

Notes on alien and native bees (Hymenoptera: Apoidea) from the Hawaiian Islands¹

KARL N. MAGNACCA^{2,3}

Hawai'i Division of Forestry and Wildlife, c/o University of Hawai'i–Hilo, Dept. of Biology, 200
W. Kawili St., Hilo, Hawaii 96720, USA; email: knm956@gmail.com

JASON GIBBS

Cornell University, Department of Entomology, 3119 Comstock Hall, Ithaca, New York, 14853,
USA; email: jason.gibbs@cornell.edu

SAM DROEGE

U.S. Geological Survey, Patuxent Wildlife Research Center, 11510 American Holly Drive, Laurel,
Maryland 20708-4017, USA; email: sdroege@usgs.gov)

Four introduced bees are recorded from the Hawaiian Islands for the first time, along with notes on previously recorded species, including rediscovery of the endemic *Hylaeus anomalous* (Perkins, 1899). Both of the new *Lasioglossum* species are relatively recent arrivals, but their precise date of introduction is not known because the alien *Lasioglossum* are often ignored by collectors and are poorly represented in collections. It had been assumed that all were *L. impavidum* (Sandhouse, 1924), which has been present in the islands since at least 1957 (Beardsley 1958, Beardsley 1959). A recent survey of O'ahu lowland disturbed sites by SD found three distinct species – *L. impavidum*, *L. imbrex* Gibbs, 2010, and *L. microlepidotes* (Ellis, 1914) – prompting a review of earlier specimens. Unless otherwise noted, specimens listed below were collected by KNM; specimens are deposited at the Bishop Museum (BPBM) and University of Hawai'i–Mānoa Insect Museum (UHIM).

Colletidae

Hylaeus (Hylaeus) leptcephalus (Morawitz, 1871)

Possible rediscovery

This introduced species had not been recorded for several decades and was presumed extirpated. More-recent specimens were found in the Bishop Museum, indicating that it may still be present. However, it has still not been documented in the past 18 years. It may be persisting at low numbers in urban areas without spreading into forested or native sites.

Material examined. O'AHU: Honolulu, Aug 31 1994, taken on *Meserschmitia argentea* [sic; *Heliotropium foertherianum*], D. Hopper, 1♂ 2♀ (BPBM).

Hylaeus (Indialaeus) strenuus (Cameron, 1897)

New host records, range extension

This species was previously recorded only from *Scaevola taccada* at a few coastal sites between Honolulu and Koko Crater (Magnacca *et al.* 2011). It has now been found at similar sites around the island visiting both *Scaevola* and *Heliotropium foertherianum* (= *Tournefortia argentea*), though it remains somewhat scattered and localized relative to the available habitat. However, it has also been found in association with *Erythrina* spp., including both the native *wiliwili* (*E. sandwicensis*) and cultivated introduced species, and

1. Contribution No. 2013-011 to the Hawaii Biological Survey.

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

3. Present address: OANRP, Department of the Army, Environmental Division, Directorate of Public Works, Schofield Barracks, Hawai'i 96857-5013, USA.

was collected at all four localities where flowering *Erythrina* were found. This is extremely unusual, since *Erythrina* exhibits a strong bird pollination syndrome, with predominantly reddish coloration, large flowers, and large quantities of dilute nectar (Bruneau 1997). Females of *H. strenuus* were observed collecting both nectar and pollen. Several individuals, including males, were seen resting on branches and extruding a droplet of nectar from their mouths, a common method of concentrating nectar by bees. No other bees were seen visiting *Erythrina* in Hawai'i, although honeybees and carpenter bees have occasionally been recorded visiting them (Toledo & Hernández 1979), nor have the endemic *Hylaeus* been observed performing this behavior.

The presence of *H. strenuus* at relatively isolated sites with *Erythrina*, and their absence from neighboring areas, suggests that it may be a favored food plant. If so, the peculiar broad, flat, but thin mandibles of both sexes characteristic of the subgenus *Indialaeus* (Dathe 2011) may be an adaptation for concentrating the nectar of bird-pollinated flowers, and suggests where to look for these rare species in their native range. While this niche is not occupied by any native bees, some of the new coastal locations are sympatric with or in close proximity to the few remaining populations of the candidate endangered endemic *Hylaeus* (*Nesoprosopis anthracinus*).

We also record it for the first time from submontane areas in association with the dominant native tree, *Metrosideros polymorpha* ('ōhi'a lehua). Although currently found at only two relatively close sites in similar habitat, below the elevation where native *Hylaeus* are found, it suggests that *H. strenuus* may eventually become widespread in a variety of habitats and potentially a serious competitor with native bees.

Material examined. O'AHU: BPBM: Kaloko inlet, Makapu'u, at *Heliotropium foertherianum*, 21.2930°N 157.6597°W, 19 Feb 2012, 2♀. Mokulē'ia beach, at *Heliotropium foertherianum*, 21.5818°N 158.2052°W, 20 May 2012, 1♂ 1♀. Kea'au Valley, 100–160 m, at *Erythrina sandwicensis*, 21.502°N 158.219°W, 28 Aug 2012, 6♂ 4♀. Lā'ie beach, at *Heliotropium foertherianum*, 21.6294°N 157.9206°W, 29 Oct 2012, 1♂. UHIM: UH–Mānoa campus, at *Erythrina crista-galli*, 21.2987°N 157.8162°W, 31 Aug 2012, 2♀. Keālia Trail, at *Erythrina sandwicensis*, 31 Aug 2012; 100 m, 21.5737°N 158.2093°W, 1♀; 200 m, 21.5728°N 158.2102°W, 1♀. Koko Crater Botanical Garden, 100 m, 21.285°N 157.681°W, 2 Sep 2012; 1♀ at *Erythrina sandwicensis*, 2♂ at *Myoporum sandwicense*. Mālaekahana, at *Heliotropium foertherianum*, 29 Oct 2012; 2♀, 21.6575°N 157.928°W; 1♂, 21.66°N 157.9275°W. Halapepenui Trail, 400 m, at *Metrosideros polymorpha*, 21.4152°N 157.9093°W, 19 Jan 2013, 1♀. Tripler Ridge, 280 m, at *Metrosideros polymorpha*, 21.3684°N 157.8779°W, 20 Jan 2013, 1♀.

Hylaeus (*Nesoprosopis*) *anomalous* (Perkins, 1899) **Rediscovery**

This enigmatic O'ahu endemic species was relatively common in early collections from the Ko'olau range, but had not been seen since 1930. Recently, two specimens from the 1970's were found in the UHIM collection, and soon afterward it was collected for the first time in the Wai'anae range. Unlike most Hawaiian *Hylaeus*, most of the collecting records are late in the year (October–February). It may be associated with *Acacia koa*, which has not been in flower for most of the past year.

Material examined. O'AHU: Tantalus, 17 Oct 1977, P. Kbshi [Kobayashi?] 1♂ (UHIM). 'Aiea, 2 Dec 1978, in flight, C. Fujii, 1♀ (UHIM). Kamaileunu Ridge, 800 m, at *Acacia koa*, 21.5023°N 158.1637°W, 22 Jan 2013, 1♂ 1♀ (UHIM).

Hylaeus (*Prosopistemon*) sp. **Interception**

A single female belonging to this Australasian subgenus was taken in a bowl trap. Without the male, it cannot be identified further, and even so this polyphyletic group has many

undescribed species (Houston 1981). Since the location was near the cargo piers and further searching, both in the near vicinity and elsewhere, has failed to turn up additional specimens, it is uncertain if it is established. It is quite distinct from both the native and introduced species in Hawai'i, with broad, pale yellow paraocular marks up to the antennal sockets, and the clypeus reddish brown with a narrow longitudinal pale yellow stripe (probably variable in size). The pronotal collar and lobes, tegula, and humeral plate of the forewing are conspicuously marked with yellow, as are the front tibia, basal quarter of the middle tibia, basal half of the hind tibia, and all basitarsi. The setae of the head and mesonotum are very short and inconspicuous. The metasoma is distinctly setose, particularly on tergites 3–6, but not obviously punctate. The basal area of the propodeum (metapostnotum) is smooth and rather short, just over half as long as the metanotum; the propodeal declivity is nearly vertical and slightly concave.

Material examined. O'AHU: Kalihi Kai, in bowl trap, 21.3213°N 157.886°W, 1–2 Mar 2012, S. Droege, 1♀ (BPBM).

Halictidae

Lasioglossum (Dialictus) imbrex Gibbs, 2010 New state record

As a member of the *tegulare* species group, this species is readily distinguished by the large, elongate, opaque, punctate tegula; in the other two species, the tegula is smaller, brown, semi-transparent, and mostly smooth. Like *L. impavidum*, the metasoma is brownish and non-metallic. The *tegulare/parvum* species group is widespread in the New World ranging from southern Canada to Chile (Engel 2001, Gibbs 2010). The COI DNA “barcode” sequence is a 100% match for *L. imbrex*, and females match the description of that species (males were not described). Related species including *L. tegulare*, *L. tegulariforme*, and *L. putealanum* are separable by both morphology and DNA. Like the other *Lasioglossum* species on the Hawaiian Islands, it is native to the western United States and Canada (Gibbs 2010). Despite being found in much smaller numbers than *L. microlepidoides* on O'ahu, it likely arrived first since it is also found on Moloka'i and Hawai'i, and specimens date from at least 2005. On the latter island it occurs primarily at the coast, closely interdigitated with *L. impavidum* but actually sympatric at only one site, Kuamo'o. There has been only one montane collection there so far, from Pōhakuoloa Training Area. On O'ahu, it is widespread and sympatric with *L. microlepidoides* at coastal disturbed sites but occurs in much lower numbers, and is also broadly sympatric with *L. impavidum* in both the Wai'anae and Ko'olau mountains.

Material examined. O'AHU: Mililani, family farm, 22 Sep 2007, S. Fang, 1♀ (UHM teaching collection). BPBM: Manuwai ridge, 550 m, at *Dodonaea viscosa*, 21.5205°N 158.1253°W, 4 Apr 2012, 2♀. Ka'ena Point, 20 m, at *Chamaesyce celastroides kaenana*, 21.5744°N 158.2742°W, 29 Aug 2012, 1♀. Wailupe W. Ridge, 200 m, at *Passiflora*, 21.3061°N 157.7536°W, 7 Oct 2012, 1♀. Lā'ie beach, at *Scaevola taccada*, 21.6294°N 157.9206°W, 29 Oct 2012, 2♂. UHIM: Pāhole, Wai'anae crest, 670 m, at *Bidens torta*, 21.5393°N 158.1924°W, 28 Jul 2012, 2♀. Lā'ie beach, at *Scaevola taccada*, 21.6294°N 157.9206°W, 29 Oct 2012, 2♂. Mau'umae Trail, 440 m, at *Santalum freycinetianum*, 21.3106°N 157.7748°W, 5 Nov 2012, 1♀. MOLOKA'I: Kalaupapa, Ho'olehua beach, at *Heliotropium foertherianum*, 21.209°N 156.965°W, 29 Aug 2005, 1♀ (BPBM). Kalaupapa, Kaupikiawa, at *Heliotropium foertherianum*, 21.204°N 156.959°W, 31 Aug 2005, 1♂ (BPBM). HAWAII: BPBM: Kohanaiki, at *Heliotropium foertherianum*, 19.6916°N 156.0389°W, 3 Feb 2012, 1♀. Kona Village Resort, at *Heliotropium foertherianum*, 19.8327°N 155.9863°W, 30 Dec 2011, 1♂. Keawaiki, at *Heliotropium foertherianum*, 19.8853°N 155.9102°W, 5 Jan 2012, 1♀. Keāhole Point, at *Heliotropium foertherianum*, 19.7186°N 156.0524°W, 6 Jan 2012, 2♂. Pōhakuoloa Training Area, Area 22, 1600 m, at *Bidens menziesii*, 19.7453°N 155.6509°W, 1♀. UHIM: Hilton Waikoloa, at

Heliotropium foertherianum, 19.9271°N 155.8877°W, 29 Dec 2011, 2♂. Keauhou, Kuamo'o, at *Heliotropium foertherianum*, 19.5515°N 155.9637°W, 13 Jan 2012, 1♂. Wawaloli beach, at *Heliotropium foertherianum*, 19.7174°N 156.0507°W, 6 Jan 2012, 1♀. Old Kona Airport, at *Heliotropium foertherianum*, 19.6431°N 156.0092°W, 13 Jan 2012, 1♀.

Lasioglossum (Dialictus) microlepoides **New state record**
(Ellis, 1914)

This is likely the most recent arrival of the *Lasioglossum* species, since it is only found on O'ahu at present and the earliest specimen appears to be from 2010. However, it has quickly become the most abundant bee in lowland disturbed and urban environments, where it has been taken in large numbers in pan trap samples. In native and semi-native habitats it is relatively uncommon. Given these habits, it can be expected to spread to the other islands soon. In its native range in the western United States and northern Mexico, *L. microlepoides* is one of the most commonly collected *Lasioglossum* (JG pers. obs.). It can be readily distinguished from the other two *Lasioglossum* in Hawai'i by the distinctly metallic blue-green gaster (rarely appearing black); the gaster of *L. impavidum* is shining black in the male and tomentose brown in the female. The tegula is similar to *L. impavidum*, small, transparent brown, and more or less smooth. Both sexes also lack tomentose setae on the face and frons, which is abundant on the faces of other male *Lasioglossum* on the islands.

Material examined. O'AHU: Makiki, 13 Nov 2010, M. Blackwell, 1♂ (UHM teaching collection). BPBM: Sand Island beach, at *Scaevola taccada*, 21.3012°N 157.8787°W, 25 Jun 2012, 3♀. Ka'ena Point, at *Myoporum sandwicense*, 21.5747°N 158.2749°W, 29 Jun 2012, 3♂. Kalaeloa, at *Myoporum stellatum*, 21.2985°N 158.0837°W, 5 Sep 2012, 1♂ 2♀. UHIM: Makapu'u beach, at *Heliotropium foertherianum*, 21.315°N 157.6618°W, 30 Jun 2012, 1♀. Ka'ena Point, 20 m, at *Chamaesyce celastroides kaenana*, 21.5744°N 158.2742°W, 29 Aug 2012, 1♀. Ke'alia Trail, 100 m, at *Myoporum sandwicense*, 21.574°N 158.2104°W, 31 Aug 2012, 1♂. Koko Crater Botanical Garden, 100 m, at *Myoporum sandwicense*, 21.2852°N 157.6819°W, 2 Sep 2012, 1♂. Kalaeloa, at *Myoporum stellatum*, 21.2985°N 158.0837°W, 5 Sep 2012, 1♂ 1♀.

KEY TO *LASIOGLOSSUM* SPECIES OF THE HAWAIIAN ISLANDS

1. Tegula enlarged, distinctly punctate; tarsi of males black *L. imbrex*
- . Tegula small, indistinctly punctate; tarsi of males yellow to pale brown 2
2. Metasoma brown; female: anterior surface of T1 with adpressed setose fan, T3–4 with abundant tomentose setae, mesonotum shining; male: head slightly elongate, distinctly protruding below the eyes, with abundant tomentose pubescence on the face and frons obscuring the cuticle *L. impavidum*
- . Metasoma metallic blue-green (rarely appearing nearly black); female: anterior surface of T1 with erect setae only, T3–4 with little or no tomentose setae, mesonotum dull; male: head nearly circular, not protruding below the eyes, with sparser, erect facial pubescence not obscuring the cuticle *L. microlepoides*

Megachilidae

Megachile (Pseudomegachile) lanata **New state record**
(Fabricius 1775)

Originally native to India, this species is now widespread in the Caribbean and south Florida as well as Africa. This is the first record for Oceania, a significant range expan-

sion. The Hawaiian population could potentially have come from either east or west. It is superficially similar to the long-established *M. umbripennis*, but is considerably larger, with the orange-brown hairs extending from the mesosoma onto the second metasomal segment instead of only the first, and with very conspicuous white apical bands on metasomal tergites 3–5, rather than thin or interrupted bands on tergites 2–4 or none.

Material examined. O'AHU: Waipi'o Peninsula, open weedy area behind soccer fields, in bowl trap, 21.3734°N 158.0008°W, 2–3 Mar 2012, S. Droege, 1♂. Waipahu, roadside bowl trap, 21.3800°N 158.0047°W, 2–3 Mar 2012, S. Droege, 1♂.

Acknowledgments

Thanks to Dr. Holger Dathe of the Senckenberg Deutsches Entomologisches Institut for identifying the *Hylaeus* (*Prosopistemon*) specimen, and to Dr. Luc Leblanc and Shepherd Myers for access to the UHIM and BPBM collections respectively.

Literature Cited

- Beardsley, J.W.** 1958. Notes and exhibitions: *Halictus* (*Chloralictus*) sp. *Proceedings of the Hawaiian Entomological Society* **16**(3): 337.
- . 1959. Notes and exhibitions: *Halictus* (*Chloralictus*) sp. *Proceedings of the Hawaiian Entomological Society* **17**(1): 2.
- Bruneau, A.** 1997. Evolution and homology of bird pollination syndromes in *Erythrina* (Leguminosae). *American Journal of Botany* **84**(1): 54–71.
- Dathe, H.H.** 2011. Studies on the systematics and taxonomy of the genus *Hylaeus* F. (7) *Indialaeus* subgen. nov., a new subgenus of *Hylaeus* from the Oriental Region (Hymenoptera: Anthophila, Colletidae). *Beiträge zur Entomologie* **61**(2): 243–258.
- Engel, M.S.** 2001. A new *Lasioglossum* from the Juan Fernandez Islands (Hymenoptera: Halictidae). *Revista Chilena de Entomología* **27**: 5–10.
- Gibbs, J.** 2010. Revision of the metallic species of *Lasioglossum* (*Dialictus*) in Canada (Hymenoptera, Halictidae, Halictini). *Zootaxa* **2591**: 1–382.
- Houston, T.F.** 1981. A revision of the Australian hylaeine bees (Hymenoptera: Colletidae). II. *Australian Journal of Zoology, Supplemental Series* **80**: 1–128.
- Magnacca, K.N., Nagamine, W.T., & Dathe, H.H.** 2011. *Hylaeus strenuus* (Hymenoptera: Colletidae), a new alien bee on O'ahu. *Bishop Museum Occasional Papers* **109**: 23–24.
- Toledo, V.M. & Hernández, H.M.** 1979. *Erythrina oliviae*: a new case of oriole pollination in Mexico. *Annals of the Missouri Botanical Garden* **66**(3): 503–511.