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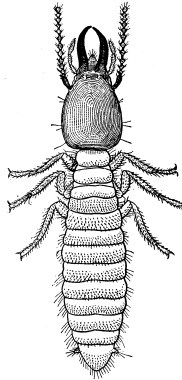
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# BISHOP MUSEUM OCCASIONAL PAPERS

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RECORDS OF THE  
HAWAII BIOLOGICAL SURVEY  
FOR 2003  
PART 2: NOTES

*NEAL L. EVENHUIS*  
AND  
*LUCIUS G. ELDREDGE, EDITORS*



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Cover illustration: soldier of *Coptotermes formosanus*, the subterranean termite (modified from Williams, F.X., 1931, *Handbook of the insects and other invertebrates of Hawaiian sugar cane fields*).

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### BISHOP MUSEUM

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1525 Bernice Street  
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**RECORDS OF THE  
HAWAII BIOLOGICAL SURVEY  
FOR 2003  
Part 2: Notes<sup>1</sup>**

This is the second of 2 parts to the *Records of the Hawaii Biological Survey for 2003* and contains the notes on Hawaiian species of plants and animals including new state and island records, range extensions, and other information. Larger, more comprehensive treatments are found in the first part of this *Records* [Bishop Museum Occasional Papers 78].

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**New records of freshwater macroalgae and diatoms from the Hawaiian Islands**

ALISON R. SHERWOOD (Department of Botany, 3190 Maile Way, University of Hawai'i at Mānoa, Honolulu, Hawai'i 96822 USA; email: asherwoo@hawaii.edu)

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.* **HAWAII:** 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) New state record**

Anagnostidis et Komárek

[syn. *Phormidium foveolarum* Mont. ex Gomont]

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.

*Material examined:* **O'AHU:** attached to rock in Hakipu'u Stream, 20 Feb 2002, A. Sherwood, *Sherwood 277* (BISH).

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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.

*Material examined:* **KAUAI:** attached to rock in Lower Hule'ia Stream, 14 Nov 2001, A. Sherwood, *Sherwood 313* (BISH).

***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.

*Material examined:* **O'AHU:** attached to rock in Kahana Stream, upper reaches, in Kahana Valley State Park, 8 Jan 2002, A. Sherwood, *Sherwood 279* (BISH).

***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.

*Material examined:* **HAWAI'I:** attached to rock in a stream on Hilo Hwy by Maulua Gulch, 11 Apr 2002, A. Sherwood, *Sherwood 280* (BISH).

***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).

*Material examined:* **KAUAI:** attached to rock in Lower Huleia Stream, 14 Nov 2001, A. Sherwood, *Sherwood 281* (BISH).

**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.

*Material examined:* **HAWAI'I:** attached to rocks in Punalulu Stream, Lapahoehoe Nui, 20 May 2001, A. Sherwood, *Sherwood 275* (BISH).

***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.

*Material examined:* **HAWAI'I:** attached to rock in a stream at Mamalahoa Hwy crossing bridge by dump, 11 Apr 2002, A. Sherwood, *Sherwood 325* (BISH).

**CHLOROPHYTA (green algae)****Cladophorales: Cladophoraceae*****Rhizoclonium crassipellium* 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.

*Material examined:* **O'AHU:** attached to rocks in Hakipu'u Stream, 19 Feb 2002, A. Sherwood, *Sherwood 291* (BISH).

**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.

*Material examined:* **HAWAII:** attached to rocks in Paopao Stream, Lapahoehoe Nui, 20 May 2001, A. Sherwood, *Sherwood 342* (BISH).

***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).

*Material examined:* **KAUAI:** attached to rocks in Makaleha Stream, 16 Nov 2001, A. Sherwood, *Sherwood 344* (BISH).

**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 North-western 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                      New state record**

[syn. *K. rivulare* (Kütz.) Morison et Sheath]

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:* **HAWAII:** 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.

*Material examined:* **NIHOA:** Miller Valley, 4 Sept 2002, A. Wegmann (USFWS), *Sherwood 363* (BISH). East Palm Valley, 5 Sep 2002, A. Wegmann (USFWS), *Sherwood 365* (BISH).

**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.

*Material examined:* **MAUI:** ditch at Pua'aka'a State Wayside, Hāna Hwy, 21 Nov 2001, A. Sherwood, *Sherwood 339* (BISH).

***Spirogyra dubia* Kütz.****New state record**

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

*Material examined:* MAUI: Kopiliula Falls, Hāna Hwy, 21 Nov 2001, A. Sherwood, *Sherwood 338* (BISH).

***Spirogyra elegantissima* Ling et Zheng****New state record**

This species of *Spirogyra* was previously known from China and Europe.

*Material examined:* O'AHU: waterfall at Waimea Falls Park, 19 Mar 2002, A. Sherwood, *Sherwood 340* (BISH).

***Spirogyra fallax* (Hansg.) Wille****New state record**

*Spirogyra fallax* appears to be a North American species. This is the first record of the species from the state of Hawai'i.

*Material examined:* HAWAI'I: Umauma Stream, 12 Apr 2002, A. Sherwood, *Sherwood 341* (BISH).

**CHROMOPHYTA (BACILLARIOPHYCEAE—diatoms)****Macroalgae Centrales*****Pleurosira laevis* (Ehrenb.) Compère****New state record**

[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.

*Material examined:* O'AHU: Waianu Stream above confluence with Uwau Stream, 25 Feb 2002, A. Sherwood, *Sherwood 369* (BISH).

**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****New state record**

This species was previously reported from Europe and Antarctica.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH). Kahana Stream upper reaches accessed through Waikāne ditch tunnel, 8 Jan 2002, A. Sherwood, *Sherwood 360* (BISH). Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH).

***Achnanthes lanceolata* subsp. *frequentissima*****New state record**

LangeBert.

This taxon was previously known from European freshwater habitats.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH).

***Achnanthes marginulata* Grunov****New state record**

This species was previously known from Europe, North America, and Antarctica.

*Material examined:* O'AHU: Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH).

*Achnanthes subatomoides* (Hust.) LangeBert. **New state record**  
et Archibald

This species was previously known from Europe, Asia, and Antarctica.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH). Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH).

*Achnantheidium biasolettianum* (Grunov) L.Bukht. **New state record**

This species was previously known from Europe, Japan, and North America,

*Material examined:* O'AHU: Kahana Stream upper reaches accessed through Waikāne ditch tunnel, 8 Jan 2002, A. Sherwood, *Sherwood 360* (BISH). Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH). Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH).

*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.

*Material examined:* O'AHU: Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH).

*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.

*Material examined:* O'AHU: Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH). Kahana Stream upper reaches accessed through Waikāne ditch tunnel, 8 Jan 2002, A. Sherwood, *Sherwood 360* (BISH). Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH). Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH).

*Eunotia curvata* var. *linearis* (Okuno) **New state record**

H.Kobay., Ando et Nagumo

This is a European taxon of *Eunotia* and represents the first record of the variety in the Hawaiian Islands.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH).

*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.

*Material examined:* O'AHU: Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH).

*Fragilaria capucina* var. *mesolepta* (Rabenh.) **New state record**

Rabenh.

This variety of *Fragilaria capucina* was previously known from Europe and North America.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH).

***Fragilaria fasciculata* (C.Agardh) LangeBert.      New state record**

This species of *Fragilaria* was previously known from Europe and Africa.

*Material examined:* O'AHU: Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH). Kahana Stream upper reaches accessed through Waikāne ditch tunnel, 8 Jan 2002, A. Sherwood, *Sherwood 360* (BISH). Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH). Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH).

***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.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH).

***Gomphonema vibrio* var. *intricatum* (Kütz.)      New state record**

R.Ross

This is a European variety of *Gomphonema vibrio*, and this represents the first record of the variety in the Hawaiian Islands.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH). Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH).

***Gyrosigma scalproides* (Rabenh.) Cleve      New state record**

This species of *Gyrosigma* was previously known from Europe and South America.

*Material examined:* O'AHU: Hakipu'u Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 359* (BISH).

***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.

*Material examined:* O'AHU: Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH).

***Navicula decussis* Østrup      New state record**

This species of *Navicula* was previously known from Europe, South America, and North America.

*Material examined:* O'AHU: Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH). Waikāne Stream upper reaches, 12 Sep 2002, A. Sherwood, *Sherwood 362* (BISH).

***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.

*Material examined:* O'AHU: Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH).

***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.



*Material examined:* O'AHU: Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH).

***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.

*Material examined:* O'AHU: Kahana Stream upper reaches accessed through Waikāne ditch tunnel, 8 Jan 2002, A. Sherwood, *Sherwood 360* (BISH).

***Navicula ventralis* Krasske**

**New state record**

This species of *Navicula* was previously known from Europe and North America.

*Material examined:* O'AHU: Kahana Stream upper reaches accessed through Waikāne ditch tunnel, 8 Jan 2002, A. Sherwood, *Sherwood 360* (BISH). Waiāhole Stream at Kamehameha Hwy, 8 Nov 2002, A. Sherwood, *Sherwood 361* (BISH).

**CHROMOPHYTA (TRIBOPHYCEAE)**

**Vaucheriales: 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.

*Material examined:* MAUI: Waihole Gulch at Hāna Hwy, 21 Nov 2001, A. Sherwood, *Sherwood 353* (BISH). O'AHU: ditch beside road following Uwau Stream, 25 Feb 2002, A. Sherwood, *Sherwood 354* (BISH).

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**Literature Cited**

- Guiry, M.D. & E. Nic Dhonncha.** 2003. *AlgaeBase*. [http://www.algaebase.org] [Version: Winter 2003] [Accessed: 1 July 2004].
- Johnson, L.R.** 2002. Phylum Xanthophyta (yellowgreen algae), p. 245–270. In: John, D.M., B.A. Whitton & A.J. Brook (eds.), *The freshwater algal flora of the British Isles: an identification guide to freshwater and terrestrial algae*. The Natural History Museum, London & Cambridge University Press, Cambridge.
- Lemmerman, E.** 1905. Die Algenflora der Sandwich-Inseln. Ergebnisse einer Reise nach dem Pacific. H. Schauinsland 1896/97. *Bot. Jahrb. Syst. Pflanzengesch. Pflanzengeogr.* **34**: 607–632.
- MacCaughy, V.** 1917. The phytogeography of Manoa Valley, Hawaiian Islands. *Am. J. Bot.* **4**: 561–603.

- . 1918. Algae of the Hawaiian Archipelago II. *Bot. Gaz.* **65**: 121–149.
- Nordstedt, C.F.O.** 1876. De Algae aquae dulcis et de Characeis ex insulis Sandvicensibus a Sv. Berggren 1875 reportatis. *Minneskr. Fysisk Sallsk. Lund* **7**: 1–24.
- Sheath, R.G. & K.M. Cole.** 1996. Stream macroalgae of the Fiji Islands: A preliminary study. *Pac. Sci.* **50**: 46–54.
- Sherwood, A.R.** 2002. Algal survey of four Windward O‘ahu streams. Final report to the Hawai‘i Division of Aquatic Resources, Department of Land and Natural Resources, Honolulu. 27 p.
- . 2004. Bibliographic checklist of the nonmarine algae of the Hawaiian islands. *Bishop Mus. Occas. Pap.* **80**: 23 p.

### 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 (flamingo 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

be found. *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

#### Range extension

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.

*Material examined:* MAUI: West Maui, Wailuku Distr, 'Iao Valley, SW of Pu'u Kukui, below Kaho'olewa Ridge, 1585 m, 5 Dec 2002, *Oppenheimer, S. Perlman, & E. Romanchak H120206* (BISH).

### Araceae

*Philodendron lacerum* (Jacq.) Schott

#### New naturalized record

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 Kīpahulu 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.

#### Range extension

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.

*Material examined:* MAUI: West Maui, Wailuku Distr, 'Iao Valley, 238 m, growing along weedy roadside near Kepaniwai Park, locally common, 30 Mar 2002, *Oppenheimer, F. Duvall, & L. Nelson H30218*.

### Begoniaceae

*Begonia hirtella* Link

#### Range extension

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 Distr, 'Iao Valley, 244 m, growing on wet roadcuts, 30 Mar 2002, *Oppenheimer, F. Duwall, & 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 Distr, UH Mānoa, 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.

*Material examined:* MAUI: West Maui, Lahaina Distr, Honokōhau, Pohakupule, 61 m, in gravelly soil, locally common, 5 Nov 2002, *Oppenheimer & R. Bartlett H110204*.

### 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 Distr, Ku'ia, 244 m, in unnamed gulch between Kanahā & Ka'ua'ula Valleys, mauka of Lahainaluna, west of Pa'upa'u, mixed with *O. ficus-indica* in alien vegetation, 2 Jan 2002, *Oppenheimer H10201*.

### Convolvulaceae

*Argyrea 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. *Argyrea* is a genus of about 90 species with *A. nervosa* native to India (*Whistler, 2000: 65*).

*Material examined:* MAUI: East Maui, Hāna Distr, Ha'o'u, 37 m, 11 Nov 2002, *Oppenheimer H110209*.

*Evolvulus alsinoides* (L.) L.

#### 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*. **HAWAII:** Ka‘u Distr, Manukā NAR, in *kīpuka* of 2000 year-old soil, rare in dry mesic forest (*olopuallamal‘ōhi‘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 rattlegod was recently collected on windward East Maui. Additionally, an unvouchered 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****New naturalized record**

& S.A. Harris

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 self-compatible, 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, Hāmākuapoko, 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, Waikapū 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:* **KAUAI:** Maha'ulepu, near Pao'ō 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.

*Material examined:* MAUI: West Maui, Wailuku Distr, 'Iao Valley, 244 m, sparingly naturalized near roadside, 30 Mar 2002, *Oppenheimer, F. Duvall, & L. Nelson H30220*.

### 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.

*Material examined:* MAUI: West Maui, Lahaina Distr, Kahana Iki Gulch, south side near reservoir, 488 m, 21 Aug 2002, *Oppenheimer & E. Romanchak H80210*.

#### *Leptospermum scoparium* J.R. Forst. & G. Forst.

#### New island record

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 Distr, 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. Agurauija H70206*.

#### *Lophostemon confertus* (R. Br.) Peter G. Wilson & Waterhouse

#### New island record

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.

*Material examined:* MAUI: East Maui, Makawao Distr, Kahakapao drainage basin, 732 m, 1 Jun 2003, *Oppenheimer, J.Q.C. Lau, & R. Agurauija H60302*.

### 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 Distr, 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.



*Material examined:* **MAUI:** East Maui, Makawao Distr, Hāmākuapoko, 98m, 4 May 2002, *Oppenheimer & F. Duvall H50206*; Hāna Distr, Ka'apahu Ridge above Kīpahulu, 360 ft (110 m) under alien canopy, plenty of seedlings, 6 May 2002, *P. Welton & B. Haus 2144* (BISH); same location, 30 May 2002, *P. Welton & R. Parry 2155* (BISH).

### **Poaceae**

*Axonopus compressus* (Sw.) Beauv.

#### **New island record**

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

*Material examined:* **O'AHU:** 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 O'ahu 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.

*Material examined:* **MAUI:** West Maui, Lahaina Distr, Mo'omoku, 311 m, on dirt road between pineapple fields, 20 Nov 2002, *Oppenheimer & E. Romanchak H110212*.

*Digitaria eriantha* Steud.

#### **New island record**

Although Herbst & Clayton (1998: 23) reported specimens from cultivated material on O'ahu and Maui in 1940 and 1939, respectively, they considered the first naturalized record of pangola grass to be from Hawai'i Island in 1942. Recently this species was documented as naturalized on Kaua'i (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 Pu'u Pi'iholo, 610 m, abundant in pasture, 8 Sep 2002, *Oppenheimer, F. Duvall, & P. Baldwin H90204*.

*Eragrostis tenuifolium* (A. Rich.) Steud.

#### **New island record**

Reported by Herbst & Clayton (1998: 28) as a new state record, specimens were cited from O'ahu and Hawai'i. 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, Ha'ikū, 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 Kaua'i (Staples *et al.*, 2003: 18). It also occurs on Maui, where it was collected along a dirt road in the Twin Falls area of Ha'ikū.

*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). 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.

*Material examined: MAUI:* West Maui, Lahaina Distr, Launiupoko, 427 m, locally common in 2nd gulch N of valley, in degraded *Erythrina* lowland forest, 3 Mar 2002, *Oppenheimer & J. Lau H30208*.

***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.

*Material examined: MAUI:* West Maui, Wailuku Distr, Waikapū Valley, 402 m, naturalized along dirt road near reservoir, 27 May 2002, *Oppenheimer, P. Bily, & F. Duvall H50222*.

**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).

*Material examined: MAUI:* East Maui, Hāna Distr, Kopili'ula, 384 m, near Hāna Hwy in standing water, 4 May 2002, *Oppenheimer & F. Duvall H50216*.

**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, Pūehuehunui, Luako'i Ridge, terrestrial, uncommon, on open ridgetop in dry shrubland, 793 m, 28 Dec 2002, *Oppenheimer H120209* (BISH); Pūehuehunui, south of Ka'ua'ula 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.).

*Material examined:* MAUI: East Maui, Makawao Distr, Māliko Gulch, leeward side of Pi'iholo, 549 m, 24 Nov 2002, *Oppenheimer, F. Duvall, & P. Baldwin H110214.*

### 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.

*Material examined:* LĀNA'I: Hulupo'e, on rock wall, 15 Apr 2001, *Oppenheimer H40125.*

### 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, Honokalā 152 m, 1 m tall herbs forming tangles in waste area, vicinity of Hāna Hwy, 14 Jul 2002, *Oppenheimer H70203*; Hāna Distr, Pa'akea, 378 m, roadside weed along Hāna 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.

*Material examined:* MAUI: West Maui, Wailuku Distr, Waikapū, 110 m, along drainage ditch, 30 Aug 2002, *Oppenheimer H80215.*

#### *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*; HAWAII: S Hilo Distr, small plants growing in gravelly roadside at edge of secondary, alien forest; cultivated nearby, 18 m, 2 Aug 2001, *Oppenheimer H80107*.

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## Literature Cited

- Bailey, L.H. & E.Z. Bailey. 1930. *Hortus second*. Macmillan Publishing Co., Inc. New York. 778 p.
- Evenhuis, N.L. & S. E. Miller, eds. 1995. Records of the Hawai'i Biological Survey for 1994. Parts 1 & 2. *Bishop Mus. Occas. Pap.* **41**, **42**.
- . 1996. Records of the Hawai'i Biological Survey for 1995. Parts 1 & 2. *Bishop Mus. Occas. Pap.* **45**, **46**.
- . 1997. Records of the Hawai'i Biological Survey for 1996. Parts 1 & 2. *Bishop Mus. Occas. Pap.* **48**, **49**.
- . 1998. Records of the Hawai'i Biological Survey for 1997. Part 1: Articles. *Bishop Mus. Occas. Pap.* **55**.
- . & L.G. Eldredge, eds. 1999. Records of the Hawai'i Biological Survey for 1998. Part 1: Articles. *Bishop Mus. Occas. Pap.* **58**.
- . 2000. Records of the Hawai'i Biological Survey for 1998. Part 1: Articles. *Bishop Mus. Occas. Pap.* **63**.
- . 2003. Records of the Hawai'i Biological Survey for 2001–2002. Part 2: Notes. *Bishop Mus. Occas. Pap.* **74**.
- Flynn, T. & D.H. Lorence. 2002. Additions to the flora of the Hawaiian Islands. *Bish. Mus. Occas. Pap.* **69**: 14–16.

- Herbarium Pacificum Staff.** 1999. New Hawaiian plant records for 1998. *Bishop Mus. Occas. Pap.* **58**: 3–11.
- Herbst, D.R. & W.D. Clayton.** 1998. Notes on the grasses of Hawai'i: new records, corrections, and name changes. *Bishop Mus. Occas. Pap.* **55**: 17–38.
- . & **W.L. Wagner.** 1999. Contributions to the flora of Hawai'i. VII. *Bishop Mus. Occas. Pap.* **58**: 12–36.
- Hillebrand, W.** 1888. *Flora of the Hawaiian Islands*. 1965 Hafner reprint, New York. 673 p.
- Hitchcock, A.S.** 1971. *Manual of the grasses of the United States*. Second edition revised by Agnes Chase. 2 vols. Dover Publications, New York. 1051 p.
- Hughes, C.** 1998. *Monograph of Leucaena (Leguminosae–Mimosoideae)*. *Syst. Bot. Monogr.* **55**, 244 p.
- Imada, C.T., G.W. Staples & D.R. Herbst.** 2000. New Hawaiian plant records for 1999. *Bishop Mus. Occas. Pap.* **63**: 9–16.
- Kepler, A.K.** 1995. *Maui's floral splendor*. Mutual Publishing, Honolulu. 144 p.
- Lorence, D. & T. Flynn.** 1999. New naturalized plant records for the Hawaiian Islands. *Bishop Mus. Occas. Pap.* **59**: 36.
- . & **W.L. Wagner.** 1995. Contributions to the flora of Hawai'i. III. New additions, range extensions, and rediscoveries of flowering plants. *Bishop Mus. Occas. Pap.* **41**: 19–58.
- Mabberley, D.J.** 1997. *The plantbook, a portable dictionary of the vascular plants*. Second edition. Cambridge University Press, Cambridge, UK. 858 p.
- Neal, M.** 1965. *In gardens of Hawaii*. New and revised edition. Bishop Museum Press, Honolulu. 924 p.
- Oppenheimer, H.L.** 2003. New plant records from Maui and Hawai'i counties. *Bishop Mus. Occas. Pap.* **73**: 3–30.
- . & **R.T. Bartlett.** 2000. New plant records from Maui, O'ahu, and Hawai'i islands. *Bishop Mus. Occas. Pap.* **64**: 110.
- Palmer, D.D.** 2003. *Hawai'i's ferns and fern allies*. University of Hawai'i Press, Honolulu. 324 p.
- Shannon, R. & W.L. Wagner.** 1996. New records of Hawaiian flowering plants primarily from the United States National Herbarium. *Bishop Mus. Occas. Pap.* **46**: 13–15.
- Skolmen, R.G.** ca. 1980. *Plantings on the forest reserves of Hawaii 1910–1960*. Institute of Pacific Islands Forestry, U.S. Forest Service, Honolulu. 441 p.
- Smith, A.C.** 1991. *Flora Vitiensis Nova*. Volume 5. National Tropical Botanical Garden, Lawai. 626 p.
- Staples, G.W., C.T. Imada & D.R. Herbst.** 2002. New Hawaiian plant records for 2000. *Bishop Mus. Occ. Pap.* **68**: 3–18.
- ., **C.T. Imada & D.R. Herbst.** 2003. New Hawaiian plant records for 2001. *Bishop Mus. Occ. Pap.* **74**: 7–21.
- ., **D.R. Herbst, & C.T. Imada.** 2000. Survey of invasive or potentially invasive cultivated plants in Hawai'i. *Bishop Mus. Occas. Pap.* **65**, 35 p.
- van Oostroom, S.J.** 1934. A monograph of the genus *Evolvulus*. *Medeed. Bot. Mus. Herb. Rijks. Univ., Utrecht* **14**: 1–267.
- Wagner, W.L.** 1999. Nomenclator and review of *Phyllostegia* (Lamiaceae). *Novon* **9**: 265–279.

- . & **D.R. Herbst**. 1995. Contributions to the flora of Hawai'i. VI. *Bishop Mus. Occas. Pap.* **42**: 13–27.
- . **D.R. Herbst** & **S.H. Sohmer**. 1999. *Manual of the flowering plants of Hawai'i*. Revised edition. 2 vols. University of Hawai'i Press & Bishop Museum Press, Honolulu. 1919 p.
- Whistler, W.A.** 2000. *Tropical ornamentals*. Timber Press, Portland. 542 p.
- Windler, D.R., & S.G. Skinner**. 1999. *Crotalaria*, p. 656–663. In: Wagner, W.L., D.R. Herbst, & S.H. Sohmer, *Manual of the flowering plants of Hawai'i*. University of Hawai'i Press & Bishop Museum Press, Honolulu.
- Wu Zhengyi & P.H. Raven**. 1998. *Flora of China*. Vol. 18. Scrophulariaceae through Gesneriaceae. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis.

## 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*: **KAUAI**: 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.

*Material examined:* **KAUAI:** Kapa'a, Burger King on Kūhiō Hwy near Kalaloku Rd, scattered in lawn, 25 ft [8 m], 25 Feb 2002, *Starr & Starr 020225-1*.

**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), *Podranea 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 near-by 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. zebrina* was 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.

*Material examined:* **MAUI:** East Maui, Makawao, climbing steep bank near town, 1600 ft [488 m], 23 Oct 2001, *Starr & Martz 011023-1*.

**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

#### Range extension

*Cuscuta campestris* was known to be sparingly naturalized on Oʻahu, Hawaiʻi, 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.

*Material examined:* MAUI: East Maui, Hāna Hwy., mile marker 7, near Pāpaʻaʻea reservoir, near roadside growing on *Sphagneticola trilobata*, 800 ft [243 m], 14 Aug 2002, *Starr & Starr 020814-1*.

### Euphorbiaceae

*Croton guatamalensis* Lotsy

#### New naturalized record

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

*Material examined:* MAUI: East Maui, Piʻiholo, 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

#### New state record

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 Haʻiku area of East Maui, where it is common in pastures and waste areas along Haʻikū 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 greenish with white margin; filaments 1.2–2 mm long, white, anthers 0.3–0.5 by 0/20.3 mm, light yellow; 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 stigmalike. Pistillate flowers c. 2 mm in diameter; pedicel 2–12 mm long; sepals 0.71 mm diameter, disc annular, thin entire, 0.71 mm diam; ovary c. 1 by 0.8 mm wide; 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, Haʻikū, in pasture near Haʻikū 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 cauline, 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, funnellform 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.

*Material examined:* **MAUI:** East Maui, Pi'iholo, growing on steep banks, 3100 ft [945 m], 26 Oct 2001, *Starr & Martz 011026-2*. **O'AHU:** Honolulu Distr, Wiliwilinui Trail, apparently established from discarded plant material dumped on this slope, now spreading, 26 Aug 2001, *Imada, Caraway, & Smith 2001-57*.

**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.

*Material examined:* **KAUA'I:** Hanalei, growing in disturbed forest with *Schefflera actinophylla*, *Ficus microcarpa*, and *Syzygium cumini*, 30 ft [9 m], 25 Feb 2002, *Starr & Starr 020225-6*.

### 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 roadsides 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-petaled 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.

*Material examined:* MAUI: East Maui, Wahinepe'e, a couple small patches growing in first clearing after bamboo forest at Waikamoi/Wahinepe'e gate on Hāna Hwy, 800 ft [243 m], 3 Aug 2002, *Starr & Starr 020803-3*.

### 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 enclosure, 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 scarid 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 Kauhāhāhā Hwy near Tartar Rd, 50 ft [15 m], 26 Feb 2002, *Starr & Starr 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 Kūiaha, 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, Kihei, 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.

*Material examined:* **KAUAI:** Waimea Distr, Mānā Plain, on the side of the road along Kaumuali‘i Hwy near Tartar Rd, 50 ft [15 m], 26 Feb 2002, Starr & Starr 020226-5.

***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.

*Material examined:* **MAUI:** East Maui, Polipoli, Waiakoa Loop Trail, growing at margin of disturbed forest comprised of *Eucalyptus* spp., *Pinus radiata*, and *Morella faya*, 6000 ft [1828 m], 8 Aug 2002, Starr & Starr 020808-9. West Maui, Hana‘ula Iki, 3500 ft [1066 m], May 1985, Hobdy 2389. Pu‘u Nianiau, Haleakalā, common in open pasture, 6000 ft [1828 m], 28 Jan 1937, Hosaka 1767. Makawao, Haleakalā, common in grassy slope among *Styphelia*, 5000 ft [1524 m], 12 Apr 1939, Hosaka 2427.

**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; Openheimer, 2003), *F. breyleyanais* 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.

*Material examined:* **MAUI:** East Maui, Kula, Calasa Rd., below fire station, common on margins of pastures, 2650 ft [807 m], 15 Aug 2002, *Starr & Starr 020815-5*. Kula, locally common and naturalized in pastures, 30 Jun 1927, *Degener 28138*. Kēōkea, Kula, rare, 27 Jan 1937, *Hosaka 1757*.

## 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 Kīhei. This collection represents a range extension to East Maui.

*Material examined:* **MAUI:** East Maui, Kīhei, Kama‘ole, Lioholo Pl., seedling under trees and nearby, spreading from plantings, 140 ft [42 m], 17 Jun 2002, *Starr & Starr 020617-2*.

## 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.

*Material examined:* **MAUI:** East Maui, ‘Ulupalakua, around 1700 ft [518 m], 12 Jun 2001, M. Steuermann, *Starr & Martz 010612-1*. **HAWAI‘I:** Ka‘ohe, Pōhakuloa State Park, 7 Jul 1977, *Herbst 5944*.

## 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 represent new island record for Kaua‘i.

*Material examined:* **KAUAI:** Kawaihau Distr, Anahola, locally established along Keālia Rd. near Kūhiō Hwy, 175 ft [53 m], 25 Feb 2002, *Starr & Starr 020225-2*.

## 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.

*Material examined:* **MAUI:** West Maui, Wailuku, crawling on fence and vegetation in empty lot, 275 ft [90 m], 22 Feb. 2001, *Starr & Martz 010222-2*.

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### Literature Cited

- Bailey, L.H. & E.Z. Bailey.** 1976. *Hortus*. Third edition. Macmillan General Reference, New York.
- Barker, C. & P.C. van Welzen.** 2003. Flora of Thailand. Biodiversity Research and Training Programme, Thai Research Fund and Thai National Center for Genetic Engineering and Biotechnology. [<http://www.nationaalherbarium.nl/thaieuph/>] [Version: 24 September 2003] [Accessed: 18 June 2004].
- Brickell, C. & J.D. Zuk.** 1997. *The American Horticultural Society A–Z encyclopedia of garden plants*. DK Publishing, Inc., New York.
- Brueggemann, M.M.** 1998. Report on a botanical survey of Midway Atoll, April 1–7, 1995. U.S. Fish & Wildlife Service, Honolulu.
- Flynn, T. & D.H. Lorence.** 2002. Additions to the flora of the Hawaiian Islands. *Bishop Mus. Occas. Pap.* **69**: 14–16.
- FLEPPC (Florida Exotic Pest Plant Council).** 1999. List of Florida's Most Invasive Species. [<http://www.fleppc.org/99list.htm>] [Version: 1999] [Accessed: 14 July 2004].
- GRIN (Germplasm Resources Information Network).** 2001. Online Database. United States Department of Agriculture, Agricultural Research Service, National Germplasm Resources Laboratory, Beltsville. [<http://www.ars-grin.gov/>] [Version: 11 October 2001] [Accessed: 29 June 2004].
- Hitchcock, A.S.** 1971. *Manual of the grasses of the United States*. Dover Publications, Inc., New York.
- Leps, J., V. Novotny, L. Cizek, K. Molem, I. Brus, W. Boen, R. Kutil, J. Auga, M. Kasbal, M. Manumber & S. Hiuk.** 2002. Successful invasion of the Neotropical species *Piper aduncum* in rain forests in Papua New Guinea. *Appl. Veg. Sci.* **5**: 255–262.
- Lorence, D.H. & T. Flynn.** 1997. New naturalized plant records for Kaua'i. *Bishop Mus. Occas. Pap.* **49**: 9–13.
- , **T. Flynn & W.L. Wagner.** 1995. Contributions to the flora of Hawai'i. III. New additions, range extensions, and rediscoveries of flowering plants. *Bishop Mus. Occas. Pap.* **41**: 19–58.
- Morton, J.F.** 1987. *Fruits of warm climates*. J.F. Morton, Miami. 505 p.
- Meidell, J.S., H.L. Oppenheimer & R.T. Bartlett.** 1997. New plant records from Pu'u Kukui Watershed and adjacent areas, Maui. *Bishop Mus. Occas. Pap.* **49**: 17–19.
- Nagata, K.M.** 1995. New Hawaiian plant records. IV. *Bishop Mus. Occas. Pap.* **42**: 10–13.
- Neal, M.C.** 1965. *In gardens of Hawaii*. Revised edition. Bishop Museum Special Publication 50. Bishop Museum Press, Honolulu.

- Oppenheimer, H.L.** 2003. New plant records from the main Hawaiian Islands. *Bishop Mus. Occas. Pap.* **73**: 3–30.
- . & **R.T. Bartlett.** 2000. New plant records from Maui, O‘ahu, and Hawai‘i Islands. *Bishop Mus. Occas. Pap.* **64**: 1–10.
- . & **R.T. Bartlett.** 2002. New plant records from the main Hawaiian Islands. *Bishop Mus. Occas. Pap.* **69**: 1–14.
- PIER (Pacific Islands Ecosystems at Risk).** 2004. Invasive plant species: *Buddleia madagascariensis*. [<http://www.hear.org/pier>] [Version: 27 February 2004] [Accessed: 18 June 2004].
- St. John, H.** 1973. *List and summary of the flowering plants in the Hawaiian Islands*. University of Hawaii Press, Lawai, Hawaii.
- Staples, G.W., Imada, C.T. & D.R. Herbst.** 2003. New Hawaiian plant records for 2001. *Bishop Mus. Occas. Pap.* **74**: 9–23.
- . 2002. New plant records for 2000. *Bishop Mus. Occas. Pap.* **68**: 3–18.
- Starr, F., K. Martz & L. Loope.** 1999. New plant records from East Maui for 1998. *Bishop Mus. Occas. Pap.* **59**: 11–15.
- ., **K. Martz & L. Loope.** 2002. New plant records for the Hawaiian Archipelago. *Bishop Mus. Occas. Pap.* **69**: 16–27.
- ., **K. Starr & L.L. Loope.** 2003. New plant records for the Hawaiian Archipelago. *Bishop Mus. Occas. Pap.* **74**: 25–34.
- Wagner, W.L. & D.R. Herbst.** 1995. Contributions to the flora of Hawai‘i. IV. *Bishop Mus. Occas. Pap.* **42**: 13–27.
- ., **D.R. Herbst & S.H. Sohmer.** 1990. *Manual of the flowering plants of Hawai‘i*. 2 vols. University of Hawai‘i Press & Bishop Museum Press, Honolulu.
- ., **D.R. Herbst & S.H. Sohmer.** 1999. *Manual of the flowering plants of Hawai‘i*. Revised edition. 2 vols. University of Hawai‘i Press & Bishop Museum Press, Honolulu.
- ., **R. Shannon & D.R. Herbst.** 1997. Contributions to the flora of Hawai‘i. VI. *Bishop Mus. Occas. Pap.* **48**: 51–65.
- Waterhouse, B.M. & A.A. Mitchell.** 1998. Northern Australia quarantine strategy weeds target list. Australian Quarantine & Inspection Service, Miscellaneous Publication No. 6/98. P. 59–60.
- Whistler, W.A.** 2000. *Tropical ornamentals*. Timber Press, Portland.

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

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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

Taxon	Status
Tipuloidea	
Family Limoniidae	
<i>Atypophthalmus</i> Brunetti, 1911	
<i>Atypophthalmus umbrata</i> (de Meijere, 1911)	adventive
<i>Dicranomyia</i> Stephens, 1829	
<i>Dicranomyia gloria</i> (Byers, 1994), <b>n. comb.</b>	endemic
<i>Dicranomyia grimshawi</i> Alexander, 1919	endemic
<i>Dicranomyia hardyana</i> (Byers, 1985), <b>n. comb.</b>	endemic
<i>Dicranomyia hawaiiensis</i> Grimshaw, 1901	endemic
<i>Dicranomyia iniquispina</i> (Hardy, 1953), <b>n. comb.</b>	endemic
<i>Dicranomyia jacobae</i> Alexander, 1919	endemic
<i>Dicranomyia kauaiensis</i> haleakalae (Alexander, 1951), <b>n. comb.</b>	endemic
<i>Dicranomyia kauaiensis</i> kauaiensis Grimshaw, 1901	endemic
<i>Dicranomyia kraussi</i> (Alexander, 1951), <b>n. comb.</b>	endemic
<i>Dicranomyia nigropolita</i> Alexander, 1923	endemic
<i>Dicranomyia sabroskyana</i> (Byers, 1982), <b>n. comb.</b>	endemic
<i>Dicranomyia stygipennis</i> Alexander, 1919	endemic
<i>Dicranomyia swezeyi</i> Alexander, 1919	endemic
<i>Dicranomyia variabilis bryani</i> Alexander, 1924	endemic
<i>Dicranomyia variabilis variabilis</i> Grimshaw, 1901	endemic
<i>Erioptera</i> Meigen, 1803	
<i>Erioptera bicornifer</i> Alexander, 1921	adventive
<i>Geranomyia</i> Haliday, 1833	
<i>Geranomyia advena</i> (Alexander, 1954), <b>n. comb.</b>	endemic
<i>Gonomyia</i> Meigen, 1818	
<i>Gonomyia hawaiiensis</i> Alexander, 1919	endemic
<i>Gonomyia molokaiensis</i> Hardy, 1953	endemic
<i>Libnotes</i> Westwood, 1876	
<i>Libnotes perkinsi</i> (Grimshaw, 1901)	adventive
<i>Styringomyia</i> Loew, 1845	
<i>Styringomyia didyma</i> Grimshaw, 1901	adventive
<i>Symplecta</i> Meigen, 1830	
<i>Symplecta pilipes</i> (Fabricius, 1787)	adventive
<i>Trentepohlia</i> Bigot, 1854	
<i>Trentepohlia australasiae</i> Skuse, 1889	adventive
Family Tipulidae	
<i>Nephrotoma</i> Meigen, 1803	
<i>Nephrotoma suturalis wulpiana</i> (Bergroth, 1888)	adventive
Family Ulidiidae	
<i>Acrosticta</i> Loew, 1868	
<i>Acrosticta apicalis</i> (Williston, 1896)	adventive
<i>Ceroxys</i> Macquart, 1835	
<i>Ceroxys latiusculus</i> (Loew, 1873)	adventive
<i>Euxesta</i> Loew, 1868	
<i>Euxesta annonae</i> (Fabricius, 1794)	adventive
<i>Euxesta stigmatias</i> Loew, 1868	adventive
<i>Euxesta wettsteini</i> Hendel, 1909	adventive
<i>Notogramma</i> Loew, 1868	
<i>Notogramma cimiciforme</i> Loew, 1868	adventive
<i>Physiphora</i> Fallén, 1810	
<i>Physiphora clausa</i> (Macquart, 1843)	adventive
<i>Physiphora demandata</i> (Fabricius, 1798)	adventive
<i>Pseudeuxesta</i> Hendel, 1910	
<i>Pseudeuxesta prima</i> (Osten Sacken, 1881)	adventive

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; S6os & 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

- Evenhuis, N.L.** 1994. *Catalogue of the fossil flies of the world (Insecta: Diptera)*. Backhuys Publishers, Leiden. 600 p.
- Hardy, D.E.** 1960. Diptera: Nematocera — Brachycera (except Dolichopodidae). *Insects of Hawaii* 10: ix + 368 p.
- Hennig, W.** 1940. Ulidiidae. *Flieg. Paläarkt. Reg.* 5(1): 1–34.
- Kameneva, E.P. & V.A. Korneyev.** 1994. Holarctic genus *Pseudoseioptera* Stackelberg (Diptera: Ulidiidae (= Otitidae)). Part 1. Phylogenetic relationships and taxonomic position. *J. Ukrain. Entomol. Soc.* 1[1993]: 65–72.
- Nishida, G.M.** 2002. Hawaiian terrestrial arthropod checklist. Fourth edition. *Bishop Mus. Tech. Rep.* 24: iv + 313 p.

- Oosterbroek, P.** 2000. Checklist of crane flies of the world (Tipuloidea: Pediciidae, Limoniidae, Cylindrotomidae and Tipulidae). Version 1.0. [[http://eti.sara.nl/project\\_info.jsp?project=322549](http://eti.sara.nl/project_info.jsp?project=322549)] [Accessed: 25 September 2003].
- . & **G.W. Courtney.** 1995. Phylogeny of the nematocerous families of Diptera (Insecta). *Zool. J. Linn. Soc.* **115**: 267–311.
- . & **B. Theowald.** 1992. Family Tipulidae, p. 56–178. In: Sóos, Á., L. Papp & P. Oosterbroek, eds., *Catalogue of Palaearctic Diptera*. Volume 1. Trichoceridae — Nymphomyiidae. Hungarian Natural History Museum, Budapest. 520 p.
- Savchenko, E.N., P. Oosterbroek & J. Stary.** 1992. Family Limoniidae, p. 183–369. In: Sóos, Á., L. Papp & P. Oosterbroek, eds. *Catalogue of Palaearctic Diptera*. Volume 1. Trichoceridae — Nymphomyiidae. Hungarian Natural History Museum, Budapest. 520 p.
- Sóos, Á. & P. Oosterbroek.** 1992. Family Cylindrotomidae, p. 179–182. In: Sóos, Á., L. Papp & P. Oosterbroek, eds., *Catalogue of Palaearctic Diptera*. Volume 1. Trichoceridae — Nymphomyiidae. Hungarian Natural History Museum, Budapest. 520 p.
- Theowald, B. & P. Oosterbroek.** 1991. Phylogeny of the Tipuloidea based on characters of larvae and pupae (Diptera, Nematocera): with an index to the literature except Tipulidae. *Tijdschr. Entomol.* **134**(2): 211–267.
- Thompson, F.C.** 2004a. Family names list by groups. [<http://www.sel.barc.usda.gov/diptera/NAMES/famlistt.htm>] [Version: 5 February 2004] [Accessed: 8 May 2004].
- . 2004b. The Biosystematic Database of World Diptera. Classification notes. [<http://www.sel.barc.usda.gov/diptera/NAMES/FamClass.htm>] [Version: 5 February 2004] [Accessed: 8 May 2004].

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

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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**

***Prosopeus* Murray, 1864: 330.**

*Nesopeplus* Sharp in Sharp & Scott, 1908: 474. **New Synonymy.**

*Nesopetinus* Sharp in Sharp & Scott, 1908: 492. **New Synonymy.**

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 posteriorad 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.

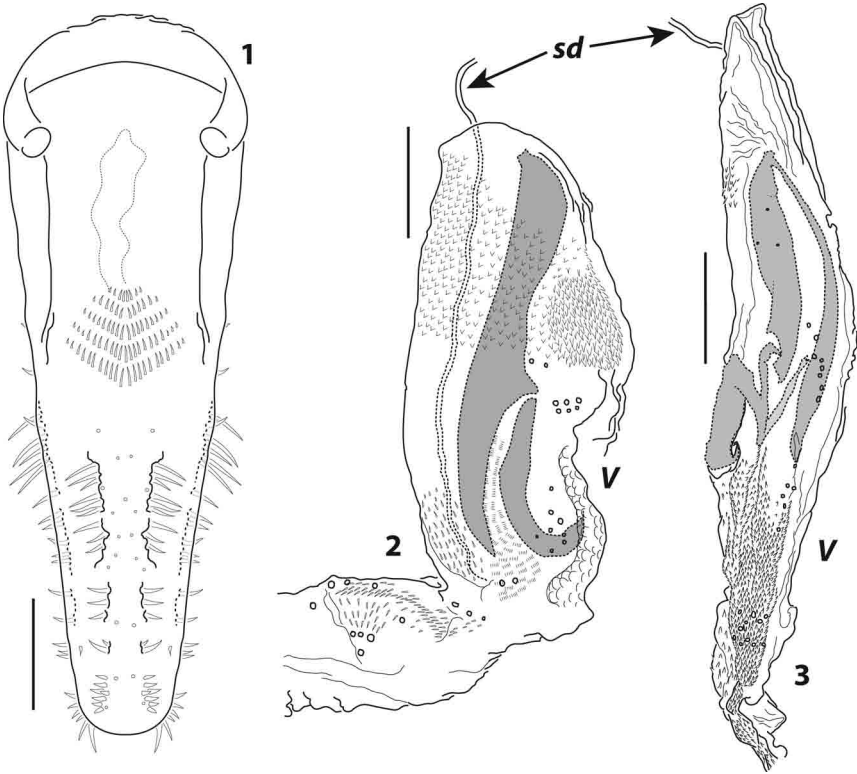
***Prosopeus subaeneus* Murray, 1864: 331**

### **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 Hualālai. 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 Hawaiiensis*, and Perkins's notes reflected this. Male genitalia were dissected in this study from type series specimens of *N. scottianus* from Kilauea, "above



**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.

Hilo”, and Kona, and from recently collected specimens from Kīpuka Pua‘ulu. The dissections of the Kīlauea, “above Hilo”, and Kīpuka Pua‘ulu specimens agreed with the holotype for *Prosopeus subaeneus* (BMNH) (see Figs. 1 and 2). The specimens from Kīlauea 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 Kīpuka Pua‘ulu or nearby.

*Material examined:* **HAWAII:** Holotype, *Prosopeus subaeneus* (BMNH). Coll #656 (= Kīlauea, Aug 1896, Perkins coll.) BPBMent 119382 (BPBM). Above Hilo, 1800 ft. [549 m], Perkins, XII 1895 (= coll. #558) coll #578 BPBMent 119383 (BPBM). HAVO, Mauna Loa Strip Rd, Kīpuka Pua‘ulu, 1235 m, *Ipomoea indica* flowers, M.-A. Lachance & W.T. Starmer, 155°18'36"N, 19°26'64"W (CUIC).

***Prosopeus scottianus* (Sharp)**

**New combination**

*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: male, length 3.4 mm, BPBMent 119381, Kona, 5000 ft [1524 m], Ka‘awaloa and Holoka‘alele gulches, R.C.L. Perkins coll., 30 Jun 1892, coll. #320.

I was not able to examine specimens from the type series from Hualālai. 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 Hualālai specimens represent this species. Dissection will be necessary to definitively establish the placement of the Hualālai 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:* **HAWAII:** [lectotype male], 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.

*Brachypeplus puncticeps* Sharp, 1878: 133 (synonymized by Sharp, 1881: 512).

*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.

*Nesopetinus vestitus*: Sharp in Sharp & Scott, 1908: 497.

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

*Brachypeplus parallelus* Blackburn in Blackburn & Sharp, 1885: 135.

*Nesopetinus parallelus*: Sharp in Sharp & Scott, 1908: 497.

***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.

*Nesopetinus celatus*: Sharp in Sharp & Scott, 1908: 498.

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

*Brachypeplus apertus* Sharp in Blackburn & Sharp, 1885: 135.

*Nesopetinus apertus*: Sharp in Sharp & Scott, 1908: 498.

***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.**

*Nesopetinus filipes* Sharp in Sharp & Scott, 1908: 501.

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

*Brachypeplus quadraticollis* Blackburn in Blackburn & Sharp, 1885: 135.

*Nesopetinus quadraticollis*: Sharp in Sharp & Scott, 1908: 501.

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

*Nesopetinus rudis* Sharp in Sharp & Scott, 1908: 502.

***Prosopeus perkinsi* (Scott), n. comb.**

*Nesopetinus perkinsi* Scott in Sharp & Scott, 1908: 502.

***Prosopeus intermedius* (Scott), n. comb.**

*Nesopetinus intermedius* Scott in Sharp & Scott, 1908: 503.

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

*Brachypeplus blackburni* Sharp, 1881: 516.

*Nesopetinus blackburni*: Sharp in Sharp & Scott, 1908: 503.

***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. *mauiensis* (Scott), n. comb., n. status**

*Nesopetinus blackburni* var. *mauiensis* 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.

*Brachypeplus affinis* Sharp, 1881: 509 (synonymized by Sharp in Sharp & Scott, 1908: 475).

*Nesopeplus inauratus*: Sharp in Sharp & Scott, 1908: 475.

***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.

*Nesopeplus olindae*: Sharp in Sharp & Scott, 1908: 477.

***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.

*Nesopeplus floricola*: Sharp in Sharp & Scott, 1908: 480.

***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

- Blackburn, T., & D. Sharp.** 1885. Memoirs on the Coleoptera of the Hawaiian Islands. *Trans. R. Dublin Soc.* (2) 3: 119–196.
- Lachance, M.-A., J.M. Bowles & W.T. Starmer.** 2003. Geography and niche occupancy as determinants of yeast biodiversity: the yeast-insect-morning glory ecosystem of Kipuka Puaulu, Hawaii. *FEMS Yeast Res.* 4: 105–111.
- Manning, A.** 1986. The Sandwich Islands Committee, Bishop Museum, and R.C.L. Perkins: cooperative zoological exploration and publication. *Bishop Mus. Occas. Pap.* 26: 1–46.
- Murray, A.** 1864. Monograph of the family Nitidulariae, Pt. I. *Trans. Linn. Soc. Lond.* 24: 211–414.
- Perkins, R.C.L.** 1892. Key to numbers and localities of Dr. Perkins' Hawaiian insects, First Expedition, 1892–94, Nos. 1–500. Made by Perkins in 1936. Box 1, Bishop Museum Archives. (Photocopy of original in The Natural History Museum, London).
- . 1895. Key to numbers and localities of Dr. Perkins' Hawaiian insects, Second Expedition, 1895–97, Nos. 501–705. Made by Perkins in 1936. Box 1, Bishop Museum Archives. ((Photocopy of original in The Natural History Museum, London).
- Sharp, D.** 1878. On some Nitidulidae from the Hawaiian Islands. *Trans. R. Entomol. Soc. Lond.* 26: 127–140.
- . 1879. On some Coleoptera from the Hawaiian Islands. *Trans. Entomol. Soc. Lond.* 27(1): 77–105.
- . 1881. On some new Coleoptera from the Hawaiian Islands. *Trans. Entomol. Soc. Lond.* 29(4): 507–534.
- . & **H. Scott.** 1908. Coleoptera III. *Fauna Hawaiiensis* 3(5): 435–508.

### 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 *Cybocephalus nipponicus* Endrödy-Younga, which is predatory. Species in the genus *Carpophilus* 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).

*Material examined:* **O'AHU:** Pawa'a, 25 Aug 1998, on hibiscus inflorescence with *Pinnaspis strachani*, M.E. Chun/98-276 (2 ♀, 1 ♂) (HDOA).

***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).

*Material examined:* **KAUA'I:** Mānā, May 1984, *ex* seed corn, S. Masukawa (2 ♀, 1 ♂) (HDOA). Kekaha, 8 Jul 1988, *ex* sunflower plants, R. Oyama, *koa*, 88-18 (1 ♂), 0-330 m, J.K. Liebherr, *ex* rotten *Passiflora* (15 ♀, 8 ♂) (CUIC). **O'AHU:** Barbers Pt, Apr 1968, E.J. Ford, Jr. (1 ♂) (BPBM). Barbers Pt, Apr 1952, Ford (1 ♂) (BPBM). Barbers Pt, Nov 1959, E.J. Ford, Jr. (1 ♂) (BPBM). Schofield, Apr 1960, E.J. Ford, Jr. (2 ♀) (BPBM). **MOLOKA'I:** Kaunakakai, 15 Jan 1990, field #2, on corn silk inside ear shoot, P. Eichhorn/90-030 (1 ♂) (HDOA).

***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 (*Freyinetia arborea* Gaudichaud-Beaupré).

*Material examined:* **O'AHU:** Ewa, 19 Dec 1973, in raisin trap, G.Y. Funasaki (1 ♀, 1 ♂) (HDOA). Nānākuli, 30 Aug 1968, in honeydew melon, G.Y. Funasaki (1 ♀, 1 ♂) (HDOA). Honolulu Airport, Jan 1953, Bixby, orig. Fiji (1 ♀) (BPBM). Barbers Pt, 10 May 1949, Ford (2 ♂) (BPBM). Schofield, Jun 1990, K. Will (1 ♂) (CUIC).

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

**New combination**

[*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.

*Material examined:* **KAUAI:** Perkins, 771 [under card] (1 ♀) (BPBM). **O'AHU:** Barbers Pt, 6-49, coll. Ford (1 ♀) (BPBM). same, 10 Apr 1949 (1 ♀), light trap, J. Rodgers, May 1958, E.J. Ford, Jr. (1 ♂) (BPBM). Waipi'o, T.H. light trap, Sep 1957, E.J. Ford, Jr. (1 ♂) (BPBM). 'Ewa, 19 Dec 1973, in raisin trap, G.Y. Funasaki (3 ♀) (HDOA).

***Epuraea (Haptoncus) ocularis* Fairmaire**

**Taxonomic change**

[*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.

*Material examined:* **O'AHU:** Poamoho tr., 9 Mar 1961, L.W. Quate (1 ♀) (BPBM). Pūpūkea tr., Mar 32, O. Bryant (1 ♀) (BPBM). Ko'olau Range, 'Āhuimanu Rd, 120 m, 2 Feb 1984, swarming, 0715–0745 hrs, G.A. Samuelson (1 ♀) (BPBM). Hālawā, 10 Dec 1970, light trap, W. Au (3 ♂) (HDOA). **HAWAI'I:** Waimanu Str, 8.v.1986, site no.1, nr. river mouth, jetsam on boulders, S.M. Gon & J. Heer Acc. #1987.051 (1 ♂) (BPBM). Upper Hāmākua Ditch tr., 15 Aug 1935, R.L. Usinger (1 ♂) (BPBM).

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

**New state record**

[*Lasiodyctylus nuatus* Reitter (*sensu* Kirejtshuk & Kvamme, 2002, after Jelínek, 1999)]

*Phenolia* species superficially resemble *Stelidota* and can be separated by the larger size, 5–8 mm, and elongate axillary space that nearly reaches the metacoxa. *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.

*Material examined:* **KAUAI:** Princeville, night at hotel light, 2 Aug 2000, via R.T. Furumizo (2 ♂) (BPBM). **O'AHU:** U.H. Mānoa campus, 200 ft [61 m], 26 Jun 1998, rotting tangerines on ground,

C. Ewing DNA vouch. #284 (1♂) (CUIC). U.H. Mānoa, 18 Jun 1998, *ex* rotting fruits, W. Nagmine (2♂) (HDOA). Waimānalo, 7 Jun 1998, *ex* ripe bananas, L. Nagasawa/98-144 (1♂) (HDOA).

***Phenolia (Lasiodytes) 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:* **O‘AHU:** UH Mānoa Campus, 200 ft [61 m], 26 Jun 1998, rotting tangerines on ground, C. Ewing coll., DNA vouch. #285 (1♀) (CUIC). Mānoa, UH, 8 Jun 1998, on mandarin oranges, W. Nagmine/L. Nagasawa/98-146 (1♀, 1♂) (HDOA). Mt. Tantalus (Mānoa Cliffs Trail), 1 Nov 2000, M.J. & C.A. Tauber (1♀, 1♂) (CUIC). **MAUI:** Kahului, 2000, MV light #2, *kiawe* woodland, *kiawe*, *Sesuvium*, *Paspalum*, *Pluchea*, F.G. Howarth, D.J. Preston, G.A. Samuelson, K. Martz, F. Starr (2♀) (BPBM). **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:* **KAUAI‘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, rotting 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 ‘*ōhi‘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). **MAUI:** Haleakalā National Park, Palikū cabin, el. 1950 m, 20°43'16"N, 156°08'38"W, 18 May 2001 lot03, diphacine bait sta., Liebherr (1♀) (CUIC). **HAWAI‘I:** Kohala Forest Reserve, 1122 m, 14 Oct 1997, fogging *M. polymorpha*, Polhemus GRU0724-006 (2♀) (BPBM), same, 12 Oct 1997, GRU0584-006 (BPBM).

***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 less 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, Kaimukī, 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

Dillingham Mem. Found., 92-357 (1 ♀) (BPBM). Same data (1 ♀) (HDOA). Kaimukī, 200 ft [61 m], BWS, 13 Dec 1992, W.D. Perreira stuck on apple maggot trap treated with TML (1 ♀) (BPBM).

***Aethina (Idaethina) concolor* (Macleay)      New island record**

[*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 O'ahu as *Macroura* sp. (Beardsley & Samuelson, 1992), and then Kaua'i (Nishida, 2002), now reported from Kailua-Kona and Kīpuka Pua'ulu on Hawai'i Island. 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 Hawai'i it has been collected in flowers of *Hibiscus* (Malvaceae), *Ipomoea indica* (Convolvulaceae) (Lachance *et al.*, 2003), and *Coccinia* (Cucurbitaceae).

*Material examined:* **KAUAI:** Kealoa lookout on *Ipomoea pes-caprae*, #366,7, A. Lachance (2 ♀) (BPBM). **O'AHU:** Schofield, Jun 90, K. Will (1 ♂) (CUIC). **MAUI:** Kahului, Div. Forestry baseyard, *Hibiscus breckenridgeii*, B. Hobby/91-220 (1 ♀, 1 ♂) (HDOA). **HAWAII:** Kona, 30 May 1992, *ex Coccinia* fls., L. Doi/S. Matayoshi 92-330 (2 ♂) (HDOA). Kona, 30 Jul 1992, *ex red hibiscus*, S. Matayoshi /92-476 (1 ♂) (HDOA).

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**Literature Cited**

- Beardsley, J.W., B.R. Kumashiro, W.D. Perreira & G.A. Samuelson.** 1995. [Notes and exhibitions:] *Stelidota* sp. (Coleoptera: Nitidulidae). *Proc. Hawaii. Entomol. Soc.* **32**: 7.
- . & **G.A. Samuelson.** 1992. [Notes and exhibitions:] *Macroura* sp. (Coleoptera: Nitidulidae). *Proc. Hawaii. Entomol. Soc.* **31**: 7–8.
- . & **D.M. Tsuda.** 1992. [Notes and exhibitions:] *Cybocephalus nipponicus* Endrödy-Younga (Coleoptera: Nitidulidae). *Proc. Hawaii. Entomol. Soc.* **31**: 10–11.
- Endrödy-Younga, S.** 1971. Neue Ergebnisse bei der Bearbeitung der paläarktischen und orientalischen *Cybocephaliden* (Coleoptera: Clavicornia). *Acta Zool. Hung.* **14**: 27–115.
- Ford, E.J.** 1960. [Notes and exhibitions:] *Haptoncus luteolus* Erichson. *Proc. Hawaii. Entomol. Soc.* **17**(2): 166.
- . 1961. [Notes and exhibitions:] *Carpophilus freemani* Dobson and *Carpophilus mutilatus* Erichson. *Proc. Hawaii. Entomol. Soc.* **17**(3): 321.
- Gough, N. & E.L. Hamacek.** 1989. Insect induced bud fall in cultivated hibiscus and aspects of the biology of *Macroura concolor* (Macleay) (Coleoptera: Nitidulidae). *J. Aust. Entomol. Soc.* **28**(4): 267–277.
- Grouvelle, A.** 1913. Byturidae, Nitidulidae: 1. Cateretinae, 2. Meligethinae, 3. *Carpophilinae*, 4. Nitidulinae, 5. Cryptarchinae, 6. *Cybocephalinae*. *Coleopterorum Catalogus*

15(56): 1–224.

- Hinton, H.E.** 1945. *A monograph of the beetles associated with stored products*. British Museum (Natural History), London.
- Illingworth, J.F.** 1929. Pests of pineapple in Hawai‘i. *Proc. Hawaii. Entomol. Soc.* **7**(2): 254–256.
- Jelínek, J.** 1999. Contribution to taxonomy of the beetle subfamily Nitidulinae (Coleoptera: Nitidulidae). *Fol. Heyrovskyana* **7**(5): 251–281.
- Kirejtshuk, A.G.** [1992]. Nitidulidae, p. 114–209. In: Ler, .A. [*Keys to the identification of the insects of the Soviet Far East. 3. Coleoptera, or beetles. Part 2.*] Nauka, St. Petersburg. [In Russian.]
- . & **J.F. Lawrence.** 1999. Notes on the *Aethina* complex (Coleoptera: Nitidulidae: Nitidulinae), with a review of *Aethina* (*Cleidorura*) subgen. nov. *Aethina* (*Idaethina*) Gemminger et Harold. *Ann. Zool.* **349**(3): 233–254.
- . & **T. Kvamme.** 2002. Revision of the subgenus *Lasiodites* Jelínek, 1999, stat. nov. of the genus *Phenolia* Erichson. 1843 from Africa and Madagascar (Coleoptera: Nitidulidae). *Mitt. Mus. Naturkd. Berlin Zool. Reihe* **78**(1): 3–70.
- Kumashiro, B.R. & R.H. Heu.** 1997. New records for Hawaiian insects. *Bishop Mus. Occas. Pap.* **49**: 19–20.
- Lachance, M.-A., J.M. Bowles & W.T. Starmer.** 2003. Geography and niche occupancy as determinants of yeast biodiversity: the yeast-insect-morning glory ecosystem of Kipuka Puulu, Hawaii. *FEMS Yeast Res.* **4**(1): 105–111.
- Murray, A.** 1864. Monograph of the family Nitidulariae, Pt. I. *Trans. Linn. Soc. Lond.* **24**: 211–414.
- Nishida, G.M.** 2002. Hawaiian terrestrial arthropod checklist. Fourth edition, *Bishop Mus. Tech. Rep.* **22**: iv + 310 p.
- Schmidt, C.T.** 1935. Biological studies on the nitidulid beetles found in pineapple fields (Nitidulidae: Coleoptera). *Ann. Entomol. Soc. Am.* **28**(4): 475–511, 10 figs.
- Sharp, D.** 1878. On some Nitidulidae from the Hawaiian Islands. *Trans. R. Entomol. Soc. Lond.* **26**: 127–140.
- . & **H. Scott.** 1908. Coleoptera III. *Fauna Hawaiiensis* **3**(5): 435–508.

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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. anastreptoides* Swezey, *O. asaphombra* Meyrick, *O. continuatalis* 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).



**Table 1: Species of Hawaiian *Omiodes* currently listed as extinct.**

Species	Agencies listing as extinct*	Rediscovered?
<i>anastrepta</i> Meyrick	HBS, USFWS.	Yes
<i>anastreptoides</i> Swezey	HBS.	Yes
<i>asaphombra</i> Meyrick	HBS, USFWS, IUCN, Gagné & Howarth.	Yes
<i>continuatalis</i> Wallengren	HBS, IUCN, Gagné & Howarth.	Yes
<i>epicentra</i> Meyrick	HBS, IUCN, Gagné & Howarth.	No
<i>eurypora</i> Meyrick	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>fullawayi</i> Swezey	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>giffardi</i> Swezey	HBS.	No
<i>iridias</i> Meyrick	HBS, USFWS.	No
<i>laysanensis</i> Meyrick	HBS, IUCN, Gagné & Howarth.	No
<i>meyricki</i> Swezey	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>monogona</i> Meyrick	HBS, USFWS.	Yes
<i>musicola</i> Swezey	HBS, USFWS, IUCN, Gagné & Howarth.	No
<i>telegrapha</i> Meyrick	HBS, IUCN, Gagné & Howarth.	No

\* HBS = Hawai'i Biological Survey (Evenhuis 2002), USFWS = U.S. Fish & Wildlife Service (Beattie 1994), IUCN = International Union for the Conservation of Nature (IUCN 2003), Gagné & Howarth (1982).

### *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).

*Material examined:* **HAWAII:** Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 10 Mar 1994, D. Foote *et al.*, 1 specimen, 1994-4275a (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at UV light, 8 Jun 1994, D. Foote *et al.*, 1 specimen, 1994-5156 (HVNP); Ka'u Distr, Hawaii'i Volcanoes National Park, Kīpuka Kī, at UV light, 1 Dec 1994, D. Foote *et al.* 1 specimen, 1994-5820 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 4 Jan 1994, D. Foote *et al.*, 1 specimen, 1994-5904 (HVNP); Ka'u Distr, Hawaii'i Volcanoes National Park, Keamoku lava flow, at white light, 10 Mar 1994, D. Foote *et al.*, 4 specimens, 1994-4276, 1994-4277, 1994-4278, 1994-4279 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Keamoku lava flow, at UV light, 13 Apr 1994, D. Foote *et al.*, 1 specimen, 1994-4627 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Keamoku lava flow, at white light, 2 Mar 1994, D. Foote *et al.*, 1 specimen, 1994-6031 (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Thurston Lava Tube, at white light, 10 May 1994, D. Foote *et al.*, 1 specimen, 1994-4887 (HVNP); South Hilo Distr, Hakalau National Wildlife Refuge, Maulua, 1300 m, 11 Feb 1999, D. LaPointe, 1 specimen, (HVNP); N. Kona, Hualālai, Keauhou 2, Pu'u Lehua, 14 Dec 2000, J. Giffin, 1 specimen, (JGPC).

### *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).

*Material examined:* **HAWAII:** S. Hilo Distr, Hilo Watershed, Pu'u O'o boundary, at light, 2 Jul 1999, J. Giffin, 1 specimen, (JGPC); S. Kohala Distr, Kohala Forest Reserve, at light, 4 Apr 1994, 30 Aug 1994, 29 Oct 1994, J. Giffin, 4 specimens, (JGPC); S. Hilo Distr, Hakalau National Wildlife Refuge, Maulua, 1300 m, 11 Feb 1999, P.L. Little, 1 specimen, (HVNP); S. Hilo Distr, Upper Waiākea Forest Reserve, at light, 8 Jul 1999, 30 May 2000, J. Giffin, 3 specimens, (JGPC).

### *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:* **HAWAII:** 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).

*Material examined:* **HAWAII:** S. Kona Distr, Honomalino Forest Reserve, at light, 24 Nov 2000, J. Giffin, 2 specimens (JGPC); Ka'u Distr, Hawaii Volcanoes National Park, Keamoku lava flow, at white light, 3 Oct 1994, D. Foote *et al.*, 1 specimen, *1994-5660* (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 10 Mar 1994, D. Foote *et al.*, 3 specimens *1994-4272*, *1994-4273*, *1994-4274a* (HVNP); N. Kona Distr, Pu'u Wa'awa'a, at light, 5 Apr 1994, J. Giffin, 1 specimen, (JGPC); N. Kona Distr, Pu'u Wa'awa'a, at light, 30 Jul 1994, J. Giffin, 1 specimen, (JGPC); N. Kona Distr, Pu'u Wa'awa'a, at light, 1 Nov 1994, J. Giffin, 1 specimen, (JGPC); N. Kona Distr, Pu'u Wa'awa'a, at light, 28 May 1995, J. Giffin, 1 specimen, (JGPC); S. Kona Distr, Pu'u honua o Honaunau, 1992, D. Foote *et al.*, 3 specimens, *PUHO 1992-424*, *PUHO 1992-425*, *PUHO 1992 449* (HVNP).

***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).

*Material examined:* **HAWAII:** S. Kona Distr, Honomalino Forest Reserve, 1050 m, at light, 23 Mar 1995, J. Giffin, 1 specimen, (JGPC); Ka'u Distr, Hawaii Volcanoes National Park, Kīpuka Kī, at white light, 10 Mar 1994, D. Foote *et al.*, 2 specimens 1994-4274b, 1994-4725b (HVNP); Puna Distr, Hawaii Volcanoes National Park, Ola'a Forest Agric. Unit, at white light, 3 May 1994, D. Foote *et al.*, 2 specimens, 1994-4810, 1994-4811, (HVNP); Ka'u Distr, Hawaii Volcanoes National Park, Kīlauea Field Station, at white light, 8 May 1994, D. Foote *et al.*, 2 specimens 1994-5021, 1994-5024 (HVNP).

**Literature Cited**

- Beattie, M.H.** 1994. Endangered and threatened wildlife and plants: animal candidate review for listing as endangered or threatened species. *Fed. Reg.* **59**(219): 58982–59028.
- Evenhuis, N.L.** 2002. *Hawai'i's extinct species – insects*. [<http://hbs.bishopmuseum.org/endangered/ext-insects.html>] [Version: 21 Mar 2002] [Accessed: 28 Jan 2004].
- Funasaki, G.Y., P. Lai, L.M. Nakahara, J.W. Beardsley & A.K. Ota.** 1988. A review of biological control introductions in Hawaii: 1890 to 1985. *Proceedings of the Hawaii. Entomol. Soc.* **28**: 105–160.
- Gagné, W.C.** 1982. *Working toward an assessment of the conservation status of Hawaii's endemic arthropods, with emphasis on the moths or Lepidoptera*. Proceedings of the 4th Conference on Natural Sciences, Hawaii Volcanoes National Park Science Conference. Pp. 63–72. University of Hawaii, Honolulu
- . & **C.C. Christensen.** 1985. Conservation status of native terrestrial invertebrates in Hawaii, p. 105–126. *In*: Stone, C.P. & J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: Preservation and Management*. University of Hawaii Press, Honolulu.
- . & **F.G. Howarth.** 1982. Conservation status of endemic Hawaiian Lepidoptera. *Proceedings of the 3rd Congress on European Lepidoptera*. pp 74–85. Cambridge, England.
- IUCN 2003.** *2003 IUCN Red List of Threatened Species*. International Union for the Conservation of Nature and Natural Resources. [<http://www.redlist.org>]. [Accessed: 29 November 2003].
- Nishida, G.M., ed.** 2002. *Hawaiian terrestrial arthropod checklist*. Fourth edition. *Bishop Mus. Tech. Rep.* **22**, iv + 313 p.
- Swezey, O.H.** 1954. Forest entomology in Hawaii. An annotated check-list of the insect faunas of the various components of the Hawaiian forests. *Bishop Mus. Spec. Publ.* **44**, ix + 266 p.
- U.S. Fish & Wildlife Service.** 1984. Endangered and threatened wildlife and plants; review of invertebrate wildlife for listing as endangered or threatened species. *Fed. Reg.* **49**(100): 21664–21675.
- Zimmerman, E.** 1958. Lepidoptera: Pyraloidea. *Insects of Hawaii* **8**, ix + 456 p.
- . 1960. Possible evidence of rapid evolution in Hawaiian moths. *Evolution* **14**(1): 137–138.

## 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).

*Material examined:* **KAHO'OLAWA:** 1, Pu'u Moa'ulaiki, in wiliwili (*Erythrina sandwicensis*) pod, 1200 ft [365 m], 22 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030922-1*.

### 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'OLAWA:** 3, Honokanaia base camp galley, 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 tiliaceus*), 25 ft [8 m], 14 Oct 2003, *Starr, Starr, & King 031014-3*. 5, same location, UV light at galley, *Starr & Starr 031014-5*. 1, same location, swept 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'OLAWA:** 1, Pu'u Moa'ulaiki, flying around, 1200 ft [365 m], 22 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030922-8*. 2, Honokanaia, flying around base camp galley, 25 ft [8 m], 22 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030922-9*. 5, Kaukaupapa Beach, ex dead kiawe (*Prosopis pallida*) stems, 10 ft [3 m], 7 Oct 2003, *Starr, Starr, King, Tokishi, & Busby 031007-3*. Kaukaupapa, swept from vegetation, 10 ft [3 m], 15 Oct 2003, *Starr, Starr, King, Tokishi, & Busby 031015-12*.

### Coleoptera: Cerambycidae

#### *Sybra alternans* (Wiedemann)

#### New island record

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

*Material examined:* **KAHO'OLAWA:** 4, Pu'u Moa'ulaiki, wiliwili (*Erythrina sandwicensis*) pods, 1200 ft [365 m], 22 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030922-3*. 1, Moaulanui, swept from vegetation, 1300 ft [396 m], 16 Oct 2003, *Starr & Starr 031016-7*.

### 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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*Material examined:* **KAHO'OLAWE:** 1, Pu'u Moa'ulaiki, on *koa haole* (*Leucaena leucocephala*) foliage, 1200 ft [365 m], 22 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030922-10*. 1, Keanakeiki Beach, dead in *kiawe* (*Prosopis pallida*) duff, 10 ft [3 m], 7 Oct 2003, *Starr, Starr, King, Tokishi, & Busby 031007-5*. 1, Kaukaupapa 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, Kaukaupapa Beach, swept from *Sesuvium portu-lacastrum*, 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, 1200 ft [365 m], 23 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030923-12*. 1, Moaulanui, under *kiawe* (*Prosopis pallida*) pile, 1300 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).

*Material examined:* **KAHO'OLAWE:** 8, Moaulanui, under *kiawe* (*Prosopis pallida*) pile, 1300 ft [396 m], 16 Oct 2003, *Starr, Starr, & Mar 031016-3*.

**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, Kaukaupapa 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*)

flowers, 1200 ft [365 m], 22 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030922-4*. 1, Kaukaikapapa Beach, visiting *kiawe* (*Prosopis pallida*) flowers, 10 ft [3 m], 15 Oct 2003, *Starr, Starr, King, Tokishi, & Busby 031015-4*.

**Hymenoptera: Formicidae**

***Leptogenys falcigera* Roger**

**New island record**

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

*Material examined:* **KAHO'OLAWA:** 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'OLAWA:** 11, Keanakeiki Beach, crawling on *kiawe* (*Prosopis pallida*) branch, 10 ft [3 m], 07 Oct 2003, *Starr, Starr, King, Tokishi, & Busby 031007-6*. 14, Kaukaikapapa Beach, crawling on *kiawe* (*Prosopis 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).

*Material examined:* **KAHO'OLAWA:** 2, Hakioawa Gulch, on rocks, 200 ft [60 m], 23 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030923-4*. 1, LZ-1, between Pu'u Moa'ulaiki and Lua Makika, beaten from tamarisk foliage, 1300 ft [396 m], 23 Sep 2003, *Starr, Starr, LeGrande, Abbott, & Busby 030923-13*. 2, Keanakeiki Beach, beaten from vegetation, 10 ft [3 m], 15 Oct 2003, *Starr, Starr, King, Tokishi, & Busby 031015-11*.

***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'OLAWA:** 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'OLAWA:** 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'OLAWA:** 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, Kaukaikapapa 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'OLAWA:** 4, Hakiowa 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, Kaukaikapapa 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**

Previously known from Midway, Kaua'i, O'ahu, Lāna'i, Maui, and Hawai'i (Nishida, 2002, Nishida & Beardsley 2002).

*Material examined:* **KAHO'OLAWA:** 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'OLAWA:** 1, Kaukaikapapa Beach, flying above saltbush (*Atriplex semibaccata*) 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'OLAWA:** 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'OLAWA:** 1, Kaukaikapapa 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'OLAWA:** 1, Moaulanui, crawling on ground, 1300 ft [396 m], 16 Oct 2003, *Starr, Starr, & Mar 031016-1*.

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**Literature Cited**

- Nishida, G.M., ed. 2002. Hawaiian terrestrial arthropod checklist. *Bishop Mus. Tech. Rep.* **22**, iv + 313 p.
- . & J.W. Beardsley. 2002. A review of the insects and related arthropods of Midway Atoll. *Bishop Mus. Occas. Pap.* **68**(1): 25–70.

## **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 Kāneʻohe Bay, Oʻahu, 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 Kāneʻohe Bay Drive, on the southern shore of the Bay. No anemones were found in Kāneʻohe Bay during subsequent searches, but the YWCA population was still thriving 4 years later, being present in March 2003, in about the same numbers.

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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 (*Protopalpythoa* 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 Kāneʻohe 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 Hawaiʻi 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 Oʻahu (Cutress, 1977). *Diadumene franciscana* Hand, of unknown origin, but previously known from California, was discovered in the Ala Wai Canal, Wakīkī, Honolulu, Oʻahu in 1999 (Coles *et al.*, 1999), and may also in Kāneʻohe Bay (personal observations, May 2001).

*Material examined:* **OʻAHU:** Kāneʻohe Bay, dock pilings behind Kokokahi Young Women's Christian Association, 15 Feb, 1999; Kāneʻohe Bay, pier pilings at Lilipuna Pier, 5 Dec 2002, C. Zabin (D7106) (BPBM); **PEARL & HERMES REEF:** Nov. 2000, on drift net in lagoon, S. Godwin (D7105) (BPBM).

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### Literature Cited

- Bailey-Brock, J.H.** 1990. *Polydora nuchalis* (Polychaeta: Spionidae), a new Hawaiian record from aquaculture ponds. *Pac. Sci.* **44**: 81–87.
- . 2000. A new record of the polychaete *Boccardia proboscidea* (family Spionidae) imported in Hawaiʻi with oysters. *Pac. Sci.* **54**: 27–30.
- Carlton, J.T.** 1979. History, biogeography, and ecology of the introduced marine and estuarine invertebrates of the Pacific Coast of North America. PhD dissertation, University of California at Davis. Davis, California. 904 p.
- Coles, S.L., R.C. DeFelice, L.G. Eldredge & J.T. Carlton.** 1999. Historical and recent introductions of nonindigenous marine species into Pearl Harbor, Oahu, Hawaiian Islands. *Mar. Biol.* **135**: 147–158.
- Cutress, C.E.** 1977. Subclass Zoantharia: Orders Corallimorpharia, Actiniaria, and Ceri-  
antharia, p. 130–147. *In: Reef and Shore Fauna of Hawaii. Section 1: Protozoa through Ctenophora. Bishop Mus. Spec. Publ.* 64(1). Bishop Museum Press, Honolulu, Hawaii. 278 p.
- da Costa-Belem, M.J. & D. da Cruz Monteiro.** 1977. Contribuições ao conhecimento da fauna de cnidários do Rio de Janeiro. 2. *Haliplanella luciae* (Verrill, 1898) (Actinaria, Acontinaria), uma nova ocorrência no Brasil. *Univ. Fed. Rio de Janeiro, Inst. Biol. Dep. Zool.* **26**: 1–19.
- Davenport, G.C.** 1903. Variation in the number of stripes on the sea-anemone, *Sagartia luciae*. *Mark Anniv. Vol.* **1903**: 137–146.
- Dunn, D.F.** 1982. Sexual reproduction of two intertidal sea anemones (Coelenterata: Actinaria) in Malaysia. *Biotropica* **14**: 262–271.

- Fukui, Y.** 1986. Catch tentacles in the sea anemone *Haliplanella luciae*: Role as organs of social behavior. *Mar. Biol.* **91**: 245–251.
- Gollasch, S. & K. Riemann-Zurneck.** 1996. Transoceanic dispersal of benthic macrofauna: *Haliplanella luciae* (Verrill, 1898) (Anthozoa, Actinaria) found on a ship's hull in a shipyard dock in Hamburg Harbour, Germany. *Helgolander Meeresuntersuchungen* **50**: 253–258.
- Hausman, L.A.** 1919. The orange striped anemone (*Sagartia luciae*, Verrill). An ecological study. *Biol. Bull.* **37**: 363–369.
- Kuhne, S. & E. Rachor.** 1996. The macrofauna of a stony sand area in the German Bight (North Sea). *Helgolander Meeresuntersuchungen* **50**: 433–452.
- Kubota, M.** 1994. A mechanism for the accumulation of floating marine debris north of Hawaii. *J. Phys. Ocean.* **24**:1059–1064.
- Minasian L.L., Jr.** 1982. The relationship of size and biomass to fission rate in a clone of the sea anemone, *Haliplanella luciae* (Verrill). *J. Exper. Mar. Biol. Ecol.* **58**: 151–162.
- Riemann-Zurneck, K.** 1998. How sessile are sea anemones? A review of free-living forms in the actiniaria (Cnidaria: Anthozoa). *Mar. Ecol.* **19**: 247–261.
- Robertson, R.** 1962. Wentletraps (Epitoniidae) feeding on sea anemones and corals. *Proc. Malacol. Soc. Lond.* **35**: 51–63.
- Schick, J.M.** 1991. *A functional biology of sea anemones*. Chapman & Hall, London. 395 p.
- . & **A.N. Lamb.** 1977. Asexual reproduction and genetic population structure in the colonizing sea anemone *Haliplanella luciae*. *Biol. Bull.* **153**: 604–617.
- Southward, A.J., R.S. Burton, S.L. Coles, P.R. Dando, R. DeFelice, J. Hoover, P.E. Parnell, T. Yamaguchi & W.A. Newman.** 1998. Invasion of Hawaiian shores by an Atlantic barnacle. *Mar. Ecol. Progr. Ser.* **165**: 119–126.
- Stephenson, T.A.** 1935. *The British sea anemones*. Volume II. The Ray Society, London. 426 p.
- Ting, J.H. & J.B. Geller.** 2000. Clonal diversity in introduced populations of an Asian sea anemone in North America. *Biol. Invas.* **2**: 23–32
- Verrill, A.E.** 1898. Descriptions of American actinians, with critical notes on other species, I. *Am. J. Sci.* **6**: 493–498.

**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  $\pm$  8.6 SD, range = 34–72 mm) and Kaua'i (n = 14, SVL = 58 mm  $\pm$  7.7 SD, range = 50–71 mm); 23 *G. mutilata* on Hawai'i (n = 2, SVL = 46 mm  $\pm$  6.4 SD, range = 41–50 mm) and Maui (n = 21, SVL = 45 mm  $\pm$  7.1 SD, range = 42–48 mm), and 26 *L. delicata* (SVL = 39 mm  $\pm$  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

##### *Physalopteroides arnoensis* Bursey & Goldberg

##### New host and island record

*Physalopteroides arnoensis* was described by Bursey & Goldberg (2001) from the mourning gecko, *Lepidodactylus lugubris* from the Republic of the Marshall Islands, Oceania. *Physalopteroides 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  $\pm$  8.5, range (lowest to highest number of parasites present): 1–13.

*Material examined:* O'AHU (BPBM H82).

**Nematoda: Seuratidae*****Skrjabinelazia machidai*** Hasegawa**New island record**

*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  $1.2 \pm 0.45$ , range: 1-2.

*Material examined:* MAUI (BPBM H83).

**Nematoda: Pharyngodonidae*****Spauligodon hemidactylus*** Bursey & Goldberg **New host and island record**

*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*, *Hemiphylloactylus typus* 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  $2.5 \pm 0.71$ , range: 2-3.

*Material examined:* MAUI (BPBM H84).

**Nematoda: Spiroceroidae*****Physocephalus* sp.****New host and island records**

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  $38.9 \pm 55.4$ , range: 4-200, O'ahu UMMZ 226739, 226742, 226754, 226765, 226770, 226771; Prevalence: 6/34 (18%), mean intensity:  $5.2 \pm 3.0$ , 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  $86.4 \pm 115.7$  SD, range: 1-476; *L. delicata* Kaua'i UMMZ 225293, 225294, 225305, 225308, 225311, 225318; Prevalence: 6/26 (23%), mean intensity  $6.3 \pm 5.8$ , 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**New host record**

*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  $6.1 \pm 8.8$  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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#### **Literature Cited**

- Ali, J.H., J. Riley & J.T. Self. 1981. A revision of the taxonomy of the blunt-hooked *Raillietiella*, pentastomid parasites of African, Southeast-Asian and Indonesian lizards, with a description of a new species. *Syst. Parasitol.* **3**: 193–207.
- Alicata, J.E. 1964. Parasitic infections of man and animals in Hawaii. *Hawaii Agric. Exp. Stn. Tech. Bull.* **61**, 138 p.
- Anderson, R.C. 2000. *Nematode parasites of vertebrates: their development and transmission*. Second edition. CABI Publishing, Wallingford, UK. 650 p.
- Barton, D.P. & S. Pichelin. 1999. *Acanthocephalus bufonis* (Acanthocephala) from *Bufo marinus* (Bufonidae: Amphibia) in Hawaii. *Parasite* **6**: 269–272.
- Bursey, C.R. & S.R. Goldberg. 1996. *Spauligodon hemidactylus* n. sp. (Nematoda; Pharyngodonidae) from *Hemidactylus frenatus* (Reptilia: Gekkonidae) from Oceania. *J. Parasitol.* **82**: 299–301.
- . & S.R. Goldberg. 2001. *Physalopteroides arnoensis* n. sp. (Nematoda: Physalopteroidea) and other intestinal helminths of the mourning gecko, *Lepidodactylus lugubris* (Sauria: Gekkonidae), from Arno Atoll, Republic of the Marshall Islands, Oceania. *J. Parasitol.* **87**: 135–138.
- Conant, R. & J. T. Collins. 1998. *A field guide to reptiles and amphibians: eastern and central North America*. Third edition. Houghton Mifflin Company, Boston. 616 p.
- Goldberg, S.R. & C.R. Bursey. 1997. New helminth records for the mourning gecko, *Lepidodactylus lugubris* (Gekkonidae) from Hawaii. *Bishop Mus. Occas. Pap.* **49**: 54–56.

- . & C.R. Bursey. 2000a. Transport of helminths to Hawaii via the brown anole, *Anolis sagrei* (Polychrotidae). *J. Parasitol.* **86**: 750–755.
- . & C.R. Bursey. 2000b. Helminth records for the house gecko, *Hemidactylus frenatus* (Gekkonidae) from Hawai'i. *Bishop Mus. Occas. Pap.* **64**: 56–59.
- . & C.R. Bursey. 2001. Gastrointestinal helminths of gekkonid lizards (Sauria: Gekkonidae) from the Philippine Islands and Thailand. *Comp. Parasitol.* **68**: 138–142.
- . & C.R. Bursey. 2002. Gastrointestinal helminths of seven gekkonid lizard species (Sauria: Gekkonidae) from Oceania. *J. Nat. Hist.* **36**: 2249–2264.
- . C.R. Bursey & H. Cheam. 1998. Gastrointestinal helminths of four gekkonid lizards, *Gehyra mutilata*, *Gehyra oceanica*, *Hemidactylus frenatus* and *Lepidodactylus lugubris* from the Marina Islands, Micronesia. *J. Parasitol.* **84**: 1295–1298.
- Hanley, K.A., K. Petren & T.J. Case. 1998. An experimental investigation of the competitive displacement of a native gecko by an invading gecko: no role for parasites. *Oecologica* **115**: 196–205.
- Hasegawa, H. 1984. *Skrjabinelazia machidai* sp. n. (Nematoda: Seuratidae) from *Gekko japonicus* on Okinawa Island, Japan. *Zool. Sci.* **1**: 483–486.
- Hunsaker, D., II & P. Breese. 1967. Herpetofauna of the Hawaiian Islands. *Pac. Sci.* **21**: 423–428.
- Kennedy, M.J. 1982. A redescription of *Acanthocephalus bufonis* (Shiple, 1903) Southwell & Macfie, 1925 (Acanthocephala: Echinorhynchidae) from the black-spotted toad, *Bufo melanostictus*, from Bogor, Indonesia. *Can. J. Zool.* **60**: 356–360.
- McKeown, S. 1996. *A field guide to reptiles and amphibians in the Hawaiian Islands*. Diamond Head Publishing, Inc., Los Osos, California. 172 p.
- Oliver, J.A. & C.E. Shaw. 1953. The amphibians and reptiles of the Hawaiian Islands. *Zoologica* **38**: 65–95.
- Prudhoe, S. & R.A. Bray. 1982. Platyhelminth parasites of the Amphibia. Oxford University Press, Oxford. 217 p. + 4 microfiche.
- Shaw, C.E. & P.L. Breese. 1951. An addition to the herpetofauna of Hawaii. *Herpetologica* **7**: 68.
- Yuen, P.H. 1965. Studies on four species of the genus *Mesocoelium* (Trematoda; Brachycoelidae) of Amphibia. *Zool. Anz.* **174**: 266–275.

## 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 herein 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.

*Material examined:* MAUI: Wailuku, 27.iii.2002, S. Wong & W. Wong (BPBM 14367).

### Chamaeleonidae

#### *Chamaeleo calyptratus* Duméril & Duméril

#### 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.

*Material examined:* MAUI: Pu'ukoli'i, 28.ii.2002, F. Duvall (BPBM 14366); Makawao, 13.xi.2002, S. Munson & M. Munson (BPBM 15757), 3–9.xii.2002 (BPBM 15822–26).

### 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-documented

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.

*Material examined:* MAUI: Huelo, 26.viii.2002, E. Schupp (BPBM 15049).

### Literature Cited

- Kraus, F.** 2002. New records of alien reptiles in Hawai'i. *Bishop Mus. Occas. Pap.* **69**: 48–52.
- . 2003. New records of alien plants and animals in Hawai'i. *Bishop Mus. Occas. Pap.* **74**: 76–78.
- . & **E. Campbell.** 2002. Human-mediated escalation of a formerly eradicable problem: the invasion of Caribbean frogs in the Hawaiian Islands. *Biol. Invasions* **4**: 327–332.
- , **E.W. Campbell, A. Allison & T. Pratt.** 1999. *Eleutherodactylus* frog introductions to Hawaii. *Herpetol. Rev.* **30**: 21–25.
- Loope, L.L., F.G. Howarth, F. Kraus & T.K. Pratt.** 2001. Newly emergent and future threats of alien species to Pacific birds and ecosystems. *Stud. Avian Biol.* **22**: 291–304.
- McKeown, S.** 1996. *A field guide to reptiles and amphibians in the Hawaiian Islands.* Diamond Head Publ., Inc., Los Osos, California.
- Necas, P.** 1999. *Chameleons: nature's hidden jewels.* Edition Chimaira, Frankfurt.
- Oliver, J.A. & C.E. Shaw.** 1953. The amphibians and reptiles of the Hawaiian Islands. *Zoologica* **38**: 65–95.



# Records of the Hawaii Biological Survey for 2003

## Part 2: Notes

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