

**RECORDS OF THE
HAWAII BIOLOGICAL SURVEY
FOR 1998
Part 2: Notes¹**

This is the second of 2 parts to the *Records of the Hawaii Biological Survey for 1998* 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 treated in the first part of this *Records* [*Bishop Museum Occasional Papers* 58].

New records of flowering plants on Midway Atoll

MARIE M. BRUEGMANN² (U.S. Fish & Wildlife Service, 300 Ala Moana Boulevard, Room 3122, Box 50088, Honolulu, Hawai'i 96850, USA; email: marie_bruegmann@fws.gov)

A brief botanical survey of Midway Atoll was conducted in 1995. The following species represent previously undocumented naturalizations for the Northwestern Hawaiian Islands, based on the results of these surveys. All supporting voucher specimens have been deposited at BISH.

Amaranthaceae

New island record

Amaranthus lividus L. subsp. *polygonoides* (Moq.) Probst

The following collection represents a new island record for Sand Island, Midway Atoll. It was previously known from Kaua'i, O'ahu, and Hawai'i (Wagner *et al.*, 1990: 188).

Material examined. MIDWAY: Sand Island, in yard of abandoned military housing, but also observed along north side of harbor, rare in all locations, naturalized in mowed grassy areas in abandoned housing and along harbor, < 2 m, erect herb, approximately 0.25 cm tall, 1 Apr 1995, *Bruegmann 2018*.

Asteraceae

New island record

Calyptracarpus vialis Less.

The following collection represents a new island record for Sand Island, Midway Atoll. It was previously known from Kaua'i, O'ahu, Moloka'i, Lāna'i, and Maui (Wagner *et al.*, 1990: 284).

Material examined. MIDWAY: Sand Island, rare around Navy galley and J housing, naturalized in mowed grassy areas, < 2 m, sprawling herb, < 0.25 cm tall, rooting at nodes, ray flowers yellow, 1 Apr 1995, *Bruegmann 2019*.

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2. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.

Euphorbiaceae***Chamaesyce hyssopifolia* (L.) Small** **New island record**

The following collection represents a new island record for Sand Island, Midway Atoll. It was previously known from Kaua'i, O'ahu, Maui, and Hawai'i (Koutnik & Huft, 1990: 610).

Material examined. **MIDWAY:** Sand Island, uncommon along the edges of the abandoned runway and in the golf course, naturalized in mowed grassy areas, < 2 m, erect herb, < 0.5 cm tall, 6 Apr 1995, *Bruegmann 2029*.

Fabaceae***Medicago polymorpha* L.** **New island record**

The following collection represents a new island record for Sand Island, Midway Atoll. It was previously known from Kaua'i, O'ahu, Lāna'i, Moloka'i, Maui, and Hawai'i (Geesink *et al.*, 1990: 684; Wagner, *et al.*, 1996: 57).

Material examined. **MIDWAY:** Sand I, one individual along north side of harbor, mowed grassy area with *Stenotaphrum secundatum* dominant, < 2 m, prostrate herb, yellow flowers, pods spiral and prickly, 1 Apr 1995, *Bruegmann 2013*.

Acknowledgments

I thank D.R. Herbst for determinations of these specimens, the U.S. Fish & Wildlife Refuges office for the opportunity to conduct a survey on Midway Atoll in April 1995, and George Staples, Bishop Museum, for his comments on the draft manuscript.

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A new distributional record for *Halophilia hawaiiiana* Doty & B. Stone (Hydrocharitaceae) in Hawai'i

RALPH C. DEFELICE (Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA; email: defelice@bishopmuseum.org)

During the course of a preliminary survey of the fouling communities of Midway Atoll in September 1997, the seagrass *Halophilia hawaiiiana* Doty & B. Stone was collected within the main boat harbor. Just inside the harbor entrance on the southern side, a

dense patch of *H. hawaiiiana*, approximately 100 m², was growing adjacent to the metal sheet piling which lines the small harbor. The seagrass was growing on a silty sand substrate at a depth of approximately 6 m. Surveys were conducted at six more locations around Midway Atoll and no additional *H. hawaiiiana* was observed (DeFelice *et al.*, 1998).

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

The collection below documents a new distributional record for the endemic marine angiosperm *H. hawaiiiana* in the Hawaiian Archipelago. This species previously was known from the islands of Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.*, 1990: 1443).

Material examined. MIDWAY: Inner harbor, at the base of metal sheet piling along inner south side of harbor, depth 6 m, 9 Sep 1997, DeFelice *s.n.* (BISH 652495).

Acknowledgments

Derral R. Herbst, Bishop Museum, identified and pressed the voucher. The U.S. Fish & Wildlife Service provided funding for the survey of Midway Atoll.

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New naturalized plant records for the Hawaiian Islands

DAVID LORENCE³ & TIM FLYNN³ (National Tropical Botanical Garden, P.O. Box 340, Lawa'i, Hawai'i 96765 USA)

The following collections represent new records based on information published in Wagner *et al.* (1990) and supplemental information published in succeeding years (Evenhuis & Miller, 1995, 1996, 1997, 1998).

Amaranthaceae

***Alternanthera pungens* Kunth New island record**

This is a new island record for Khaki weed. It is also known from the islands of O'ahu, Moloka'i, and Hawai'i.

Material examined. KAUA'I: Kōloa/Waimea District boundary: Hanapēpē, at Swinging bridge parking lot., ca. 4.5 m, 13 Oct 1998, D. Jamieson *s.n.* (PTBG).

Asclepiadaceae

***Hoya australis* R. Brown ex J. Traill New naturalized record**

Hoya australis is a new naturalized record for the state. It is abundantly naturalized at the first locality, climbing in *Casuarina* trees with copious flowers and fruits. It is evidently naturalized at the second locality also, with several plants and seedlings. *Hoya* is

3. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.

easily distinguished from the other three species of Asclepiadaceae naturalized in Hawai'i by the following combination of characters: twining lianescent habit, white latex, thick, succulent opposite leaves, sweetly fragrant flowers, the corolla lobes cream with purple spots at base and white corona. Besides *H. australis* several additional species of *Hoya*, known as wax flower, are cultivated in Hawai'i.

Material examined. MAUI: Hāna District, along Waikōloa Road ca. 500 ft [150 m] south of Hāna Refuse Station; secondary vegetation of *Leucaena leucocephala*, *Casuarina equisetifolia* and *Trema orientalis*, 10 m, 7 May 1998, D. Lorence, T. Flynn, D. Ragone & J. Wiseman 8325 (BISH, PTBG, MO, US); Hāna, Ka'uiki head, on SE side of Hāna Bay, 80–386 ft, secondary forest dominated by *Casuarina*, *Terminalia*, *Syzygium*, *Ardisia*, *Lantana*, 10 Oct 1987, Flynn & Lewis 2410 (PTBG).

Buddleiaceae

Buddleia madagascariensis Lam.

New island record

New naturalized island record for Kaua'i. Previously known elsewhere in Hawai'i from near the Volcano dump on the Big Island. A single plant was naturalized at this Koke'e site, but other naturalized plants were also observed near the end of Halemanu Road along trail to the Halemanu ditch intake. *Buddleia madagascariensis* differs from the other two species in Hawai'i, *B. asiatica* Lour. and *B. davidii*, in having larger leaves 9–21 × 3.0–4.5 cm and corollas with a white tube, and orange lobes.

Material examined. KAUA'I: Waimea District: Koke'e State Park, along Water Tank Road across from Koke'e Museum, ca. 30 m from water tank, 3760 ft, 16 Oct 1997, D. Lorence & F. Kraus 8147 (PTBG).

Fabaceae

Bauhinia monandra Kurz

New naturalized record

New naturalized record for state. *Bauhinia monandra* can be distinguished from all other indigenous and naturalized Fabaceae in Hawai'i by its simple bilobed leaves 8–15 cm long, large showy white and pink flowers with a single stamen, and large pods to 20 cm long dehiscent along both sutures. The pink bauhinia or St. Thomas tree is believed to be native to Asia.

Material examined. HAWAII: South Kona District: along road to Ho'okena Beach, secondary vegetation and pasture land with *Panicum maximum* and scattered *Samanea saman* and *Bauhinia monandra*, 19°23'00"N, 156°53'00"W, 200 m, 23 Jan 1997, D. Lorence & T. Flynn 7947 (BISH, PTBG, US).

Liliaceae

Asparagus densiflorus (Kunth) Jessop

New naturalized record

New naturalized record for state. *Asparagus densiflorus* can be distinguished from other *Asparagus* species in Hawai'i by its flattened cladodes. A common ornamental used as both a ground cover and a potted plant, it will frequently volunteer in home gardens. It forms large mounds up to 1 m across with spiny, arching branches that are festooned with bright scarlet-red, single-seeded fruits. The widespread use of this plant in ornamental settings coupled with production of large numbers of fruit that are undoubtedly attractive to birds which will continue to contribute to the plants spread. Recent observations seem to show a tolerance to herbicides used in controlling roadside vegetation.

Material examined. KAUA'I: Kōloa District: Hwy 50, 0.1 mi West of junction with Maluhia Road (Tunnel of Trees). Ruderal vegetation of *Panicum*, *Sporobolus*, *Plantago*, *Taraxacum*, *Chamae-*

syce, and *Eragrostis*, ca. 195 m, 14 Dec 1998, *T. Flynn 6494* (BISH, PTBG, US); Hwy 50, 0.5 mi West of entrance to Kāhili Mt. Park. Ruderal vegetation of *Panicum*, *Chamaesyce*, *Emilia*, *Sonchus*, and *Bidens*, ca. 195 m, 14 Dec 1998, *T. Flynn 6495* (BISH, PTBG, US).

Nyctaginaceae

Boerhavia acutifolia (Choisy) J. W. Moore **New island record**

This collection represents a new island record for Kauaʻi. In the *Manual* treatment of Nyctaginaceae, Fosberg (1990: 978) applied the name *Boerhavia glabrata* Blume to this species. However, in the revised edition of the *Manual*, Wagner & Herbst (1999) have adopted the name *B. acutifolia*. Widespread in the southern and western Pacific, this species has previously been recorded from Niʻihau, Molokaʻi, Oʻahu, Maui, Kahoʻolawe, and Hawaiʻi.

Material examined. **KAUAʻI:** Hanalei District: Kilauea Point National Wildlife Refuge, on Mololea Point; coastal vegetation (herbland) on basalt cliff tops, with *Cynodon dactylon*, *Digitaria ciliaris*, *Lipochaeta succulenta*, *Ipomoea pes-caprae*, *Fimbristylis cymosa* and *Boerhavia glabrata*, 20–25 m, 22°13'20"N, 159°23'15"W, 6 Jun 1997, *D. Lorence, T. Flynn & A. Asquith 7996* (PTBG, US).

Oleaceae

Ligustrum sinense Lour. **New state record**

These collections represent a new state record for the genus *Ligustrum* L. This species has become naturalized profusely around the cabins at Kokeʻe State Park and now extends far into the forest. It likely originated at this site as yard plantings by residential cabins where shrubs reaching 4 m tall and 5 m in diameter were observed. The specimens were kindly identified by Peter S. Green of Royal Botanic Gardens, Kew, who notes two other specimens collected from cultivated plants on Hawaiʻi Island: Puna, Volcano, *Degener & Degener 32472* (K); South Kona, Captain Cook, *Staples 628* (K). Green warns that *L. sinense* has become a serious naturalized weed pest in New South Wales and the southeastern United States and should be eradicated before it spreads further in Hawaiʻi (P.S. Green, pers. comm., 1998). The juicy berries are presumably dispersed by birds.

Material examined. **KAUAʻI:** Waimea District: Kokeʻe State Park, along Halemanu road by group of three cabins near Kokeʻe-Halemanu trailhead, degraded *Acacia koa* mesic forest, 22°07'05"N, 159°39'42"W, 3520 ft, 16 Oct 1997, *D. Lorence, T. Flynn, S. Joe, F. Kraus, K. Reinard, J. Plews 8149* (BISH, K, MO, PTBG, US); Faya Road, *Acacia/Metrosideros* forest with *Coprosma*, *Styphelia*, *Myrica*, *Psidium*, and *Dodonaea*, ca. 1060 m, 29 Apr 1997, *T. Flynn & D. Lorence 6132* (BISH, K, PTBG).

Poaceae

Eragrostis brownii Nees **New island record**

This collection represents a new island record for this species. It has previously been recorded from the islands of Molokaʻi, Maui, and Hawaiʻi.

Material examined. **KAUAʻI:** Hanalei District: Hanalei National Wildlife Refuge. Secondary forest of *Psidium*, *Syzygium*, and *Rhodomyrtus* with remnant *Pandanus*, *Acacia*, and *Wikstroemia*, 45–130 m, 6 Jun 1997, *T. Flynn et al. 6169* (K, PTBG).

Garnotia acutigluma (Steud.) Ohwi **New island record**

This collection represents a new island record for this species. There is some doubt as to whether or not it is indigenous or naturalized, but it has previously been recorded from Molokaʻi, Maui, and Hawaiʻi.

Material examined. **KAUA'I**: Waimea District: Waimea Canyon State Park, along Hwy 550 near mile marker 12. Disturbed *Acacia koa* forest with *Lantana*, *Psidium*, *Dodonaea*, *Stenotaphrum*, *Plantago*, and *Setaria*, 1030 m, 14 Apr 1997, *T. Flynn & D. Lorence 6145* (BISH, K, PTBG, US).

Paspalum notatum Flugge

New state record

This collection represents a new state record for this species. It is not uncommon along the roadsides, in pastures and lawns in this area of Kaua'i. It forms dense mats of vegetation, spreading by large, coarse stolons. The inflorescence is erect with two opposite racemes.

Material examined. **KAUA'I**: Kawaihau District: upper Wailua Homesteads along Hwy 580 at junction with Pa'ako St., ca. 135 m, 19 Apr 1997, *T. Flynn et al. 6127* (BISH, K, PTBG, US).

Zizania latifolia (Griseb.) Turez. ex Stapf

New island record

This collection represents a new island record for *Zizania latifolia* which has previously been noted as being naturalized on the islands of O'ahu and Hawai'i.

Material examined. **KAUA'I**: Kōloa District: Lawa'i Valley. National Tropical Botanical Garden, large clump-forming grass along banks of Lawa'i Stream behind Stillwater Dam, ca. 36 m, 22 May 1997, *T. Flynn 6157* (K, PTBG, US).

Acknowledgments

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New plant records for Maui and Molokaʻi

HANK L. OPPENHEIMER, J. SCOTT MEIDELL, & R.T. BARTLETT (Maui Pineapple Company, Ltd., Hono-lua Division, Puʻu Kukui Watershed Dept., 4900 Honoapiʻilani Hwy., Lahaina, Hawaiʻi, 96761 USA).

With continuing exploration and observations of Hawaiʻi's residential, agricultural and natural areas, we herein report 10 new island records and 9 significant range extensions for 19 taxa (2 endemic, 17 non-indigenous). All voucher specimens are deposited at the Bishop Museum's (BISH) Herbarium Pacificum.

Acanthaceae***Hemigraphis reptans* (G. Forster) T. Anderson New island record**

Wagner *et al.* (1990: 172) document the naturalized range of this species in Hawaiʻi as the islands of Kauaʻi, Oʻahu and Hawaiʻi. It is now known from Maui.

Material examined. MAUI: East Maui, Hāna District, Kalāhū Pt., 0–15 m, 15 Oct 1987, *Flynn & Tully 2440*; Haleleikeʻoha Stream, 9 m, 22 Jun 1998, *Oppenheimer 320*.

Aizoaceae***Tetragonia tetragonioides* (Pall.) Kuntze New island record**

Known from scattered coastal sites on Nihoa, Kauaʻi, Oʻahu and Hawaiʻi (Wagner *et al.*, 1990: 178), the following collections document the occurrence of this species on Maui.

Material examined. MAUI: West Maui, Lahaina District, near the mouth of Pohakupule Stream, 3 m, 14 Apr 1998, *Oppenheimer 302*; Honokahua, Oneloa, on sand dunes, 3 m, 21 Sep 1998, *Oppenheimer H99805*.

Apiaceae***Cryptotaenia canadensis* (L.) DC. New island records**

According to Wagner *et al.* (1990: 203), this taxon is naturalized on Kauaʻi, Oʻahu and Hawaiʻi. The following collections represent new island records for both Molokaʻi and Maui.

Material examined. MOLOKAʻI: Waiehu, among rocks above the high tide line, 1 m, 17 Sep 1997, *Oppenheimer H99701*. MAUI: West Maui, Wailuku District, ʻĪao Valley, Kīnihāpai Stream, growing atop a large boulder, 397 m, 1 Jan 1998, *Oppenheimer H19801*.

Asclepiadaceae***Stapelia gigantea* N. E. Brown New island record**

The following collection extends the known naturalized range of this species to Maui. It was previously known only from Oʻahu (Wagner *et al.*, 1990: 241).

Material examined. MAUI: West Maui, Lahaina District, Ukumehame Valley, between Koai and ʻUlaʻUla, 756 m, 25 Apr 1998, *Oppenheimer 304*.

Euphorbiaceae***Macaranga tanarius* (L.) Mull. Arg. New island record**

Previously recorded as naturalized on Kauaʻi and Oʻahu (Wagner *et al.*, 1990: 624), the following specimen documents the occurrence of this species on Maui. Additionally, Bob Hobby (pers. comm.) had collected this taxon several years ago from the same locality. These specimens were not seen at BISH.

Material examined. MAUI: West Maui, Wailuku District, Waikapū Valley, 475 m, 3 May 1998, *Oppenheimer 303*.

***Phyllanthus tenellus* Roxb.**

New island record

A common garden and roadside weed but documented only from Kaua'i and O'ahu (Wagner *et al.*, 1990: 628). Now widespread on Maui.

Material examined. MAUI: East Maui, Makawao District, in a yard in Pukalani, 458 m, 19 Jul 1998, *Oppenheimer & Duvall H79803*; West Maui, Lahaina District, weed in yard, Honokeana, 49 m, 22 Sep 1998, *Oppenheimer & Bartlett H99802*.

Fabaceae

***Medicago sativa* L.**

Range extension

According to Wagner *et al.* (1990: 686), this species was known to be naturalized on Midway Atoll, Kaua'i, O'ahu, Lana'i and Hawai'i. Wagner & Herbst (in Evenhuis & Miller, 1995b: 20) later reported its occurrence on Maui, citing a collection by Hobdy (*Hobdy et al.* 3381 BISH), from a roadside near Hali'imaile on East Maui. Wagner *et al.* (in Evenhuis & Miller, 1997a: 57) again cited this specimen, as well as a collection by Medeiros (*Medeiros 295*, BISH). The following collections document a range extension to West Maui.

Material examined. MAUI: West Maui, Lahaina District, Growing in lawn at the Maui County Mahinahina Water Treatment Facility, 214 m, 27 Jul 1998, *Oppenheimer H79804A*; 9 Sep 1998, *Oppenheimer H79804B*.

***Senna occidentalis* (L.) Link**

Range extension

Wagner *et al.* (1990: 701) report this taxon as naturalized on Ni'ihau, Kaua'i, O'ahu, East Maui and Hawai'i. The following collections represent a range extension to West Maui.

Material examined. MAUI: West Maui, Lahaina District, growing in open field at Alaeloa, North of Ka'ōpala Gulch, 67 m, 15 Jul 1998, *Oppenheimer H79805*; North side of Honokowai Valley, along dirt road in pineapple field, 305 m, 5 Aug 1998, *Oppenheimer H89803*.

Lamiaceae

Phyllostegia glabra* (Gaud.) Benth. var. *glabra **Range extension**

Previously known to occur on O'ahu, Moloka'i, Lana'i and East Maui, (Wagner *et al.* 1990: 816), this taxon is now documented from West Maui. In addition to the specimens cited here, the authors have also observed plants growing along Kaluanui Stream (Western Honokohau drainage basin), Kahanā Valley, and in The Nature Conservancy Kapunakea Preserve.

Material examined. MAUI: West Maui, Lahaina District, Olowalu, 7 May 1920, *Forbes 2254M*; Pu'u Kukui Watershed, Honokohau Valley, sprawling over vegetation in *Metrosideros* dominated mesic forest, along a short tributary near the main stream, 488 m, 29 Aug 1996, *Meidell & Oppenheimer 136* (BISH); 7 Apr 1998, same locality, *Meidell & Oppenheimer 299*.

Malvaceae

***Sida spinosa* L.**

New island record

Wagner *et al.* (1990: 899) reported this species from O'ahu, Hawai'i and possibly other islands. Lorence & Flynn (in Evenhuis & Miller, 1997b: 10–11) later reported it from Kaua'i. The following collections document its occurrence on Maui.

Material examined. MAUI: West Maui, Lahaina District, in an open field at Alaeloa, north of Ka'ōpala Gulch, 67 m, 15 Jul 1998, *Oppenheimer H79809*; North of Honokowai Valley, along a dirt road near pineapple fields, 244 m, 5 Aug 1998, *Oppenheimer H89804*.

Myricaceae

Myrica faya Aiton

Range extension

According to Wagner *et al.* (1990: 931), firetree is naturalized on Kaua'i, O'ahu, Lāna'i, Maui and Hawai'i. A search at BISH revealed that all the collections from Maui were made on East Maui, the earliest in 1929 (*D. Cooke s. n.*, Haleakalā, 4300 ft). The following specimen represents a range extension to West Maui.

Material examined. MAUI: West Maui, Lahaina District, West Maui Natural Area Reserve—Pana'ewa Section, growing on a hilltop South of Kanahā Valley, East of Pa'upa'u, 769 m, 28 Jun 1998, *Oppenheimer H69802*.

Myrtaceae

Metrosideros waialealae (Rock) Rock

New island record

var. *fauriei* (H. Lev.) Dawson & Stemmermann

Previously known from the islands of Moloka'i and Lāna'i, (Wagner *et al.*, 1990: 970), the following collections document this taxon from Maui, with additional populations noted in Kahanā Valley and Honokowai Valley (J. Lau, pers. comm.) on West Maui.

Material examined. MAUI: West Maui, Lahaina District, West Maui Natural Area Reserve - Lihau Section, growing in lowland 'ōhi'a mixed mesic forest, 1049 m, 28 Nov 1991, *Welton & Lau 1401*; Pu'u Kukui Watershed, growing on a ridge above the South side of Kahanā Iki stream, in the vicinity of Kaulalewelewe, 793 m, 24 Oct 1997, *Oppenheimer 255*.

Orchidaceae

Phaius tankarvilleae (Banks ex L'Hér.) Blume

New island record

According to Wagner *et al.* (1990: 1474), this species is found on Kaua'i, O'ahu, Lāna'i and Hawai'i. It is now known from Maui.

Material examined. MAUI: West Maui, Lahaina District, Pu'u Kukui Watershed, growing in wet forest, slopes of Honolua Peak, 719 m, 24 Mar 1998, *Oppenheimer & Meidell 300*.

Poaceae

Andropogon virginicus L.

Range extension

Wagner *et al.* (1990: 1497) reported this taxon as being naturalized on O'ahu and Hawai'i. Hughes (in Evenhuis & Miller, 1995b: 8) later documented its occurrence on Moloka'i, and also cited a collection from Maui (*Higashino 9360*, BISH), which was made on East Maui. Although Hughes reported observing *A. virginicus* in Kapunakea Preserve as early as 1993, the following is the first collection from West Maui. The authors have also observed this species in a wide range of habitats on West Maui, including bogs, wet and mesic forests, pastures and roadsides.

Material examined. MAUI: West Maui, Lahaina District, abundant weed in a pasture W of Honolua Valley, North of Pu'u Ka'eo, 336 m, 23 Sep 1998, *Oppenheimer H99804*.

Chrysopogon aciculatus (Retz.) Trin.

New island record

Previously known from Kaua'i, O'ahu, Moloka'i, Lāna'i and Hawai'i, (Wagner *et al.*, 1990: 1517), the following collection documents its occurrence on Maui.

Material examined. MAUI: West Maui, Lahaina District, growing on a ridge-top along a trail on the Eastern rim of Honokohau Valley, 256 m, 14 Jul 1998, *Oppenheimer H79707*.

Holcus lanatus* L.*Range extension**

Wagner *et al.* (1990: 1551) reported this species as naturalized on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. A search at BISH revealed that all of the specimens from Maui had been collected on East Maui, although great effort was made during the preparation of the *Manual* to treat East and West Maui as separate geographic entities (D. Herbst, pers. comm.). The following collection documents the presence of this taxon on West Maui.

Material examined. MAUI: West Maui, Lahaina District, Pu'u Kukui Watershed, growing in the yard around Haela'au Cabin, Kaulalewelewe, 909 m, 8 Jul 1998, *Oppenheimer H79810*.

Polygalaceae***Polygala paniculata* L.****Range extension**

According to Wagner *et al.* (1990: 1058), this species is naturalized on O'ahu, East Maui and Hawai'i. Lorence *et al.* (in Evenhuis & Miller, 1995a: 48) later documented it from Kaua'i. The following collections document a range extension to West Maui.

Material examined. MAUI: West Maui, Wailuku District, Hana'ula, 824 m, 27 Sep 1983, A.C. Medeiros 544; Lahaina District, on a ridge-top dividing Kaluanui and Pöhakupule Gulches, 354 m, 3 Jan 1997, *Meidell & Oppenheimer 164*.

Solanaceae***Solanum elaeagnifolium* Cav.****Range extension**

This noxious weed was reported by Wagner *et al.* (1990: 1270) from O'ahu, Moloka'i, and Maui. The only report at BISH of the occurrence of this species on Maui is a newspaper article (*Honolulu Star-Bulletin*, 14 Oct. 1958) reporting it from Kīhei on East Maui. The following collection represents a range extension to West Maui.

Material examined. MAUI: West Maui, Lahaina District, along a dirt road South of Kahañā Stream, 18 m, 14 Jul 1998, *Oppenheimer & Price H79801* (BISH).

Solanum torvum* Sw.*Range extension**

According to Wagner *et al.* (1990: 1276) the naturalized range of this species in Hawai'i was previously known to be O'ahu and along 'Īao Stream on West Maui. The following collection extends its range to East Maui.

Material examined. MAUI: East Maui, Hāna District, Ka'eleku, along the road to Hāna Airport, 61 m, 21 Jun 1998, *Oppenheimer 305* (BISH).

Acknowledgments

We thank the staff of Bishop Museum/Herbarium Pacificum for all of their help with research and the handling and verification of voucher specimens.

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New plant records from East Maui for 1998

FOREST STARR, KIM MARTZ, & LLOYD L. LOOPE¹ (United States Geological Survey—Biological Resources Division, P.O. Box 369, Makawao, Hawai'i 96768, USA)

The following contributions include new island records, new naturalized records, a range extension, and a name change of plants located on East Maui, Hawai'i. Also included is a map of Maui showing locations of collections discussed in text (Fig. 1). Voucher specimens are housed in the Bishop Museum, Honolulu (BISH).

Acanthaceae

Thunbergia laurifolia Lindl.

New island record

Previously known from Kaua'i and O'ahu (Wagner *et al.*, 1990: 175), this collection represents a new island record of this species from Maui. *Thunbergia laurifolia*, a native of India, is often cultivated for its showy flowers and sprawling habit. It commonly escapes the confines of the garden and, although not known to produce seeds in the Hawaiian islands, this vine is well established and has been observed spreading vegetatively in the Wailua, Honomanū and Kokomo areas of East Maui.

Material examined. MAUI: Hāna District, East Maui, Hāna Hwy., West side of Honomanū gulch, along road nr. Kaumahina State Wayside, 360 ft [110 m], 7 May 1998, Starr & Martz 980507-7.

Asteraceae

Senecio madagascariensis Poiret

New island record

Native to Madagascar and South Africa, this species was first discovered in the early 1980s by Parker Ranch staff on the Big Island (Motooka *et al.*, 1996: 1). Lorence *et al.* (1995: 24) reported *Senecio madagascariensis* as a new island record for Kaua'i where it was presumably introduced as a contaminant in grass seed used in a roadcut. It can now be found occurring in lawns, pastures, and roadsides on East Maui in Pukalani and has also been observed in Makawao, Kokomo, Olinda, Kahului, Kula, and Ulupalakua. This plant is poisonous to horses, cattle, and other livestock and has been implicated in the death of a pony in Kokomo.

Material examined. MAUI: Makawao District, East Maui, Pukalani, Makani Rd., from horse paddock, 1440 ft [440 m], 15 Feb 1998, Starr & Martz 980215-71..

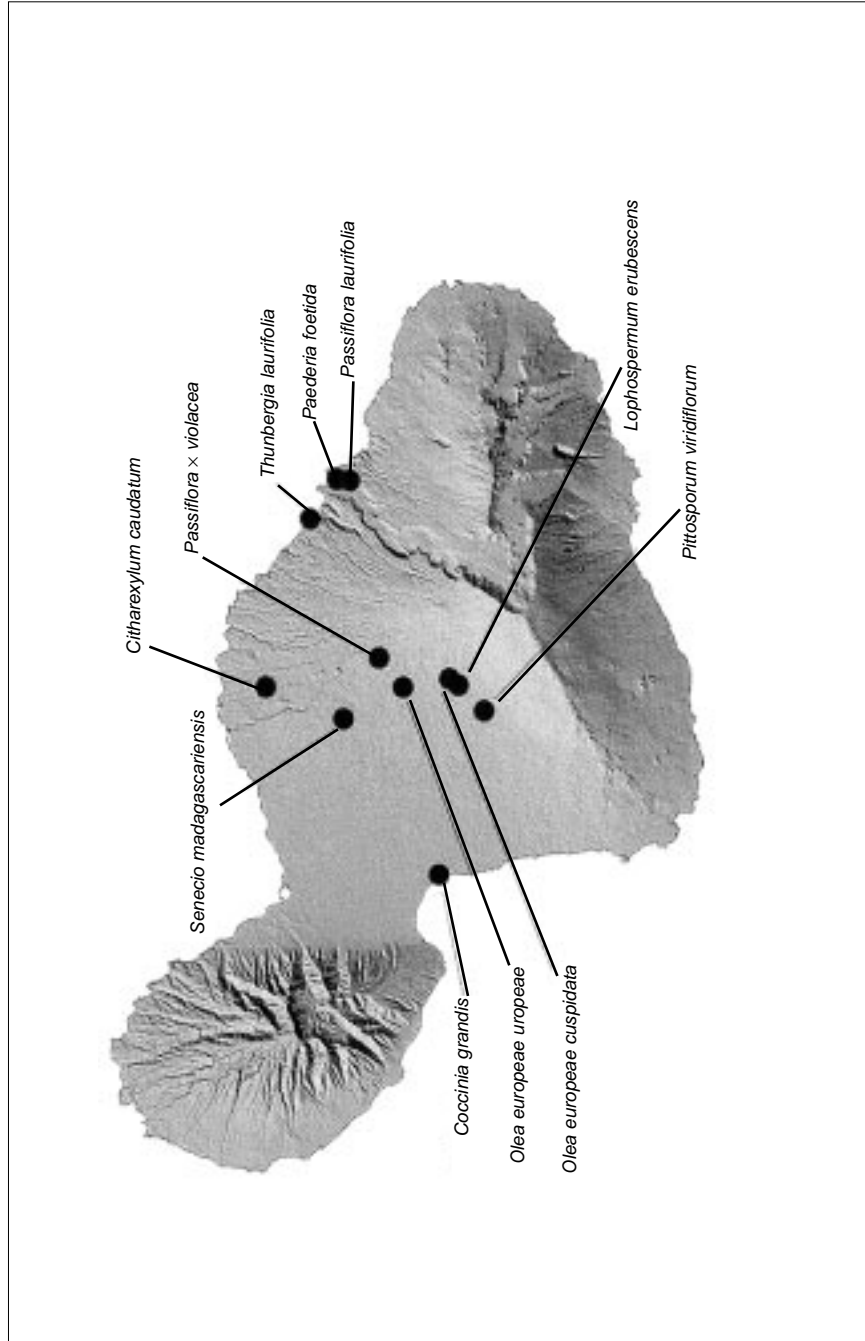
Cucurbitaceae

Coccinia grandis (L.) Voigt

New island record

Native to Africa, Asia, and Australia, *Coccinia grandis*, was previously known from O'ahu and Hawai'i (Wagner *et al.*, 1990: 570) and was first reported from Maui in 1992 by Robert Hobby in Kahului's industrial district (Medeiros *et al.*, 1993: 89). *Coccinia*

1. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.



grandis is established in Kīhei and has also been observed in Waiehu, Waikapū, Makawao, North Kīhei, Lahaina, Ka‘anapali, and Honolulu.

Material examined. MAUI: Wailuku District, East Maui, North Kīhei, at intersection of Konale and Ali‘ilani, 20 ft [6 m], 27 Jan 1998, *Starr & Martz 980127-12*.

Oleaceae

***Olea europaea* L. subsp. *cuspidata* (Wall. Ex G. Don) Ciferri** **New naturalized record**

[*Olea europaea* L. subsp. *africana* (Mill.) P. Green]

Native to the Mediterranean region, Wagner *et al.* (1990: 992–93) reported this subspecies as being “naturalized and becoming a serious pest on Hawai‘i in the vicinity of ‘Āinahou Ranch . . . since the fruit is a food source for game birds and since it is widely cultivated in Hawai‘i, it will presumably become more widely naturalized”. This subspecies was reported as a new island record for Kaua‘i by Lorence *et al.* (1995: 42). The article describes this subspecies as “becoming abundantly naturalized from planted trees”. On Maui, this subspecies has also been widely planted, has escaped from gardens and is naturalized in at least the Kula area.

Material examined. MAUI: Makawao District, East Maui, Kula, Pulehunui, from abandoned lot off side of Haleakalā Hwy., 3640 ft [1110 m], 14 Nov 1997, *Starr & Martz 971114-2*.

Olea europaea* L. subsp. *europaea **New naturalized record**

Cultivated for more than 4000 years (Neal, 1965: 677), this native of the Mediterranean region is reported by Wagner *et al.* (1990: 992–93) as “recently naturalized but spreading rapidly by game birds on Parker Ranch, west of Ke‘āmuku Camp, Hawai‘i”. On Maui, this subspecies has not spread as rapidly as subspecies *cuspidata* (syn. *africana*) but has proliferated beyond original plantings and is naturalizing in the Kula area.

Material examined. MAUI: Makawao District, East Maui, Kula, ‘A‘apueo, Haleakalā Hwy., adjacent to pasture land, 2720 ft [830 m], 17 Aug 1998, *Starr & Martz 980817-1*.

Passifloraceae

***Passiflora laurifolia* L.** **Range extension**

Passiflora laurifolia, a native of Central and South America, is reported by Wagner *et al.* (1990: 1011) from Kaua‘i, O‘ahu, Moloka‘i, and Hawai‘i. Meidell *et al.* (1998: 7) reported *P. laurifolia* from West Maui as a new island record. This collection represents the range extension of *P. laurifolia* to East Maui. The collection was made from a forested thicket of *Hibiscus tiliaceus*, *Psidium guajava*, *Ardisia elliptica*, and *Pandanus tectorius*.

Material examined. MAUI: Hāna District, East Maui, Wailua, Hāna Hwy., Wailua Valley lookout park, 480 ft [145 m], 4 Aug 1998, *Starr & Martz 980807-22*.

***Passiflora* × *violacea* Loisel.** **New island record, name change**

[*Passiflora caerulea* sensu Degener (1934), Wagner *et al.* (1990), non L.]

Passiflora × *violacea* is a hybrid between *P. caerulea* and *P. racemosa*. It is the oldest documented *Passiflora* hybrid (Vanderplank, 1996: 174). Wagner *et al.* (1990: 1010) reported it under the misapplied name *P. × caerulea* as “easily propagated vegetatively, it has persisted since the 1920s on Kaua‘i and O‘ahu”. This collection represents a new island record of this species from Maui and a name change (N. Evenhuis, pers. comm.).

Material examined. MAUI: Makawao District, East Maui, Pi‘iholo Rd., collection made nr. Aloha o ka ‘Āina farms from a vine growing with *Eucalyptus* and *Senecio mikanioides*, 3320 ft [1010 m], 6 Apr 1998, *Starr & Martz 980406-24*.

Pittosporaceae***Pittosporum viridiflorum* Sims****New island record**

Pittosporum viridiflorum, a native of South Africa, is previously known from Hawai'i and Lāna'i (Wagner *et al.*, 1990: 1048). This collection represents a new island record of this species from Maui. It is known only from one abandoned pasture in Kula where it is persisting and spreading along with *Pennisetum clandestinum*, *Passiflora mollissima* and *Myrica faya*.

Material examined. MAUI: Makawao District, East Maui, Kula, Kekaulike Ave., 3250 ft [990 m], 1 May 1998, *Starr & Martz 980506-135*.

Rubiaceae***Paederia foetida* L.****New island record**

[*Paederia scandens* (Lour.) Merr.]

Paederia foetida, a native of Eastern Asia, is previously known from Kaua'i, O'ahu, and Hawai'i where it is naturalized and locally common in disturbed mesic forest, coastal sites, dry forest, and subalpine woodland (Wagner *et al.*, 1990: 1160). This collection represents a new island record of this species from Maui. The collection was made from a vine that was smothering a thicket of *Hibiscus tiliaceus* near Ke'anae School. It has also been observed in the village of Wailua.

Material examined. MAUI: Hāna District, East Maui, Wailua, nr. Ke'anae School, 240 ft [75 m], 7 Aug 1998, *Starr & Martz 980807-12*.

Scrophulariaceae***Lophospermum erubescens* D. Don****New island record**

Wagner *et al.* (1990: 1244) report this native of Mexico from O'ahu and Hawai'i, where it is widely cultivated and sometimes naturalized in dry forest, alien grassland, and shrubland. On Maui, a single population was found by Emil Lynch in Hāpapa Gulch, Kula, Maui. This collection represents a new island record of this species from Maui.

Material examined. MAUI: Makawao District, East Maui, Kaono'ulu, Kula, Hāpapa Gulch, Emil Lynch collector, 3600 ft [1100 m], 4 Apr 1998, *Starr & Martz 980404-22*.

Verbenaceae***Citharexylum caudatum* L.****New island record**

Citharexylum caudatum, a native of Central and South America, is previously known from O'ahu where it is "spreading rapidly via bird dispersal out of Mānoa Valley into the Ko'olau Mountains" (Wagner *et al.*, 1990: 1317). This collection represents a new island record of this species from Maui. It has also been observed near Kōlea Stream on the Hāna Hwy.

Material examined. MAUI: Makawao District, East Maui, Ha'ikū, Pauwela, in bamboo thicket off W. Kuiaha Rd., 720 ft [220 m], 2 Apr 1998, *Starr & Martz 980402-49*.

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New records and range extensions of native Odonata (Coenagrionidae) and introduced aquatic species in the Hawaiian Islands

RONALD A. ENGLUND (Hawaii Biological Survey, Bishop Museum, 1525 Bernice St., Honolulu, Hawai'i 96817-2704, USA; email: englunr@bishopmuseum.org)

The following represent new state and island records of aquatic species for Hawai'i. Voucher specimens are deposited in the Bishop Museum, Honolulu (BPBM), University of Michigan Zoology Museum Collection, Ann Arbor (UMMZ), and the Canadian National Collections of Insects, Arachnids, and Nematodes, Ottawa (CNC).

Odonata: Coenagrionidae

Megalagrion pacificum McLachlan

New island record

Megalagrion pacificum McLachlan was previously known from specimens collected on Kaua'i, O'ahu, Maui, Moloka'i, and Lāna'i Islands. Because of the complete lack of museum specimens or records, and only one reference to the existence of *M. pacificum* on Hawai'i Island, Polhemus & Asquith (1996) described the status of this species occurring on that island as uncertain. Two *M. pacificum* recently discovered in CNC confirm the presence of this species from Hawai'i Island; and a visit to the 1985 collection site confirmed the continued existence of this species on Hawai'i Island. Specimens of *M. pacificum* were collected by D. Hilton, Bishop's University, on 2 days in 1985 (29 and 30 November) in Mā'ili Stream, 512 m, in the area where the rainforest abruptly ends and sugar cane fields began. Mā'ili Stream at this transition zone was low flowing, and was highly degraded with evidence of heavy livestock grazing and trampling of the stream banks (D. Hilton, pers. comm.). In 1985, *M. pacificum* were uncommon, and all speci-

mens were collected in full sun, immediately downstream of the rainforest zone. Other *Megalagrion* vouchers from the CNC collected at the same location on 29 and 30 November 1985, at Mā'ili Stream include *M. blackburni* McLachlan and *M. calliphya* McLachlan. Although no voucher specimens of *M. pacificum* from Hawai'i Island have been found until now, a search of early damselfly records indicates that only Perkins (1899) reported this species from Hawai'i Island. Blackburn (1884) stated he collected *M. pacificum* on Maui and Lāna'i. McLachlan (1883) received his specimens and information from Blackburn.

A revisit to Hilton's 1985 collecting area on 31 December 1998 found *M. pacificum* persisting in a small, impounded tributary of Mā'ili Stream. Two adult *M. pacificum* males were observed, and one was collected in a large, 15 m long by 5 m wide artificial pool formed just before the tributary cascades into Mā'ili Stream. *Megalagrion calliphya* were more common in this area, with at least 15–20 individuals observed, and many captured, during the same time period (1045–1215 hrs). The native dragonfly *Anax strenuus* Hagen was also common, and frequently patrolled the impoundment area. *Megalagrion pacificum* were observed in full sun, perching on *uluhe* fern (*Dicranopteris linearis*) lining the small impoundment but were not observed in the main Mā'ili Stream, possibly due to the presence of at least two species of introduced fish (*Xiphophorus helleri* (Heckel), and *Poecilia reticulata* (Peters)). In 1998, *M. pacificum* were found only in a restricted area of the small tributary above a 10 m high waterfall that flows into Mā'ili Stream. Introduced fish were not present in this tributary. In contrast to 1985, habitat conditions in the both the tributary and stream were good, with no evidence of grazing. Houses are now located near the area where *M. pacificum* was found, and development appears to have displaced cattle grazing in this area.

Although Mā'ili Stream was not surveyed by Polhemus & Asquith (1996), they considered *M. pacificum* extirpated from Hawai'i Island, and their surveys elsewhere failed to locate surviving populations. The discovery of recent *M. pacificum* specimens from Hawai'i Island indicates this species still survives in small, localized populations. A similar situation currently exists with the last O'ahu population of *M. xanthomelas* Selys-Longchamps found in only 95 m of remnant habitat at the Tripler Army Medical Hospital (Englund, 1998; Polhemus, 1996a). Further surveys and conservation efforts are necessary throughout Hawai'i Island to ensure the survival of remnant populations of *M. pacificum*, a candidate endangered species. This species has apparently been extirpated from Kaua'i, O'ahu, and Lāna'i, and is now restricted to a few remote streams on Maui and Moloka'i, with only one location presently known from Hawai'i Island.

Material examined. **HAWAII:** 1♂, 1♀, Mā'ili Stream, 8 km west of Kaiwiki, 512 m, D. Hilton, 29 and 30.xi.1985 (CNC). 1♂, Mā'ili Stream tributary, end of paved Kaiwiki Road, 512 m, R. Englund & D.S.K. Kanewa, 31.xii.1998 (BPBM).

Odonata: Libellulidae

***Orthemis ferruginea* Fabricius**

New island records

First collected at Hale'iwa, O'ahu, in 1977 (Beardsley, 1980), *Orthemis ferruginea* Fabricius now appears to be established throughout the Hawaiian Archipelago. In 1998, specimens were collected and observed along the north shore of Moloka'i in ephemeral wetlands of an old fishpond adjacent to the Kalaupapa Airport, and in the lowest coastal portions of Wailau and Pelekunu Stream. On Moloka'i, this species was observed only in still-water habitats near the ocean. *Orthemis ferruginea* is also now established on Lāna'i, Maui and Hawai'i Islands. In 1994, this species was observed at the mouth of Pololū

Valley, Hawai'i Island, near sea level (Polhemus, 1995). In 1996 and 1997 this species was found at 120 m and lower elevations of Waipi'o River, Hawai'i Island (Englund & Filbert, 1997), and a female was collected by RAE at 210 m elevation in Waipi'o River at the junction of Alakahi and Kawainui tributaries in December 1998. Although capture attempts were unsuccessful on Maui, *O. ferruginea* was observed by R. Englund & R. Filbert (unpubl.) at Māliko Stream near sea level in 1996. Polhemus & Preston (1995) also observed *O. ferruginea* in West Maui along the Spreckels Ditch, 107 m, in 1995.

A search of the Bishop Museum collection located only one specimen from an island other than O'ahu: a single *O. ferruginea* captured in 1995 on Lāna'i by D.A. Polhemus. Prior to this, Nishida (1997) had recorded this species from Kaua'i and O'ahu. The distribution of *O. ferruginea* overlaps with that of several native species of Odonata, including the native dragonfly *Anax junius* Drury, and several critically rare Hawaiian damselflies such as *Megalagrion pacificum* and *M. xanthomelas*, posing an opportunity for negative interactions.

Material examined. **MOLOKA'I:** (BPBM). 1 male, Kalaupapa fishpond wetlands near airport, sea level, (R.A. Englund & W. Puleloa), 17.i.1998; **LĀNA'I:** (BPBM). 1 male, The Experience at Kō'ele Golf Course ponds, near Lāna'i City, 580 m, 27.iv.1995, (D.A. Polhemus, D.J. Preston, A. Asquith); **HAWAI'I:** (BPBM). 1 female, Waipi'o River at junction of Kawainui and 'Alakahi tributaries, 210 m, (R.A. Englund), 11.xii.1998. —**Ron Englund & William Puleloa**

Diptera: Tipulidae

***Limonia advena* Alexander**

New island records

First described from Honolulu, O'ahu, in 1952 (Hardy, 1960), *Limonia advena* Alexander was previously recorded from Kaua'i, O'ahu, and Maui (Nishida, 1997). This species occurs throughout the Hawaiian Archipelago, and was collected from 1996 to 1998 around seeps and adjacent to riffle habitats in streams on Moloka'i and Hawai'i. On the north shore of Moloka'i, *Limonia advena* were collected from 43–335 m in Waikolu, Wailau, and Wai'ale'ia Streams. In 1997, this species was collected between 107 and 347 m in Hi'ilawe, Koi'awe, Alakahi, and Kawainui Streams, all tributaries of Waipi'o River, Hawai'i (Englund & Filbert, 1997).

Material examined. **MOLOKA'I:** (BPBM). 2 females, Wailau Stream, 43 m, 18 Jul 1998, (R.A. Englund, W. Puleloa, S. Jordan); 1 female, Wai'ale'ia Stream (Kalaupapa National Historic Park), 76 m, 17 Jan 1998, (R.A. Englund, W. Puleloa); **HAWAI'I:** (BPBM). 2 males, Hi'ilawe Stream, 107 m, 2 Dec 1997, (R.A. Englund, P. Hart); 2 males, 1 female, Ko'iawe Stream, 1 Nov 1996, 292 m, (R.A. Englund, R.B. Filbert); 1 male, 1 female, Alakahi Stream, 238 m, 31 Oct 1996, (R.A. Englund, R.B. Filbert); 1 male, 347 m, 30 Oct 1996, (R.A. Englund, R.B. Filbert). —**Ron Englund & William Puleloa**

Heteroptera: Notonectidae

***Anisops kuroiwae* Matsumura**

New island record

A new island record was established for an aquatic backswimmer insect, *Anisops kuroiwae* Matsumura, found in Kauhakō Crater, Moloka'i and ephemeral wetlands in old fishponds near the Kalaupapa Airport within the Kalaupapa National Historic Park. *Anisops kuroiwae* is apparently saline tolerant, as it was common in the Kauhako Crater lake. Salinity was measured at 8 ppt in Kauhakō Crater when *A. kuroiwae* was collected, while the fishpond wetlands near the Kalaupapa Airport contained freshwater. These introduced backswimmers were previously known from Lāna'i and Maui (Polhemus 1996b).

Material examined. **MOLOKA'I:** (BPBM). Many males and females, Kalaupapa fishpond

wetlands near airport, Kalaupapa National Historic Park, sea level, (R.A. Englund, W. Puleloa), 17 Jan 1998; Kauhakō Crater (BPBM), sea level, many males and females, 16 Jan 1998, (R.A. Englund, W. Puleloa).
—Ron Englund & William Puleloa

Hirudinea: Glossiphoniidae

Placobdelloides bdellae (Ingram)

New state record

This collection represents a new state record for an introduced freshwater leech. Individuals were obtained from a water lily planter in a residential area of Princeville, Kaua'i. The source of the water lily planter and disposition of the planter contents is unknown.

Placobdelloides bdellae was described from Tasmania, Australia with the type specimen collected from the buccal cavity of lampreys. Leech species in this genus have been shown to transmit blood parasites (Siddall & Desser, 1991; Siddall & Desser, 1992), and also are carnivorous parasites of fish, frogs, and turtles, and have occasionally been reported to take a blood meal from humans (Pennak, 1989). If established in Hawaiian freshwater habitats, this species could have potentially detrimental effects on native aquatic invertebrates and vertebrates (Mann, 1962).

Material examined. KAUA'I: (BPBM, UMMZ). Princeville residential area, in lily planter, 5 spms, D. Jamieson & K. Ciabattani (det. by Mark Siddall). —Ron Englund & Mark Siddall

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New arthropod records for Kaua'i

DEAN W. JAMIESON⁴ (National Tropical Botanical Garden, P.O. Box 340, Lawa'i, Hawai'i 96765, USA; email: djamie@hgea.org)

This paper lists 44 new island records for Kaua'i. These contributions include new island records noted since the publication of Nishida (1997). Unless otherwise noted, new records are represented by voucher specimens deposited in the Bishop Museum and identified by the author (DWJ). Other specimens are in Hawaii State Department of Agriculture, Honolulu (HDOA).

Blattodea: Blaberidae

Nauphoeta cinerea (Olivier)

New island record

Commonly called the Cinereous Cockroach, this species has been recorded as being found in dwellings and other structures. It has not been found to do so on Kaua'i, where it is only rarely encountered.

Material examined. **KAUA'I**: Hanapēpē, 14 Apr 1989 (DWJ), 1 female.

Blattodea: Blattellidae

Balta sp.

New island record

First reported from O'ahu by Strazanac (1993), this cockroach was noted emerging in large numbers from a nearly mature sugar cane field adjacent to a residential area in

4. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.

Coleoptera: Tenebrionidae***Amarygmus morio*** (Fabricius)**New island record**

This darkling beetle has previously been recorded from O'ahu and Hawai'i. Specimens from Kaua'i were found in the yard of a home.

Material examined. KAUA'I: 'Ōma'o, 22 Oct 1994 (Nohea Tachera), 1 spm; 8 Jan 1995 (Nohea Tachera), 2 spms.

Diaperis maculatus Olivier**New island record**

These beetles were excavated from bract fungi found growing in the same pine forest where the zorapteran, *Zorotypus swezeyi*, can be found in decaying logs.

Material examined. KAUA'I: Mākaha Ridge, Koke'e, 16 Jul 1993 (DWJ), 7 spms.

Dermaptera: Chelisodochidae***Hamaxus nigrorufus*** (Burr)**New island record**

This earwig was previously known only from the island of Hawai'i.

Material examined. KAUA'I: Wailua, 27 January 1993 (DWJ), 1 spm; 'Ōma'o, 20 August 1993 (DWJ), 1 spm.

Diptera: Asteidae***Loewinyia orbiculata*** Hardy**New island record**

These rare flies were found sweeping grasses and low vegetation. The collecting site is a small natural area bordered by sugar cane fields and the Pacific Missile Range Facility. The site is several acres in size and has been the source of other interesting finds including the endemic *Oecharia* (Pentatomidae).

Material examined. KAUA'I: Mana, 17 Jan 1996 (DWJ), 2 spms.

Diptera: Culicidae***Wyeomyia mitchelli*** (Theobald)**New island record**

I first discovered this tiny mosquito in the native plant nursery at the National Tropical Botanical Garden in Lawa'i. A search of nearby bromeliads revealed larvae and more adults. This mosquito has since been found in 'Ōma'o and other locations in Lawa'i. It is known as the bromeliad mosquito and has the unusual behavior of carrying its hind legs over its body while in flight. It is a day-time biter.

Material examined. KAUA'I: 'Ōma'o, 20 Nov 1993 (D.W.Jamieson), 2 spms; Lawa'i, 3 Oct 1995 (DWJ), 3 spms.

Diptera: Micropezidae***Taeniaptera angulata*** (Loew)**New island record**

The first specimen was collected on an interior window at the National Tropical Botanical Gardens in Lawa'i by Dr. David Lorence. I began seeing it shortly afterwards and for some reason it seems drawn to the interior of structures. I have seen and collected it on more than one occasion in the rainforests at about 3800 ft in Koke'e. While at rest it assumes a spider like appearance, holding its pictured wings straight back over the abdomen.

Material examined. KAUA'I: Lawa'i, 10 Nov 1994 (D.H. Lorence), 1 spm; 'Ōma'o, 22 May 1995 (DWJ), 1 spm; 30 Jul 1995 (DWJ), 1 spm; 19 Dec 1995 (DWJ), 1 spm; 20 Feb 1996 (DWJ), 1 spm; Kumuwela Rd., Koke'e, 23 Aug 1995 (DWJ), 1 spm.

Diptera: Stratiomyidae***Exaireta spinigera* (Wiedemann) New island record**

This large soldier fly can be recognized by the wings which are smoky on the apical half. At rest it holds its wings over the abdomen and appears wasp-like.

Material examined. **KAUA'I:** Koke'e, 10 May 1987 (DWJ), 1 spm; Wahiawa Bog, 15 Sep 1993 (DWJ), 1 spm.

***Wallacea albisetia* Meijere New island record**

This adventive species of soldier fly was previously known only from the island of O'ahu.

Material examined. **KAUA'I:** Makaha Ridge, Koke'e, 11 Oct 1993 (DWJ), 1 spm.

Hemiptera: Aradidae***Mezira membranacea* (Fabricius) New island record**

The first record of this aradid on Kaua'i resulted from examination of the loose bark of the 'ōhi'a tree, *Metrosideros polymorpha*. The second specimen was found in a spider web in the Allerton Section of the National Tropical Botanical Garden in Lawa'i. The second specimen was submitted for further examination, and I have only a written record of its existence.

Material examined. **KAUA'I:** Nualolo Trail, Koke'e, 5 Sep 1992 (DWJ), 1 spm; Lawa'i, 1995 (D.W.Jamieson), 1 spm.

Heteroptera: Cimicidae***Cimex lectularius* Linnaeus New island record**

Hotel guests reported that bedbugs were infesting a room where they were staying. One or another of the previous occupants presumably carried an infestation with them. This infestation was treated and abated.

Material examined. **KAUA'I:** Lihu'e, 13 Aug 1996 (DWJ), 3 spms.

Heteroptera: Notonectidae***Notonecta indica* Linnaeus New island record**

This specimen was found swimming in an ornamental pool in the Allerton Section of the National Tropical Botanical Garden in Lawa'i.

Material examined. **KAUA'I:** Lawa'i, 28 Mar 1993 (DWJ), 1 spm.

Heteroptera: Pentatomidae***Eysarcoris ventralis* (Westwood,) New island record**

This stink bug was previously recorded from O'ahu.

Material examined. **KAUA'I:** 'Ōma'o, May 1991 (DWJ), 1 spm; 14 Oct 1993 (DWJ), 1 spm; 5 May 1995 (DWJ), 2 spms.

Heteroptera: Rhopalidae***Niesthra louisianica* Sailer New island record**

This insect occurred in a drainage ditch near Vidinha Stadium in Lihu'e. The infestation was found while surveying for other insects. A number of host plants in the Malvaceae, including *Abutilon*, *Hibiscus*, and *Sida* have been recorded by HDOA for this pest.

Material examined. **KAUA'I:** Lihu'e, 29 Jan 1996 (DWJ), 12 spms; 3 May 1996 (DW J), 1 spm; Po'ipū, 12 Feb 1996 (DWJ), 3 spms.

Heteroptera: Reduviidae

Ectomocoris biguttulus Stål **New island record**

Specimens of this reduviid bug were collected at the UV light operated by the State Department of Agriculture at their office adjacent to Pua Loke Park. The species has previously been recorded from O'ahu.

Material examined. **KAUA'I:** Lihu'e, 1993 (L.Ishii), 1 spm.

Haematoloecha rubescens Distant **New island record**

This reduviid bug has become common on Kaua'i where it can be found at both low and high elevations. This species was previously known from O'ahu.

Material examined. **KAUA'I:** Kōloa, 18 Apr 1987 (DWJ), 1 spm; Pihea Trail, Koke'e, 7 May 1987 (DWJ), 1 spm; Nā Pali Coast, 13 Feb 1988 (DWJ), 1 spm; Makaleha Mts, 16 Apr 1993 (D.H. Lorence), 1 spm.

Homoptera: Coccidae

Saisettia oleae (Olivier) **New island record**

I have occasionally found specimens of black scale on red ginger, *Alpinia purpurata*, in the backyard of my home during the past couple of years. The female scales appear singly on older stems. I have recently found a single specimen on *Dodonaea viscosa* in the area of the Hunter Check-in Station at Koke'e.

Material examined. **KAUA'I:** 'Ōma'o, 9 Jul 1997 (DWJ), 1 female; Koke'e State Park, 29 Oct 1998 (DWJ), 1 female.

Hymenoptera: Vespidae

Delta campaniforme campaniforme (Fabricius) **New island record**

This species has previously been recorded from all the other major Hawaiian Islands.

Material examined. **KAUA'I:** Lihu'e, 20 Apr 1987 (DWJ), 1 spm; Makaweli, 27 Oct 1988 (DWJ), 1 spm.

Polistes aurifer Saussure **New island record**

This paper wasp is fairly common in many of the residential areas around Kaua'i.

Material examined. **KAUA'I:** Makaweli, 17 Mar 1987 (DWJ), 1 spm; 'Ōma'o, 7 Aug 1988 (DWJ), 1 spm.

Lepidoptera: Geometridae

Disclisioprocta stellata Guinée **New island record**

The three specimens of the Bougainvillea caterpillar from 'Ōma'o were reared from larvae on *Bougainvillea*. This species has become widespread on Kaua'i, but damage seems to be limited only to certain varieties of *Bougainvillea*.

Material examined. **KAUA'I:** Laha'i, 25 Jan 1995 (C.L. Campbell); 'Ōma'o, 21 Feb 1995 (DWJ), 3 spms.

Lepidoptera: Sphingidae

Hyles lineata (Fabricius) **New island record**

The original specimens of the white-lined sphinx were collected both as larvae and adults by Nohea Tachera in 1995 at both Hanapēpē and Poipu. Specimens of this species

were submitted at that time but have not been formally recorded until now.

Material examined. **KAUA'I:** Poipu, 31 Jan 1998 (D.V. Boucher), 3 spms.

Lepidoptera: Tineidae

***Opogona purpuricella* Swezey**

New island record

Adults of this species of *Opogona* are occasionally seen but are often difficult to collect. The series from Lawa'i was reared.

Material examined. **KAUA'I:** Līhu'e, 17 Nov 1988 (DWJ), 1 spm; Lawa'i, 19 Apr 1993 (DWJ), 11 spms.

Mantodea: Mantidae

***Orthodera burmeisteri* Wood-Mason**

New island record

These specimens were collected as mantid species have become increasingly uncommon on Kaua'i, possibly due in part to predation by the introduced cattle egret.

Material examined. **KAUA'I:** 'Ōma'o, 1989 (DWJ), 1 spm; Wahiawa Bog, 15 Oct 1993 (DWJ), 1 spm.

Neuroptera: Coniopterygidae

***Coniocmpsa zimmermani* Kimmins**

New island record

My first collection of this species occurred when it came to black light. The second was found in a mosquito light trap.

Material examined. **KAUA'I:** Makaweli, 17 Apr 1987 (DWJ), 1 spm; Waimea, 23 Jul 1996 (DWJ), 1 spm.

Strepsiptera: Stylopidae

***Xenos auriferi* Pierce**

New island record

This strepsipteran was found parasitizing *Polistes olivaceus*.

Material examined. **KAUA'I:** Līhu'e, 8 Sep 1993 (DWJ), 1 spm.

Thysanura: Nicoletiidae

***Nicoletia phytophila* Gervais**

New island record

This little thysanuran myrmecophile can be found almost anywhere on the island in the nests of the big-headed ant, *Pheidole megacephala*. It is commonly accompanied by the gryllid cricket, *Myrmecophila* sp.

Material examined. **KAUA'I:** Lawa'i, 1 Nov 1995 (DWJ), 1 spm.

Class Arachnida

Scorpiones: Buthidae

***Isometricus maculatus* (DeGeer)**

New island record

This scorpion is common on the drier side of the island from Kōloa and Poipu to Waimea.

Material examined. **KAUA'I:** Hanapēpē, 15 Aug 1992 (DWJ), 2 spms.

Class Chilopoda

Scolopendromorpha: Scolopendridae

***Scolopendra subspinipes* Leach**

New island record

This centipede is common throughout much of the lowlands of Kaua'i and frequently invades homes. Attacks on humans are not uncommon.

Material examined. **KAUAI:** Hanapēpē, 13 Oct 1998 (B.A. Freitas, DWJ, N.R. Murray), 5 spms.

Acknowledgments

I express my appreciation to Bernarr Kumashiro, Hawaii State Department of Agriculture, and to Gordon Nishida, Bishop Museum, for their courteous assistance in making their collections available to the author. I would also like to thank Ron Englund, Bishop Museum for his encouragement in the preparation of this manuscript.

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New island record of *Carposina nigronotata* Walsingham on Maui (Lepidoptera: Carposinidae)

KIM MARTZ, FOREST STARR & ARTHUR C. MEDEIROS⁵ (United States Geological Survey - Biological Resources Division, P.O. Box 369, Makawao, Hawai'i 96768, USA)

The following represents a new island record of *Carposina nigronotata* for Maui. Voucher specimens are housed in the Bishop Museum (BPBM), Honolulu.

Lepidoptera: Carposinidae

Carposina nigronotata Walsingham

New island record

Carposina nigronotata is previously known from Hawai'i Island (Nishida, 1997: 151) with specimens collected from Ola'a and Mt. Kilauea (Zimmerman, 1978: 871). The following collection represents a new island record of this species from Maui. Moths were reared from *Myrsine lessertiana* A. DC fruit collected on 5 December 1997 from Auwahi, Maui. Moths began emerging on 25 December 1997 and continued to emerge until 9 February 1998. Approximately 157 moths emerged during that time. Moth emergence was observed to predate the seeds of the fruits. Parasitic wasps, identified as *Pristomerus hawaiiensis* Perkins, began to emerge from moth pupal cases on 1 January 1998 and continued to emerge until 9 February 1998. Approximately 36 wasps emerged during that time. Out of approximately 1,554 seeds collected, approximately 630 seeds had visible exit holes. Specimens of moths and parasitic wasps were submitted to Bishop Museum where David Preston made the determination.

Material examined. **MAUI:** Hāna District, Auwahi, 3800 ft [1160 m], collected ca. 100 m southwest of the southwestern corner of the Po'ouli enclosure, reared ex fruit of *Myrsine lessertiana*, 5 Dec 1997, Starr and Martz 971205-1 (BPBM)

Acknowledgments

We thank the staff of Hawaii Biological Survey particularly David Preston for his valuable assistance with the handling and verification of the specimen. We also thank Betsy Gagné for assisting in determination.

5. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.

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Notable rediscoveries of *Megalagrion* species on Maui (Odonata: Coenagrionidae)

DAN A. POLHEMUS⁶ (Dept. of Entomology, MRC 105, Smithsonian Institution, Washington, D.C. 20560, USA; email: bugman@bpbm.org), HANK OPPENHEIMER (Maui Pineapple Co., Ltd., Honolulu Division, Pu'u Kukui Watershed Dept., 4900 Honoapi'ilani Hwy., Lahaina, Hawai'i, 96761, USA), FOREST STARR & KIM MARTZ (3572 Baldwin Ave., Makawao, Hawai'i, 96788, USA)

Among the species of endemic *Megalagrion* damselflies in Hawai'i, particular concern in recent years has centered on the fate of two taxa, *M. pacificum* (McLachlan) and *M. xanthomelas* (Selys-Longchamps), which formerly occupied lowland habitats throughout the state. Based on surveys conducted in the early 1990s, the former species was known to occur only as scattered populations on the windward flanks of Haleakalā and eastern Moloka'i, while a distributional review of the latter species by Polhemus (1996) noted that it had not been taken on the island of Maui in this century. It is therefore significant that additional colonies of both these species have been located on Maui during the past two years; these records are reported below.

Voucher specimens are housed in the Bishop Museum, Honolulu (BPBM).

Megalagrion pacificum* (McLachlan)*Notable rediscovery**

Although colonies of this species are scattered along the Hāna Coast of eastern Maui, there have been no records of *M. pacificum* from the West Maui Mountains since 1902, when R.C.L. Perkins took a short series in 'Īao Valley (BPBM collection database). In early 1998, however, one of us (Oppenheimer) located a population in the middle reaches of Honokohau Valley, a narrow, deeply incised canyon that cuts nearly to the center of the West Maui volcano (Fig. 1). Subsequently, a second population was located along the midreach of Honolua Valley, further to the west. The presence of these colonies indicates that additional populations may exist in other remote West Maui catchments, such as Kahakuloa Stream or the upper reaches of the Waihe'e River.

Material examined. MAUI: 1, West Maui Mountains, Honokohau Stream, below dam and ditch house, 250 m [820 ft], 17 Mar 1998, H. Oppenheimer (BPBM); 1, West Maui Mountains, Honolua Valley, above dam, 275 m [900 ft], 10 Jul 1998, H. Oppenheimer & S. Meidell (BPBM).

Megalagrion xanthomelas* (Selys)*Notable rediscovery**

The only previous records of *M. xanthomelas* on Maui were a few specimens taken by Perkins in the "West Maui Mountains" in 1894 and 1895, probably at or near 'Īao Valley. Surveys of suitable lowland habitats on Maui between 1991 and 1996 did not locate the species, leading Polhemus (1996) to speculate that it might have been extirpated on the island. This conjecture was disproven in 1997, when two of us (Starr & Martz)

6. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.

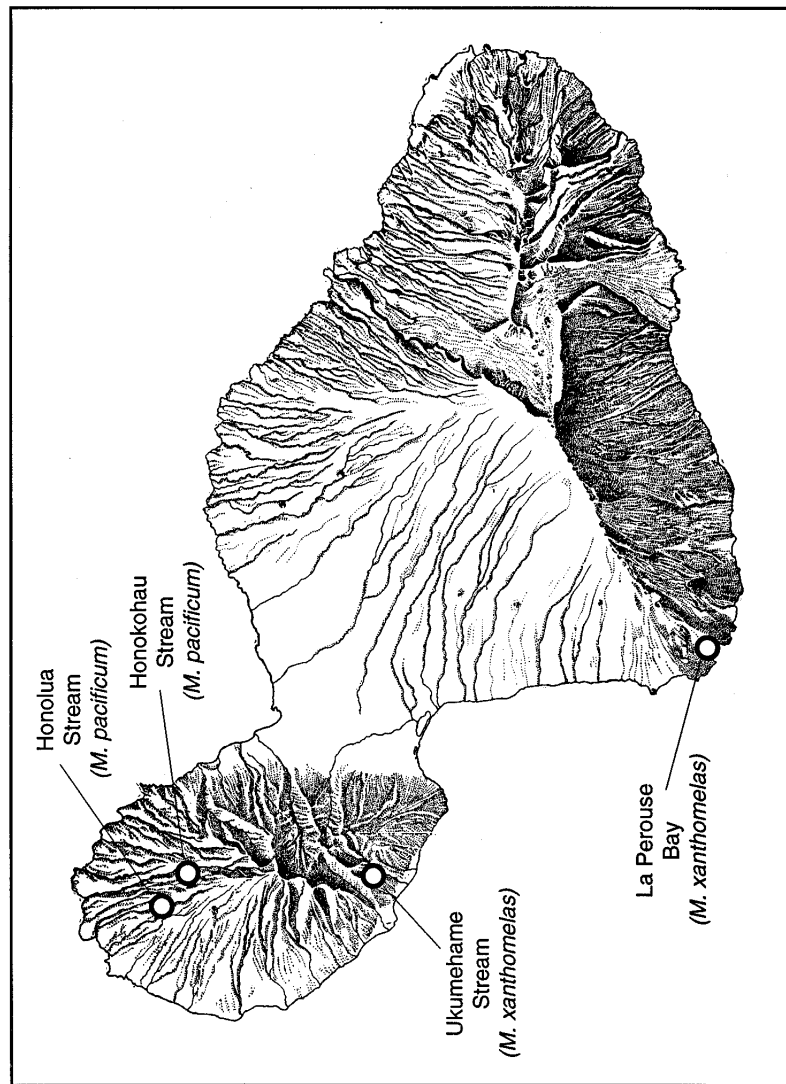


Fig. 1. Map of Maui showing collection locations of *Megalagrion* spp. discussed in the text.

located populations at separate sites on the leeward sides of both the West Maui Mountains and Haleakalā.

The first specimen was taken at a native plant enclosure upslope from La Perouse Bay in February 1997. A subsequent visit to this site in January 1998 revealed that the species was breeding further downslope, in anchialine ponds near the La Perouse light-house. This habitat is similar to that recorded for the species on the Kona Coast of Hawai‘i Island by Polhemus (1996). The West Maui specimen was captured along the midreach of Ukumehame Stream, in the deep canyon downstream of its bowl-like upper valley.

Despite these discoveries, it is clear that *M. xanthomelas* remains highly localized on Maui, and must be considered a rare and potentially threatened insect species on the island.

Material examined. MAUI. 1, native plant enclosure upslope of La Perouse Bay, 55 m. (180 ft), 8 Feb 1997, F. Starr & K. Martz (BPBM); 1, West Maui Mountains, Ukumehame Stream, 120 m. (400 ft), 23 Feb 1997, F. Starr & K. Martz (BPBM).

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Cassida circumdata Herbst established in the Hawaiian Islands (Coleoptera: Chrysomelidae)

G.A. SAMUELSON (Department of Natural Sciences, Bishop Museum, Honolulu, Hawai‘i 96817-2704, USA; email: alsam@bishopmuseum.org), BERNARR KUMASHIRO (Hawaii State Department of Agriculture, 1428 South King Street, Honolulu, Hawai‘i 96814, USA), & D.W. JAMIESON⁷ (National Tropical Botanical Garden, Lawa‘i, Hawai‘i 96765, USA; email: djamie@hgea.org).

In 1994, the Hawaii State Department of Agriculture (via Kumashiro) sent specimens of a *Cassida* species to Samuelson at Bishop Museum for identification. All specimens were from the Waimānalo area, O‘ahu and were keyed by Samuelson to *Cassida papuana* (Spaeth) in Borowiec (1990), but they also compared with some question to *C. circumdata* Herbst (the latter was not included in the Borowiec key). The Waimānalo specimens also varied to some extent (discussed below). Specimens from this series were then sent to Lech Borowiec, who identified it as *Cassida circumdata* Herbst, 1790. In 1998, specimens collected on Kaua‘i by Jamieson were sent to Samuelson for confirmation. The Oahu records were initially reported by Kumashiro in Hawaii Department of Agriculture Plant Pest Control (PPC) Branch reports: “PPC Highlights” for March 1994 and again for September 1994. We felt, however, that these records should be formally published here. This, too, would also provide a basis for Jamieson’s new records for Kaua‘i.

Voucher specimens are deposited in Hawaii State Department of Agriculture, Honolulu (HDOA) and Bishop Museum, Honolulu (BPBM).

Cassida circumdata Herbst New state record

Cassida circumdata Herbst, 1790, *Natursyst. Kaf.* 8: 268, pl. 132, fig. 11.

Cassida trivittata Fabricius, 1801, *Syst. Eleuth.* 1: 397.

Metriora circumdata: Weise, 1901, *Dtsch. Entomol. Z.* 1901: 53.

7. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai‘i 96817-2704, USA.

Cassida (Taiwania) circumdata: Gressitt, 1952, *Proc. Cal. Acad. Sci.* (4) 27(17): 489, pls. 28, 36; 1955, *Insects Micronesia* 17(1): 58, fig. 18. Gressitt & Kimoto, 1963, *Pac. Insects Mon.* 1B: 970, fig. 276b. A more complete synonymy is given in Gressitt & Kimoto (1963).

Distribution. Sri Lanka and India to SE Asia and S China, Indonesia, Philippines, Taiwan, Japan, Micronesia (Guam, Palau, Chuuk), and now Hawai'i (O'ahu, Kaua'i).

Material examined. **O'AHU**: Waimānalo Experiment Station, 4 Apr 1994, ex eggs on sweet potato leaves (R. Heu & W. Nagamine), ca. 6 larvae in EtOH (HDOA); Waimānalo, Soukaseum Farm, 7 Apr 1994, ex edible *Ipomoea* leaves (R. Heu & G. Uchida), 5 specimens (HDOA); ditto (BPBM), 1 specimen; Waimānalo, G. Hamachi Farm, 7 Apr 1994, ex sweet potato leaves (R. Heu & G. Uchida), 4 specimens (HDOA); ditto (BPBM), 1 specimen; same data, except (R. Heu), ca. 15 larvae in EtOH (HDOA); same data except 14 Apr (R. Heu & P. Watanabe), 20 specimens (including 4 pair en copulo) and ca. 10 larvae in EtOH (HDOA); Honolulu: Pawa'a (HDOA facility), 18 Apr 1994, laboratory reared on sweet potato leaves (W. Nagamine), 15 specimens, ca. 15 larvae in EtOH (HDOA); ditto (BPBM), 4 specimens; Kailua, Kapa'a Quarry Road, ex morning glory flower (R. Heu & M. Chun), 2 specimens (HDOA); **KAUA'I**: Lawa'i, National Tropical Botanical Garden, 18 Jun 1998, on *Ipomoea batatas* (D.W. Jamieson), 4 specimens (BPBM), 16 (Jamieson).

Plant hosts: Records show a number of species of *Ipomoea*, including *I. batatas* (L.) Lam., the sweet potato, and *I. triloba* L. Jamieson adds, "I found a single specimen on a leaf of the common weed, *Ipomoea triloba*, while doing nighttime pollination studies in the Lawai area in January 1998. No additional activity was noted until what appeared as a second generation in the following June. At that time the beetles and larvae were also found attacking the sweet potato, *Ipomoea batatas*, as well as *I. triloba*. So far, the damage has not been extensive. Overlapping generations are now occurring. Specimens have been seen in both Koloa and Lawai."

Diagnosis. The subovate-circular outline of this beetle (body length 4.55–5.30 mm; breadth 3.9–4.3 mm), along with its strongly explanate margins and its remarkable coloration (liquid greenish gold in living specimens fading to yellow-testaceous with blackish irregular stripes) easily separate it from other Chrysomelidae found in the islands. The larva is a leaf-surface feeder on its plant host and it carries a "parasol" of previous larval exuviae together with feces over its "back"; this arrangement is attached to the spinose caudal process of the abdomen, which is carried up and forward over the body.

Remarks. Coloration and body form appears rather stable in many species of *Cassida* from Pacific islands, as treated by Borowiec (1990). However, *C. circumdata*, not treated in that work, is quite variable. Because of variation noted in *C. circumdata* from the Pacific and Asia, we had thought it appropriate to send Hawaiian material to Borowiec for identification. The black markings on the pronotum may be present or absent; the median elytral stripe is usually confined to the basal half and is usually weaker than the sublateral stripe, which on the elytra together appear more or less U-shaped, joined at the suture preapically and open on each side anteriorly. In some parts of continental Asia the elytral disc can be largely darkened with various degrees of pale spotting; but a few specimens with hardly any dark at all can usually be found. In Hawaiian specimens (so far as noted) the O'ahu ones tend to have a black pronotal mark, while the Kaua'i ones tend to lack it. O'ahu specimens differ from many "average" specimens of Asian and W Pacific populations by having the body form very slightly more elliptical and the dark areas rather cleanly delimited from surrounding pale areas; Kaua'i specimens tend to have the dark elytral marking thinner and have the pronotum completely pale.

Acknowledgments

We thank Lech Borowiec of the Zoological Institute, Wrocław University, Wrocław, Poland for providing the definitive identification.

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New insect records from Maui

RAINA L. TAKUMI (Haleakalā National Park, P.O. Box 369, Makawao, Hawai‘i 96768, USA)

Haleakalā National Park comprises about 11,730 ha on Haleakalā volcano on the east side of Maui Island and ranges in elevation from sea level at ‘Ohe‘o to 3055 m at the summit. Insects for the Park voucher collection have been collected opportunistically from 1996 to present, mostly on the NW slope and within Haleakalā Crater (Haleakalā National Park Crater District) but also at other localities around the island. The following lists new state or island records from the island of Maui. All specimens are vouchered at Haleakalā National Park (HALE) except where indicated at Bishop Museum (BPBM). Specimens were determined by the author except where indicated.

COLEOPTERA**Coccinellidae**

Serangium maculigerum Blackburn **New island record**

Introduced as a biocontrol for whitefly, this species was previously recorded from O‘ahu only (Nishida, 1997). The three specimens below were identified by G.A. Samuelson (BPBM).

Material examined. MAUI: Waikamoi, Maile Trail, 1341–1524 m, 30 Dec 1996, R. Takumi.

Cucujidae

Cryptomorpha desjardinsi (Guérin-Méneville) **New island record**

This species is widely distributed across the state and recorded from Nihoa, Kaua‘i, O‘ahu, Moloka‘i, Lāna‘i, Hawai‘i, Kure, Pearl, and Laysan (Nishida, 1997) but not yet from Maui. Four specimens were collected between 500–1180 m on Haleakalā.

Material examined. MAUI: Haleakalā Natl. Pk., Kaupō Gap, 1180 m, 9 Jul 1997, R. Takumi; Kula, 945 m, 26 Jan 1997, P. Welton; Makawao, 4 Apr 1998, R. Takumi.

Dermestidae

Dermestes frischii Kugelann

New island record

This species was previously recorded from O‘ahu and Nihoa (Nishida, 1997). Thirteen specimens (7 females, 6 males) were collected from various localities in the Crater District and Haleakalā Observatories on the summit of Haleakalā; specimens were identified by G. A. Samuelson (BPBM).

Material Examined. MAUI: Haleakalā, Lure Obs., 3018 m, 12 Jun 1996, R. Takumi, ex. old cat/dog food (BPBM; HALE); Haleakalā Natl. Park: Crater rim, 2740 m, 22 May 1996, R. Takumi, ex. old cat/dog food (BPBM); La‘ie flats, 2010 m, 13 May 1998, R. Takumi, ex. dead cat (HALE);

Palikū, 1950 m, 7 Jan 1998, R. Takumi (HALE); Visitor Center, 2970 m, 2 Jul 1996, R. Takumi (BPBM; HALE); nr. Visitor Center, 2850 m, 3 Jul 1996, R. Takumi (HALE).

DIPTERA

Dolichopodidae

Dolichopus exsul Aldrich

New island record

This species originally described from O'ahu was reported as common on all the islands by Hardy & Kohn (1964), but only on Kaua'i, O'ahu, Moloka'i, and Hawai'i by Nishida (1997). Within Haleakalā Crater, it is common at Palikū, especially on 'akala (*Rubus hawaiiensis*) near the cabins. Twenty-five specimens (10 males, 15 females) were collected, and 3 specimens were found in the Haleakalā USGS Research Division's collection.

Material examined. MAUI: Haleakalā Crater, Palikū, 1850 m, 27 May 1998, R. Takumi; Palikū, 1950 m, 30 Jun 1998, R. Takumi; Palikū, 1950 m, 1 Jul 1998, R. Takumi; Palikū, 1950 m, 23 Jul 1998, R. Takumi; Kīpahulu, 6 Jul 1970, E.H. Bryan, Jr.; Olinda, 1370 m, 8 Apr 1932, O. Bryant.

Tachytrechus angustipennis Loew

New island record

This species was previously recorded from Kaua'i and O'ahu (Evenhuis, 1997; Nishida, 1997). It is common along the Pīpiwai Stream to Waimoku Falls in 'Ohe'o Gulch, where 6 specimens (4 males, 2 females) were collected on exposed rocks in the stream. Specimens were determined by N.L. Evenhuis (BPBM).

Material examined. MAUI: Haleakalā Natl. Pk., Waimoku Falls, 240 m, 21 Jul 1998, R. Takumi.

Neriidae

Telostylinus lineolatus (Wiedemann)

New island record

Eight specimens of this immigrant species were collected on East and West Maui. It also occurs on Kaua'i, O'ahu, and Hawai'i (Nishida, 1997).

Material examined. MAUI: Haleakalā Natl. Park, Waimoku Falls, 240 m, 21 Jul 1998, R. Takumi; 'Īao Valley, Kepaniwai Park, 11 Jan 1993, R. Takumi.

Sepsidae

Decachaetophora aenipes (Meijere)

New state record

This species is widely distributed in the Oriental, Palaearctic, and Nearctic Regions (Iwasa, 1987), and was collected abundantly around the Palikū Visitor and Ranger Cabins of Haleakalā Crater. They were found flying a few feet above the ground, resting on vegetation and flying near and resting on horse dung. Forty specimens were collected. Original identification was made by K. Arakaki (BPBM); 3 males and 3 females were verified by M. Iwasa (Obihiro Univ. Agric. & Vet. Medicine, Japan); other specimens were identified by R. Takumi.

Materials examined. MAUI: Haleakalā Crater: Palikū VC, 1950 m, 16 Mar 1998, R. Takumi (HALE); Palikū Patrol Cabin, 1950 m, 24 Sep 1997, R. Takumi (BPBM, HALE); Palikū, 1980 m, 16 Apr 1998, R. Takumi (HALE); Palikū, 1950 m, 22 Jul 1998, R. Takumi (BPBM; HALE); Palikū, 1950 m, 1 Jul 1998, R. Takumi, ex. horse dung (HALE). —R. Takumi & K. Arakaki.

Stratiomyidae

Exaireta spinigera (Wiedemann)

New island record

This immigrant species was reported as common on all the main islands by Hardy (1960) but only on O'ahu, Moloka'i, Lāna'i, and Hawai'i by Nishida (1997). One speci-

men was collected on West Maui and four specimens were collected on East Maui.

Materials examined. MAUI: 'Īao Val., Tableland Trail, 8 Aug 1994, R. Takumi; Kīpahulu Val., nr. Pu'u Ahu'ula, 400–500 m, 23 Jul 1980, sweeping, W.C. Gagné; nr. Pu'u Ahu'ula, 400–600 m, 23 Jul 1980, W.A. Steffan; Haleakalā Natl. Park, RM Office, 2073 m, 21 Oct 1998, R. Takumi.

Wallacea albiset Meijere

New island record

This Asian species was first collected on O'ahu in the 1970s (Howarth, 1975), and was previously recorded from that island only (Nishida, 1997). One specimen was collected at Kīpahulu's Waimoku Falls and was determined by K. Arakaki (BPBM).

Material examined. MAUI: Haleakalā Natl. Park, Waimoku Falls, 240 m, 21 Jul 1998, R. Takumi.

HETEROPTERA

Cydnidae

Rhytidoporus indentatus Uhler

New island record

This species from the West Indies and Florida was previously recorded from Kaua'i, O'ahu, and Hawai'i (Nishida, 1997). Two specimens collected from Kīpahulu Valley in 1980 were found in the collection of Haleakalā's USGS Research Division, identified by the late W.C. Gagné.

Material examined. MAUI: Kīpahulu Val., Pua'alu'u Str., 300 m, 21–22 Jul 1980; Kīpahulu Val., Palikea Str., 300 m, 4–6 Jul 1980, S.L. Montgomery, G. Young.

Lygaeidae

Geocoris pallens Stål

New island record

This species was previously recorded from Ni'ihau, Kaua'i, O'ahu, and Hawai'i (Nishida, 1997) and was first collected from Kaua'i and Hawai'i in 1935 (Usinger, 1936). It is known as a predator, and is commonly seen running on the ground in grassy areas of Haleakalā National Park's Crater district.

Material examined. MAUI: Haleakalā Natl. Park, Halemāu'u prkg. lot, 2400 m, 7 Aug 1996, R. Takumi; Halemāu'u Trail nr. crater rim, 8 Aug 1996, R. Takumi; Haleakalā Crater, Lau'ulu Trail, 2010 m, 16 Mar 1998, R. Takumi; Palikū, 1830–1950 m, 27 May 1998, R. Takumi, ex. diphacinone bait sta.; Palikū, 1830–1950 m, 8 Jan 1998, R. Takumi, ex. diphacinone bait sta.; Palikū, 1910 m, 14 May 1998, R. Takumi; Palikū, 1920 m, 17 Feb 1998, R. Takumi; Palikū, 1950 m, 5 Aug 1998, R. Takumi; RM Office, 2073 m, 17 Jun 1997, R. Takumi.

Reduviidae

Haematoloecha rubescens Distant

New island record

This immigrant species was previously recorded from O'ahu (Nishida, 1997). Four specimens were collected on East and West Maui in native as well as disturbed habitats, similar to what Gagné (1973) reported for O'ahu.

Material examined. MAUI: Haleakalā Natl. Park, Kīpahulu Val., 945 m, 7 Jan 1997, R. Takumi; Haleakalā Natl. Park, RM Office, 2073 m, 26 Aug 1996, R. Hart, ex. spider web; Makawao, 12 Jan 1998, R. Takumi; Pu'u Kukui below Nakalalua, 1200 m, 4 Mar 1998, R. Takumi.

HYMENOPTERA

Chrysididae

Chrysis angolensis Radoszkowski

New island record

This species is found worldwide except for Europe and was previously recorded from O'ahu (Nishida, 1997). Members of the *angolensis* species group are known to prey on the nests of mud wasps (Kimsey & Bohart, 1990). The specimen recorded here was

identified by L.S. Kimsey (U.C. Davis).

Material examined. MAUI: Waikapū, 1 Jan 1995, R. Takumi.

***Praestochrysis lusca* (Fabricius)**

New island record

This species is was previously recorded from Kaua'i and O'ahu (Nishida, 1997). Both specimens recorded here were identified by L.S. Kimsey (U.C. Davis).

Material examined. MAUI: Waikapū, 1 Jan 1995, R. Takumi; Keālia NWR, Kīhei, 28 Sep 1998, R. Takumi.

***Trichrysis luzonica* (Mocsary)**

New state record

This Oriental species was previously known from the Philippines, Taiwan, and Hong Kong (Kimsey & Bohart, 1990). Both specimens recorded below were identified by L.S. Kimsey (U.C. Davis).

Material examined. MAUI: Waikapū, 1 Jan 1995, R. Takumi; Keālia NWR, Kīhei, 28 Sep 1998, R. Takumi.

Pompilidae

***Anoplius toluca* (Cameron)**

New island record

This species was previously recorded on Ni'ihau, Kaua'i, O'ahu, Moloka'i, Lāna'i, and Hawai'i as *Anoplius ventralis tarsatus* Banks (Nishida, 1997). However, *A. ventralis tarsatus* Banks was synonymized with *A. toluca* (Cameron) by Evans (1966), and the latter is the correct name for this species. Twenty-eight specimens (12 males, 16 females) were collected on Haleakalā and identified by H.E. Evans (Colo. St. Univ.).

Material examined. MAUI: Haleakalā Natl. Park.: Halemau'u Trail nr. crater rim, 2317 m, 5 Sep 1996, R. Takumi; Lelewi, 2680 m, 9 Aug 1996, ex. inn trap, R. Takumi; Haleakalā Crater rim nr. Kilohana Pk., 2880 m, 12 Sep 1996, R. Takumi; Haleakalā Crater rim nr. Kilohana Pk., 2880 m, 19 Sep 1996, R. Takumi; NW Slope, 2500 m, 12–24 Jul 1991; 20 Jun–2 Jul 1991; 5–12 Jul 1991; 12–24 Jul 1991, ex. Malaise trap, R. Takumi.

***Ceropales maculata stretchii* Fox**

New state record

Ceropales maculata (Fabricius) occurs in Europe and North America, and has several color forms described as subspecies. *Ceropales maculata stretchii* Fox is restricted to California and adjacent states, undoubtedly the origin of the Haleakalā population (H.E. Evans, pers. comm.). Species of this genus are parasites of spider wasps of the genus *Anoplius*, and oviposit on the prey of the host before it is placed in the nest. Four specimens were collected from Haleakalā; 3 females were identified by H.E. Evans (Colo. St. Univ.), and 1 female was identified by R. Takumi.

Material examined. MAUI: Haleakalā Natl. Park: Kapalaoa Cabin, 2195 m, 7 Apr 1997, R. Takumi; Kapalaoa, 2195 m, 18 Nov 1997, R. Takumi; Kilohana pali, 2740 m, 15 Aug 1998, R. Takumi; between Lelewi & Halemau'u, 2440–2620 m, 1 Oct 1996, R. Takumi.

LEPIDOPTERA

Oecophoridae

***Endrosis sarcitrella* (Linnaeus)**

New island record

This cosmopolitan household and stored products detritivore was previously recorded from Hawai'i Island (Nishida, 1997). The adults were found in a diphacinone (rodent toxicant) bait station in Haleakalā Crater. Moth larvae, probably of the same species, were seen feeding on the diphacinone bait blocks in the same station. Two adults were collect-

ed at Hōlua Cabin and identified by J.A. Powell (U.C. Berkeley).

Material examined. MAUI: Haleakalā Crater, Hōlua Cabin, 2130 m, 13 Mar 1997, ex. dipha-cinone bait sta., R. Takumi.

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Discovery of *Aeptencyrtus bruchi* (De Santis) (Hymenoptera: Encyrtidae) in the Hawaiian Islands

VLADIMIR A. TRJAPITZIN (Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, St. Petersburg 199034, Russia) & JOHN W. BEARDSLEY⁸ (1026 Oak Dale Lane, Arcadia, California 91006, USA)

Hymenoptera: Encyrtidae

Aeptencyrtus bruchi (De Santis)

New state record

In 1988, the junior author found in Honolulu some females of a peculiar flightless myrmecomorphic encyrtid, tentatively identified by him as a new species of *Aeptencyrtus* De Santis. He also received a specimen from Dr. L. LeBeck that she had collected in Honolulu in 1986. In 1997 he gave a female from Kaua'i for identification to the senior author who was then visiting the Department of Entomology, University of California, Riverside. The senior author compared the specimen with three females of *A. bruchi* from Trinidad & Tobago and one from St. Vincent, identified by J.S. Noyes and preserved in the Zoological Institute, Russian Academy of Sciences, St. Petersburg. He concluded that the Hawaiian and West Indian specimens were conspecific.

Aeptencyrtus bruchi was described in the genus *Pheidoloxenus* Ashmead (De Santis 1957) from Argentina, and redescribed as the type and only species of *Aeptencyrtus* (De Santis 1964). It has been cited also from Peru (Kerrich, 1978), Trinidad & Tobago, and St. Vincent (Noyes, 1980), and Florida, USA (Noyes *et al.*, 1997). It also has been found in Cuba (new record—see below). Hosts are known only from Peru where it was reared from the mealybugs *Antonina ?graminis* (Maskell) and *Saccharicoccus sacchari* (Cockerell)

8. Research Associate, Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA.

(Homoptera: Pseudococcidae). Both of these mealybugs are well known pests; the former on several grasses and the latter on sugarcane. Both species are present in Hawai'i.

West Indian and Hawaiian specimens of *A. bruchi* differ from the type series from Argentina (De Santis, 1957, 1964) mainly in the color of the antennal funicle. This was described by De Santis as being light yellow-brown but is black in specimens from Hawai'i and the West Indies. However, we agree with Noyes (1980) who treated this difference as an intraspecific variation. Kerrich (1978), who redescribed the species based on specimens from Peru and Argentina (one female not of the type series), noted that the first five funicular segments are dull brown, and the sixth merges in color with the club, which is bronzy black. Therefore, it appears that the coloration of the funicle as described by Kerrich is intermediate between that of the type series and that of the West Indian and Hawaiian specimens. The scape length/greatest width ratio in our specimens of *A. bruchi* is about 3 ×. The ratio indicated by De Santis (1964: 122) is 0.140/0.079 = about 2 ×. This may be incorrect, as also is the case with his drawing, where the ratio is about 4 ×. Possibly De Santis' measurements were made from specimens that were not properly aligned.

There is no doubt that *Aeptencyrtus bruchi* is a recently established immigrant species in Hawai'i as it was not collected there until 1986. It has now spread from O'ahu, where it was first taken, to Kaua'i and Moloka'i.

It is of interest that of 111 species of Encyrtidae previously recorded from the Hawaiian Islands (Nishida, 1997), 62 (56%) are adventive, 21 (19%) purposely introduced, and 28 (25%) endemic.

Material Examined. HAWAIIAN ISLANDS: **KAUA'I:** Moloa'a, *Casuarina* belt above sea cliff, sweeping low vegetation, 3.v.1994, J.W. Beardsley (2 females). **MIDWAY:** Sand I., harbor area, sweeping mostly in grass, 13.v.1997, G.M. Nishida (1 female). **MOLOKA'I:** Kaluakoi, 10–50 ft, sweeping weeds and *Sida*, 12.v.1994, J.W. Beardsley & W.D. Perreira (1 female). **O'AHU:** Hickam A.F.B., 13.v.1988, J.W. Beardsley, sweeping (1 female); Honolulu, Univ. of Hawaii Campus, x.1986, L. LeBeck (1 female); Waimānalo, U.H. Agricultural Experiment Station, 2.viii.1988. J.W. Beardsley (2 females).

Non-Hawaiian Material. **CUBA:** Guanalo, prov. La Habana, 22.xi.1986, I.U. Kershner (2 females), det. V.A. Trjapitzin. **ST. VINCENT:** St. George, Kingstown, Botanical Garden, 13.vii.1976, J.S. Noyes (1 female), det. J.S. Noyes. **TRINIDAD & TOBAGO:** Toho, Wasteground, 28.vi.1976, J.S. Noyes (1 female), det. J.S. Noyes; Curepe, Santa Margarita, Circ. Rd., 9-23.vi, F.D. Bennett (2 females), det. J.S. Noyes.

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Terrestrial isopods from Midway Atoll (Crustacea: Oniscidea)

STEFANO TAITI (Centro di Studio per la Faunistica ed Ecologia Tropicali del Consiglio Nazionale delle Ricerche, Via Romana 17, 50125 Firenze, Italy; email: taiti@csfet.fi.cnr.it)

To date, 51 species of terrestrial isopods have been recorded from the Hawaiian Islands (Taiti & Howarth, 1996, 1997). While the oniscidean fauna from the southeastern high volcanic islands is fairly well known, knowledge of the fauna from the northwestern low islands is still fragmentary. In particular, only two species of Mediterranean origin and cosmopolitan distribution had been reported from Midway Atoll: *Porcellionides pruinosus* (Brandt) and *Porcellio laevis* Latreille. However, recent investigations carried out by A. Asquith and G.M. Nishida revealed the presence of 9 species from Midway. All species are either halophilic, littoral, or synanthropic, very widely distributed, and certainly introduced. One littoral species of Mediterranean origin, *Halophiloscia couchii* (Kinahan), represents the first record for the Hawaiian Islands and for the whole Pacific basin.

Notes on the ecology and distribution of some of the species dealt with here are reported in Taiti & Howarth (1996). All specimens examined are vouchered in the collections of the Bishop Museum, Honolulu.

Scyphacidae***Armadilloniscus ellipticus* (Harger)****New island record**

A strictly halophilic littoral species found under debris, logs and stones on both rocky and sandy shores. It has a very wide distribution; currently known from the Atlantic coasts of the USA, Bermuda, the Azores, Madeira, the Mediterranean, Madagascar, Malaysia, Hong Kong, Japan, Korea and the Hawaiian Islands.

Material examined. **MIDWAY:** Spit I, 1 male, 1 female, ii.1997, A. Asquith. Sand I, 1 male, 11 females, SW corner of harbor, under splash zone rocks on jetty, ii.1997, A. Asquith; 3 females, beach N of harbor, under splash zone debris, ii.1997, A. Asquith.

Halophilosciidae***Halophiloscia couchii* (Kinahan)****New state record**

This halophilic species occurs on coasts of marine and brackish waters. It is widely distributed along the coasts of the Mediterranean, Atlantic Europe, and Africa as far south as Dakar, the Azores, Canaries, Madeira, and Cape Verde. It has also been introduced to Virginia, Bermuda, Argentina, and Western Australia.

Material examined. **MIDWAY:** Sand I, 1 male, near SE damp site around pond, under log, ii.1997, A. Asquith.

Philosciidae***Littorophiloscia culebrae* (Moore)****New island record**

Material examined. **MIDWAY:** Spit I, many males and females, ii.1997, A. Asquith. Sand I, 2 females, SW corner of harbor, under splash zone rocks on jetty, ii.1997, A. Asquith.

Trachelipodidae***Nagurus nanus* (Budde-Lund)****New island record**

Previously known from O'ahu and Hawai'i islands.

Material examined. **MIDWAY:** Spit I, 3 females, 4 juvs, ii.1997, A. Asquith.

Porcellionidae***Porcellionides pruinosus* (Brandt)**

Material examined. **MIDWAY:** Eastern I, 7 females, under dead log, 13.v.1997, G.M. Nishida; 2 males, Berlese extraction of *Casuarina* litter, 16.xii.1997, G.M. Nishida. Spit I, 1 male, ii.1997, A. Asquith. Sand I, 1 female, harbor area, under concrete in *Casuarina* grove, 12.v.1997, G.M. Nishida; 1 female, cart path in *Casuarina* duff, 19.xii.1997, G.M. Nishida; 1 female, cart path, litter under *Coccoloba* tree, 18.xii.1997, G.M. Nishida; 3 males, 6 females, 1 juv., Dump Lake, under rocks among *Casuarina* duff, 19.xii.1997, G.M. Nishida; 2 females, Frigate Pt., in duff under *Scaevola*, ii.1997, A. Asquith; many males and females, NW of runway, in duff under *Coccoloba*, ii.1997, A. Asquith; 2 males, 6 females, beach N of harbor, under splash zone debris, ii.1997, A. Asquith; 3 males, 4 females, south beach, under wood on ground, ii.1997, A. Asquith.

Agabiformius lentus* (Budde-Lund)*New island record**

This species is native to the Mediterranean and has been spread by humans to many parts of the world.

Material examined. **MIDWAY:** Sand I, 1 male, Dump Lake, under rocks among *Casuarina* duff, 19.xii.1997, G.M. Nishida; 3 males, 5 females, near SE dump site around pond, under log, ii.1997, A. Asquith; many males and females, Frigate Pt., in duff under *Scaevola*, ii.1997, A. Asquith; 1 male, 1 female, beach N of harbor, under splash zone debris, ii.1997, A. Asquith; many males and females, south beach, under wood on ground, ii.1997, A. Asquith.

***Porcellio laevis* Latreille**

Material examined. **MIDWAY:** Eastern I, 1 male, 1 female, under rocks, 16.xii.1997, G.M. Nishida; 2 males, 2 females, yellow pan traps, 13–16.v. 1997, G.M. Nishida; 3 males, 3 females, under tin sheeting, 14.v.1997, G.M. Nishida. Sand I, 1 male, Halsey Drive, 18.xii.1997, G.M. Nishida; 7 males, 9 females, 1 juv., Frigate Pt., in duff under *Scaevola*, ii.1997, A. Asquith.

Porcellio lamellatus lamellatus* Budde-Lund*New island record**

Material examined. **MIDWAY:** Eastern I, 8 females, under bark of standing dead *Casuarina*, v.1997, G.M. Nishida; 1 male, 2 females, E side, under rocks on beach, 14.v.1997, G.M. Nishida; 6 males, 2 females, under dead log, 13.v.1997, G.M. Nishida; 1 female, Berlese extraction of *Casuarina* litter, 16.xii.1997, G.M. Nishida. Spit I, 13 males, 9 females, 7 juvs, ii. 1997, A. Asquith.

Armadillidae***Venezillo parvus* (Budde-Lund)****New island record**

Material examined. **MIDWAY:** Sand I, 2 males, 3 females, Dump Lake, under rocks among *Casuarina* duff, 19.xii.1997, G.M. Nishida.

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First records for freshwater oligochaetes (Annelida, Oligochaeta, Naididae) in the Hawaiian Islands with notes on their association with an alien snail (Mollusca, Gastropoda, Ampullariidae)

DAVID K. BRITTON (Department of Zoology, University of Hawaii at Manoa, 2538 The Mall, Edmondson 152, Honolulu, Hawai'i 96822, USA; email: britton@hawaii.edu) & MARK J. WETZEL (Illinois Natural History Survey, Center for Biodiversity, 172 Natural Resources Building, MC-652, 607 E. Peabody Drive, Champaign, Illinois 61820-6917 USA)

Naididae

Haemonais waldvogeli Bretscher

New state record

Dero (Aulophorus) furcata (Müller)

New state record

These records mark the first documented occurrences of freshwater oligochaetes in the Hawaiian Islands, and the first record of *Haemonais waldvogeli* and *Dero furcata* in association with the alien apple snail *Pomacea canaliculata* (Lamarck). *Pomacea canaliculata* is a species native to South America but introduced to Southeast Asia and, in the late 1980s, purposely brought into Hawai'i (likely from the Philippines) as food for human consumption (Cowie, 1995, 1997).

In their summary of Hawaiian species, Eldredge & Miller (1995) noted that 26 marine and 20 terrestrial species of oligochaetes were known from Hawai'i. However, no freshwater oligochaetes were discussed and none was added in subsequent revisions to the list of Hawaiian species (Eldredge & Miller, 1997, 1998).

Haemonais waldvogeli were found living, apparently commensally, within the shell umbilici of the apple snails. Two specimens of the other naidid oligochaete, *Dero furcata* were collected from grooves in the outer surface of the snails' shells (ca. 1 mm deep below the periostracum).

Snails harboring *Haemonais waldvogeli* and *Dero furcata* were collected from a small pool of slowly flowing (almost stagnant) water in Kawainui Marsh, O'ahu. The pool was approximately 10 cm deep, had a soft, muddy bottom, and was dominated by the invasive water hyacinth *Eichhornia crassipes* (Mart.) Solms.

Close observation without magnification revealed approximately three to seven *H. waldvogeli* protruding from the umbilicus of most live snails examined. Under the dissecting microscope, worms were translucent, with a conspicuous, coiled gut filled with organic material running the length of the worms. Blood vessels were also visible running alongside the gut, an observation first documented by Stephenson (1915) in his original description of *H. laurentii* (= *H. waldvogeli*) and subsequently discussed by Sperber (1948).

Further examination revealed that the worms appeared to be anchored posteriorly inside the snail's umbilicus. *Haemonais waldvogeli* extended their anterior ends toward and beyond the opening of the umbilicus and were observed feeding on organic matter adhering to the snail's shell. These worms fed by extending and retracting a large pharynx, drawing (or sucking) organic material into their mouths. We have not observed any feeding behavior in the second species, *D. furcata*. The causal agent for the grooves in the periostracum of the snail, and from which the two specimens of *D. furcata* were collected, is not known.

Oligochaetes taken from live host snails were fixed in buffered formalin for 48 hours,

then transferred to 70% ethanol. They were then carefully cleaned of minute sand and detrital material, processed through an ethanol series, washed in punctilious ethanol, placed in an ethanol/xylene solution for 30 minutes, then mounted in Permount™ on standard microscope slides under cover slips. Specimens were identified through an Olympus BX-50 compound microscope equipped with Nomarski Differential Interference Contrast. Identifications and distributional information follow that provided in the original descriptions, and by Sperber (1948), Brinkhurst & Jamieson (1971), Brinkhurst & Wetzel (1984), and Kathman & Brinkhurst (1998). Specimens of each species are deposited in the Illinois Natural History Survey Annelida Collection, Champaign Illinois (INHS) and the Bishop Museum, Honolulu (BPBM).

Dero furcata is known from North and South America, Europe, Asia, and Africa. It is widespread in North America, particularly east of a line from Wisconsin to Texas (Kathman & Brinkhurst, 1998); it is common in the southeastern states, less common elsewhere. This species is characterized by one hair and one bifid needle with short, subequal teeth in the dorsal bundles (beginning in segment V), and three pairs of gills with two elongate, ciliated palps in the branchial fossa on the posterior end of the worm. We could find no records of *Dero furcata* nor for any of its congeners in the literature suggesting an association with gastropods.

Haemonais waldvogeli, the only species in this genus, is known from North and South America, India, Europe, Asia, and Africa. In North America, it is considered widespread east of a line from Wisconsin to Texas. This species is characterized by the absence of chaetae in the dorsal bundles of segments II-XVIII or XX; dorsal bundles consist of a single short, slightly curved hair chaeta, and a single, robust, slightly curved bifid chaeta.

Sperber (1948), Brinkhurst & Jamieson (1971), Brinkhurst (1986), and Kathman & Brinkhurst (1998) all suggested that dorsal bundles may begin in VI, or even II, but are soon shed. Stephenson (1930) and Gelder (1980) did note the ectocommensal association of *H. waldvogeli* (as *H. laurentii*) with the mantle cavity of the freshwater snail *Vivipara bengalensis*. We could find no other records of *H. waldvogeli* in the literature suggesting an association with gastropods.

The literature discussing symbiotic relationships of aquatic oligochaetes, particularly for the naidid *Chaetogaster limnaei* von Baer, is extensive (Gruffydd, 1965; Buse, 1974; Learner *et al.*, 1978; Gelder, 1980; Anderson & Holm, 1987; and literature cited therein). The only reference to an invertebrate association with *Pomacea*, however, was provided by Naranjo-Garcia (1996) in a recent review of invertebrates exploiting mollusks, noting an unidentified dipteran larva inhabiting the shell of *Pomacea* cf. *flagellata*.

Only specimens from the Kawainui Marsh population of *P. canaliculata* have been examined for oligochaetes. Thus, the distribution of *D. furcata* and *H. waldvogeli* in Hawaii and extent of their association with *P. canaliculata* and other freshwater mollusks is currently unknown.

Material examined. O'AHU: Northwest edge Kawainui Marsh, 2.6 km WNW Kailua (PO), 21°24'20" N; 157°45'49" W, Universal Transverse Mercator System coordinates: Zone 4, 627650m East, 2667500m North (NAD 1927), Elevation 6 m, Mōkapu, HI (7.5' series, 1983 edition) USGS topographic quadrangle map, 5 Dec 1998 (R.H. & D.K. Britton), 4 specimens *Haemonais waldvogeli* mounted on slides and 9 specimens *H. waldvogeli* retained in 79% ethanol (INHS Annelida Collection and Database: Ø.DKB5DEC1998), 1 specimen *Dero furcata* mounted on slide (BPBM Invertebrate Zoology R-2449), 5 specimens *H. waldvogeli* mounted on slides (BPBM Invertebrate Zoology R-2450 - R2454); 2 Jan 1999 (R.H. & D.K. Britton), 1 specimen *D. furcata* mounted on

slide, 5 specimens *Haemonais waldvogeli* mounted on slides, and 9 specimens *H. waldvogeli* retained in 79% ethanol (INHS Annelida Collection and Database: Ø.DKB2JAN1999); 6 specimens *H. waldvogeli* mounted on slides (BPBM Invertebrate Zoology R2455 – R2460).

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Records of marine invertebrates in Hawai'i from the hull of the *USS Missouri* in Pearl Harbor, O'ahu

RALPH C. DEFELICE & L. SCOTT GODWIN (Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA)

The decommissioned World War II battleship *USS Missouri* was moved from the Puget Sound Naval Shipyard in Bremerton, Washington to Pearl Harbor, O'ahu to serve as a World War II memorial museum in June 1998. Before being towed to Pearl Harbor, the ship was moored in the highly stratified fresh and brackish waters of the Columbia River, at Astoria, Oregon for 9 days in an attempt to kill fouling organisms that were potential invaders to the Hawaiian Islands. The hull of the *USS Missouri* was last cleaned when the ship was drydocked and painted in January 1993. On 22 June 1998 a small portion of the hull of the vessel was examined by divers two hours after the *USS Missouri* arrived in Pearl Harbor. Three species of euryhaline sessile invertebrates (2 bivalves and 1 barnacle) were found living on the hull of the ship near the stern section. Two species of euryhaline amphipod crustaceans were also present in the scrapings taken from the hull. The remains of several dead marine invertebrate species were also collected during the hull survey. All species of living and dead invertebrates found in the *USS Missouri* samples are known from the Pacific Northwest coast. No live animals were found between the water line and approximately 5 m depth on the hull, indicating that the upper portion of the ships' hull remained in fresh water while moored in the Columbia River. Both living and dead organisms were found on the lower portions of the hull.

The survey conducted on 22 June was neither comprehensive nor quantitative and it is likely that additional species, living and dead, occurred elsewhere on the ship's hull. Of the 11 living and dead species found during this survey, 4 [*Mytilus galloprovincialis* (as *M. "edulis"*), *Pododesmus cepio*, *Balanus crenatus*, and *Styela gibbsii*] were previously reported as occurring on the hull of the *USS Missouri* while still in Puget Sound (Brock & Brock, 1997). They reported 116 taxa from the ships' hull while moored in Puget Sound.

A follow-up survey of the hull was conducted on 15 October 1998 that included the *USS Missouri* hull and the adjacent pier. None of the sessile species collected on the hull in June were observed. Although apparently not established, they are reported here in order to verify possible establishment in the event that individuals are found in Hawai'i in the future. All specimens collected are vouchered in the Bishop Museum.

Species found alive on the hull

MOLLUSCA

Bivalvia

Mytilidae

***Mytilus galloprovincialis* Lamarck**

The mussel was fairly abundant on the hull, especially 5 m below the water line. Approximately 30 individuals were collected, ranging in size from about 2 to 12 cm in

length. Mussels were noted as spawning in the field and laboratory. *Mytilus galloprovincialis* is found naturally on the coasts of the Mediterranean Sea (Quesada et al., 1995), and southwest Europe (Gardner, 1992; Seed, 1992). This species has invaded Japan (Wilkins et al., 1983), Hong Kong (Lee & Morton, 1983), South Africa (Grant & Cherry, 1985) and the west coast of the United States (Geller, 1999). Identification was confirmed through genetic analysis of the samples (Apte et al., in prep.).

Material examined. O'AHU: BPBM MO254424; Pearl Harbor, *USS Missouri* hull, stern section (22 June 1998).

Ostreidae

***Ostrea conchaphila* Carpenter [= *O. lurida* Carpenter]**

This species was less common than *M. galloprovincialis* and was found only near the keel of the ship (below 8 m). Five individuals were collected, ranging in size from 3.5–4.5 cm in diameter. It is usually found near the lowtide line attached to rocks, concrete pilings and boat hulls, with one valve cemented to the substrate, but can also occur in beds on mud flats and gravel bars in estuaries and bays. The species natural range is southern Alaska south to Baja California. (Abbott, 1974; Morris et al., 1980).

Material examined. O'AHU: BPBM MO254423; Pearl Harbor, *USS Missouri* hull, stern section (22 June 1998).

ARTHROPODA

Crustacea

Cirripedia

Balanidae

***Balanus crenatus* Bruguière**

Empty barnacle skeletons were very abundant on all parts of the hull, but numerous live individuals were observed, especially 5 m below the water line. Approximately 20 live barnacles were collected. This barnacle ranges from Alaska south to Santa Barbara, California. It occurs on rocks, pier pilings and boat bottoms, usually subtidally to 100 m (Henry, 1940; Morris et al., 1980). An unverified previous report of this species off Pearl Harbor (Long, 1972) is considered dubious.

Material examined. O'AHU: BPBM B685; Pearl Harbor, *USS Missouri* hull, stern section (22 June 1998).

Amphipoda

Ansiogammaridae

***Eogammarus oclairi* Bousfield**

This amphipod was found among the fouling organisms scraped from the hull. It is found from British Columbia to Washington State, including the mouth of the Columbia River and occurs intertidally to shallow subtidally in fresh to brackish water of estuaries (Bousfield, 1979).

Material examined. O'AHU: BPBM S11811; Pearl Harbor, *USS Missouri* hull, stern section (22 June 1998).

Corophiidae

***Corophium spinicorne* Stimpson**

Also found among the fouling organisms scraped from the hull, this amphipod is known from British Columbia to Southern California. It inhabits mainly brackish waters

of bays and estuaries and is also known from fresh water (Shoemaker, 1949).

Material examined. O'AHU: BPBM S11812; Pearl Harbor, *USS Missouri* hull, stern section (22 June 1998).

Species found dead on the hull

In addition to the following species, empty tubes of unidentified sabellid and serpulid worms were abundant on the hull, as were two additional unidentifiable ascidians.

MOLLUSCA

Bivalvia

Anomiidae

Pododesmus cepio Gray

Empty shells of this species were common on the *USS Missouri* hull. This jingle shell occurs from Southern Alaska to the Gulf of California and it is commonly found on hard substratum near low tide level and subtidally (Morris *et al.*, 1980).

Mytilidae

Modiolus modiolus Linnaeus

Two shells of this species were found on the hull. This mussel normally lives in soft-bottom habitats, from the low intertidal zone to 50 m. The species is known from British Columbia south to the Gulf of California. (Abbott, 1974; Morris *et al.*, 1980).

Lyonsiidae

Entodesma pictum (Sowerby) [= *E. saxicola* (Baird)]

A single shell of this bivalve was observed within a recessed area of the hull. This species is commonly found attached by byssus in the low intertidal zone on rocky shores or among fouling growth on wharf pilings or boat hulls. It is found from the Aleutian Islands to Baja, California (Morris *et al.*, 1980).

ARTHROPODA

Crustacea

Cirripectida

Balanidae

Balanus nubilus Darwin

Empty skeletons of this species were rare on the ship hull. This large barnacle is found intertidally on rocks and pier pilings, to depths of 90 m. It occurs from southern Alaska to La Jolla, California (Morris *et al.*, 1980).

UROCHORDATA

Asciacea

Styelidae

Styela gibbsii Stimpson

Dead individuals were common on the hull. *Styela gibbsii* occurs in the low-intertidal zone on hard substrates from British Columbia to Oregon (Kozloff, 1996).

Pyuridae

Boltenia villosa Stimpson

A single specimen of this species was collected. The species occurs in the low-inter-

tidal and sub-tidal zone, usually attached to rocks and pilings from Prince Rupert (British Columbia) to San Diego (Morris *et al.*, 1980).

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New records of introduced fouling Bryozoa from O'ahu, Hawai'i

CHELA J. ZABIN (Kewalo Marine Laboratory, University of Hawaii, 41 Ahui Street, Honolulu, 96813, Hawai'i, USA; email: chela@hawaii.edu)

Bryozoans were collected as part of two larger surveys of marine invertebrates; one in Pearl Harbor (Coles *et al.*, 1997) and one in Honolulu Harbor and adjacent embayments (Coles *et al.*, 1999). Four previously unrecorded bryozoan species, in the family Bugulidae, were collected. Major surveys of bryozoans were carried out in Kāne'ohe Bay, O'ahu, between 1966 and 1971 (Soule & Soule, 1968; Soule *et al.*, 1987) and in 1983 (Dade & Honkalehto, 1986). Three of the four species reported here are unique in appearance and not likely to have been overlooked; they may be relatively recent introductions into Hawaiian waters. All specimens examined are deposited in the invertebrate zoology collection at Bishop Museum.

Bugulidae

Bugula dentata (Lamouroux)

New state record

This bushy, typically blue-green *Bugula* was found in abundance at 15 sites in Honolulu Harbor, Ala Wai Yacht Harbor, and Barbers Point during the summer and late fall of 1997 and summer of 1998. An Indo-Pacific species, *B. dentata*, has been anecdotally reported from O'ahu waters for several years.

The material examined was a good match to species descriptions by Harmer (1926). Color of preserved specimens ranged from blue-green to gray to violet. In addition to color, key characteristics include two sizes of "bird's head" avicularia, the larger ones just below bifurcations; zooids slightly inrolled, with 3 short outer spines; and ovicells set on the inside distal corner of zooids, angled slightly outward.

Material examined. O'AHU: Honolulu Harbor, Piers 4, 5, 6 (20 Aug 1997), Piers 7, 8, 11 (26 Aug 1997), Pier 2 (16 September 1997), Pier 29 (23 Sep 1997), Pier 27 (28 Sep 1997); Ala Wai Yacht Harbor (30 Jul 1998); Barbers Point Deep Draft Coal Pier (6 Aug 1998).

Bugula robusta MacGillivray

New state record

Bugula robusta resembles the better known and cosmopolitan fouling bryozoan *B. neritina* in color and general morphology but is easily distinguished from its congener by its large and numerous "bird's head" avicularia. Specimens were found at 2 sites in Pearl Harbor in the spring of 1996, at 4 sites in Honolulu Harbor in the summer and fall of 1997, and at 2 sites in Barbers Point in the summer of 1998. *Bugula robusta* has a wide distribution which includes Japan, Pacific islands, Indian Ocean, Sudanese Red Sea, East Africa, and the Caribbean. Specimens have been reported at Kewalo Basin and in Kāne'ohe Bay at Coconut Island since at least 1995 (R. Woollacott, pers. comm.).

The material examined matched descriptions by Harmer (1926) in nearly every detail, with the exception of the absence of basal median spines which were found on only one specimen. The avicularian cusps, described by Harmer as "evanescent" were not found on any of the O'ahu material.

Material examined. O'AHU: Honolulu Harbor, Piers 7 & 8 (26 Aug 1997), Pier 14 (16 Sep 1997), Pier 29 (23 Sep 1997), Pier 41 Drydock (9 Oct 1997); Barbers Point Deep Draft Coal Pier (6 Aug 1998).

Caulibugula dendrograpta (Waters)

New state record

This white, delicate, branching bryozoan was found at 5 sites in Honolulu Harbor and 1 at Barbers Point during the summer and late fall of 1997 and summer of 1998,

respectively. No *Caulibugula* have been previously reported from Hawaiian waters.

The specimens were a good match with descriptions by Harmer (1926) from various Indo-Pacific locations. The type specimen, described by Waters, was collected at Zanzibar. Key characteristics include avicularia of lower zooecia located proximally, whereas those of upper zooecia were located at the distal end; primary zooecia with 10–12 spines, and others with 3–4 distal outer spines and a single inner spine.

Material examined. O‘AHU: Honolulu Harbor, Piers 4, 5, 6 (20 Aug 1997), Pier 41 Drydock (9 Oct 1997), Pier 36 (15 Oct 1997); Barbers Point, Deep Draft Coal Pier (6 Aug 1998).

***Caulibugula caliculata* (Levinsen)**

New state record

Caulibugula caliculata is a white, feathery bryozoan easily mistaken at first glance for a hydroid. Large colonies of *C. caliculata* were found at 2 sites in Honolulu Harbor in the fall of 1997.

Zooids on the material examined were slightly more elongate than in Levinsen’s (1909) drawings but otherwise were as described. Key characteristics include zooids with an outer corner developed into a short, slightly curved spine and 1 spine on the inner corner; shorter, wider kenozooids and “bird’s beak” avicularia just before bifurcations. Colonies consist of long stalks ending in highly branched broom-like arrangements. This bryozoan has been previously reported from Hong Kong and the Philippines.

Material examined. O‘AHU: Honolulu Harbor, Coast Guard Harbor (9 Oct 1997), Pier 36 (15 Oct 1997).

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New records of alien nonmarine mollusks in the Hawaiian Islands

ROBERT H. COWIE (Hawaii Biological Survey, Bishop Museum, 1525 Bernice Street, Honolulu, Hawaii 96817-2704, USA; email: rhcowie@bishopmuseum.org)

New introductions of snails and slugs continue to be recorded in the Hawaiian Islands. Many of the terrestrial species appear to be associated with the horticultural trade. This note records a number of species not previously reported by the Hawaii Biological Survey (Cowie, 1996, 1997, 1998a,b).

Helicarionidae

Liardetia doliolum (Pfeiffer)

New state record

The first realization that this tiny (3 mm) arboreal land snail was present in the Hawaiian Islands resulted from its interception in 1997 by officials of the State of Arizona Department of Agriculture on a shipment of horticultural plants from a nursery near Hilo (Hawai'i Island). Subsequently it has also been intercepted by State of California Department of Food and Agriculture officials, on a shipment from the same nursery. Earlier unidentified interceptions (1989, 1994) on horticultural products from Hawai'i (island unknown) shipped to California have only now been identified as this species. It has also been recorded on O'ahu, on 'ōhi'a (*Metrosideros polymorpha*) growing in a greenhouse, supplied by a nursery in Honolulu. Its natural distribution appears to be the western Pacific (Philippines, Mariana Islands, Caroline Islands) (Baker, 1938) but it may well be more widespread. The likelihood of its further spread is strong because of its apparent association with the horticultural trade.

Material examined. **HAWAIIAN ISLANDS** [island unknown]: intercepted in California, 12 October 1989, California Department of Food and Agriculture, donated by A. Hardy (BPBM Malacology 254605); intercepted in California, 1 September 1994, California Department of Food and Agriculture, donated by A. Hardy (BPBM Malacology 254606). **HAWAI'I**: Hilo, Puna Certified Nurseries, intercepted in Arizona, 7 January 1997, C. Baptista (BPBM Malacology 253695); Hilo, Puna Certified Nurseries, intercepted in California, 10 December 1998, California Department of Food and Agriculture, donated by A. Hardy (BPBM Malacology 254552). **O'AHU**: Mānoa Valley, Lyon Arboretum, 23 January 1998, R. Helling (BPBM Malacology 253684).

Arionidae

Arion intermedius Normand

New state record

This small, pale gray to whitish slug is western European in origin (Kerney *et al.*, 1979). It has not previously been recorded from the Hawaiian Islands. However, a possible earlier record is the finding of an unidentified species of *Arion* in the gut of a Kalij pheasant from the Island of Hawai'i (Cowie, 1997; Lewin & Lewin, 1984); this record may refer to the same species but this cannot be determined. *Arion intermedius* is probably more widespread than this new record indicates, and may have been in the Hawaiian Islands for a considerable time. The mode by which it arrived is unknown.

Material examined. **HAWAI'I**: Upper Waiakea Forest Reserve, proposed site for new correctional center on the north side of Stainback Highway, 2900 ft [884 m]–3100 ft [945 m], November–December 1998, R.H. Cowie & R.J. Rundell (BPBM Malacology 254607–254630).

Hydrobiidae

Pyrgophorus coronatus (Pfeiffer)

New state record

The genus *Pyrgophorus* occurs in the islands of the Caribbean and in the continental

areas bordering the Caribbean (e.g., Taylor, 1966; Hershler & Thompson, 1992; Botero & Rusch, 1994; Ditrich *et al.*, 1996). There are a number of nominal species, but their taxonomy is in need of revision; the present identification as *Pyrgophorus coronatus* is provisional, pending such revision. There is little literature on this species (some references in Taylor, 1975). They are fresh- to brackish-water snails usually occurring in marshland habitats but also in streams (e.g., McKillop & Harrison, 1982). As in other species of *Pyrgophorus* (e.g., Harrison, 1984), the material examined exhibits morphological variation, especially in the extent that the shells bear spines but also in the relative height and width of the shells. How this species arrived in the Hawaiian Islands is unknown; although it reproduces sexually and does not have planktonic larvae (Heard, 1982) introduction with ballast water cannot be excluded.

Material examined. OAHU: Pearl Harbor; Waiawa Wildlife Refuge, 26 August 1998, R. Englund & D.J. Preston (BPBM Malacology 254559); Pearl Harbor, Pouhala Marsh, 18 August 1998, D.J. Preston & R. Wolff (BPBM Malacology 254560); Pearl Harbor, Waiawa Springs, 6 April 1998, D.J. Preston & R. Wolff (BPBM Malacology 254561).

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Preliminary identification and current distributions of two suckermouth armored catfishes (Loricariidae) introduced to O‘ahu streams

MARK H. SABAJ (Illinois Natural History Survey, 607 E. Peabody Dr., Champaign, Illinois 61820, USA; email: msabaj@denr1.igis.uiuc.edu) & RONALD A. ENGLUND (Hawaii Biological Survey, Bishop Museum, 1525 Bernice St., Honolulu, Hawai‘i 96817, USA; email: englund@bishopmuseum.org)

Specimens of two species of loricariid catfishes introduced to O‘ahu, Hawai‘i are briefly described and tentatively referred to *Ancistrus* cf. *temminckii* and *Hypostomus watwata*-group. These identifications are preliminary because the precise origins of the introduced species are unknown, and *Ancistrus* and *Hypostomus* are large genera in need of taxonomic revision. Loricariidae is a large family (ca. 600 species and 70 genera) of freshwater catfishes characterized by a body covering of bony plates and a ventral suctorial mouth (Isbrücker, 1980). Loricariids are native to South and Central America, and introduced populations are established in Florida, Hawai‘i, Nevada, and Texas (Lever, 1996). Loricariids previously listed as introduced to Hawai‘i include *Ancistrus* sp. (Courtenay *et al.*, 1991; Devick, 1991; Courtenay, 1993; Eldredge, 1994), *Hypostomus* spp. (Eldredge, 1994) and *Pterygoplichthys multiradiatus* (Courtenay *et al.*, 1991; Courtenay, 1993; Eldredge, 1994). Recent collections in stream habitats on O‘ahu by RAE did not yield specimens of *P. multiradiatus*. Voucher specimens are deposited in the collections of the Bishop Museum, Honolulu (BPBM) and Illinois Natural History Survey, Champaign (INHS).

Ancistrus* cf. *temminckii

Ancistrus sp. -- Devick, 1991: 191.

Ancistrus Kner is a large genus (about 57 nominal species) diagnosed by the presence of fleshy snout tentacles that are best developed in breeding males (Burgess, 1989; Sabaj *et al.*, in press). Although six new species have been described since 1987 (Sabino & Trajano, 1997), the identification of many species remains problematic. Hawaiian specimens are tentatively identified as *Ancistrus* cf. *temminckii* based on a description of the holotype (Stigchel, 1947) and on descriptions of this species' coloration in Regan (1904) and Eigenmann (1912).

Valenciennes (*in* Cuvier & Valenciennes, 1840) described *Ancistrus temminckii* based on one specimen collected in Suriname and sent to Paris on loan by C.J. Temminck, Director of the Leiden Museum, Netherlands (Boeseman, 1972). Valenciennes' original description provided little information. However, Stigchel (1947) provided a useful

Revised identification

description of the holotype and a second specimen in the Leiden Museum that was collected with the holotype and identified as *A. temminckii*. Measurements of the Hawaiian specimens agree well with those reported by Stigchel for the two Leiden specimens (e.g., interorbital width 4.5–5.0 × greater than diameter of eye; when depressed, pectoral fin spine reaches to half the length of pelvic fins). Coloration of the Hawaiian specimens is identical to that described for *A. temminckii* by Regan (1904) and Eigenmann (1912); however, their descriptions were based on specimens from Guyana. The coloration of the Leiden specimens of *A. temminckii* is given as brown (Cuvier & Valenciennes, 1840; Stigchel, 1947) or uniformly dark (Eigenmann, 1912). Further study is needed to determine whether the Guyanan specimens are, in fact, conspecific with *A. temminckii*. Finally, it is noted that the Hawaiian specimens match well with photographs of putative *A. temminckii* published in aquarium literature (e.g., Burgess, 1989; Kobayagawa, 1989; Glaser & Glaser, 1995).

Preserved specimens from Hawai‘i have white spots on an overall dark background. The spots are small and well defined on the head, becoming larger posteriorly. Spots on the caudal peduncle are largest, poorly defined, and often joined to form irregular oblique bars. Ventral surfaces are usually dark with white markings; most specimens (n = 18) have large white spots irregularly joined to form a broad vermiculate pattern on the abdomen (light and dark areas in more or less equal proportions). Larger specimens (n = 7) have relatively small, well defined white spots and/or narrow light vermiculations on the abdomen and a few specimens (n = 5) have a more or less uniformly dusky abdomen.

Dorsal, caudal, and paired fins have dark spots or blotches often forming irregular bands, especially in the dorsal and caudal fins. When intact, dorsal and ventral tips of caudal fin are often white, and the caudal fin of smaller specimens (< 44 mm SL) may have a thin white distal margin. The distal tip of the dorsal fin spine and anteriormost rays are similarly white in intact specimens (< 47 mm SL). The white distal tips of the dorsal and caudal fins are often lacking or absent in larger specimens (> 63 mm SL).

Ancistrus cf. *temminckii* was discovered on O‘ahu in 1985 (Devick, 1991) and is currently found in Baskerville Springs, Nu‘uanu, Waikele/Kīpapa, Mānoa/Palolo, He‘eia and Kāwā Streams. On O‘ahu, this species prefers high velocity riffle and run habitats, and is less common in pool habitats. Densities of *Ancistrus* cf. *temminckii* are high in all O‘ahu streams where found, and may be contributing to the near absence in these areas of native gobiids such as *Awaous guamensis* (Valenciennes) and the completely algivorous *Sicyopterus stimpsoni* (Gill). *Ancistrus*, like many loricariids, is primarily algivorous and detritivorous (Power, 1984; Burgess, 1989), and introduced populations may adversely affect native stream gobies through competition for food and space and perhaps predation on eggs. The impacts of introduced populations of loricariids on native fish communities have not been studied.

Material examined. **O‘AHU:** INHS 48306, 10 males and/or immature females, 28.2–74.1 mm SL, Waikele Stream at Waikele Springs, 4.5 m (R.A. Englund & D.J. Preston), 5 June 1998; BPBM 38537, 2 specimens, 65–69 mm SL, Waikele Stream at Waikele Springs, 4.5 m (R.A. Englund & D.J. Preston), 5 June 1998; INHS 48304, 3 large males, 63.7–109.4 mm SL, with well developed tentacles, 17 females and/or immature males, Mānoa Stream near Mānoa Elementary School, 55 m (R.A. Englund & D.J. Preston), 8 May 1998; BPBM 38536, 2 specimens, 58–78 mm SL, Mānoa Stream near Mānoa Elementary School, 55 m (R.A. Englund & D.J. Preston), 8 May 1998.

Hypostomus watwata* group*Revised identification**

Hypostomus sp. -- Devick, 1991: 192.

Hypostomus Lacépède is the largest genus in Loricariidae with about 115 nominal species (Isbrücker, 1980). No unique characteristics diagnose *Hypostomus* (Armbruster, 1997) and species of *Hypostomus* are sometimes confused with members of the genus *Pterygoplichthys* Gill (sensu Armbruster, 1997). Like *Hypostomus*, *Pterygoplichthys* (sailfin catfish) is extremely common in the aquarium trade and two species, *P. multiradiatus* and *P. disjunctivus*, are established in Florida (Page, 1994). *Pterygoplichthys* is easily distinguished by having 9–14 dorsal fin rays vs. 7 (very rarely 8) in *Hypostomus* and most other loricariids (Weber, 1991, 1992; Armbruster, 1997).

Although some species of *Hypostomus* are well marked and can be reliably identified (e.g., see Mazzoni *et al.*, 1994), the majority of described forms is poorly known. Taxonomic studies of *Hypostomus* that may be useful for identifying the Hawaiian population are those of Boeseman (1968, 1969) who recognized 15 species and three subspecies in Suriname. Boeseman (1968) separated the Suriname species into two distinct groups, the *H. plecostomus* (Linnaeus) and *H. watwata* Hancock groups, by comparing ratios between the minimum depth of the caudal peduncle and interdorsal length (i.e., distance measured between base of last dorsal-fin ray and origin of adipose-fin spine). Based on Boeseman's ratios, the Hawaiian specimens are referable to the *Hypostomus watwata* group (depth of caudal peduncle 1.8–2.7 in interdorsal length vs. 1.35–1.70 for species of the *H. plecostomus* group).

Unfortunately, the Hawaiian specimens are not clearly identifiable as any of the eight Surinamese species assigned to the *Hypostomus watwata* group. Based on descriptions in Boeseman (1968), the Hawaiian specimens (Table 1) most closely resemble *H. corantijni* with respect to the following: post-occipital plate single, depressed dorsal fin falling considerably short of origin of adipose fin spine, depth of caudal peduncle 2.05–2.41 in interdorsal length (2.1–2.3 in *H. corantijni*), mandibular ramus 1.97–2.32 in interorbital width (compared to 2.2–2.5), and mandibular teeth about 46–59 per ramus (compared to 40–60). However, the cleithral width of the Hawaiian specimens (3.19–3.32 into SL) falls outside the range reported for *H. corantijni* (3.50–3.85). The Hawaiian specimens are not readily assignable to any of the species native to southern Brazil and Paraguay that were recently described and revised by Weber (1986a, 1986b, 1987), Reis *et al.* (1990) and Mazzoni *et al.* (1994). There is not enough taxonomic information available to compare the Hawaiian specimens to the numerous species of *Hypostomus* that occur throughout the Amazon and Orinoco basins.

Coloration of species in the *Hypostomus watwata* group is similar and shared by many other species of *Hypostomus* outside Suriname. Body and fins are light to medium brown with numerous dark spots that are smallest, most distinct and most closely spaced on the dorsal surface of the head (see figures in Boeseman, 1968, 1969). According to Boeseman (1968), dusky spots are present on the ventral surfaces in *H. watwata* (but become vague or disappear in old or badly preserved specimens), and are lacking in *H. corantijni*. The ventral surface of the Hawaiian specimens is covered with dusky round spots. However, the length of the mandibular ramus relative to the interorbital width in the Hawaiian specimens precludes their identification as *H. watwata* assuming this character is useful for discriminating species of *Hypostomus*. *Hypostomus* is easily distinguished from sympatric *Ancistrus* cf. *temminckii* by the presence of small bony plates along the

Table 1. Selected morphometric features of *Hypostomus* introduced to Hawai'i. Measurements to nearest 0.01 mm according to Boeseman (1968) and Armbruster & Page (1996). Range of ratios in parentheses are those reported for *H. corantijni* by Boeseman (1968, 1969).

	n = 1	2	3	4	5	6
standard length (SL)	126.60	135.40	167.00	201.50	208.50	218.00
predorsal length	50.10	52.06	63.63	73.44	75.41	79.78
interdorsal length	28.76	30.50	34.04	41.88	42.53	44.35
head length	39.45	41.44	48.33	56.52	59.53	61.02
head depth	24.42	25.74	31.16	36.46	38.60	38.55
snout length	25.40	26.52	32.85	36.76	38.68	39.36
post-anal peduncular length	41.19	47.50	57.19	66.30	67.40	73.85
least caudal peduncle depth	12.03	12.64	16.20	20.38	20.37	21.20
folded dorsal-fin length	51.33	54.61	69.85	89.19	96.44	94.25
dorsal-spine length	damaged	40.04	52.28	59.00	60.33	60.92
pectoral-spine length	37.37	38.82	51.88	63.90	65.13	67.80
pelvic-spine length	32.20	35.15	43.08	54.78	53.63	52.72
bony orbital diameter	5.55	5.55	6.90	7.65	8.25	8.35
bony interorbital width	15.85	17.03	20.21	22.77	23.80	23.35
max. cleithral width	38.25	41.01	50.29	60.99	63.75	68.32
mandibular ramus length (tooth bearing portion)	7.30	7.45	8.71	11.09	11.49	11.88
SL/head D (5.15-5.65)	5.18	5.26	5.36	5.53	5.40	5.65
SL/cleithral W (3.5-3.85)	3.31	3.30	3.32	3.30	3.27	3.19
head L/snout L (1.45-1.8)	1.55	1.56	1.47	1.54	1.54	1.55
head L/interorbital W (2.4-2.8)	2.49	2.43	2.39	2.48	2.50	2.61
interdorsal L/caudal peduncle D (2.1-2.3)	2.39	2.41	2.10	2.05	2.09	2.09
interorbital W/mandibular L (2.2-2.5)	2.17	2.29	2.32	2.05	2.07	1.97
snout L/orbital diameter (2.6-4.0)	4.58	4.78	4.76	4.81	4.69	4.71

snout margin that feel rough to the touch (plates absent from snout margin in *Ancistrus*, replaced by smooth skin and, in males, with fleshy tentacles).

On O'ahu, *Hypostomus* occurs in lower Nu'uuanu, Waiawa, Kalihi, Mānoa, Kamo'oali'i (Kāne'ohe), and Kāwā Streams, and can dominate the low-elevation areas of streams where it has been introduced. For example, *H. watwata* comprised more than 66% of the fish catch (by number) in Kāwā Stream draining into Kāne'ohe Bay, with native fish always accounting for less than three percent of the catch (Filbert & Englund, 1995). Potential negative impacts on native stream communities would likely be similar to those cited for *Ancistrus* cf. *temminckii*. *Hypostomus* also attains a much larger size (nearly 300 mm SL vs. usually <150 mm in *Ancistrus*). On O'ahu, *Hypostomus* is restricted to the lower freshwater portions of streams above areas of tidal influence and appears to be intolerant of salt or brackish water.

Material examined. O'AHU: INHS 48305, 6 adults 126.6-218 mm SL, Mānoa Stream at Kaimuki High School (R.A. Englund & D. J. Preston), 15 October 1998; BPBM 38535, 2 adults 140-

160 mm SL, Mānoa Stream at Kaimuki High School (R.A. Englund & D. J. Preston); 1 male and/or immature female, 75 mm SL, Kalihi Stream, BPBM; 1 adult 175 mm SL, Waiawa Stream, 29 April 1998, BPBM (R.A. Englund, D.J. Preston, & R. Wolff).

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