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RECORDS OF THE HAWAII BIOLOGICAL SURVEY FOR 2021

NEAL L. EVENHUIS, EDITOR

BISHOP MUSEUM PRESS
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Cover: *Thaumastocoris peregrinus* Carpintero & Dellape (Heteroptera: Thaumastocoridae) - first record of the family in the Hawaiian Islands (see p. 21).

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RECORDS OF THE HAWAII BIOLOGICAL SURVEY FOR 2021

Editor's Preface

I am pleased to present the annual compilation of *Records of the Hawaii Biological Survey*; this year for the year 2021. The Hawaii Biological Survey, established by the Hawaii State Legislature in 1992 as a program of Bishop Museum, is an ongoing natural history inventory of the Hawaiian Archipelago. It was created to locate, identify, and evaluate all native and nonnative species of flora and fauna within the state; and by State Law to maintain the reference collections of that flora and fauna for a wide range of uses. In coordination with related activities in other federal, state, and private agencies, the Hawaii Biological Survey gathers, analyzes, and disseminates biological information necessary for the wise stewardship of Hawai'i's biological resources.

An intensive and coordinated effort has been made by the Hawaii Biological Survey to make our products, including many of the databases supporting the papers published here, available to the widest user-community possible through our web server. Products currently available include taxonomic authority files (species checklists for terrestrial arthropods, flowering plants, nonmarine snails, marine invertebrates, fossil taxa, and vertebrates), bibliographic databases (vascular plants, nonmarine snails, and insects), specimen databases (fungi, fish, invertebrates, portions of the insect collection) and type specimens (entomology; botany—including algae and fungi; and vertebrates), collections data (lists of holdings for select groups of flies as well as Cicadellidae and Pentatomidae), detailed information and/or images on endangered, threatened, and extinct plants and animals; as well as our staff publication lists. Additional reference databases include: the list of insect and spider collections of the world (based on Arnett, Samuelson & Nishida, 1993, 'Insect and spider collections of the world') with links to institutional web sites; and an authority file with full names and vital dates of more than 6,700 authors who have described new taxa of flies (Diptera).

The Records for 2021 includes descriptions of four endemic new species, 12 new state records of alien species, 39 new island records of alien species; and. most significantly, three rediscoveries of plant species thought to be extinct in he wild.

Our Primary Web Products:
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http://nsdb.bishopmuseum.org/

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Hawaii Biological Survey's "Good Guys/Bad Guys" website
http://hbs.bishopmuseum.org/good-bad/

World Diptera taxonomist list
http://hbs.bishopmuseum.org/dipterists/

Many of the new records reported here resulted from curatorial projects and field surveys funded by the National Science Foundation, the U.S. Navy, the U.S. Geological Survey, the U.S. Fish & Wildlife Service, the Hawaii Department of Transportation, and the Hawaii Department of Land and Natural Resources; they are thanked for their support and partnership of the Hawaii Biological Survey over the years.

We encourage authors with new information concerning flora or fauna occurring in the Hawaiian Islands to submit their data to the editor for consideration for publication in the Records. Submission and format of papers must follow format of recent papers. Information on submission of manuscripts and guidelines for contributors may be obtained at: http://hbs.bishopmuseum.org/guidelines.pdf ——*N.L. Evenhuis, editor*

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Records of the Hawaii Biological Survey for 2021. Edited by Neal L. Evenhuis. *Bishop Museum Occasional Papers* 142: 3–9 (2021)

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Two new species of the endemic Hawaiian predaceous fungus gnats *Tylparua* Edwards from the Wai‘anae Mountains, O‘ahu, Hawai‘i (Diptera: Keroplatidae)[1]

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Abstract. Two new species of *Tylparua* Edwards from the Wai‘anae Mountains of O‘ahu: *Tylparua kolekole*, **n. sp.**, and *T. vulgaris*, **n. sp.** are described and illustrated.

INTRODUCTION

Keroplatids in Hawai‘i have been little studied but studies by me underway appear to show they possess a high diversity. Hardy (1960) was the last to revise the family in Hawai‘i (in Mycetophilidae). Evenhuis (2006) described a second species of *Trigemma* Hardy, and Evenhuis (2019) recorded the first introduced species, *Apyrtula sastrei* Matile.

Two new species from O‘ahu are described here to allow their analysis in a more detailed review of the genus *Tylparua* in the Hawaiian Islands.

MATERIAL AND METHODS

Specimens studied derive from and/or are deposited in the the following (abbreviations follow Evenhuis 2021): Bernice P. Bishop Museum, Honolulu, Hawai‘i, USA (BPBM); Canadian National Collection of Arthropods, Ottawa, Ontario, Canada (CNCI); Hawaii State Department of Agriculture, Honolulu, Hawai‘i, USA (HDOA); Hawaii Sugar Planters’ Association (HSPA; now at HDOA); and the University of Hawai‘i Insect Collection, University of Hawai‘i at Manoa, Honolulu, Hawai‘i, USA (UHIM).

Morphological terminology follows Cumming & Wood (2017), and Blagoderov & Ševčik (2017) for wing venation terminology. Confocal photographic images were accomplished by obtaining a series of stacked images using a Leica M165C stereo dissecting scope via the Leica Microsystems LASX 3.04 Multifocus software and using Zerene Stacker® stacked focusing software (v. 1.04) (Zerene Systems, LLC, Richmond, Washington, USA) to align and stack-focus each final image.

TAXONOMY

Tylparua kolekole Evenhuis, **new species**

(Figs. 1, 3, 5, 7, 9 ,11)

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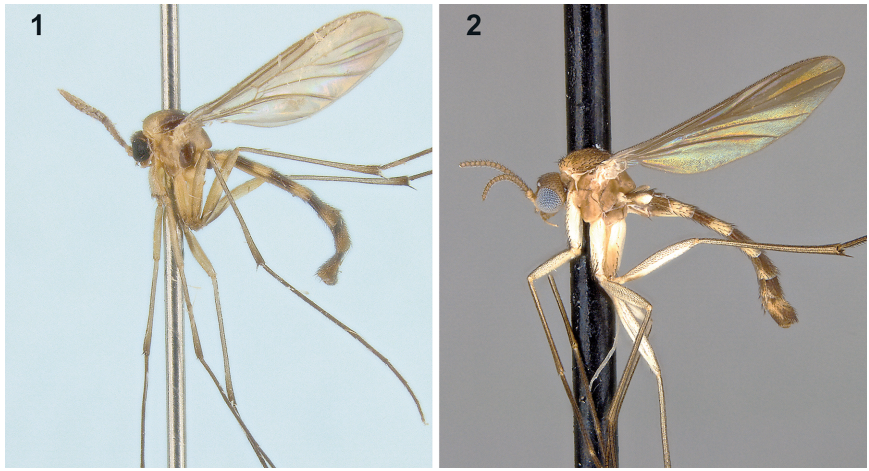
Diagnosis. Most similar to *Tylparua fuscocostata* (Grimshaw) in having infuscation along the costa and males with antennal flagellomeres II–XIII as long as wide; but it can be separated from it by yellow and black-patterned mesonotum (almost all black in *T. fuscocostata*); the scutellum with yellow along the posterior margin (scutellum all black in *T. fus-*

1. Contribution 2021-007 to the Hawaii Biological Survey.



Figs. 1–2. *Tylparua,* male lateral habituses. **1.** *Tylparua kolekole*, n. sp. **2**. *T. vulgaris*, n. sp.

cocostata); the yellow hind coxae (black in *T. fuscocostata*), distinctly patterned abdomen with yellow on posterior half of each tergite I–V (black in *T. fuscocostata*), and the mediotergite extensively yellow laterally (brown to black in *T. fuscocostata*).

Description. Male (Fig. 1). Lengths: Body: 5.8–6.2 mm; wing; 4.0–4.2 mm. *Head*. Occiput brown. Two ocelli. Ocellar callus black. Frons brown. Antennae (Fig. 3): scape and pedicel yellow. Flagellum: segment 1 longer than wide; segments 2–14 squarish, each successive segment reduced in width apically as antennae slightly tapers to segment 14 ellipsoid with rounded apex. Flagellomeres brown except flagellomere 1 yellow at basal 1/3. Face and palpi yellow.

Thorax. Mesonotum and scutellum subshining yellow with dark brown on posterior and lateral margins of mesonotum making a U-shaped pattern when viewed dorsally (Fig. 5), with scattered black setulae dorsally, longest laterally. Pleurae predominantly yellowish white, laterotergite contrastingly brown. Mediotergite (cf. Fig. 5) yellowish white with brownish medial stripe, without minute apical setae. Halter stem yellow, knob black with minute black setae dorsally.

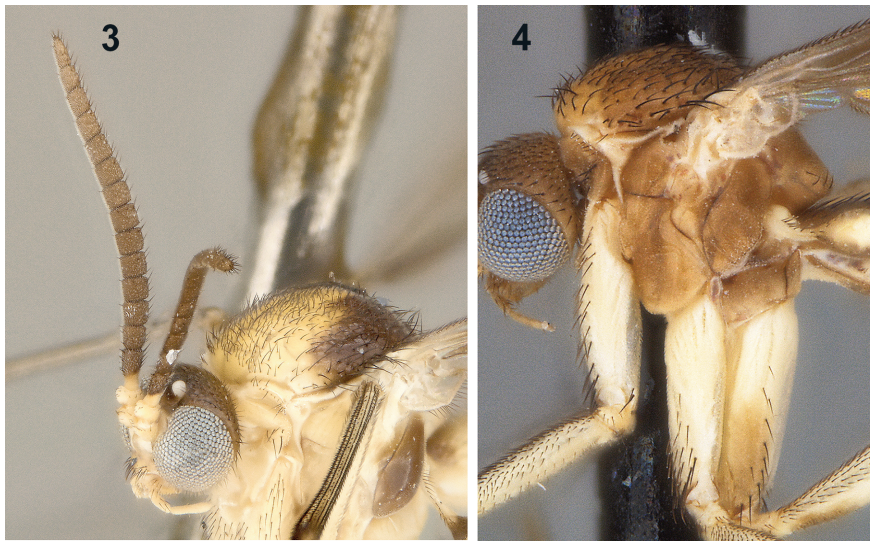
Legs. Coxae and fore femur yellow, mid and hind femora with pale brownish color on basoventral 1/4; tibiae yellow, yellowish brown only at extreme apex; tibial setae in rows; tibial spurs 1:2:2; hind tibia with spurs of unequal length (Fig. 7); tarsi all black. Claws minute.

Wing (Fig. 9). Grayish hyaline with infuscation along most of costa to tip of wing and in cell r1; apical 1/5 slightly infuscated; vein CuP darkly sclerotized, extending to level of M_4 base.

Abdomen. Generally patterned yellow and black with tergites I–VI black basally and yellow posteriorly. Sternites with same pattern as tergites.

Hypopygium. Genitalia not dissected. Epandrium (Fig. 11) dark brown, yellow basally, with distinctly cleft apical margin.

Female. Unknown.



Figs 3–4. *Tylparua*, heads and thoraces, lateral view. **3**. *T. kolekole*, n. sp. **4**. *T. vulgaris*, n. sp.

Material Examined. *Holotype* ♂ from HAWAIIAN ISLANDS: **O‘ahu**: Kolekole Pass, 1,725 ft [ca. 525 m], 5 Jun 1967, J.R. Vockeroth (CNCI). *Paratype*: 1♂, same data as holotype except, 8 May 1967 (CNCI). Holotype in CNCI; paratype in BPBM.

Remarks. Although the genitalia were not dissected, they will be as part of a larger study when more material is available. The fact that somal colors and patterns and epandrial shape and coloration has shown to be consistent within species in the genus allows for this species to be confidentally separated from the congeners.

Etymology. The specific name refers to the type locality of Kolekole Pass on O‘ahu. The specific name is treated as a noun in apposition.

Tylparua vulgaris Evenhuis, **new species**
(Figs. 2, 4, 6, 8, 10, 12, 13)
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Diagnosis. Separated from other species in the genus by having the combination of infuscation in the apical one-fourth of the wing and vein M_4 effaced basally (Fig. 10) (no other species with an apically infuscated wing are known with an effaced base of M_4). Using Hardy’s (1960) key, *T. vulgaris* runs to *T. insularis* (Grimshaw). It can be separated from it by the effaced M_4 basally (not effaced in *T. insularis*), and male genitalic characters (cf. Figs. 13–14): the densely setose gonocoxa apically (gonocoxa uniformly setose in *T. insularis*) and the single subapical setae on the gonostylus (multiple subapical setae in *T. insularis*).

Description. Male (Fig. 2). Lengths: Body: 2.5–2.8 mm; wing; 2.8–3.0 mm. *Head*. Occiput dark brown to black. Two ocelli. Ocellar callus black. Frons brown. Antennae:

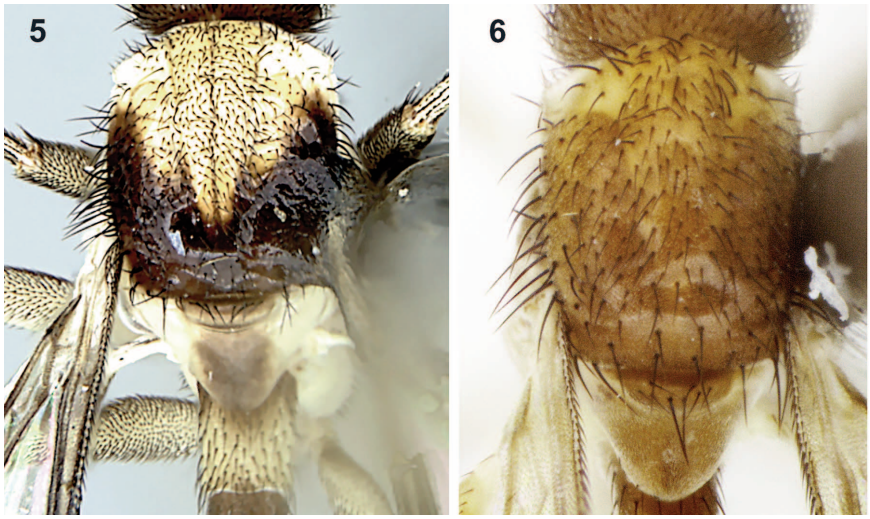

Fig. 5–6. *Tylparua*, thoraces, dorsal view. **5**. *T. kolekole*, n. sp. **6**. *T. vulgaris*, n. sp.

scape and pedicel yellowish brown. Flagellum: segments 2 times longer than wide; segments 2–13 squarish, each successive segment reduced in width apically as antennae slightly tapers to segment 14 ellipsoid with rounded apex. Flagellomeres brownish black except flagellomere 1 yellow at extreme base. Face brown, palpi brown.

Thorax. Mesonotum (Fig. 6) and scutellum subshining brown, humeri yellowish brown, with scattered black setulae dorsally, longest laterally. Pleurae (Fig. 4) brown, propleuron with patch of small fine black hairs, otherwise pleura bare. Mediotergite brown, with minute setulae apically (Fig. 4). Halter stem white, knob white with tan dorsal margin.

Legs. Coxae whitish yellow, yellowish brown apically on hind coxa; femora and tibiae yellow; tibial setae in rows; tibial spurs 1:2:2; hind tibia with spurs of subequal length (Fig. 8), hind basitarsus subequal in length to hind tibia; tarsi black. Claws minute.

Wing (Fig. 10). Grayish hyaline with densely distributed microtrichiae, infuscated slightly darker grayish on apical one-fourth; Tip of vein Sc effaced, ending in C before origin of Rs. C ending halfway between R_{4+5} and M_1; vein bm-m weak to effaced; M_4 effaced basally; CuP rudimentary; CuA not reaching wing margin.

Abdomen. Tergite I all black; tergites II–IV black basally, yellowish white apically; Tergite V with a thin yellow band posteriorly; Tergite VI all black; tergites with scattered black hairs; sternites II–V predominantly yellow with dark brown basally; sternite VI predominantly black with yellow apically.

Hypopygium (Figs. 12–13). Pale yellowish brown. Epandrium (Fig. 12) longer than gonocoxites, subconical. Gonocoxites (Fig. 13) broad, subrectangular, tapering toward apex, densely long setose apicolaterally. Gonostyle (Fig. 13) hook-shaped, tapered to a point and sclerotized apically, with single subapical seta, short haired laterally.

Female. As in male except female tibial spurs shorter than in male.

Figs. 7–8. *Tylparua*, hind tibiae showing tibial spurs. **7**. *T. kolekole*, n. sp. **8**. *T. vulgaris*, n. sp.

Material Examined. *Holotype* ♂ (BPBMENT000016665) and 5♂, 1♀ paratypes from HAWAIIAN ISLANDS: **Oʻahu**: Lualualei Naval Magazine, Halona Valley, 1,280 ft [390 m], 21.42611°N, 158.10304°W, 10–13 Sep 2019, N.L. Evenhuis, yellow pan traps. *Other paratypes*: **Oʻahu**: 15♂, topotypic, 10–12 Jul 2019, 23♂, 6♀, same data, 23–26 Jul 2019, yellow pan traps (BPBM); 1♂, 2♀, Lualualei Naval Magazine, Halona Valley, Pohakea Spring, 21°26.0′N, 158°05.8′W, 1475ft. [ca. 450 m], 24 Apr–16 May 1996, D.J. Preston, F.G. Howarth, Malaise trap (BPBM); 1♀, Makaleha Stream, 3 ft [1 m], 27 Mar–3 Apr 2017, W.D. Perreira & D.A. Yee (BPBM); 1♂, Round Top, 1,100 ft. [335 m], 17–20 Nov 2020, black pan trap, W.D. Perreira, D.A. Yee (BPBM); 1♂, 1♀, Mt. Tantalus, 1,800 ft. [ca. 549 m], 17, 27 Nov 1966, J.R. Vockeroth (CNCI). Holotype in BPBM. Paratypes in BPBM, CNCI, HDOA, and UHIM. Non-types. HAWAIIAN ISLANDS. **Lānaʻi**: 1♂, 1♀, Lanaihale, 914 m, W.C. Gagné (BPBM); 1♂, Lānaʻi Mountains, 17 Feb 1965, N.L.H. Krauss (BPBM).

Remarks. The specimens collected at the type locality and environs over the years had been misidentified in reports as *Tyl. hawaiiensis* based on the apical infuscation of the wing (true *hawaiiensis* does not have vein M_4 effaced basally). Specimens of Hawaiian keroplatids are rarely collected and usually only as singletons or a few at a time, so it is highly unusual that dozens of specimens would be collected from one locality over a period of a few months (and only three collecting events). The only other species of keroplatid with such large numbers from one locality is *Tyl. cratericola* (Hardy) from Paliku in Haleakalā Crater on Maui. It could be that the use of pan traps allowed more specimens to be collected, but collecting with pan traps in previous years at the same locality did not produce any results; and it is noteworthy that no specimens were collected in the Malaise trap that was set up a few meters away from the pan traps. As can be seen, the vast major-

Figs. 9–10. *Tylparua*, wings. **9**. *T. kolekole*, n. sp. **10**. *T. vulgaris*, n. sp.

ity of those collected using yellow pans were males, which may indicate that males were swarming. The same male-predominant collecting results is seen in the material of *Tyl. cratericola*. Searching at the type locality was conducted to determine where the immatures might be (but without luck) including creating a dark moist area under a rock in hopes it would be seen as a possible site for females to oviposit and immatures to breed. It became inhabited instead by a spider.

Since all the other specimens from this species are known only from Oʻahu, the specimens from Lānaʻi that key to this species are not considered part of the type series as they differ slightly in coloration of the pleura and epandrium. Dissection of male genitalia of the Lānaʻi specimen was not conducted due to the paucity of material. Further study of additional specimens is needed to better ascertain their position.

Etymology. The specific name derives from the Latin *vulgaris* [= common, commonplace]; referring to the relative commonness of adults on the island of Oʻahu.

ACKNOWLEDGMENTS

Thanks to Dan Rubinoff (UHIM) for providing access to the UHIM material; Owen Lonsdale kindly loaned specimens from CNCI for study. Janis Matsunaga graciously

Figs. 11–14. *Tylparua*, male genitalia. **11**. *T. kolekole*, epandrium. **12**. *T. vulgaris*, epandrium. **13**. *T. vulgaris*, gonocoxa and gonostylus, ventral view. **14**. *T. insularis* gonocoxa and gonostylus, ventral view.

allowed examination of specimens from HSPA currently housed in HDOA and transfer of type material to BPBM. William Perreira kindly donated specimens he collected. Scott Fitzgerald reviewed the manuscript and his suggestions helped improve it.

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New species of *Bemlos* Shoemaker (Amphipoda, Senticaudata, Aoridae) from the Hawaiian Islands and Madagascar[1]

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Abstract. A new species of aorid amphipod *Bemlos kaholaloa* **sp**. **nov**. is described from Hawai'i. It was collected from an autonomous reef monitoring structure deployed near Honolulu Harbor, O'ahu. The new species is compared with two sibling species, one from Micronesia and the other, also given new species status, from the Indian Ocean.

INTRODUCTION

During a study in 2018 of aquatic invasive species, by the State of Hawai'i's Division of Aquatic Resources, a previously undescribed species of aorid amphipod was discovered at Māmala Bay in Oahu. It appeared to be closely allied to *Bemlos tridens* (Schellenberg) from Micronesia but differed from it in several important character states. Furthermore, material described from Madagascar by Ledoyer (1983) and attributed to *B. tridens* (Schellenberg) is found here to represent a third species in the *B. tridens* complex of species. The two new species, *Bemlos kaholaloa* **sp**. **nov**. (Hawai'i) and *B. ledoyeri* **sp**. **nov**. (Madagascar) are formally described and figured and compared with *B. tridens* (Schellenberg).

MATERIALS AND METHODS

Autonomous reef monitoring structures (ARMS) were used to monitor waters near state harbors for aquatic invasive species. ARMS are standardized structures designed to sample understudied marine cryptofauna passively (Global ARMS Program, 2017).

A modified ARMS, consisting of four plates rather than the standard nine, was deployed 10 July 2018 on a coral reef outside (southwest of the mouth of) Honolulu Harbor on the island of O'ahu, Hawai'i and retrieved approximately 34 months later. All crustaceans retained on a 2-mm sieve were fixed in formalin and preserved in alcohol. These were received on 10 September 2021. Unrecognized specimens were dissected following the procedure outlined in Barnard (1971). Body parts were mounted on glass slides, either temporarily in water or permanently with Permount mounting medium and observed on a Richter Optica UXID compound microscope outfitted with a 5 mega pixel camera. Type material is deposited at Bernice P. Bishop Museum, Honolulu (BPBM) and the Muséum National d'Histoire Naturelle, Paris (MNHN).

Abbreviations used in figures: G1, 2 = gnathopod 1, 2; Hd = head; L = labium; Md = mandible; Mx 2 = maxilla 2; U1, 2, 3 = uropods 1, 2, 3; SP = sternal processes; T = telson.

1. Contribution 2021-008 to the Hawaii Biological Survey.

Fig. 1. *Bemlos kaholaloa* sp. nov. male, 4.5 mm, Māmala Bay, Oʻahu, Hawaiʻi.

SYSTEMATICS

Order AMPHIPODA Latreille, 1816
Suborder SENTICAUDATA Lowry & Myers, 2013
Infraorder COROPHIIDA Leach, 1814
Superfamily AOROIDEA Stebbing, 1899
Family AORIDAE Stebbing, 1899

Bemlos kaholaloa sp. nov.

(Figs. 1–2)

lsid:zoobank.org:act:F7378097-3F99-4186-A859-9518F8D521AE

Type material. Holotype ♂, 4.5 mm, Māmala Bay, Oʻahu (21.29575°N, 157.873097°W), 4.27 m, 13 May 2021, BPBM S18774.

Type locality. Māmala Bay, Oʻahu .

Etymology. From the Hawaiian place name of the reef from which the species was collected.

Description (based on male 4.5 mm).

Head. Lateral cephalic lobes obtuse, eye of medium size. *Antenna 1* about two thirds body length; peduncular articles in the ratio (basi-distal) 14:18:5; flagellum subequal to peduncle; accessory flagellum with 4 articles. *Antenna 2* about 80% the length of antenna 1; peduncular articles 4 and 5 equal in length; flagellum slightly longer than peduncular article 5, with 7 articles. *Maxilla 2* outer and inner plates subequal; inner plate with oblique setal row; *Mandible* palp article ratios (basi-distal) approximately 3:6:9; *Labium* mandibular projections acute.

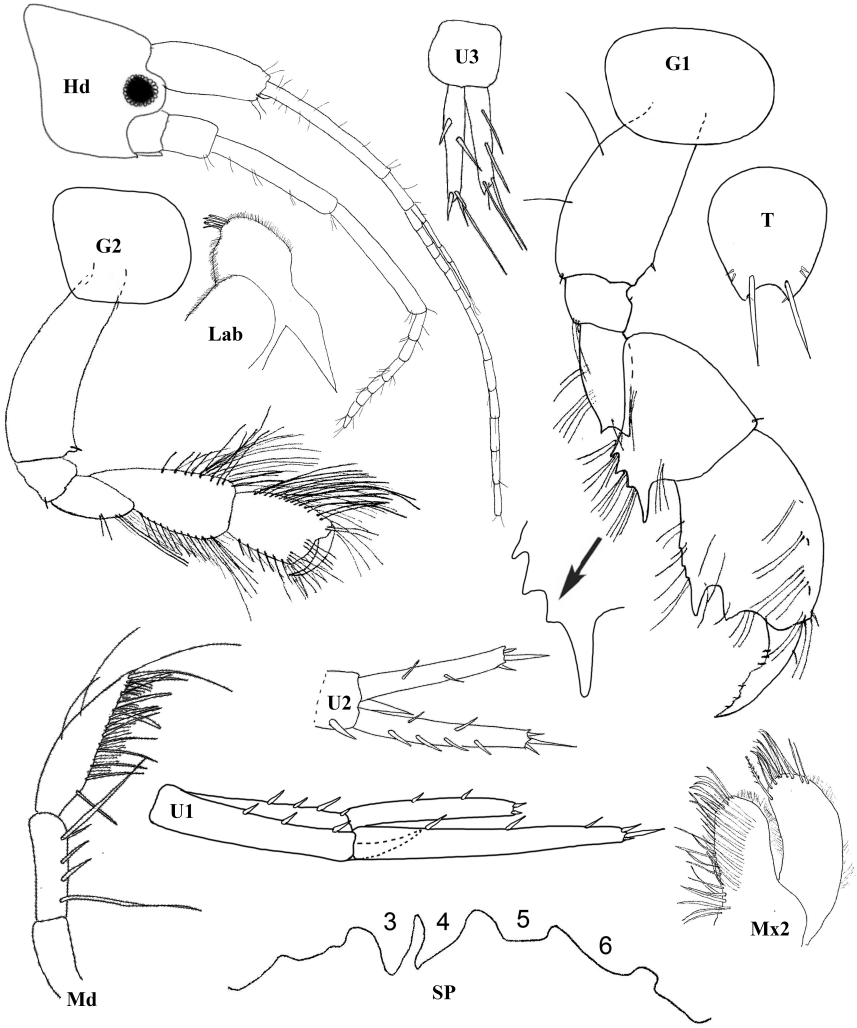

Fig. 2. *Bemlos kaholaloa* sp. nov. male, 4.5 mm, Māmala Bay, O‘ahu, Hawai‘i.

Pereon. *Color* (in alcohol): eyes dark; dark bands extend laterally on the dorsum of pereonites 2, 3, 5, 6, 7 and pleonites 1, 2; those on pereonites 2 and 5 widest. *Segments* with sternal spines, on segment 3 long, weakly acute and straight, on segment 4 very acute, produced forward, on segment 5 blunt. *Gnathopod 1* basis very stout, about twice as long as broad, anterior margin straight; merus with small posterodistal spine; carpus as broad as long, posterior margin produced into 4 spines, the most anterior one the longest, very acute, the second-most anterior blunt, the posterior third and fourth small, acute; pro-

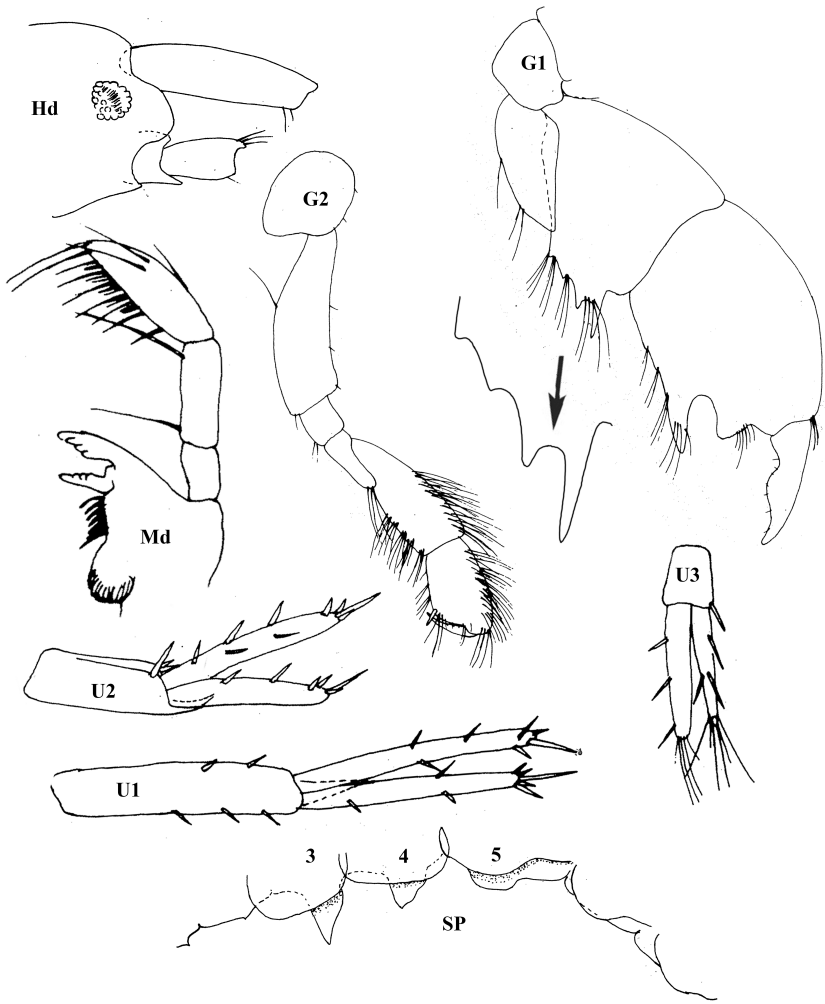

Fig. 3. *Bemlos ledoyeri* sp. nov. male, 5.0 mm, Grand Réciif de Tuléar, Madagascar (after Ledoyer, 1983 as *Bemlos tridens*).

podus longer than carpus, palm with deep distal excavation resulting in long slender defining spine; dactylus elongate, almost straight, posterior margin with shallow excavation, overlapping palm. *Gnathopod 2* coxa subround; basis elongate slender, anterior margin weakly concave, posterior margin convex; carpus elongate, twice as long as broad, anterodistal margin clothed in dense, long setae, posterodistal margin with long setae; propodus about two-thirds length of carpus, palm evenly convex, defined by a small robust seta; dactylus curved, slightly overlapping palm. *Pereopods* unknown.

Pleon. *Uropod 1* peduncle subequal with rami, with stout interramal spine about one third length of peduncle; endopodite much shorter than exopodite (perhaps regenerated). *Uropod 2* peduncle about three-quarters length of rami, with stout interramal spine almost half length of peduncle; endopodite longer than exopodite. Uropod 3 peduncle scarcely longer than broad; rami moderately long, less than two times length of peduncle; endopodite shorter than exopodite; both rami with long slender apical setae and marginal robust setae. *Telson* with a single seta on each dorsolateral crest.

Habitat. Natural habitat unknown.

Distribution. Hawaiian endemic.

Remarks. *Bemlos kaholaloa* **sp**. **nov**. differs from *B. tridens* in the structure of the male sternal processes, of the male gnathopod 1 and of the uropods. In the male segment 3 of *Bemlos kaholaloa* **sp**. **nov**, there is a stout triangular sternal process. In *B. tridens* this process is slender, curved forwards and acute. Segment 4 of *Bemlos kaholaloa* **sp**. **nov**. bears a forward directed acute sternal process, but this process is broad and truncated in *B. tridens*. Segment 5 bears a low flat-topped hump in *Bemlos kaholaloa* **sp**. **nov**., but a tall, truncated plate in *B. tridens*. In the male gnathopod 1 the propodus is longer than the carpus in *Bemlos kaholaloa* **sp**. **nov**., but carpus and propodus are subequal in *B. tridens*. The posterior margin of the carpus of *Bemlos kaholaloa* **sp**. **nov**. bears a long, slender posterodistal spine followed by 3 much shorter marginal spines. *B. tridens* has 3 identical shaped spines in disto-proximal graded sizes. In gnathopod 2, the basis and carpus are much less elongate and slender in *B. kaholaloa* **sp**. **nov**. than they are in either *B. tridens* or *B. ledoyeri*. The rami of uropod 3 in *Bemlos kaholaloa* **sp**. **nov**. are less than twice the length of the peduncle and only moderately slender but they are more than twice the length of the peduncle and very long and slender in both *B. tridens* and *B. ledoyeri* **sp**. **nov**.

Bemlos kaholaloa **sp**. **nov**. differs from *B. ledoyeri* in the long and acutely terminating article 3 of the mandibular palp (short and obtuse in *B. ledoyeri*), in the presence of a spine on the posterodistal margin of the merus (absent in *B. ledoyeri*), in the long acute process on sternite 4 of the male (short and triangular in *B. ledoyeri*) and in the shorter rami of uropod 3 (long in *B. ledoyeri*).

***Bemlos ledoyeri* sp. nov.**

(Fig. 3)

lsid:zoobank.org:pub:25263046-E13F-4B4F-B3A4-9B63B5F3B4A8

Microdeutopus tridens: Ledoyer, 1978: 255. Ledoyer 1979: 43, fig. 22; 1983: 302, fig. 112. (misidentification).

Type material. Holotype ♂, 4.5 mm, pente externe du Grand Réciif de Tuléar, 15 m depth. 3 slides. MNHN-IU-2008-22898 (= MNHN-Am3491) 1 M St 6-11-2 M. Peyrot-Clausade coll; MNHN-IU-2008-22898 (= MNHN-Am3491) 1 juv ? Cn 1-2 St 6-11-10 M. Peyrot-Clausade coll; MNHN-IU-2008-22898 (= MNHN-Am3491) 1 M Gn1 scu it St 6-11-4 M. Peyrot-Clausade coll.

Type locality. Tuléar Madagascar.

Etymology. Named for Michel Ledoyer in acknowledgement of his epic work on the amphipods of Madagascar.

Description (based on male 5.0 mm).

Head. Lateral cephalic lobes obtuse, eye of medium size. *Antenna* unknown. *Mandible* palp article ratios (basi-distal) approximately 3:6:10 *Labium* mandibular projections acute.

Pereon. *Segments* with sternal spines, on segment 3 long, acute and straight on segment 4 acute and irregular, on segment 5 weak. *Gnathopod 1* coxa unproduced, subquadrangular; basis very stout, about twice as long as broad, anterior margin straight; merus lacking a posterodistal spine; carpus as broad as long, posterior margin produced into 4 spines, the most anterior one slender and the longest, the second most anterior of similar shape but shorter, the posterior 2 spines very small; propodus longer than carpus, palm with deep distal excavation resulting in long slender defining spine; dactylus stout and relatively straight, the posterior margin sinuous, medially swollen, fitting palm. *Gnathopod 2* coxa subround; basis elongate slender, anterior margin strongly concave, posterior margin strongly convex; carpus elongate, three times as long as broad, anterodistal and posterodistal margins clothed in dense setae; propodus about two-thirds length of carpus, palm evenly convex, defined by a small robust seta; dactylus curved, slightly overlapping palm. *Pereopods* unknown.

Pleon. *Epimera* rounded. *Uropod 1* peduncle and rami subequal in length, with stout interramal spine about one third length of peduncle; rami subequal in length. *Uropod 2* peduncle equal in length to exopodite and with stout interramal spine almost half length of peduncle; endopodite longer than exopodite. Uropod 3 peduncle a little longer than broad; rami more than two times length of peduncle, very long and slender, endopodite shorter than exopodite; both rami with very long slender apical setae, endopodite and exopodite with marginal robust setae. *Telson* with a single long seta on each dorsolateral crest.

Habitat. Found to a depth of 15 meters on reef slopes in "very degraded" *Acropora* and *Acropora* with concretions.

Distribution. Indian Ocean: Toliara (Tuléar), Republic of Madagascar (Ledoyer 1979, 1983) and Republic of Mauritius (Ledoyer 1978).

Remarks. *Bemlos ledoyeri* differs from *B. tridens* in the structure of the sternal spines in the male. In *B. ledoyeri*, the spine on segment 3 is anteriorly straight whereas in *B. tridens* it is weakly concave, in *B. ledoyeri* the spine on segment 4 is short, and triangular whereas in *B. tridens* it is long and truncated and the spine on segment 5 in *B. ledoyeri* is a weak hump but a strong rectangular plate in *B. tridens*. The male gnathopod 1 of *B. ledoyeri* lacks a spine on the merus (present in both *B. tridens* and *B. kaholaloa*) has very different shaped spines on the posterior margin of the carpus (variable in shape in *B. ledoyeri* but uniform in shape although not in size in *B. tridens*), a propodus longer than the carpus (subequal in *B. tridens*) and a short dactylus with a sinuous posterior margin in *B. ledoyeri*, but a a long dactylus with an even posterior margin in *B. tridens*.

For differences between this species and *B. kaholaloa* **sp**. **nov**. see remarks under that species.

Bemlos tridens (**Schellenberg**)
(Fig. 4)

Microdeutopus tridens Schellenberg, 1938: 74–75, fig. 38. Barnard 1965: 531, fig. 28f.
Lembos tridens Ren, 2006: 386–388, fig. 165.
Bemlos tridens Myers, 2012: 16, figs. 11, 12.

Description (based on male 4.0 mm)

Head. Lateral cephalic lobes obtuse, eye of medium size. *Antenna* unknown. *Mandible* palp article ratios (basi-distal) approximately 4:6:8 (Schellenberg) 4:7:11 (Myers); *Labium* mandibular projections acute.

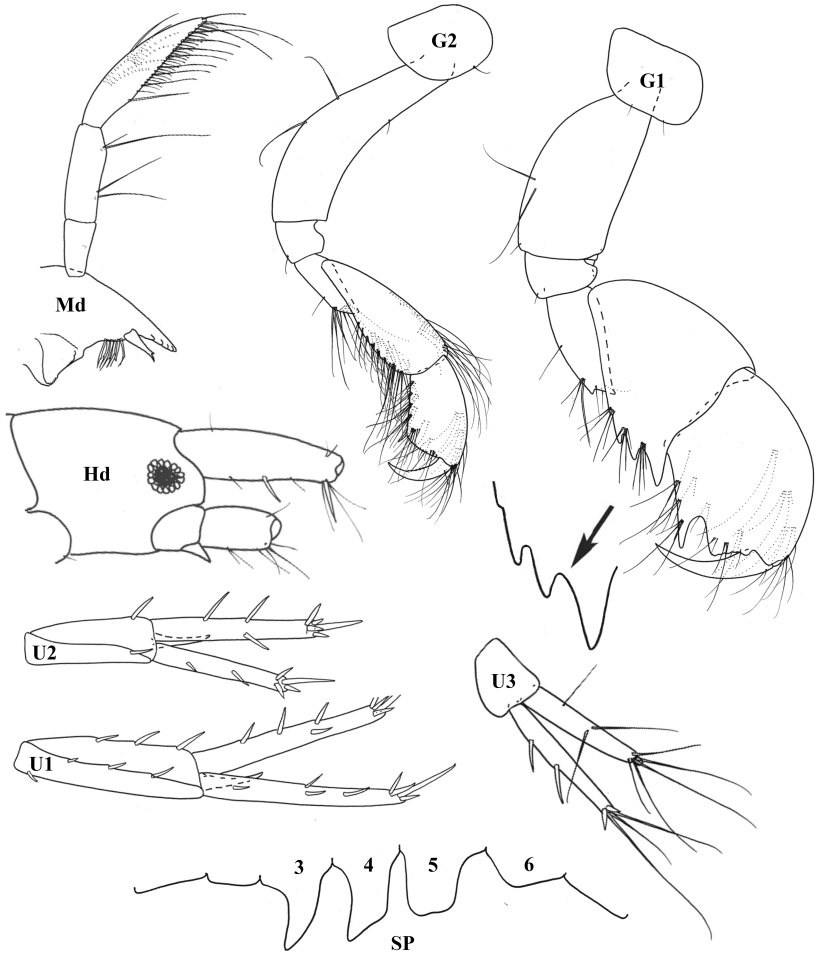

Fig. 4. *Bemlos tridens* (Schellenberg), male, 4.0 mm, Palau, Federated States of Micronesia (after Myers, 2012).

Pereon. *Segments* with sternal spines, on segment 3 long, acute and curved forwards, on segment 4 truncated, acute anterodistally, on segment 5 blunt, on segment 6 weak, triangular. *Gnathopod 1* coxa unproduced, rounded; basis very stout, about twice as long as broad, anterior margin straight; merus with small posterodistal spine; carpus as broad as long, posterior margin produced into 3 spines of identical shape, the most anterior one the longest, the most posterior one the shortest; propodus subequal in length with

carpus, palm with deep distal excavation resulting in long slender defining spine; dactylus elongate, strongly curved, narrowing uniformly distally, overlapping palm. *Gnathopod 2* coxa subround; basis elongate slender, anterior margin strongly concave, posterior margin strongly convex; carpus elongate, twice as long as broad, anterodistal margin clothed in dense, long setae, posterodistal margin with long setae; propodus about two-thirds length of carpus, palm evenly convex, defined by a small robust setae; dactylus curved, slightly overlapping palm. *Pereopods 3–4* similar; dactylus shorter than propodus. *Pereopods 5–6* basis slender. *Pereopod 7* unknown.

Pleon. *Epimera* rounded. *Uropod 1* peduncle a little shorter than rami, with stout interramal spine about one third length of peduncle; rami subequal in length. *Uropod 2* peduncle about three-quarters length of rami, with stout interramal spine almost half length of peduncle; endopodite longer than exopodite. Uropod 3 peduncle scarcely longer than broad; rami more than two times length of peduncle, very long and slender, endopodite shorter than exopodite; both rami with very long slender apical setae, endopodite with three long, slender marginal setae; exopodite with 2 marginal robust setae. *Telson* with a pair of unequal setae on each dorsolateral crest.

Habitat. *Bemlos tridens* occurs intertidally and on reef flats and in a harbor channel, among live and dead coral heads, sponges, algae, and the seagrass *Enhalus*.

Distribution. **Micronesia and South China Sea**. Described from Abemama (Apamama) Atoll, Gilbert Islands, Republic of Kiribati (Schellenberg 1938), Ifalik Atoll, Yap State, Federated States of Micronesia and Enewetak Atoll, Republic of the Marshall Islands (Barnard 1965), Spratly (Nansha) Islands, South China Sea (Ren 2006) and Republic of Palau (Myers 2012).

Remarks. This species differs from both *B. ledoyeri* and *B. kaholaloa* **sp**. **nov**. in the structure of the male gnathopod 1. The carpus and propodus of that podomere are subequal in length (propodus longer than the carpus in both the other two species) and the spines on the posterior margin of the carpus are of identical shape, whereas in the other two species the spines are variable in shape. For other differences see the remarks sections under the other species.

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The First Record of the Family Thaumastocoridae (Heteroptera) from the Hawaiian Islands[1]

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The heteropteran family Thaumastocoridae is a widespread but infrequently collected group. On 5 May 2020, entomologist Karl Magnacca contacted the first author (DP) to inquire as to the identity of an odd bug he had collected in a remote tract of predominantly native forest on Pu'u Hāpapa, in the Wai'anae Mountains of O'ahu, Hawai'i. He noted that the insects were abundant but moved rapidly and were difficult to capture. He suspected on first evaluation that this taxon might be an infrequently encountered member of the family Lygaeidae. However, upon closer microscopic examination by the first author (DP) it became clear that based on the highly elongated lateral mandibular plates (Fig. 1), which exceed the length of the clypeus (the pointed central portion of the head that forms the anterior apex in most families of Heteroptera), that the specimen in question was in fact a thaumastocorid.

The single specimen provided was a female, which presented difficulties in determining the proper genus and species, since confident identification of thaumasticorid species requires male specimens. Therefore, it was fortuitous that on a field excursion several weeks later to Mt. Ka'ala, the highest peak in the Wai'anae Mountains of western O'ahu, with a Bishop Museum crew sampling native tardigrades, the first author was able to collect a male specimen of the same species. This was taken while sampling from *Coprosma ochracea*, a native species of Rubiaceae, near the summit of the mountain. Based on this collection, it was then possible to definitively identify the insect in question.

Thaumastocoridae
Thaumastocoris peregrinus Carpintero & Dellape, 2006 **New State Record**
(Figs. 1–3)

The thaumastocorid taken on O'ahu proved to be *Thaumastocoris peregrinus* Carpintero & Dellape, also known as the bronze bug. This species was described from specimens

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Fig. 1. *Thaumastocoris peregrinus* Carpintero & Dellape, female, specimen from Puʻu Hāpapa, Waiʻanae Mountains, Oʻahu.

taken in Argentina (Carpintero & Dellapé 2006), but appears to be originally native to Australia, where it feeds on *Eucalyptus* (Noack *et al*. 2011). It has been subsequently spread by human agency to New Zealand (Sopow & George 2012), South Africa (Jacobs & Nesser 2005), Reunion (Streito *et al*. 2016), Italy (Laudonia & Sasso 2012), Portugal (Garcia *et al*. 2013), Malta (Mifsud & Carapezza 2020), Israel (Novoselsky & Freidberg 2016), South America (Martinez & Bianchi 2010; Ide *et al*. 2011), Mexico (Jiménez-

Figs. **2**, **3**. *Thaumastocoris peregrinus* photographed on various host plants on O‘ahu. **2**. Adult male at Mauna Kapu, Wai‘anae Mountains, feeding on *Cordyline fruticosa.* **3**. Adults and immatures at Schofield Barracks, feeding on *Eucalyptus robusta*. Photos: K. Magnacca.

Quiroz *et al*. 2011), and southern California (Hodel *et al*. 2016). In these areas it can be a pest of ornamental *Eucalyptus* and *Corymbia* plantings, causing leaf silvering and loss, canopy thinning, and in some cases branch dieback (Soliman *et al*. 2012). Because this species seems to attack a range of host plants across several genera in the family Myrtaceae, it is plausible that it could also feed on *Metrosideros*, known to Native Hawaiians as *ʻōhiʻa*, the dominant species of canopy-forming tree in Hawaiian forests across a variety of elevations and precipitation regimes. Given that both recent captures came from areas where there are no *Eucalyptus* trees present, but where *Metrosideros* is abundant, the first author considered it possible that this species could be established on Oʻahu, probably breeding on *Eucalyptus*, but potentially also feeding on *ʻōhiʻa*. The discovery of this species, and the associated concerns, were subsequently communicated to staff at the Hawaii Department of Agriculture.

Based on this report, additional field survey work was undertaken by the second and third authors (KM and JM) at the Mt. Kaʻala capture site. They found the species to be common there on many species of native plants, but with no obvious signs of feeding damage, and no immature specimens detected. In addition to the area around the summit shelter, specimens were also observed in even higher abundance at the far western end of the summit boardwalk, on the opposite side of the summit plateau, but again with no feeding damage or immature specimens seen.

The species was later found at the Palikea summit area, further south along the Waiʻanae Mountains crest, in this case present on introduced *Eucalyptus* and other nearby plants (Fig. 2). Another, larger population was then located on the grounds of the Schofield Barracks military base in July 2021, breeding on *Eucalyptus robusta*. The survey team observed hundreds of individuals on a few branches, including adults, immatures, and eggs (Fig. 3). This to date is the only host on which this level of infestation and reproduction has been seen. Subsequent visits to the same area in September and October found only a few sporadic adults and no nymphs.

Thaumastocorids, although oddly rare in world collections, are capable of attaining high local population densities. As noted by Schuh & Weirauch (2020): "The now classic work of Drake & Slater (1957) might allow one to conclude that thaumastocorids are uncommon in nature because those authors examined relatively few specimens, and in most museum collections specimens of the group are unknown or few in number. This would be an erroneous conclusion, however, because thaumastocorids can occur in tremendous numbers on their host." Therefore, it is possible that the specimens seen in native upland forest systems on Oʻahu may have been wafted upward into such habitats from higher density populations breeding on *Eucalyptus* in the lowlands.

It is concluded that *T. peregrinus* is now established on Oʻahu and breeding on *Eucalyptus robusta*, with individuals possibly being carried uphill into native forest habitats. Hawaii Department of Agriculture's records indicated in June 2021 that this species had not yet been officially reported from Hawaiʻi (JM). Clearly, it has now viably invaded the archipelago, where it most likely initially established itself on *Eucalyptus* in lowland settings before moving into the upland native forest habitats where it was first detected. The covid pandemic that reduced many field survey activities in 2020 and 2021 may have delayed its detection and reporting in urban and suburban settings.

It also remains to be seen what impact the introduction of this species will have on the wide array of both introduced and native Myrtaceae present on Oʻahu. In the near term, it is likely that this species will spread to the remainder of the main Hawaiian Islands in short order, given that it has already hopped across multiple ocean basins and continents. It is also likely to be a permanent pest of ornamental *Eucalyptus* in the islands in the future.

Material examined: HAWAIIAN ISLANDS, **Oʻahu**: 1 female, Waiʻanae Mountains, Puʻu Hāpapa shelter, 2670 ft [810 m], 21°28′00″N, 158°06′10″W, 7 Dec 2020, on self, K. Magnacca (BPBM); 1 male, Waiʻanae Mountains, Mt. Kaʻala, near shelter on east side of summit area, 3980 ft [1215 m], 21°30′29″N, 158°08′38″W, 15 May 2021, on *Coprosma ochracea*, CL 8065, D.A. Polhemus (BPBM); 1 female, Waiʻanae Mountains, Mt. Kaʻala, east side of summit plateau near parking area, 3970 ft [1210 m], 21°30′29″N, 158°08′38″W, 1 Jun 2021, sweeping low vegetation, K. Magnacca (BPBM); 1 female, same data as preceding but on *Metrosideros polymorpha*, K. Magnacca (BPBM); 1 male, Waiʻanae Mountains, Peacock Flat, 1500 ft [455 m], 21°32′52″N, 158°11′09″W, 4 Jul 2021, on *Eucalyptus* cf. *robusta*, K. Magnacca (BPBM); 3 males, 8 immatures, Schofield Barracks, 1000 ft [305 m], 21°29′39″N, 158°04′56″W, 15 Jul 2021, on *Eucalyptus robusta,* K. Magnacca (BPBM); 1 male, 2 females, Waiʻanae Mountains, Mauna Kapu, 2750 ft [840 m], 21°24′16″N, 158°05′52″W, 15 Jul 2021, on *Cordyline fruticosa* and *Hibiscus arnottianus*, K. Magnacca (BPBM); 1 female, Waiʻanae Mountains, Mauna Kapu, 2675 ft [955 m], 21°24′12″N, 158°05′52″W, 23 Sep 2021, on *Eucalyptus robusta*, K. Magnacca (BPBM).

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Notes on the Hawaiian Flora: Kauaʻi Rediscoveries and Range Extensions

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We report the rediscovery of two Kauaʻi single-island endemic flowering plant taxa previously thought to be extinct, *Euphorbia remyi* var. *hanaleiensis* (Euphorbiaceae) and *Melicope nealae* (Rutaceae); and two new Kauaʻi island records for endemic pteridophyte taxa, *Hymenophyllum obtusum* (Hymenophyllaceae) and *Athyrium haleakalae* (Athyriaceae). The rediscoveries and new island records offer hope that other individuals or populations of these species may exist and advances the potential to protect rare Kauaʻi taxa and secure *ex situ* conservation collections.

Athyriaceae

Athyrium haleakalae K.R. Wood & W.L. Wagner **New island record**

Athyrium haleakalae, a recently discovered and described fern species that was considered to be a single-mountain endemic restricted to Haleakalā, East Maui (Wood & Wagner 2017), has now been documented in a remote interior canyon drainage of northwestern Kauaʻi (Fig. 1). True to its description as being an obligate rheophyte, preferring sites of fast-moving water along steep-walled drainages, two close groupings of ca. 80 individuals total were documented along the walls of a small side drainage of Waiʻalae Stream. Observed late in the day while rushing to make a helicopter rendezvous, it is likely that with additional regional surveys in the general area more individuals will be located. Maui's *Athyrium haleakalae* is currently being cultivated by the Hawaiʻi State Division of Forestry and Wildlife at their Olinda Rare Plant Facility on East Maui. Naturally occurring plants on Maui are estimated to total around 700 individuals (Wood & Wagner 2017; H. Oppenheimer, pers. comm., Jan 2022). It is recommended that conservation efforts be made to collect spores and grow representatives of the Kauaʻi population, and that molecular phylogenetic research be conducted to gain a clearer understanding of the relationship between the Kauaʻi and East Maui populations of *A. haleakalae*, in addition to other athyrioid fern taxa, especially its Hawaiian endemic relative, *Athyrium microphyllum.*

Material examined. **KAUAʻI**: side streamlet of Waiʻalae, *Metrosideros-Cheirodendron* montane wet forest with matting ferns of *Dicranopteris-Diplopterygium-Sticherus*, trees and shrubs of *Clermontia fauriei, Cyanea hirtella, C. leptostegia, Dubautia paleata, D. raillardioides, Elaeocarpus bifidus, Hydrangea arguta, Kadua affinis, Leptecophylla tameiameiae, Melicope clusiifolia, M. kauaiensis, Vaccinium calycinum,* and *V. dentatum,* herbs and vines of *Peperomia hesperomannii, Smilax melastomifolia, Stenogyne purpurea*, ferns and lycophytes of *Asplenium insiticium*, *Huperzia serrata*, and sedges of *Gahnia vitiensis* subsp. *kauaiensis* and *G. beecheyi.* Fern, rheophyte, terrestrial and lithophytic on stream banks, rhizome erect, up to 9 cm tall × 1.25 cm wide, scales pale-brown on rhizome tips and lower stipes, stipes delicate, up to 40 mm long × 0.3 mm wide, up to 12 fronds, fertile

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Figure 1. *Athyrium haleakalae,* fertile along headwater drainage of Waiʻalae, Kauaʻi, 7 Aug 2019, *Wood, Walsh & Perlman 18272* (BISH, NY, PTBG, UC, US).

blade 3.5–9.0 cm long × 1.5–3.0 cm wide, lanceolate, single colony of ca. 40 plants, sympatric with *Athyrium microphyllum*, 1,170 m elev., 7 Aug 2019, *K.R. Wood, S. Walsh & S. Perlman 18272* (BISH, NY, PTBG, UC, US); *loc. cit.,* additional small colony, 1,170 m elev., 7 Aug 2019, *K.R. Wood, S. Walsh & S. Perlman 18274* (PTBG).

Figure 2. *Euphorbia remyi* var. *hanaleiensis,* herbarium specimen*,* showing branching inflorescence and cyathia with insert showing close-up of diagnostic tomentose capsule, Wainiha, Kauaʻi, 23 Apr 2014, *Wood, Perlman & Query 15925* (BISH, CAS, PTBG).

Euphorbiaceae

Euphorbia remyi A. Gray ex Boiss. **Rediscovery**

var. ***hanaleiensis*** (Sherff) Degener & I. Degener

Previously known only from the type collection made by Mann & Brigham between 1864 and 1865 on Kauaʻi and described by Earl Edward Sherff (1936: 588), this variety of *Euphorbia remyi* is unique for its densely tomentose capsules (Fig. 2). A significant colony of ca. 100 trees fitting Sherff's description was documented around the upper northeastern fork of Wainiha Valley, Kauaʻi in April 2014. The authors have since observed this colony to be somewhat stable but the region is seriously threatened by invasive weedy plant species such as *Buddleja asiatica, Hedychium gardnerianum, Miconia crenata* (= *Clidemia hirta*), and *Psidium guajava*.

In the *Manual of the Flowering Plants of Hawai'i* (Wagner *et al.* 1999: 614), Koutnik mistakenly describes the presumed extinct *Euphorbia remyi* var. *hanaleiensis* as having solitary cyathia. This was an error that delayed us from reporting this discovery. Subsequently, the authors have examined the holotype specimen from CU (Cornell University), which conforms to Sherff's description of *E. r.* var. *hanaleiensis* having a branched inflorescence (*i.e.,* "inflorescence open, branched, 3–7-cephalous and capsules with broad lengthwise bands of dense tomentum") (Sherff 1936: 588; 1938: 15, 23). It should also be noted that previous to his contribution to Wagner *et al.* (1999), Koutnik had

Figure 3. *Euphorbia remyi* var. *kauaiensis.* **A.** Erect tree habit, headwaters of Wailua River, Kaua'i, 29 Sep 2021, *Wood, Heintzman & Deans 18814* (PTBG). **B.** Cyathia with glabrous capsules, *loc. cit.,* 21 Feb 2017, *Wood, Walsh & Perlman 17259* (BISH, CAS, PTBG, US).

Figure 4. *Euphorbia remyi* var. *remyi* **A.** Low shrubby habit. **B.** Cyathia with glabrous capsules, headwaters of Lumaha'i River, Kaua'i, 18 May 2017, *Wood et al. 17413* (BISH, PTBG, US).

correctly described the inflorescence as having open-branched cymes (Koutnik 1987: 377). The following emended key should now be used in Wagner *et al.* 1999, page 614, to divide the 3 varieties: var. ***hanaleiensis***, a tree with many-branched inflorescences and tomentose capsules (Fig. 2); var. ***kauaiensis***, a tree with many-branched inflorescences and glabrous capsules (Fig. 3); and var. ***remyi***, a scandent shrub with solitary cyathia (or occasionally few-branched) and glabrous capsules (Fig. 4). Further molecular research is suggested to investigate whether the highly distinctive scandent shrub, *E. r.* var. *remyi*, may be recognized at the species level, as its habit differs strikingly from the two tree varieties of *E. remyi*, and whether the unusual narrow-leafed variety described as *E. remyi* var. *molesta* Sherff (1938: 19–20) from Wahiawa, Kauaʻi, *i.e., Forbes 224-K* (F); *Lorence et al. 6758* (BISH, DAV, PTBG, US); *Wood 0722* (DAV, PTBG, US), should remain a synonym of *Euphorbia halemanui* Sherff, be considered an aberrant form of *E. r.* var. *remyi*, or be recognized as a unique taxon (pers. comm. T. Flynn, PTBG Curator).

Material examined. **KAUAʻI**: Hanalei, 1864–1865, *Mann & Brigham s.n*. (CU, holotype; GH, isotype); Wainiha, upper northeastern fork, closed *Metrosideros* lowland wet forest, 8–12 m canopy, surrounded by steep valley walls with *Dicranopteris* and mixed shrubs, understory dominated by *Antidesma* with associated trees and shrubs of *Cheirodendron* spp., *Coprosma waimeae, Cyrtandra* spp.*, Dubautia* spp., *Geniostoma* spp., *Hydrangea arguta, Perrottetia sandwicensis, Polyscias kavaiensis, P. oahuensis, Psychotria* spp., *Syzygium sandwicense,* and a rich fern and bryophyte understory. Tree, 3 m tall, capsules purple-red with dense white villousness, cyathia purple-red, ca. 100 trees around gulch banks and surrounding slopes, 671 m elev., 23 Apr 2014, *K.R. Wood, S. Perlman & M. Query 15925* (BISH, PTBG, US).

Hymenophyllaceae

Hymenophyllum obtusum Hook. & Arn. **New island record**

Hymenophyllum obtusum (Fig. 5), an epiphytic, filmy fern with filamentous rhizomes, previously documented as endemic to Oʻahu, Molokaʻi, Lānaʻi, Maui, and the Big Island of Hawaiʻi (Palmer 2003) was recently documented in several disjunct areas on the island of Kauaʻi, including Kahuamaʻa Flat, Kōkeʻe, and Lumahaʻi Valley. The authors have also seen a recent photograph of *H. obtusum* taken in Limahuli Valley by Kassandra Jensen, Kupu Conservation Technician. Because of its broad distribution from the Big Island to Oʻahu, local botanists believed that it was only a matter of time before this relatively small epiphyte would be documented on Kauaʻi. Plants are easily distinguishable from the sympatric *Hymenophyllum lanceolatum* by their ovate to oblong blades (vs. lanceolate), and blades clothed in hairs that branch at the base and distally (vs. hairs unbranched or 1-branched only at base) (Palmer 2003). On Kauaʻi, plants were observed growing epiphytically on *Antidesma* and *Metrosideros*.

Material examined. **KAUAʻI**: Kahuamaʻa Flat, Kōkeʻe, *Metrosideros-Cheirodendron-Dicranopteris* montane wet forest, with trees and shrubs of *Bobea brevipes, Coprosma kauaense, C. waimeae, Elaeocarpus bifidus, Ilex anomala, Melicope clusiifolia, Myrsine lessertiana, Nestegis sandwicensis, Perrottetia sandwicensis, Polyscias waialealae, P. waimeae, Psychotria greenwelliae, P. hexandra, P. mariniana, Scaevola procera, Syzygium sandwicense,* and *Xylosma hawaiiense*, herbs of *Astelia argyrocoma,* and ferns of *Athyrium microphyllum, Dryopteris fusco-atra, D. glabra, D. unidentata, Diplazium sandwichianum, Doodia kunthiana, Microlepia strigosa, Sadleria pallida,* and *S. cyatheoides*. Fern, rhizome filamentous, long-creeping, epiphytic on *Metrosideros*, 310 deg. NW aspect, fronds green with brownish tinge, fertile, first time documented on Kauaʻi, with *H. lanceolatum*, 1,260 m elev., 14 Aug 2019, *K.R. Wood & S. Walsh 18278* (BISH, PTBG); Lumahaʻi Valley, along main drainage, *Metrosideros* lowland wet forest bordered by steep slopes of *Dicranopteris* and *Diplopterygium* matting ferns, 90% closed canopy, with *Antidesma platyphyllum* var. *hillebrandii,*

Figure 5. *Hymenophyllum obtusum,* Kahuamaʻa Flat, Kōkeʻe, Kauaʻi, 14 Aug 2019, *Wood & Walsh 18278* (BISH, PTBG).

Cheirodendron forbesii, Cibotium spp. *Diplazium sandwichianum, Dubautia knudsenii, Ilex anomala, Kadua affinis, Melicope feddei, M. wawraeana, Psychotria mariniana, Sadleria* spp., and *Syzygium sandwicensis.* Fern, epiphytic on *Antidesma*, rhizome creeping, with *Hymenophyllum lanceolatum*, uncommon on Kauaʻi, 512 m elev., 8 Aug 2021, *K.R. Wood, S. Heintzman & N. Barca 18762* (BISH, PTBG, US).

Rutaceae

Melicope nealae (B.C. Stone) T.G. Hartley & B.C. Stone **Rediscovery**

Only two known collections of the Kauaʻi single-island endemic *Melicope nealae* have been previously recorded, one made in 1909 by C.N. Forbes in the Kahōluamanu region, east of Waiʻalae Canyon, and the other by B.C. Stone in 1960 along a level forested region to the north of Kumuwela, Kōkeʻe (Stone 1969). In March 2019, a single vegetative plant of *M. nealae* was discovered in the Kahuamaʻa Flat region of Kōkeʻe State Park, in quite similar habitat as its previously known range around Kahōluamanu and Kumuwela. Subsequently, the plant has been observed in flower during the months of July through September and with immature fruit from September through December (Fig. 6). Flowers have consistently aborted before fruit-set, with the exception of two fruit initially observed forming on 26 Sep 2019 and closely monitored on 24 Oct 2019 and 22 Nov 2019. Returning on 18 Dec 2019, the fruit were observed prematurely fallen, most likely the result of torrential rains during the previous week. The capsules were empty of seed.

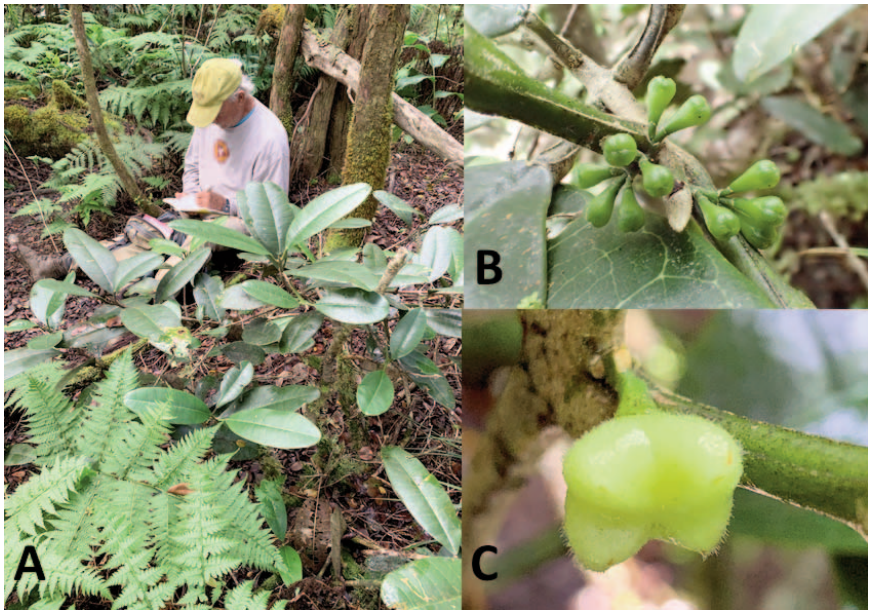

Figure 6. *Melicope nealae*, Kahuamaʻa Flat, Kōkeʻe, Kauaʻi. **A.** Low decumbent shrub habit, with Steve Perlman, 21 Sep 2021. **B.** In flower bud, 21 Nov 2021, *Wood, Walsh & Query 18235* (PTBG). **C.** Immature fruit with puberulent exocarp, 22 Nov 2019, *Wood, P. Wood & Atwell 18351* (PTBG).

The Plant Extinction Prevention Program has attempted air layers, but without success. Continued attempts to monitor and collect fruit for conservation and propagation are necessary to prevent extinction of the species, as are additional attempts to obtain air layers or other means of vegetative reproduction, and continued searches of the surrounding forests for additional individuals. It should be noted that this rediscovery leaves only one other Kauaʻi species of *Melicope* remaining on its presumed extinct list with no wild individuals known, namely *M. macropus* (Hillebr.) T.G. Hartley & B.C. Stone, a megacarp from northwestern Kauaʻi.

Material examined. **KAUAʻI**: Kahōluamanu, Sep 1909, *Forbes 341K* (BISH); Kumuwela, Kōkeʻe plateau, 3,500 ft. (1,067 m), 12 Apr 1960, *B.C. Stone, P.J. Scheuer & F. Werny 3359* (BISH, holotype); Kahuamaʻa Flat, *Metrosideros-Cheirodendron-Dicranopteris* montane wet forest with trees and shrubs of *Bobea brevipes, Claoxylon sandwicensis, Coprosma kauaense, C. waimeae, Dodonaea viscosa, Elaeocarpus bifidus, Ilex anomala, Kadua affinis, Melicope clusiifolia, Myrsine lessertiana, Nestegis sandwicensis, Perrottetia sandwicensis, Planchonella sandwicensis, Polyscias waialealae, P. waimeae, Psychotria greenwelliae, P. hexandra, P. mariniana, Scaevola procera, Syzygium sandwicensis, Xylosma hawaiiense, Zanthoxylum dipetalum,* perennial herbs of *Astelia argyrocoma* and *Peperomia membranacea,* and ferns of *Athyrium microphyllum, Coniogramme pilosa, Elaphoglossum crassicaule, E. paleaceum, E. wawrae, Deparia marginalis, Diplazium sandwichianum, Doodia kunthiana, Dryopteris fusco-atra, D. glabra, D. unidentata, Microlepia strigosa, Sadleria cyatheoides*, and *S. pallida.* Shrub or small tree, 1 m tall, vegetative, leaf size and pubescence unusual, recommend returning for fertile material, single plant observed, 1,265 m elev., 14 Mar 2019, *K.R. Wood & M. Query 18131; loc. cit*., stems gray-brown, sprawling, leaf size and pubescence

unusual, with ca. 3–5 small buds (mostly in leaf axils, occasionally ramiflorous), 12 m tall canopy, 60% closed, single plant observed, 2 Jul 2019, *K.R. Wood, S. Walsh & M. Query 18235* (PTBG); *loc. cit*., 2 small immature fruit fallen after storm with heavy rain, hairs on exocarp, no seeds forming, fruit collected for voucher, only known plant, 18 Dec 2019, *K.R. Wood, P. Wood & R. Atwell 18351* (PTBG).

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Iniforis reevei (Mollusca: Triphoridae), a new marine species record for the Hawaiian Islands[1]

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While collecting micromollusks from beach drift at a site east of the Sharks Cove area on the island of O'ahu following a high surf event, the first author recovered a single specimen of a distinctive species of Triphoridae that did not match any currently identified from the Hawaiian Islands. The spindle-shaped, golden-colored shell tapered both basally and distally, with a contrastingly dark coloration on the siphonal canal (Fig. 1), making it immediately distinctive within the local triphorid assemblage.

A photomicrograph of this specimen was sent to the second author, who confirmed that it represented *Iniforis reevei* (Deshayes, 1863), a widespread species with a range extending across the Indo-Pacific region. Based on personal observations of specimens by the second author, we can include within this distribution records from the Red Sea, Reunion, New Caledonia and Taiwan. Specimens are never observed in large numbers, which aligns with the apparent rarity of this triphorid on O'ahu.

Iniforis reevei Deshayes, 1863 **New State Record**

Triphoris reevei Deshayes, 1863: 101, pl. 21, fig. 25–26. Type-locality: Reunion.
Triforis reevei Deshayes, 1863: Martens 1880: 282.
Iniforis reevii (Deshayes, 1863) [sic]: Jousseaume 1898: 71.
Trifora reevei Deshayes, 1863: Viader 1937: 43.
Iniforis reevei (Deshayes, 1863): Dekker & Orlin 2000: 24.
Mastonia reevei (Deshayes, 1863): Chang & Wu 2005: 33, fig. 70.
Triphora reevei Deshayes, 1863: Jay 2007: 39, fig. 25–27, 54.
Iniforis sp.: Severns, 2011: 234, pl. 100, fig. 7.

Iniforis reevei is a newly confirmed record for the Hawaiian Islands, although it is not the first time that the species has been figured based on a local specimen. Hemmes *et al.* (1997, fig. 62) figured and discussed this species as the unidentified "chocolate siphon triphora" and noted that his group at the University of Hawai'i Hilo had taken 4 specimens at a depth of 15 m off Honaunau, on the leeward coast of Hawai'i island. Subsequently, Severns (2011: 234, pl. 100, fig. 7) figured one of these Honaunau specimens as "*Iniforis* sp." In neither of these previous cases was a species identification provided.

Iniforis reevei was originally described from Reunion Island, in the Western Indian Ocean. The holotype specimen could not be located by Jay (2007), who designated a

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Figure. **1**. *Iniforis reevei* Deshayes. Specimen with damaged aperture and partially missing protoconch (brown when intact), from USA, Hawai‘i, O‘ahu.

neotype, also from Reunion. This neotype, along with additional specimens from Reunion held in the Muséum national d’Histoire naturelle, in Paris, has been examined by the second author as part of a larger study of triphorid holotypes held in that institution

(Albano *et al.* in press), and forms the basis for our determination of the O‘ahu specimen.

The opinion as to the generic placement of this species has varied widely among authors over time. It was originally placed in *Triphoris* (Deshayes, 1863), an invalid subsequent emendation of *Triphora* Blainville, 1828, then later transferred to *Iniforis* by Jousseaume (1898). Other authors continued to assign it to *Triphora* using the unjustified emendations *Triforis* (Martens, 1880), and *Trifora* (Viader, 1937), until it was moved back to *Iniforis* by Dekker & Orlin (2000), then to *Mastonia* by Chang & Wu (2005). Although Chang & Wu did not provide any justification for their transfer of this species to *Mastonia*, this assignment is currently adopted in the online World Register of Marine Species, a widely consulted global authority file. Jay (2007), in his review of Triphoridae described from Reunion, placed all the species involved back in their original genera, thus moving *reevei* back into *Triphora*, a genus that has served over time as a polyphyletic dumping ground for a disparate array of taxa. Overall, this species seems to us to fit best in *Iniforis*, in agreement with the placement by Jousseaume (1896), Dekker & Orlin (2000), and Severns (2011), based on the presence of a hole in the peristome which does not have a connection to the aperture. In *Mastonia*, by contrast, this sinus has a small canal or slit which connects to the aperture.

Based on current records, it seems likely that *I. reevei* will eventually be shown to occur as small, localized populations throughout the main Hawaiian Islands.

Material examined. HAWAIIAN ISLANDS: **O‘ahu**: limestone basin E. of Sharks Cove, 21°39′09″N, 158°03′42″W, 1 specimen (6.2 mm, missing protoconch and with aperture damaged): USA, Hawai‘i, O‘ahu, 23 Feb 2019, in beach drift after high surf event, D.A. Polhemus (in D. A. Polhemus collection, catalog number POL-SHL-2019-0001, to be deposited in the Bishop Museum).

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Angiostrongylus cantonensis in Hawai‘i: updated records and distributions of gastropod hosts on Maui, Moloka‘i and Lāna‘i[1]

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Abstract. The Hawaiian Islands are a hotspot for the emerging infectious disease known as neuroangiostrongyliasis, caused by the parasitic nematode *Angiostrongylus cantonensis*. Gastropods are intermediate hosts of this parasite, and this study provides an update to the distributions of non-native gastropod hosts of *A. cantonensis* on the islands of Moloka‘i, Lāna‘i and Maui. Of the 29 gastropod species screened, *A. cantonensis* was detected in six (*Lissachatina fulica*, *Paropeas achatinaceum*, *Parmarion martensi*, *Cornu aspersum*, *Ambigolimax* cf. *nyctelius*, *Laevicaulis alte*), with *L. fulica* and *P. achatinaceum* as new host records for Moloka‘i and Lāna‘i, respectively. *Ambigolimax* cf. *nyctelius* is tentatively a newly recorded host of *A. cantonensis*. These updated data on the distributions of hosts for *A. cantonensis* contribute to the development of monitoring and effective management actions aimed at reducing the spread of the disease.

Keywords: Parasite, invasive species, snail, nematode, Pacific Islands, rat lungworm

INTRODUCTION

Angiostrongylus cantonensis, commonly referred to as the rat lungworm (RLW), is a parasitic nematode that causes the disease, eosinophilic meningitis in several groups of vertebrates, including humans (Diaz 2010). Rats are the definitive hosts and snails are intermediate hosts for the parasite, and both hosts are necessary in the life cycle of the parasite. Humans, other mammals, and birds are accidental hosts and can become ill after ingestion of the third-stage larvae, which are primarily found in the intermediate hosts.

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Infection typically occurs from accidental or intentional consumption of raw or undercooked gastropods (Cowie 2013, Kim *et al.* 2014), or less commonly from paratenic hosts such as fish, frogs, and crustaceans, carrying third-stage larvae (Qvarnstrom *et al.* 2007). Originally described from East Asia, *A. cantonensis* probably spread to the Hawaiian Islands via hosts that were unintentionally transported on ships (Kliks & Palumbo 1992) and was first documented in the Hawaiian Islands in 1961 (Horio & Alicata 1961) based on observations in 1960 reported by Ash (1962). Subsequently, the parasite has been reported from all six major Hawaiian Islands (Kim *et al.* 2014). Between 2007 and 2017, 82 cases of RLW were reported (Johnston *et al.* 2019) and an additional 17 more cases from 2017 to 2020 (Hawai‘i DOH).

As of 2019, the total number of known snail hosts for *A. cantonensis* in Hawai‘i was 22 (Kim *et al.* 2014, Yeung *et al.* 2018, Cowie *et al.* 2019). The development of effective control measures for the parasite and thus reduction of incidences of disease must be predicated on an accurate understanding of the distributions of its hosts, particularly those that carry the infective third stage larvae (Kim *et al*. 2014). As such, continued monitoring and updated survey data for the gastropod hosts of *A. cantonensis* are imperative (Diaz 2010). An increase in the number of reported cases on Maui (Cowie *et al*. 2018) prompted a need for additional surveys on Maui Nui (i.e. Maui, Lāna‘i and Moloka‘i; excluding Kaho‘olawe), and herein we report the results from these surveys and updated information on the distribution of infected RLW intermediate hosts on Maui Nui.

METHODS

Specimen Collection

Between November 2018 and June 2019, 23 sites were surveyed for non-native gastropods; ten on Moloka‘i, seven on Lāna‘i and six on Maui. Sites targeted for surveys were all < 700 m in elevation, since range modeling indicates most snails infected with RLW are restricted to low-mid elevations (Kim *et al.* 2018). Survey protocols followed Cowie *et al.* (2008) for agricultural and horticultural facilities while those conducted outside these facilities (e.g. forest reserves) followed Durkan *et al.* (2013). All non-native snails at each site were collected, euthanized with boiling water (Fukuda *et al.* 2008), fixed and preserved in 95% ethanol and vouchered in the Bishop Museum Malacology collection (BPBM 287093–287105, 287107–287122, 287124, 287126–287130, 287139 –287149, 287158–287162, 287164–287172, 287174, 287176, 287179, 287180, 287182, 287183, 287186–287188, 287190, 287193–287200, 287202–287208, 287210, 287211, 287214, 287216–287218, 287222, 287342–287345, 287348, 287350–287358, 287363– 287377, 288380, 288381). An additional 15 specimens collected during seven previous surveys by Yeung *et al.* (2018) were also tested (BPBM 284181, 284186, 284189, 284195, 284196, 284213, 284214, 284232, 284237, 286897), bringing the total number of sites analyzed to 30.

DNA Extraction and Rat Lungworm Screening

Total genomic gDNA was extracted from up to eight specimens per species from each site, and these samples were screened for RLW using PCR of the ITS1 locus following Kim *et al.* (2014). All samples that tested positive, and a random sample of 20% of all negatives, were re-tested to verify results. Tissue and gDNA are vouchered in the cryorepository of the Pacific Center for Molecular Biodiversity at the Bishop Museum (PCMB50988, PCMB50989, PCMB53807–PCMB53810, PCMB53812, PCMB53816, PCMB56544–PCMB56933).

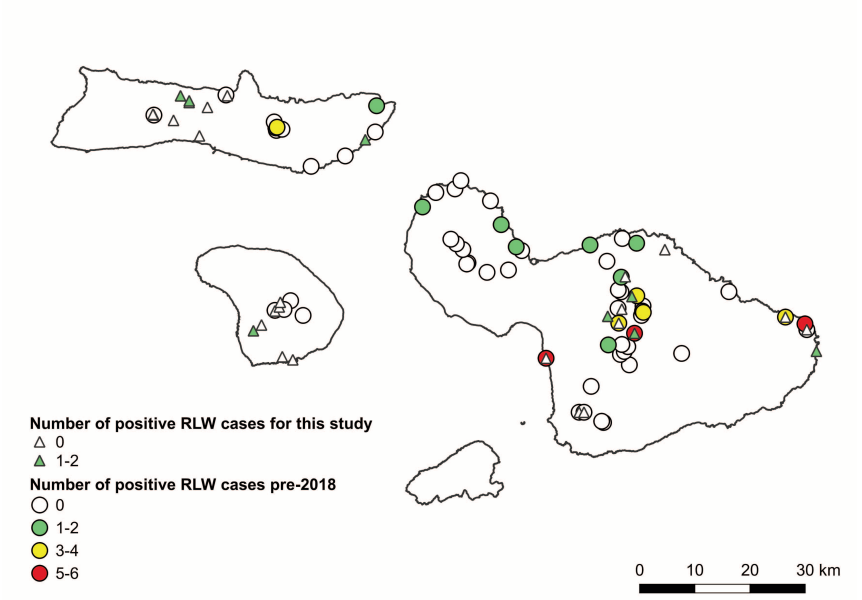

Figure 1. Map of sites surveyed on Maui Nui for non-native snail hosts of rat lungworm (RLW). Circles are historical data from Kim *et al.* (2014) and Yeung *et al.* (2018), and triangles are data from the present study. Map created in QGIS v. 3.10.

RESULTS

Surveys of 30 sites across the three islands (Fig. 1) yielded 979 non-native snails representing 29 species, of which 398 specimens were screened (Table 1). One of the 30 sites had previously been surveyed in October 2004 and was revisited in November 2018. Eight of the 30 sites contained snails that tested positive for RLW: three on Molokaʻi, one on Lānaʻi and four on Maui (Fig. 1). Twelve individuals representing six species (*Lissachatina fulica*, *Paropeas achatinaceum*, *Parmarion martensi*, *Cornu aspersum*, *Ambigolimax* cf. *nyctelius*, *Laevicaulis alte*) tested positive for *A. cantonensis*, and all six species except *A.* cf. *nyctelius* were previously reported as hosts of the nematode (Kim *et al.* 2014, Yeung *et al*. 2018). However, *L. fulica* and *P. achatinaceum,* as RLW intermediate hosts, are new island records for Molokaʻi and Lānaʻi, respectively, and *A.* cf. *nyctelius* is a potentially newly recorded host of *A. cantonensis* and new state record for the occurrence of this species, pending confirmation of the identification. Accounts of the six species that tested positive are provided below.

Achatinidae

Lissachatina fulica (Bowdich, 1822) **New Island Record for Gastropod Host on Molokaʻi**

Lissachatina fulica was first recorded in Hawaiʻi in 1936 and is present across the main Hawaiian Islands (Cowie 1998, Gerlach *et al*. 2021). Kim *et al.* (2014) reported 11% of

Table 1. List of all species that were tested for *Angiostrongylus cantonensis* in this study. Total number of individuals collected for each species with number of sites in parentheses are given, as well as total number of individuals screened, with the number of individuals that tested positive for *A. cantonensis* in parentheses. Catalog numbers for each lot (BPBM) are provided next to the number of specimens collected, screened, and individuals that tested positive for *A. cantonensis* (collected/screened/postive).

			Molokaʻi			Lānaʻi			Maui		
Family	Genus	Species	*n* = collected (*n* = sites)	BPBM	*n* = screened (*n* = positive)	*n* = collected (*n* = sites)	BPBM	*n* = screened (*n* = positive)	*n* = collected (*n* = sites)	BPBM	*n* = screened (*n* = positive)
				287103 (5/4/0)			287165 (6/3/0)				
				287120 (6/3/0)			387270 (2/1/0)				
Achatinidae	*Allopeas*	*clavulinum*	23 (3)	287139 (12/4/0)	11 (0)	11 (3)	287203 (3/3/0)	7 (0)	8 (1)	287376 (8/6/0)	6 (0)
				287093 (19/5/0)							
				287100 (7/5/1)							
				287118 (27/5/0)			287158 (4/4/0)				
				287126 (12/5/0)			287174 (6/5/0)				
				287130 (2/2/2)			287186 (2/2/0)				
Achatinidae	*Lissachatina*	*fulica*	69 (6)	287140 (2/2/0)	24 (3)	48 (4)	287199 (36/5/0)	16 (0)	4 (1)	287342 (4/4/1)	4 (1)
							287171 (1/1/0)				
							287193 (2/1/0)				
							287204 (1/1/0)			287358 (2/1/0)	
Achatinidae	*Opeas*	*hannense*	1 (1)	288381 (1/1/0)	1 (0)	6 (4)	287211 (2/2/0)	5 (0)	3 (2)	287372 (1/1/0)	2 (0)
				287095 (10/5/0)							
				287108 (8/2/0)							
				287116 (69/5/0)			287166 (13/5/0)			284189 (2/2/0)	
				287128 (80/5/0)			287172 (5/4/1)			287353 (3/2/0)	
				287142 (1/1/0)			287179 (3/3/0)			287363 (8/8/0)	
				287146 (1/1/0)			287194 (4/3/0)			287371 (1/1/0)	
Achatinidae	*Paropeas*	*achatinaceum*	170 (7)	288380 (1/1/0)	20 (0)	32 (5)	287205 (7/5/0)	20 (1)	17 (5)	287377 (3/3/0)	16 (0)
				287096 (1/1/0)							
				287109 (7/5/0)							
				287121 (4/4/0)						284232 (1/1/0)	
Achatinidae	*Subulina*	*octona*	13 (4)	287147 (1/1/0)	11 (0)	1 (1)	287180 (1/1/0)	1 (0)	5 (2)	287364 (4/3/0)	4 (0)
										287343 (9/5/0)	
				287113 (10/5/0)						287350 (1/1/0)	
Agriolimacidae	*Deroceras*	*laeve*	13 (2)	287144 (3/3/0)	8 (0)	1 (1)	287159 (1/1/0)	1 (0)	24 (3)	287354 (14/5/0)	11 (0)
Agriolimacidae	*Deroceras*	*reticulatum*	0 (0)		0 (0)	0 (0)		0 (0)	7 (1)	284195 (7/1/0)	1 (0)
Ampullariidae	*Pomacea*	*canaliculata*	0 (0)		0 (0)	11 (1)	287216 (11/2/0)	2 (0)	0 (0)		0 (0)
Ariophantidae	*Parmarion*	*martensi*	0 (0)		0 (0)	0 (0)		0 (0)	13 (1)	287366 (13/5/2)	5 (2)
							287160 (2/1/0)				
							287168 (1/1/0)				
							287187 (21/5/0)				
Assimineidae	*Cyclotropis*	sp.	15 (1)	287114 (15/5/0)	5 (0)	45 (4)	287200 (21/5/0)	12 (0)	1 (1)	287367 (1/1/0)	1 (0)
				287094 (16/5/0)							
				287101 (7/3/0)							
				287107 (17/5/0)						284181 (13/3/0)	
				287115 (1/1/0)			287161 (25/5/0)			287344 (14/7/0)	
				287119 (2/2/0)			287169 (3/3/0)			287351 (2/2/0)	
Bradybaenidae	*Bradybaena*	*similaris*	53 (8)	287127 (2/2/0)	24 (0)	60 (3)	287188 (32/5/0)	13 (0)	34 (4)	287355 (5/5/0)	17 (0)

Table 1. List of all species that were tested for *Angiostrongylus cantonensis* in this study (continued)...

			Moloka'i			Lāna'i			Maui	
Family	**Genus**	**Species**	*n* = collected (*n* = sites)	BPBM	*n* = screened (*n* = positive)	*n* = collected (*n* = sites)	BPBM	*n* = screened (*n* = positive)	*n* = collected (*n* = sites)	BPBM	*n* = screened (*n* = positive)
				287141 (1/1/0) 287145 (7/5/0)							
Chronidae	*Kaliella*	*doliolum*	2 (1)	287102 (2/2/0)	2 (0)	8 (1)	287162 (8/5/0)	5 (0)	0 (0)		0 (0)
										284213 (6/2/0)	
Euconulidae	*Kororia*	cf. *palaensis*	0 (0)		0 (0)	0 (0)		0 (0)	14 (2)	287369 (8/5/0)	7 (0)
				287099 (2/2/0)							
				287124 (1/1/0)							
Gastrodontidae	*Zonitoides*	*arboreus*	5 (3)	287149 (2/2/0)	5 (0)	2 (1)	287198 (2/2/0)	2 (0)	0 (0)		0 (0)
										287368 (1/1/0)	
Helicarionidae	*Ovachlamys*	*fulgens*	0 (0)		0 (0)	0 (0)		0 (0)	11 (2)	287374 (10/5/0)	6 (0)
										284196 (4/1/1)	
										284237 (5/1/0)	
										287345 (2/2/0)	
										287352 (3/3/0)	
Helicidae	*Cornu*	*aspersum*	0 (0)		0 (0)	0 (0)		0 (0)	15 (5)	287356 (1/1/0)	8 (1)
Limacidae	*Ambigolimax*	cf. *nyctelius*	0 (0)		0 (0)	0 (0)		0 (0)	3 (1)	287357 (3/3/1)	3 (1)
Philomycidae	*Meghimatium*	*bilineatum*	0 (0)		0 (0)	0 (0)		0 (0)	5 (1)	287375 (5/5/0)	5 (0)
										286897 (6/1/0)	
										284214 (4/1/0)	
Philomycidae	*Pallifera*	sp.	0 (0)		0 (0)	1 (1)	287190 (1/1/0)	1 (0)	12 (3)	287370 (2/2/0)	4 (0)
Physidae		sp.	0 (0)		0 (0)	9 (1)	287202 (9/5/0)	5 (0)	0 (0)		0 (0)
Planorbidae	*Planorbella*	*trivolvis*	0 (0)		0 (0)	5 (1)	287217 (5/4/0)	4 (0)	0 (0)		0 (0)
				287098 (4/3/0)			287183 (1/1/0)				
				287112 (2/1/0)			287197 (1/1/0)				
Pristilomatidae	*Hawaiia*	*minuscula*	7 (3)	287129 (1/1/0)	5 (0)	3 (3)	287214 (1/1/0)	3 (0)	0 (0)		0 (0)
Sagdidae	*Lacteoluna*	*selenina*	0 (0)		0 (0)	2 (1)	287176 (2/2/0)	2 (0)	0 (0)		0 (0)
							287210 (14/3/0)				
Spiraxidae	*Euglandina*	*rosea*	0 (0)		0 (0)	31 (1)	287222 (17/5/0)	8 (0)	0 (0)		0 (0)
				287110 (1/1/0)			287195 (17/5/0)				
Succineidae	*Succinea*	*unicolor*	7 (2)	287117 (6/1/0)	2 (0)	18 (2)	287206 (1/1/0)	6 (0)	0 (0)		0 (0)
							287207 (11/5/0)				
Thiaridae	*Melanoides*	*tuberculata*	0 (0)		0 (0)	24 (2)	287218 (13/5/0)	10 (0)	0 (0)		0 (0)
				287097 (7/5/2)							
				287104 (3/3/1)							
Veronicellidae	*Laevicaulis*	*alte*	11 (3)	287111 (1/1/0)	9 (3)	0 (0)		0 (0)	9 (1)	287348 (9/5/0)	5 (0)
				287105 (3/3/0)			287167 (5/5/0)				
				287122 (1/1/0)			287182 (4/4/0)			284186 (5/3/0)	
				287143 (3/3/0)			287196 (11/5/0)			287365 (2/2/0)	
Veronicellidae	*Veronicella*	*cubensis*	13 (4)	287148 (6/5/0)	12 (0)	22 (4)	287208 (2/2/0)	16 (0)	19 (3)	287373 (12/5/0)	10 (0)
Vertiginidae	*Gastrocopta*	*servilis*	0 (0)		0 (0)	33 (1)	287164 (33/5/0)	5 (0)	0 (0)		0 (0)
Total			402 (10)		139 (6)	373 (7)		144 (1)	204 (13)		115 (5)

individuals (2 individuals from Kauaʻi, 3 from Oʻahu and 2 from Maui) tested positive for RLW across the six major Hawaiian Islands. Similar levels of infection, 10% (1 of 10), were reported for *L. fulica* on Maui (Yeung *et al.* 2018). In this study 121 *L. fulica* were collected from six sites on Molokaʻi (BPBM 287093, 287100, 287118, 287126, 287130, 287140), four sites on Lānaʻi (BPBM 287158, 287174, 287186, 287199) and one site on Maui (BPBM 287342). Of these, 44 *L. fulica* were screened for RLW, and 4 (9%; BPBM 287100, 287130, 287342) tested positive. The prevalence of infection differed among islands (Table 1): 13% on Molokaʻi (3 of 24), 0% on Lānaʻi (0 of 16), and 25% on Maui (1 of 4).

Paropeas achatinaceum (Pfeiffer, 1846) **New Island Record for Gastropod Host on Lānaʻi**

Paropeas achatinaceum was first recorded in Hawaiʻi in 1904 (Cowie 1997) and is now found throughout the main Hawaiian Islands (Hayes *et al*. 2007). Kim *et al*. (2014) reported 4% of individuals (2 from Kauaʻi and 1 from Hawaiʻi) tested positive for RLW across the six major Hawaiian Islands. None of the specimens that were screened by Yeung *et al*. (2018) tested positive. In the current study, 219 *P. achatinaceum* were collected from seven sites on Molokaʻi (BPBM 287095, 287108, 287116, 287128, 287142, 287146, 288380) and five sites each on Lānaʻi (BPBM 287166, 287172, 287179, 287194, 287205) and Maui (BPBM 284189, 287353, 287363, 287371, 287377). Of these, 56 individuals were screened for RLW with only 1 of 20 (5%; BPBM 287172) from Lānaʻi testing positive and 0% from Maui (0 of 16) or Molokaʻi (0 of 20).

Ariophantidae

Parmarion martensi (Simroth, 1893)

Thirteen *P. martensi* were collected from one site on Maui (BPBM 287366). This species was first recorded on Oʻahu in 1996 and has only been observed on the islands of Hawaiʻi, Oʻahu, and Maui (Cowie 1998, Cowie *et al.* 2008, 2018). Kim *et al.* (2014) reported that 68% of individuals from Oʻahu and Hawaiʻi (2 from Oʻahu and 11 from Hawaiʻi) tested positive for *A. cantonensis,* and Yeung *et al.* (2018) reported that 31% of individuals (5 of 16) on Maui tested positive for the parasite. In this study, 40% (2 of 5) tested positive (BPBM 287366).

Helicidae

Cornu aspersum (Müller, 1774)

Cornu aspersum was first recorded in Hawaiʻi in 1952 (Cowie 1997) and is now known to be established only on Maui and Hawaiʻi (Yeung *et al.* 2018). None of the specimens that were screened by Kim *et al.* (2014) tested positive, while Yeung et al. (2018) reported 20% of individuals (2 of 10) as positive for the parasite. For this study, a total of 15 specimens were collected from five sites on Maui (BPBM 284196, 284237, 287345, 287352, 287356), of which 13% (1 of 8) tested positive (BPBM 284196).

Limacidae

Ambigolimax cf. ***nyctelius*** (Bourguignat, 1861) **Possible New Record of Gastropod Host**

The specimens screened for this study were tentatively identified as *Ambigolimax* cf. *nyctelius*, and once confirmed this will make it a new host of rat lungworm and constitute

a new state record for this non-native snail. In this study, three specimens from one site on Maui were collected, and one tested positive (33%; BPBM 287357).

Veronicellidae

Laevicaulis alte (Férussac, 1822)

Laevicaulis alte was first recorded in the Hawaiian Islands in 1900 (Cowie 1998) but can now be found on six of the largest main Hawaiian Islands, excluding Niʻihau or Kahoʻolawe (Hayes *et al.* 2007, Cowie *et al.* 2008). Kim *et al.* (2014) reported that 30% of individuals (1 from Kauaʻi, 4 from Oʻahu, 1 from Molokaʻi, 3 from Maui and 4 from Hawaiʻi) tested positive across the six major Hawaiian Islands and Yeung *et al.* (2018) reported that only 22% of individuals (2 of 9) on Maui tested positive for *A. cantonensis*. In the current study, 21% (3 of 14) of individuals screened tested positive for *A. cantonensis* (BPBM 287097, 287104) out of 20 total individuals collected (BPBM 287097, 287104, 287111, 287348). The percentage of individuals found to be infected with *A. cantonensis* varies by island: all 3 individuals that tested positive were from Molokaʻi with 33% of individuals (3 of 9) testing positive, and none of the specimens (0 of 5) collected from Maui were found to carry *A. cantonensis.* Although *Laevicaulis alte* is established on Lānaʻi, no individuals were found there during the recent surveys.

DISCUSSION

The Hawaiian Islands, with their warm, tropical climate, are vulnerable to outbreaks of emerging infectious diseases like eosinophilic meningitis (Diaz 2010, Horio & Alicata 1961). As large numbers of gastropod species continue to be inadvertently transported around the world, it is expected that *A. cantonensis* will continue to spread to new places along with its intermediate hosts (Lafferty 2009, Iwanowicz *et al*. 2015). Snails at three new sites on Molokaʻi, one on Lānaʻi and three on Maui tested positive for *A. cantonensis*, and while infected *Lissachatina fulica* and *Paropeas achatinaceum* have previously been recorded in the Hawaiian Islands, this is the first record for Molokaʻi and Lānaʻi, respectively. Yeung *et al.* (2018) first recorded *Cornu aspersum* as a host, with two specimens from Maui testing positive for the parasite. In this study, an additional *C. aspersum* specimen from the same site tested positive. There were no instances of snails testing positive from sites on Maui where no snails had tested positive before this study. However, surveys of new sites revealed additional rat lungworm hosts. The detection of the spread geographically and to new hosts was possible only through ongoing and expanded surveys and testing, highlighting the critical need for continued monitoring across the islands. Such data are necessary for accurate estimates of the distribution of this parasite and for understanding its potential impacts.

Surprisingly, although there are several snail species on Lānaʻi that are known to carry the parasite on other islands, our current surveys and testing detected *Angiostrongylus cantonensis* in only one of the snails from Lānaʻi. Although we have no well-supported explanation for its low prevalence there, it may be because Lānaʻi is in the rain shadow of Maui, and receives less rainfall than other islands (Leopold 1948), and may be less suitable for *A. cantonensis*, as the parasite appears to proliferate in wetter, warmer conditions (Kim *et al.* 2018). Environments with higher precipitation facilitate the transfer of the nematode parasite to its hosts better because the wetter conditions support parasite larvae persistence in rat feces, possibly protecting them from desiccation (Kim *et al.* 2018, Hollingsworth *et al.* 2007). Alternatively, our limited sampling may affect our

ability to detect the parasite at low thresholds, and additional testing is needed to evaluate the presence/absence and distribution of *A. cantonensis* hosts on Lānaʻi. In this study, *Ambigolimax* cf. *nyctelius* is tentatively identified as a new gastropod host of *A. cantonensis* pending confirmation of the identification, increasing the total in the state to 23 known species of snails that serve as intermediate hosts for the parasite. These results should be supported with additional testing to ensure an up-to-date record of gastropod vectors, as it is impossible to determine whether the lack of new species is due to limited spread of the parasite across species or limited testing capability.

As the number of sites containing hosts infected with *A. cantonensis* increases, the probability of eosinophilic meningitis outbreaks also increases. Furthermore, rising global temperatures will increase the availability of suitable habitat, expanding the range in which intermediate hosts and the parasite can thrive (Kim *et al.* 2018). In the Hawaiian Islands, and globally, it is essential to build on our knowledge of non-native molluscs and their distribution to inform proper management of these species, as this information is vital to maintaining public health and functioning ecosystems. Many of the sites containing snails infected with *A. cantonensis* include farms, nurseries, and places with high human traffic, and if food products from these facilities are not sanitized appropriately, accidental hosts (e.g. humans) risk ingesting carriers of *A. cantonensis* and contracting the rat lungworm disease (Qvarnstrom *et al.* 2007).

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Eleven New Records of Lepidoptera in the Hawaiian Islands including corrections to the Hawaiian Terrestrial Arthropod Checklist

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Eleven new state records of Lepidoptera are reported for Hawai'i along with 63 new island records of previously introduced species. A complete list of taxonomic changes and corrections to the Lepidoptera checklist in Nishida (2002) is presented (Table 1), including previous corrections by Matsunaga *et al*. (2019). Proposed changes to the establishment status of 32 species are presented alongside. A list of all species of Lepidoptera described from Hawai'i since 2002, as well as all new state records of Lepidoptera published since 2002 is provided (Table 2) to serve as a more complete supplement to Nishida (2002).

Information regarding the formerly known distribution in Hawai'i of species discussed herein is based on Nishida (2002) and subsequent publications (Giffin 2007; Giffin & Rowe 2007; Howarth & Preston 2002a, 2002b, 2006, 2007; Howarth *et al.* 2012; Matsunaga *et al.* 2019; Starr *et al.* 2004, 2006; Starr & Starr 2011, 2012). Identifications were made by the first author except where otherwise noted. Identifications were based on external morphology and genitalia dissections. Specimens were compared with illustrations and figures in the published literature as well as through comparisons with material in the Bernice Pauahi Bishop Museum (BPBM), Hawai'i Department of Agriculture (HDOA), and the University of Hawai'i Insect Museum, University of Hawai'i at Mānoa (UHIM). Voucher specimens and other examined material are deposited in the aforementioned three collections.

Blastobasidae

Blastobasis inana (Butler) **New island record**

Although originally described from Hawai'i, this species has been collected widely across the Pacific, and is probably not part of the native fauna. Zimmerman (1978) considered it introduced and examined specimens from Hawai'i Island, Lāna'i, and O'ahu. We report it from Kaua'i for the first time. It likely occurs on all the main islands except perhaps Kaho'olawe and Ni'ihau.

Material examined. **Kaua'i**: 2♂, Nā Pali-Kona For[est] Res[erve], Koai'e Valley, nr. Piwa Exclosure Area; 22.1000, -159.6111; 560 m; 12–13 Oct 2021; K.A. Austin; LED bucket trap (UHIM). 1♂, same as previous except 22.1007, -159.6103; 565 m (UHIM).

Cosmopterigidae

Asymphorodes dimorpha (Busck) **New island record**

Zimmerman (1978) reported this species from almost all the Hawaiian Islands: Ni'ihau, O'ahu, Moloka'i, Maui, Lāna'i, Hawai'i, Nihoa, Necker, Pearl and Hermes, Midway, and

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Kure. He also examined specimens from elsewhere in the Pacific. Curiously though, he did not examine any from Kauaʻi (he wrote, "probable, but I have no record."). Nishida (2002) followed Zimmerman (1978) in omitting Kauaʻi. We therefore report this species from Kauaʻi for the first time.

Material examined. **Kauaʻi**: 1♂, 1♀, McBryde Fld. 210; 19 Nov 1992; ex. coffee; V. Chang (HDOA).

Crambidae

Asciodes quietalis (Walker) **New state record**

The earliest records of this species in Hawaiʻi are a series of nine specimens reared from *Bougainvillea* (Nyctaginaceae) on Oʻahu in 2017. James Hayden (Florida Department of Agriculture and Consumer Services) provided the initial ID, which was subsequently confirmed by M. Alma Solis (USDA-SEL). A photo of this species from Hawaiʻi Island was uploaded to iNaturalist in 2021 [link], suggesting this species is also established on that island. *Asciodes quietalis* was previously only known from Hispaniola and the Galápagos Islands (Landry 2016), but its actual range may be considerably wider because it is easily confused with *Asciodes gordialis* Guenée.

Material examined. **Oʻahu**: 5♂, 4♀, Pāwaʻa; 2 Jun 2017; ex. *Bougainvillea* sp.; J.N. Matsunaga (HDOA).

Hellula undulalis (Fabricius) **New island record**

This introduced species is a significant pest of Brassicaceae. Nishida (2002) included records of it from all the main islands except Kahoʻolawe and Niʻihau. We report it from Kahoʻolawe for the first time.

Material examined. **Kahoʻolawe**: 3♂, Puʻu Moaʻulanui, 7 Mar 2013. 1♂, Base of Moaʻulaiki; 20.56457, -156.58519; UV bucket trap; 7 iii 2013 (UHIM).

Herpetogramma licarsisalis (Walker) **New island record**

This introduced species is a pest of various grasses. Nishida (2002) recorded it from all the main islands except Kahoʻolawe and Niʻihau. We report it from Midway Atoll for the first time.

Material examined. **Midway**: 2♀, Sand Isle; 10 May [20]08; J.J. Le Roux, D. Rubinoff (UHIM).

***Herpetogramma* sp. A** **New state record**

This species closely resembles *Herpetogramma stultalis* (Walker), known from South Korea, China, Japan, India, Sri Lanka, Pakistan, Malaysia, Papua New Guinea, Australia, the Democratic Republic of the Congo, and La Réunion (Park *et al.* 2016). However, subtle differences in the angle of the forewing postmedial line make this identification somewhat suspect (James Hayden, Florida Department of Agriculture and Consumer Services, pers. comm. 2022). The dissected genitalia do not allow recognition below the generic level. We choose to include it as *Herpetogramma* sp. A until a more precise identification can be made via molecular methods.

Material examined. **Hawaiʻi**: 1♂, Ha[waiʻi] Vo[lcanoes] Nat[ional] Park, Kahuku Sect[ion], Lower Palm Trail; 771 m; 19.0888, -155.6926; 17–18 Mar 2021; D. Rubinoff, C. Doorenweerd, K. Austin, R. Rubinoff; UV bucket trap. KAA diss. #0688 (UHIM). **Oʻahu**: 1♂, Round Top For[est] Res[erve], Mānoa Cliff Restoration Area; 21.3381, -157.8110; 560 m; 26–27 Nov 2021; K.A. Austin, K. Faccenda; UVLED light sheet (UHIM).

Nomophila noctuella (Denis & Schiffermüller) **New island records**
After some confusion in the earlier literature, Munroe (1973) confirmed that the species of *Nomophila* introduced to Hawai'i is *N. noctuella*, a polyphagous Palearctic and African species. Nishida (2002) reported it from Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. We report it from Kaho'olawe, Lāna'i, and Midway Atoll for the first time.

Material examined. **Kaho'olawe**: 1♂, Kaukaukapapa, N20.53539, W156.569323; UV bucket trap; 5 Mar 2013; W. Haines, D. Rubinoff (UHIM). **Lāna'i**: 1♀, Munro Trail Head 16–17 May [20]07; WPT #15; Rubinoff, Eiben (UHIM). 3♂, 2♀, Munro Trail; N20°50.549, W156°54.585; wet area bl trap; 16–17 May [20]07; Rubinoff, Eiben (UHIM). 2♂, Kānepu'u Pres[erve]; 2 Jul [20]05; W. Haines (UHIM). **Midway**: 1 individual [sex unknown], Eastern Island; 10 May [20]08; J.J. Le Roux, D. Rubinoff (UHIM).

Orphanostigma haemorrhoidalis **(**Guenée) **New island record & name change**
This species was released in Hawai'i in 1956 to as a biological control agent for *Lantana camara* (Verbenaceae) (Funasaki *et al.* 1988). Nishida (2002) reported it from Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. We report it from Lāna'i for the first time.

Material examined. **Lāna'i**: 1♂, 6 iii [20]08; 20.87560, -156.97836; P. Schmitz (UHIM). 1♂, Munro Trail; 3 Jul [20]05; W. Haines (UHIM). 2♂, TNC reserve; 20.87464, -156.97533; 548 m; 6 Mar [20]08; P. Schmitz, D. Rubinoff (UHIM).

***Terastia* sp. A** **New island record & name change**
This species was first reported in Hawai'i in 1922 from O'ahu as *Terastia meticulosalis* Guenée (Swezey 1923) but has not been reported in the literature since. Zimmerman (1958b) wrote that "there is reason to doubt the species is established in our islands." Nishida (2002) listed it as *Terastia subjectalis* Lederer, presumably following Hampson (1899), who considered the Asian *T. subjectalis* Lederer synonymous with the American *T. meticulosalis* Guenée, but Nishida may have been unaware of Munroe (1995) who had validated both species. Sourakov *et al.* (2015) redescribed, figured, and diagnosed *T. meticulosalis* and *T. subjectalis* in addition to three other species in the genus. The species reported from Hawai'i does not appear to match any of those figured in Sourakov *et al.* (2015). Hawaiian specimens have never been dissected – Zimmerman (1958b) figured an adult and male and female genitalia from Mexican specimens of *T. meticulosalis*. We feel it is best to treat the Hawaiian taxon as *Terastia* sp. A until a more comprehensive revision has been completed. We report it from Maui for the first time.

Material examined. **Maui**: 3♂, Makena; 23 Sep 2011; ex. *Erythrina sandwicensis* seed pods; J. Yalemar (HDOA).

Depressariidae

Ethmia nigroapicella (Saalmüller) **New island record**
This introduced species feeds primarily on *Cordia subcordata* (Boraginaceae). Nishida (2002) reported it from Kaua'i, O'ahu, Maui, and Hawai'i. We report it from Moloka'i for the first time. It likely occurs on Lāna'i as well.

Material examined. **Moloka'i**: 1♂, Kaunakakai, Moloka'i Shores Apartments; 21.0800, -157.0565; 11 May 2021; 20 m; D. Rubinoff, K. Austin, C. Doorenweerd; hand collected indoors (UHIM).

Dryadaulidae

Dryadaula terpsichorella Busck **New island record**

Though described from the Hawaiian Islands and commonly known as the "Hawaiian Dancing Moth," Zimmerman (1978) treated it as an introduced species. It also has been reported from California, Florida, and many islands in the Pacific (Kawahara *et al.* 2011). Nishida (2002) reported it from Oʻahu, Molokaʻi, Maui, and Hawaiʻi. We report it from Kauaʻi for the first time. It likely occurs on all the main islands.

Material examined. **Kauaʻi**: 1♂, Nā Pali-Kona For[est] Res[erve], Koaiʻe Valley, nr. Piwa Exclosure Area; 22.1000, -159.6111; 560 m; 12–13 Oct 2021; K.A. Austin; LED bucket trap (UHIM).

Erebidae

Eublemma accedens (Felder & Rogenhofer) **New island record**

This species was first collected in the Hawaiian Islands in 1960 (Davis, 1964). It has been reared from flower buds and leaves of *Waltheria indica* (Malvaceae). Nishida (2002) reported it from Kauaʻi, Oʻahu, Molokaʻi, and Hawaiʻi; Howarth *et al.* (2012) reported it from Maui; Starr *et al.* (2006) reported it from Kahoʻolawe. We report it from Lānaʻi for the first time.

Material examined. **Lānaʻi**: 1♂, 6 Mar [20]08; N20.87560°, W156.97836°; P. Schmitz (UHIM).

Galtara extensa (Butler) **Name change**

This species was released in 2013 on Maui and Hawaiʻi Island to control the noxious weed *Senecio madagascariensis* (Asteraceae). It has been referred to in the recent literature as *Secusio extensa* (e.g., Ramadan *et al.* 2011, Krushelnycky *et al.* 2018) based on comments made by a collaborating taxonomist pending a revision of *Secusio* and *Galtara* (Ramadan *et al.* 2011). However, as the type species of *Secusio* (*Secusio strigata* Walker, 1854) is significantly different from both the type species of *Galtara* (*Galtara purata* Walker, 1863) and the species in question, which more closely resemble each other, we believe it is most appropriate to treat the introduced biocontrol species as *Galtara extensa* (Butler, 1880) pending a published revision of both genera.

Hypena laceratalis Walker **New island records**

This species was first introduced to Hawaiʻi in 1957 to control *Lantana camara* (Verbenaceae) (Davis & Krauss 1962). Nishida (2002) reported it from Kauaʻi, Oʻahu, Lānaʻi, Maui, and Hawaiʻi Island. We report it from Kahoʻolawe and Molokaʻi for the first time.

Material examined. **Kahoʻolawe**: 1♂, 1♀, Base of Moaʻulaiki; 20.56457, -156.58519; UV bucket trap; 7 Mar 2013 (UHIM). 1♂, 1♀, Wiliwili Grove; 6 Mar 2013 (UHIM). **Molokaʻi**: 1♂, 1♀, Kamakou Preserve, Pēpēʻōpae Bog Boardwalk; 21.1183, -156.9041; 1230 m; 11–12 May 2021; K.A. Austin, C. Doorenweerd, D. Rubinoff; UV/LED bucket trap (UHIM).

Euteliidae

Targalla delatrix (Guenée) **New island record**

This species was first recorded in the Hawaiian Islands in 1964 (Beardsley 1979). Nishida (2002) included records from Kauaʻi, Oʻahu, Molokaʻi, Maui, Hawaiʻi, and Pearl & Hermes Atoll. We report it from Lānaʻi for the first time.

Material examined. **Lānaʻi**: 1♂, Munro Trail; 3 Jul [20]05; W. Haines (UHIM).

Gelechiidae

Mesophleps adustipennis (Walsingham) **New state record**

This species has been reared from seeds of the highly invasive *Leucaena leucocephala* (Fabaceae) on Oʻahu. It was first collected in the Waiʻanae Mountains in 2020 but has since been collected throughout Oʻahu. Specimens have also been collected in relatively intact native forest, suggesting that it may be feeding on *Acacia koa* as well. A photograph of an individual near Kalaoa on Hawaiʻi Island in November 2020 was uploaded to iNaturalist (https://www.inaturalist.org/observations/65455998), suggesting that it may also be established on that island. This species also occurs in the southern United States, Central America, South America, the Caribbean, and the Galápagos Islands, where it feeds on various fruits and seeds of Fabaceae (Li & Sattler 2012). It is the only species of *Mesophleps* in the Western Hemisphere.

Material examined. **Oʻahu**: 1♂, Nānākuli Forest Reserve, Palikea Ridge Trail; D. Rubinoff, M. San Jose, J.B. Reil, K.A. Austin; 19 Nov 2020 (UHIM). 1♂, Kaʻiwi Shoreline; 21.2947, -157.6613; larva coll. 25 Sep 2021, adult ecl. 2 Oct 2021; K.A. Austin, K. Faccenda. HOST: *Leucaena leucocephala* seed pod (UHIM). 2♂, Kuliʻouʻou Forest Reserve, west ridge; 21.3086, -157.7299; 260 m; 1–2 Oct 2021; K.A. Austin, K. Faccenda; LED bucket trap (UHIM). 2♂, same as previous except 21.3135, -157.7296; 410 m; K. A. Austin diss. #0630 (UHIM). 1♂, ʻEwa For[est] Res[erve], Mānana Ridge, inside fenced area; 21.4499, -157.8899; 560 m; 24–25 Nov 2021; K.A. Austin, K. Faccenda; LED bucket trap (UHIM). 1♀, same as previous except 21.4502, -157.8887; 575 m (UHIM). 2♂, Round Top For[est] Res[erve], Mānoa Cliff Restoration Area; 21.3376, -157.8108; 565 m; 26–27 Nov 2021; K.A. Austin, K. Faccenda; LED bucket trap (UHIM). 1♂, same as previous, except 21.3379, -157.8108; 555 m (UHIM).

Geometridae

***Chloroclystis* sp. A** **New state record**

This species is superficially similar to some species of Australian *Chloroclystis* such as *C. pyrrholopha* Turner and *C. poliophrica* Turner. Males possess a unique patch of elongated scales along the basal half of the forewing costa. A more precise identification may require molecular methods. Species of *Chloroclystis* are known to feed on a wide variety of plant families (Robinson *et al.* 2010), so predicting its host range in Hawaiʻi is not possible at present.

Material examined. **Oʻahu**: 1♂, 1♀, ʻEwa For[est] Res[erve], Mānana Ridge, inside fenced area; 21.4502, -157.8887; 575 m; 24–25 Nov 2021; K.A. Austin, K. Faccenda; LED bucket trap (UHIM). 1♀, same as previous, except 21.4499, -157.8899; 560 m (UHIM). 1♂, Pahole N[atural] A[rea] R[eserve], in gulch; 21.5146, -158.1931; 610 m; 18–19 Dec 2021; K.A. Austin, K. Faccenda, H. Szczygieł; LED light trap (UHIM).

Cyclophora nanaria (Walker) **New island records**

This introduced species was first detected in Hawaiʻi in 1964 (Beardsley 1979). Nishida (2002) reported it from all of the main islands except Kahoʻolawe and Niʻihau. We report it from Kahoʻolawe and Midway for the first time.

Material examined. **Kahoʻolawe**: 1♂, 1♀, Hakiowa Pt., 5 m, 7 Nov 1979, G.M. Nishida (BPBM). **Midway**: 1♂, 3♀, Sand I[sle], 15 Jul 1983; at light; W.C. Gagné (BPBM).

Disclisioprocta stellata (Guenée) **New island records**

This species was first recorded in the Hawaiian Islands in 1993 (Kumashiro 1998). Nishida (2002) reported it from Kauaʻi and Maui, but apparently omitted a record from Hawaiʻi which was included in the original note (Kumashiro 1998). Tavares *et al.* (1998) mentioned

that it was reported from Oʻahu as early as 1993, but we cannot find a published record from that island. Therefore, we report it from Oʻahu and Laysan for the first time.

Material examined. **Laysan**: 3♂, Cocos Grove; bucket trap; 25 Mar [20]08; C. King (UHIM). **Oʻahu**: 1♀, Hawaiʻi Kai; 17 Oct [19]93; reared from caterpillar feeding on *Bougainvillea* (HDOA). 2♂, 3♀, Honolulu, Kalihi, 21 Jun 2001, 120 m, reared [from] *Bougainvillea*; F.G. Howarth (BPBM).

***Pleuroprucha* sp. A** **New state record**

This species was identified as "Undetermined genus sp. A" by Matsunaga *et al.* (2019). We identify it here as *Pleuroprucha* sp. A. The earliest records we have examined are from Oʻahu in 1997. All species of *Pleuroprucha* are native to the Americas. A more precise identification may require molecular methods pending a taxonomic revision of the genus.

Material examined. **Kauaʻi**: 1♀, Kōkeʻe; 22.1305, -159.6595; 1122 m; 20–22 Jul 2020; D., and R. Rubinoff, C. Doorenweerd (UHIM). **Maui**: 1♂, Makawao Forest Res[erve] near banana patch; 762 m; NAD83 04 Q 783642 2306658 [20.8383, -156.2745]; UV light trap; 20–21 Jun 2006; W. Haines (UHIM). **Oʻahu**: 1♀, Mānoa Valley, elev. 250 ft [76.2 m]; 23 Oct 1997; reared from marigold flower; pupation time: 7 days; W.D. Perreira (HDOA). 1♂, Koʻolau Mtns., Wiliwilinui Trail; 6 Jun 2006; UV light trap; J. Eiben, W. Haines (UHIM). 1♀, Kuliouou Forest Reserve, west ridge; 21.3135, -157.7296; 410 m; 1–2 Oct 2021; K.A. Austin, K. Faccenda; LED bucket trap; K. A. Austin diss. #0628 (UHIM).

Scopula personata (Prout) **New island records**

This species was identified as "*Scopula personata*?" by Howarth *et al.* (2012), an identification which we provisionally follow. Confirmation may require molecular methods. The earliest record of this species is from near the Honolulu International Airport in 1976. Howarth *et al*. (2012) reported it from Maui, where they considered it "common." We examined a single specimen from Lānaʻi that appears to have been reared, but the host plant is not included on the label. A photo of this species on Hawaiʻi Island was uploaded to iNaturalist [link], suggesting that it is also established on that island.

Material examined. **Lānaʻi**: 1♀, Garden of the Gods, N20°32.805, W157°00.094; 15 May [20]07; em[e]rg[e]d 17 May [20]07 (UHIM). **Oʻahu**: 1♂, Kuliʻouʻou Forest Reserve, west ridge; 21.3135, -157.7296; 410 m; 1–2 Oct 2021; K.A. Austin, K. Faccenda; LED bucket trap; K. A. Austin diss. #0629 (UHIM). **Kauaʻi**: 1♂, Kipu; 29 Jun 1983; J.C.E. Riotte (BPBM).

Meessiidae

***Eudarcia* sp. A** **New state record**

Larval cases of this species have been collected on rocks and have been confused with cases of the native fancy case caterpillars (Cosmopterigidae: *Hyposmocoma*). This represents the first record of the family Meessiidae in Hawaiʻi. A more precise identification of this species is not possible until a comprehensive revision of the genus is completed. Though the earliest record we have is from 2006, this species may have been present in the Hawaiian Islands before then and simply overlooked because of its diminutive size. It may be the same species as "Tineidae genus sp. A" in Howarth *et al.* (2012), but we were unable to locate the voucher specimens deposited in the Bishop Museum. The genus has a nearly cosmopolitan distribution.

Material examined. **Kahoʻolawe**: 2♀, "Naval" Wiliwili Grove; light trap; 7 Mar 2013 (UHIM). **Kauaʻi**: 1♀, Nā Pali-Kona For[est] Res[erve], Koaiʻe Valley, nr. Piwa Exclosure Area; 22.1000, -159.6111; 560 m; 12–13 Oct 2021; K.A. Austin; LED bucket trap; K. A. Austin diss. #0649 (UHIM). 1♀, same as previous except 22.1007, -159.6103; 565 m; K. A. Austin diss. #0648 (UHIM). **Maui**:

1♀, Auwahi area, makai of Hokano on lava; 25–29 Mar [20]08; em. 28 Apr [20]08; DR08C10B; S. Montgomery, M. Bryce (UHIM). **O‘ahu**: 1♂ [abdomen missing], 1♀, Ewa, Makaiwa Hills; 1000ft [304.8 m]; 21–22 Nov 2006; under stone (UHIM).

Momphidae

Mompha eloisella (Clemens) **Name change**

Nishida (2002) included “*Laverna herellara*?” as one of two species of Momphidae in the Hawaiian Terrestrial Arthropod Checklist. We can find no records of this name anywhere in the published literature, as was likely the case for Nishida which is why he may have included a question mark. We believe the most likely origin for this name is a misspelling of *Laverna oenotheraeella* Chambers, 1875 where the “*oenot-*” was somehow omitted. This species is now treated as a synonym of *Mompha eloisella* (Clemens, 1860), which feeds on *Oenothera* spp. (Onagraceae) and may have been under consideration as a biocontrol agent for *Oenothera* on Maui and Hawai‘i Island. However, we can find no published references to any releases made of this species in the state. It should be listed as “not established” in the checklist.

Noctuidae

Amyna natalis (Walker) **New island records**

This species was first collected on O‘ahu in 1945 (Zimmerman 1958a); Nishida (2002) included a record from Kaua‘i. Howarth *et al.* (2012) reported it from Maui; Giffin & Rowe (2007) reported it from Hawai‘i Island. We report it from Lāna‘i, Moloka‘i, and Nihoa for the first time.

Material examined. **Lāna‘i**: 3♂, Munro Trail; 3 vii [20]05; W. Haines (UHIM). 7♂, 3♀, TNC reserve; N20.87464, W156.97533; 548 m; 6 Mar [20]08; P. Schmitz, D. Rubinoff (UHIM). **Moloka‘i**: 1♀, TNC Barracks, Kamakou Pres[erve]; 18 May [20]04 (UHIM). **Nihoa**: 1♀, Upper Miller’s Gulch; UV bucket trap; 23.06223, -161.92557; 7–8 Jun 2015; J. Sprague (UHIM). 1♂, UV bucket trap; 23.05973, -161.92343; 4–5 Jun 2015; J. Sprague (UHIM).

Argyrogramma verruca (Fabricius) **New state record**

This is a broadly distributed species in the Americas, recorded from Canada to Argentina. It is somewhat polyphagous and is sometimes considered a minor pest of various garden crops in its native range (Lafontaine & Poole 1991). Photographs of this species have been uploaded to iNaturalist from near Waimea [link] and Waikoloa Village [link] on Hawai‘i Island, suggesting that it has been established on the island for a while.

Material examined. **Hawai‘i**: 1♂, Ocean View, Maile Drive; 560 m; 19.0744, -155.7585; 17–19 Mar 2021; D. Rubinoff, C. Doorenweerd, K. Austin, R. Rubinoff; MV light (UHIM). **O‘ahu**: 1♂, Moanalua Valley; Dec 1999; W.D. Perreira (HDOA).

Callopistria floridensis (Guenée) **Name correction**

Beardsley (1979) first reported the presence of this genus in Hawai‘i, but simply listed it as “*Callopistria* sp.” Later he identified specimens in the UHIM as *Callopistria floridensis* (Guenée) as evidenced by a handwritten note. Riotte (1991) listed the species in Hawai‘i as *Callopistria meridionalis* Collenette from material in the BPBM identified by F. Howarth and P. Maddison. Someone (perhaps Riotte) then appears to have changed Beardsley’s label to “*Callopistria* sp. nr. *floridensis*” with a separate label referencing the specimens in the BPBM identified as *C. meridionalis*. Nishida (2002) listed it as

Callopistria maillardi Guenée, presumably following Holloway (1989) in treating *C. meridionalis* as a synonym of *C. maillardi*. However, Beardsley was correct. The species present in Hawai‘i is the North American *C. floridensis* (Guenée) as evidenced by the absence of the “three to five enlarged spatulate setae” on the node of the antennae which are present in *C. maillardi* and other Pacific species (Holloway 1983). Neither *C. maillardi* nor *C. meridionalis* (if treated as a distinct species) are currently recorded from Hawai‘i. The “*Callopistria* sp. of Mau *et al.* 1990” mentioned by Nishida (2002) may be *C. floridensis*, but we have not been able to find this reference.

Elaphria nucicolora (Guenée) **New island record**

Nishida (2002) reported this species from all the main islands except Ni‘ihau and Moloka‘i. He also reported it from Laysan. We report it from Moloka‘i for the first time.

Material examined. **Moloka‘i**: 2♂, Kamakou Preserve, Waikolu Valley Lookout; 21.1295, -156. 9209; 1095 m; 12–13 May 2021; K.A. Austin, C. Doorenweerd, D. Rubinoff; UV/LED bucket trap (UHIM).

Feltia subterranea (Fabricius) **New island records**

Prestes (2014) reported this recently introduced species from Hawai‘i Island, Lāna‘i, and Maui. We report it from Moloka‘i and O‘ahu for the first time. This species has also been photographed in Kapa‘a on Kaua‘i [link], suggesting that this species is established on that island as well.

Material examined. **Moloka‘i**: 3♂, 1♀, Kamakou Preserve, Waikolu Valley Lookout; 21.1295, -156. 9209; 1095 m; 12–13 May 2021; K.A. Austin, C. Doorenweerd, D. Rubinoff; UV/LED bucket trap (UHIM). **O‘ahu**: 1♀, Wai‘anae Kai For[est] Res[erve], Mt. Ka‘ala, past south end of bog boardwalk; 1180 m; 10–11 iv 2021; 21.5029, -158.1482; K.A. Austin, M. San Jose; K. Faccenda; UV bucket trap (UHIM). 1♂, Mokulē‘ia For[est] Res[erve], West Makaleha restoration area; 21.5201, -158.1734; 840 m; 15–16 May 2021; K.A. Austin, M. San Jose; LED bucket trap (UHIM).

Leucania loreyimima Rungs **New island record**

This introduced species was first recorded in Hawai‘i in 1975 as *Leucania loreyi* (Duponchel) (Beardsley 1979). Peter Maddison reidentified it as *L. loreyimima* Rungs as reported by Riotte (1991). Nishida (2002) included records from Midway, Kaua‘i, O‘ahu, and Hawai‘i Island. Howarth *et al.* (2012) reported it from Maui. We report it from Nihoa for the first time.

Material examined. **Nihoa**: 3♂, UV bucket trap; 23.05973, -161.92343; 4–5 Jun 2015; J. Sprague (UHIM). 2♂, 1♀, same as previous except 23.06082, -161.92748; 6–7 Jun 2015 (UHIM). 2♂, 1♀, Upper Miller’s Gulch; UV bucket trap; 23.06223, -161.92557; 7–8 Jun 2015; J. Sprague (UHIM). 5♂, 1♀, West Central Plateau; UV bucket trap; 23.06152, -161.92237; 6–7 Jun 2015; J. Sprague (UHIM).

Leucania striata Leech **New island records**

This introduced species was first recorded in Hawai‘i in 1969 (Beardsley 1979). Nishida (2002) included records from Kaua‘i, O‘ahu, and Maui. We report it from Hawai‘i Island and Lāna‘i for the first time.

Material examined. **Hawai‘i**: 1♂, Ha[wai‘i] Vo[lcanoes] Nat[ional] Park, Kahuku Sect[ion], along border of Kau Forest Reserve; 1050 m; 19.1112, -155.6758; 18–19 Mar 2021; D. Rubinoff, C. Doorenweerd, K. Austin, R. Rubinoff; UV bucket trap (UHIM). **Lāna‘i**: 1♂, Munro Trail; 3 Jul [20]05; W. Haines (UHIM).

Mouralia tinctoides (Guenée) **New island record & new status**

This species is listed as "adventive, not established?" in Nishida (2002), where it was reported from a single specimen from Kauaʻi collected in 1982 (Riotte 1991). We report it from Oʻahu for the first time and consider it likely established in the state based on the presence of the host plant (*Tradescantia* spp., Commelinaceae) in both cultivated and natural settings.

Material examined. **Oʻahu**: 1♂, Koʻolau Mtns., Waʻahila Ridge; 360 m; 21.3084, -157.7958; UV light trap; 9 Jan 2010; W. Haines (UHIM).

Mythimna unipuncta (Haworth) **New island records**

This introduced species is among the most abundant and common moths in the Hawaiian Islands. It was first reported in Hawaiʻi by Butler (1880). Nishida included records from Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, Hawaiʻi Island, Midway, Lisianski, and Laysan. We report it from Kahoʻolawe and Nihoa for the first time. It likely occurs on Niʻihau and most, if not all, of the Northwestern Hawaiian Islands.

Material examined. **Kahoʻolawe**: 5♂, 2♀, Keālialalo; N20.53992, W156.63897; UV bucket trap; 5 Mar 2013. W. Haines, D. Rubinoff (UHIM). 3♀, planted *Erythrina* grove nr. Luamakika; N20.55715, W156.57303; UV bucket trap; 6 Mar 2013; W. Haines, D. Rubinoff (UHIM). 3♂, 4♀, Base of Moaʻulaiki; 20.56457, -156.58519; UV bucket trap; 7 Mar 2013 (UHIM). **Nihoa**: 1♂, 1♀, UV bucket trap; 23.06082, -161.92748; 6–7 Jun 2015; J. Sprague (UHIM). 1♂, Upper Miller's Gulch; UV bucket trap; 23.06223, -161.92557; 7-8 Jun 2015; J. Sprague (UHIM).

Peridroma saucia (Hübner) **New island record & name correction**

In Hawaiʻi this species has been repeatedly misidentified as *Lycophotia porphyrea* (Denis & Schiffermüller, 1775) (e.g., Riotte, 1991; Nishida 2002; Giffin 2007; Howarth *et al.* 2012). This likely stems from the fact that Zimmerman (1958a) listed it as *Peridroma porphyrea* (Denis & Schiffermüller, 1775). Zimmerman also incorrectly stated that "*Noctua porphyrea*" was the type species of *Peridroma* when in fact it is the type species of *Lycophotia* Hübner. He also erroneously included *Agrotis saucia* Hübner, 1808 as a synonym.

Riotte (1991), who was the first to treat the Hawaiian noctuoid fauna after Zimmerman, appears to have recognized this discrepancy and attempted to remedy it by changing the combination to a correct one, *Lycophotia porphyrea* (Denis & Schiffermüller, 1775), not recognizing that this species and the species present in Hawaiʻi are not the same. What should have been done is the exact opposite: correct the specific epithet to that of the type species of *Peridroma* Hübner. This is what Zimmerman intended when treating both the introduced species and the native Hawaiian ones as congenerics. This would have created the correct and already widely used combination *Peridroma saucia* (Hübner, 1808).

This introduced species is among the most common Lepidoptera in Hawaiʻi. It was first reported from Hawaiʻi by Meyrick (1899), but likely had been present for some years before. Nishida (2002) included records from Kauaʻi, Oʻahu, Molokaʻi, Kahoʻolawe, Maui, Hawaiʻi, and Laysan. We report it from Lānaʻi for the first time. It likely also occurs on Niʻihau and many of the Northwestern Hawaiian Islands.

Material examined. **Lānaʻi**: 1♀, Kānepuʻu Reserve, near outplanting; 18–19 Sep [20]09; D. Rubinoff, C. King, W. Haines (UHIM). 1♂, Munro Trail; N20°50.549, W156°54.585; wet area bl trap; 16–17 May [20]07; Rubinoff, Eiben (UHIM).

Papilionidae

Battus philenor (Linnaeus) **New state record**

A single adult was photographed by Kevin Konishi in the Sand Island area in early 2019 and reported to Janis Matsunaga. HDOA Plant Quarantine staff were able to capture the individual shortly thereafter as it was nectaring on landscaped *Pseuderanthemum carruthersii* (Acanthaceae) flowers. No additional specimens have been reported since, but because its host plant (*Aristolochia* spp., Aristolochiaceae) is naturalized in Hawai‘i (Wagner *et al.* 1999), establishment may be possible. *Battus philenor* is native to the continental United States and Mexico. Identification was provided by Paul Goldstein (USDA-SEL).

Material examined. **O‘ahu**: 1♀, Sand Island; 1 Feb 2019; ex. at large; coll. C. Kishimoto (HDOA).

Pyralidae

Corcyra cephalonica (Stainton) **New island records**

Nishida (2002) only included records from O‘ahu for this introduced species. We report it from Maui and Moloka‘i for the first time.

Material examined. **Maui**: 1♀, Haiku; Dec 1919; O.H. Swezey; ex. peanuts (HDOA). 1♀, Pā‘ia; 22 May [19]35; O.H. Swezey; ex. jar of prepared steer feed (HDOA). **Moloka‘i**: 1♂, Kaunakakai; 15 Feb [19]29; O.H. Swezey; in house (HDOA).

Hypsopygia mauritialis (Boisduval) **New island record**

Nishida (2002) included records from Ni‘ihau, Kaua‘i, and O‘ahu for this species. We report it from Hawai‘i Island for the first time.

Material examined. **Hawai‘i**: 4♂, 1♀, Hilo; 22 Oct 1974; in old *Polistes* nest; S. Matayoshi (HDOA). 1♂, Kūka‘iau Ranch; Sep 1955; ex. *Myrica faya*; C.J. Davis (HDOA).

Trachylepidia fructicassiella Ragonot **New state record**

This species has been intercepted twice on the U.S. mainland from outbound O‘ahu residents. M. Alma Solis (USDA-SEL) provided the identification of those records, but no field records on O‘ahu were recorded at the time. We reared this species in good numbers from pods of *Cassia bakeriana* (Fabaceae) on the campus of the University of Hawai‘i at Mānoa. M. Alma Solis subsequently confirmed our identification. It has not been recorded elsewhere on O‘ahu to date, but is likely widely established based on the popularity of the host plant in landscaping. There is one iNaturalist observation of a larva from 2019 (https://www.inaturalist.org/observations/37776400), suggesting that it has been established for at least two years. *Trachylepidia fructicassiella* occurs in India, Pakistan, and Sri Lanka, where it is believed to be native, as well as in Central America and the Caribbean, where it has been introduced. It is frequently intercepted at U.S. ports of entry but is not believed to be established in the continental United States (Solis 2006).

Material examined. **O‘ahu**: 13♂, 5♀, UH Mānoa Campus, SE corner of Hamilton Library; 21.3003, -157.8158; pods coll[ected] 30 Nov 2021; adult ecl. 1–16 Dec 2021; K. Faccenda (all UHIM except 2♂, 2♀ sent to HDOA).

Sphingidae

Hippotion rosetta (Swinhoe) **New status**

Nishida (2002) listed a junior synonym of this species, *Hippotion depictum* Dupont, 1941, as having been intercepted in quarantine and not established in Hawai‘i. It was first col-

lected in Hawai‘i in 1998 from O‘ahu and Kaua‘i (Kumashiro *et al.* 2002). Howarth *et al.* (2012) reported it from Maui. Having examined more recent material from O‘ahu and seen photographs from across the state, we have sufficient evidence to consider it permanently established across the main Hawaiian Islands.

Psilogramma increta (Walker) **New island records**

This species was first collected in Hawai‘i in 1977 on O‘ahu, where it was misidentified as *P. menephron* (Cramer, 1780) (Higa 1981). Nishida (2002) included records from Kaua‘i under this misidentification. Matsunaga *et al.* (2019) reported that the species in Hawai‘i is actually *P. increta* (Walker, 1865). We report it here from Lāna‘i, Maui, and Hawai‘i Island for the first time. It likely occurs on Moloka‘i as well, but we have not seen specimens of it from that island.

Material examined. **Lāna‘i**: 3♂, [no locality given] WPT 15; 6 Mar 2008 (UHIM). **Hawai‘i**: 1♀, Papaikou; 26 Jan 2015; ex. at large near *Dracaena* farm; M. Akiyama (HDOA). **Maui**: 3♂, Makawao Forest Res[erve], Waiohiwi Gulch; 2500 ft [762 m]; UV light trap; 17 Jan 2005; W. Haines (UHIM). 1♂, same as previous except 16 Jan 2005 (UHIM). 1♂, Makawao Forest Res[erve], Kahakapao; 3200 ft [975 m]; UV light trap; 17 Jan 2005; W. Haines (UHIM). 1♀, Makawao Forest Res[erve] near banana patch; 762 m; NAD83 04 Q 783642 2306658 [20.8383, -156.2745]; UV light trap; 20–21 Jul 2006; W. Haines (UHIM).

Tineidae

Erechthias pelotricha (Meyrick) **New state record**

This species was described from Rapa Island but has been recorded in French Polynesia as well as Fiji. Clarke (1971) reared adults from dead wood of *Pandanus tectorius* (Pandanaceae). We suspect that it may also feed on dead wood of *Freycinetia arborea* (Pandanaceae) in Hawai‘i based on the proximity of these plants to the localities where it has been collected so far in the central and southern Ko‘olau Range where *Pandanus tectorius* is much less common.

Material examined. **O‘ahu**: 1♂, Round Top; elev. 900 ft [274 m]; 16 Aug 2006; W.D. Perreira (HDOA). 1♂, Pu‘u ‘Ualaka‘a; elev. 900 ft [274 m]; 25 May 2006; W. D. Perreira (HDOA). 1♂, same as previous except 29 Apr 2006 (HDOA). 1♂, Ko‘olau Mtns., Wa‘ahila Ridge; 360 m; 21.3084, -157.7958; UV light trap; 9 Jan 2010; W. Haines (UHIM). 1♂, 4♀, Tantalus Restoration Area; 8 Dec 2013; A. Prestes, L. Leblanc (UHIM). 1♂, Kuli‘ou‘ou Forest Reserve, west ridge; 21.3126, -157.7300; 390 m; 1–2 Oct 2021; K.A. Austin, K. Faccenda; UVLED light sheet; K. A. Austin diss. #0634 (UHIM). 2♂, same as previous, except 21.3135, -157.7296; 410 m; LED bucket trap (UHIM).

Erechthias simulans (Butler) **New island records**

Nishida (2002) included records from Kaua‘i, O‘ahu, and Hawai‘i Island for this introduced species. Howarth *et al.* (2012) reported it from Maui. We report records from Lāna‘i and Moloka‘i for the first time.

Material examined. **Lāna‘i**: 3♂, 4♀, Munro Trail; N20°50.549, W156°54.585; wet area bl trap; 16-17 May [20]07; Rubinoff, Eiben. 2♂, Munro Trail Head 16–17 May [20]07; WPT #15; Rubinoff, Eiben (UHIM). **Moloka‘i**: 1♀, TNC Barracks; Kamakou Pres[erve]; 18 May [20]04 (UHIM).

Monopis crocicapitella (Clemens) **New island records**

Nishida (2002) included records of this species from O‘ahu, Moloka‘i, Lāna‘i, and Hawai‘i Island. We report it from Kaua‘i and Maui for the first time, although the specimens are over a century old.

Material examined. **Kaua‘i**: 1♂, Kōke‘e; 29 Aug 1921; Swezey (HDOA). 1♀, same as previous except 26 Aug 1921 (HDOA). **Maui**: 1 specimen, sex undetermined, Kula; 26 Jan [19]10 (HDOA).

Monopis meliorella (Walker) **New island record**

Nishida (2002) included records of this introduced species from Necker, Nihoa, Kaua‘i, O‘ahu, Moloka‘i, and Gardner Pinnacles. Howarth *et al.* (2012) reported it from Maui; Giffin & Rowe (2007) reported it from Hawai‘i Island; and we report it from Lāna‘i for the first time.

Material examined. **Lāna‘i**: 1♂, Munro Trail; 16–17 May [20]07; WPT #16, “wet area;” Rubinoff, Eiben (UHIM). 1♂, Kānepu‘u Reserve, near outplanting; 18–19 Sep [20]09; D. Rubinoff, C. King, W. Haines (UHIM).

Monopis longella (Walker) **New island record & name change**

Butler (1881) first recorded this introduced species in Hawai‘i as *Blabophanes longella* (Walker, 1863) and said it was “unquestionably distinct” from *B. monachella*. Despite this, Meyrick (1894) synonymized the two, with Zimmerman (1978) following this treatment. Huang *et al.* (2011) removed *Monopis longella* from synonymy with *Monopis monachella* and diagnosed the two species. Based on the presence of a dark stain within the large white patch on costal margin of forewing of all Hawaiian specimens examined by us, *Monopis longella* (Walker, 1863) is the correct name for the species in the Hawaiian Islands.

Nishida (2002) included records from Kaua‘i, O‘ahu, Lāna‘i, and Hawai‘i Island. We report it from Maui for the first time. It likely occurs on all the main islands.

Material examined. **Maui**: 1♂, 1♀, Makawao Forest Res[erve], Waiohiwi Gulch; 2500 ft [762 m]; UV light trap; 17 Jan 2005; W. Haines (UHIM). 1♂, Makawao Forest Res[erve] near banana patch; 762 m; NAD83 04 Q 783642 2306658 [20.8383, -156.2745]; UV light trap; 20–21 Jun 2006; W. Haines (UHIM).

Opogona sacchari (Bojer) **New island records**

Nishida (2002) included records from O‘ahu and Hawai‘i Island for this introduced species. We report it from Kaua‘i and Maui for the first time. It is undoubtedly more widespread, feeding in a wide array of substrates from rotting wood to pineapple (Vorsino *et al.* 2005).

Material examined. **Kaua‘i**: 1♀, Nā Pali-Kona For[est] Res[erve], Koai‘e Valley, nr. Piwa Exclosure Area; 22.1007, -159.6103; 565 m; 12–13 Oct 2021; K.A. Austin; LED bucket trap (UHIM). **Maui**: 1♂, 1♀, Kihei; 4 Apr [19]90; ex. palm; J. Tavares. 2♀, Makawao Forest Res[erve] near banana patch; 762 m; NAD83 04 Q 783642 2306658 [20.8383, -156.2745]; UV light trap; 19 Jun 2006; W. Haines (UHIM). 1♀, same as previous, except 18 Jun 2006 (UHIM). 1♀, Hali‘i Maile, south of Haleakalā Hwy, in sugar cane fields; UV light trap; 1 Jun [20]05; C. King (UHIM).

Opogona purpuriella Swezey **New island record**

Nishida (2002) reported this species from Kaua‘i, O‘ahu, Moloka‘i, and Hawai‘i Island. We report it from Maui for the first time, even though the specimens are nearly a century old.

Material examined. **Maui**: 2♀, Olinda; Apr 1932; O. Bryant (HDOA).

Trichophaga mormopis Meyrick **New island record**

Nishida (2002) included records from O‘ahu and Maui for this introduced species. We report it from Kaua‘i for the first time.

Material examined. **Kaua‘i**: 2♀, [no locality given]; Jun 1963; ex. orchid media; S. Au (HDOA).

Tortricidae

Acleris zimmermani (Clarke) **New island record & name change**

This species was first introduced to Hawai‘i in 1964 on Maui to control non-native *Rubus* (Davis & Kraus 1965). It was then released on Kaua‘i in 1965 and Hawai‘i Island in 1966 (Zimmerman 1978). We report it from O‘ahu for the first time. We can find no published records of intentional releases on O‘ahu. It has been collected only in the vicinity of Ka‘ala.

Material examined. **O‘ahu**: 2♂, 1♀, Ka‘ala N[atural] A[rea] R[eserve], fenceline near FAA “twin towers;” 1200 m; N21.50866, W158.14838; UV light trap; 25 Feb 2012; W. Haines, A. Prestes (UHIM). 1♂, Wai‘anae Kai For[est] Res[erve], Mt. Ka‘ala, near south end of bog boardwalk; 1200 m; 21.5033, -158.1478; 10–11 Apr 2021; K.A. Austin, M. San Jose; K. Faccenda; UV bucket trap (UHIM). 1♀, Mt. Ka‘ala shelter; 1220 m; 21.5082, -158.1441; 10–11 Apr 2021; K.A. Austin, M. San Jose; K. Faccenda; UV light sheet (UHIM). 1♂, 2♀, Wai‘anae Kai For[est] Res[erve], Ka‘ala Trail; 21.5027, -158.1505; 1050 m; 4–5 Sep 2021; K.A. Austin, K. Faccenda; LED bucket trap (UHIM).

Crocidosema lantana Busck **New island records**

This species was introduced to Hawai‘i in 1902 by Koebele for the biological control of *Lantana camara* (Zimmerman 1978). Nishida (2002) included records from Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i. We report it from Kaho‘olawe and Lāna‘i for the first time.

Material examined. **Kaho‘olawe**: 1♀, planted *Erythrina* grove nr. Luamakika; N20.55715, W156.57303; UV bucket trap; 6 Mar 2013; W. Haines, D. Rubinoff (UHIM). **Lāna‘i**: 1♂, Kānepu‘u Reserve, near outplanting; 18–19 Sep [20]09; D. Rubinoff, C. King, W. Haines (UHIM).

Cryptophlebia illepida (Butler) **New island record**

It is unclear if this species in endemic, indigenous, or introduced in Hawai‘i. It has not been collected outside of the state. Zimmerman (1978) treated it as probably introduced. Nishida (2002) listed it as adventive and occurring on Maui, O‘ahu, Moloka‘i, Lāna‘i, Maui, and Hawai‘i Island. We report it from Kaho‘olawe for the first time.

Material examined. **Kaho‘olawe**: 2♂, [no specific locality], ex. old native plant matter; 6 Mar 2013 (UHIM).

Episimus unguiculus Clarke **New island record & name change**

This species was introduced to Hawai‘i from Brazil in 1954 to control *Schinus terebinthifolia* (Anacardiaceae), at which time it was undescribed (Zimmerman 1978). Zimmerman (1978) described it as *Episimus utilis*, now considered a junior synonym of *Episimus unguiculus* Clarke, 1951 (Razowski & Brown 2008). Nishida (2002) reported it as occurring on Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai‘i Island. We report it from Lāna‘i for the first time.

Material examined. **Lāna‘i**: 2♂, 6 iii [20]08; N20.87464, W156.97533; P. Schmitz. 2♂, Kānepu‘u Reserve, near outplanting; 18–19 Sep [20]09; D. Rubinoff, C. King, W. Haines (UHIM).

Eucosmogastra poetica (Meyrick) **New state record**

A single specimen of this species was reared from the critically endangered native tree *Flueggea neowawraea* (Phyllanthaceae) by the O‘ahu Army Natural Resource Program (OANRP) staff at the NIKE greenhouse in the northern Waianae Mountains near Pahole Natural Area Reserve. Although the specimen is missing a locality label, Karl Magnacca (OANRP) provided us with the locality data and year. It is unclear whether or not it is established in that area, but further surveys should be conducted as it is near one of the only places *Flueggea neowawraea* still occurs naturally on O‘ahu.

Material examined. **O‘ahu**: 1♂, [NIKE greenhouse]; coll[ected] as caterpillar 10 Nov [2015] on *Flueggea neowawraea*; pupated 22 Nov [2015], em[erged] 22 Dec [2015] (UHIM).

Lorita scarificata (Meyrick) **New island records**

This species was first recorded from Hawai‘i in 1974 (Beardsley 1979). Nishida (2002) reported it from Kaua‘i and O‘ahu. We report it from Kaho‘olawe and Midway Atoll for the first time.

Material examined. **Kaho‘olawe**: 1♂, [no specific locality], ex. old native plant matter; 6 Mar 2013 (UHIM). **Midway**: 2♂, 2♀, Sand Isle; 10 May [20]08; J.J. Le Roux, D. Rubinoff (UHIM).

Platynota stultana Walsingham **New island records**

Platynota stultana was first collected in Hawai‘i in 1985 but has only been reported from O‘ahu (Miller & Hodges 1995) and Maui (Howarth *et al.* 2012). We report it from Hawai‘i Island, Kaho‘olawe, Kaua‘i, and Lāna‘i for the first time. It likely occurs on Moloka‘i as well, but we have not examined any specimens from that island to date. It has been reared from a wide variety of both native and introduced plant species in Hawai‘i (Austin & Rubinoff, in prep.).

Material examined. **Hawai‘i**: 1♂, 0.5 mi W of Kamuela; dry scrub; 22 Apr [20]03; Rubinoff, Nogues (UHIM). **Kaho‘olawe**: 1♂, [no specific locality], ex. old native plant matter; 6 Mar 2013 (UHIM). **Kaua‘i**: 1♀, Nā Pali-Kona For[est] Res[erve], Koai‘e Valley, nr. Piwa Exclosure Area; 22.0982, -159.6115; 550 m; 12–13 Oct 2021; K.A. Austin; UVLED light sheet (UHIM). **Lāna‘i**: 1♀, Munro Trail Head; 16–17 May [20]07; WPT #15; Rubinoff, Eiben (UHIM).

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Table 1. Taxonomic and establishment status changes to the Lepidoptera checklist of Nishida (2002)

Family in Nishida 2002*	Name in Nishida 2002*	Current family	Current name/status	Notes/Source	Status in Nishida 2002*	Proposed status	Notes/Source
Acrolepiidae	-	Glyphipterigidae	Acrolepiinae	van Nieukerken *et al*., 2011	-	-	-
Agonoxenidae	-	Elachistidae	Agonoxeninae	van Nieukerken *et al*., 2011	-	-	-
Arctiidae	-	Erebidae	Arctiinae	van Nieukerken *et al*., 2011	-	-	-
Arctiidae	*Utetheisa pulchelloides*	Erebidae	*Utetheisa pulchelloides*	-	advNE?	advNE	[a]
Carposinidae	*Carposina bullata*	-	-	-	purNE?	purNE	Conant *et al*., (2013)
Castniidae	*Castnia licus*	Castniidae		Lamas, 1995	advNE?	advNE	[a]
Coleophoridae	*Coleophora parthenica*	-	-	-	purNE?	purNE	Conant *et al*., (2013)
Coleophoridae[d]	*Pigritia uuku*[d]	Blastobasidae	*Pigritia uuku*	van Nieukerken *et al*., 2011	-	adv?[d]	-
Cosmopterigidae	*Pyroderces badia*	Cosmopterigidae	*Anatrachyntis badia*	Koster & Sinev, 2003	adv	-	-
Cosmopterigidae	*Pyroderces rileyi*	Cosmopterigidae	*Anatrachyntis rileyi*	Koster & Sinev, 2003	adv	-	-
Crambidae	*Ategumia adipalis*	-	-	-	pur	purNE	[a]
Crambidae	*Ategumia ebulealis*	-	-	-	pur	err	Nakahara *et al*., (1992)
Crambidae	*Ategumia matutinalis*	-	-	-	purNE?	pur	Nakahara *et al*., (1992)
Crambidae	*Blaphala homoesomella*	Pyralidae	*Baphala homoeosomella*	[b]	purqua	-	-
Crambidae	*Diaphania bivitralis*	Crambidae	*Glyphodes bivitralis*	Nuss *et al*., 2003-2022	qua	-	-
Crambidae	*Hyperectis dioctias*	Crambidae	*Hydriris dioctias*	Mally *et al*., 2019	adv	adv?	Zimmerman (1958b)
Crambidae	*Pleuroptya aurantiacalis*	Crambidae	*Patania balteata*	Nuss *et al*., 2018	qua	-	-
Crambidae	*Pyrausta perelegans*	Crambidae	*Glyphodes perelegans*	Nuss *et al*., 2003-2022	pur	-	-
Crambidae	*Salbia haemorrhoidalis*	Crambidae	*Orphanostigma haemorrhoidalis*	Shaffer & Munroe, 2003	pur	-	-
Crambidae	*Synclita obliteralis*	Crambidae	*Elophila obliteralis* [g]	Nuss *et al*., 2003-2022	adv	-	-
Crambidae	*Terastia subjectalis*	Crambidae	*Terastia* sp.	See comments in text	adv	-	-
Crambidae	*Uresiphita polygonalis virescens*	Crambidae	*Uresiphita gilvata*	Nuss *et al*., 2003-2022	end?	adv	Mally *et al*., 2019
Erebidae	*Secusio extensa*[e]	Erebidae	*Galtara extensa*	See comments in text	pur[e]	-	-
Gelechiidae	*Anarsia lineatella*	-	-	-	advNE?	advNE	[a]
Gelechiidae	*Autosticha*	Autostichidae	*Autosticha* [g]	van Nieukerken *et al*., 2011	adv	-	-
Gelechiidae	*Stoeberhinus testaceus*	Autostichidae	*Stoeberhinus testaceus*	Hodges, 1998	adv	-	-
Geometridae	*Anacamptodes fragilaria*	Geometridae	*Iridopsis fragilaria*	Parsons et al., 1999	adv	-	-
Geometridae	*Macaria abydata*	Geometridae	*Psamatodes abydata*	Ferguson, 2008	adv	-	-
Heliodinidae	*Schreckensteinia*	Schreckensteiniidae	-	van Nieukerken *et al*., 2011	-	-	-
Hesperiidae	*Catochrysops cnejus*	Lycaenidae	*Euchrysops cnejus*	Bridges, 1994 [b]	purNE	-	-
Lycaenidae	*Cyanophrys amyntor*	-	-	-	purNE?	purNE	[a]
Lycaenidae	*Thecla* sp. nr. *polybetes*	Lycaenidae	*Parrhasius* sp. nr. *polibetes*	Bridges, 1994 [b]	purNE?	purNE	[a]
Lymantriidae	-	Erebidae	Lymantrinae	van Nieukerken *et al*., 2011	-	-	-
Lyonetiidae	*Bedellia*	Bedelliidae	*Bedellia*	van Nieukerken *et al*., 2011	-	-	-
Lyonetiidae	*Bucculatrix*	Bucculatricidae	*Bucculatrix*	van Nieukerken *et al*., 2011	-	-	-
Momphidae	*Lavema herellara*?	Momphidae	*Mompha eloisella*	See comments in text	qua	-	-
Momphidae	*Mompha trithalama*	-	-	-	purNE?	pur	Conant *et al*., (2013)
Noctuidae	*Achaea*	Erebidae	*Achaea* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Anomis*	Erebidae	*Anomis* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Anomis vulpicolor*	Erebidae	*Gonitis vulpicolor*	Holloway, 2005	end	-	-
Noctuidae	*Antiblemma*	Erebidae	*Antiblemma* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Ascalapha*	Erebidae	*Ascalapha* [g]	Zahiri et al., 2011	-	-	

Table 1. Taxonomic and establishment status changes to the Lepidoptera checklist of Nishida (2002) (continued)

Family in Nishida 2002*	Name in Nishida 2002*	Current family	Current name/status	Notes/Source	Status in Nishida 2002*	Proposed status	Notes/Source
Noctuidae	*Bocana*	Erebidae	*Bocana* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Callopistria maillardi*	Noctuidae	*Callopistria floridensis*	See comments in text	adv	-	-
Noctuidae	*Diastema tigris*	-	-	-	pur	purNE	Conant *et al*., (2013)
Noctuidae	*Discestra trifolii*	Noctuidae	*Anarta trifolii* [g]	Matsunaga *et al*., 2019	adv	advNE	Riotte (1991)
Noctuidae	*Earias*	Nolidae	*Earias*	Zahiri et al., 2013	-	-	-
Noctuidae	*Eublemma*	Erebidae	*Eublemma* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Eudocima*	Erebidae	*Eudocima* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Eudocima fullonia*	Erebidae	*Eudocima phalonia*	Zilli & Hogenes, 2002	adv	-	-
Noctuidae	*Grapholitha molesta*	Tortricidae	*Grapholita molesta*	[b]	qua	-	-
Noctuidae	*Hypena*	Erebidae	*Hypena* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Hypocala*	Erebidae	*Hypocala* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Lycophotia porphyrea*	Noctuidae	*Peridroma saucia*	See comments in text	adv	err	See comments in text
Noctuidae	*Melipotis*	Erebidae	*Melipotis* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Mouralia tinctoides*	-	-	-	advNE?	adv	See comments in text
Noctuidae	*Ophiusa*	Erebidae	*Ophiusa* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Pandesma*	Erebidae	*Pandesma* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Penicillaria*	Euteliidae	*Penicillaria*	Zahiri *et al.*, 2011	-	-	-
Noctuidae	*Pericyma cruegeri*	Erebidae	*Pericyma cruegeri*	-	adv	advNE	Riotte (1991) [a]
Noctuidae	*Polydesma*	Erebidae	*Polydesma* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Pseudaletia*	Noctuidae	*Mythimna*	Hacker *et al*., 2002	-	-	-
Noctuidae	*Pseudoschrankia*	Erebidae	*Pseudoschrankia*	Zahiri et al., 2011	-	-	-
Noctuidae	*Rhynchopalpus brunellus*	Nolidae	*Meganola brunellus*	László et al., 2015	pur	-	-
Noctuidae	*Schrankia*	Erebidae	*Schrankia* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Schrankia arrhecta*	Erebidae	junior syn. *of Schrankia altivolans*	Medeiros *et al.*, 2009	end	-	-
Noctuidae	*Schrankia oxygramma*	Erebidae	junior syn. *of Schrankia altivolans*	Medeiros *et al.*, 2009	end	-	-
Noctuidae	*Schrankia sarothrura*	Erebidae	junior syn. *of Schrankia altivolans*	Medeiros *et al.*, 2009	end	-	-
Noctuidae	*Schrankia simplex*	Erebidae	junior syn. *of Schrankia altivolans*	Medeiros *et al.*, 2009	end	-	-
Noctuidae	*Simplicia*	Erebidae	*Simplicia* [g]	Zahiri et al., 2011	-	-	
Noctuidae	*Stictoptera*	Euteliidae	*Stictoptera*	Zahiri *et al.*, 2011	-	-	-
Noctuidae	*Targalla*	Euteliidae	*Targalla*	Zahiri *et al.*, 2011	-	-	-
Noctuidae	*Trichoclea edwardsi*	Noctuidae	*Anarta edwardsii* [g]	Matsunaga *et al*., 2019	adv	advNE	Riotte (1991)
Noctuidae	*Trichoclea postica*	Noctuidae	*Anarta decepta* [g]	Matsunaga *et al*., 2019	adv	-	-
Oecophoridae	*Agonopterix ulicetella*	Depressariidae	*Agonopterix umbellana*	Ireson *et al*., 2013	purNE?	pur	Conant *et al*., (2013)
Oecophoridae	*Ethmia*	Depressariidae	*Ethmia*	Heikkilä *et al*., 2014	-	-	-
Oecophoridae	*Ptochoryctis tsugensis*	Xyloryctidae	*Metathrinca tsugensis*	Hodges, 1998	qua	-	-
Oecophoridae	*Thyrocopa*	Xyloryctidae	*Thyrocopa*	Medeiros, 2009	-	-	-
Oecophoridae	*Thyrocopa adumbrata*	Xyloryctidae	junior syn. of *Thyrocopa altema*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa argentea*	Xyloryctidae	junior syn. of *Thyrocopa indecora*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa criminosa*	Xyloryctidae	junior syn. of *Thyrocopa usitata*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa depressariella*	Xyloryctidae	junior syn. of *Thyrocopa abusa*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa fraudulentella*	Xyloryctidae	junior syn. of *Thyrocopa abusa*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa immutata*	Xyloryctidae	junior syn. of *Thyrocopa abusa*	Medeiros, 2009	end	-	-

Table 1. Taxonomic and establishment status changes to the Lepidoptera checklist of Nishida (2002) (continued)

Family in Nishida 2002*	Name in Nishida 2002*	Current family	Current name/status	Notes/Source	Status in Nishida 2002*	Proposed status	Notes/Source
Oecophoridae	*Thyrocopa inermis*	Xyloryctidae	junior syn. of *Thyrocopa alterna*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa ingeminata*	Xyloryctidae	junior syn. of *Thyrocopa abusa*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa librodes*	Xyloryctidae	junior syn. of *Thyrocopa usitata*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa mediomaculata*	Xyloryctidae	junior syn. of *Thyrocopa apatela*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa nubifer*	Xyloryctidae	junior syn. of *Thyrocopa abusa*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa pallida*	Xyloryctidae	junior syn. of *Thyrocopa abusa*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa phycidiformis*	Xyloryctidae	junior syn. of *Thyrocopa brevipalpis*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa pulverulenta*	Xyloryctidae	junior syn. of *Thyrocopa epicapna*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa sucosa*	Xyloryctidae	junior syn. of *Thyrocopa usitata*	Medeiros, 2009	end	-	-
Oecophoridae	*Thyrocopa tessellatella*	Xyloryctidae	junior syn. of *Thyrocopa indecora*	Medeiros, 2009	end	-	-
Olethreutidae	-	Tortricidae	Olethreutinae	Obraztsov, 1945	-	-	-
Pieridae	*Colias ponteri*	Pieridae	*Colias ponteni*	[b]	dub	-	-
Pterophoridae	*Platyptilia lantanadactyla*	Pterophoridae	*Lantanophaga pusillidactyla*	Gielis, 2006	pur	[c]	Gielis 2006
Pyralidae	*Corcyra cephalonica*	Pyralidae	*Aphomia cephalonica* [g]	Nuss *et al*., 2003-2022	adv	-	-
Pyralidae	*Ectomyelois ceratoniae*	Pyralidae	*Apomyelois ceratoniae* [g]	Nuss *et al*., 2003-2022	adv	-	-
Pyralidae	*Melitara prodenialis*	-	-	-	pur	purNE	Conant *et al*., (2013)
Pyralidae	*Pempelia genistella*	-	-	-	purNE?	purNE	Conant *et al*., (2013)
Saturniidae	*Samia cecropia*	Saturniidae	*Hyalophora cecropia*	Ferguson, 1972	qua	-	-
Saturniidae	*Samia euryalus*	Saturniidae	*Hyalophora euryalus*	Ferguson, 1972	advNE	-	-
Saturniidae	*Telea polyphemus*	Saturniidae	*Antheraea polyphemus*	Ferguson, 1972	advNE	-	-
Sesiidae	*Melittia oedipus*	-	-	-	NE	pur	Culliney *et al*., (2003)
Sesiidae	*Pennisetia marginata*	-	-	-	pur	purNE	Conant *et al*., (2013)
Sphingidae	*Deilephila nerii*	Sphingidae	*Daphnis nerii* [g]	Matsunaga *et al*., 2019	adv	-	-
Sphingidae	*Hippotion boerhaviae*	-	-	-	qua	err	Kumashiro *et al*., (2002)
Sphingidae	*Hippotion rosetta*	-	-	-	qua	adv	Kumashiro *et al*., (2002)
Sphingidae	*Hyles wilsoni perkinsi*	Sphingidae	*Hyles perkinsi*	d'Abrera, 1986	end	-	-
Sphingidae	*Psilogramma menephron*	Sphingidae	*Psilogramma increta* [g]	Matsunaga *et al*., 2019	adv	-	Matsunaga *et al*., 2019
Symmocidae	*Oecia*	Autostichidae	*Oecia*	van Nieukerken *et al*., 2011	adv	-	-
Tineidae	*Argyresthia*	Argyresthiidae	*Argyresthia*	van Nieukerken *et al*., 2011	-	-	-
Tineidae	*Choropleca advena*	Dryadaulidae	*Dryadaula advena*	Regier *et al*., 2015	adv	-	-
Tineidae	*Decadarchis flavistriata*	Tineidae	*Erechthias flavistriata*	Robinson & Nielsen, 1993	adv	-	-
Tineidae	*Decadarchis kerri*	Tineidae	*Erechthias kerri*	Robinson & Nielsen, 1993	adv	-	-
Tineidae	*Decadarchis penicillata*	Tineidae	*Erechthias penicillata*	Robinson & Nielsen, 1993	adv	-	-
Tineidae	*Dryadaula terpsichorella*	Dryadaulidae	*Dryadaula terpsichorella*	Regier *et al*., 2015	adv	-	-
Tineidae	*Monopis monachella*	Tineidae	*Monopis longella*	See comments in text	adv	-	-
Tortricidae	*Bradleylla*	Tortricidae	*Nuritamburia*	Koçak & Kemal, 2007	-	-	-
Tortricidae	*Cacoecia rosaceana*	Tortricidae	*Choristoneura rosaceana*	Freeman, 1958	qua	-	-
Tortricidae	*Crocidosema leprara*	-	-	-	end?	end	Zimmerman (1978)
Tortricidae	*Crocidosema marcidella*	-	-	-	end?	end	Zimmerman (1978)
Tortricidae	*Crocidosema plebejana*	-	-	-	adv?	err	Zimmerman (1978)
Tortricidae	*Croesia zimmermani*	Tortricidae	*Acleris zimmermani*	Razowski, 1987	pur	-	-
Tortricidae	*Cydia dehaisiana*	Tortricidae	*Cydia saltitans*	Gilligan *et al*., 2020	qua	-	

Table 1. Taxonomic and establishment status changes to the Lepidoptera checklist of Nishida (2002) (continued)

Family in Nishida 2002*	Name in Nishida 2002*	Current family	Current name/status	Notes/Source	Status in Nishida 2002*	Proposed status	Notes/Source
Tortricidae	*Episimus utilis*	Tortricidae	*Episimus unguiculus*	Razowski & Brown, 2008	pur	-	
Tortricidae	*Laspeyresia splendana*	Tortricidae	*Cydia splendana*	Brown, 1979	qua	-	
Tortricidae	*Laspeyresia ulicetana*	Tortricidae	*Cydia ulicetana*	Brown, 1979	purNE?	purNE	[a]
Tortricidae	*Tortrix excessana*	Tortricidae	*Planotortrix excessana*	Dugdale, 1990	qua	-	-
Tortricidae[f]	*Crocidosema blackburnii*[†]	Tortricidae	*Crocidosema blackburnii*	Zimmerman, 1978	[f]	end	Zimmerman (1978)
Yponomeutidae	*Prays*	Praydidae	*Prays*	van Nieukerken *et al*., 2011	-	-	-

* Except where noted

[a] We can find no published records of this species in Hawaii since Nishida (2002). We have also not examined any specimens collected since this species was first reported/released in Hawaii or the years shortly thereafter. We therefore treat it as not presently established in Hawaii.

[b] Incorrect spelling and/or family listing in Nishida (2002)

[c] *Platyptilia lantanadactyla* is a junior synonym of *Lantanophaga pusillidactyla*. Both species are listed in Nishida (2002). It should be omitted in future checklists unless synonyms are included. See Gielis (2006).

[d] Not listed in Nishida (2002). First reported from Hawaii in Medeiros & Adamski 2011.

[e] Not listed in Nishida (2002). First reported from Hawaii in Matsunaga et al. 2019.

[f] Not listed in Nishida (2002). Zimmerman (1978) diagnoses it as being distinct from *C. plebejana*.

[g] Updated taxonomy noted in Matsunaga et al. 2019

Table 2. Additions to the Lepidoptera checklist of Nishida (2002)

Family	Genus	Species	Authorship	Status	Distribution	Reference
Autostichidae	undet. gen. nr. *Autosticha*	sp. A		adv	Ma	see references/comments in Matsunaga *et al.*, 2019
Blastobasidae	*Pigritia*	*uuku*	Medeiros & Adamski, 2012	end?	Kh	Medeiros & Adamski, 2012
Carposinidae	*Carposina*	*gagneorum*	Medeiros & Oboyski, 2016	end	Mo	Medeiros *et al*., 2016
Carposinidae	*Carposina*	*hahaiella*	Doorenweerd, Austin, & Rubinoff, 2021	end	Ka	Doorenweerd *et al*., 2021
Carposinidae	*Carposina*	*urbanae*	Medeiros & Oboyski, 2016	end	Ka	Medeiros *et al*., 2016
Choreutidae	*Choreutis*	sp. A		adv	Ha, Ka, Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Cosmopterigidae	*Hyposmocoma*	*anoai*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*aumakuawai*	Schmitz & Rubinoff, 2011b	end	Ka	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*carnivora*	Schmitz & Rubinoff, 2011a	end	Ha	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*eepawai*	Schmitz & Rubinoff, 2011b	end	Ka	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*ekemamao*	Schmitz & Rubinoff, 2009	end	Ly	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*eliai*	Schmitz & Rubinoff, 2011a	end	Ka	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*hooilo*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*ipohapuu*	Kawahara & Rubinoff, 2012	end	Ha	Kawahara & Rubinoff, 2012
Cosmopterigidae	*Hyposmocoma*	*ipowainui*	Schmitz & Rubinoff, 2011b	end	Ka	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*kahaiao*	Schmitz & Rubinoff, 2011b	end	Ma	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*kahamanoa*	Schmitz & Rubinoff, 2011b	end	Oa	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*kaikuono*	Schmitz & Rubinoff, 2008	end	Mo	Schmitz & Rubinoff, 2008
Cosmopterigidae	*Hyposmocoma*	*kamakou*	Schmitz & Rubinoff, 2011b	end	Mo	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*kamaula*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*kanaloa*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*kapakai*	Schmitz & Rubinoff, 2008	end	Oa	Schmitz & Rubinoff, 2008
Cosmopterigidae	*Hyposmocoma*	*kaupo*	Schmitz & Rubinoff, 2008	end	Ma	Schmitz & Rubinoff, 2008
Cosmopterigidae	*Hyposmocoma*	*kawaikoi*	Schmitz & Rubinoff, 2011b	end	Ka	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*kikokolu*	Schmitz & Rubinoff, 2009	end	Na	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*laysanensis*	Schmitz & Rubinoff, 2009	end	Ly	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*mahoepo*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*makawao*	Kawahara & Rubinoff, 2012	end	Ma	Kawahara & Rubinoff, 2012
Cosmopterigidae	*Hyposmocoma*	*menehune*	Schmitz & Rubinoff, 2009	end	Na	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*mokumana*	Schmitz & Rubinoff, 2009	end	Ne	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*molluscivora*	Rubinoff & Haines, 2006	end	Ma, Mo	Rubinoff & Haines, 2006
Cosmopterigidae	*Hyposmocoma*	*moopalikea*	Schmitz & Rubinoff, 2011b	end	Ma	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*nihoa*	Schmitz & Rubinoff, 2009	end	Na	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*nohomaalewa*	Schmitz & Rubinoff, 2011a	end	Ka	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*nohomeha*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*oolea*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*opuulaau*	Schmitz & Rubinoff, 2011a	end	Ma	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*opuumaloo*	Schmitz & Rubinoff, 2009	end	Ne	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*pahanalo*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*papahanau*	Schmitz & Rubinoff, 2009	end	Na	Schmitz & Rubinoff, 2009
Cosmopterigidae	*Hyposmocoma*	*papaiili*	Schmitz & Rubinoff, 2011a	end	Ma	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*pukoa*	Schmitz & Rubinoff, 2011a	end	Ma	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*pupumoehewa*	Schmitz & Rubinoff, 2011a	end	Ma	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*tantala*	Kawahara & Rubinoff, 2012	end	Oa	Kawahara & Rubinoff, 2012
Cosmopterigidae	*Hyposmocoma*	*uhauiole*	Schmitz & Rubinoff, 2011b	end	Ka	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*waauhi*	Medeiros, Haines & Rubinoff, 2017	end	Kh	Medeiros *et al*., 2017
Cosmopterigidae	*Hyposmocoma*	*wahikanake*	Schmitz & Rubinoff, 2011a	end	Ln	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*waihohonu*	Schmitz & Rubinoff, 2011b	end	Ma	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Hyposmocoma*	*waikamoi*	Schmitz & Rubinoff, 2011a	end	Ma	Schmitz & Rubinoff, 2011a
Cosmopterigidae	*Hyposmocoma*	*wailua*	Schmitz & Rubinoff, 2011b	end	Ka	Schmitz & Rubinoff, 2011b
Cosmopterigidae	*Ithome*	*lassula*	Hodges, 1962	adv	Oa	see references/comments in Matsunaga *et al.*, 2019
Crambidae	*Asciodes*	*quietalis*	(Walker, 1859)	adv	Oa	
Crambidae	*Diaphania*	*nitidalis*	(Stoll, 1781)	adv	Ha, Ka, Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Crambidae	*Herpetogramma*	sp. A		adv	Ha, Oa	
Crambidae	*Mestolobes*	*olali*	Medeiros & Howarth, 2017	end	Ha	Medeiros & Howarth, 2017
Crambidae	*Orthomecyna*	*keoniae*	Medeiros & Adamski, 2012	end	Kh	Medeiros & Adamski, 2012
Crambidae	*Tamsica*	*kawikae*	Medeiros & Adamski, 2012	end	Kh	Medeiros & Adamski, 2012
Erebidae	*Galtara*	*extensa*	(Butler, 1880)	pur	Ha, Ln, Ma	see references/comments in Matsunaga *et al.*, 2019
Erebidae	*Oraesia*	*excavata*	(Butler, 1878)	adv	Ka, Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Erebidae	*Pseudoschrankia*	*nohoana*	Medeiros & Howarth, 2017	end	Ha	Medeiros & Howarth, 2017
Erebidae	*Schrankia*	*howarthi*	Davis & Medeiros, 2009	end	Ha, Ma	Medeiros et al., 2009
Gelechiidae	*Mesophleps*	*adustipennis*	(Walsingham, 1897)	adv	Oa	
Geometridae	*Chloroclystis*	sp. A		adv	Oa	
Geometridae	*Pleuroprucha*	sp. A		adv	Ka, Ma, Oa	
Geometridae	*Scopula*	*personata*	(Prout, 1913)	adv	Ka, Ln, Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Geometridae	undet. gen.	sp. A		adv	Oa	identified here as Pleuroprucha sp. A; see Matsunaga *et al.*, 2019
Gracillariidae	*Caloptilia*	*coruscans*	(Walsingham, 1907)	adv	Ha	see references/comments in Matsunaga *et al.*, 2019
Gracillariidae	*Philodoria*	*alakaiensis*	Kobayashi, Johns & Kawahara, 2021	end	Ka	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*funkae*	Kobayashi, Johns & Kawahara, 2021	end	Ka	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*haelauensis*	Kobayashi, Johns & Kawahara, 2021	end	Ma, Mo	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*hesperomanniella*	Kobayashi, Johns & Kawahara, 2021	end	Ma, Oa	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*kauaulaensis*	Kobayashi, Johns & Kawahara, 2018	end	Ma	Kobayashi *et al.*, 2018
Gracillariidae	*Philodoria*	*keaensis*	Kobayashi, Johns & Kawahara, 2021	end	Ha	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*keahii*	Kobayashi, Johns & Kawahara, 2021	end	Ma	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*knudseniiella*	Kobayashi, Johns & Kawahara, 2021	end	Ka	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*kolea*	Kobayashi, Johns & Kawahara, 2018	end	Ha	Kobayashi *et al.*, 2018

Table 2. Additions to the Lepidoptera checklist of Nishida (2002) (continued)

Family	Genus	Species	Authorship	Status	Distribution	Reference
Gracillariidae	*Philodoria*	*lama*	Kobayashi, Johns & Kawahara, 2021	end	Ln, Ma, Oa	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*limahuliensis*	Kobayashi, Johns & Kawahara, 2021	end	Ka	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*napaliensis*	Kobayashi, Johns & Kawahara, 2021	end	Ka	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*obamaorum*	Kobayashi, Johns & Kawahara, 2021	end	Ha	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*opuhe*	Kobayashi, Johns & Kawahara, 2021	end	Oa	Kobayashi *et al.*, 2021
Gracillariidae	*Philodoria*	*platyphylliella*	Kobayashi, Johns & Kawahara, 2021	end	Ma	Kobayashi *et al.*, 2021
Gracillariidae	*Phyllocnistis*	*citrella*	Stainton, 1856	adv	Ha, Ka, Ma, Mo, Oa	see references/comments in Matsunaga *et al.*, 2019
Limacodidae	*Darna*	*pallivitta*	(Moore, 1877)	adv	Ka, Ha, Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Lycaenidae	*Zizina*	*otis*	(Fabricius, 1787)	adv	Ha, Ka, Oa	see references/comments in Matsunaga *et al.*, 2019
Meessiidae	*Eudarcia*	sp. A		adv	Ka, Kh, Ma, Oa	
Noctuidae	*Agrotis*	*helela*	Medeiros, 2019	end	Ha	Medeiros *et al.*, 2019
Noctuidae	*Agrotis*	*kuamauna*	Medeiros & Kirkpatrick, 2019	end	Ha	Medeiros *et al.*, 2019
Noctuidae	*Argyrogramma*	*verruca*	(Fabricius, 1794)	adv	Ha, Oa	
Noctuidae	*Ctenoplusia*	*albostriata*	(Bremer & Grey, 1853)	adv	Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Noctuidae	*Feltia*	*subterranea*	(Fabricus, 1794)	adv	Ha, Ln, Ma,Mo, Oa	see references/comments in Matsunaga *et al.*, 2019
Papilionidae	*Battus*	*philenor*	(Linneaus, 1771)	advNE?	Oa	
Pieridae	*Abaeis*	*nicippe*	(Cramer, 1779)	adv	Ha, Ka, Kh, Ma, Mo, Oa	see references/comments in Matsunaga *et al.*, 2019
Pieridae	*Phoebis*	*agarithe*	(Boisduval, 1836)	adv	Ka, Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Pyralidae	*Loryma*	cf. *recusata*	(Walker, 1863)	adv	Ha, Ma	see references/comments in Matsunaga *et al.*, 2019
Pyralidae	*Trachylepidia*	*fructicassiella*	Ragonot, 1887	adv	Oa	
Sphingidae	*Hippotion*	*rosetta*	(Swinhoe, 1892)	adv	Ha, Ka, Ma, Oa	see references/comments in Matsunaga *et al.*, 2019
Tineidae	*Erechthias*	*pelotricha*	(Meyrick, 1926)	adv	Oa	
Tineidae	undet. gen.	sp. A		adv	Ka, Kh, Ma, Oa	possibly the same as Eudarcia sp. A identified here; see Howarth & Preston, 2002
Tortricidae	*Eucosmogastra*	*poetica*	(Meyrick, 1909)	advNE?	Oa	
Xyloryctidae	*Thyrocopa*	*apikia*	Medeiros, 2009	end	Mo	Medeiros, 2009
Xyloryctidae	*Thyrocopa*	*elikapekae*	Medeiros, 2009	end	Ka	Medeiros, 2009
Xyloryctidae	*Thyrocopa*	*kanaloa*	Medeiros, 2009	end	Kh	Medeiros, 2009
Xyloryctidae	*Thyrocopa*	*kea*	Medeiros, 2009	end	Ka	Medeiros, 2009
Xyloryctidae	*Thyrocopa*	*kokeensis*	Medeiros, 2009	end	Ka	Medeiros, 2009
Xyloryctidae	*Thyrocopa*	*neckerensis*	Medeiros, 2009	end	Ne	Medeiros, 2009
Xyloryctidae	*Thyrocopa*	*nihoa*	Medeiros, 2009	end	Na	Medeiros, 2009

Island distribution: Ha=Hawaii, Ka=Kauai, Kh-Kahoolawe, Ln=Lanai, Ly=Laysan, Ma=Maui, Mo=Molokai, Ne=Necker, Na=Nahoa, Oa=Oahu

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The *Scaptomyza cyrtandrae* species group, with the description of a new species (Diptera: Drosophilidae)

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Abstract. The genus *Scaptomyza* includes over 270 species, about half of which are endemic to the Hawaiian Islands. These species show similar levels of host plant specificity and single island endemism as their sister group, the Hawaiian *Drosophila*, although they display less dimorphism in secondary sexual characters. Instead, *Scaptomyza* species possess diverse characters associated with the male terminalia, even between closely related species. Here we use dissections of male terminalia between two closely related taxa found living on the undersides of leaves of native *Cyrtandra* species to erect the *Scaptomyza cyrtandrae* group and describe one new species, *Scaptomyza neocyrtandrae* Burgunder, Rampasso, and O'Grady, from the island of Maui.

Key words: *Elmomyza*, Hawaiian Islands, description, Drosophilidae, taxonomy

INTRODUCTION

The genus *Scaptomyza* was erected by Hardy (1849) for *Scaptomyza graminum* and contains a total of 273 described species, 148 of which are endemic to the Hawaiian Islands (Rampasso & O'Grady 2022). Currently, twenty-one subgenera are placed within *Scaptomyza* (O'Grady *et al.* 2010), including several endemic Hawaiian groups formerly considered to be genera (*Grimshawomyia* and *Titanochaeta*) or subgenera (*Engiscaptomyza*) of *Drosophila*, but synonymized with *Scaptomyza* on the basis of male terminalia characters (O'Grady *et al.* 2003). In addition, Magnacca & O'Grady (2008) transferred eight *Drosophila* species to various subgenera of *Scaptomyza* on the basis of male terminal morphology. Nine *Scaptomyza* subgenera are either completely endemic to the Hawaiian archipelago (*Alloscaptomyza, Elmomyza, Engiscaptomyza, Exalloscaptomyza, Grimshawomyia, Tantalia,* and *Titanochaeta*) or contain species which are endemic to this island chain (*Bunostoma* and *Rosenwaldia*). The remaining 125 described species of *Scaptomyza* are placed in eleven subgenera and are found elsewhere in the world (O'Grady *et al.* 2010; Rampasso & O'Grady 2022; Wheeler 1981, 1986).

Throckmorton (1966) referred to all members of the genus *Scaptomyza* as "scaptoids" and considered the Hawaiian and mainland taxa to be monophyletic. O'Grady & DeSalle (2008) used a molecular phylogeny to examine the evolutionary and biogeographic history of this group. Their study supported all members of the genus *Scaptomyza* as the monophyletic sister group to the endemic Hawaiian *Drosophila*, which has been corroborated by several recent studies (Finet *et al.* 2021; Katoh *et al.* 2017; Lapoint *et al.* 2013; Russo *et al.* 2013; Suvorov *et al.* 2021; Yassin 2013) and reviewed in O'Grady & DeSalle (2018a, b). The mainland taxa were derived from a Hawaiian ancestor that left Hawaii and subsequently diversified within the past ~10 million years. The Hawaiian *Scaptomyza* have underdone significant radiation, particularly within the past 5 million

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years, as more high islands with suitable rainforest habitat have emerged in the archipelago (Lapoint *et al.* 2013).

The Hawaiian endemic subgenus *Elmomyza* is the largest group in *Scaptomyza*, with 85 described species (Bächli 2021; O'Grady *et al.* 2010; Rampasso & O'Grady 2022). Based on undescribed material present in the entomology collection at the Bernice Pauahi Bishop Museum, University of Hawai'i, Manoa, and in the Cornell University Insect Collection, the actual number of species in this subgenus may be nearly double the current number (O'Grady & Rampasso, pers. observ.). While additional taxonomic work focusing on the subgenus *Elmomyza* is necessary, this clade can be divided further into groups of closely related species on the basis of external morphology and ecological associations. For example, there are several clades distributed throughout the high islands that are associated with the same plant genera (Magnacca *et al.* 2008), suggesting the ancestor of these clades may have adapted to a host plant in the past and radiated on plants with similar chemistries, similar to the evolutionary pattern observed in the Hawaiian *Drosophila* (O'Grady *et al.* 2011).

Phylogenetic relationships within the genus *Scaptomyza* are poorly understood (reviewed in O'Grady & DeSalle 2018b). Lapoint *et al.* (2013) produced a phylogeny of 63 *Scaptomyza* species, representing 13 of the 21 established genera, using a dataset of ~5,000 molecular characters. Several Hawaiian subgenera (*Alloscaptomyza, Bunostoma, Engiscaptomyza, Grimshawomyia, Rosenwaldia, Tantalia,* and *Titanochaeta*) were recovered as monophyletic. Interestingly, the largest subgenus, *Elmomyza*, was paraphyletic with respect to the subgenera *Rosenwaldia* and *Tantalia*. Sampling within *Elmomyza* included 25 described and 5 putative new species, accounting for about 30% of the known species diversity in this subgenus. The phylogeny sampled both *S. cyrtandrae* and *S. neocyrtandrae* and suggested that they were sister taxa with weak support (<50% bootstrap, 96% posterior probability). Clearly, additional taxon sampling and an expanded number of molecular characters will need to be analyzed before we have a more resolved understanding of evolutionary relationships within and between *Scaptomyza* subgenera.

Here we describe a new species of *Scaptomyza, S. neocyrtandrae* Burgunder *et al.,* and erect the *cyrtandrae* species group within subgenus *Elmomyza*, based on a combination of ecological associations, morphological characters, and phylogenetic relationships.

MATERIAL AND METHODS

Collections

Specimens were either aspirated directly from leaves of *Cyrtandra* spp. or swept from vegetation. This species is endemic to the island of Maui and has been collected in the Waikamoi Forest Preserve on East Maui, roughly at 4,000 ft. in elevation. Collection numbers are preceded with an O (O'Grady Collections), an L (Lapoint Collections) or an M (Magnacca Collections). Six-digit barcodes refer to O'Grady Lab Accession numbers. Museum abbreviations follow Evenhuis (2021).

Species Descriptions and Imaging

Hardy (1965) described *Scaptomyza cyrtandrae* based on individuals collected in the Napau Crater, Hawai'i, in July 1956. Through the following decades, additional collections of morphologically similar individuals from the hirsute leaves of *Cyrtandra* spp. (Gesneriaceae) were made on the Big Island of Hawai'i and on Maui. Upon examination of the male terminalia of specimens sampled on each island, it became evident that they were two distinct entities, and the population collected on Maui was an undescribed species.

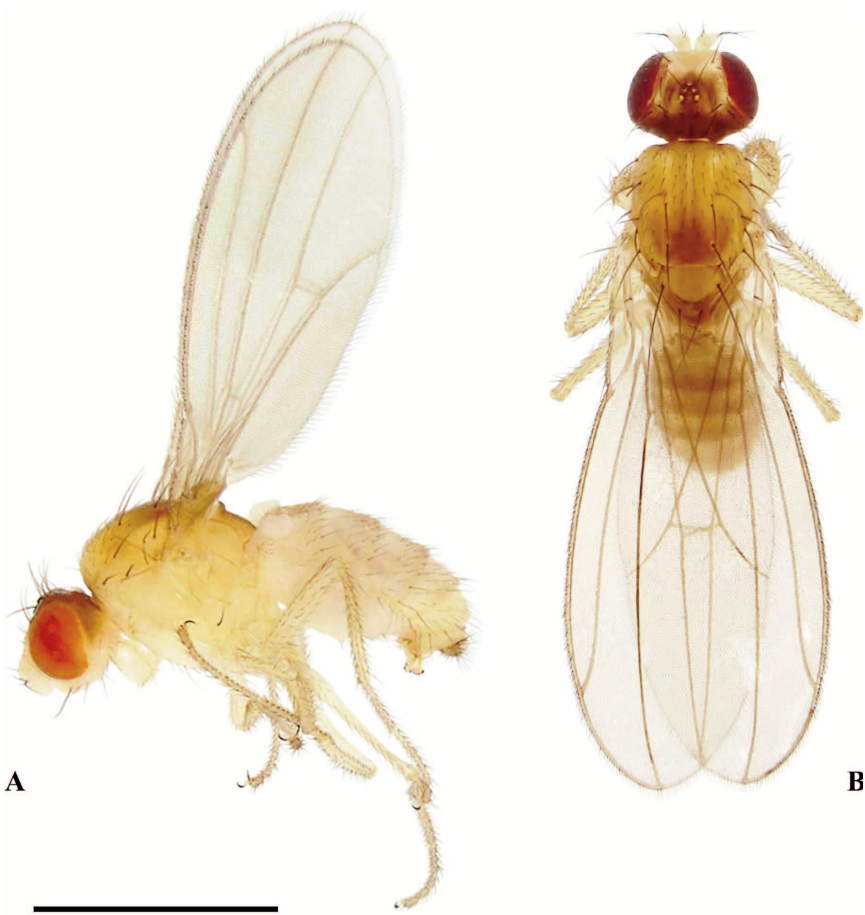

Fig. 1: Habitus of *Scaptomyza cyrtandrae* Hardy, 1965 in left lateral (**A**) and dorsal (**B**) views. Scale bar = 1 mm. Photo: A.S. Rampasso.

All material was sorted to species and individuals within each of the two *cyrtandrae* group species were verified as conspecific prior to dissection and description. Measurements and indices follow Hardy *et al.* (2001), whereas all morphological characters follow recent nomenclatural revisions (Cumming & Wood 2009, 2017; Rampasso & O'Grady 2021; Rice *et al.* 2019). The holotype and allotype are housed in the Bernice Pauahi Bishop Museum. Paratypes are present in the Cornell University Insect Collection and the University of Hawai'i at Manoa Insect Museum.

We used different individuals for the habitus and terminalia imaging. Although paratypes of *S. neocyrtandrae* were dissected, no holotypes were dissected. The habitus of two ethanol-preserved male individuals belonging to *Scaptomyza cyrtandrae* (Fig. 1) and two males of *Scaptomyza neocyrtandrae* sp. nov. (Fig. 2) were imaged. Material was held in

position using white aquarium sand, then covered in ethanol prior to being imaged at different depths of focus in under a Nikon SMZ1500 stereomicroscope equipped with an Excelis HD Microscope Camera with an 11.6-in AU-600-HDS monitor. One male of each species was imaged in left lateral view, and the other, in dorsal view. Sets of 69–87 photos were taken with 15–20× magnification and the software CombineZP was used to stack the photos into all-in-focus composites, following Vilela & Prieto (2018)

One ethanol-preserved male specimen of *Scaptomyza cyrtandrae* (Figs. 3 and 4) and another of *Scaptomyza neocyrtandrae* sp. nov. (Fig. 5) were dissected and subsequently pointed. The technique of terminalia dissection is based on Wheeler & Kambysellis (1966), Kaneshiro (1969) and Bächli *et al.* (2004). The sclerites were disarticulated in depression slides filled with 70% ethanol, using a pair of entomological pins, and terminalia slides were prepared using Euparal as the mounting medium.

Slides were stored at room temperature and imaged under a Macroscopic Solutions Macropod Pro and Canon EOS 6D DSLR camera body using EF 70–200 mm zoom lens with 50× Mitutoyo objective lens in at least three positions (posterior, oblique posterior, and left lateral views). For each view, a set of 147–462 photos were taken in different depths of focus and stacked using Zerene Stacking Software Version 1.04 (Zerene Systems, LLC 2014). Since the male terminalia of *S. cyrtandrae* was heavily sclerotized and has multiple overlapping sclerites, initially the surstylus was disarticulated from the epandrium, and then the hypandrium and associated sclerites were disarticulated from the epandrium as well and imaged following the same methodology. The resulting all-in-focus composites were edited on Adobe Photoshop 2021 to remove the background and correct color and white balance. The analyzed terminalia and the remaining of the abdomens were stored in microvials filled with glycerol and attached by the stopper to the pins of the dissected specimens.

***Scaptomyza cyrtandrae* Hardy, 1965**

(Figs. 1, 3, 4)

Scaptomyza cyrtandrae Hardy, 1965: 673.

Diagnosis. *Scaptomyza cyrtandrae* is characterized by having four rows of acrostichal setae, a yellow body and two pairs of dorsocentral setae. It differs from its closest sibling species, *S. neocyrtandrae* Burgunder, Rampasso & O'Grady, by characters of the male terminalia (Fig. 3).

Distribution. Hawaiian Islands: Hawai'i.

Ecology. This species is associated with native *Cyrtandra* as both feeding and breeding sites (Hardy 1965).

Measurements. N=2♂: TL=0.6 mm (0.6); WL=1.5 mm (1.5); TL/WL=0.4 (0.4); CI=2.65 (2.6-2.7); 4V=1.75 (1.5-2.0); 5X=1.6 (1.4-1.8); 4C=0.9 (0.8-1.0); M=0.55 (0.5-0.6). N=1♀: TL =0.6 mm; WL=1.4 mm; TL/WL=0.4; CI=2.3; 4V=1.8; 5X=1.8; 4C=0.9; M=0.5.

Types. The holotype male and allotype female are deposited in the BPBM. **Hawai'i:** Napau Crater, 2,900 ft [884 m], Jul 1956, D.E. Hardy.

Material Examined. Hardy (1965) reported this species from a number of localities on the Big Island of Hawaii. Additional material, present in the BPBM, UHM, and CUIC collections has been examined. **Hawai'i:** Crater Road, Kilauea, Hawaii, 3,300 ft [1,005 m], Jun 1918, W.M. Giffard; Upper Ola'a Forest, 4,000 ft [1219 m], Aug 1952, D.E. Hardy, W.C. Mitchell; Upper Ola'a Forest, 4,000 ft [1,219 m], Jul

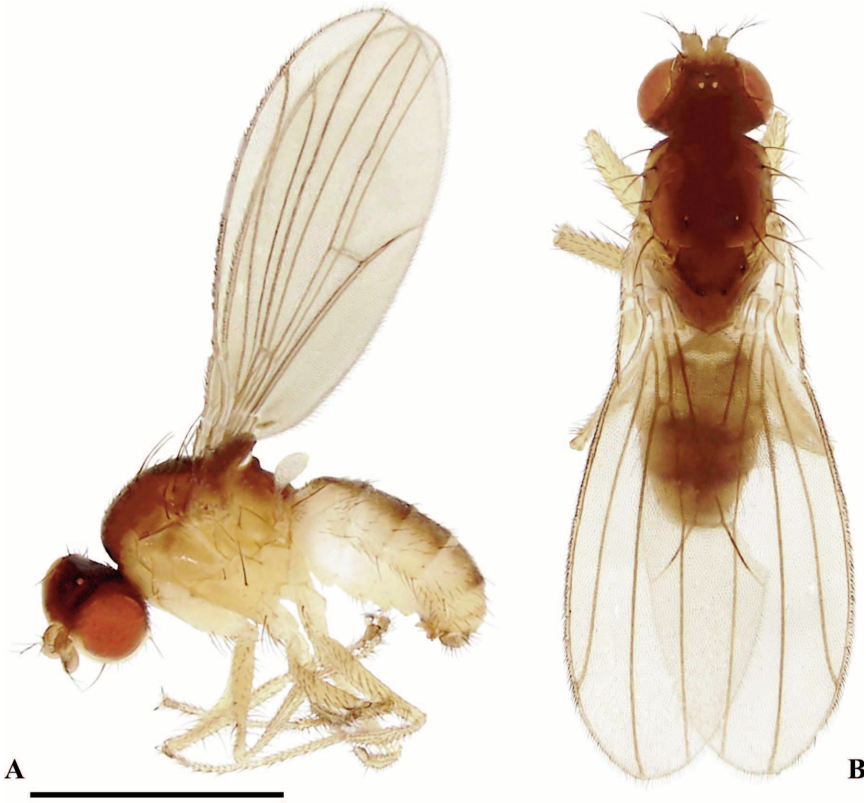

Fig. 2: Habitus of *Scaptomyza neocyrtandrae* Burgunder, Rampasso and O'Grady, sp. nov. in left lateral (**A**) and dorsal (**B**) views. Scale bar = 1 mm. Photo: A.S. Rampasso.

1953, D.E. Hardy, W.C. Mitchell; Upper Olaʻa Forest, 4,000 ft [1,219 m], Jul 1956, D.E. Hardy, W.C. Mitchell; Hawaii Volcanoes National Park, Thurston Lava Tube, on leaves of *Cyrtandra*, Aug 1957, John W. Beardsley; Hawaii Volcanoes National Park, Thurston Lava Tube, on leaves of *Cyrtandra*, Apr 1962, H.A. Bess; Hawaii Volcanoes National Park, Thurston Lava Tube, on leaves of *Cyrtandra*, Dec 1962, John W. Beardsley; Stainback Highway, near Kulani Prison Camp, 25 mi [40.5 km] from Hilo, 7—8 Feb 1999, O49.C, 200341, P.M. O'Grady, S.L. Montgomery; Hawaii Volcanoes National Park, Kīpuka Kī, 9 Sep 2000, O99.8, 200177, P.M. O'Grady, D. Foote; Hawaii Volcanoes National Park, Olaʻa Forest, 20 Oct 2000, O112.4, 200342, P.M. O'Grady; Hawaii Volcanoes National Park, Thurston Lava Tube, aspirated from *Cyrtandra*, 7 Jul 2004, O249.1, 201465, P.M. O'Grady, C.D. Specht, M. Gianullo; Hawaii Volcanoes National Park, Mauna Ulu, 11 Aug 2005, 313.I, 201201, P.M. O'Grady, G.M. Bennett; Stainback Highway, Tom's Trail, 3,200 ft [975 m], 1 Oct 2006, L3.6, 202313, R.T. Lapoint, G.M. Bennett, K.N. Magnacca; Stainback Highway, Kīpuka 3,600 ft [1,096 m], on *Cyrtandra platyphylla*, 1 Oct 2006, M06-1088, 202583, K.N. Magnacca; Tree Planting Road 4,100 ft [1,250 m], sweeping vegetation, 3 Oct 2006, M06-1109, 202586, K.N. Magnacca; Hawaii Volcanoes National Park, Olaʻa Forest, Trail 1, 3,800 ft [1158 m], sweeping vegetation, 3 Oct 2006, M06-1115, 202588, K.N. Magnacca; Puʻu Huluhulu Crater 3,400 ft [1036 m], on *Cyrtandra platyphylla*, 4 Oct 2006, M06-1121, 202590, K.N.

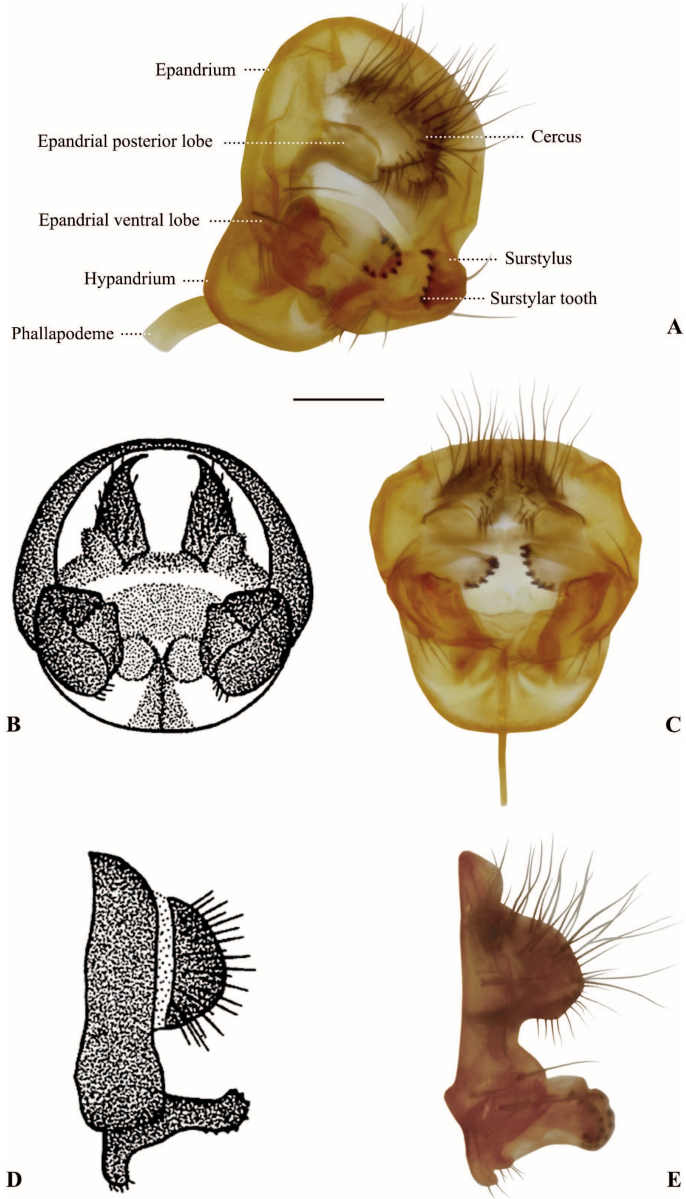

Fig. 3. Male terminalia of *Scaptomyza cyrtandrae* Hardy, 1965 imaged in the present study in oblique posterior (**A**), posterior (**C**), and left lateral (**E**) views, in comparison to the drawings from the original species description in Hardy (1965) in posterior (**B**) and left lateral (**D**) views. Scale bar = 0.1 mm. Photo: A.S. Rampasso.

Magnacca; Hawaii Volcanoes National Park, Mauna Ulu, 9 Jan 2009, O512.2, P.M. O'Grady, G.M. Bennett, D. Crowser, E. Young, S. Bridgers; Hawaii Volcanoes National Park, Thurston Lava Tube, 9 Jan 2009, O513.1, P.M. O'Grady, G.M. Bennett, D. Crowser, E. Young, S. Bridgers.

***Scaptomyza neocyrtandrae* Burgunder, Rampasso & O'Grady, sp. nov.**
(Figs. 2, 5)

lsid:zoobank.org:act:223B8B21-4381-4FA9-9A19-EC60107AD887

Diagnosis. This species fits in the complex characterized by having four rows of acrostichal setae, a yellow body and two pairs of dorsocentral setae. It differs from its closest sibling species, *S. cyrtandrae*, by having distinctly different male terminalia (Fig. 3).
Description. Male. Head. Pedicel and first flagellomere yellow-brown. Arista with two dorsal and no ventral branches in addition to terminal fork. Terminal fork deep, about 1/2–2/3 as long as basal segment of arista. Two small inner branches present at base of arista. Vertex, ocellar triangle and frons brown. Anterior reclinate inserted posterolaterally to proclinate and short, about 1/4–1/5 length of proclinate. Proclinate orbital about 3/4 length of posterior reclinate. Ocellar and vertical setae strong, as least as long as posterior reclinate. Gena yellow to yellow-brown. Vibrissae strong. Subvibrissal setae minute, less than 1/5 length of vibrissae. Face, mouthparts and palps yellow to yellow-brown. Palps with three long subapical setae, longest on ventromedial surface, remaining palpal setae subequal, inserted on dorsolateral and dorsomedial surfaces. Shorter palpal setae 2/3 length of ventromedial seta. **Thorax.** Scutum with central yellow stripe roughly defined by medial pair of acrostichal setae. Remainder of scutum diffusely light brown; light brown coloration interrupted at transverse suture, on anterior margin of postpronotum, and along margin with pleurae. Scutellum is uniform light brown. Two pairs of dorsocentral setae present. Acrostichal setae in 4 regular rows when counted between anterior dorsocentral setae. Basal scutellar setae parallel; apical scutellar setae cruciate. Pleura light yellow. One postpronotal seta present. Anterior katepisternal seta approximately 3/4 length of posterior katepisternal seta. **Legs.** Pale yellow to white. **Wings.** Hyaline without distinct pattern. **Abdomen.** Light yellow, tinged with light brown on dorsal margin. **Male terminalia.** Epandrium microtrichose, with an anterodorsal phragma and neither posterior nor ventral lobes. Cercus rounded in lateral view, connected to epandrium by membranous tissue, setose in the dorsal and in the posteroventral regions. Surstylus strongly developed, with three posterior projections. The dorsal projection is digitate and bears a single surstylar tooth at the apex; the medial is broadened, whereas the ventral projection is apically narrowed in lateral view. Hypandrium shorter than epandrium. Phallus expanded and somewhat rectangular shaped in lateral view, with a narrowed projection on the posterodorsal region. Phallapodeme is about the same length as the phallus, laterally flattened and the anterior portion is expanded.

Female fits with the male in all characters except coloration. Frons light brown on anterior margin. Fronto-orbital plates, vertex, gena, and posterior margin of frons dark brown. Median yellow stripe and yellow areas on postpronotum, pleural margin and transverse suture reduced; remainder of scutum dark brown. Pleura with distinct yellow-brown tinges. Abdomen dark brown dorsally, with diffuse yellow white coloration on lateral margin.
Measurements. N=1♀, TL=0.53 mm; WL=1.66 mm; TL/WL=0.32; CI=2.43; 4V=1.73; 5X=1.60; 4C=0.93; M=0.53. N=1♂, TL=0.56; WL=1.44; TL/WL=0.39; CI=2.25; 4V=1.50; 5X=2.0; 4C=1.0; M=0.50.
Distribution. Hawaiian Islands: Maui.

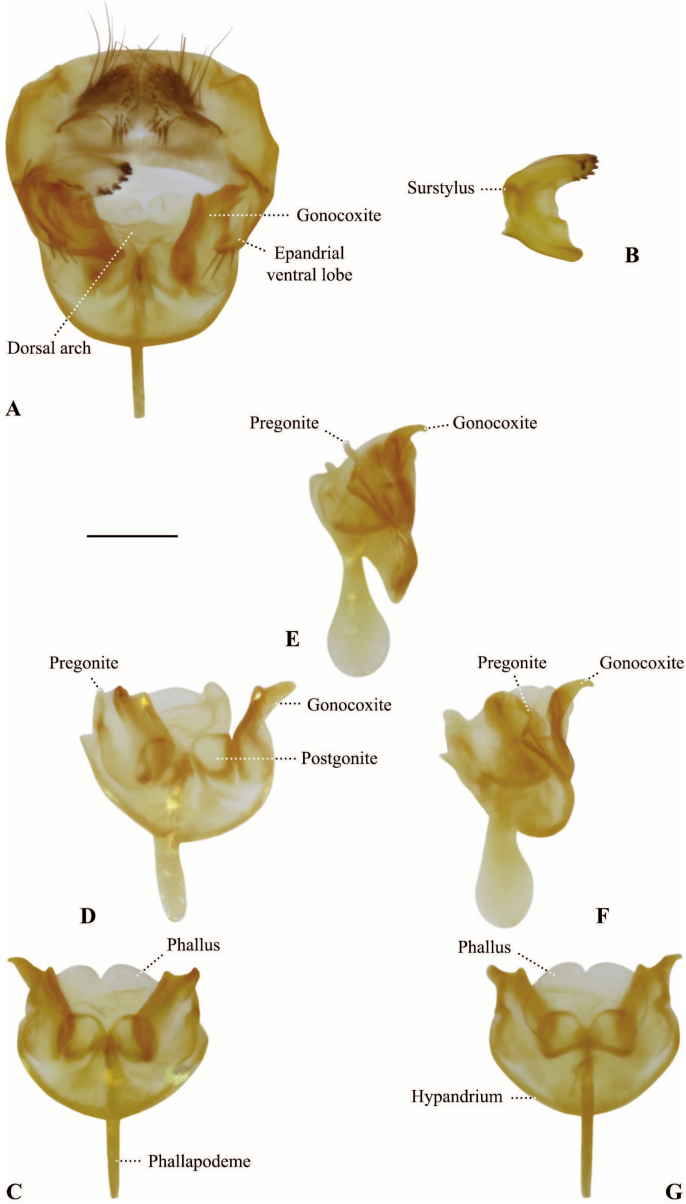

Fig. 4. Male terminalia of *Scaptomyza cyrtandrae* Hardy, 1965 in posterior view, with the left surstylus disarticulated (**A**), disarticulated left lateral surstylus in anterior view, and hypandrium and associated sclerites in posterior (**C**), oblique posterior (**D**), left lateral (**E**), oblique anterior (**F**), and anterior (**G**) views. Scale bar = 0.1 mm. Photo: A.S. Rampasso.

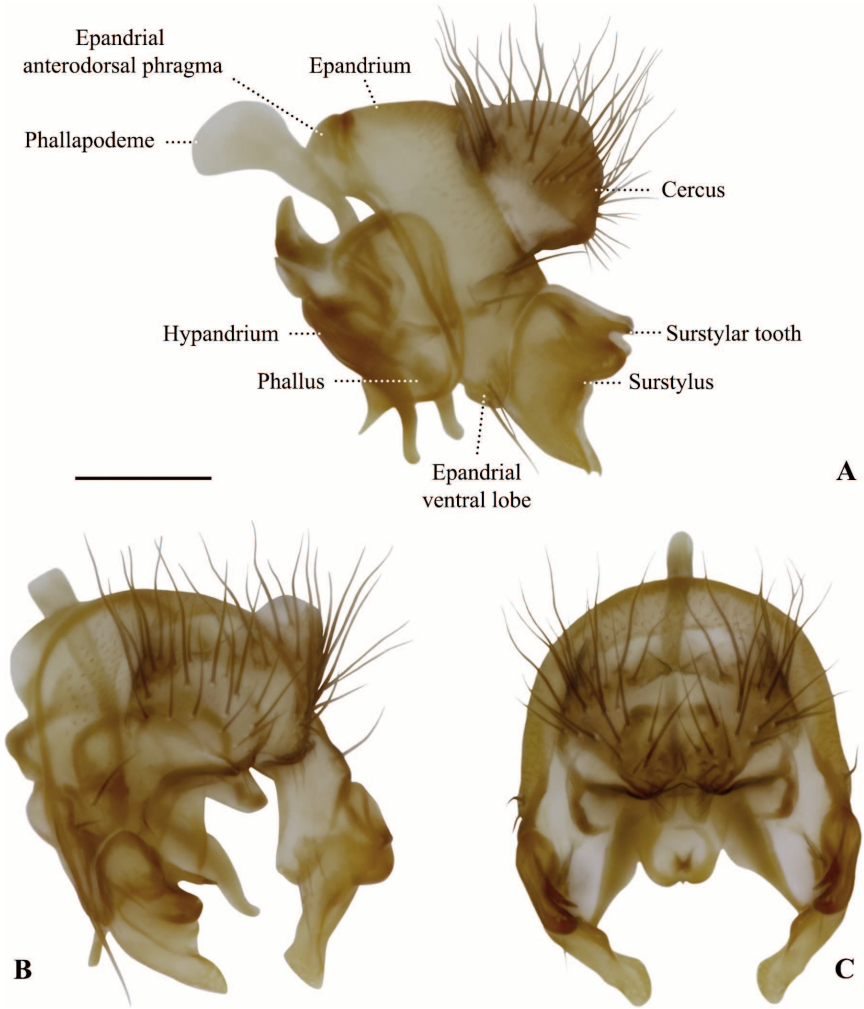

Fig. 5. Male terminalia of *Scaptomyza neocyrtandrae* Burgunder, Rampasso and O'Grady sp. nov. in left lateral (A), oblique posterior (B), and posterior (C) views. Scale bar = 0.1 mm. Photo: A.S. Rampasso.

Ecology. This species is associated with native *Cyrtandra* spp. as both feeding and breeding sites.

Types. The holotype male and allotype female are deposited in BPBM. **Maui:** Waikamoi Forest Reserve, Carson Trail, 3,600 ft [1097 m], 6 Aug 2005, O305.2, 205635, P.M. O'Grady, G.M. Bennett.

Material Examined. The following paratypes are placed in the BPBM, UHM, and CUIC collections.

Maui: 2♂, 3♀, Waikamoi Forest Preserve, Heed Trail, 3,600 ft [1097 m], 4 Aug 2005, O301.G, 201368, P.M. O'Grady, G.M. Bennett, C. Hayashi, J.E. Gatesy; 5♂, 9♀, same collection as holotype and allotype; 2♂, 1♀, Waikamoi Forest Preserve, Heed Trail, 3,600 ft [1,097 m], 31 Jul 2007, O389, 200798, P.M. O'Grady, K. N. Magnacca, R.T. Lapoint, G.M. Bennett; 3♂, 1♀, Waikamoi Forest Reserve, Carson Trail, 3,600 ft [1,097 m], 6 Aug 2007, O406.8, P.M. O'Grady, K.N. Magnacca, R.T. Lapoint, G.M. Bennett; 1♂, Waikamoi Forest Reserve, Haiku Uka Flume Road, 31 Jul 2007, KNM07-0494, K.N. Magnacca.

Etymology. Named for its close relationship with *S. cyrtandrae*.

DISCUSSION

Scaptomyza cyrtandrae and *S. neocyrtandrae* are associated with the plant genus *Cyrtandra,* a member of the African violet family (Gesneriaceae). This is a large, complex plant group endemic to the Hawaiian Islands, leading Wagner *et al.* (1999) to describe it as being characterized by "kaleidoscopic polymorphism" within a single small geographic area and rampant hybridization among species. Species numbers in the group have ranged from around 30 in the early revisions (Clarke 1883; Rock 1917, 1918, 1919a,b) to over 250 in St. John's work (*e.g.,* St. John & Takeuchi 1988). Wagner *et al.* (1999) recognized a total of 53 endemic species in six sections, and proposed 4-6 independent colonization events for the Hawaiian flora. However, recent phylogenetic studies (Clark *et al.* 2009; Cronk *et al.* 2005; Kleinkopf *et al.* 2019) suggest that the Hawaiian taxa are the sister clade to the rest of the Pacific species, and was the result of a single ancestral colonization event. Some recent work on endemic *Cyrtandra* suggest that the island of Hawaii was colonized multiple times and that *C. platyphylla* populations on the islands of Hawaii and Maui are quite distinct (Johnson *et al*. 2019).

The two species treated here are pale yellow and can be found on the hirsute undersides of *Cyrtandra* leaves as adults, larvae and pupae. Hardy (1965) reported the larvae of *S. cyrtandrae* were "rather sluggish and apparently feed on exudate from the hairs on the undersides of the leaves. The larvae appress their mouthparts closely to the hairs of the leaf and remain in one position for long periods of time." Both *S. cyrtandrae* and *S. neocyrtandrae* have been recorded from *C. platyphylla* (section *Crotonocalyces*) from Hawai'i and Maui, respectively. Additional research will be necessary to determine whether other *Scaptomyza* species are present, either within the section *Crotonocalyces*, or across the genus as a whole.

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