Oppenheimer, 2003: 3–4) and Hawai‘i (Staples et al., 2002: 3), the following specimen represents a significant range extension to East Maui.

*Material examined:* MAUI: East Maui, Makawao Distr, Māliko Gulch, 366m, along streamside, 2 Mar 2003, Oppenheimer H30302.

**Justicia carnea** Lindl.  
**New naturalized record**
Native to northern Brazil (Whistler, 2000: 291), this ornamental species (flamengo plant, jacobinia) has recently been found growing outside of cultivation. There are specimens at BISH from plants cultivated on Kaua‘i, O‘ahu, and Lāna‘i, where wild plants might also
Justicia carnea differs from the other 2 naturalized species of *Justicia* in Hawai‘i, *J. betonica* and *J. spicigera* (Wagner et al., 1999: 172; Staples et al., 2002: 4) by its inconspicuous bracts and dense panicle of pink to rosered flowers. It is often purple on the abaxial leaf surface. Although mature fruit is uncommon, it grows easily from cuttings and spreads vegetatively. It has also been observed growing wild at higher elevation in the Olinda area (F. Duvall, pers. comm.).

*Material examined:* MAUI: East Maui, Hāna Distr, Honomanu, 5 m, along unimproved road and spreading into hau, bamboo and rose apple thickets, 11 Nov 2002, Oppenheimer H110210.

**Apiaceae**

*Sanicula sandwicensis* A. Gray

Scattered in subalpine shrubland and woodland, 2000–2600 m, on the slopes of Haleakalā, East Maui, and Mauna Kea, Mauna Loa, and Hualālai, Hawai‘i (Wagner et al., 1999: 210), the following specimen represents a significant range extension to West Maui. A small population of 3 plants was recently found growing in montane wet shrubland on the steep, upper rim of ‘Iao Valley facing Haleakalā. The plants were growing in good habitat for *S. purpurea* but are several hundred meters from the nearest known plants.


**Araceae**

*Philodendron lacerum* (Jacq.) Schott

Species of *Philodendron* have only recently been reported as naturalized in Hawai‘i: Flynn & Lorence (2002: 14–15) documented 2 taxa from Kaua‘i. A third species is naturalized on Maui. *Philodendron lacerum*, native to Cuba but known as Jamaican fingers (Bailey & Bailey, 1930: 557), is well established and spreading, at least vegetatively, in the area from Huelo to Kipahulu in wet, lowland alien forest. Additionally, it was observed to be persisting after cultivation, and possibly spreading, in Honokōhau Valley on West Maui, also in lowland, alien forest.

*Material examined:* MAUI: East Maui, Hāna Distr, vicinity Kaumahina State Park, 134 m, naturalized lianas climbing alien vegetation to at least 40 ft (12 m), or sprawling on very steep slopes, 22 Jun 2002, Oppenheimer H60203.

**Asteraceae**

*Artemisia vulgaris* L.

Previously reported from Kaua‘i, O‘ahu, East Maui, and Hawai‘i (Wagner et al., 1999: 265; Wagner & Herbst, 1995: 15), the following collection represents a significant range extension to West Maui. It has also been observed as a garden weed in the Mahinahina area, Lahaina District.


**Begoniaceae**

*Begonia hirtella* Link

Naturalized on Kaua‘i, O‘ahu, East Maui, and Hawai‘i (Wagner et al., 1999: 384; Lorence et al., 1995: 25), this begonia also occurs on West Maui.
Material examined: MAUI: West Maui, Wailuku Dist., 'Iao Valley, 244 m, growing on wet roadcuts, 30 Mar 2002, Oppenheimer, F. Duvall, & L. Nelson H30219.

Bignoniaceae

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

First documented as growing outside of cultivation on Maui (Oppenheimer, 2003: 8), pink trumpet tree is also sparingly naturalized on O‘ahu in the Ko‘olau Range. As this is a widely planted ornamental species with wind-dispersed seeds, it will probably spread beyond plantings on all the islands where it is cultivated.

Material examined: O‘AHU: Honolulu Dist., UH Mänoa, seedling plants from beneath mature tree, 18 Mar 1991, F. Rauch s.n. (BISH 599682); Palolo Valley, near rim at Wa‘ahila Ridge, 396 m, on bare, red cinder slopes, all size classes observed, 1 Dec 2002, Oppenheimer H120202 (BISH).

Brassicaceae

*Lepidium densiflorum* Schrad.  
**New island record**

Known only from disturbed sites on northern, leeward Hawai‘i (Wagner et al., 1999: 407), *L. densiflorum* also occurs on Maui, where it was found growing in a severely disturbed area.


Cactaceae

*Opuntia conchenillifera* (L.) Mill.  
**New island record**

This taxon has been documented as naturalized in low elevation, disturbed areas of Kaua‘i and O‘ahu (Wagner et al., 1999: 419). While cochineal cactus is occasionally observed in gardens in the Lahaina area, the following collection represents a new record for Maui outside of cultivation.

Material examined: MAUI: West Maui, Lahaina Dist., Ku‘ia, 244 m, in unnamed gulch between Kanahā & Ka‘u‘a‘ula Valleys, mauka of Lahainaluna, west of Pa‘upa‘u, mixed with *O. ficus-indica* in alien vegetation, 2 Jan 2002, Oppenheimer H10201.

Convolvulaceae

*Argyreia nervosa* (Burm. f.) Bojer  
**New island record**

Baby woodrose was first reported as a naturalized species in the Hawaiian Islands by Lorence & Flynn (1999: 32), citing specimens from Kaua‘i. On windward East Maui it is also sparingly naturalized in lowland, secondary vegetation with wild populations noted in Hāna, Nāhiku, and possibly Huelo. *Argyreia* is a genus of about 90 species with *A. nervosa* native to India (Whistler, 2000: 65).


Evolvulus alsinoides  
**New state record**

This is a new record for the genus *Evolvulus* L. growing wild in the Hawaiian Islands. *Evolvulus glomeratus* Nees & Mart. subsp. *grandiflorus* (Parodi) Ooststr. (blue daze) is a common landscape plant that is not known to have escaped cultivation. *Evolvulus* is a genus of about 100 species; the name derives from the Greek for “untwist”, in reference to the nonclimbing habit of these plants, unlike most other Convolvulaceae (Whistler, 2000: 207). *Evolvulus alsinoides* is a widespread perennial with 15 named varieties,
native in Asia, Philippines, Madagascar, tropical east Africa, Australia, New Caledonia, and tropical and subtropical parts of the Old and New World (van Ooststroom, 1934). Smith (1991: 42–43) noted that var. *decumbens* (R.Br.) van Ooststr. appears to be adventive but not an escape from cultivation, in Fiji.

**Material examined:** MAUI: West Maui, Lahaina Distr, Launiupoko, 549 m, growing on dry ridgetop 2 ridges N of valley, locally common in exposed areas of degraded *Dodonaea* dry shrubland, 3 Mar 2002, Oppenheimer & J. Lau H30209.

**Costaceae**

*Costus woodsonii* Maas

**New naturalized record**

Red spiral flag is native from Nicaragua to Colombia (Whistler, 2000: 155). It occurs in scattered populations on windward Haleakalā at low elevations from Waipi‘o to Kīpahulu.

**Material examined:** MAUI: East Maui, Hāna Distr, Honomanū, 91 m, naturalized along Hāna Hwy, 22 Jun 2002, Oppenheimer H60204.

**Dennstaedtiaceae**

*Microlepia speluncae* (L.) T. Moore

**New island record**

According to Palmer (2003: 184), this indigenous fern is found in Hawai‘i on the islands of Kaua‘i, O‘ahu, and Hawai‘i. The following collections represent a new island record of Maui, where it seems to be rare, with only a few plants found in two adjacent drainages.

**Material examined:** MAUI: West Maui, Lahaina Distr, Kahana Iki Gulch, 610 m, among rocks in intermittent stream, 28 Aug 2002, Oppenheimer & E. Romanchak H80214 (BISH); same location, 7 Nov 2002, Oppenheimer & E. Romanchak H110205 (PTBG); Kahana Valley, single plant, 549 m, 3 Jul 2003, Oppenheimer H70303; Kahana Valley, 3 plants on steep slope, 579 m, 3 Jul 2003, Oppenheimer H70304.

**Euphorbiaceae**

*Omalanthus populifolius* R.C. Graham

**New naturalized record**

[Homalanthus populifolius ortho. var.]

Native to Australia, Papua New Guinea, and the Solomon Islands, *O. populifolius* (Queensland poplar, bleeding heart) is also naturalized in Sri Lanka. It is a rounded, many-branched shrub or small narrow tree 2–4 m tall and superficially resembles poinsettia or a small poplar when sterile. The inflorescence is a long narrow spike, with pistillate flowers basally. This species was first discovered outside of cultivation on the Big Island, and some effort is made to control it in the Manukā area (N. Agorostis, pers. comm.), although it is apparently well established in the adjacent Hawaiian Ocean View Estates subdivision (F. Duvall, pers. comm.). At the Māliko site on Maui it is common, with plants to 4 m tall, and occurs in a stretch of gulch bottom at least a couple of hundred meters long. Survey efforts were impeded by a high waterfall, but the infestation undoubtedly continues downstream.

**Material examined:** MAUI: East Maui, Makawao Distr, Ha‘ikū, Kokomo, Pololei Pl., 425 m, 4 Apr 2002, R.W. Hobdy, Starr & Starr 0204041 (BISH); Māliko Gulch, E side, 427 m, 4 May 2002, Oppenheimer & F. Duvall H50203. HAWAI‘I: Ka‘u Distr, Manukā NAR, in kīpuka of 2000 year-old soil, rare in dry mesic forest (*olopuu*/*lama*/*öhi‘a*), elev. 731 m, Aug. 1997, B. Stevens 11 (BISH); Hawaiian Ocean View Estates, near Ginger Blossom Lane, near Manukā State Park, 630 m, mesic forest, perennial shrub 6–10 ft, numerous plants, 2 May 2002, F. Duvall, Starr & Starr 0205021 (BISH).
Fabaceae

*Crotalaria lanceolata* E. Mey New island record

Previously known from Hawai‘i Island (Windler & Skinner, 1999: 660), this rattlepod was recently collected on windward East Maui. Additionally, an unvouched population was observed in the Pi‘iholo area, also growing as a roadside weed.

*Material examined:* MAUI: East Maui, Makawao Distr, Honokalā, 122 m, roadside weed, 14 Jul 2002, Oppenheimer H70204.

*Leucaena × spontanea* C.E. Hughes & S.A. Harris New naturalized record

This taxon is a spontaneous hybrid of *L. leucocephala* (Lam.) De Wit subsp. *glabrata* (Rose) S. Zárate and *L. diversifolia* (Schlecht.) Benth., which occurs wherever the parents have been brought together in cultivation (Hughes, 1998: 217). This hybrid was recently recreated in Hawai‘i, is selfcompatible, and a prolific seeder with the potential to spread and become weedy, particularly in mid-elevations where cooler conditions do not favor *L. leucocephala* (Hughes, 1998: 217). It has been found in Central America, the West Indies, Papua New Guinea, and the Philippines in disturbed areas including backyards, gardens, coffee plantations, and secondary vegetation on roadsides (Hughes, 1998: 214). This is consistent with recent observations on Maui, where many seedlings and all size classes have been noted among and adjacent to plantings made at two former agricultural experiment stations. It should be searched for near other similar sites where it may have been intentionally cultivated or inadvertently produced. *Leucaena × spontanea* is distinguished from *L. leucocephala* by having 9–30 pairs of pinnae (vs. 4–9 pairs), and leaflets (20)–30–60 per pinnae (vs. 13–21) (Hughes, 1998: 82).

*Material examined:* MAUI: East Maui, Makawao Distr, Hämäkuapoko, 98 m, 4 May 2002, Oppenheimer & F. Duvall H50207; Pi‘iholo, 640 m, 12 Jun 2003, Oppenheimer, P. Bily, & A. Michailidis H60312.

*Melilotus alba* Medik. Range extension

Reported from Midway Atoll and Hawai‘i (Wagner *et al*., 1999: 686–687) and subsequently from East Maui (Wagner & Herbst, 1995: 20) and Moloka‘i (Shannon & Wagner, 1996: 14), the following collection represents a significant range extension to West Maui.

*Material examined:* MAUI: West Maui, Wailuku Distr, Wailuku, 73 m, in sandy soil near golf course, 4 Nov 2002, Oppenheimer H110203.

*Iridaceae*

*Watsonia meriana* (L.) Mill. New naturalized record

A second species of *Watsonia* Mill. is naturalized on Maui, the other being *W. borbonica*. Although not known to produce seed, it spreads mainly via the axillary bulbils. Plants have been noted mostly along roadsides, often with *W. borbonica*, as well as in a nearby *Pinus* plantation. The infestation is referable to cultivar “Bulbilifera”. It is also naturalized and a noxious weed in Australia (Mabberley, 1997: 753).

*Material examined:* MAUI: East Maui, Makawao Distr, Olinda, 1126 m, terrestrial on roadside, forming patches, spreading by root suckers and bulbils, 6 Apr 2002, Oppenheimer, F. Duvall, & L. Nelson H40203.
Juncaceae

*Juncus ensifolius* Wikstr.  New island record

Naturalized on Hawai‘i and also reported from Maui (Wagner *et al*., 1999: 1453) based on a personal communication, the following collections document its occurrence here.

**Material examined:** MAUI: East Maui, Makawao Distr, east of Ukulele, 21 Jul 1919, C.N. Forbes 901M (BISH); Waikamoi, growing in small gully along trail from Hosmer Grove to boardwalk, 2017 m, 20 Oct 2002, Oppenheimer & F. Duvall H100204.

Lamiaceae

*Phyllostegia bracteata* Sherff  Notable rediscovery

In a current assessment of *Phyllostegia*, Wagner (1999: 267) reported extant populations of this rare species from East Maui, although it had historically been known to occur on West Maui as well. A search at BISH revealed the last collection from West Maui was made in 1916. Recently, two plants were located, an adult and a seedling, in *Metrosideros* wet forest. Actions to eliminate feral cattle and pigs, the most serious and immediate threats to this population, have been in progress for several years now with much success.

**Material examined:** MAUI: West Maui, Lahaina Distr, lower slope forest bog, Mt. Kukui, 24 Sep 1916, G.C. Munro 428 (BISH); Wailuku Distr, Waikapü 1219 m, windward slope of Hāna‘ula, E of Pōhākea Gulch, S of Waikapū Valley, near USFWS Transect 32 Station 10, 30 Aug 2001, Oppenheimer, Chumbley, & Collins H80116.

Linaceae

*Linum bienne* Mill.  New island record

Known from a single collection made on Maui at Wailaulau in 1982, and sparingly naturalized in meadows at 1280 m (Wagner *et al*., 1999: 850), *L. bienne* has been recently observed as a lawn and garden weed in Makawao. The following collection represents a new island record.

**Material examined:** KAUA‘I: Maha‘ulepu, near Pao‘o Pt., 6 m, erect plants with purple flowers naturalized in sandy soil, 26 Apr 2002, Oppenheimer H40213.

Melastomataceae

*Medinilla cumingii* Naudin  New naturalized record

A second species of *Medinilla* is naturalized on Maui, the other being *M. venosa* (Wagner *et al*., 1999: 909–910). *Medinilla cumingii* is often confused with *M. magnifica* Lindl. (e.g., Kepler, 1995: 9, 51), but lacks the large, pink inflorescence bracts. Both are attractive and commonly planted ornamentals, at least in Hāna District, where *M. cumingii* has escaped cultivation. Frugivorous birds are undoubtedly dispersing the small, fleshy, purple fruit. At the present time, it is difficult to accurately assess the extent of infestation, but it is likely more significant than it seems from Hāna Hwy or Nāhiku Rd. Staples *et al.* (2000: 24) listed it as potentially invasive.

**Material examined:** MAUI: East Maui, Hāna Distr, vicinity Wai‘oni Gulch, 274 m, naturalized, mostly epiphytic (to 20 ft [6 m] high) on mossy, alien tree species near Hāna Hwy, 22 Jun 2002, Oppenheimer H60205.

Myrsinaceae

*Ardisia crenata* Sims  New island record

Naturalized on O‘ahu and Hawai‘i and commonly cultivated elsewhere (Wagner *et al*., 1999: 932), this taxon is also sparingly naturalized on Maui, where it may have been formerly cultivated.

Myrtaceae

_Eucalyptus punctata_ DC.  
New naturalized record

Native to New South Wales in Australia, over 1200 trees of grey gum were planted in forest reserves on Kaua‘i, Moloka‘i, and Hawai‘i between 1932 and 1958 (Skolmen, ca. 1980: 191–192). There are specimens at BISH from O‘ahu, Moloka‘i, and Makawao Forest Reserve on East Maui, as well as var. _longirostrata_ Blakely from Kaho‘olawe. The planting on West Maui appears to be of limited extent. Like many other species of _Eucalyptus_ in Hawai‘i this one is reproducing in and around the site but not spreading far. It is a tall tree with thin, flaky, gray bark and red twigs.


_Leptospermum scoparium_ J.R. Forst. & G. Forst.

Wagner _et al._ (1999: 963) reported this taxon as being naturalized on Kaua‘i, O‘ahu, and Lāna‘i. A more recent reassessment of the genus in Hawai‘i (Herbarium Pacificum Staff, 1999: 5) did not affect the local distribution of _L. scoparium_. The following collection represents a new island record.

Material examined: MAUI: East Maui, Makawao Distri, Kamaole, Kula F.R., below the Plum Trail, 1768 m, naturalized shrubs to 3 m tall, many seedlings, 15 Jul 2002, Oppenheimer, S. Perlman, J. Lau, & R. Aguraiuja H70206.

_Lophostemon confertus_ (R. Br.) Peter G. Wilson & Waterhouse

Forestry plantings of this species were made on Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i but only recently has this tree become naturalized on O‘ahu (Wagner _et al._, 1999: 964). Lately it has been noticed to have spread from plantings mixed with _Fraxinus, Pinus_, and _Eucalyptus_ in lowland mesic sites on Maui.


_Nephrolepidaceae_

_Nephrolepis ×copelandii_ W.H. Wagner  
New island record

A hybrid of the indigenous _Nephrolepis cordifolia_ (L.) C. Presl and the alien _N. multiflora_ (Roxb.) F.M. Jarrett ex C.V. Morton, Palmer (2003: 193) reported it to occur on O‘ahu and Hawai‘i. It has recently been collected on Maui where it is locally common with both parents.

Material examined: MAUI: West Maui, Lahaina Distri, N slope of Keahikano between Honolua & Honokōhau valleys, 500 m, 8 Aug 2003, Oppenheimer & G. Hansen H803004.

_Ochnaceae_

_Ochna thomasiana_ Engl. & Gilg  
Range extension

Recently documented as naturalized on O‘ahu (Imada _et al._, 2000: 13) and West Maui (Oppenheimer, 2003: 17), the following collections represent a significant range extension to include East Maui as well.

Poaceae

*Axonopus compressus* (Sw.) Beauv.  
**New island record**

Reported recently as naturalized on Molokaʻi and Maui (Oppenheimer, 2003: 19), the following specimen documents the occurrence of this carpet grass on Oʻahu. It is widespread and common on the island in wet lawns and other disturbed areas.

Material examined: **OʻAHU**: Honolulu Distr, St. Louis Heights, 305 m, roadside weed, 1 Dec 2002, *Oppenheimer H120201* (BISH).

*Cynodon aethiopicus* Clayton & J.R. Harlan  
**New island record**

Documented as naturalized in the Hawaiian Islands by Herbst & Clayton (1998: 22), who cited specimens from Oʻahu and the Big Island. On West Maui, it has been purposely introduced to Maui Pineapple Co. lands at Honolua Plantation under the name “Puerto Rican stargrass” for use as ground cover on bare soils. Although not presently thought to set seed, it easily roots from short sections of stolons. The following collection was made in an area where it had not been deliberately planted. It may have been dispersed via farm vehicles or machinery, or small portions of discarded stolon could have been wind blown to a new area.


*Digitaria eriantha* Steud.  
**New island record**

Although Herbst & Clayton (1998: 23) reported specimens from cultivated material on Oʻahu and Maui in 1940 and 1939, respectively, they considered the first naturalized record of pangola grass to be from Hawaiʻi Island in 1942. Recently this species was documented as naturalized on Kauaʻi (Staples et al., 2003: 17). On Maui, this is a widespread and abundant pasture grass, sometimes observed to occur in adjacent waste areas as well.

Material examined: **MAUI**: East Maui, Makawao Distr, Haleakalā Branch Station, good growth, spreading, 9 Apr 1939, *E.Y.Hosaka 2446* (BISH); mauka of Puʻu Piʻiholo, 610 m, abundant in pasture, 8 Sep 2002, *Oppenheimer, F. Duvall, & P. Baldwin H90204*.

**New island record**

Reported by Herbst & Clayton (1998: 28) as a new state record, specimens were cited from Oʻahu and Hawaiʻi. It seems to be fairly common at least on East Maui, and locally abundant in lawns, pastures, and roadsides.

Material examined: **MAUI**: East Maui, Makawao Distr, Haʻikū, Kauhikoa, 335 m, common grass in open areas, 3 Jul 2003, *Oppenheimer H70315* (BISH).

*Paspalum longifolium* Roxb.  
**New island record**

Longleaved paspalum was recently found growing wild on Kauaʻi (Staples et al., 2003: 18). It also occurs on Maui, where it was collected along a dirt road in the Twin Falls area of Haʻiʻikū.

Material examined: **MAUI**: East Maui, Makawao Distr, Honokalā, 165 m, clumping grass growing along unimproved road, uncommon, 14 Jul 2002, *Oppenheimer H70202* (BISH).
**Paspalum malacophyllum** Trin.  
New naturalized record

This is a new naturalized record for ribbed paspalum in Hawai‘i. The species had been collected here only once, from an experimental grass plot at the Hawaiian Agricultural Experiment Station, Poamoho, O‘ahu in 1940 ([E.Y. Hosaka 2540 BISH](https://www.specimen.bish.org/search SPECIMEN: E.Y. Hosaka 2540 BISH)). It should be searched for there as well. According to Hitchcock (1971: 626) it is native from Mexico to Bolivia and Argentina. It was introduced to the southern U.S., occasionally being grown for hay or used in soil conservation work, which may explain the reason for its introduction here.


**Paspalum paniculatum** L.  
New island record

Herbst & Wagner (1999: 28) considered this species to be naturalized on O‘ahu and Hawai‘i. It was recently collected on Maui.


**Polygonaceae**

**Persicaria punctata** (Elliot) Small  
New island record

Formerly known as *Polygonum punctatum* Elliot, and naturalized in the Hawaiian Islands only on the Big Island (Wagner et al., 1999: 1064), water smartweed has been recently collected on Maui. The change in taxonomy was reported by Herbst & Wagner (1999: 29–30).


**Polypodiaceae**

**Polypodium pellucidum** Kaulf. var. *pellucidum*  
*f. opacum* (Hillebr.) D.D. Palmer  
New island record

According to Palmer (2003: 216) this taxon was known from the islands of Kaua‘i, O‘ahu, Moloka‘i, and Lāna‘i, and was probably also present on Maui and Hawai‘i but not yet collected. The following specimens document its occurrence on Maui.

*Material examined: MAUI: West Maui, Lahaina Distr, Pūhehehunui, Luako‘i Ridge, terrestrial, uncommon, on open ridgetop in dry shrubland, 793 m, 28 Dec 2002, Oppenheimer H120209 (BISH); Pūhehehunui, south of Ka‘uu‘aula Valley, 732 m, 17 Feb 2003, Oppenheimer & F. Duvall H20305 (BISH).*

**Proteaceae**

**Macadamia tetraphylla** L.A. Johnson  
New naturalized record

The roughshell macadamia was introduced from eastern Australia (Neal, 1965: 322). It now has been found to be naturalized in the Pi‘iholo area of East Maui. One area of infestation is dominated by *Schinus terebinthifolius*, *Psidium cattleianum*, *Fraxinus uhdei*, and *Cinnamomum camphora*, with remnant native elements. Plants in all size classes are randomly scattered on steep slopes and along an intermittent stream. Pigs, cattle, and axis deer are present, and one or more of these animal species are probably spreading the nuts. Gravity and stream flow may also be dispersal mechanisms. This species has nearly sessile leaves in whorls of four per node, with spiny margins. It is believed to have escaped from a nearby agricultural experiment station. More recently, it was found naturalized at higher elevation in the Olinda area (F. Duvall, pers. comm.).

Pteridaceae

Pteris vittata L.  New island record

According to Palmer (2003: 229–230) this naturalized fern occurs on the islands of Kaua‘i, O‘ahu, Maui, and Hawai‘i, and is probably present, but not yet collected, on Moloka‘i and Lāna‘i. The following collection represents a new record for Lāna‘i.


Rubiaceae

Spermacoce latifolia Aubl.  New island record

First documented as a weed in the Hawaiian Islands by Lorence et al. (1995: 51–52), they cited specimens from Kaua‘i collected in 1990. At the time, it was presumed to be a recent introduction, but was expected to spread.

Material examined: MAUI: East Maui, Makawao Distr, Honokalä 152 m, 1 m tall herbs forming tangles in waste area, vicinity of Häna Hwy, 14 Jul 2002, Oppenheimer H70203; Häna Distr, Pa‘akea, 378 m, roadside weed along Häna Hwy, 22 Jun 2003, Oppenheimer & F. Duvall H60318.

Scrophulariaceae

Lindernia antipoda (L.) Alston  New island record

Recently naturalized in Hawai‘i and known from a single collection made in 1987 in Waipi‘o Valley, Hawai‘i (Wagner et al., 1999: 1242), this small herb also occurs on Maui.


Mazus pumilis (Burm. f.) Steenis  New state record

[syn. M. japonicus (Thunb.) Kuntze; M. rugosus Lour.] Hillebrand (1888: 324) had reported this species as being naturalized along watercourses in Honolulu. However, Wagner et al. (1999: 1235) saw no evidence that it had persisted. Four varieties of this annual herb are recognized (Wu & Raven, 1998: 46); the specimens cited seem referable to var. pumilis. The species is native to Bhutan, China, India, Indonesia, Japan, Kashmir, Korea, Nepal, New Guinea, Philippines, Russia, Sikkim, Thailand, and Vietnam where it grows in wet grassland, along streams, trailsides, waste fields, and edge of forests, below 2500 m (Wu & Raven, 1998: 47). On Maui, it was found as a weed in a wet lawn and also growing in spaces between bricks recently installed as paving stones. Neal (1965: 758–759) reported it as being used in Hawai‘i sometimes as a groundcover. It is similar to species of Lindernia All. naturalized in Hawai‘i but differs in characteristics of the calyx and filaments (Wu & Raven, 1998: 4). Smith (1991: 78–79) notes this species to be sparingly naturalized in Fiji, where it was probably introduced as a ground cover, in gardens and damp, shady banks near sea level.

Material examined: MAUI: East Maui, Makawao Distr, Māliko Gulch, 372 m, terrestrial blue flowered herbs in lawn, 7 Apr 2002, Oppenheimer H40207 (BISH); same location, 366 m, 2 Mar 2003, Oppenheimer H30301.

Sterculiaceae

Melochia umbellata (Houtt.) Stapf  New island record

Wagner et al. (1999: 1279) reported this species as naturalized only on Hawai‘i but also cultivated on O‘ahu, Lāna‘i, and Maui. Skolmen (ca.1980: 301) does not list this species.
as being planted in any Maui forest reserve, and there is only a single specimen, from a cultivated tree on East Maui, at BISH. On West Maui it is naturalized, growing among other weedy trees such as *Grevillea robusta* and *Macaranga tanarius*.

**Material examined:** MAUI: West Maui, Wailuku Distr, Waikapū Valley, 396 m, large trees naturalized in alien forest near reservoir on S side of valley, 27 May 2002, Oppenheimer, P. Bily, & F. Duvall H50227; East Maui, Hamakuapoko, in the old Grant Bailey yard, 30 Mar 1939, Crosby s.n.(BISH 70257).

**Turneraceae**

*Turnera ulmifolia* L.

**New island records**

Cultivated on many of the main islands and naturalized on Kaua‘i and Moloka‘i (Wagner *et al*., 1999: 1296), this species easily escapes and is common in areas adjacent to plantings. Often plants are observed to be growing out of cracks and holes in rock walls, suggesting that ants may be dispersing the seeds, as reported by Staples *et al.* (2000: 10).

**Material examined:** MAUI: West Maui, Lahaina Distr, Lahaina, growing in rock wall, near sea level, 13 May 2001, Oppenheimer H50111; Lahaina, in rock wall, 3 m, 13 May 2001, Oppenheimer H50112; Hanaka‘ō‘ō, side of Hwy, 6 m, 17 Jun 2001, Oppenheimer H60133; Mahinahina, 427 m, small, yellow flowered shrub growing in weedy, disturbed site, 1 Aug 2003, Oppenheimer & G. Hansen H80301; East Maui, Makawao Distr, Ku‘au, 15 m, in sidewalk crack at base of rock wall, 12 Nov 2001, Oppenheimer H110110; HAWAI‘I: S Hilo Distr, small plants growing in gravelly roadsides at edge of secondary, alien forest; cultivated nearby, 18 m, 2 Aug 2001, Oppenheimer H80107.

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**Literature Cited**


New plant records from the Hawaiian Archipelago

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The following contributions include new island records, new naturalized records, new state records, and range extensions of plants located on Midway Atoll, Kaua‘i, Maui, and Hawai‘i. Voucher specimens are housed in the Bishop Museum’s Herbarium Pacificum, Honolulu (BISH).

Asclepiadaceae
Calotropis gigantea (L.) W.T. Aiton New island record
Previously reported to be naturalized on Maui (Starr et al., 2002), C. gigantea is now also known from Kaua‘i, where this common ornamental is locally established in sandy areas along the coast in the Kekaha/Mānā Plain area. This collection represents a new island record for Kaua‘i.

Material examined: KAUA‘I: Kekaha, Kekaha Beach Park, on sand near coast, 10 ft [3 m], 26 Feb 2002, Starr & Starr 0202263.

Asteraceae
Centratherum punctatum Cass. subsp. punctatum New island record
Previously known from Kaua‘i (Lorence et al., 1995) and Hawai‘i (Oppenheimer, 2003), C. punctatum is now also known from Maui, growing in sidewalk cracks and other spots of opportunity in the town of Makawao. These collections represent a new island record for Maui.

Material examined: MAUI: East Maui, Makawao, Makawao Elementary School, growing in lawn border, 1600 ft [487 m], 12 Sep 2002, Starr & Starr 020912-1; East Maui, Makawao, Brewer Rd, escaping down gulch, 1600 ft [487 m], 5 Nov 2001, Starr & Martz 011105-2.

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Erigeron bellioides DC.  
New island record
Previously known from O‘ahu, Moloka‘i, Maui, and Hawai‘i (Wagner et al., 1990; Nagata, 1995; Oppenheimer & Bartlett, 2000; Oppenheimer, 2003; Staples et al., 2003), the easily overlooked E. bellioides is now also known from Kaua‘i, where it is in lawns. This collection represents a new island record for Kaua‘i.


Bignoniaceae
Podranea ricasoliana (Tanfani) Sprague  
New naturalized record
Native to southern Africa and cultivated in Hawai‘i since at least 1940 (Neal s.n.) (Neal, 1965; Whistler, 2000), P. ricasoliana (pink trumpet vine, Zimbabwe creeper) is now sparingly naturalized in upcountry Maui, where it has been observed spreading in the Ha‘ikū, Makawao, Olinda, and Kula areas. Papery seeds are produced, and spread also occurs through long underground tuberous roots. Podranea ricasoliana is identified by its vine-like habit; opposite, pinnately compound leaves with 7–11 leaflets; funnel-shaped pink flowers with red lines inside; and fruits that are long, narrow capsules, up to 35 cm long [14 in], containing numerous papery seeds (Whistler, 2000). This collection represents a new naturalized record for the Hawaiian Islands.

Material examined: MAUI: East Maui, Makawao, Māliko Gulch, sprawling in gulch and nearby lot, producing abundant winged seeds, 1600 ft [488 m], 30 Apr 2000, Starr & Martz 000430-1.

Caryophyllaceae
Cerastium glomeratum Thuill.  
New state record
Native to Africa, temperate and tropical Asia, and Europe (GRIN, 2001), and reported from the State of Hawai‘i by St. John (1973) without locality, C. glomeratum is now known from Maui, where it is present in lawns in Makawao and Olinda. These collections represent a new state record for the Hawaiian Islands.

Material examined: MAUI: East Maui, Olinda, scattered in lawn, 2600 ft [792 m], 2 Feb 2002, Starr & Martz 020202-1; East Maui, Makawao, scattered in lawn, 1600 ft [488 m], 8 Mar 2002, Starr & Starr 020308-1.

Commelinaceae
Tradescantia zebrina Bosse  
Range extension
A common houseplant that occasionally escapes from cultivation (Wagner et al., 1990), T. zebrinawas previously documented as naturalized on Kaua‘i and West Maui (Lorence & Flynn, 1997; Oppenheimer & Bartlett, 2000). It is now also known from Makawao, East Maui. This collection represents a range extension to East Maui.


Convolvulaceae
Poranopsis paniculata (Roxb.) Roberty  
New naturalized record
Native to temperate and tropical Asia (GRIN, 2001), P. paniculata (bridal bouquet, snow-in-the-jungle) is known from BISH specimens to have been in Hawai‘i since at least 1936 and to have been collected from the islands of Kaua‘i, O‘ahu, and Hawai‘i. This rampant vine is now also known from Maui, where it is spreading well beyond initial plantings...
in Makawao. It can be identified by its ability to grow up to 30 ft [9 m] into the canopy of trees, heart-shaped leaves to 6 in [15 cm] long with white pubescence underneath, and small, 5/16 in [0.8 cm] white flowers growing in dense masses (Bailey & Bailey, 1976). This collection represents a new naturalized record for the Hawaiian Islands.

*Material examined:* MAUI: East Maui, Makawao, Māliko Gulch, sprawling into gulch, 1600 ft [488 m], 5 Jan 1999, Starr & Martz 990105-4.

**Cuscutaceae**

*Cuscuta campestris* Yuncker

*Cuscuta campestris* was known to be sparingly naturalized on O‘ahu, Hawai‘i, and West Maui (Wagner et al., 1990; Oppenheimer, 2003). This orange parasitic vine is now also known from East Maui, where it is hosting on *Sphagneticola trilobata* along the Hāna Hwy. This collection represents a range extension to East Maui.


**Euphorbiaceae**

*Croton guatamalensis* Lotsy

According to BISH specimens, *C. guatamalensis* has been cultivated on O‘ahu since 1977. It is now naturalized on Maui, where it escaped from the Agricultural Experiment Station in Pi‘iholo. This collection represents a new naturalized record for the Hawaiian Islands.

*Material examined:* MAUI: East Maui, Pi‘iholo, Agricultural Experiment Station, spreading from plantings, W. Haines, 1800 ft [548 m], 3 Sep 2002, Starr, Starr, & Haines 020903-1.

*Flueggea virosa* (Roxb. ex Willd.) Voigt

Native to tropical Africa and Asia to Japan, Australia, and Polynesia and a weed in Florida (FLEPPC, 1999), *F. virosa* (Chinese waterberry, white currant) is naturalized in the Ha‘ikū area of East Maui, where it is common in pastures and waste areas along Ha‘ikū Rd. Distinguished by the following set of characteristics. “Shrubs up to 4 m high, side branches, especially lower ones often with thorny end. Stipules 1.1–1.7 by 0.7–0.8 mm, margin often fimbriate. Leaves: petiole 36 mm long; blade elliptic to obovate, 18 by 0.6–5 cm, index c. 1.6; base usually attenuate, apex rounded to slightly acuminate, dark green above, light greenish beneath; venation indistinct on both sides, nerves 6–13. Staminate flowers c. 1.5 mm in diameter, greenish to yellowish, pendulous, sweet scented; pedicel 2–6.5 mm long, pale light greenish; sepals 0.7–1.2 by 0.31.1 mm, light yel - low; disc glands fleshy, yellow; pistillode 1.5–2.3 mm long, basally connate, deeply divided into 3 branches, apical 0.3–0.7 mm bent and stigmatic. Pistillate flowers c. 2 mm in diameter; pedicel 2–12 mm long; sepals 0.71 mm diameter; style 0.5–0.7 mm long, stigmas 0.8–1.1 mm long, upper third split. Fruits 3.4–5.2 mm in diameter, white. Seeds 2.2–2.4 by 1.2–1.8 mm.” (Barker & van Welzen, 2003). This collection represents a new state record for the Hawaiian Islands.

*Material examined:* MAUI: East Maui, Ha‘ikū, in pasture near Ha‘ikū reservoir, 450 ft [137 m], Starr & Martz 001128-2.
Iridaceae
**Gladiolus dalenii** Van Geel  
New state record
Native to Eastern Cape of South Africa and through tropical Africa to Ethiopia and W. Arabian Peninsula (Brickell & Zuk, 1997), and previously not known in the state, *G. dalenii* has recently been collected from pastures in Kula, Maui and Waimea, Hawai‘i. *Gladiolus* is a genus of “between 250 and 300 spp. of perennial herbs with truncate corms, native to Europe, Mediterranean region, the Near East, but chiefly to tropical and South Africa; stems usually unbranched, leafy; leaves basal and cauleine, swordshaped, less frequently linear or cylindrical; flowers showy, in 1-sided spike, irregular, borne in 2 spathe-valves, perianth segments 6, united basally into a curved, funnelform tube, the upper 3 segments larger than the lower 3, stamens 3, filaments not united, borne below the throat, style branches 3, entire; fruit a 3-valved capsule.” (Bailey & Bailey, 1976). *Gladiolus dalenii* is distinguished by the following characteristics. “Robust, cormous perennial, spreading freely by underground runners, with linear or swordshaped leaves, to 24 in [60 cm] long. Bears onesided spikes of few to many hooded, funnelshaped flowers, 2 in [5 cm] across, which are red, orange, or yellow, sometimes spotted green or brown.” (Brickell & Zuk, 1997). These collections represent a new state record for Hawai‘i.

**Material examined:** MAUI: East Maui, Kula, side of road near Rice Park on Kula Hwy, 3040 ft [926 m], 31 Aug 2000, Starr & Martz 000831-1. HAWAI‘I: Waimea, in open dry pasture near Waikoloa Stream, 23 May 2000, Herbst 9879.

Lamiaceae
**Plectranthus verticillatus** (L.f.) Druce  
New naturalized record
Native to South Africa (Northern Transvaal, Eastern Transvaal, Eastern Cape), Swaziland, and Mozambique (Brickell & Zuk, 1997), *P. verticillatus* is known from BISH specimens to have been first collected in Hawai‘i on O‘ahu in 1986 and is now naturalized in Pi‘iholo and Olinda, Maui where it can be seen growing wild on many stretches of road. *Plectranthus verticillatus* is also apparently established and spreading on O‘ahu. This prostrate herb can be distinguished from other *Plectranthus* in the state by the following combination of characteristics. “Mat-forming, semi-succulent perennial with creeping stems rooting at the nodes. Ovate to rounded coarsely toothed, soft, fleshy leaves, 1/2–1 1/2 in [1.5–4 cm] long, have purplish green undersides. Terminal spikes, 6 in [15 cm] long, of whorled, tubular, 2-lipped, purple-speckled, white or pale mauve flowers, 1/2–1 in [1.5–2.5 cm] across.” (Brickell & Zuk, 1997). These collections represent a new naturalized record for the Hawaiian Islands.


Lauraceae
**Cinnamomum burmannii** (Nees) Blume  
New island record
Previously known from O‘ahu, Maui, and Hawai‘i (Wagner et al., 1990; Wagner & Herbst, 1995; Wagner et al., 1997; Meidell et al., 1997), *C. burmannii* is also growing wild on Kaua‘i in mesic forest near Limahuli Garden on the north shore. This collection represents a new island record for Kaua‘i.

**Malvaceae**

**Malva parviflora** L.  
New island record

Previously known from disturbed areas of French Frigate Shoals and all the main islands (Wagner et al., 1999), *M. parviflora* is now also documented from Midway Atoll, where this weedy herb is uncommon in the north part of Sand Island. Previously collected in 1988 and reported from Midway in Bruegmann (1998) but not in Wagner et al. (1999). These collections represent a new island record for Midway Atoll.

Material examined: **MIDWAY ATOLL**: Sand Island, in field of Bermuda grass (*Cynodon dactylon*) and other common lawn weeds, across from barracks, 20 ft [6 m], 20 May 2001, Starr & Martz 010520-1; Sand Island, 6 Jul 1988, Herbst & Takeuchi 9077.

**Sida ciliaris** L.  
Range extension

Previously known from Kaua‘i, O‘ahu, and West Maui (Wagner et al., 1997; Oppenheimer & Bartlett, 2000; Staples et al., 2003), *S. ciliaris* is now known from East Maui, where it is found near road-sides in the Kanahā Beach area of Kahului. This collection represents a range extension to East Maui.

Material examined: **MAUI**: East Maui, Kahului, Kanahā Beach, growing on side of Amala Rd along with naupaka (*Scaevola sericea*) and Indigofera suffruticosa, 15 ft [5 m], 23 Nov 2001, Starr & Martz 011123-1.

**Meliaceae**

**Sandoricum koetjape** (Burm. f.) Merr.  
New naturalized record

Native from India to the East Indies (St. John, 1973), *S. koetjape* (santol) is known from BISH specimens to have been first collected on O‘ahu in 1933 and has recently been collected spreading from plantings on both East and West Maui. Distinguished from other Meliaceae in Hawai‘i by the following. “The santol is a fast-growing, straight-trunked, pale-barked tree 50 to 150 ft [15–45 m] tall, branched close to the ground and buttressed when old. Young branchlets are densely brown-hairy. The evergreen, or very briefly deciduous, spirally-arranged leaves are compound, with 3 leaflets, elliptic to oblong-ovate, 4 to 10 in [20–25 cm] long, blunt at the base and pointed at the apex. The greenish, yellowish, or pinkish-yellow, 5-petalled flowers, about 3/8 in [1 cm] long are borne on the young branchlets in loose, stalked panicles 6 to 12 in [15–30 cm] in length. The fruit (technically a capsule) is globose or oblate, with wrinkles extending a short distance from the base; 1 1/2 to 3 in [4–7.5 cm] wide; yellowish to golden, sometimes blushed with pink. The downy rind may be thin or thick and contains a thin, milky juice. It is edible, as is the white, translucent, juicy pulp (aril), sweet, subacid or sour, surrounding the 3 to 5 brown, inedible seeds which are up to 3/4 in [2 cm] long, tightly clinging or sometimes free from the pulp.” (Morton, 1987). These collections represent a new naturalized record for the Hawaiian Islands.

Material examined: **MAUI**: East Maui, Hāna Hwy, at Ulumalu Rd intersection, many young seedlings spreading in gulch from nearby planting, reported by Monroe Bryce, 550 ft [168 m], 30 Jan 2002, Starr & Martz 020130-1; West Maui, Lahaina Distr, Honokōhau Valley, spreading locally from plantings made ca. 1932, 60 ft [18 m], 1 Jul 2003, Oppenheimer & Bartlett H70302.
Myrtaceae

*Metrosideros kermadecensis* W.R.B. Oliv.  
**New naturalized record**

Native to New Zealand including Raoul Island (Brickell & Zuk, 1997), *M. kermadecensis* (*pohutakawa*) is known from BISH specimens to have been first collected in Hawai‘i on O‘ahu in 1995 and is now spreading from plantings at the Agricultural Experiment Station in Kula, where it is sparingly naturalized and a pest for the station. This collection represents a new naturalized record for the Hawaiian Islands.

*Material examined:* MAUI: East Maui, Kula, Kula Agriculture Station, numerous seedlings and saplings spreading from plantings, 3100 ft [944 m], 15 Aug 2002, *Starr & Starr 020815-3.*

Ochnaceae

*Sauvagesia erecta* L.  
**New island record**

Previously known from Moloka‘i (Wagner et al., 1990), *S. erecta* is now also known from Maui where it is along roads on the moist windward coast of East Maui. This collection represents a new island record for Maui.


Onagraceae

*Oenothera kunthiana* (Spach) Munz  
**New state record**

Native from Texas to Guatemala (Bailey & Bailey, 1976), *O. kunthiana* (Kunth’s evening primrose) is known from a single site near Pu‘u o Kali, Maui. *Oenothera kunthiana* can be distinguished from other *Oenothera* in Hawai‘i by the following characteristics. “Evening-flowering perennial, stems slender, to 2 ft [0.6 m]; basal leaves oblanceolate, 1–4 in [2.5–10.2 cm] long, sinuate-pinnatifid, stem leaves reduced; flowers few, petals 5/16–5/8 in [1.6 cm] long, whitish to pink; capsules obovoid, about 0.5 in [1.3 cm] long, 4-winged above.” (Bailey & Bailey, 1976). This collection represents a new record for the Hawaiian Islands.

*Material examined:* MAUI: East Maui, Pu‘u o Kali, near third gate on south road to exclosure, 750 ft [228 m], 18 May 2002, *Starr & Starr 020518-1.*

Piperaceae

*Piper aduncum* L.  
**New naturalized record**

Native to the West Indies and tropical America (PIER, 2003) and considered one of the worst weeds in Papua New Guinea up to 2000 m [6562 ft] (Leps et al., 2002), *P. aduncum* (spiked pepper) is known from BISH specimens to have been first collected in the state of Hawai‘i in 1986. This rapidly growing tree is now well established in the Nāhiku area of East Maui, where it is occasionally a dominant in open or recently cleared areas.

*Piper aduncum* can be distinguished from other *Piper* species in Hawai‘i by the tree habit and compound leaves. The following characteristics describe this species: “Small tree to 7 m tall, with short silt roots and soft, brittle wood; foliage and twigs aromatic. Branches erect, but with drooping twigs and swollen, purplish nodes. Leaves alternate, distichous, elliptic, 12–22 cm long, shortly petiolate; lamina scabrid above, with sunken nerves, softly hairy beneath. Inflorescence a leaf-opposed, curved spike on a 12–17 cm peduncle, white to pale yellow, turning green with maturity. Flowers crowded in regular
transverse ranks. Perianth absent; usually 4 stamens. Fruit a 1-seeded berry, blackish when ripe. Seeds brown to black, 0.7–1.25 mm long, compressed with a reticulate surface.” (Waterhouse & Mitchell, 1998). This collection represents a new naturalized record for the Hawaiian Islands.

**Material examined:** **MAUI:** East Maui, Nāhiku, numerous plants of all size classes spreading and forming thickets in disturbed areas, 400 ft [121 m], 13 Sep 2002, Starr, Starr, & Fukada 020913-2.

**Poaceae**

*Axonopus compressus* (Sw.) Beauv.  
**New island record, range extension**

Previously known from O’ahu, Moloka‘i, and West Maui (Oppenheimer, 2003, 2004), *A. compressus* is now also known from Kaua‘i and East Maui, where this common carpeting grass is in lawns. These collections represent a new island record for Kaua‘i and a range extension to East Maui.

**Material examined:** **KAUA‘I:** Hanalei Bay, growing in lawn at park at end of ‘Ama ‘Ama Rd, 15 ft [5 m], 25 Feb 2002, Starr & Starr 020225-3.  
**MAUI:** East Maui, Makawao, growing in moist and unmaintained area of lawn, 1600 ft [488 m], 5 Nov 2001, Starr & Martz 011105-1.

*Brachiaria plantaginea* (Link) Hitchc.  
**Range extension**

Previously known from O‘ahu, Moloka‘i, and West Maui (Wagner & Herbst, 1995; Oppenheimer & Bartlett, 2002), *B. plantaginea* is now also known from East Maui, where it is a roadside grass in the Makawao area. This collection represents a range extension to East Maui.

**Material examined:** **MAUI:** East Maui, Makawao, Brewer Rd, 1600 ft [488 m], 31 Oct 2001, Starr & Martz 011031-1.

*Cenchrus setigerus* Vahl  
**New naturalized record**

Known from BISH specimens to have been first collected in the state in 1940, and known from an adventive collection in 1976 on Moloka‘i (Wagner *et al.,* 1990), *C. setigerus* (cow sandbur) is now also known from Kaua‘i, where it is a roadside grass on the Mānā Plain. This collection represents a new naturalized record for the Hawaiian Islands.

**Material examined:** **KAUA‘I:** Waimea Distr, Mānā Plain, on the side of the road along Kau-mualii Hwy near Tartar Rd, 50 ft [15 m], 26 Feb 2002, Starr & Martz 020226-6.

*Hemarthria altissima* (Poir.) Stapf & C.E. Hubb.  
**New state record**

Native to Africa, temperate and tropical Asia, and Europe (GRIN, 2001), *H. altissima* (limpo grass) is locally common on Maui in pastures and roadsides from Pi‘iholo to Ha‘iku. This robust grass can be distinguished by the following characteristics. “Perennial; culms ascending from a long creeping base, compressed and 2-edged, 40–80 cm long, freely branching toward the ends; blades flat, 3–8 mm wide; flowering branches often short and fascicled, the racemes 3–5 cm, sometimes 10 cm long, compressed; pedicel free or partly adnate to the rachis joint; sessile spikelet 5–7 mm long, the keels of the first glume very narrowly winged toward the apex; pedicellate spikelet 5–6 mm long, acute.” (Hitchcock, 1971). These collections represent a new state record for the Hawaiian Islands.

**Material examined:** **MAUI:** East Maui, Ha‘ikū, West Kuiaha, in pasture and side of road, 1100 ft [335 m], 29 Jun 2001, Starr & Martz 010629-1; East Maui, Makawao, Makawao Forest Reserve, on side of Kahakapau Rd, 2400 ft [731 m], 30 Oct 2001, Starr & Martz 011030-1.
**Panicum antidotale** Retz.  
*RANGE EXTENSION*  
Previously known from O‘ahu, Moloka‘i, West Maui, and Hawai‘i (Wagner *et al.*, 1990; *Starr et al.*, 2003), *P. antidotale* is now also known from East Maui. This collection represents a range extension to East Maui.  

*Material examined: MAUI*: East Maui, Kīhei, Kawililipoa, growing in sand dunes behind beach with *Cenchrus ciliaris* and *Leucaena leucocephala*, 10 ft [3 m], 1 Feb 2002, *Starr & Martz* 020201-1.

**Pennisetum polystachion** (L.) Schult.  
*NEW ISLAND RECORD*  
Previously known from O‘ahu, Lāna‘i, Maui, and Hawai‘i (Wagner *et al.*, 1990; *Starr et al.*, 2002; *Starr et al.*, 2003), *P. polystachion* is now also known from Kaua‘i, where it is a roadside grass on the Mānā Plain. This collection represents a new island record for Kaua‘i.  


**Rytidosperma semiannulare** (Labill.)  
*NEW NATURALIZED RECORD*  
Conner & Edgar  
Previously known to be adventive on Maui under the name *Danthonia semiannularis* (Wagner *et al.*, 1990), *R. semiannulare* (Tasmanian wallaby grass) is known from BISH specimens to have been first collected on Maui in 1937 and was described by previous collectors as “common”. This pasture grass is indeed naturalized and locally common on both East and West Maui. These collections represent a new naturalized record for the Hawaiian Islands.  


**Rutaceae**  
**Flindersia breyleyana** F. Muell.  
*RANGE EXTENSION*  
Introduced by the State Division of Forestry to all the main islands, and previously known to be naturalized on West Maui and Hawai‘i (Wagner *et al.*, 1990; Oppenheimer, 2003), *F. breyleyana* is now also known to be naturalized on East Maui, where it is escaping from forestry plantings into adjacent open wet forest along the Hāna Hwy This collection represents a range extension to East Maui.  

*Material examined: MAUI*: East Maui, Kūhiwa Forest Reserve, Hāna Hwy, spreading for forestry plantings into native uluhe (*Dicranopteris linearis*) dominated areas, 925 ft [28 m], 13 Sep 2002, *Starr & Starr* 020913-5.

**Ruta graveolens** L.  
*NEW NATURALIZED RECORD*  
Native to south eastern Europe (Brickell & Zuk, 1997), *R. graveolens* (common rue) is known from BISH specimens to have been first collected in Hawai‘i on Maui in 1927 and was noted to be “locally common and naturalized in pastures”. Today, this plant is still naturalized and locally common in pastures and along rock walls in Kula, Maui. This herb
can be distinguished by the following characters. “Rounded to erect, evergreen shrub producing alternate, broadly ovate to rounded, 2-pinnatisect, aromatic, glaucous, blue-green leaves, to 6 in [15 cm] long, with numerous obovate lobes. Cymes of cup-shaped, 4-petaled, dull yellow flowers, 3/4 in [2 cm] across.” (Brickell & Zuk). These collections represent a new naturalized record for the Hawaiian Islands.


Sapindaceae

*Filicium decipiens* (Wight & Arn.) Thwaites  
Range extension

A common tree that has escaped cultivation on O‘ahu, West Maui, and Hawai‘i (Staples *et al.*, 2002; Oppenheimer, 2003), *F. decipiens* is now also known from East Maui, where it is locally established in Kihei. This collection represents a range extension to East Maui.


Solanaceae

*Solanum rostratum* Dunal  
New island record

Previously known from Pōhakuloa, Hawai‘i in 1977 until all plants were removed (Wagner *et al.*, 1999), *S. rostratum* is now known from Maui, where it was recently collected as a volunteer in a cinder pile in ‘Ulupalakua. Similarly, all known plants were removed. This collection represents a new island record for Maui.


Verbenaceae

*Citharexylum caudatum* L.  
New island record

Previously known from O‘ahu, Maui, and Hawai‘i (Wagner *et al.*, 1990; Starr *et al.*, 1999; Oppenheimer, 2003), *C. caudatum* is now also known from Hilo, Hawai‘i and from the eastern coast of Kaua‘i along Keālia Rd. This collection represents a new island record for Kaua‘i.


Vitaceae

*Cissus rhombifolia* Vahl  
New naturalized record

Native to tropical America (Brickell & Zuk, 1997), *C. rhombifolia* (grape ivy) is known from BISH specimens to have been first collected in the state on O‘ahu in 1961. This vine is now sparingly naturalized in Wailuku, Maui. *Cissus rhombifolia* is distinguished from other *Cissus* in the state by the following characteristics: “Vigorous climber producing forked tendrils and 3-palmate, dark green leaves, to 6 in [15 cm] long, with ovate to diamond-shaped leaflets, boldly veined and coarsely toothed, with rust-red hairs beneath. Bears hairy green flowers in cymes 1 1/4–3 in [3–8 cm] long, opposite the leaves, followed by blue-black berries, 1/4–1/2 in [0.5–1.5 cm] across.” (Brickell & Zuk, 1997). This collection represents a new naturalized record for the Hawaiian Islands.

Acknowledgments
We thank Peter Van Welzen at Leiden, Holland for determination of *Flueggea virosa*; Peter Goldblatt at Missouri Botanical Garden for determination of *Gladiolus dalenii*; Warren L. Wagner at the Smithsonian for determination of *Oenothera kunthiana*; W.D. Clayton at Kew for determination of *Hemarthria altissima*; Monroe Bryce, Pat Bily, Fern Duvall, Mach Fukada, Will Haines, Robert Hobdy, Hank Oppenheimer, Michelle Steuermann, and Patti Welton for help with voucher specimens; and especially George Staples, Derral Herbst, and Clyde Imada at BISH for their continued assistance.

Literature Cited


**Limoniidae and Ulidiidae in Hawai‘i (Insecta: Diptera)**

NEAL L. EVENHUIS (Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai‘i 96817-2704, USA; email: neale@bishopmuseum.org)

The most recent checklist of Hawaiian arthropods (Nishida, 2002) listed species of Hawaiian tipuloids and otitids in a broad sense of those families. Nishida’s checklist is based on published references to taxa occurring in Hawai‘i and, despite higher classifications that recognized the raising of certain subfamilies in Tipulidae to family level, no
### Table 1. Checklist of Tipuloidea and Ulidiidae in Hawai‘i

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tipuloidea</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Family Limoniidae</strong></td>
<td></td>
</tr>
<tr>
<td><em>Atypophthalmus</em> Brunetti, 1911</td>
<td></td>
</tr>
<tr>
<td><em>Atypophthalmus umbrata</em> (de Meijere, 1911)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Dicranomyia</em> Stephens, 1829</td>
<td></td>
</tr>
<tr>
<td><em>Dicranomyia gloria</em> (Byers, 1994), n. comb.</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia grimshawi</em> Alexander, 1919</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia hardyana</em> (Byers, 1985), n. comb.</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia hawaiiensis</em> Grimshaw, 1901</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia iniquispina</em> (Hardy, 1953), n. comb.</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia jacobae Alexander, 1919</em></td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia kauaiensis</em> haleakalae (Alexander, 1951), n. comb.</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia kauaiensis</em> kauaiensis Grimshaw, 1901</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia kraussi</em> (Alexander, 1951), n. comb.</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia nigropassi</em> Alexander, 1923</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia sabroskyana</em> (Byers, 1982), n. comb.</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia stygipennis</em> Alexander, 1919</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia swezyei</em> Alexander, 1919</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Dicranomyia variabilis</em> bryani Alexander, 1924</td>
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</tr>
<tr>
<td><em>Dicranomyia variabilis</em> variabilis Grimshaw, 1901</td>
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</tr>
<tr>
<td><em>Erioptera</em> Meigen, 1803</td>
<td></td>
</tr>
<tr>
<td><em>Erioptera bicdornifler Alexander, 1921</em></td>
<td>adventive</td>
</tr>
<tr>
<td><em>Geranomyia</em> Haliday, 1833</td>
<td></td>
</tr>
<tr>
<td><em>Geranomyia advena</em> (Alexander, 1954), n. comb.</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Gonomyia</em> Meigen, 1818</td>
<td></td>
</tr>
<tr>
<td><em>Gonomyia hawaiiensis</em> Alexander, 1919</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Gonomyia molokaiensis</em> Hardy, 1953</td>
<td>endemic</td>
</tr>
<tr>
<td><em>Libnotes</em> Westwood, 1876</td>
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<tr>
<td><em>Libnotes</em> perkinsi (Grimshaw, 1901)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Styringomyia</em> Loew, 1845</td>
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</tr>
<tr>
<td><em>Styringomyia didyma</em> Grimmshaw, 1901</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Symplecta</em> Meigen, 1830</td>
<td></td>
</tr>
<tr>
<td><em>Symplecta pilipes</em> Fabricius, 1787</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Trentepohlia</em> Bigot, 1854</td>
<td></td>
</tr>
<tr>
<td><em>Trentepohlia</em> australasiae Skuse, 1889</td>
<td>adventive</td>
</tr>
<tr>
<td><strong>Family Tipulidae</strong></td>
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</tr>
<tr>
<td><em>Nephostoma</em> Meigen, 1803</td>
<td></td>
</tr>
<tr>
<td><em>Nephostoma sutturalis</em> wulpiana (Bergroth, 1888)</td>
<td>adventive</td>
</tr>
<tr>
<td><strong>Family Ulidiidae</strong></td>
<td></td>
</tr>
<tr>
<td><em>Acrosticta</em> Loew, 1868</td>
<td></td>
</tr>
<tr>
<td><em>Acrosticta</em> apicalis (Williston, 1896)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Ceroxys</em> Macquart, 1835</td>
<td></td>
</tr>
<tr>
<td><em>Ceroxys latusculus</em> (Loew, 1873)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Eucesta</em> Loew, 1868</td>
<td></td>
</tr>
<tr>
<td><em>Eucesta</em> annonaes (Fabricius, 1794)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Eucesta</em> stigmaeas (Loew, 1868)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Eucesta</em> wettsteini* Hendel, 1909</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Notogramma</em> Loew, 1868</td>
<td></td>
</tr>
<tr>
<td><em>Notogramma</em> cimiciformne* Loew, 1868</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Physiphora</em> Fallén, 1810</td>
<td></td>
</tr>
<tr>
<td><em>Physiphora</em> clausa (Macquart, 1843)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Physiphora</em> demandata (Fabricius, 1798)</td>
<td>adventive</td>
</tr>
<tr>
<td><em>Pseudeuxesta</em> Hendel, 1910</td>
<td></td>
</tr>
<tr>
<td><em>Pseudeuxesta</em> prima (Osten Sacken, 1881)</td>
<td>adventive</td>
</tr>
</tbody>
</table>
worker specifically has updated the familial placement of the Hawaiian taxa formerly placed in those three families. The following checklist (Table 1) updates the current familial and generic placement of Hawaiian species previously placed in Tipulidae and Otitidae and follows the current Biosystematic Database of World Diptera (BDWD) family classification standards (Thompson, 2004a).

**Tipuloidea**

Results of research on the higher classification of Tipulidae have recognized the families Cylindrotomidae, Limoniidae, Pediciidae, and Tipulidae for many years. Recent catalogs (Oosterbroek & Theowald, 1992; Sóos & Oosterbroek, 1992; Savchenko *et al.*, 1992; Evenhuis, 1994; Oosterbroek, 2000) recognized these 4 families based on phylogenetic work that has continued to support this classification (e.g., Theowald & Oosterbroek, 1991; Oosterbroek & Courtney, 1995). Summary notes on the classification of these families can be found in Thompson (2004b). The listing below follows the treatment of these separate families as well as the concept of genera within these families by recent catalogers. As a result of following the generic concepts of these works as well as those of contemporary European specialists, the subgenera of *Limonia* are here recognized as separate genera.

In Hawai‘i, the only family of Tipuloidea with endemic species is Limoniidae, which is represented by a significant amount of speciation in the genus *Dicranomyia* Stephens. Currently, there are 13 endemic Hawaiian species in *Dicranomyia* including 3 flightless species that are found on the older islands of O‘ahu and Kaua‘i.

When Hardy (1960) first enumerated the tipuloid fauna of the islands, 17 species of crane flies were known. Of these, 3 were adventive species. Since then, an additional 3 endemic species have been described (all flightless) and an additional 4 alien species have been introduced to the islands, most likely in potting soil through the nursery trade.

**Otitidae/Ulidiidae**

Hennig (1940) treated the family Ulidiidae as separate from Otitidae, while others continued to treat it as a subfamily within the Otitidae. Recent work by Kameneva & Korneyev (1994) noted the priority of the family-group name Ulidiidae over Otitidae and I follow this treatment.

In Hawai‘i, all species of Ulidiidae are adventive (introduced) species. Following the current classification, nine species found in the Hawaiian Islands (see Table 1) are now placed in Ulidiidae.

**Literature Cited**


Identity of *Prosopeus subaeneus* Murray, 1864 and *Nesopetinus scottianus* Sharp, 1908 and paraphyly of *Nesopeplus* Sharp and *Nesopetinus* Sharp (Coleoptera: Nitidulidae)

CURTIS EWING (Department of Entomology, Comstock Hall, Cornell University, Ithaca, New York 14853-0901, USA; email: cpe1@cornell.edu)

Murray (1864) described *Prosopeus subaeneus* based on a single male specimen. The type locality was stated to be “Caffraria” (now part of Eastern Cape Province, South Africa). Dissection of the type specimen has shown it to be conspecific with the Kilauea specimens in the type series of *Nesopetinus scottianus* Sharp, endemic to the Big Island of Hawai‘i. Recent interest in *P. subaeneus* and its relationship with species of endemic Hawaiian yeast demands immediate attention. Nitidulid specimens were recently collected in the morning glory *Ipomoea indica* (Convolvulaceae) in Kīpuka Pua‘ulu on the Big Island of Hawai‘i and designated undetermined nitidulid “B” (Lachance *et al*., 2003). Dissection and examination by the author of specimens of nitidulid “B” determined them to be *P. subaeneus*. The Kilauea specimens of *N. scottianus* are considered a misidentification of *P. subaeneus*. The type series of *Nesopetinus scottianus* includes specimens from Kona. One of these is here designated the lectotype of *Prosopeus scottianus*. 


The endemic Hawaiian genera *Nesopetinus* and *Nesopeplus* form a monophyletic group in combination and each genus is paraphyletic with respect to the other. Therefore *Nesopetinus* and *Nesopeplus* are junior synonyms of *Prosopeus* and all species of *Nesopetinus* and *Nesopeplus* are here moved to *Prosopeus* as new combinations.

Material was examined from: (BMNH) the Natural History Museum, London; (BPBM) Bishop Museum, Honolulu; and (CUIC) Cornell University Insect Collection, Ithaca, New York.

**Coleoptera: Nitidulidae**


David Sharp (1878) described the genera *Nesopetinus* and *Nesopeplus* and placed species into either genus based on the form of the prosternal process (Sharp & Scott, 1908). In *Nesopetinus*, the process is little directed dorsally posteriad of the procoxae, meeting the mesosternum at an oblique angle. In *Nesopeplus*, it is sharply directed dorsally, meeting the mesosternum at a right angle. Some species were placed in one genus based on this character despite Sharp’s belief that a particular species in question, on the weight of evidence, might be most closely related to a species in the other genus.

Phylogenetic analysis of molecular sequence data and morphological data indicate that *Nesopetinus* and *Nesopeplus* are paraphyletic with respect to one another. The mitochondrial gene cytochrome oxidase I, analyzed under both strict parsimony and maximum likelihood, supports monophyly of *Nesopetinus* + *Nesopeplus* and fails to support monophyly for either group alone (C. Ewing, unpubl. data). Parsimony analysis of the male internal sac supports the results of the molecular analysis (C. Ewing, unpubl. data). The evidence indicates the form of the prosternal process has undergone multiple reversals. The phylogenetic hypothesis generated is a mosaic of clusters of *Nesopetinus* and *Nesopeplus* species with a few single species of one genus nested within clusters of species of the other genus. Therefore both genera, *Nesopetinus* and *Nesopeplus*, are junior synonyms of *Prosopeus*, requiring new combinations for all species placed in the former two genera.

*Prosopeus subaeneus* Murray, 1864: 331 Misidentification

*Nesopetinus scottianus* Sharp in Sharp & Scott, 1908: 499 (in part). *Nesopetinus scottianus* is endemic to the Big Island of Hawai‘i. The type series (Sharp & Scott, 1908) included specimens from Kilauea, above Hilo, the Kona district, and Hua-lālai. The locality of the only specimen examined labelled “above Hilo” is questionable. The card on which the specimen is affixed is labelled “578” in ink and there are fragmentary pencil markings discernable as 578 from before the card was cut. Collection 578, in Perkins notes, is Kilauea, Hawai‘i, Aug 1895 (Perkins, 1895). The label associated with the specimen corresponds to collection 558; which in Perkins notes is; “above Hilo, Hawaii, *Brachypeplus*, 1800ft. [549m], XII ‘95” (Perkins, 1895).

Sharp (1878) originally placed the majority of endemic Hawaiian Nitidulidae in the genus *Brachypeplus*, including all *Nesopetinus* and *Nesopeplus* described prior to the publication of the *Fauna Hawaïiensis*, and Perkins’s notes reflected this. Male genitalia were dissected in this study from type series specimens of *N. scottianus* from Kilauea, “above
Hilo”, and Kona, and from recently collected specimens from Kipuka Pua’ulu. The dissections of the Kilauea, “above Hilo”, and Kipuka Pua’ulu specimens agreed with the holotype for *Prosopeus subaeneus* (BMNH) (see Figs. 1 and 2). The specimens from Kilauea and “above Hilo” determined as *Nesopetinus scottianus* by Sharp in Sharp & Scott (1908) are therefore considered here misidentifications of *Prosopeus subaeneus*.

A specimen dissected from the Kona District was shown to be distinct by virtue of the form of the apex of the male internal sac (Fig. 3). The name *P. scottianus* is limited to these specimens (see below). The tegmen of *P. scottianus* is very similar to that of *P. subaeneus* confirming the close relationship between these species.

The South African type locality as stated for *Prosopeus subaeneus* (Murray, 1864) is considered here erroneous, and *Prosopeus* should be considered an endemic Hawaiian genus. The type locality for *P. subaeneus* is thus probably Kipuka Pua’ulu or nearby.

**Figs. 1–3.** *Prosopeus* male genitalia. 1. *Prosopeus subaeneus* Murray; tegmen of male, ventral; 2, same, apex of inverted male internal sac; 3, *Prosopeus scottianus* (Sharp); apex of inverted male internal sac. *sd*, sperm duct; *v*, ventral surface. Scale bars 0.1mm.

**Prosopeus scottianus** (Sharp)

*Nesopetinus scottianus* Sharp *in* Sharp & Scott, 1908: 499 (in part).

The specimen examined from the type series of *N. scottianus* from Kona is here designated **lectotype** for *P. scottianus* (fig. 3). The lectotype and its locality data are: ♂, length 3.4 mm, BPBMent 119381, Kona, 5000 ft [1524 m], Ka‘awaloa and Holokaalele gulches, R.C.L. Perkins coll., 30 Jun 1892, coll. #320.

I was not able to examine specimens from the type series from Hualalai. The Kona collection was from the area to the northeast of Kealakekua Bay (eg. Ka‘awaloa and Holoka‘alele gulches) (Perkins, 1892; Manning, 1986), and it seems probable that the Hualalai specimens represent this species. Dissection will be necessary to definitively establish the placement of the Hualalai specimens. Sharp *in* Sharp & Scott (1908), in the description of *Nesopetinus scottianus*, stated “I have named this species in honor of my colleague, Mr. Hugh Scott, who has devoted a great deal of attention to these very difficult insects” (Sharp & Scott, 1908: 499), and I am pleased to preserve this specific epithet and the honor it represents.

Material examined: **HAWAI'I**: [**lectotype***], Kona, 5000 ft [1524 m], Perkins, 30 Jun 1892, coll #320 (= from fls. & dead wood) BPBMent 119381 (BPBM).

The placement of *Nesopetinus* and *Nesopeplus* as junior synonyms under *Prosopeus* requires the following new combinations:

**Prosopeus tinctus** (Sharp), **n. comb.**

*Brachypeplus tinctus* Sharp, 1879: 83.

*Nesopetinus tinctus* Sharp *in* Sharp & Scott, 1908: 493.

**Prosopeus gonioryctoides** (Sharp), **n. comb.**

*Nesopetinus gonioryctoides* Sharp *in* Sharp & Scott, 1908: 493.

**Prosopeus metallescens** (Sharp), **n. comb.**

*Brachypeplus metallescens* Sharp, 1881: 511.

*Nesopetinus metallescens* Sharp *in* Sharp & Scott, 1908: 493.

**Prosopeus discedens** (Sharp), **n. comb.**

*Brachypeplus discedens* Sharp, 1878: 133.

*Nesopetinus discedens* Sharp *in* Sharp & Scott, 1908: 494.

**Prosopeus kauaiensis** (Blackburn), **n. comb.**

*Brachypeplus discedens var. kauaiensis* Blackburn *in* Blackburn & Sharp, 1885: 137.

*Nesopetinus kauaiensis* Sharp *in* Sharp & Scott, 1908: 495.

**Prosopeus omissus** (Sharp), **n. comb.**

*Nesopetinus omissus* Sharp *in* Sharp & Scott, 1908: 495.
Prosopeus varius (Sharp), n. comb.
Brachypeplus varius Sharp, 1881: 512.
Nesopetinus varius: Sharp in Sharp & Scott, 1908: 496.

Prosopeus pusillus (Sharp), n. comb.
Nesopetinus pusillus Sharp in Sharp & Scott, 1908: 496.

Prosopeus vestitus (Sharp), n. comb.
Brachypeplus vestitus Sharp, 1881: 511.

Prosopeus parallelus (Sharp), n. comb.

Prosopeus eremitus (Sharp), n. comb.
Nesopetinus eremitus Sharp in Sharp & Scott, 1908: 497.

Prosopeus celatus (Sharp), n. comb.
Brachypeplus celatus Sharp in Blackburn & Sharp, 1885: 134.

Prosopeus apertus (Sharp), n. comb.
Brachypeplus apertus Sharp in Blackburn & Sharp, 1885: 135.

Prosopeus pallidus (Sharp), n. comb.
Nesopetinus pallidus Sharp in Sharp & Scott, 1908: 500.

Prosopeus concolor (Sharp), n. comb.
Nesopetinus concolor Sharp in Sharp & Scott, 1908: 500.

Prosopeus filipes (Sharp), n. comb.

Prosopeus quadraticollis (Blackburn), n. comb.
Brachypeplus quadraticollis Blackburn in Blackburn & Sharp, 1885: 135.

Prosopeus rudis (Sharp), n. comb.

Prosopeus perkinsi (Scott), n. comb.

Prosopeus intermedius (Scott), n. comb.
Nesopetinus intermedius Scott in Sharp & Scott, 1908: 503.

Prosopeus blackburni (Sharp), n. comb.
Brachypeplus blackburni Sharp, 1881: 516.

Prosopeus blackburni ssp. lanaiensis (Blackburn), n. comb., n. status
Brachypeplus blackburni var. lanaiensis Blackburn in Blackburn & Sharp, 1885: 138.
Nesopetinus blackburni var. lanaiensis: Sharp in Sharp & Scott, 1908: 504.
Prosopeus blackburni ssp. mauensis (Scott), n. comb., n. status
Nesopetinus blackburni var. mauensis Scott in Sharp & Scott, 1908: 504.

Prosopeus blackburnianus (Scott), n. comb.
Nesopetinus blackburnianus Scott in Sharp & Scott, 1908: 504.

Prosopeus inauratus (Sharp), n. comb.
Brachypeplus inauratus Sharp, 1881: 508.

Prosopeus collaris (Sharp), n. comb.
Nesopeplus collaris Sharp in Sharp & Scott, 1908: 476.

Prosopeus curtithorax (Scott), n. comb.
Nesopeplus curtithorax Scott in Sharp & Scott, 1908: 476.

Prosopeus anticatus (Sharp), n. comb.
Nesopeplus anticatus Sharp in Sharp & Scott, 1908: 476.

Prosopeus olindae (Blackburn), n. comb.
Brachypeplus olindae Blackburn in Blackburn & Sharp, 1885: 132.

Prosopeus segnis (Sharp), n. comb.
Nesopeplus segnis Sharp in Sharp & Scott, 1908: 477.

Prosopeus vagepictus (Sharp), n. comb.
Nesopeplus vagepictus Sharp in Sharp & Scott, 1908: 478.

Prosopeus molokaiensis (Sharp), n. comb.
Nesopeplus molokaiensis Sharp in Sharp & Scott, 1908: 478.

Prosopeus roridus (Sharp), n. comb.
Nesopeplus roridus Sharp in Sharp & Scott, 1908: 479.

Prosopeus fallax (Sharp), n. comb.
Nesopeplus fallax Sharp in Sharp & Scott, 1908: 479.

Prosopeus floricola (Blackburn), n. comb.
Brachypeplus floricola Blackburn in Blackburn & Sharp, 1885: 134.

Prosopeus pictus (Sharp), n. comb.
Nesopeplus pictus Sharp in Sharp & Scott, 1908: 480.

Prosopeus abnormalis (Sharp), n. comb.
Nesopeplus abnormalis Sharp in Sharp & Scott, 1908: 481.

Prosopeus solitarius (Sharp), n. comb.
Nesopeplus solitarius Sharp in Sharp & Scott, 1908: 481.

Prosopeus insolitus (Sharp), n. comb.
Nesopeplus insolitus Sharp in Sharp & Scott, 1908: 482.
**Prosopeus serratus** (Scott), **n. comb.**
*Nesopeplus serratus* Scott *in* Sharp & Scott, 1908: 482.

**Prosopeus bidens** (Sharp), **n. comb.**
*Brachypeplus bidens* Sharp, 1881: 510.
*Nesopeplus bidens*: Scott *in* Sharp & Scott, 1908: 483.

**Prosopeus lambianus** (Scott), **n. comb.**
*Nesopeplus lambianus* Scott *in* Sharp & Scott, 1908: 484.

**Prosopeus testaceipes** (Scott), **n. comb.**
*Nesopeplus testaceipes* Scott *in* Sharp & Scott, 1908: 484.

**Prosopeus torvus** (Blackburn), **n. comb.**
*Brachypeplus torvus* Blackburn *in* Blackburn & Sharp, 1885: 133.
*Nesopeplus torvus*: Scott *in* Sharp & Scott, 1908: 485.

**Prosopeus obscurans** (Scott), **n. comb.**
*Nesopeplus obscurans* Scott *in* Sharp & Scott, 1908: 486.

**Prosopeus protinoides** (Sharp), **n. comb.**
*Brachypeplus protinoides* Sharp, 1879: 85.
*Nesopeplus protinoides*: Scott *in* Sharp & Scott, 1908: 486.

**Prosopeus nigricans** (Scott), **n. comb.**
*Nesopeplus nigricans* Scott *in* Sharp & Scott, 1908: 487.

**Prosopeus cognatus** (Scott), **n. comb.**
*Nesopeplus cognatus* Scott *in* Sharp & Scott, 1908: 487.

**Prosopeus koelensis** (Blackburn), **n. comb.**
*Brachypeplus koelensis* Blackburn *in* Blackburn & Sharp, 1885: 133.
*Nesopeplus koelensis*: Scott, 1908: 488.

**Prosopeus latiusculus** (Scott), **n. comb.**
*Nesopeplus latiusculus* Scott *in* Sharp & Scott, 1908: 488.

**Prosopeus similis** (Scott), **n. comb.**
*Nesopeplus similis* Scott *in* Sharp & Scott, 1908: 489.

**Prosopeus confertus** (Scott), **n. comb.**
*Nesopeplus confertus* Scott *in* Sharp & Scott, 1908: 490.

**Prosopeus puncticollis** (Scott), **n. comb.**
*Nesopeplus puncticollis* Scott *in* Sharp & Scott, 1908: 490.

**Prosopeus sinuatus** (Scott), **n. comb.**
*Nesopeplus sinuatus* Scott *in* Sharp & Scott, 1908: 491.

**Prosopeus ater** (Scott), **n. comb.**
*Nesopeplus ater* Scott *in* Sharp & Scott, 1908: 491.

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**Literature Cited**


**New records and taxonomic updates for adventive sap beetles (Coleoptera: Nitidulidae) in Hawai’i**

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The adventive sap beetles present in Hawai’i are all saprophagous, except for *Cyboccephalus nipponicus* Endrödy-Younga, which is predatory. Species in the genus *Carposphilus* are the most commonly encountered and are considered nuisance pests around pineapple fields and canneries (Illingworth, 1929; Schmidt, 1935; Hinton, 1945). The remaining species are less frequently encountered and are not considered to be important pests. We report 2 new state records, 5 new island records, and 4 taxonomic changes for the adventive sap beetles in Hawai’i. With the exception of *Stelidota chontalensis* Sharp,
all of the species reported are widely distributed outside Hawai‘i. The records below increase the number of known introduced species from 16 to 18 (Nishida, 2002). Material was examined from: (HDOA) Hawai‘i Department of Agriculture, Honolulu; (BPBM) Bishop Museum, Honolulu; (CUIC) Cornell University Insect Collection, Ithaca, New York.

**Cybocephalus nipponicus** Endrödy-Younga  
*New island record*
Easily distinguished from all other nitidulids in Hawai‘i by its small size (1 mm), and hemispherical body form with head concealed from above. Females are all black; males have black elytra with the head and pronotum light brown. The new island record for O‘ahu is based on specimens collected in 1988, a year earlier than the previously reported specimens from Maui and Hawai‘i (Beardsley & Tsuda, 1992). Distribution: Japan, China, India, Ceylon, Singapore, Palau, and Mariana Is (Endrödy-Younga, 1971). All *Cybocephalus* species are predatory on scale insects and whiteflies. Though *C. nipponicus* has been used as a biocontrol agent, there is no record of intentional introduction into Hawai‘i (Beardsley & Tsuda, 1992).


**Carpophilus mutilatus** Erichson  
*New island records*
*Carpophilus mutilatus* is most similar to *Carpophilus freemani* Dobson and can be separated from other *Carpophilus* present in Hawai‘i by the short 3rd antennal segment, small axillary space, densely punctate pronotal disc, acuminate female pygidium, and acuminate male anal sclerite. First recognized as being established in Hawai‘i from material collected in 1952 on the island of O‘ahu (Ford, 1961). Specimens examined from Kaua‘i and Moloka‘i represent new island records. Distribution worldwide. Relatively common in decaying fruits and grains. *Carpophilus mutilatus* was synonymized from 1913 until 1954 with *Carpophilus dimidiatus* Fabricius and many of the host records for the latter reflect the habits of the former (Hinton, 1945).


**Epuraea (Haptoncus) luteola** Erichson  
*Taxonomic change*
[Haptoncus luteolus (Erichson) (sensu Grouvelle, 1913; after Murray, 1864)]
Originally placed in the genus *Epuraea* by Erichson, this species was moved to *Haptoncus* by Grouvelle based on Murray’s description of the latter genus. The genus *Haptoncus* is presently considered a subgenus of *Epuraea* (see e.g., Kirejtshuk, 1992). It is superficially similar to *Epuraea munda* (Sharp) but can be distinguished externally by the pronotal microsculpture, which consists of fine parallel lines, and the elytra, which are longest near the midline of each. Some teneral individuals of *E. ocularis* may be lacking the dark marks on the pronotum and elytra, and from these specimens *E. luteola* can be distinguished by the differences in pronotal microsculpture mentioned under that species. First collected in Hawai‘i in October and November 1949 (Ford, 1960). Distribution worldwide. Primarily associated with decaying fruit (Hinton, 1945). *E. luteola* is often found with specimens of *E. munda* and *E. ocularis* in lowlands as well as in native forests, and can often be collected from the decaying fruit of ‘ie‘ie (*Freycinetia arborea* Gaudichaud-Beaupré).

**Epuraea (Haptoncus) munda** (Sharp)  
*Haptoncus mundus* Sharp

*Haptoncus* is now considered a subgenus of *Epuraea*. This species can be distinguished from the other *Epuraea* present in Hawai‘i by virtue of the form of the elytra, which are longest near the suture, and by the microsculpture of the pronotum, which is nearly obsolete and shining. This name has only been applied to specimens collected in Hawai‘i, although Sharp considered it to be introduced (Sharp & Scott, 1908). Sharp (1878) believed it to be closely related to *E. testacea* Murray from New Guinea and separated the Hawaiian specimens on the basis of the more explanate pronotal margins. When a complete revision of this genus is completed *E. munda* may prove to be a synonym, though it is possible it represents and endemic species resulting from a relatively recent colonization event. Found in the same situations as the other *Epuraea* species.


**Epuraea (Haptoncus) ocularis** Fairmaire  
*Haptoncus ocularis* (Fairmaire) *(sensu Grouvelle, 1913; after Murray, 1864)*

Originally placed in the genus *Epuraea* by Fairmaire, this species was moved to *Haptoncus* by Grouvelle based on Murray’s description of the latter genus. *Haptoncus* is now considered a subgenus of *Epuraea*. Mature, well sclerotized individuals of this species can be easily distinguished from other *Epuraea* species in Hawai‘i by the dark marks on the anterior and posterior margin of the pronotum and on the elytra. Immature specimens can be more difficult, with the form of the elytra and luster being similar to *E. luteola*, however the microsculpture on the pronotum is distinctive, consisting of a granular mesh. First reported in Hawai‘i by Sharp (1878) from specimens collected by Blackburn. Distribution worldwide. Found in the same situations as the other *Epuraea* species.


**Phenolia (Aethinodes) attenuata** (Reitter)  

*Phenolia attenuata* can be distinguished from *Phenolia limbata tibialis* by its smaller size, 5.0–5.5 mm, interstitial setae on the elytra which are fine and closely spaced forming continuous rows, and the divergent metacoxal lines on the first visible abdominal sternite. Distribution: New Guinea, Malay Archipelago, and Southeast Asia. It is present on Kaua‘i and O‘ahu, where it is common at low elevations in decaying citrus and other rotting fruits.


**Phenolia (Lasiodites) limbata tibialis** (Boheman)  
**New combination/new island records**  
*Soronia tibialis* Boheman (*sensu* Kirejtshuk & Kvamme, 2002; after Jelínek, 1999)

Originally described as *Soronia tibialis*, then moved to *Lasiodactylus*, this species was recently moved to *Phenolia* and treated as a subspecies of *P. limbata* (Kirejtshuk & Kvamme, 2002). Previously reported as "*Lasiodactylus* sp. prob. *tibialis*" (Kumashiro & Heu, 1997) from Hawai‘i Island. The identification has been confirmed through dissection of male genitalia. This species is the largest adventive nitidulid in Hawai‘i (5.6–8.0 mm). This species is similar to *P. attenuata* in overall form but has coarser and more widely spaced interstitial elytral setae, shallower serial punctures of the striae, and the metacoxal lines not divergent from the metacoxal cavity. The O‘ahu and Maui specimens represent new island records. Distribution worldwide. Found with *P. attenuata*.

**Material examined:**  
**HAWAI‘I:** Waiākea, 30 May 1996, ex guava, H. Hirae (1♂, 1♀) (HDOA).

**Stelidota geminata** (Say)  
**New state record**  
*Stelidota* species are superficially similar to *Phenolia* species. However, they are smaller (2–3 mm) and the axillary space is not elongate. Both Hawaiian species of *Stelidota* have the metacoxal lines present. *Stelidota geminata* can be distinguished from *Stelidota chontalensis* by the form of the pronotum which is more constricted anteriorly and posteriorly, more deeply emarginate anteriorly, and has the lateral margins more evenly curved. The pronotal and elytral margins are more explanate in dorsal view. First collected in the 1990s, it has spread quickly and may be present on all of the main islands. Most commonly found in decaying fruit at low elevations and in leaf litter in higher elevation native forests. Distribution worldwide.

**Material examined:**  
**KAU‘I:** Koke‘e State Park, Nu‘alolo Tr., 22°07’48"N 159°39’37"W, ex Polypore on log (2♀, 3♂) (BPBM).  
**O‘AHU:** UH Mānoa Campus, 200 ft [61 m], 26 Jun 1998, rolling tangerines on ground, C. Ewing, DNA vouch. #292 (1♂) (CUIC). Waimānalo, 13 Aug 1997, in fallen false *kamani* with 5 other nitidulid spp., M. Ramadan/97-330 (1♂, 2♀) (HDOA).  
**MOLOKA‘I:** Pu‘u Lua, summit above spring, 3180 ft [969 m], 16 Jun 1999, sifting *öhi‘a* litter, C. Ewing coll. #98 21°06’28"N 156°48’48"W (1♂, 1♀) (CUIC).  
**LĀNA‘I:** Hauola ridge tr., 3360 ft [1024 m], 15 Dec 1998, C. Ewing coll. #24, sifting *Pritchardia* fronds 20°48’33"N, 156°52’00"W (1♂) (CUIC).  

**Stelidota chontalensis** Sharp  
**Reidentification**  
Can be distinguished from *S. geminata* by the form of the pronotum, which has the hind angles quadrate, anterior margin little constricted and shallowly emarginate, and the lateral margins more explanate and parallel for posterior half. Pronotal and elytral margins narrowly explanate in dorsal view. Previously reported as *Stelidota* sp. from specimens collected in Kapi‘olani Park, Kaimuki, and on dried guava leaves at the University of Hawai‘i Experimental Farm at Waimānalo, all in 1992 (Beardsley et al., 1995). Native to Central America.

**Material examined:**  
**O‘AHU:** Kapi‘olani Park, 5 ft [2 m], 11–12 Jan 1992, W.D. Perreira Louise
Aethina (Idaethina) concolor (Macleay)  

New island records

[Nitidula concolor Macleaysensu Kirejtshuk & Lawrence, 1999]

Can be distinguished by the combination of the following characters: pygidium with basal pits, shallowly emarginated labrum with fringe of long setae, pronotum emarginate and not at all explanate, pygidium and small portion of 6th tergite exposed at elytral suture, color dark brown to black and covered with conspicuous golden setae. Originally reported from Kahuku and other locations on Oʻahu as Macroura sp. (Beardsley & Samuelson, 1992), and then Kauaʻi (Nishida, 2002), now reported from Kailua-Kona and Kïpuka Puaʻulu on Hawaiʻi Island and Kahului, Maui. This species is native to Australia where it is most commonly found in association with hibiscus flowers (Gough & Hamacek, 1989). It has been found across the South Pacific on Norfolk Island, New Zealand, New Guinea, Bismarck Archipelago, New Britain, New Caledonia, Loyalty Islands, Solomon Islands, Vanuatu, Fiji, Tonga Islands, Samoa, and Society Islands (Kirejtshuk & Lawrence, 1999). In Hawaiʻi it has been collected in flowers of Hibiscus (Malvaceae), Ipomoea indica (Convolvulaceae) (Lachance et al., 2003), and Coccinia (Cucurbitaceae).

Material examined:  
KAUAʻI: Kealoha lookout on Ipomoea pes-caprae, #366,7, A. Lachance (2♂) (BPBM).  
OʻAHU: Schofield, Jun 90, K. Will (1♂) (CUIC).  
MAUI: Kahului, Div. Forestry baseyard, Hibiscus breckenridgeii, B. Hobdy/91-220 (1♀,1♂) (HDOA).  

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Rediscovery of five species of Omiodes Guenée (Lepidoptera: Crambidae) on Hawai‘i Island

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Beginning in 1980, through a contract from the U.S. Fish & Wildlife Service, an assessment of the conservation status of more than 800 species of native Hawaiian insects was undertaken by Wayne Gagné, Carl Christensen, and others (Gagné, 1982; Gagné & Christensen, 1985). Twenty-two species of endemic leafrollers in the genus Hedylepta (=

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Omiodes: Crambidae) were among the first groups of Lepidoptera analyzed, and Gagné (1982: Table 2) reported nine species that were “presumed recently extinct”. These results were based upon an analysis of the most recent museum specimen collection dates and an assessment of threats. The results were subsequently reported internationally (Gagné & Howarth, 1985), citing the reasons for extinctions as the combined pressures of habitat destruction, increased rarity of host plants, and the introduction of alien parasitoids for biological control. These data were subsequently reported to the U.S. Fish & Wildlife Service and became the basis for listing candidate endangered species (U.S. Fish & Wildlife Service, 1984).

Since then, 14 of the 23 known Hawaiian species of Omiodes leafroller moths have been variously cited as extinct or possibly extinct (Table 1) (Gagné & Howarth, 1985; Beattie, 1994; Evenhuis, 2002; IUCN, 2003). This amounts to more than half of the native species in this genus. The species currently listed as extinct by HBS are: O. anastrepta Meyrick, O. anastreptiodes Swezey, O. asaphombra Meyrick, O. continuaalis Wallengren, O. epicentra Meyrick, O. euryprora Meyrick, O. fullawayi Swezey, O. giffardi Swezey, O. iridias Meyrick, O. laysanensis Meyrick, O. meyricki Swezey, O. monogona Meyrick, O. musicola Swezey, and O. telegrapha Meyrick.

An examination of the insect collections of Hawaii Volcanoes National Park and the collection of J. Giffin revealed recently collected specimens for five of these 14 species. Some of these species are represented by only a few specimens from a few localities, and may truly be threatened with extinction. Other species, however, have been quite widely collected on Hawai’i Island. The “rediscovery” of these widespread species suggests either that they were never truly in danger of extinction (at least on this island), or that their numbers have increased in recent decades. It is possible that the previous lack of recent collection records for these species may have been due to a lack of active interest in them since the 1950s.

Much of the concern for Omiodes moths and the speculation surrounding their conservation status stems from the group’s unusual history. Because of their occurrence on sugarcane and coconut palms, two species, O. accepta and O. blackburni, were specifically targeted for biological control using imported parasitoids between 1895 and 1958 (Funasaki et al., 1988). As early as 1954, entomologists in Hawai’i recognized a decline in populations of native Omiodes moths, and suggested that this decline was due in part to pressure from introduced parasitoids and predators (Swezey, 1954; Zimmerman, 1958).

However, at least some species seem to be present in good numbers, and it is clear that the conservation status of Omiodes moths should be reexamined. The many peculiarities of this genus, with regards to biological control (Funasaki et al., 1988), conservation biology (Gagné & Howarth, 1985), and evolutionary history (Zimmerman, 1960), make it an ideal subject for future surveys and studies.

Since the rediscoveries reported here are primarily based on incidental collections on a single island, rather than active searches for Omiodes moths, it is highly possible that other ‘extinct’ species are extant. These rediscoveries illustrate the drawbacks of relying solely on museum specimens (although they are often the best data source available), and the need for focused surveys when proposing extinction status. An attempt should be made to relocate Omiodes species on all islands, especially since several of the currently listed species are likely to be rare or threatened, if not yet extinct. If populations of threatened moths are located, distributions may be mapped, and actions may be taken to protect these moths by protecting their host plants and habitats.

Institutions with vouchered material are abbreviated as follows: Hawaii Volcanoes National Park (HVNP); Jon Giffin, personal collection (JGPC).
**Omiodes anastrepta** Meyrick

**Rediscovery**

This species has historically been reported from the islands of O‘ahu, Moloka‘i, and Hawai‘i (Nishida, 2002). Its recorded host plant is *Carex wahuensis* Mey (Zimmerman, 1958). Here we report thirteen specimens, collected from wet and mesic forest on the windward and leeward sides of the island of Hawai‘i. This species was first cited as possibly extinct in 1994 by the U.S. Fish & Wildlife Service (Beattie, 1994). Subsequently, it was listed as extinct by HBS (Evenhuis, 2002).


**Omiodes anastreptoides** Swezey

**Rediscovery**

This species has historically been reported only from the island of Hawai‘i (Nishida, 2002). Larvae have been reared from a sedge, possibly *Carex wahuensis* Mey (Zimmerman, 1958). Here we report nine specimens of this species, all collected from wet forest
on the windward side of the island of Hawai‘i. This species was first officially cited as a Category 2 species of concern in 1994 by the U.S. Fish & Wildlife Service (Beattie, 1994). Subsequently, it was listed as extinct by HBS (Evenhuis, 2002).


**Omiodes asaphombra** Meyrick

**Rediscovery**

This species has historically been collected on the islands of Kaua‘i, O‘ahu, Moloka‘i, and Hawai‘i (Nishida, 2002). Here we report six specimens from the leeward and windward sides of the island of Hawai‘i. This species has only been reared from *Joinvillea adscendens* Gaudichaud, and has been reported to be specific to this plant (Swezey, 1954). Despite the fact that this plant is not known to occur on the leeward side of Hawai‘i Island, five of these six specimens were collected from the district of S. Kona. Therefore, we consider it likely that *O. asaphombra* is able to utilize another host plant. *Omiodes asaphombra* was first presumed extinct by Gagné & Howarth (1982) due to the scarcity of *Joinvillea adscendens*. It was subsequently listed as possibly extinct by FWS (Beattie, 1994), and as extinct by the IUCN (2003) and HBS (Evenhuis, 2002).

**Material examined: HAWAI‘I**: S. Hilo Distr, Hilo Watershed, Pu‘u O‘o boundary, at light, 2 Jul 1999, J. Giffin, 1 specimen (JGPC); S. Kona Distr, Kona Forest Unit of Hakalau NWR, Field camp, 20 Jul 2000, W. Haines, 1 specimen, HVNP003587, (HVNP); S. Kona Distr, Kona Forest Unit of Hakalau NWR, 1372 m, 1 Aug 2000, K. Magnacca, 3 specimens, HVNP003712, HVNP003713, HVNP003714 (HVNP); S. Kona Distr, S. Kona Forest Reserve, 1500 m, at light, 10 Apr 2001, J. Giffin, 1 specimen (JGPC).

**Omiodes continuatalis** Wallengren

**Rediscovery**

This species has been reported from all the main islands except Kaho‘olawe and Ni‘ihau (Nishida, 2002), and early entomologists reported this to be one of the most commonly seen moths in Hawai‘i in the late 1800s (Zimmerman, 1958). Recorded host plants for this species include both native and non-native grasses, including *pili* (*Heteropogon contortus* L.). We here report 13 specimens from mesic forest on both the windward and leeward sides of Hawai‘i Island. *Omiodes continuatalis* was first presumed extinct by Gagné & Howarth (1982) due to the loss of habitat and introduction of biocontrol agents and was subsequently listed as extinct by the International Union for Conservation of Nature (IUCN, 2003) and HBS (Evenhuis, 2002).

Omiodes monogona Meyrick

Rediscovery

This species has been historically reported from all the main islands except Kaho’olawe and Ni’ihau (Nishida, 2002). Zimmerman (1958) reported its principal native host to be wiliwili, Erythrina sandwicensis Degener, but he also listed several other native and non-native legumes as alternate hosts for the caterpillars. Here we report seven specimens, from mesic to wet forest on both windward and leeward sides of southern Hawai’i Island. O. monogona was first cited as possibly extinct in 1994 by the U.S. Fish & Wildlife Service (Beattie, 1994) and was subsequently listed as such by HBS (Evenhuis, 2002).


Literature Cited


New arthropod records from Kaho‘olawe

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The following contributions include new island records of arthropods located on the island of Kaho‘olawe. Voucher specimens were collected and determined by the authors. Most specimens were confirmed by Mach Fukada. All vouchers are housed in Bishop Museum, Honolulu.

**Araneae: Clubionidae**

*Cheiracanthium mordax* Koch

New island record

Previously known from all the Northwestern Hawaiian Islands except Necker, and from all the main islands except Ni‘ihau and Kaho‘olawe (Nishida, 2002).


**Coleoptera: Bostrichidae**

*Amphicerus cornutus* (Pallas)

New island record

Previously known from Ni‘ihau, Kaua‘i, O‘ahu, Moloka‘i, and Maui (Nishida, 2002).

Material examined: **KAHO‘OLAWE**: 3, Honokanaia base camp gallely, attracted to UV light, 25 ft [8 m], 22 Sep 2003, Starr & Starr 030922-2. 1, LZ-1, between Pu‘u Moa‘ulaiki and Lua Makika, boring into live tamarisk (*Tamarix aphylla*) stems, 1300 ft [396 m], 23 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030923-1. 1, Honokanaia, beaten from hau (*Hibiscus tiliae*) stems, 25 ft [8 m], 14 Oct 2003, Starr, Starr, & King 031014-5. 1, Honokanaia, beaten from buffel grass (*Cenchrus ciliaris*), Starr & Starr 031014-6.

*Sinoxylon conigerum* Gerstaecker

New island record

Previously known from O‘ahu, Moloka‘i, Maui, and Hawai‘i (Nishida, 2002).

Material examined: **KAHO‘OLAWE**: 1, Pu‘u Moa‘ulaiki, flying around, 1200 ft [365 m], 22 Sep 2003, Starr & Starr 030922-3. 2, Moaulanui, swept from vegetation, 1300 ft [396 m], 16 Oct 2003, Starr & Starr 031016-7.

**Coleoptera: Cerambycidae**

*Sybra alternans* (Wiedemann)

New island record

Previously known from Kaua‘i, O‘ahu, Moloka‘i, Maui, Hawai‘i, and Midway (Nishida 2002).


**Coleoptera: Coccinellidae**

*Coccinella septempunctata* Linnaeus

New island record

Previously known from all the main islands except Ni‘ihau and Kaho‘olawe (Nishida 2002).

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¹. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai‘i 96817-2704, USA.
Material examined: **KAHO'OLawe**: 1, Pu’u Moa’ulaiki, on koa haole (Leucaena leucocephala) foliage, 1,200 ft [365 m], 22 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030922-10. 1, Keanakelii Beach, dead in kiawe (Prosopis pallida) duff, 10 ft [3 m], 7 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031007-5. 1, Kaukaukapapa Beach, swept from beach grasses, 10 ft [3 m], 15 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031015-9. 1, same location, beaten from foliage, 15 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031015-10.

**Olla v-nigrum** (Mulsant)  
New island record  
Previously known from Midway and all the main islands except Ni‘ihau and Kaho‘olawe (Nishida, 2002).

Material examined: **KAHO'OLawe**: 1, Kaukaukapapa Beach, swept from Sesuvium portulastrum, 10 ft [3 m], 15 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031015-5.

**Coleoptera: Curculionidae**  
**Asynonychus godmanni** Crotch  
New island record  
Previously known from Midway and all the main islands except Kaho‘olawe (Nishida, 2002).

Material examined: **KAHO'OLawe**: 2, LZ-1, between Pu’u Moa’ulaiki and Lua Makika, beaten from ‘aweoweo (Chenopodium oahuense) foliage, 1,300 ft [396 m], 23 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030923-11. 1, Pu’u Moa’ulaiki, on ground, 1,200 ft [365 m], 23 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030923-12. 1, Moaulanui, under kiawe (Prosopis pallida) pile, 1,300 ft [396 m], 16 Oct 2003, Starr, Starr, & Mar 031016-4.

**Coleoptera: Tenebrionidae**  
**Gonocephalum adpressiforme** Kaszab  
New island record  
Previously known from Kure, Midway, and all the main islands except Kaho‘olawe (Nishida, 2002).


**Diptera: Syrphidae**  
**Eristalinus arvorum** (Fabricius)  
New island record  
Previously known from all the main islands except Ni‘ihau and Kaho‘olawe (Nishida, 2002).

Material examined: **Kaho'olawe**: 1, Kaukaukapapa Beach, visiting kiawe (Prosopis pallida) flowers near the wetland, 10 ft [3 m], 15 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031015-1.

**Heteroptera: Pentatomidae**  
**Eysarcoris ventralis** (Westwood)  
New island record  
Previously known from Kaua‘i and O‘ahu (Nishida, 2002).

Material examined: **KAHO'OLawe**: 13, Honokanaia, base camp, beaten from buffel grass (Cenchrus ciliaris) in gray water overflow near beach, 6 ft [2 m], 6 Oct 2003, Starr, Starr, & King 031006-1. 13, same location, 14 Oct 2003, Starr, Starr, & King 031014-4.

**Hymenoptera: Apidae**  
**Apis mellifera** Linnaeus  
New island record  
Previously known from all the main islands except Kaho‘olawe (Nishida, 2002).

Material examined: **KAHO'OLawe**: 1, Pu‘u Moa‘ulaiki, visiting uhaloa (Waltheria indica)

**Hymenoptera: Formicidae**

*Leptogenys falcigera* Roger

New island record

Previously known from all the main islands except Kaho’olawe (Nishida, 2002).

*Material examined:* **KAHO'OLAWE:** 1, Hakioawa Gulch, on rocks, 200 ft [60 m], 23 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030923-2.

*Ochetellus glaber* (Mayr)

New island record

Previously known from Kaua‘i, O‘ahu, Maui, and Hawai‘i (Nishida, 2002).

*Material examined:* **KAHO'OLAWE:** 11, Keanakeiki Beach, crawling on *kaue* (*Prospis pallida*) branch, 10 ft [3 m], 07 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031007-6. 14, Kaukaukapapa Beach, crawling on *kaue* (*Prospis pallida*) trunk, 10 ft [3 m], 15 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031015-6. 3, Moaulanui, general, 1300 ft [396 m], 16 Oct 2003, Starr, Starr, & Mar 031016-5.

*Paratrechina longicornis* (Latreille)

New island record

Previously known from Midway, French Frigate Shoals, Nihoa, and all the main islands except Ni‘ihau and Kaho‘olawe (Nishida, 2002).


*Pheidole megacephala* (Fabricius)

New island record

Previously known from Midway, Pearl & Hermes, Laysan, and all the main islands except Kaho‘olawe (Nishida, 2002).

*Material examined:* **KAHO'OLAWE:** 13, Pu‘u Moa‘ulaiki, on ground, 1200 ft [365 m], 22 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030922-11.

*Pseudomyrmex gracilis* (Fabricius)

New island record

Previously known from O‘ahu (Nishida, 2002).

*Material examined:* **KAHO'OLAWE:** 1, Hakioawa Gulch, on gulch wall, 200 ft [60 m], 23 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030923-3.

*Solenopsis geminata* (Fabricius)

New island record

Previously known from Midway, Kaua‘i, O‘ahu, Moloka‘i, Lāna‘i, Maui, and Hawai‘i (Nishida, 2002).

*Material examined:* **KAHO'OLAWE:** 10, Honokanaia, base camp, on ground behind KIRC hut, 25 ft [8 m], 22 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030922-5. 4, Hakioawa Gulch, 100 ft [30 m], 23 Sep 2003, Starr, Starr, LeGrande, Abbott, & Busby 030923-5. 37, Kaukaukapapa Beach, forming trails on ground, 10 ft [3 m], 07 Oct 2003, Starr, Starr, King, Tokishi, & Busby 031007-4.
**Technomyrmex albipes** (F. Smith)  
**New island record**  
Previously known from Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i (Nishida, 2002).

*Material examined:* **KAHO‘OLAWE:** 4, Hakioawa Gulch, eating dead cockroach (*Periplaneta* sp.), 200 ft [60 m], 23 Sep 2003, **Starr, Starr, LeGrande, Abbott, & Busby 030923-6.** 1, Honokanaia, galley, 10 ft [3 m], 14 Oct 2003, **Starr & Starr 031014-1.** 2, Kaukaukapapa Beach, collected on ground near wetland, 10 ft [3 m], 15 Oct 2003, **Starr, Starr, King, Tokishi, & Busby 031015-8.**

**Tetramorium simillimum** (F. Smith)  
**New island record**  

*Material examined:* **KAHO‘OLAWE:** 9, Honokanaia, base camp, at UV light, 10 ft [3 m], 14 Oct 2003, **Starr & Starr 031014-2.**

**Lepidoptera: Lycaenidae**

**Brephidium exilis** (Boisduval)  
**New island record**  
Previously documented from Kaua‘i, and O‘ahu (Nishida, 2002) and commonly observed on Maui.

*Material examined:* **KAHO‘OLAWE:** 1, Kaukaukapapa Beach, flying above saltbush (*Atriplex semibacatta*) foliage next to wetland, 10 ft [3 m], 15 Oct 2003, **Starr, Starr, King, Tokishi, & Busby 031015-2.**

**Odonata: Aeshnidae**

**Anax junius** (Drury)  
**New island record**  
Previously known from all the main islands except Ni‘ihau and Kaho‘olawe (Nishida, 2002).

*Material examined:* **KAHO‘OLAWE:** 1, Keanakeiki Beach, resting on *kiawe* (*Prosopis pallida*) foliage behind sand dune, 10 ft [3 m], 07 Oct 2003, **Starr, Starr, King, Tokishi, & Busby 031007-2.**

**Odonata: Libellulidae**

**Pantala flavescens** (Fabricius)  
**New island record**  
Previously known from Kure, Midway, French Frigate Shoals, and all the main islands except Kaho‘olawe (Nishida, 2002).

*Material examined:* **KAHO‘OLAWE:** 1, Kaukaukapapa Beach, flying near wetland at north end of beach, 10 ft [3 m], 07 Oct 2003, **Starr, Starr, King, Tokishi, & Busby 031007-1.**

**Scorpiones: Buthidae**

**Isometrus maculatus** (DeGeer)  
**New island record**  
Previously known from Midway, Kaua‘i, O‘ahu, Maui, and Hawai‘i (Nishida, 2002).

*Material examined:* **KAHO‘OLAWE:** 1, Moaulanui, crawling on ground, 1300 ft [396 m], 16 Oct 2003, **Starr, Starr, & Mar 031016-1.**

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First report of the Asian sea anemone *Diadumene lineata* from the Hawaiian Islands

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**Anthozoa: Actiniaria Diadumenidae**

*Diadumene lineata* (Verrill)  
**New state record**

The intertidal sea anemone *Diadumene lineata* [= *Haliplanella luciae* (Verrill, 1898)] may be one of the most widely distributed asexually reproducing marine species (Minasian, 1982). Its generic junior synonym, *Haliplanella* (“sea wandering”) is an apt reference to its cosmopolitan distribution. A native of Japan, *D. lineata* has spread throughout temperate and tropical regions of the world, including Indonesia, New Zealand, the Pacific, Atlantic, and Gulf coasts of North America, Brazil, and Europe, where it has been recorded from various locations from the North Sea to the Mediterranean (da Costa-Belem & da Cruz Monteiro, 1977; Schick & Lamb, 1977; Dunn, 1982; Kuhne & Rachor, 1996). Surprisingly, given its far flung wanderings, *D. lineata* has not been previously reported from the Hawaiian Islands.

A common member of the fouling community (on pilings, floats, and boat hulls) in many locations, *D. lineata* is also frequently found on both Atlantic and Japanese oysters (*Crassostrea virginica* and *C. gigas*, respectively). Thus ship hull-fouling and the movement of oysters have been thought to be the most likely modes of introduction of *D. lineata* (Verrill, 1898; Stephenson, 1935; Gollasch & Riemann-Zurneck, 1996) around the world.

*Diadumene lineata* was first found by CJZ and JTC in the Hawaiian Islands in Kāne‘ohi Bay, O‘ahu, in February 1999. About 20 individuals, 4 to 6 mm in diameter, were observed living on and among Japanese oysters fouling the remnant pilings of an old former dock, near the low tide mark behind the Kokokahi Young Women’s Christian Association (YWCA) building on Kāne‘ohi Bay Drive, on the southern shore of the Bay. No anemones were found in Kāne‘ohi Bay during subsequent searches, but the YWCA population was still thriving 4 years later, being present in March 2003, in about the same numbers.
In November 2000, about 100 individuals of *D. lineata* were found by LSG on a derelict commercial trawl net in the lagoon at Pearl and Hermes Reef, Northwestern Hawaiian Islands (NWHI). These anemones ranged from 3 to 10 mm in diameter, with a mean of about 7 mm. Where the net was when the anemones settled on it is unknown. There are no commercial fishing operations in Hawai‘i that use trawl gear. Tons of floating debris (derelict fishing gear, plastics, etc.) wash into the NWHI each year from the north and central Pacific due to the current and wind factors in this region (Kubota, 1994). The net could have come from anywhere from Japan to the Pacific Northwest, where commercial trawl fisheries do exist. It is not known whether *D. lineata* is capable of surviving a transoceanic journey. It is possible the net arrived in the Hawaiian Archipelago from afar and had been drifting in the islands for some time. Under this scenario, anemones could have been picked up in elsewhere in the island chain; current patterns are variable enough that the net could have traveled from islands to the southeast or the northwest. It is also possible that *D. lineata* colonized the net after it arrived at Pearl and Hermes Reef, though no other individuals of *D. lineata* were discovered during numerous surveys of the lagoon.

In December 2002, 8 individuals were found on 2 fouling panels (which had been placed in the water in July 2001 and monitored semi-monthly by CJZ) near the low tide mark on the Lilipuna Pier at the Hawaii Institute of Marine Biology at Coconut Island, Kāne‘ohe Bay. This location is approximately 2.5 km northeast of the YWCA population in Kāne‘ohe Bay. The anemones were living inside and around empty tests of the introduced barnacle *Balanus reticulatus*. By January 2003, the anemones on these same panels had increased in number to 14. The individuals on the panel were tiny, approximately 2–4 mm in diameter. In April 2003, some 40 individuals were found under the pier on a piece of coral rock just above the zero tide mark. These ranged in size from 2 to 10 mm in diameter.

All specimens of *D. lineata* seen in the Hawaiian archipelago at the above three locations were translucent olive green to brown, with single pale orange stripes and gray tentacles.

The success of *D. lineata* in spreading around the globe can be attributed to several factors: its tolerance of a wide range of environmental conditions (including its ability to encyst), its capability of reproducing asexually, and its relative mobility. As delicate as they appear to be, individuals of *D. lineata* can survive periods of encasement in ice, exposure to air during hot summer days, sand scour and temporary burial, and wide fluctuations of water temperature and salinity (Verrill, 1898; Shick, 1991; Gollasch & Riemann-Zurneck, 1996). In the laboratory, *D. lineata* has been observed to form a hard cyst, apparently in response to starvation and hypersaline water conditions, and to then excyst when supplied with food and fresh seawater (Carlton, 1979). The ability to encyst offers the advantage of surviving environmental stress, and may thus aid in the survival of the anemones during transport from one location to another.

Although *D. lineata* reproduces sexually in its native range in southern Japan (Fukui, 1991), populations that have been studied elsewhere have invariably tended to be unisexual or composed of sterile individuals (Minasian, 1982; Dunn, 1982; Shick, 1991; Riemann-Zurneck, 1998; Ting & Geller, 2000). Rapid asexual reproduction via binary fission or pedal laceration has been observed in the laboratory and the field (Shick, 1991). The rate of binary fission appears to be linked, at least in part, to water temperature, with
individuals in warmer water tending to be smaller as a result (Minasian, 1982). The ability to reproduce asexually offers an obvious advantage to an invading species, and is one of the features that, for example, introduced nuisance algae in Hawai‘i have in common.

In addition to being able to be spread on boat hulls and with oysters, perhaps in encysted as well as in free-living form, individuals of *D. lineata* are relatively mobile as adults and have been observed to detach from aquaria and float on the surface of the water (Davenport, 1903; Hausmann, 1919; Riemann-Zurneck, 1998). In the field, the anemones have been reported floating on detached pieces of eelgrass (Robertson, 1962) and algae (Carlton, 1979). This attribute could facilitate the spread of *D. lineata* within Kāne‘ohe Bay (as is perhaps already being observed), around O‘ahu, or between nearby islands. The discovery of *D. lineata* on what appeared to be a relatively newly arrived trawl net in the Northwestern Hawaiian Islands suggests that rafting on floating pieces of debris may be another way *D. lineata* can spread, although for what maximum distances is unknown.

When and how *D. lineata* arrived in Hawai‘i are not yet known. This sea anemone may have been present on O‘ahu, or elsewhere on the Hawaiian Islands, for several years or several decades without being recognized. As an example, the Caribbean barnacle *Chthamalus proteus* was not recorded in Hawai‘i until 1995 (J. Hoover, pers. comm.) although it may have arrived (and been overlooked) any time over the previous 20 years since the last previous thorough barnacle survey was conducted in Hawai‘i in 1973 (Southward et al., 1998). The last shallow-water and intertidal sea anemone survey of O‘ahu appears to have been conducted no later than the mid-1970s by Charles Cutress (Cutress, 1977), an experienced sea anemone field naturalist and systematist. It is thus possible that *D. lineata* arrived sometime between about 1975 and 1999.

If individuals of *D. lineata* in Hawai‘i remain small, they may be much more widely spread than noted here. The individuals on the fouling panels were noticed only because the panels were being viewed under a microscope. Tiny anemones are nearly impossible to see in the field, especially when contracted at low tide.

*Diadumene lineata* may have arrived with imported commercial oysters, on hull fouling of commercial ships or visiting recreational vessels or by some other means. Relatively recent arrivals of non-native invertebrates in Hawai‘i with commercial oysters have been reported. Bailey-Brock (1990) reported the eastern North Pacific spionid polychaete worm *Polydora nuchalis* Woodwick from an Atlantic oyster (*Crassostrea virginica*) farm on O‘ahu in 1988. Bailey-Brock (2000) found the spionid polychaete worm *Boccardia proboscidea* Hartman in newly imported Atlantic oysters from the state of Maine, in March 1990 at an oyster culture facility in Keahole, Hawai‘i (Bailey-Brock, 2000). Numerous commercial vessels and private yachts visit the Hawaiian Islands annually, and these also appear to have led to several recent successful invasions (Coles et al., 1999).

Genetic analysis of the Hawaiian population may aid in determining a possible source, and thus aid in refining the potential vector (for example, the Hawaiian populations may be genetically similar to *D. lineata* populations in regions from which oysters are not imported).

Given their ability to reproduce asexually and survive a wide range of environmental conditions, the prognosis for continued survival and spread in Hawai‘i seems good. There are a number of other fouling anemones, such as the highly abundant *Aiptasia pulchella*, and intertidal zooanthids (*Protopalythoa* spp.) in Hawai‘i that might be expected
to compete with *D. lineata* at lower tidal heights, but *D. lineata* appears to be able to survive higher in the intertidal than these species (pers. observ.). It is also possible that *D. lineata* could spread to intertidal areas in Kāne‘ohe Bay, where it might be expected to compete for attachment space with the native anemone *Anthopleura nigrescens*. Whether any of the common fouling or intertidal nudibranchs or other predatory gastropods known to prey on other anemones in Hawai‘i might prey upon *D. lineata*, and thus serve as a check on its spread, is unknown at this point.

*Diadumene lineata* becomes the third introduced species of sea anemone in the Hawaiian Islands. The other two species are also in the genus *Diadumene*. The western Atlantic Ocean anemone *Diadumene leucolena* (Verrill) is established on O‘ahu (Cutress, 1977). *Diadumene franciscana* Hand, of unknown origin, but previously known from California, was discovered in the Ala Wai Canal, Wakīkī, Honolulu, O‘ahu in 1999 (Coles et al., 1999), and may also in Kāne‘ohe Bay (personal observations, May 2001).


**Acknowledgements**

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**Literature Cited**


New helminth records for the green anole, *Anolis carolinensis* (Polychrotidae), stump-toed gecko, *Gehyra mutilata* (Gekkonidae), and the metallic skink, *Lampropholis delicata* (Scincidae), from Hawai‘i

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The green anole was first observed in the Kaimuki district of Honolulu, O‘ahu in 1950 where it is believed to have become established after release of pets bought in local pet shops (Shaw & Breese, 1951; Oliver & Shaw, 1953; Hunsaker & Breese, 1967). It was
described from specimens collected at Charleston, South Carolina and in the mainland United States ranges from North Carolina to Key West, Florida, west to southeast Oklahoma and central Texas (Conant & Collins, 1998). The stump-toed gecko, Gehyra mutilata was described from specimens collected in Manila, Philippines and is found on large buildings, lumber piles, under rocks and under the bark of large shade trees on the main Hawaiian islands (McKeown, 1996). The metallic skink, Lampropholis delicata was described from specimens collected in southeastern Queensland, Australia and is thought to have arrived in the Hawaiian islands around 1900 where it is the most common skink (Oliver & Shaw, 1953).

Between May 1999 and June 2000, 48 A. carolinensis were collected on O‘ahu (n = 34, Mean Snout-vent length, SVL = 64 mm ± 8.6 SD, range = 34–72 mm) and Kaua‘i (n = 14, SVL = 58 mm ± 7.7 SD, range = 50–71 mm); 23 G. mutilata on Hawai‘i (n = 2, SVL = 46 mm ± 6.4 SD, range = 41–50 mm) and Maui (n = 21, SVL = 45 mm ± 7.1 SD, range = 42–48 mm), and 26 L. delicata (SVL = 39 mm ± 6.8 SD, range = 20–46 mm) on Kaua‘i. The gastrointestinal tract and lungs were removed and searched for helminths. Trematodes were regressively stained with Delafield’s hematoxylin and mounted in Canada balsam for study. Nematodes and pentastomes were placed in glycerol on glass slides, allowed to clear and examined under a light microscope. Lizards were deposited in the herpetology collections of the Bishop Museum, Honolulu (BPBM) and the University of Michigan, Ann Arbor (UMMZ): A. carolinensis BPBM 14780-14793; UMMZ 226739-226746, 226748-226751, 226753-226774; G. mutilata UMMZ 225328-225350; L. delicata UMMZ 225293-225318. Voucher helminths were placed in vials of alcohol and deposited in the Bishop Museum, Honolulu (BPBM).

Trematoda: Brachycoeliidae

Mesocoelium monas (Rudolphi)  New host and island record

Mesocoelium monas is a widespread parasite in the intestines of amphibians, mainly anurans, and reptiles in tropical and subtropical regions (Prudhoe & Bray, 1982). It was first reported in Hawai‘i in Bufo marinus by Yuen (1965). It also occurs in Anolis sagrei on O‘ahu (Goldberg & Bursey, 2000a). Gehyra mutilata represents a new host record; Maui a new location record. Infection site: small intestine; G. mutilata Maui UMMZ 225344; Prevalence (number infected hosts/number hosts examined): 1/23 (4%); mean intensity (mean number parasites per infected host): 3.0.

Material examined: MAUI (BPBM F220).

Nematoda: Physalopteridae

Physaloptoidea arnoensis Bursey & Goldberg  New host and island record

Physaloptoidea arnoensis was described by Bursey & Goldberg (2001) from the mourning gecko, Lepidodactylus lugubris from the Republic of the Marshall Islands, Oceania. Physaloptoidea arnoensis has also been reported in Lepidodactylus moestus and Lepidodactylus paurolepis from the Marshall Islands, L. lugubris from the Society and Tuamotu Islands (Goldberg & Bursey, 2002). Anolis carolinensis represents a new host record and is the first nongekkonid lizard to harbor P. arnoensis. O‘ahu is a new location record. Infection site: stomach; A. carolinensis O‘ahu UMMZ 226746, 226771; Prevalence: 2/34 (1%); mean intensity: 7.0 ± 8.5, range (lowest to highest number of parasites present): 1–13.

Material examined: O‘AHU (BPBM H82).
Nematoda: Seuratidae

Skrjabinelazia machidai Hasegawa

*Skrjabinelazia machidai* was described from *Gekko japonicus* on Okinawa Island, Japan by Hasegawa (1984). It has been reported from *Hemidactylus frenatus* and *L. lugubris* from O‘ahu by Hanley *et al.* (1998) and Guam by Goldberg *et al.* (1998), *Lepidodactylus aureolineatus* from the Philippine Islands by Goldberg & Bursey (2001), *L. moestus* from Belau, *Hemidactylus garnotii* from Fiji and *G. mutilata* from Fiji and Western Samoa (Goldberg & Bursey, 2002). Maui is a new location record. Infection site: small intestine; *G. mutilata* Maui UMMZ 225336, 225341, 225348-225350; Prevalence: 5/23 (22%), mean intensity 1.2 ± 0.45, range: 1–2.

Material examined: MAUI (BPBM H83).

Nematoda: Pharyngodonidae

Spauligodon hemidactylus Bursey & Goldberg

*Spauligodon hemidactylus* was described from *Hemidactylus frenatus* from Oceania (Fiji, Guam, Hawaii, Marshall Islands, Palau, Philippines, Samoa, Solomon Islands, Society Islands, Thailand, Vanuatu) by Bursey & Goldberg (1996). It has been found in *H. frenatus*, *Cosymbotus platyurus*, *H. garnotii*, *Hemiphyllodactylus typhus* from Thailand (Goldberg & Bursey, 2001) and *H. garnotii*, *L. lugubris* from Fiji (Goldberg & Bursey, 2002). *Gehyra mutilata* represents a new host record; Maui a new location record. Infection site: large intestine; *G. mutilata* Maui UMMZ 225334, 225342; Prevalence: 2/23 (9%), mean intensity 2.5 ± 0.71, range: 2–3.

Material examined: MAUI (BPBM H84).

Nematoda: Spirocercidae

*Physocephalus* sp.

Adults of *Physocephalus* occur in the stomachs of swine, horses, cattle, and rabbits; infected larvae have been recovered from dung beetles and are found in the tissues of amphibians, reptiles, birds and mammals which have ingested infected beetles (Anderson, 2000). *Physocephalus sexalatus* Molin has been reported from feral pigs in Hawai‘i (Alicata, 1964). Larvae of *Physocephalus* sp. in *H. frenatus* were first reported from O‘ahu by Hanley *et al.* (1998) and Kaua‘i by Goldberg and Bursey (2000b). Infection site: stomach, large intestine walls; *A. carolinensis* Kaua‘i BPBM 14781–14789, 14791, 14793. Prevalence 11/14 (79%), mean intensity 38.9 ± 55.4, range: 4–200, O‘ahu UMMZ 226739, 226742, 226754, 226765, 226770, 226771; Prevalence: 6/34 (18%), mean intensity: 5.2 ± 3.0, range: 2–9; *G. mutilata* Hawai‘i UMMZ 225328; Prevalence: 1/2 (50%), mean intensity 150; Maui UMMZ 225332–225350; Prevalence: 19/21 (90%), mean intensity 86.4 ± 115.7 SD, range: 1–476; *L. delicata* Kaua‘i UMMZ 225293, 225294, 225305, 225308, 225311, 225318; Prevalence: 6/26 (23%), mean intensity 6.3 ± 5.8, range: 2–16. *Anolis carolinensis*, *G. mutilata*, and *L. delicata* represent new host records for *Physocephalus* sp. Hawai‘i and Maui are new island records.

Material examined: *A. carolinensis* Kaua‘i (BPBM H85), O‘ahu (BPBM H86); *G. mutilata* Hawai‘i (BPBM H87), Maui (BPBM H88); *L. delicata* Kaua‘i (BPBM H89).

Pentastomida: Cephalobaenidae

Raillietiella frenatus Ali, Riley & Self

*Raillietiella frenatus* was originally described from the lungs of *H. frenatus* collected in
Malaysia by Ali et al. (1981) who reported it from the same host from the Philippine Islands, South Vietnam, Taiwan, and Thailand. Raillietiella frenatus was first reported from Hawai‘i (O‘ahu) by Hanley et al. (1998). Goldberg & Bursey (2000a) found it in A. sagrei from O‘ahu. Goldberg & Bursey (2000b) found it in H. frenatus from Hawai‘i and O‘ahu. Raillietiella frenatus in A. carolinensis is a new host record. Infection site: lungs; A. carolinensis O‘ahu UMMZ 226739, 226745, 226749, 226751, 226753, 226758–226760, 226762, 226764, 226766, 226767, 226771, 226772, 226774; Prevalence: 15/34 (41%), mean intensity 6.1 ± 8.8 SD, range: 1–35.

Material examined: O‘ahu (BPBM H90).

Acanthocephala: Echinorhynchidae

Acanthocephalus bufonis (Shipley, 1903) New host record
Acanthocephalus bufonis was first found in Hawai‘i (O‘ahu) in the introduced cane toad, Bufo marinus by Barton & Pichelin (1999). Acanthocephalus bufonis has an Oriental distribution where it is known from bufonids, ranids and the lacertid lizard, Takydromus sexlineatus (Kennedy, 1982). Anolis carolinensis represents a new host record. Infection site: small intestine; A. carolinensis O‘ahu UMMZ 226739; Prevalence: 1/34 (3%), mean intensity: 3.

Material examined: O‘ahu (BPBM H91).

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New records of alien reptiles and amphibians in Hawai‘i

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Recent introductions and range extensions of reptiles and amphibians in Hawai‘i have largely been through the pathway of pet animal release and include both animals imported legally and illegally (Kraus, 2002). The only exceptions to this 60-year trend appear to have been the establishments of Eleutherodactylus coqui and E. planirostris (Kraus et al.,
1999; Kraus & Campbell, 2002) and possibly Anolis sagrei (Kraus, 2002, 2003). We here-in report new additions and range extensions for the artificial Hawaiian herpetofauna that continue this trend. All specimens are deposited in the herpetological collection at the Bishop Museum.

Dendrobatidae

*Dendrobates auratus* (Girard) **New island record**

Previously reported only from O‘ahu (Oliver & Shaw, 1953; McKeown, 1996), this species was originally imported to that island in 1932 for presumptive biocontrol of insects. Given its attractive coloration, this species has commonly been kept as a pet on that island, and its spread to Maui is no doubt for that purpose. We have received reports of green and black frogs on Maui for a number of years from Wailuku, ‘Iao Valley, and along the Hāna Highway; this specimen confirms the validity of the species’ establishment on Maui.


Chamaeleonidae

*Chamaeleo calyptratus* Duméril & Dumérl **New state record**

This species is distinguished from the widely established *C. jacksonii* by its crest of white mid-ventral scales, its larger size, large head casque with lateral lappets, and lack of horns in adult males. It is a popular item in the international pet trade and is widely kept for that purpose on the mainland United States. In Hawai‘i, importation or possession of this species is illegal, and evidence indicates this species (along with several other lizard species popular in the pet trade) was smuggled into the state and intentionally released with the view of establishing wild populations.

This species is native to the southwestern portion of the Arabian peninsula. In its native range, *C. calyptratus* lives as high as 2000 m, occupies tropical and subtropical habitats receiving as much as 2000 mm of rain yearly and can occur at very high densities (Necas, 1999). It has been noted that chameleons pose a potential threat to native Hawaiian fauna, including birds, because of their large sizes, catholic diets, high population densities, and possession of novel feeding mechanisms (Loope *et al*., 2001). *Chamaeleo calyptratus* attains a significantly larger size than does the already widespread *C. jacksonii* and, therefore, poses a similar, if not greater, threat than does that species. Because of this, attempts are currently being made to exterminate this potential pest from its known range on Maui before it becomes irretrievably established. Fifty-nine specimens have been removed from a 1.5 ha area in ten nights of searching, hinting at the population densities the species is capable of attaining in Hawai‘i. The population size suggests that the species was probably released in either the late 1990s or early 2000s; we are inclined to favor the former estimate.


Emydidae

*Trachemys scripta* (Schoepff) **New island record**

Previously recorded in Hawai‘i only from O‘ahu (McKeown, 1996), this species is a ubiquitous pet trade item that has become established worldwide. Despite its well-document-
ed history of invasiveness, this species is still legally allowed for sale in Hawai’i, so its appearance on Maui can hardly be viewed with any surprise.


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