

**INSECTS OF HAWAII**

# INSECTS OF HAWAII

*A Manual of the Insects of the Hawaiian Islands, including an Enumeration of the Species and Notes on Their Origin, Distribution, Hosts, Parasites, etc.*

VOLUME 17

HAWAIIAN *HYLAEUS* (*NESOPROSOPIS*) BEES

(HYMENOPTERA: APOIDEA)

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## ABSTRACT

The native colletid bee species of the genus *Hylaeus* (*Nesoprosopis*) are revised for the Hawaiian Islands based on adult morphology. Sixty species are recognized. NEW SPECIES described by Magnacca and Daly are *H. akoko* and *H. gliddenae* from Hawaii; *H. kukui* and *H. takumiae* from Maui; *H. kuakea*, *H. mana*, *H. mimicus*, and *H. nalo* from Oahu; and *H. kokeensis* and *H. solaris* from Kauai. NEW SYNONYMIES are proposed (senior synonyms first): *H. assimulans* (Perkins) = *H. assimulans oahuensis* (Perkins); *H. coniceps* (Blackburn) = *H. comes* (Perkins); *H. connectens* (Perkins) = *H. koae* (Perkins), *H. insulae* Meade-Waldo (earlier replacement name for *Nesoprosopis vicina* Perkins), and *Prosopis trigona* Warncke (unwarranted replacement name for *Nesoprosopis vicina* Perkins); *H. flavipes* (F. Smith) = *H. blackburni* (F. Smith); *H. fuscipennis* (F. Smith) = *H. fuscipennis obscuripes* (Perkins), *H. fuscipennis swezeyi* (Cockerell), and *H. caeruleipennis* (Perkins); *H. haleakalae* (Perkins) = *H. neglectus* (Perkins); *H. nivicola* (Meade-Waldo) = *Prosopis farinosa* Warncke (unwarranted replacement name for *Nesoprosopis nivalis* Perkins); *H. paradoxicus* (Perkins) = *H. erythrodemas* (Perkins); *H. rugulosus* (Perkins) = *Prosopis ovatula* Warncke (unwarranted replacement name for *Nesoprosopis rugulosa* Perkins); *H. specularis* (Perkins) = *H. homoeochromus* (Perkins); *H. unicus* (Perkins) = *H. binominatus* Meade-Waldo (earlier replacement name for *Nesoprosopis laticeps* Perkins) and *Prosopis avara* Warncke (unwarranted replacement name for *Nesoprosopis laticeps* Perkins). NEW COMBINATIONS are *Hylaeus muranus* (Warncke) and *Hylaeus niloticus* (Warncke). The following names are considered nomina dubia: “*Nesoprosopis rubrocaudatus* Blackburn and Cameron” and “*Nesoprosopis attripennis* Perkins.”

The history of collections of the bees, their taxonomy, attributes for dispersal, and their biology and ecology are discussed. Taxa of adventive bees are characterized as an aid to identification of native species. Terminology used in the treatment is explained, followed by keys to the identification of species based on adult males and females. Treatment of each species includes annotated synonymy and other references; diagnosis of identifying features and general distribution; description of male and female; localities where first collected and recent collections; flower records; remarks on taxonomic problems and other information; and line illustrations. Recent collection records are provided in an appendix.

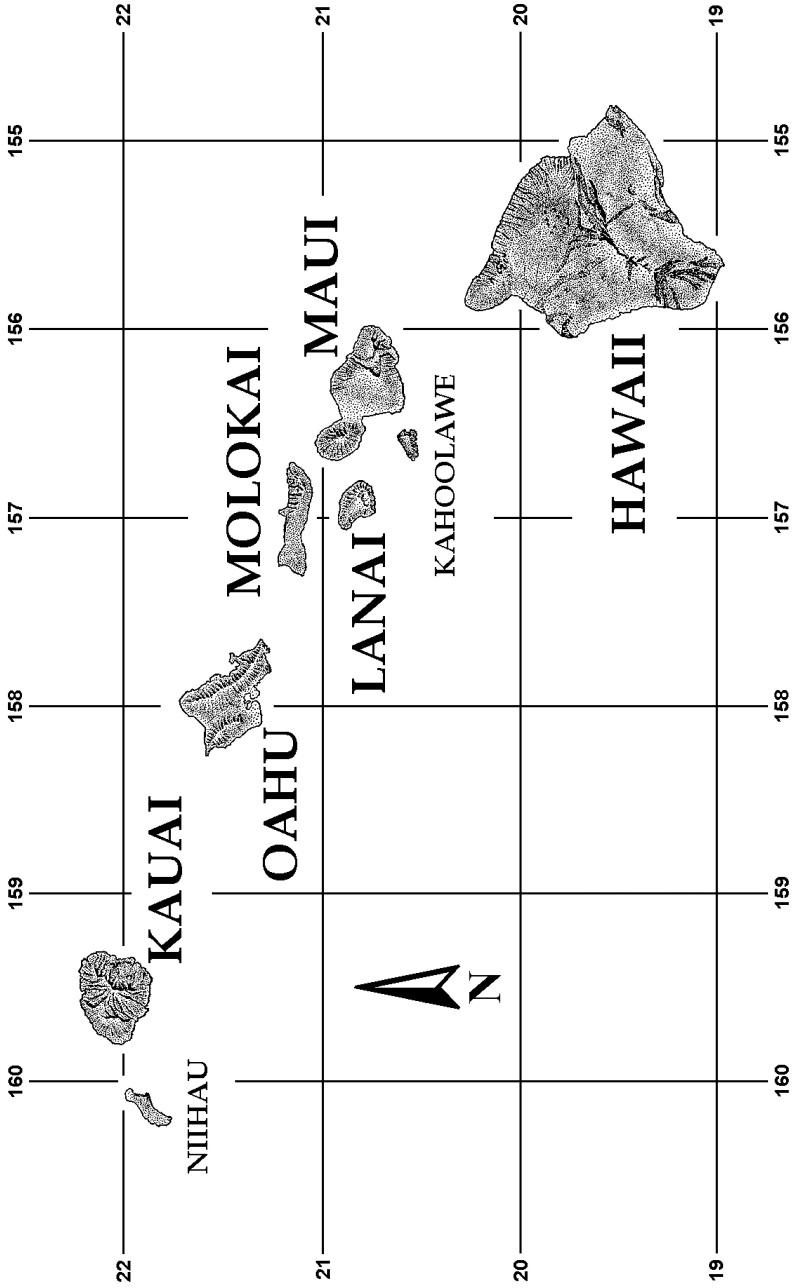


Fig. 1. Map of major islands in the Hawaiian Island chain (after Zimmerman 1948:10).

## INTRODUCTION

The native bees of the Hawaiian Islands are believed to have evolved from a single lineage of the genus *Hylaeus* (family Colletidae) and are assigned to the subgenus *Nesoprosopis*. The genus *Hylaeus* is worldwide in distribution with 46 subgenera and an estimated 579 species (Michener 2000:62). The subgenus *Nesoprosopis* is among the largest of the subgenera with 60 of its species found in the Hawaiian Islands and eight species in the Oriental region. The latter includes one species also known from the Palearctic region (Hirashima 1977, Ikudome 1989). About three-quarters of the species described from the Hawaiian Islands by Perkins (1899, 1910, 1911) have been collected recently (Table 1). Some are still as rare or as abundant as he observed, yet others, formerly abundant, have not been collected recently. After more than a century, we have little knowledge of their mating and nesting habits, food preferences, natural enemies, or roles as pollinators of endemic Hawaiian plants. The purpose of this volume is to encourage future research by facilitating identification and by documenting the survival of these interesting bees.

### The Hawaiian Islands

Hawaii consists of an east-west chain of volcanic islands, each formed as the Pacific plate moves over a stationary hot spot in the Earth's crust. There are currently six high islands (Fig. 1), along with two smaller ones and a chain of subsided low islands and coral atolls stretching WNW to Midway. Beyond that, the Emperor Seamounts extend nearly to Kamchatka. Eruptive activity is almost entirely restricted to the youngest island, Hawaii, which is about 500,000 years old and still growing. The oldest high island at present, Kauai, is about 5.1 million years old, but it is believed that there has been at least one high island (i.e., one capable of inducing rainfall and thus supporting a diverse biota) continuously since Kure, about 29 million years (Carson and Clague 1995). As islands subside and erode, volcanoes that were previously joined by land bridges are separated by channels. The islands of Maui, Molokai, Lanai, and Kahoolawe (referred to collectively as Maui Nui) were once joined in this way; earlier, Molokai was probably joined to Oahu. However, Kauai was never linked to Oahu, nor Hawaii to Maui, although the channels were much narrower in the past.

Because of Hawaii's great isolation – the Islands are over 3500 km from any continental landmass, the most isolated high islands in the world – the flora and fauna are derived from relatively few introductions. As a result, they are depauperate at the family level, but contain a number of extraordinary radiations, such as the celebrated *Drosophila* flies, and the *Clermontia* and *Cyanea* lobelioids. *Hylaeus* may be included among these; there are more species of the genus in the Hawaiian Islands than the 48 species in America north of Mexico.

### History of Collections and Taxonomy

The first specimens of bees from the Hawaiian Islands were collected during the voyage of the British ship *Blossom* commanded by Captain Frederick William Beechey. The specimens

Table 1. Checklist and distribution of *Hylaeus* (*Nesoprosopis*) in the Hawaiian Islands. Key: ○ = original published Perkins' records (1899, 1910, 1911) and Perkins' collection, but not recently recollected; ● = Perkins' records and recently collected (after 1989); ◐ = new records for islands (from recent collections unless noted); ◑ = new species. The last row provides the sum of all species and the sum of endemic species recorded from each island.

Species	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
<i>H. akoko</i>						◑
<i>H. andrenoides</i>	●					
<i>H. angustulus</i>				○	◐	
<i>H. anomalus</i>		○				
<i>H. anthracinus</i> <sup>1</sup>		●	●	○	● <sup>2</sup>	●
<i>H. assimulans</i>		○		●	● <sup>2</sup>	
<i>H. chlorostictus</i>	●					
<i>H. coniceps</i>					●	●
<i>H. connectens</i>	◐	●	◐ <sup>3</sup>	●	●	●
<i>H. crabronoides</i>						●
<i>H. difficilis</i>			●	●	●	●
<i>H. dimidiatus</i>						●
<i>H. dumetorum</i>						●
<i>H. facilis</i>		○	○	○	●	
<i>H. filicum</i>						●
<i>H. finitimus</i>	○					
<i>H. flavifrons</i> <sup>4</sup>	●					
<i>H. flavipes</i>				● <sup>5</sup>	○	●
<i>H. fuscipennis</i>		○	●	●	●	
<i>H. gliddena</i>						◑ <sup>6</sup>
<i>H. haleakalae</i>			●		●	
<i>H. hilaris</i>			● <sup>7</sup>	○	○	
<i>H. hirsutulus</i>	●					
<i>H. hostilis</i>	●					
<i>H. hula</i>						●
<i>H. inquilina</i>						●
<i>H. kauaiensis</i>	●					
<i>H. kokeensis</i>	◑					
<i>H. kona</i>						●
<i>H. kuakea</i>		◑				
<i>H. kukui</i>					◑	
<i>H. laetus</i>	●	●	○	● <sup>8</sup>	●	● <sup>8</sup>
<i>H. longiceps</i>		● <sup>8</sup>	●	●	●	
<i>H. mana</i>		◑				
<i>H. mauiensis</i>					○	

Species	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
<i>H. melanothrix</i>					○	
<i>H. mimicus</i>		◻				
<i>H. muranus</i>						●
<i>H. mutatus</i>	●					
<i>H. nalo</i>		◻ <sup>9</sup>				
<i>H. niloticus</i>			○	○		○
<i>H. nivicola</i>					●	
<i>H. ombrias</i>						●
<i>H. paradoxicus</i>						●
<i>H. pele</i>						●
<i>H. perkinsianus</i> <sup>10</sup>						
<i>H. perspicuus</i>	○					
<i>H. psammobius</i>					◐	○
<i>H. pubescens</i>						●
<i>H. rugulosus</i>						●
<i>H. satelles</i>			○	○	○	
<i>H. setosifrons</i>						●
<i>H. simplex</i>						○
<i>H. solaris</i>	◻					
<i>H. specularis</i>	◐	◐			◐ <sup>11</sup>	●
<i>H. sphecodoides</i>						●
<i>H. takumiae</i>					◻	
<i>H. unicus</i>		●	●	●	◐	
<i>H. volatilis</i>		○	○	○	●	
<i>H. volcanicus</i>					●	●
<i>H. species A</i> <sup>12</sup>			◻			
Total/endemic	14/11	15/5	14/1	15/0	24/5	28/18

<sup>1</sup> *Hylaeus anthracinus* reported from Niihau by Beardsley and Tuthill (1959) is probably *H. flavifrons*; *H. anthracinus* reported from Kauai by Hopper and Daly (1995) is *H. solaris*.

<sup>2</sup> Recently collected from Kahoolawe (CUIC).

<sup>3</sup> 1913 is most recent collection (BPBM).

<sup>4</sup> Niihau and Lehua; *Hylaeus anthracinus* reported from Niihau by Beardsley and Tuthill (1959) is probably *H. flavifrons*.

<sup>5</sup> Recorded as *H. blackburni* by Fullaway (1918).

<sup>6</sup> 1934 is most recent record (BPBM).

<sup>7</sup> Recorded by Fullaway (1918).

<sup>8</sup> Unpublished records from Perkins' collection.

<sup>9</sup> 1914 is most recent record (BPBM).

<sup>10</sup> Nihoa; Timberlake (1926), Beardsley (1966).

<sup>11</sup> Female only, identification tentative; 1972 is most recent record (BPBM).

<sup>12</sup> Identifiable as a distinct species, but insufficient material for formal description.



were labeled “Sandwich I. Beechey” and were presumably taken on Oahu by the ship’s naturalist, George Tradescant Lay. Captain Beechey visited Oahu twice: 19 to 31 May 1826, and 25 January to 4 March 1827. On the first visit, Lay arrived ill with dysentery and was left to recuperate until the ship returned in 1827. Beechey wrote about Lay in his narrative (1832:345), “During our absence, he had unfortunately been prevented pursuing his researches among the islands by a severe illness.” One might assume that Lay was confined to Oahu, but evidence exists that Lay or some other member of the expedition did visit other Hawaiian Islands, including Hawaii (see remarks under species treatment of *H. flavipes*). Lay did recover and complete the voyage. As a result of the voyage, about half a dozen species of Hymenoptera from the Hawaiian Islands were deposited in the British Museum (today The Natural History Museum, London). In 1853, the bees were described as *Prosopis anthracina* and *P. flavipes* by Frederick Smith. The genus *Prosopis* Fabricius was later found to be a junior synonym of *Hylaeus* Fabricius, the generic name now in use (Dathe 1979). *Prosopis* continues to be a valid subgenus of *Hylaeus* (Michener 2000:183).

The next collections of bees were made by Reverend Thomas Blackburn, who resided on Oahu from 1876 to 1882 and made brief trips to other islands (Anonymous 1913). From these specimens, also deposited in the British Museum, Smith (1879a, 1879b) described five new species. Shortly afterward, Blackburn, W. F. Kirby, and P. Cameron reviewed the Hawaiian Hymenoptera and described a total of five additional new species of bees, bringing the number to twelve (Blackburn and Kirby 1880; Blackburn 1886, 1887).

In 1891, the “Sandwich Islands Committee,” a joint committee of the British Association for the Advancement of Science and the Royal Society, selected Robert Cyril Layton Perkins to investigate the land fauna of the Hawaiian Islands. They could not have made a better choice (Scott 1956, Manning 1986, Liebherr and Polhemus 1997, Liebherr and Zimmerman 2000). Perkins arrived in Honolulu early in 1892 and worked for the committee until 1902. He continued to live in Hawaii and work as an entomologist until retiring to England in 1912. Perkins initially assigned numbers to his collections that were replaced with printed locality and identification labels (Perkins 1897). The collections from 1892 to 1906 were divided later and deposited in the Bernice P. Bishop Museum, Honolulu; The Natural History Museum, London; and the Hope Entomological Collection, Oxford University Museum of Natural History, Oxford. Locality records for Perkins’ collections from 1892 to 1906 are given below under the species treatments.

His monumental *Fauna Hawaiiensis* includes descriptions of 43 new species-group names of native bees and a key to the males of 47 species (1899, 1910). Perkins proposed the genus *Nesoprosopis* just for the native bees of Hawaii (1899:75), including the 12 species previously described by other authors in *Prosopis*. In 1911, he added five more new species. *Prosopis facilis* Smith was designated the type species of *Nesoprosopis* by Popov (1939:168). *Nesoprosopis* is currently considered a subgenus of *Hylaeus* (Michener 2000:201).

By an odd coincidence, Perkins on his return to England discovered a bee new to England. The bee was *H. pectoralis* Forster (= *H. kriechnbaumeri* Forster), which he recognized was closely similar to his Hawaiian *Nesoprosopis* (Perkins 1913:lxviii). This species is now

known from Europe to Japan (Hirashima 1977:25), but is considered by some authors to belong to the subgenus *Prosopis* rather than *Nesoprosopis* (Dathe 1980).

A large collection of Hawaiian aculeates was made by W. M. Giffard mainly during 1901-1915 in which 49 of the 58 described species of native *Hylaeus* were represented. This provided D. T. Fullaway the opportunity to augment some descriptions and to point out possible synonyms (1918). The latter apparently have been ignored, probably because of his tentative and unconventional statements of synonymy. In our judgment, he was correct in most instances. Giffard's collections also confirmed the distributions of the species recorded by Perkins. Most locality records for Giffard's collections (Bishop Museum) and those of P. H. Timberlake (Los Angeles County Museum) are not provided in this study.

Meade-Waldo (1923) placed *Nesoprosopis* as a subgenus of *Hylaeus* and proposed new names for three homonyms that resulted from his action. The last new taxa to be proposed were a new species from Nihoa Island by Timberlake (1926) and a new variety by Cockerell (1926). These brought the total to 62 species-group names for the endemic bees of Hawaii. The bees are known from the six main islands plus Kahoolawe, Niihau, and Nihoa. The smaller islands are undercollected and may have more species than are recorded from them. Daly (1994) designated lectotypes for 44 species-group names and identified holotypes for 13. Type specimens for five species-group names could not be found.

Recent records reported here date from after 1989 and are based primarily on collections from all the major islands by K. Magnacca (KM), and from Hawaii and Maui by P. Gambino (PG) and R. Takumi (RT). Due to the large number of localities, only representative sites are listed under the species description; the full list of complete records and abbreviations is in the Appendix. Museum collections cited are the British Museum of Natural History (BMNH), Cornell University Insect Collection (CUIC), Bernice Pauahi Bishop Museum (BPBM), Essig Museum of Entomology (UCB), Hawaii State Department of Agriculture collection (DOA), and Oxford University Museum of Natural History (OUMNH).

Some species, such as *H. anthracinus*, *H. facilis*, and *H. simplex*, were common in Perkins' time but are now rarely collected. Out of the 60 species recognized here, the following 11 species (18%) have not been recently collected (i.e., since 1989); however, without further searching the species are not presumed to be extinct: *H. perkinsianus* (Timberlake) from Nihoa; *H. finitimus* (Perkins) and *H. perspicuus* (Perkins) from Kauai; *H. anomalus* (Perkins) and *H. nalo* new species from Oahu; *H. mauiensis* (Perkins) and *H. melanothrix* (Perkins) from Maui; *H. gliddena* new species and *H. simplex* (Perkins) from Hawaii; *H. satelles* (Blackburn) from Lanai, Maui, and Molokai; and *H. niloticus* (Warncke) from Molokai, Lanai, and Hawaii.

## Dispersal and Evolution of *Hylaeus* Species in Hawaii

The nearest relatives of the native Hawaiian species are eight *Nesoprosopis* species in Japan (Hirashima 1977, Ikudome 1989); additional undescribed species may exist in China (Hirashima 1977). However, the geographic origin and characteristics of the initial colonist in Hawaii are unknown. Like some other kinds of bees, *Hylaeus* have features that should favor dispersal. Female bees are inseminated as young adults and use the stored sperm for

the rest of their lives. The typical longevity of female *Hylaeus* is unknown. Although males are usually considered short-lived compared to females, an adult male was kept alive for 74 days (Daly and Coville 1982:76). *Hylaeus* are capable of flight in search of food, mates, and nest sites. Carried by wind to a distant location, an inseminated young female could make a nest and produce offspring of both sexes. The nest itself can be transported as well. Some *Hylaeus* females make their nests in wood or stems that could be carried by water with floating vegetation. With these attributes, it is not surprising that native *Hylaeus*, as well as adventive species of bees with similar biology, have spread among the Hawaiian Islands. However, after reviewing the record, Michener (2000:99) concluded that most bees are not particularly successful in crossing major barriers. According to Michener, the rare colonization of remote oceanic islands is probably limited to small bees such as *Hylaeus*.

Dispersal between islands appears to be much easier. Unlike many speciose Hawaiian groups such as *Drosophila*, about one-third of the known *Hylaeus* species (21/61, including *H. species A*) are not island endemics, including three (*H. connectens*, *H. laetus*, and *H. specularis*) found on all major islands (see Table 1). Only five species each are endemic to Oahu and Maui, one to Molokai, and none to Lanai (six of these have been extremely rarely collected, and they may yet be found on other islands). This indicates that they are probably able to cross narrow barriers such as those between the islands of Maui Nui with relative ease. In contrast, most of the species of Kauai (11/14) and Hawaii (18/28) are endemics. Given that *Hylaeus* are relatively strong fliers and tend to spend time at or above the forest canopy rather than below, it is not surprising that they should be carried between islands with relative frequency.

Evolutionary relationships among the Hawaiian species are difficult to assess, as many morphological characters occur in several groups in different combinations. However, five basic groups can be relatively easily distinguished. A coastal group, consisting of *H. assimulans*, *H. finitimus*, *H. flavipes*, *H. longiceps*, *H. niloticus*, and *H. ombrias*, is characterized by weakly dilated scapes, T6/7 hair golden and appressed or prostrate, face marks extending above the antennal sockets, and short body hair. Another group, consisting of *H. chlorostictus*, *H. difficilis*, *H. facilis*, *H. hirsutululus*, *H. laetus*, *H. nivicola*, *H. perkinsianus*, *H. simplex*, and *H. volcanicus*, is characterized by an undilated median process of the eighth sternum, T6/7 hair prostrate, and a single central mark on the face, and is primarily found in dry habitats. Five species, *H. hilaris*, *H. hostilis*, *H. inquilina*, *H. sphecodoides*, and *H. volatilis*, are united by parasitic habits and other characters (see below). A large group composed of *H. angustulus*, *H. coniceps*, *H. crabronoides*, *H. dumetorum*, *H. filicum*, *H. kona*, *H. mana*, *H. mauiensis*, *H. melanothrix*, *H. mimicus*, *H. pele*, *H. specularis*, and *H. species A*, is distinguished by three separate face marks, a groove on the underside of the scape, T6/7 hair erect and dark, and a generally smooth propodeum, and occurs mainly in wet forest. Finally, *H. akoko*, *H. andrenoides*, *H. anomalus*, *H. fuscipennis*, *H. gliddena*, *H. kukui*, *H. muranus*, *H. paradoxicus*, *H. perspicuus*, *H. pubescens*, *H. satelles*, and *H. setosifrons* form a group of generally large species with punctured terga. The remaining species possess unusual characters or combinations of those that occur in the above groups, and do not fit clearly into one of them.

## Biology of *Hylaeus*

Female bees of the subfamily Hylaeinae, to which *Hylaeus* belongs, and the Australian Euryglossinae are unique among bees in carrying all the pollen for their nest provisions in their internal crop rather than on external scopal hairs (Michener 2000:15). The lack of the usual scopa gives *Hylaeus* a hairless, wasplike appearance. However, both sexes of *Hylaeus* (*Nesoprotopis*) have plumose hairs on the body that are longest on the sides of the thorax.

Females of most species of *Hylaeus* are believed to construct and provision their own nests (i.e., they exhibit solitary nesting behavior even when nesting in aggregations). Nesting sites are usually in preexisting cavities such as hollow stems, holes in wood, under bark, in crevices or under rocks, and burrows in soil (see plant hosts as nesting substrates in index). Although wood-nesters usually use preexisting beetle and other burrows, sawdust under nest holes of *H. pubescens* suggests they are capable of enlarging or modifying them. Females can be attracted to trap nests with predrilled holes (Daly and Coville 1982). The female constructs a series of chambers or cells with a cellophane-like membrane produced by the salivary and Dufour's glands (Espelie et al. 1992). Each cell is provided with pollen, nectar, and an egg. The flowers of native and, occasionally, exotic plants are visited by both sexes (see flower visitation records in index), but the female alone provisions the nest. Based on observations elsewhere in the world, females of *Hylaeus* apparently groom the pollen from just their head and forelegs and transfer it to their mouth. The rest of the pollen is discarded (Michener 2000:84). The behavior of both sexes at flowers will be important to examine in studying the roles of native bees as pollinators of Hawaiian plants. Adventive wasps, ants, and bees such as the honey bee are probably significant competitors for nectar.

## Native and Adventive Enemies

Enemies of *Hylaeus* are poorly known. Five species of native *Hylaeus* are believed to be cleptoparasites of other species of *Hylaeus* (i.e., the parasitic females enter nests of host bees and lay their own eggs). Female Hawaiian *Hylaeus* normally have abundant curved hairs on the fore tarsi that function in gathering pollen. Perkins (1899:106, 1913:lxix) discovered five species in which the females have short, straight hairs on the fore tarsi and considered them closely allied: *H. hilaris*, *H. hostilis*, *H. inquilina*, *H. sphecodoides*, and *H. volatilis*. He associated the straight tarsal hairs with cleptoparasitic habits. If true, these five species would be unique among all colletids in their cleptoparasitic behavior. At present, the evidence is circumstantial; no rearing has been done to confirm parasitism. During his field studies, KM observed behavior characteristic of cleptoparasites. The bees were collected almost exclusively while they flew over the ground rather than at flowers. They briefly entered nest burrows of other bees and one bee was seen apparently being repelled by the resident. The details of how the cleptoparasitic larva ultimately kills the host egg or larva and consumes the provisions are unknown. Individuals of the same cleptoparasitic species were observed to vary in body size according to the sizes of their presumed host's provisions: larger host species provide more food and produce larger cleptoparasites, smaller

host species provide less food (Michener 2000:30). For further discussion of cleptoparasites see remarks under *H. hiliaris* and *H. volatilis* in the treatment of species.

The brood also may be attacked by encyrtid and eupelmid parasitoid wasps (see arthropod enemies and associates in index). The most important predators are probably adventive ants, primarily the big-headed ants, *Pheidole megacephala* (Fabricius) and *P. fervens* F. Smith; the long-legged ant, *Anoplolepis longipes* (Jerdon); and the Argentine ant, *Linepithema humile* (Mayr) (formerly known as *Iridomyrmex humilis*). These ants are considered a serious threat to the endemic arthropod fauna and have extirpated many native insects from the lowland areas (Reimer 1993, and references therein). Although Perkins (1913:cii) considered adult Hymenoptera to be least susceptible to attack by *Pheidole*, the brood is undoubtedly more vulnerable to these aggressive predators. *Pheidole* will even take over honey bee apiaries, killing or driving out the bees and feeding on the brood (Illingworth 1916).

Both *Pheidole* and *Anoplolepis* are primarily restricted to low elevations, while the Argentine ant inhabits montane areas. The absence of *Hylaeus* from some apparently well-suited coastal habitats may be due to the presence of ants. Argentine ants have been documented to severely impact *Hylaeus* on Haleakala, with no nesting activity found in areas inhabited by ants (Cole et al. 1992). Although the ants are now in relatively small pockets on Haleakala, if they were to spread over the entire area they could potentially wipe out the densest population of *Hylaeus* in the Islands. Because they form very large colonies and are attracted to sugar, Argentine ants may also be major competitors for nectar.

Adult *Hylaeus pubescens* may be hosts to the adventive, phoretic mite *Afrocypholaelaps africana* (Evans) (Daly and Coville 1982). Some bees are heavily infested, but the nature of injury, if any, is unknown. Other species, including *H. fuscipennis*, *H. paradoxicus*, and the much smaller *H. specularis*, may also host mites. Gambino (1992) made an analysis of the diet of the adventive yellowjacket wasp *Vespula pensylvanica* (Saussure), a generalist predator, at natural areas in Hawaii Volcanoes and Haleakala National Parks. He found adult *Hylaeus* (*Nesoprosopis*) sp. among prey items collected by wasp foragers. Although the bees were common at four study sites, they made up only a small fraction of prey items (2 of the 170 arthropods identified to genus) and were retrieved at only one of the sites (Haleakala), suggesting that *Hylaeus* are not preferred prey.

Perkins (1912) noted the remarkable black body color and dark wings of many Hawaiian aculeates. He considered such wasps and bees conspicuous among day-flying insects. Groups of wasps and bees were identified that were similar in color patterns and occurred together, yet were from unrelated lineages. The stomachs of many birds were examined and only a single wasp was found. These color groups of species could readily be explained as examples of Mullerian mimicry. However, Perkins questioned this interpretation, pointing out that other bees and wasps, not members of the predominant color group, flew in the same places and were equally ignored by birds. Small *Nesoprosopis* with clear wings, for example, have been extraordinarily successful. He argued that perhaps it was the general appearance of an aculeate that was avoided. This left him unable to offer a satisfactory explanation for

the color groups unless they were Mullerian mimics that evolved in response to predators now extinct.

### Ecology of *Hylaeus* in Hawaii

Perkins (1912:688) considered *Nesoprosopis* to be “almost the most ubiquitous of any Hawaiian insects,” and indeed they range through virtually all native habitats. They can be found from the coastal strand to above 3000 m in the mountains, and from the driest to the wettest locales. A few species are strictly confined to a single habitat type, but most occur across a range of habitats, though many favor one or another. Nesting habit is a stronger constraint on habitat suitability than food plant, because ground-nesting species such as *H. nivicola* require relatively dry areas, while wood-nesters such as *H. pubescens* can inhabit wetter areas. Either species may sometimes be found foraging in both habitats, because in some areas the wet/dry transition is quite abrupt. Furthermore, some common host plants, notably *Metrosideros*, occur in both.

Hawaii is noted for its highly diverse plant lineages consisting of rare or localized species, but plant visitation by *Hylaeus* is largely limited to community-dominant plants. These consist of a small number of species, most of which are members of genera with one or a few representatives in Hawaii: *Metrosideros polymorpha* (ohia, Myrtaceae), *Cheirodendron trigynum* (olapa, Araliaceae), *Claoxylon sandwicense* (poola, Euphorbiaceae), *Acacia koa*, *Sesbania tomentosa*, and *Sophora chrysophylla* (koa, ohai, and mamane, Fabaceae), *Myoporum sandwicense* (naio, Myoporaceae), *Dodonaea viscosa* (aalii, Sapindaceae), *Styphelia tameiameia* (pukiawe, Epacridaceae), *Scaevola* spp. (naupaka, Goodeniaceae), *Jacquemontia ovalifolia* (pau o Hiiaka, Convolvulaceae), and *Sida fallax* (ilima, Malvaceae). The one major exception is *Chamaesyce* (akoko, Euphorbiaceae); *Hylaeus* visit members of this genus ranging from the prostrate creeper *C. celastroides* to the arborescent *C. olowaluana*. Some other, more diversified groups are among secondary hosts, including *Dubautia/Argyroxiphium/Wilkesia* and *Bidens* (Asteraceae). Several of these, notably *Dodonaea* and *Chamaesyce*, have very small, nearly petalless flowers that do not conform to the stereotypical “bee flower.” *Dodonaea* is dioecious, with the male flowers consisting of little more than anthers. While *Hylaeus* use it as a major pollen source, they have never been observed visiting the female flowers and may not pollinate them. Furthermore, because the flowers have little if any nectar, they are rarely visited by male bees. Very few introduced plants are visited, even those with close relatives in Hawaii such as *Acacia*, with the result that *Hylaeus* are almost completely absent from exotic-dominated habitats. The only exception to this rule is the frequent use of *Tournefortia argentea* (Boraginaceae) by coastal species, which may be due to a decline in abundance of the related native *Heliotropium*.

Flower records are listed under each species. Because only one species of most plant genera is used, only the genus name of the species listed above is given. Exotic plants are indicated with an asterisk (\*). Bees were frequently caught flying around plants (especially males searching for foraging females); thus, these records do not necessarily mean that the bee was actually visiting the flower. However, pollen from all plants listed above has been identified in crop contents.



## Native and Adventive Bees of the Hawaiian Islands

The bees of the Hawaiian Islands include the native bees of the genus *Hylaeus* (*Nesoprosopis*) as well as over a dozen other species that arrived after the Islands were colonized by humans. Here we briefly review the bee fauna as an aid to identifying the native species. The nonnative bees are being treated in detail by R. R. Snelling (in preparation). All bees can be distinguished from wasps by the possession of at least some branched or plumose hair on the body. The hair of wasps is simple or unbranched. The plumose hair of *Hylaeus* is most conspicuous on the sides of the thorax. *Hylaeus* are recognizable as small to medium-sized bees (forewing lengths about 3-8 mm), slender bodied, usually black, relatively hairless, with short bilobed tongues, and two submarginal cells in the forewing. Males of most species and females of some species have yellow marks on the face, hence the common name "yellow-faced bees." All native species of Hawaiian *Hylaeus* belong to the subgenus *Nesoprosopis*, characterized by the shapes of the last three metasomal sterna of males: S6, the last visible sternum, has an apical, median emargination; S7, concealed in the genital chamber, has reduced hemisternites with sparse or no hairs; and S8, also concealed (the tip may be exposed), has a long, narrow, median process that may be curved and rodlike or dorsoventrally dilated and apically bifid with a fringe of hair.

Two adventive *Hylaeus* are present in Hawaii. They belong to subgenera other than *Nesoprosopis*, and both can be distinguished from the native species by the appearance of the propodeum in dorsal view: the dorsal anterior area is deeply sculptured (areolate) and separated sharply from the vertical, flat, posterior area by an irregular, transverse carina. The anterior area of the propodeum of the native *Nesoprosopis* is usually weakly to moderately rugose, rarely areolate, and not separated from the rounded, posterior area by a carina. Males also can be separated by the appearance of S6, which is not emarginate in the adventive species. Of the two adventive species, *H. (Hylaeus) bisinuatus* Forster probably came to North America from Europe and then to Hawaii (Beardsley 1959:23, Snelling 1975:8). This species is small (forewing length about 3.5 mm) with a black body, yellow markings, and coarse, dense punctation. It has been collected only twice on Oahu, in 1959 and 1994, and may not be established. Recently, a second species was discovered, the Australian *H. (Gnathoprosopis) albonitens* (Cockerell). This distinctive small bee (forewing length about 3 mm) has a dark metallic blue body and extensive ivory markings on the face and legs (Houston 1981:52, Hopper and Daly 1995:35). It has been collected from all islands except Maui and Lanai. It is usually found on ohia in dry lowlands where native bees are absent, but occasionally overlaps with them at middle elevations.

The only other bees in the Hawaiian Islands with two submarginal cells in the forewing are the Megachilidae, which are distinguished by their long tongues and thick, hairy bodies. More likely to be mistaken for *Hylaeus* are two species of small carpenter bees, *Ceratina arizonensis* and *C. (Neoceratina) sp. nr. C. dentipes* Friese. The former has been collected on Oahu and the Kona coast of Hawaii; the latter is widespread on all the major islands and appears to be parthenogenic, as only females have been collected. These are small bees (forewing length about 2.5-3 mm) that are black, relatively hairless, with facial and other

marks, but have long tongues and three submarginal cells in the forewing. The facial mark of the female, a single small median ivory spot, is unlike that of any native *Hylaeus*.

*Hylaeus* is a member of the large family Colletidae. Colletids are among the families of bees that are informally called “short-tongued” because the tongue is relatively short in proportion to body size. In these bees the blunt mouthparts and short-segmented palpi are visible projecting forward beneath the head or retracted and partly concealed behind the mandibles. Adventive short-tongued bees in Hawaii are the two *Hylaeus* species mentioned above, and a species of sweat bee (Halictidae), *Lasioglossum (Dialictus) impavidum* (Sandhouse), which are small (forewing length about 3 mm), dull metallic green bees with three submarginal cells in the forewing.

The other major group of bees, the “long-tongued” bees, have slender, elongate mouthparts thrust forward or folded back under the head. These include species in Hawaii such as the honey bee, *Apis mellifera* L. (Apidae) with pollen baskets on the hind legs; six species of *Megachile* and one *Lithurgus* (Megachilidae), with two submarginal cells in the forewing; small carpenter bees, genus *Ceratina* (Apidae), including the two black species already mentioned, and a bright metallic green species, *Ceratina (Pithitis) smaragdula* (Fabricius); and a large carpenter bee, *Xylocopa (Neoxylocopa) sonorina* F. Smith (Apidae), a very large bee with black females and yellow-brown males. All species appear to be adventive with the exception of *Apis*, which was purposely introduced in 1857 (Crane 1990:27).

Most adventive bees are found primarily in nonnative habitats and are not major competitors with the native *Hylaeus*. However, *Ceratina* are often found in large numbers in native coastal habitats and may have an impact on *Hylaeus* populations. The impact may not be entirely detrimental. *Ceratina* excavate nest burrows in dead twigs, a behavior that might create nest sites for *Hylaeus*. *Ceratina smaragdula*, discovered in 1995 on Oahu, has built up a substantial population at Kaena Point, the only recent collection site for coastal *Hylaeus* on the island. It now makes up a large proportion of visits to *Sesbania tomentosa*, an endangered shrub, and is expanding its range (D. Hopper, pers. comm.). In other areas, *Apis* is a major competitor for nectar and pollen resources and is often very abundant in native habitats.



## DESCRIPTIVE TERMINOLOGY

Terms used in this present text and frequently encountered in previous literature on *Hylaeus* (*Nesoprosopis*) are given here. The main references on terminology used here are Eady (1968), Harris (1979), and Nichols (1989). Illustrations of the anatomy of bees can be found in Michener (2000). More detail on the anatomy of *Hylaeus* in particular may be found in Houston (1975). The descriptions of species are intended to include the variation observed in the available specimens. These are often few in number and may be old and discolored. Many species that were rarely collected in Perkins' time remain rare in collections. Specimens collected during the last four years have been used whenever possible. Variation beyond that described here will no doubt be found as more specimens are examined. This is to be expected, especially for the extent of markings, wing color, punctuation, and propodeal sculpture.

As indications of dimensions of various features of the male head, distances were measured to the nearest 0.02 mm at  $\times 64$  (Fig. 2C-E) and expressed here as millimeters  $\times 100$ . The measurements are based on one specimen, usually a type or specimen from Perkins' collecting efforts. Some quantification, however imperfect, is also required to express size and proportions. Ratios are based on too few specimens to provide useful statistics, so the range of values is given and must be considered approximate. The dilation of the scape, length of the malar space, and width of the supraclypeal area are expressed as ratios (further explanation below). As an indication of body size, the length of the forewing, from the base of the costal vein (Fig. 3) to the apex, was measured to the nearest 0.1 mm. Body sizes of bees are divided into three categories: small (forewing length less than about 4 mm), medium-sized (about 4-6 mm), and large (more than about 6 mm).

**Colors.** We have used simple terms for body colors, such as yellow, red, brown, or black. Where an area or structure is of an intermediate color it may be described as red-brown or yellow-brown. Colors of the wing membranes are clear, smoky, brown, or dark brown. The membrane may also be iridescent. The cuticle of specimens collected by Perkins often has faded to a pale brown or brownish black in comparison with fresh specimens that are black.

**Cuticle.** The general sclerotized cuticle of the exoskeleton, used here in reference to the general melanized color (yellow-brown, brown, or black) of a leg or other body part in contrast to yellow or ivory marks.

**Face.** The face is divided by several fine lines called sulci (Snodgrass 1956:18; sutures of Michener 2000:40). The face also has topographic areas that are approximately delimited by imaginary lines rather than by sulci (Fig. 2A-B). The **vertex** is the area on the top of the head surrounding the ocelli. The **frons** is the area immediately below the vertex and above the clypeus, including the area between and above the antennal sockets. The frons is continuous with the upper paraocular areas at each side and delimited by imaginary lines running between the lateral ocelli and antennal sockets. That part of the frons below and between the antennal sockets is usually called the **supraclypeal area**. It is defined at each side by the **subantennal sulci** and apically by the **frontoclypeal sulcus** (median part of the epistomal sulcus). The shape of the supraclypeal area is expressed as a ratio of the width

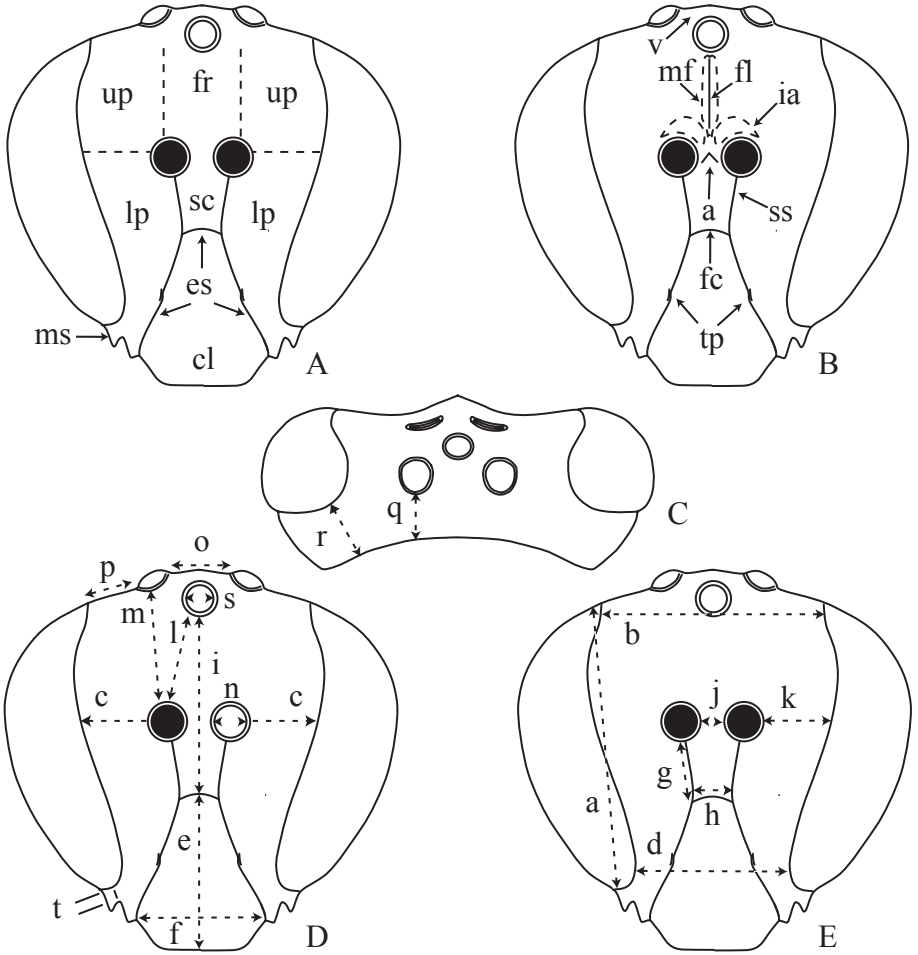


Fig. 2. Face of a male *Hylaeus* bee. A-B. Features of the face: a, acme (median prominence between antennal sockets); cl, clypeus; es, epistomal sulcus; fc, frontoclypeal sulcus (median part of epistomal sulcus); fl, frontal line; fr, frons; ia, impunctate areas above antennal sockets; lp, lower paraocular area; mf, middle of frons; ms, malar space; sc, supraclypeal area; ss, subantennal space; tp, tentorial pits; up, upper paraocular area; v, vertex. C-E. Measurements: Malar space, t; eye, a: b: c: d; clypeus, e × f; frons, g × h: i; interalveolar, j: k: l: m, D (diameter) n; interocellar, o: p: q: r, D (diameter) s.

(frontoclypeal sulcus)/length (subantennal sulcus from outer rim of antennal socket to junction with frontoclypeal suture). A longitudinal groove or **frontal line** is sometimes visible at the midline below the median ocellus. A narrow linear area just at each side of the midline or frontal line is here called the **middle** area and is often distinctively punctured. The prominence between the antennal sockets is defined here as the frons **acme**. The **paraocular area** extends along the sides of the face parallel to the eye. The **lower paraocular area** is at or below the antennal sockets and is separated from the clypeus by the epistomal and subantennal sulci. The **upper paraocular area** is above the antennal sockets and separated from the frons by an imaginary line between the lateral ocellus and antennal socket. In females, a narrow groove, the **facial fovea**, runs along the upper margin of the eye and may terminate dorsad below or above an imaginary, transverse line tangent to the anterior edges of the lateral ocelli. The paraocular area, mainly the lower area, may be visibly depressed relative to the surface of the eye and clypeus.

**Frontal, lateral, and caudal views.** The frontal view of a body part is seen by the observer in front of the specimen. The frontal view of the head is the view from immediately in front of the bee with the plane of the bee's face at right angles to the long axis of the body. The caudal view is the view from immediately behind the bee. The frontal view of the foreleg is the view of the leg as if it were extended laterally at a right angle to the long axis of the body, revealing the anterior surface of the leg. Specifications for viewing the scape are complicated by the various positions that the antennae can assume on specimens. The scape of males is usually somewhat flattened and may be "dilated" or expanded. The frontal view of the antennal scape is defined here as the view of the scape as if the scape is positioned vertically upward and appressed to the surface of the face, revealing the maximum width and length of the scape. In this position, the punctured surface of the scape is visible whereas the impunctate underside next to the face is hidden underneath. Also in this position, the scape has a "median margin or edge" that is often convex (morphologically dorsal or posterior if the axis of the antenna is parallel to the long axis of the body and rotated so the convex margin is up) and a "lateral margin or edge" that is usually nearly straight (morphologically ventral or anterior). The median edge of a moderately dilated scape is broadly rounded (convex) and often with longer hairs, whereas the lateral edge is more or less straight. In species with a strongly dilated scape both edges are convex. The degree of a scape's arch is seen from the side in an edge-on view of the lateral margin.

**Ground.** The ground is the surface of the cuticle excluding punctures (pits) and rugae. Different surfaces that reflect light from the microscope illuminator can be described as: *shiny* or polished, reflecting the maximum amount of light; *lustrous*, a bright, but diffuse reflection of light; *slightly lustrous*, a less intense reflection; and *dull*, the minimum reflection of light. The usual surface texture can be described by the term **coriaceous**, which refers to a microscopic fine network of lines, possibly representing the outlines of epidermal cells. Types of coriaceous ground used here are: *smooth*, showing only the network of fine interconnecting lines, producing a shiny or lustrous surface; *nearly smooth*, with each cell raised in a low, round bump; *granular*, with each "cell" elevated enough to produce a rough, less shiny surface; *minutely wrinkled*, with elevations aligned in short wrinkles to

produce a wavy pattern and slightly lustrous or dull surface; *minute parallel wrinkles*, elevations aligned in longer, more or less parallel wrinkles, also known as a striate surface.

**Malar space.** The malar space is the area between the lower eye margin and the base of the mandible; also known as the “cheek.” Length is measured as the minimum distance between the eye margin and edge of the space next to the base of the mandible. The length of the malar space is compared with the diameter of the median ocellus. The diameter of the median ocellus (**DMO**; Fig. 2D, s) is measured as the transverse distance across the clear area of the ocellus. The clear area of the ocellus and not the maximum diameter of the lens itself was chosen because the exact outside, dark edge of the lens is sometimes difficult to see. The ratio “malar length/diameter of median ocellus (DMO)” is used to specify the length of the malar area: *very short* (0.2 or less of DMO); *short* (0.3 to 0.4); *medium* (0.5 to 0.6 DMO or about half the diameter of the median ocellus); *long* (0.7-1.0 or almost as long as the diameter of the median ocellus); and *extremely long* (greater than 1.0 or longer than the diameter of the median ocellus). The ocelli of females are often smaller than those of the males, resulting in a higher ratio for equal malar lengths.

**Mark.** Marks are limited areas of reddish, yellow, or ivory color surrounded by the general color of the cuticle. Marks may occur on the face, pronotal collar and lobes, tegula, median plate of the forewing (Fig. 3), and legs. Entire segments of the legs may be marked with a single color. An *obscure* mark is one off-color (brownish or reddish yellow) and whose boundaries are diffuse, not sharp. Perkins (1899) used the term *vitta* (pl., *vittae*) for a stripe or band of color. See also “pale area” below.

**Mesosoma, metasoma, T, S.** A bee’s body is divided in three parts like most insects, but what appears to be the “thorax” is the thorax combined with the first abdominal segment or propodeum (see below). This middle subdivision of the body is called the mesosoma. In dorsal view, from front to rear, are the pronotum, scutum, scutellum, metanotum, and propodeum. In lateral view, the mesepisternum is the large sclerite below the wings and between the fore and middle legs. What appears to be the “abdomen” is the second and succeeding abdominal segments and is called the metasoma. The terga and sterna of the

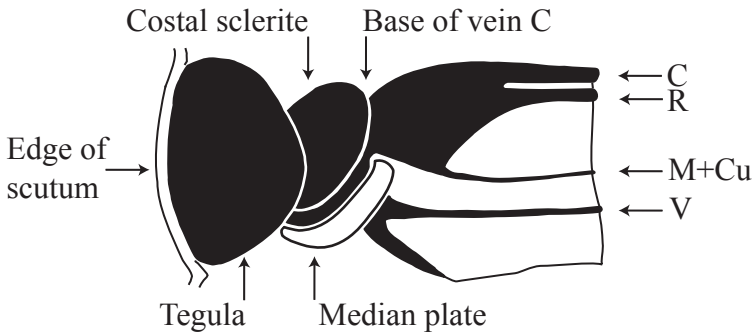


Fig 3. Base of right fore wing showing the median plate, which is yellow in *H. kokeensis* and *H. kona*. The median plate is brown in all other species. Note that length of the forewing is measured from the base of vein C to the apex of the wing.

metasoma are abbreviated and numbered as T1 and S1 for the first metasomal segment and so forth. The disk of the tergum is the central area.

**Pale area.** As in “pale area” of the fore tibia; an area of cuticle of the fore tibia, and sometimes fore femur, seen in frontal view that is weakly melanized, somewhat transparent, and pale in color, but different from spots or stripes of yellow or ivory pigments that are called marks. The pale area is not considered here to be a mark. However, the area may be combined with a yellow spot or stripe along the dorsal margin. The pale area is usually present on males and sometimes on females. **Important:** For brevity in the diagnoses, the pale area is not mentioned, and a bee may be said to be entirely black in color or unmarked even though the bee may have the tibial pale area.

**Pronotal lobes and collar.** The lobes are the rounded, posterolateral part of the pronotum just in front of the wing bases; the collar is the narrow, transverse dorsum of the pronotum just visible behind the head and in front of the scutum. These structures may be marked with yellow or ivory.

**Propodeum.** The propodeum is subdivided topographically into the ventrolateral, punctured, and pubescent “sides” and the impunctate, hairless, dorsal **basal area of the propodeum** (Michener 2000:45). The sides and basal area may be sharply delimited or only obscurely so by an impressed line. In *Hylaeus (Nesoprotopis)* the basal area has a broad, subhorizontal “anterior area” that is variously sculptured. Sculpture “at the front” or “at the base” means sculpture along the very anterior margin of the basal area. The anterior area is continuous with the posterior, subvertical surface of the propodeum along a transverse **brow** that serves as the boundary between the anterior and posterior surfaces. The brow has no discrete landmarks and is merely the rounded transition from subhorizontal to subvertical surfaces. Sculpture “to the brow” means sculpture extended over most of the anterior area, from the front to the rounded transition or brow. The basal area continues beyond the brow, forming a triangle on the posterior surface. A lateral carina arises posterolaterally on the propodeum and diminishes anterolaterally; the carina may be strong and discrete or merely a ridge.

**Pubescence.** Hair is described as *simple* (without branches), *weakly plumose* (some hairs with at least one branch and usually mixed with simple hairs that may be in the majority), and *plumose* (hairs mostly with more than one branch). Plumosity can be difficult to discern when branches or the primary hairs are short. The length of hairs on the scutum can be important in distinguishing similar species. Because the scutal pubescence typically occurs as a dense underlayer with scattered longer hairs, the measurements for it are presented in the form 8-12 (in millimeters  $\times 100$ , as for the dimensions of the head). The first number represents the average height of the lower layer, and the second the maximum height of the longer hairs. Hair length should be measured in lateral view. On the scutum, average hair length often increases from front to back, and the extreme anterior and posterior areas should be ignored. For females, the hairs of the vertex are sometimes useful; these include those on the top of the head just behind the ocellar triangle (hairs within the ocellar triangle may be differentiated and distinctly longer). In a few wide-ranging species, notably *H. flavipes* and *H. difficilis*, specimens from higher elevations have longer hair than those near the coast. Hairs are easily rubbed off, and on specimens where this is the case those

left may be shorter than the length given. In all cases, a few unusually long hairs may be present. The coloration of the hairs, especially those of the apex of the abdomen, can be useful. The color must be used with caution because variation in lighting can make the hairs appear lighter or darker. Description of T6 or T7 hairs refers to those on the dorsal area of the sclerite as seen in lateral view; those along the lateral and apical margins are typically much longer. The hairs may be described as erect (at least a 45° angle to the cuticle), prostrate (more bent down), or appressed (hairs dense, decumbent, and in close contact, though not necessarily pressed down on the cuticle). Hairs that are bent over near the base are not considered erect even if they arise perpendicular from the cuticle. The normal posture of the hairs can be altered by retraction of the abdomen, matting of hairs, or other disturbance, resulting in erect hairs that appear prostrate and vice versa.

**Punctuation, density of pits.** The density of pits is expressed in terms of “pit widths” as estimated by eye. The pits of very dense punctuation are less than 1 pit width apart and may be so close together that the pits are contiguous and distorted or subpolygonal in shape. Less dense punctuation is expressed as “1 pit width apart” or “1-2 pit widths apart” and so forth. The density and distinctness of pits should be measured in frontal view at relatively high magnification; even impunctate areas often have micropits that are visible at low angles.

**Rugae.** Rugae (sing., ruga) are wrinkles on the surface of the cuticle. As used here for the sculpture of the basal area of the propodeum, types of rugosity are *lineately rugose*, rugae more or less straight, parallel, and longitudinal with reference to the body axis; *irregularly lineately rugose*, rugae that are not interconnecting, but somewhat forked or not parallel or not longitudinal (oblique or transverse with reference to the body axis); *reticulately rugose*, interconnecting or netlike; and *clathrately rugose*, latticed, elevated ridges intersecting at right angles. The last two types may form shiny depressions between the rugae and be described as areolate.

**Scape.** The basal segment of the antenna is the scape. In frontal view (see definition above), the scape of the male may be nearly cylindrical or variously **dilated** (expanded) and, in lateral view, more or less **arched** (broadly bent). Degrees of dilation of the scape are measured by the ratio of width/length. Width is measured as the maximum at a right angle to the length; length is measured from the apex of the scape to the base just above the basal constriction. Categories of dilation of the scape are *not or weakly dilated* (W/L ratio 0.4 or less), *slightly dilated* (0.5-0.6), *moderately dilated* (0.7-0.8), *strongly dilated* (0.9-1.0), and *extremely dilated* (1.0 or more) (Fig. 4A-J). The arch of the scape, seen in an edge-on view of the lateral margin, is estimated by eye and described as *not arched*, *slightly arched*, *moderately arched*, or *strongly arched* (Fig. 4K-P). The maximum arch of the scape is the highest point above an imaginary line connecting the base and apex of the scape. The maximum arch may be in the middle or closer to the apex of the scape. Since the arch is sometimes diagonal across the scape, it may be necessary to view it at a slight apical angle in order to clearly see the full arch of the lateral edge. The scape of each species is illustrated here in frontal view and lateral view. The lateral-view drawings of the scape for the new species include a line indicating the lateral edge (not always obvious when the thickness varies). The impunctate underside (posterior in frontal view) of the scape of some species may have a groove or pit near the median edge. This appears to be

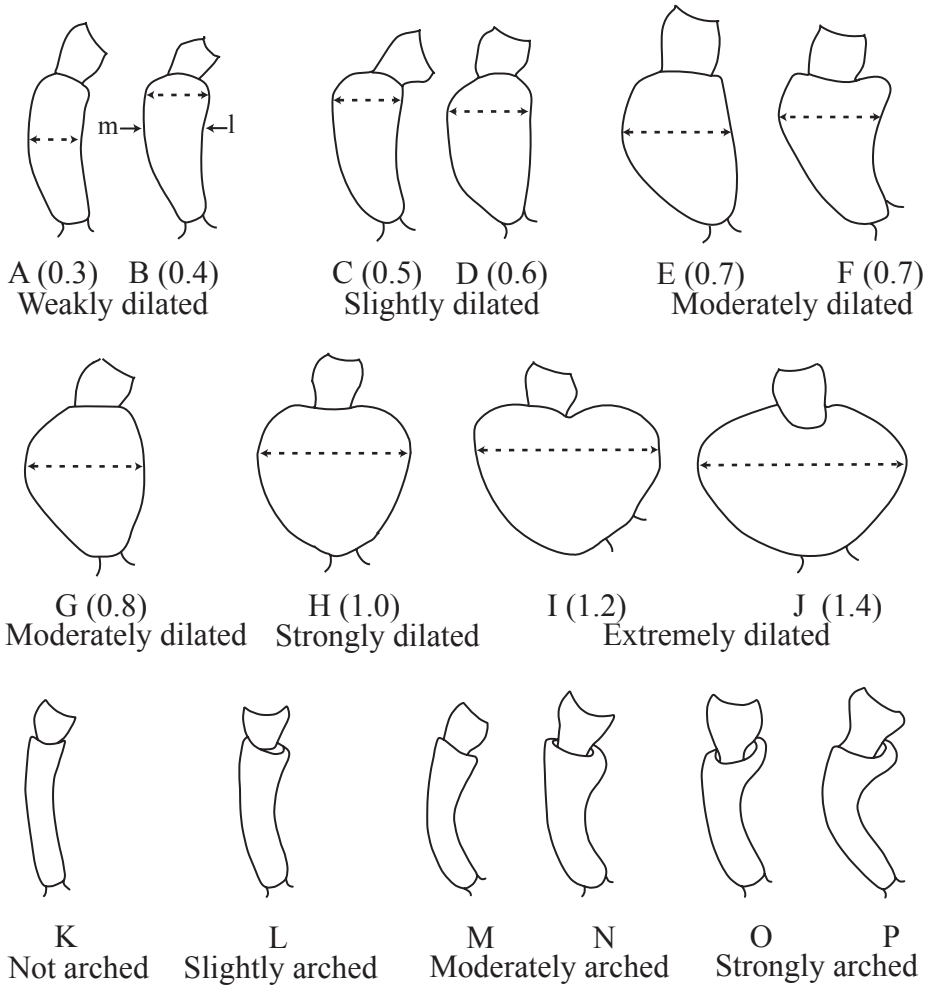


Fig. 4. Scapes of male *Hylaeus* antennae, showing variation. A-J. Frontal views of bee's left scape and pedicel showing degrees of dilation: l, lateral margin on right of figure; m, median margin; width indicated by dashed lines and W/L ratios in parentheses. F. Shows concave lateral margin and angular lateral apex, called "hooked." K-P. Lateral views of scape and pedicel showing degrees of arch. L-N. Shows maximum arch near middle. O-P. Shows maximum arch near apex.

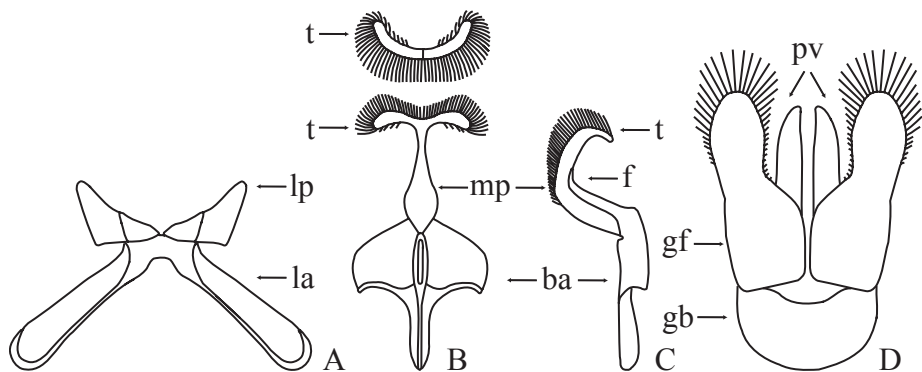


Fig. 5. Terminalia of male *Hylaeus*. A. Seventh sternum, ventral view: la, lateral apodeme; lp, lateral process. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view: ba, basal apodeme; f, flexure of process; mp, median process; t, tip of apical bifurcation. D. Genitalia, dorsal view: gb, gonobase; gf, gonoforceps; pv, penis valves.

the outlet for a gland in the scape and may be similar to those reported for Australian hylaeines (Houston, 1975:11).

**Tarsus.** The basitarsus is the long, basal tarsal segment and the distitarsus is the last tarsal segment. The tarsal segments in between are the mediotarsus. We call the mediotarsus and distitarsus together the terminal tarsal segments.

**Terminalia of male.** The term terminalia is applied here to S7 and S8 plus the genitalia, all of which normally are retracted into the metasoma and concealed by T7 and S6. S7 is reduced and divided medially into sclerotized and lightly pigmented, external hemisternites each with a lateral portion that may be elongated posteriorly in a **lateral process of S7** (Fig. 5A). The length of the lateral process may be less than, subequal to, or greater than the transverse width of the hemisternite. The lateral process may be described as *tapered* (a variety of shapes, gradually narrowed from base to apex), *parallel-sided* (elongate process with more or less parallel sides and with a rounded apex) or *sword-shaped* (process relatively broad throughout its length and with a pointed apex). Internally, each hemisternite also has an anterior, elongated **lateral apodeme of S7**. The hemisternites of S7 and their apodemes fit closely against S8 just anterior to the median process of S8. The hemisternites and their apodemes are illustrated here in ventral view. Although in life they normally are in a curved plane, they are shown here as if they were flat to show the maximum outline. S8 has a broad, internal apodemal base with an external, posterior **median process** (Fig. 5B). The process may be essentially **linear** with a nearly uniform diameter like a curved rod (Fig. 6A-I) or it may be **dilated** (expanded dorsoventrally) to various degrees. Dilated processes usually have a **flexure** (obtuse angle in the dorsoventral plane) at midlength. At this point the dilation is usually broader, creating a prominent **hump**. The dilation is a flat, membranous cuticle, usually hairy along the ventroposterior edge. The dilation may be variable within species and on some specimens may be partly collapsed or folded, appearing smaller than



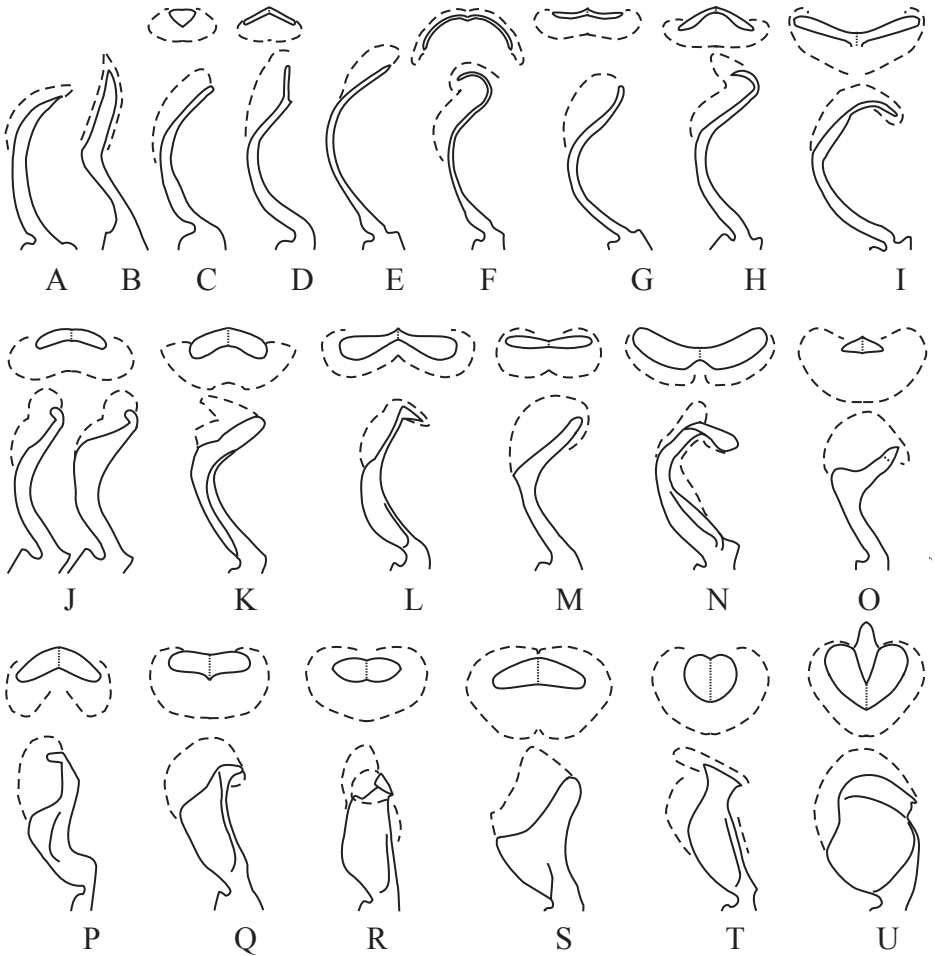


Fig. 6. Median processes of eighth sternum of male *Hylaesus*, lateral view, and apex, caudal view, showing variation. A. *H. hirsutulus*. B. *H. mutatus*. C. *H. difficilis*. D. *H. laetus*. E. *H. nivicola*. F. *H. volcanicus*. G. *H. simplex*. H. *H. facilis*. I. *H. chlorostictus*. J. *H. anthracinus* (two forms). K. *H. kuakea*. L. *H. psammobius*. M. *H. ombrias*. N. *H. andrenoides*. O. *H. sphecodoides*. P. *H. flavipes*. Q. *H. connectens*. R. *H. kauaiensis*. S. *H. kokeensis*. T. *H. dumetorum*. U. *H. muranus*. Extent of pubescence shown by dashed lines.

normal. Degrees of dilation are: *weakly dilated*, a slight dorsoventral expansion (Fig. 6J-N); *moderately dilated*, a distinct, but narrow membrane beneath the process (Fig. 6O-P); and *strongly dilated*, a broad membrane beneath the process (Fig. 6Q-U). The apex of the process may be **simple** (no bifurcation) or **bifurcate** with **tips** of various sizes and shapes: filamentous, straplike, or broad, round tips. The process and tips are usually pubescent, in some species so much so that the extent of dilation and the shape of the cuticular tips are obscured by matted hair. Care should be taken in distinguishing cuticle from hair because the descriptions refer to the shape of the cuticular structures. The entire S8 is shown here in a ventral view with the tip shown in a caudal view (dorsal side up) and also in a lateral view (Fig. 5C). The male genitalia has a basal sclerite, the **gonobase**, an inner pair of narrow **penis valves** (sagittae of Perkins 1910), and an outer pair of broad **gonoforceps** (stipites) that are apically pubescent (Fig. 5D). The apices of the gonoforceps may be subequal to the apices of the penis valves or, if the gonoforceps are expanded apically, exceed them; only in a few species are the gonoforceps shorter. The genitalia are shown here in dorsal view.

## KEYS TO SPECIES

The keys are designed for identification and do not necessarily indicate cladistic relationships. Characteristics of adventive species of bees and an explanation of anatomical terms and measurements are given in the preceding section. In each couplet, the characters given first are easiest to see or most reliable. Read through the entire couplet before deciding, as some have qualifications or exceptions. Some species appear more than once in the keys to include intraspecific variation. Maui Nui refers collectively to the islands of Maui, Lanai, and Molokai.

To identify males, it may be necessary to measure certain structures with an ocular micrometer and to partly extract the male terminalia. Couplet 2 separates species with the median process of S8 dilated and bifurcated with broader tips (Fig. 6M-U), versus the process not dilated and with very slender or no tips (Fig. 6A-I). For most specimens the decision is obvious, but some specimens may appear to be intermediate, especially if the tips are shriveled or the dilation of the process is collapsed. If in doubt, the best choice is to assume the process is dilated (i.e., couplet 2a). Five of the potentially troublesome species (Fig. 6J-L) have been keyed under both choices. The process of *H. anthracinus* is variable in width; *H. kuakea*, *H. mana*, *H. nalo*, and *H. psammobius* have weak dilations.

Females are more difficult to key because they have fewer structural and color characters. Many common species are far down in the key, and often characters are not as obvious or well defined as in the males. Their identification is greatly aided by narrowing down possibilities using associated males. It is not uncommon, however, to collect mainly males of one species and mainly females of another at a given site, especially when the total number of specimens is low. Males and females may also frequent different species of plants in the same area.

Nearly all females can be separated, though some couplets (notably 4, 5, and 50) may require experience with multiple species to identify them correctly. Females of *H. difficilis*, *H. facilis*, and *H. simplex* cannot be reliably distinguished. However, the first is the most common and widespread species on Hawaii and Maui Nui; the latter two, although formerly abundant, have become extremely rare since Perkins' time. Thus, unless an associated male is available, specimens can generally be assumed to be *H. difficilis*. Females should be collected carefully to keep them clean and dry. Avoid damaging the pubescence, position the antennae forward so that the upper frons is exposed, and pry open the mandibles so that the apical teeth are visible.

Correct association of males and females is often difficult in *Hylaeus* due to the generalized morphology of the latter. Most species for which recently collected males and females are available have been associated using DNA sequences (KM, unpubl. data). These total 39 species; a further 10 can be unambiguously associated due to unique characters shared by both sexes. Of the remaining species, 4 can be placed with relative certainty based on close association with and similarity to males, or by process of elimination. Finally, *H. finitimus* (only type female known) and *H. perkinsianus* (two females known, but no specimens are available) are provisionally placed in the key as our best guess based on earlier descriptions

and our notes. *Hylaeus akoko*, *H. gliddenae*, *H. kuakea*, and *H. nalo* were not included because the females are unknown. The female of *H. akoko* would probably key to *H. pubescens*, and that of *H. gliddenae* to *H. paradoxicus*. The female of *H. muiensis* could not be included because the original description is insufficient and no specimen is available.

Males have the antenna with 13 segments; metasoma with 7 visible terga; scape of antenna (long basal segment) often, but not always, dilated; hairy structures may project from apex of metasoma; no sting; face and legs often, but not always, marked with yellow.

Females have the antenna with 12 segments; metasoma with 6 visible terga; scape of antenna subcylindrical, never dilated; slender, hairless sting may project from apex of metasoma; face and legs often, but not always, unmarked.

**Key to males**

- 1. Scape weakly to moderately dilated in frontal view (Fig. 4A-G; W/L ratio up to about 0.8); or if about as wide as long, then paraocular marks are present . . . . . 2
- Scape strongly to extremely dilated, always as wide as long or wider than long (Fig. 4H-J); paraocular area black . . . . . 5
- 2(1). Median process of S8 weakly to strongly dilated (Fig. 6J-U) and with the apex bifurcate with hairy tips of various sizes and shapes, tips sometimes long and straplike but not very slender or filamentous . . . . . 3
- Median process of S8 not dilated, narrow and linear, of nearly uniform diameter throughout, and with the apex simple or bifurcate with very slender or filamentous tips much longer than wide (Fig. 6A-I) . . . . . 8
- 3(2). Basal area of propodeum lineate or reticulately rugose over entire anterior area to brow; T7 hair variable . . . . . 4
- Basal area of propodeum mostly smooth coriaceous, rugae at most reaching halfway to brow, often with only a few very short rugae at the anterior margin; T7 hair erect, dark brown to black . . . . . 22
- 4(3). Metasomal terga distinctly punctured (at least T3-7; may be somewhat shallow in small specimens, but still clear); vertex and scutum hair long, (16-)20-30 or more and 10-20 respectively . . . . . 39
- Metasoma impunctate, pits (if any) very shallow and indistinct; vertex hair shorter, 4-20(-24); scutum hair often short, 4-20 . . . . . 48
- 5(1). Median process of S8 very broadly dilated, almost quadrate in lateral view (Fig. 6U) . . . . . 6
- Median process of S8 only slightly dilated, with a distinct flexure or arc . . . . . 7

- 6(5). Scape wider than long, oval in profile (Fig. 46E; W/L ratio about 1.5); clypeus dark or with an irregular ivory mark; sculpture of basal area of propodeum varying from weakly lineate at base to reticulately rugose over most of the basal area; Hawaii .....  
 ..... *Hylaeus muranus* (Warncke), **new combination** (p. 145)
- Scape width nearly equal to length, circular in profile (Fig. 59E; W/L ratio about 1.1); clypeus dark or, sometimes together with lower frons, of a yellowish red color; basal area of propodeum sparsely sculptured with linear rugae at the base, if at all; Maui Nui ..... *Hylaeus satelles* (Blackburn) (p. 179)
- 7(5). Metasoma conspicuously metallic blue; clypeus with a more or less parallel-sided ivory mark (Fig. 11E); Kauai ..... *Hylaeus andrenoides* (Perkins) (p. 45)
- Metasoma entirely dark brown to black; clypeus unmarked or with a small subapical yellow mark; Maui ..... *Hylaeus takumiae*, **new species** (p. 195)
- 8(2). Malar space long (ratio 0.8-1.2 DMO) ..... 9
- Malar space short (ratio 0.2-0.4 DMO) ..... 10
- 9(8). Malar space very long (ratio about 1.2 DMO); paraocular depression deep and with a rounded ridge below the antennal socket; scape moderately dilated (W/L ratio about 0.7); Maui ..... *Hylaeus nivicola* Meade-Waldo (p. 155)
- Malar space long (ratio about 0.8 DMO), paraocular depression shallow and without a ridge below the antennal socket; scape only weakly to slightly dilated (W/L ratio about 0.4-0.5); Hawaii, Maui .....  
 ..... *Hylaeus volcanicus* (Perkins) (p. 205)
- 10(8). Face with paraocular marks adjacent to eye (sometimes filling entire area between eye and clypeus; Figs. 47E, 56E); clypeal yellow mark, if present, partly or entirely separated from paraocular yellow marks by dark areas along sulci and usually with no yellow mark on supraclypeal area ..... 11
- Face with a single yellow mark, often including supraclypeal area; paraocular marks, if present, adjacent to clypeal sulci and relatively narrow (Figs. 14E, 50E) ..... 14
- 11(10). Paraocular depression deep, evident in frontal view; punctation of scutum dense, pits about 1 pit width apart over most of the disc ..... 12
- Paraocular depression shallow or absent, appearing flat in frontal view; punctation of scutum not particularly dense, pits 2-3 pit widths apart ..... 13
- 12(11). Paraocular mark small, near eye, clypeus black; gonoforceps blunt, shorter than penis valves (Fig. 48); Oahu ... *Hylaeus nalo*, **new species**, in part (p. 150)
- Paraocular mark nearly or entirely filling in area below antennal socket, clypeus almost entirely yellow; gonoforceps slightly pointed, longer than penis valves (Fig. 56); Hawaii, Maui .... *Hylaeus psammobius* (Perkins), in part (p. 170)

- 13(11). Face almost entirely yellow, paraocular marks extending to or above antennal sockets; all tibiae with yellow markings; median process of S8 with apex bifurcate (Fig. 42B, E); Oahu .....  
 ..... *Hylaeus mana*, **new species**, in part (p. 135)
- Face with apical clypeal mark and narrow paraocular marks not extending above antennal sockets; tibiae black except for pale area; median process of S8 simple, somewhat spatulate (Fig. 47B, E); Kauai .....  
 ..... *Hylaeus mutatus* (Perkins) (p. 148)
- 14(10). Scape moderately to strongly dilated (Figs. 14E, 38E; W/L ratio 0.7-0.9), clearly wider in middle than at apex; median process of S8 weakly dilated, compressed laterally in cross-section (Fig. 6J-K) ..... 15
- Scape weakly to slightly dilated (Fig. 20E; W/L ratio 0.4-0.6), widest point near apex; median process of S8 rodlike, round in cross section at midlength (Fig. 6A-I) ..... 16
- 15(14). Hair of vertex and scutum short (6-10 and 4-6 respectively); frons with pits not much closer medially than laterally; paraocular mark usually wide (Fig. 14E); Hawaii, Maui Nui, Oahu .... *Hylaeus anthracinus* (F. Smith), in part (p. 52)
- Hair of vertex long (16-24), of scutum medium (8-12); frons with pits dense medially, nearly contiguous; paraocular mark usually narrow (Fig. 38E); Oahu .....  
 ..... *Hylaeus kuakea*, **new species**, in part (p. 125)
- 16(14). Gonoforceps not expanded apically or medially, subequal to the penis valves in length and not contiguous (Fig. 7C-D) ..... 17
- Gonoforceps expanded apically so that they project beyond the penis valves and may touch medially (Fig. 7A-B) ..... 18
- 17(16). Median process of S8 with apex simple or bifurcate with short tips, apex always spatulate (Fig. 20B); scutum hair longer (12-20), usually reddish brown; Hawaii, Maui Nui ..... *Hylaeus difficilis* (Perkins) (p. 71)
- Median process of S8 with apex bifurcate with long, slender tips (Fig. 40B); scutum hair shorter (8-12), white to pale brown; Hawaii, Maui Nui, Oahu, Kauai ..... *Hylaeus laetus* (Perkins) (p. 129)
- 18(16). Lateral process of S7 very short, triangular (Fig. 7F); median process of S8 simple; scape slightly arched (Fig. 31B, F) ..... 19
- Lateral process of S7 long and broad (Fig. 7E); median process of S8 bifurcate with long slender tips; scape moderately arched (Fig. 23B, F) ..... 20
- 19(18). Hind tibia with large basal yellow mark; wings smoky; Kauai .....  
 ..... *Hylaeus hirsutulus* (Perkins) (p. 106)
- Hind tibia unmarked or with only obscure yellow spots at base; wings clear; Nihoa .....  
 ..... *Hylaeus perkinsianus* (Timberlake) (p. 166)

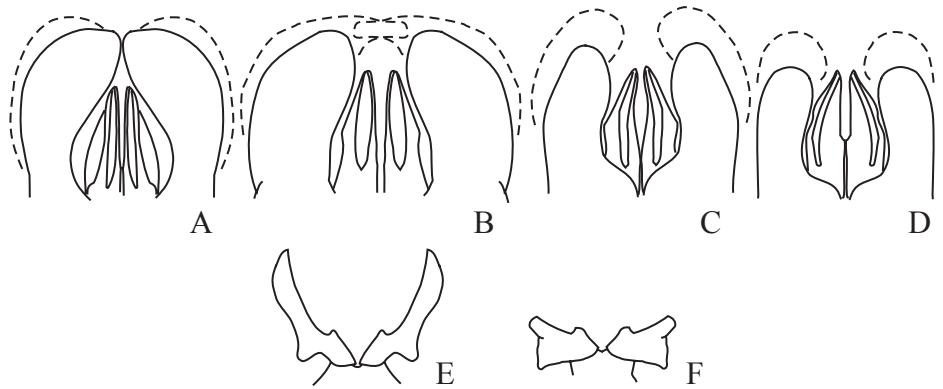


Fig. 7. Genitalia of male *Hylaeus*, dorsal view (A-D) and seventh sternum, ventral view (E-F) showing variation. A and E. *H. facilis*. B and F. *H. hirsutulus*. C. *H. difficilis*. D. *H. laetus*.

- 20(18). Legs mostly unmarked or with small obscure spots of yellow, no basal white or yellow stripe on hind tibia ..... 21  
 — Legs marked with yellow, including basal yellow stripe on hind tibia; Kauai .....  
     ..... *Hylaeus chlorostictus* (Perkins) (p. 58)
- 21(20). Gonoforceps with pubescence very short or missing at inner apex (Fig. 23D);  
 Maui Nui, Oahu ..... *Hylaeus facilis* (F. Smith) (p. 80)  
 — Gonoforceps with pubescence extended around apex to inner angle (Fig. 61D);  
 Hawaii ..... *Hylaeus simplex* (Perkins) (p. 184)
- 22(3). Underside of scape deeply arched, much more so than upper side (Figs. 35F, 45F)  
 and/or apex abruptly thickened in lateral view, almost hooked (Figs. 44F,  
 66F) ..... 23  
 — Scape gently arched, may be gradually thickened toward the apex but not with an  
 abrupt projection (e.g., Fig. 36F) ..... 27
- 23(22). Paraocular marks extending well above antennal sockets ..... 24  
 — Paraocular marks not extending above antennal sockets ..... 25
- 24(23). Scutum hair medium (6-8); apex of scape gradually thickened in lateral view;  
 pronotum and bases of mid and hind tibiae clearly marked with yellow; process  
 of S8 with tips two or more times longer than wide (Fig. 45B); Oahu .....  
     ..... *Hylaeus mimicus*, **new species** (p. 142)  
 — Scutum hair long (12-20); apex of scape abruptly thickened in lateral view;  
 pronotum and tibiae unmarked or bases of tibiae with only yellowish traces;  
 process of S8 with tips twice as long as wide or less than twice (Fig. 24B);  
 Hawaii ..... *Hylaeus filicum* (Perkins) (p. 83)

- 25(23). Supraclypeal area distinctly wider than long, W/L ratio 1.5-2.5 ..... 26  
 — Supraclypeal area about as wide as long; Maui .....  
 ..... *Hylaeus melanothrix* (Perkins) (p. 140)
- 26(25). Clypeus entirely yellow or nearly so, paraocular marks short and narrow, not or  
 barely extended above clypeal mark; process of S8 without a flexure at  
 midlength (Fig. 35C, E); Kauai ..... *Hylaeus kauaiensis* (Perkins) (p. 117)  
 — Clypeus black or with a subapical yellow spot up to about half its length; paraocular  
 marks, if present, longer than clypeal mark or extended to antennae; process  
 of S8 with a flexure at midlength (Fig. 66C, E); Maui Nui, Oahu .....  
 ..... *Hylaeus unicus* (Perkins), in part (p. 198)
- 27(22). Median plate at base of forewing distinctly yellow (Fig. 3); or if only an obscure  
 orange color, mandible with a large yellow mark ..... 28  
 — Median plate brown; mandible without markings (except sometimes *H.*  
*crabronoides* with a small, obscure mark) ..... 29
- 28(27). Legs extensively marked with yellow, all tibiae with large basal and smaller apical  
 marks often joined by a dorsal stripe; mandible with a yellow mark; scape  
 with a distinct groove on the underside of the median edge, greatest width  
 near middle, often marked with yellow; Hawaii .....  
 ..... *Hylaeus kona* (Blackburn) (p. 122)  
 — Legs not extensively marked, hind tibia at most with a yellow mark extended half  
 its length; mandible black; scape without a distinct groove underneath, greatest  
 width near apex, unmarked; Kauai .....  
 ..... *Hylaeus kokeensis*, **new species** (p. 119)
- 29(27). Scape not marked with yellow ..... 30  
 — Scape marked with yellow along lateral edge; Hawaii .....  
 ..... *Hylaeus hula* (Perkins) (p. 112)
- 30(29). Median process of S8 moderately dilated, at least basally, usually with a distinct  
 hump (Figs. 19C, 21C) ..... 31  
 — Median process of S8 hardly dilated, of even width in lateral view, without a  
 hump (Fig. 42C); Oahu ..... *Hylaeus mana*, **new species**, in part (p. 135)
- 31(30). Scape nearly flat (Fig. 12F) ..... 32  
 — Scape slightly but distinctly arched (Fig. 19F) ..... 33
- 32(31). Upper frons with a distinct patch of black hairs, conspicuous in frontal and lateral  
 view; Hawaii ..... *Hylaeus dumetorum* (Perkins) (p. 78)  
 — Upper frons with a dark area of dense sculpture but not a conspicuous patch of  
 black hairs; Maui and Lanai ..... *Hylaeus angustulus* (Perkins) (p. 47)



- 33(31). Paraocular marks longer against eyes than clypeus (Fig. 17E) or filling in entire area up to antennal sockets (Fig. 19E); or if absent, the clypeal mark is subapical and extends less than half the length of the plate, or absent ..... 34
- Paraocular marks entirely adjacent to clypeus (as in Fig. 20E) or absent; clypeus all yellow or with a large central mark (Fig. 18E); Hawaii, Maui Nui, Oahu, Kauai ..... *Hylaeus connectens* (Perkins), in part (p. 64)
- 34(33). Clypeus usually partly to mostly yellow, clypeus basal margins and supraclypeal area always black (Figs. 17E, 19E); frons with dark patch of hair or denser sculpture in middle; scape with a small pit or groove on the underside of the median edge (sometimes indistinct) ..... 35
- Clypeus entirely yellow (Fig. 21E); frons without dark patch of hair in middle, sculpture even; scape without a groove on the underside of the median edge; Hawaii ..... *Hylaeus dimidiatus* (Perkins) (p. 75)
- 35(34). Clypeus with a yellow mark, usually large; if reduced, then paraocular marks are reduced or absent ..... 36
- Clypeus black (known only from type; individuals with a small apical mark may be found), paraocular marks present; Maui ..... *Hylaeus mauiensis* (Perkins) (p. 138)
- 36(35). Scutum hairs mostly short, 4-8, with only scattered longer hairs to 14; paraocular marks large, filling in area up to antennal sockets or nearly so ..... 37
- Scutum hairs long, 14-18; paraocular marks usually small or absent, not reaching antennal sockets; Hawaii, Maui ..... *Hylaeus coniceps* (Blackburn), in part (p. 61)
- 37(36). Head in dorsal view normal, less than half as long as wide; frons with impunctate, shining areas above antennal sockets and laterad of medial dark patch ... 38
- Head in dorsal view thick, about half as long (from acme to middle of occiput) as wide (may be difficult to distinguish in isolation, but obvious in comparison with any other species); frons punctate over entire area; Hawaii ..... *Hylaeus crabronoides* (Perkins) (p. 68)
- 38(37). Flagellum of antenna yellow underneath; pronotal collar unmarked, lobes sometimes with small marks; Hawaii ..... *Hylaeus pele* (Perkins) (p. 163)
- Flagellum of antenna dark underneath; pronotal collar and usually lobes marked with yellow; Hawaii, Maui?, Oahu, Kauai ..... *Hylaeus specularis* (Perkins) (p. 189)
- 39(4). Pronotal collar with or without a narrow transverse ivory stripe, median breadth of stripe, if present, less than diameter of median ocellus; tibiae less extensively marked with ivory ..... 40
- Pronotal collar with very broad transverse ivory stripe; full length of all tibiae marked with ivory; Kauai ..... *Hylaeus perspicuus* (Perkins) (p. 168)

- 40(39). Metasoma entirely red ..... 41  
 — Metasoma dark brown to black, or red only on T1 ..... 42
- 41(40). Paraocular area, clypeus, and scape marked with yellow; Hawaii .....  
 ..... *Hylaeus gliddenae*, **new species** (p. 98)  
 — Face entirely black; Hawaii ..... *Hylaeus paradoxicus* (Perkins) (p. 160)
- 42(40). Scape with a distinct stripe along the full length of the lateral edge ..... 43  
 — Scape unmarked, entirely orange-brown (*H. anomalus*), or with an obscure orange  
 mark near the base of the lateral edge (*H. kukui*) ..... 45
- 43(42). Scape with a narrow stripe along the lateral edge, which is distinctly convex; pale  
 area only on front tibia ..... 44  
 — Scape broadly ivory on the lateral third, lateral edge not distinctly convex; pale  
 areas on front and mid tibiae, and all femora; Hawaii .....  
 ..... *Hylaeus akoko* **new species** (p. 43)
- 44(43). Second metasomal sternum with subapical hump visible in lateral view; Hawaii  
 ..... *Hylaeus pubescens* (Perkins) (p. 173)  
 — Second metasomal sternum evenly convex, without a distinct hump; Maui Nui,  
 Oahu ..... *Hylaeus fuscipennis* (F. Smith) (p. 94)
- 45(42). Lateral margin of scape straight or nearly so; paraocular area usually marked;  
 paraocular depression shallow ..... 46  
 — Lateral margin of scape distinctly convex; paraocular area unmarked; paraocular  
 depression deep, shining; Maui ..... *Hylaeus kukui*, **new species** (p. 127)
- 46(45). Scape black; legs black, usually with yellow or ivory marks ..... 47  
 — Scape and legs largely orange-brown; Oahu .....  
 ..... *Hylaeus anomalus* (Perkins) (p. 50)
- 47(46). Face with three yellow marks (Fig. 29E), or entirely yellow; Maui, Molokai .....  
 ..... *Hylaeus haleakalae* (Perkins) (p. 100)  
 — Paraocular areas nearly entirely filled in with ivory, clypeus unmarked or with  
 only a narrow, transverse, apical band (Fig. 60E); Hawaii .....  
 ..... *Hylaeus setosifrons* (Perkins) (p. 181)
- 48(4). Paraocular depressions deep, distinct in frontal view ..... 49  
 — Paraocular depressions shallow or absent ..... 51
- 49(48). Paraocular mark small or absent, clypeus black; gonoforceps blunt, shorter than  
 penis valves (Figs. 48D, 58D) ..... 50  
 — Paraocular mark nearly or entirely filling in area below antennal socket, clypeus  
 almost entirely yellow; gonoforceps slightly pointed, longer than penis valves  
 (Fig. 56); Hawaii, Maui ..... *Hylaeus psammobius* (Perkins), in part (p. 170)

- 50(49). Median process of S8 very weakly dilated, without a hump at flexure; gonoforceps rounded apically (Fig. 48); Oahu .....  
 ..... *Hylaeus nalo*, **new species**, in part (p. 150)
- Median process of S8 strongly dilated, with a distinct hump; gonoforceps somewhat truncate apically, with a distinct angle medially (Fig. 58); Hawaii .....  
 ..... *Hylaeus rugulosus* (Perkins), (p. 176)
- 51(48). Paraocular marks not extended above antennal sockets, or absent; clypeus entirely yellow or with only narrow margins black (Figs. 18E, 25E) ..... 52
- Paraocular marks extended in a stripe up to or above antennal sockets (Figs. 15E, 26E); or if reduced or absent, then clypeus with a small spot or unmarked (Fig. 17E) ..... 55
- 52(51). Median process of S8 moderately dilated, with a pronounced hump (Figs. 18C, 25C) ..... 53
- Median process of S8 weakly dilated, hump absent or poorly developed (Figs. 14C, 38C) ..... 54
- 53(52). Scape moderately dilated, W/L ratio 0.6-0.7; paraocular marks narrow or absent (Fig. 18E); Hawaii, Maui Nui, Oahu, Kauai .....  
 ..... *Hylaeus connectens* (Perkins), in part (p. 64)
- Scape strongly dilated (W/L ratio 0.8-1.0); paraocular marks broad, usually filling area below antennal socket (Fig. 25E); Kauai, Niihau, Lehua .....  
 ..... *Hylaeus flavifrons* (Kirby) (p. 87)
- 54(52). Hair of vertex and scutum short (6-10 and 2-6 respectively); frons with pits not much closer medially than laterally; paraocular mark usually relatively broad (Fig. 14E); Hawaii, Maui Nui, Oahu .....  
 ..... *Hylaeus anthracinus* (F. Smith), in part (p. 52)
- Hair of vertex long (16-24), of scutum medium (8-12); frons with pits dense medially, nearly contiguous; paraocular mark usually narrow (Fig. 38E); Oahu .....  
 ..... *Hylaeus kuakea*, **new species**, in part (p. 125)
- 55(51). Scape with lateral edge nearly straight in frontal view, or very slightly and evenly concave ..... 56
- Scape with lateral edge distinctly concave in frontal view, projecting somewhat at apex (Fig. 34E); Hawaii ..... *Hylaeus inquilina* (Perkins) (p. 114)
- 56(55). Face long and narrow, supraclypeal area distinctly longer than wide (W/L ratio 0.6-0.8; Figs. 41E, 62E) ..... 57
- Face normal, supraclypeal area about as long as wide ..... 58

- 57(56). Scape weakly dilated (W/L ratio 0.3-0.4), median edge more or less straight, greatest width near apex (Fig. 41E); Maui Nui, Oahu .....  
 ..... *Hylaeus longiceps* (Perkins) (p. 133)
- Scape moderately dilated (W/L ratio 0.7-0.8), median edge strongly convex, greatest width near middle (Fig. 62E); Kauai .....  
 ..... *Hylaeus solaris*, **new species** (p. 187)
- 58(56). T7 hair short, prostrate or appressed, plumose, golden to brown ..... 59
- T7 hair long, erect, weakly plumose, dark brown to black; Hawaii, Maui .....  
 ..... *Hylaeus coniceps* (Blackburn), in part (p. 61)
- 59(58). Median process of S8 with bifurcations short and relatively broad (Fig. 67B); lateral carina of front coxa lamellate, drawn at base into a distinct angle or a short spine (Fig. 8D; may be weakly developed in *H. hostilis*) ..... 60
- Median process of S8 with bifurcations narrow and straplike (Fig. 15B); lateral carina of front coxa not lamellate or spinose (Fig. 8C) ..... 62
- 60(59). Yellow mark on face extended to or above antennal sockets in a narrowing and pointed stripe (Fig. 67E) or reduced; scape unmarked; red color, if present, only on basal segments of metasoma ..... 61
- Yellow mark on face extended well above antennal sockets in a broad stripe (Fig. 32E); scape marked with yellow or orange; basal segments of metasoma always orange or red, often with extensive reddish patches on mesosoma; Kauai ..... *Hylaeus hostilis* (Perkins) (p. 109)
- 61(60). Malar space short (ratio about 0.3 DMO); Maui Nui, Oahu .....  
 ..... *Hylaeus volatilis* (F. Smith) (p. 201)
- Malar space very short (ratio about 0.2 DMO); Hawaii .....  
 ..... *Hylaeus sphecodoides* (Perkins) (p. 192)
- 62(59). Metasoma entirely black, without hair bands; scape black or with a yellow mark, but never entirely yellow ..... 63
- Basal segments of metasoma red, apical segments usually with white hair bands (sometimes rubbed off); scape entirely yellow; Maui Nui .....  
 ..... *Hylaeus hilaris* (F. Smith) (p. 103)
- 63(62). Median process of S8 moderately dilated, with a pronounced hump (Fig. 26C); all tibiae usually with extensive yellow markings; face with yellow paraocular mark usually extended as a broad stripe above antennal sockets (Fig. 26E; specimens from higher elevations sometimes with a narrowing stripe) ... 64
- Median process of S8 slightly dilated, hump weak or absent (Figs. 15C, 49C); mid and hind tibiae entirely black except for small basal marks; face with paraocular mark extended as a narrowing stripe above the antennal sockets (Figs. 15E, 49E) ..... 65

- 64(63). Hind tibiae mostly yellow, at least basal half and apical ring marked; Hawaii, Maui, Lanai ..... *Hylaesus flavipes* (F. Smith) (p. 90)  
 — Hind tibiae mostly black, with yellow marks only at the very base and apex; Kauai (known only from description and key by Perkins 1899:100, 1910:602) ....  
 ..... *Hylaesus finitimus* (Perkins) (p. 86)
- 65(63). Scape with greatest width near middle, about twice as long as wide (W/L ratio about 0.5), hair on median edge plumose; clypeal mark often reduced ... 66  
 — Scape with greatest width near apex, more than twice as long as wide (W/L ratio about 0.4), hair on median edge mostly simple; clypeus always entirely yellow; Hawaii, Lanai, Molokai .....  
 ..... *Hylaesus niloticus* (Warncke), **new combination** (p. 152)
- 66(65). Wings slightly smoky to smoky; face with more yellow marking: clypeus entirely yellow or nearly so, supraclypeal area with or without a yellow mark; Maui, Lanai, Oahu ..... *Hylaesus assimulans* (Perkins) (p. 55)  
 — Wings dark smoky; face with less yellow marking: clypeus with a large central spot of yellow or no mark, supraclypeal area without a yellow mark; Hawaii .....  
 ..... *Hylaesus ombrias* (Perkins) (p. 158)

### Key to females

1. Setae of front mediotarsus erect, especially ventrally, distinctly and rather abruptly curved at apex (Fig. 8A); no projection on lateral edge of front coxa, carina very narrow and indistinct or absent (Fig. 8C) ..... 2  
 — Setae of front mediotarsus straight or gently arcing, prostrate, similar to other tarsal setae (Fig. 8B); front coxa sometimes with a lateral lamellate carina terminating proximally in a projection or spine (Fig. 8D) ..... 6
- 2(1). Younger islands ..... 3  
 — Kauai or Northwestern Islands ..... 10
- 3(2). Metasomal terga impunctate or with very minute, indistinct pits; usually smaller species, wing length about 6 mm or less; basal area of propodeum usually more or less lineate to weakly reticulate or mostly smooth ..... 4  
 — Metasomal terga distinctly punctured, at least on T3-6; basal area of propodeum reticulate (except *H. satelles*); usually large species, wing length about 6 mm or greater (except *H. haleakalae*) ..... 23
- 4(3). Basal area of propodeum roughened all over, the rugae sometimes weak but not smoothly coriaceous anywhere on the dorsal surface; or if smooth near brow, then T6 hairs prostrate, pale brown ..... 5  
 — Basal area of propodeum usually with very short lineate rugae at front, sometimes extending about halfway to brow, but brow beyond rugae always smoothly coriaceous; T6 hairs erect, usually dark brown to black ..... 31

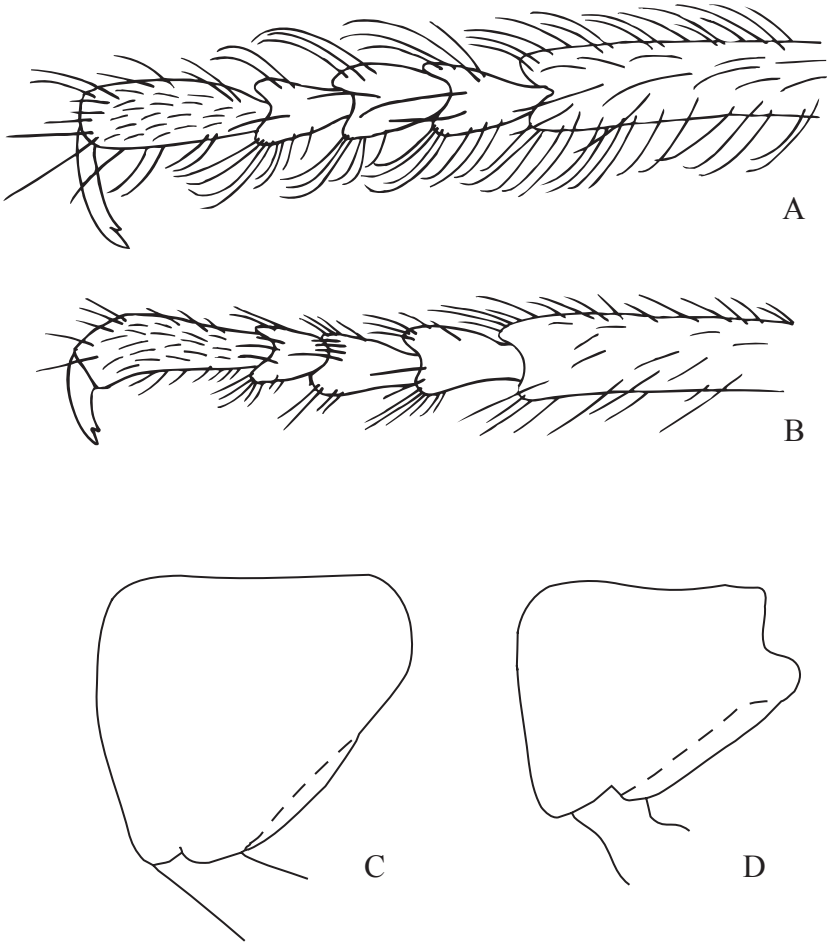


Fig. 8. Left fore tarsi (posterodorsal view) and fore coxae (frontal view) of female *Hylaeus*. A. *H. difficilis*, showing curved, pollen collecting setae. B. *H. volatilis*, a cleptoparasite, showing straight setae. C. *H. inquilina*, showing narrow carina along lateral edge. D. *H. sphecodoides*, frontal view of fore coxa showing broad lamellate carina (base of carina marked by dashed lines).

- 5(4). Punctures of upper frons clearly evident but shallow, without distinct edges, blending into ground in frontal view; T6 hairs pale to brown, short and/or prostrate ..... 46
- Punctures of upper frons distinct in frontal view, relatively deep (may be obscured by sculpture of ground); T6 hairs variable: golden and prostrate, or dark and erect ..... 50
- 6(1). Hawaii ..... 7
- Older islands ..... 8
- 7(6). Metasoma and legs entirely black; coxal lamella absent or very narrow, without a projection (Fig. 8C); Hawaii ..... *Hylaeus inquilina* (Perkins) (p. 114)
- At least T1 and/or mid and hind tarsi reddish brown; front coxa with a distinct lateral lamella and a dorsal projection (Fig. 8D); Hawaii .....  
..... *Hylaeus sphecodoides* (Perkins) (p. 192)
- 8(6). Red marks sometimes present on metasoma and face but not mesosoma; Maui Nui and Oahu ..... 9
- Extensive red markings over entire body; Kauai .....  
..... *Hylaeus hostilis* (Perkins) (p. 109)
- 9(8). Apical terga of metasoma with white hair bands (may be indistinct or lost by abrasion); coast of Maui Nui ..... *Hylaeus hilaris* (F. Smith) (p. 103)
- Metasoma lacking hair bands; coast and mountains of Maui Nui and Oahu .....  
..... *Hylaeus volatilis* (F. Smith) (p. 201)
- 10(2). Paraocular marks present ..... 11
- Paraocular area unmarked ..... 14
- 11(10). Median plate of forewing dark brown to black; clypeal mark absent, or if present, transverse and apical ..... 12
- Median plate of forewing yellow (Fig. 3); clypeus with at least a small longitudinal mark; Kauai ..... *Hylaeus kokeensis*, **new species** (p. 119)
- 12(11). Basal area of propodeum with very short rugae at front; with or without marks on prothoracic lobes; scutum hairs short, 2-8 ..... 13
- Basal area of propodeum with distinct, widely spaced, lineate rugae, extending about halfway to brow; without marks on prothoracic lobes; scutum hairs medium, basal layer about 6 with longer hairs 12-20; Kauai .....  
..... *Hylaeus kauaiensis* (Perkins) (p. 117)

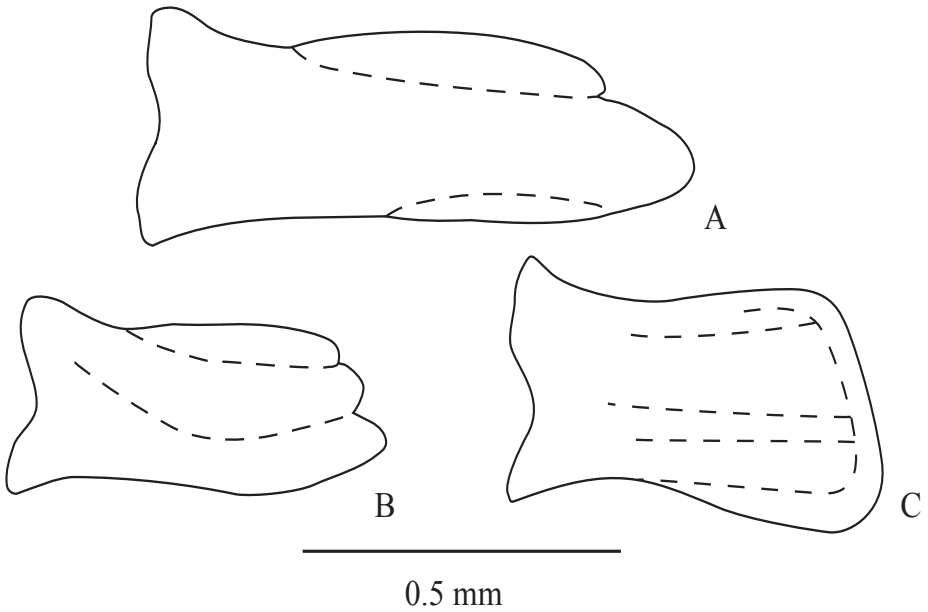


Fig. 9. Right mandibles of female *Hylaeus*. A. *H. longiceps*, showing typical form with two apical teeth (grooves marked by dashed lines). B. *H. anthracinus*, with three apical teeth. C. *H. rugulosus*, with no apical teeth and broad apex.

- 13(12). Punctuation of upper frons distinct, medially denser with pits less than 1 pit width apart; scutum very dull; Hawaii, Maui?, Oahu, Kauai .....  
 ..... *Hylaeus specularis* (Perkins), in part (p. 189)
- Punctuation of upper frons shallow, pits about 1 pit width apart even around median line; scutum slightly lustrous; Kauai .... *Hylaeus mutatus* (Perkins) (p. 148)
  
- 14(10). Cuticle without metallic blue tint or metasomal hair bands ..... 15
- Body, especially metasoma, somewhat metallic blue; apical terga of metasoma with hair bands; Kauai ..... *Hylaeus andreoides* (Perkins) (p. 45)
  
- 15(14). Prothoracic collar unmarked ..... 16
- Prothoracic collar with a broad, solid stripe; Kauai .....  
 ..... *Hylaeus perspicuus* (Perkins) (p. 168)
  
- 16(15). Mandible normal, with two teeth (Fig. 9A) ..... 17
- Mandible with three subequal apical teeth (Fig. 9B); Kauai, Niihau, Lehua .....  
 ..... *Hylaeus flavifrons* (Kirby) (p. 87)



17(16).	Hairs of upper frons and vertex short, 4-8 .....	18
—	Hairs of upper frons and usually vertex medium to long, 10-14 or more .....	19
18(17).	Upper frons with pits evenly spaced; Kauai .....	
	..... <i>Hylaeus solaris</i> , <b>new species</b> (p. 187)	
—	Upper frons with pits denser medially; Kauai .....	
	..... <i>Hylaeus finitimus</i> (Perkins) (p. 86)	
19(17).	Scutum hairs short, mostly 4-6 with a few up to 12; vertex hairs medium, 6-16 .....	20
—	Scutum hairs longer, 8-16; vertex hairs long, 14-30 .....	21
20(19).	T6 hairs long, dark brown to black, erect; Hawaii, Maui Nui, Oahu, Kauai .....	
	..... <i>Hylaeus connectens</i> (Perkins), in part (p. 64)	
—	T6 hairs short, pale, prostrate; Hawaii, Maui Nui, Oahu, Kauai .....	
	..... <i>Hylaeus laetus</i> (Perkins), in part (p. 129)	
21(19).	Clypeus without a longitudinal line .....	22
—	Clypeus with a longitudinal depression or faint impunctate line (may be faint or difficult to see; most prominent just below the frontoclypeal suture, best observed from an oblique frontodorsal view); Kauai .....	
	..... <i>Hylaeus chlorostictus</i> (Perkins) (p. 58)	
22(21).	Wings dark smoky; Kauai .....	<i>Hylaeus hirsutululus</i> (Perkins) (p. 106)
—	Wings subhyaline; Nihoa .....	<i>Hylaeus perkinsianus</i> (Timberlake) (p. 166)
23(3).	Cuticle of at least part of metasoma and/or head (other than clypeus) red .....	24
—	Cuticle almost entirely dark brown to black .....	25
24(23).	Entire metasoma red, head black; Hawaii .....	
	..... <i>Hylaeus paradoxicus</i> (Perkins) (p. 160)	
—	Head and first segment of metasoma red; Oahu .....	
	..... <i>Hylaeus anomalus</i> (Perkins) (p. 50)	
25(23).	Clypeal hairs pale to red-brown, prostrate or decumbent, inconspicuous; hind tibia with a small mark (up to about half the length) or none .....	26
—	Clypeus with conspicuous erect, black hairs; hind tibia with an ivory stripe the entire length; Hawaii .....	<i>Hylaeus setosifrons</i> (Perkins) (p. 181)
26(25).	Hawaii .....	27
—	Maui Nui or Oahu .....	28

- 27(26). Metasoma with faint blue reflections; S2 normal; pronotum unmarked; T6 hairs black, erect; Hawaii .....  
 ..... *Hylaeus muranus* (Warncke), **new combination** (p. 145)
- Metasoma without blue reflections; S2 with a more or less distinct median protuberance; pronotal collar with or without an ivory stripe; T6 hairs reddish, densely plumose; Hawaii ..... *Hylaeus pubescens* (Perkins) (p. 173)
- 28(26). Punctuation of frons not particularly dense, pits not crowded and distorted even at middle; scutum and vertex hairs pale, white to yellow; punctuation of T2-3 strong; larger species, wing length usually over 7 mm ..... 29
- Punctuation of frons very dense, pits crowded and distorted even laterally; scutum and vertex hairs dark brown to black (may appear pale due to reflection of light); punctuation of T2-3 not very strong; smaller species, wing length usually less than 6.5 mm ..... 30
- 29(28). Pronotum unmarked; face with or without reddish or yellow marks; Maui Nui .  
 ..... *Hylaeus satelles* (Blackburn) (p. 179)
- Pronotal collar with an ivory stripe; face black; Maui Nui, Oahu .....  
 ..... *Hylaeus fuscipennis* (F. Smith) (p. 94)
- 30(28). Hairs of lower paraocular area short, 4-10; face black; Maui .....  
 ..... *Hylaeus kukui*, **new species** (p. 127)
- Hairs of lower paraocular area very long, 14-20; sometimes with paraocular marks; Maui and Molokai ..... *Hylaeus haleakalae* (Perkins), in part (p. 100)
- 31(4). Paraocular marks large and broad (Fig. 45G), usually extending well above the antennal sockets; or if only slightly above, a longitudinal or triangular clypeal mark is usually present ..... 32
- Paraocular marks small and narrow, not or barely extended above the antennal sockets, or absent; clypeal mark, if present, transverse and apical (Fig. 42G) ..... 33
- 32(31). Median plate yellow (Fig. 3); clypeus entirely black; Hawaii .....  
 ..... *Hylaeus kona* (Blackburn) (p. 122)
- Median plate brown to black; clypeus with at least a small apical mark; Oahu .....  
 ..... *Hylaeus mimicus*, **new species** (p. 142)
- 33(31). Supraclypeal area short, W/L ratio 2.5 or more; or if ratio about 2.0, the propodeum is almost entirely smooth coriaceous and flat with a pronounced brow ..... 34
- Supraclypeal area relatively long, W/L ratio about 2.0; propodeum with lineate rugae about halfway to brow; basal area sloping, brow rounded; Hawaii ...  
 ..... *Hylaeus hula* (Perkins) (p. 112)

- 34(33). Hairs of lower paraocular area long, 10-20 ..... 35  
 — Hairs of lower paraocular area short, 4-10 ..... 36
- 35(34). Face with paraocular marks; Hawaii ..... *Hylaeus filicum* (Perkins) (p. 83)  
 Face entirely black; Maui ..... *Hylaeus melanothrix* (Perkins) (p. 140)
- 36(34). Prothorax unmarked, or with marks only on the lobes or collar (not both); face  
 variable ..... 37  
 — Prothoracic collar and lobes both marked; paraocular area usually marked (some  
 specimens may have facial marks reduced) ..... 41
- 37(36). Basal area of propodeum with dorsal surface not as long as scutellum, and sloping,  
 brow not particularly pronounced; mesosoma convex in lateral view; wing  
 length greater than 4.0 mm ..... 38  
 — Basal area of propodeum with horizontal surface long, about as long as scutellum,  
 with brow pronounced; mesosoma depressed, nearly flat in lateral view; small  
 species, wing length usually less than 4.0 mm; Hawaii .....  
 ..... *Hylaeus pele* (Perkins) (p. 163)
- 38(37). Vertex and scutum hair medium to long, 10-20 and (4-)6-16 respectively ..... 39  
 — Vertex and scutum hair short, 6-10 and 2-6 respectively; Molokai .....  
 ..... *Hylaeus* species A (p. 208)
- 39(38). Pale area of front tibia obscure (sometimes with a small yellow spot at base of  
 tibia); face in lateral view gently convex ..... 40  
 — Pale area of front tibia bright orange or yellow; face in lateral view strongly convex;  
 Maui Nui, Oahu ..... *Hylaeus unicus* (Perkins) (p. 198)
- 40(39). Punctuation of upper frons distinct, relatively deep, pits crowded and distorted  
 medially; Hawaii, Maui ..... *Hylaeus coniceps* (Blackburn), in part (p. 61)  
 — Punctuation of upper frons evident but shallow, pits not crowded medially except  
 sometimes near frontal line; Hawaii, Maui Nui, Oahu, Kauai .....  
 ..... *Hylaeus connectens* (Perkins), in part (p. 64)
- 41(36). Face in lateral view only slightly protruding beyond the inner margin of the eyes  
 ..... 42  
 — Face strongly bulging outward, very obvious in lateral view; Hawaii .....  
 ..... *Hylaeus crabronoides* (Perkins) (p. 68)
- 42(41). Upper frons with pits about 1 pit width apart, sometimes slightly closer medially  
 but not crowded or distorted anywhere ..... 43  
 — Upper frons with dense punctuation, less than 1 pit width apart, pits crowded and  
 distorted at least near the frontal line ..... 44

- 43(42). Upper frons smooth, shiny; only known specimen with large paraocular marks and a transverse clypeal mark (Fig. 42G); Oahu .....  
 ..... *Hylaeus mana*, **new species** (p. 135)
- Upper frons minutely granular, slightly lustrous; paraocular marks small, sometimes reduced to an obscure spot, clypeus black; Hawaii .....  
 ..... *Hylaeus dimidiatus* (Perkins) (p. 75)
- 44(42). Scutum hairs short, mostly 4-6, longer hairs to 10 common ..... 45
- Scutum hairs extremely short, mostly 2, very few longer hairs; Maui, Lanai .....  
 ..... *Hylaeus angustulus* (Perkins) (p. 47)
- 45(44). Impunctate area laterad of lateral ocellus shiny, surface sculpture faint or indistinct; dull area between median ocellus and antennal sockets broad, about twice as wide as ocellus, and strongly contrasting with lustrous lateral frons; wing length usually 3.8 mm or less; uncommon, local; Hawaii, Maui?, Oahu, Kauai .....  
 ..... *Hylaeus specularis* (Perkins), in part (p. 189)
- Impunctate area laterad of lateral ocellus only slightly lustrous, distinctly coriaceous or minutely granular; dull area between median ocellus and antennal sockets narrow, only about as wide as median ocellus, and not strongly contrasting with lateral frons; wing length usually 3.8 mm or more; very common and widespread; Hawaii ..... *Hylaeus dumetorum* (Perkins) (p. 78)
- 46(5). Scutum hair long, 12-20, usually red-brown ..... 47
- Scutum hair short, 6-10, white to pale brown; Hawaii, Maui Nui, Oahu, Kauai .....  
 ..... *Hylaeus laetus* (Perkins), in part (p. 129)
- 47(46). Malar area medium to long, ratio greater than 0.6 DMO ..... 48
- Malar area short, ratio 0.6 DMO or less ..... 49
- 48(47). Malar area very long, ratio greater than 1.0 DMO; longest hairs of lower paraocular area about 20; Maui ..... *Hylaeus nivicola* Meade-Waldo (p. 155)
- Malar area medium length, ratio 0.8-1.0 DMO; longest hairs of lower paraocular area about 14; Hawaii, Maui ..... *Hylaeus volcanicus* (Perkins) (p. 205)
- 49(47). Hawaii, Maui Nui; very common ..... *Hylaeus difficilis* (Perkins) (p. 71)
- Hawaii; rare ..... *Hylaeus simplex* (Perkins) (p. 184)
- Maui Nui, Oahu; rare ..... *Hylaeus facilis* (F. Smith) (p. 80)
- 50(5). T6 hairs conspicuously erect, dark, usually simple or sparsely plumose ..... 51
- T6 hairs prostrate or appressed, golden brown, densely plumose ..... 55
- 51(50). Malar area short, ratio about 0.5 DMO or less ..... 52
- Malar area long, ratio about 0.8 DMO; Maui .....  
 ..... *Hylaeus takumiae*, **new species** (p. 195)

- 52(51). Mandible normal, with two teeth (Fig. 9A) ..... 53  
 — Mandible modified, with three teeth or none (Figs. 9B, 9C) ..... 54
- 53(52). Vertex and scutum hair short to medium, 6-12; Hawaii, Maui .....  
 ..... *Hylaeus psammobius* (Perkins) (p. 170)  
 — Vertex and scutum hair long, 12-20 and 10-18 respectively; Hawaii, Maui .....  
 ..... *Hylaeus coniceps* (Blackburn), in part (p. 61)
- 54(52). Mandible with three similar-sized teeth (Fig. 9B); scutum hair short, 2-6; coast of  
 Hawaii, Maui Nui (including Kahoolawe), Oahu .....  
 ..... *Hylaeus anthracinus* (F. Smith) (p. 52)  
 — Mandible straight across at apex, as wide or wider at apex than at articulation  
 (Fig. 9C); scutum hair medium to long, 8-20; mountains of Hawaii .....  
 ..... *Hylaeus rugulosus* (Perkins), (p. 176)
- 55(50). Upper frons with dense granular sculpture and minute transverse wrinkles,  
 obscuring punctation medially in frontal view, only very slightly lustrous;  
 large species, wing length usually over 6 mm ..... 56  
 — Upper frons ground almost smooth to coriaceous, punctation obvious, more  
 strongly lustrous; smaller species, wing length less than 6 mm ..... 57
- 56(55). Maui Nui (including Kahoolawe), Oahu .. *Hylaeus assimulans* (Perkins) (p. 55)  
 — Hawaii ..... *Hylaeus ombrias* (Perkins) (p. 158)
- 57(55). Punctation of upper frons denser medially, with crowded, distorted pits around  
 median line ..... 58  
 — Punctation of upper frons almost even, pits sometimes close above antennal socket  
 but not crowded and distorted; Hawaii, Maui, Lanai .....  
 ..... *Hylaeus flavipes* (F. Smith), in part (p. 90)
- 58(57). Upper frons strongly lustrous, almost shining, especially laterally; rare, Hawaii,  
 Lanai, Molokai .. *Hylaeus niloticus* (Warncke), **new combination** (p. 152)  
 — Upper frons only slightly lustrous, even laterally; Maui Nui, Oahu .....  
 ..... *Hylaeus longiceps* (Perkins) (p. 133)

TAXONOMY OF *HYLAEUS* (*NESOPROSOPIS*) SPECIES*Hylaeus* (*Nesoprosopis*) *akoko* Magnacca and Daly, new species

(Fig. 10)

**DIAGNOSIS.** Large bees with punctured terga. Males with a large ivory mark on the scape, irregular apical spots on the clypeus (probably some individuals will be found with a complete transverse line, or unmarked), and orange and ivory marks on the legs. Scape strongly arched. Most of body with close, deep punctation. Similar to *H. pubescens*, differing in the more extensive markings, nearly straight lateral edge of scape, lack of a distinct hump on S2, and lack of densely plumose golden or orange hair on T5-T7.

**Distribution.** Hawaii; only one specimen known, from mesic forest.

**Male.** Measurements: Malar space, 8; eye, 180:134:136:96; clypeus, 96×86; frons, 36×34:108; interalveolar, 24:32:54:62, D 24; interocellar, 30:36:36:42, D 18; scape, 60×46; wing length, 7.1 mm (holotype).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons with distinct, nearly round pits about 1 pit width apart or less; ground minutely granular, slightly lustrous; no impunctate area above antennal sockets. Lower paraocular depression distinct. Frontoclypeal sulcus nearly straight. Scape in frontal view moderately dilated, width more than half length, ratio about 0.8; lateral edge in frontal view nearly straight; strongly arched in lateral view with maximum arch about two-thirds along; underside with a narrow groove; with medium-length, pale, simple hair. Vertex hair 16-24, white, simple.

**Mesosoma.** Scutum with distinct pits 1 pit width apart or less, ground granular, dull; hair medium to long (10-16), white, simple. Scutellum similar, with pits slightly larger. Mesepisternum with pits distinct, round, less than 1 pit width apart, and long, pale brownish white, plumose hair; ground granular, dull. Hypoepimeron punctured, slightly lustrous, distinctly swollen. Metanotum dull. Basal area of propodeum slightly protuberant in middle, roughened overall by reticulate rugae; rugae and ground minutely wrinkled, slightly lustrous; lateral carina strong, terminating anterolaterally in a protuberant area.

**Metasoma.** Disk of T2 with distinct punctation, pits less than 1 pit width apart; with fine, pale, appressed hairs denser, longer, plumose, and white at posterolateral margins; ground smoothly coriaceous, lustrous. Pits deeper, more distinct on T3-7. S2 evenly convex, but without a distinct hump. T7 hair dark reddish brown, prostrate; T5-6 hair not particularly plumose or dense.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 strongly dilated, apex bifurcate with broad, rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face of holotype with small, obscure ivory spots along apical margin of clypeus, probably varying from unmarked to a transverse stripe; scape in frontal view ivory on lateral third. Pronotum with narrowly interrupted ivory transverse collar stripe; lobes unmarked. Legs marked as follows: fore and mid tibiae and femora orange anteriorly (similar to typical pale area), fore and mid tibiae with small basal and apical ivory marks; hind tibia with an ivory stripe along entire

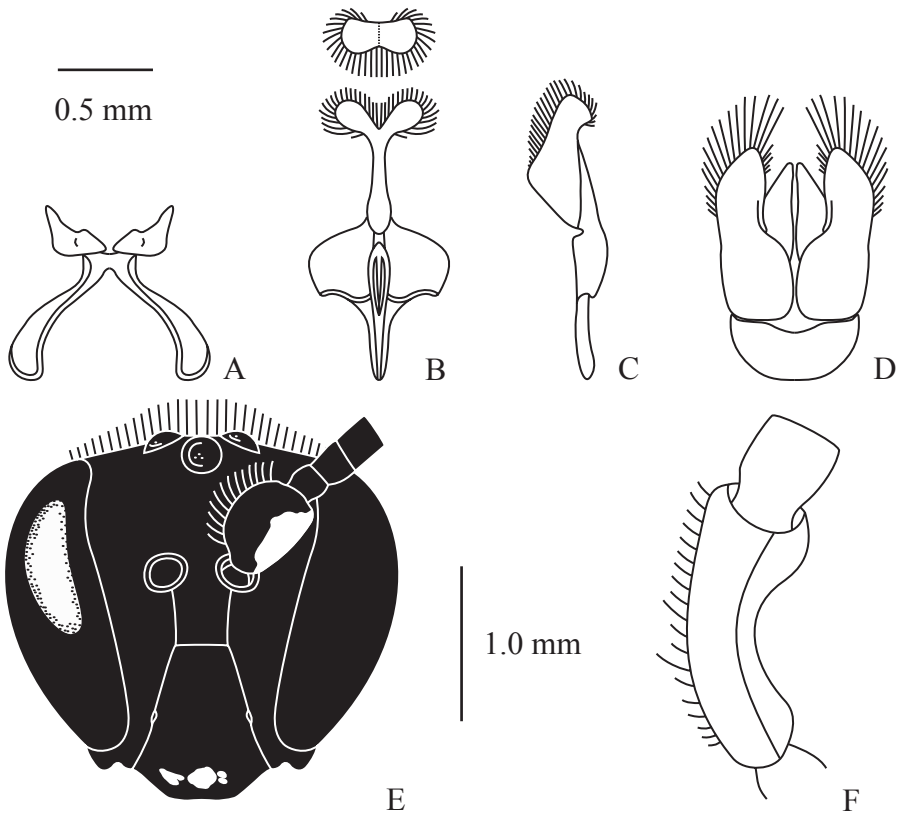


Fig. 10. *Hylaeus akoko*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E.

dorsal length, narrowly interrupted about three-quarters to apex; all basitarsi ivory; mid and hind second tarsal segments with ivory spot. Wings dark smoky.

**Female.** Unknown.

**Holotype** ♂ labeled "HI: Hawaii Is., Puu Waawaa, 4100', on *Chamaesyce olowaluana*. K. Magnacca, 1 August 2002, KM-02-092" (CUIC).

**Flower records.** *Chamaesyce olowaluana*.

**Etymology.** The species epithet *akoko* comes from the Hawaiian name for *Chamaesyce*.

**Remarks.** This appears to be a relative of *H. pubescens* adapted to drier habitats. Although only a few *C. olowaluana* trees have been collected on, they can support a remarkable density of bee species; eight species were collected in company with this one, including the rare *H. dimidiatus*, *H. filicum*, and *H. hula*. Unfortunately these formerly common trees are not reproducing because seedlings are eaten by sheep.

***Hylaeus (Nesoprosopis) andreoides* (Perkins)**

(Fig. 11)

*Nesoprosopis andreoides* Perkins, 1899:111 (♀; Pl. 2, Fig. 6; flower: *Metrosideros*).*Hylaeus (Nesoprosopis) andreoides*, Meade-Waldo, 1923:35 (list).*Nesoprosopis andreoides*, Daly, 1994:116 (lectotype ♀ BMNH 17a 145; Kauai, Waimea, 2000 ft; wing length, 7.6 mm).

**DIAGNOSIS.** Large bees with punctured terga and dark wings, terga with unique apical bands of white pubescence, and unique body color with blue reflections. Male face with a parallel-sided stripe and with extremely dilated scape.

**Distribution.** Kauai; montane mesic and wet forest.

**Male.** Measurements: Malar space, 7; eye, 154:142:140:93; clypeus, 83×81; frons, 25×32:98; interalveolar, 20:34:56:66, D 20; interocellar, 32:42:29:44, D 20; scape, 56×69; wing length, 6.2 mm (Kauai, Alakai Swamp Trail, 3600 ft, KM-99-212).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area, frons, and middle uniformly with contiguous, slightly distorted pits; ground largely eliminated by pits, lustrous; frontal line present; small impunctate, lustrous area above antennal socket. Lower paraocular depression distinct, minutely wrinkled to smooth, shiny. Frontoclypeal sulcus slightly arched. Scape in frontal view heart-shaped, extremely dilated, width greater than length, ratio about 1.2; lateral edge in frontal view strongly convex; strongly arched in lateral view with maximum arch near middle of scape; underside of median edge with a broad, shallow pit near the apex; with long, brownish, simple hair. Vertex hair 16-30, pale brown, mostly simple.

**Mesosoma.** Scutum with distinct pits 1-2 pit widths apart, ground slightly granular and slightly lustrous; hair medium-length (10-14), brown, mostly simple. Scutellum with slightly larger pits, smoothly coriaceous, lustrous. Mesepisternum with distinct to indistinct, mostly round pits, about 1 pit width apart or less, with long, brown, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron punctured, smooth, lustrous, swollen. Metanotum minutely wrinkled, dull. Basal area of propodeum reticulate to areolate rugose including brow, shiny between rugae; below brow granular, dull.

**Metasoma.** Disk of T2 impunctate, polished and shiny, generally with fine short hairs spaced about one hair length apart; apical terga with minute pits. Terga 1-3 at sides with conspicuous apical bands of appressed, white, thick, plumose hair. T7 hair long, erect, dark brown.

**Terminalia.** Lateral process of S7 tapered, slender, length greater than width of hemisternite. Median process of S8 slightly dilated, apex bifurcate with moderately long, straplike, rounded tips. Apices of gonoforceps exceeding penis valves, strongly curved inward.

**Color.** Labrum and mandible black. Face with a narrow, longitudinal stripe: clypeus with central yellow stripe full length; supraclypeal area below acme with yellow spot that may or may not be continuous with clypeal stripe; paraocular area and scape unmarked. Pronotum unmarked. Legs dark brown to black except fore tibia and distal fore femur with pale areas. Mesosoma black with faint metallic blue reflections; metasoma black with distinct blue reflections. Wings dark brown with iridescence.



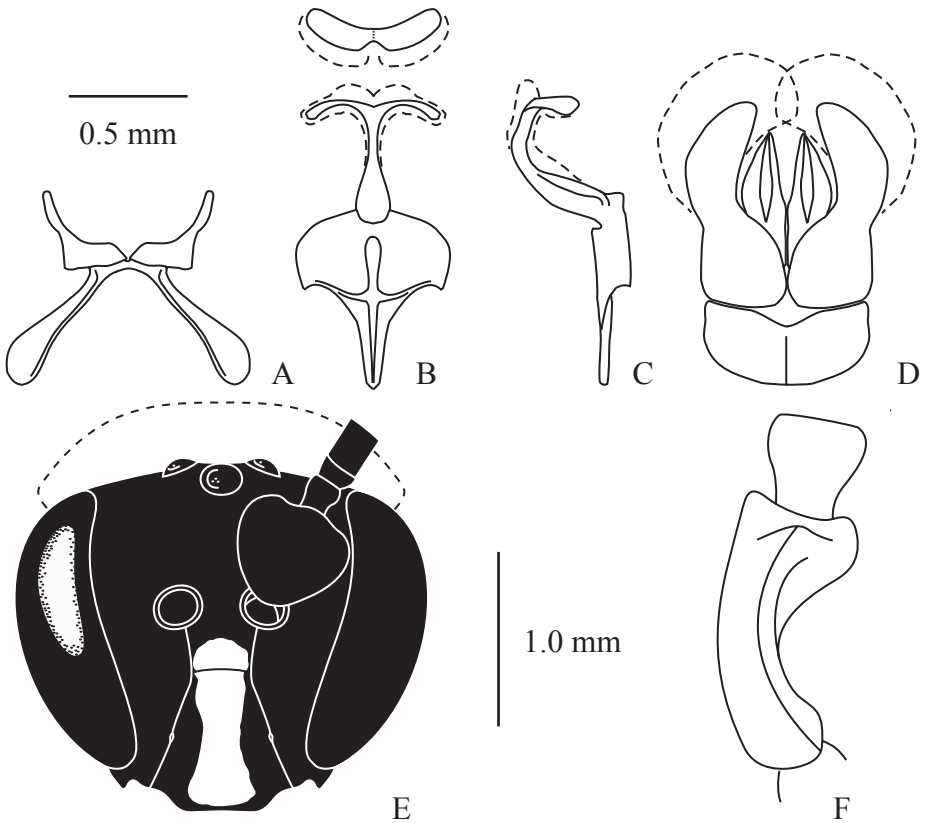


Fig. 11. *Hylaeus andrenoides*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Female. Head.** Malar space medium (ratio about 0.5 DMO). Upper paraocular area, frons, and middle uniformly with round or slightly distorted pits about 1 pit width or less apart; ground not visible in some bees, if visible among pits then with minute parallel wrinkles curved laterad from beneath ocelli to downward along eye, slightly lustrous; frontal line present. Apex of clypeus shallowly emarginate. Mandible weakly three-toothed, the two anterior (dorsal) teeth poorly separated. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-30, white, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct pits 1-2 pit widths apart, ground granular, dull; hair long (12-24), white, weakly plumose. Scutellum with slightly larger pits, ground dull to slightly lustrous. Mesepisternum with distinct, round pits, 1 pit width apart, and medium-length, brown, weakly plumose hair; ground minutely

wrinkled, slightly lustrous. Hypoepimeron with distinct, round pits, 1-2 pit widths apart, ground minutely wrinkled; slightly swollen. Metanotum dull. Basal area of propodeum reticulately rugose over most of the area including brow, shiny between rugae.

**Metasoma.** Disk of T2 impunctate, polished and shiny, generally with fine very short hairs more than a hair length apart; apical terga with minute pits. Conspicuous apical bands of appressed, thick, white, plumose hair on terga 1-4, thin or interrupted at middle of terga 1 and 4, complete on terga 2-3. T6 hair long, prostrate to erect, dark brown.

**Color.** Head and legs dark brown, except fore tibia with or without pale area; thorax black; metasoma black with bluish reflections. Face and pronotum unmarked. Wings dark brown with iridescence.

**Perkins' collections. Kauai:** Waimea, 2000 ft (BMNH).

**Recent collections. Kauai:** Alakai Swamp Trail, 3600 ft; Mohihi Trail, 3700 and 4000 ft; Paaiki Valley, 2700 ft, Pihea Trail.

**Flower records.** *Chamaesyce atrocoeca*, *Cheirodendron*, *Claoxylon*, *Metrosideros*, *Psychotria mariniana*.

**Remarks.** The unusual blue color and abdominal hair bands of this species make it one of the most striking *Nesoprosopis*.

**References.** Perkins, 1913:82 (biogeography).

### *Hylaeus (Nesoprosopis) angustulus* (Perkins)

(Fig. 12)

*Nesoprosopis angustula* Perkins, 1899:95-96 (♂ ♀).

*Hylaeus (Nesoprosopis) angustulus*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis angustula*, Daly, 1994:116 (lectotype ♂ BMNH 17a 150a; Lanai, Mts. Koele, 2500 ft).

**DIAGNOSIS.** Medium-sized bees with clear wings, propodeum with weak basal rugae, otherwise smooth to brow. Male has unusual scape with very slight arch, very short malar space, frons with dull, dense pits but no dark patch of hair, three separate yellow facial marks and otherwise unmarked. Female with black body, short malar space, pronotal lobes and collar at extreme sides marked with yellow, sometimes with yellow paraocular marks.

**Distribution.** Maui (new record) and Lanai; montane wet forest.

**Male.** Measurements: Malar space, 3; eye, 99:89:86:57; clypeus, 52×49; frons, 18×22:71; interalveolar, 14:17:40:48, D 18; interocellar, 22:26:18:26, D 14; scape, 37×18; wing length, 4.0 mm (*H. angustulus* lectotype).

**Head.** Malar space very short (ratio about 0.2-0.3 DMO). Upper paraocular area with nearly round, distinct pits about 1 pit width apart, ground with parallel wrinkles; frons with pits becoming closer, smaller, distorted, contiguous and aligned with parallel wrinkles; at middle pits very dense and dull (at certain angles a transverse band of dark sculpture is evident), but no dark spot with hairs; no frontal line; large lustrous impunctate area above antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus nearly straight or slightly arched. Scape in frontal view slightly dilated, width half length, ratio about 0.5;

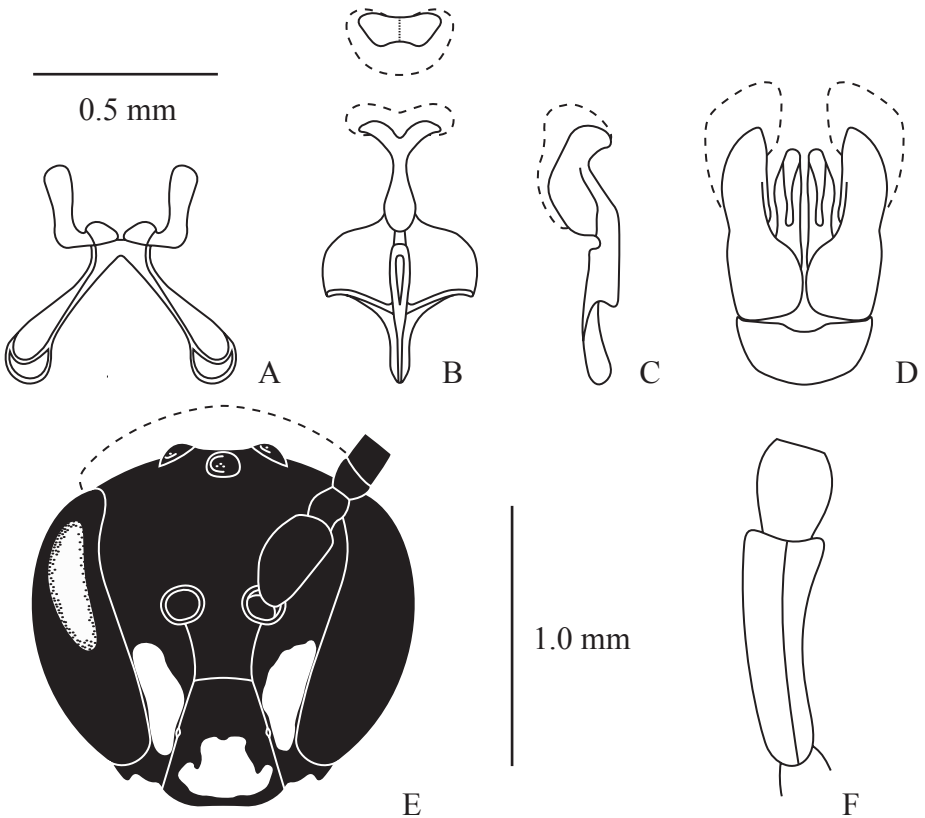


Fig. 12. *Hylaeus angustulus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

lateral edge in frontal view nearly straight; very slightly arched in lateral view with maximum arch near middle of scape; underside of median edge with a broad depression with granular sculpture; with medium-length, brown, simple hair. Vertex hair 12-20, brown, simple.

**Mesosoma.** Scutum with indistinct minute pits 1-2 pit widths apart, ground granular, dull; hair very short (2-4), dark brown, simple. Scutellum and metanotum with pits larger, more distinct, 2 pit widths apart and with ground granular, slightly lustrous. Mesepisternum with indistinct, round pits about 1-3 pit widths apart, and sparse, long, pale brown, weakly plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Basal area of propodeum with short, weak, widely spaced, lineate rugae in basal quarter; anterior area rather long, smoothly coriaceous, lustrous, and with pronounced brow.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; largely hairless, but with some fine, pale, appressed hairs spaced more than a hair length apart. T7 hair long, black, erect.

**Terminalia.** S7 strongly L-shaped: lateral process almost parallel-sided, widest near apex, length greater than width of hemisternite; hemisternite very short. Median process of S8 strongly dilated, apex bifurcate with short, broad, rounded tips. Apices of gonoforceps exceeding penis valves.

**Color.** Labrum and mandible brown to black. Head and mesosoma black; metasoma dark brown. Face with three separate yellow marks: clypeus with irregular subapical spot; lower paraocular area with mark to level of antennal socket; scape unmarked. Pronotum with or without yellow marks on lobes. Legs dark brown except fore tibia with pale area, sometimes extended onto apex of femur or base of basitarsus. Wings clear.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with distinct, round pits about 1 pit width apart; on frons pits becoming smaller but still 1 pit width apart, ground minutely wrinkled and lustrous; at middle pits contiguous, distorted, separated by longitudinal wrinkles. Frontal line faint. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 10-16, brown, mostly simple.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with extremely small, obscure pits more than 2 pit widths apart, ground granular, dull; hair very short (2-4), brown, simple. Scutellum with pits larger, more distinct, 2 pit widths apart and with ground granular, slightly lustrous. Mesepisternum with indistinct pits 1-3 pit widths apart, and yellowish white, weakly plumose hair; ground smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Metanotum with indistinct pits less than 1 pit width apart, ground granular and dull. Basal area of propodeum with short, weak, widely spaced, lineate rugae in basal quarter; anterior area long, smoothly coriaceous, lustrous, and with pronounced brow.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with large bare areas, otherwise with fine, short, pale, appressed hairs spaced more than a hair length apart. T6 hair long, dark brown, erect.

**Color.** Head and mesosoma black; legs and metasoma dark brown. Face with small paraocular marks or unmarked. Pronotum with lobes yellow and with yellow spots at extreme sides of collar. Legs with fore tibia with obscure pale area, all tibiae with or without yellow marks at base. Wings yellowish, nearly clear.

**Perkins' collections. Lanai:** Mts. Koele, 2500 ft (BMNH).

**Recent collections. Maui:** Makawao Forest Reserve, 3600-4300 ft.

**Flower records.** *Melicope* sp., *Rubus penetrans*\*.

**Remarks.** Although this species has not been recollected on Lanai, recent specimens from East Maui match them closely. It is very close to *H. dumetorum* from Hawaii, including the unique broad groove on the underside of the scape, but lacks the conspicuous patch of long black hair on the frons of that species.

**References.** Perkins, 1910:602 (key).

*Hylaeus (Nesoprosopis) anomalus* (Perkins)

(Fig. 13)

*Nesoprosopis anomala* Perkins, 1899:112-113 (♀; holotype ♀ BMNH 17a 146; Oahu, Honolulu, 2000 ft, wing length, 5.6 mm; flower: *Acacia koa*).

*Hylaeus (Nesoprosopis) anomalus*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis anomala*, Daly, 1994:116 (holotype ♀ confirmed).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings; scutum with unusual dense punctation less than 1 pit width apart; unique long, pale yellow-brown, plumose hair on mesosoma; may have some red on metasomal terga; and punctured terga. Male with yellow facial mark only at apex of clypeus or extended at sides in a narrowing stripe above antennal sockets; clypeal mark transverse and apical, or extended dorsally to the supraclypeal area. Face marks similar to *H. gliddena*, from which it differs by the mostly black metasoma and the shape of the scape and terminalia. Fresh male specimens are said to have T1-3 orange red at base. Female with unique red head, antennae, and T1.

**Distribution.** Oahu; montane mesic and wet forest. No recent collections.

**Male.** Measurements: Malar space, 7; eye, 141:124:120:84; clypeus, 77×69; frons, 23×31:90; interalveolar, 22:28:51:61, D 22; interocellar, 33:33:26:33, D 17; scape, 46×32; wing length, 5.1 mm (Oahu, Waimea, 1800 ft, BPBM 3221).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with round, contiguous pits; a broad area of frons above antennal sockets with smaller, contiguous pits and dark hair creating a large somewhat dark area. Lower paraocular depression absent. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view nearly straight; strongly arched in lateral view with maximum arch near middle of scape; no groove on underside; with medium-length, pale yellow-brown, mostly weakly plumose hair. Vertex hair 20-30, pale yellow-brown, mixed simple and weakly plumose.

**Mesosoma.** Scutum with distinct, nearly round pits, less than 1 pit width apart, ground minutely wrinkled and dull; hair medium-length (10-16), pale yellow-brown, plumose. Mesepisternum with round pits less than 1 pit width apart, and long, pale yellow-brown, plumose hair; ground smooth to minutely wrinkled, slightly lustrous. Hypoepimeron punctate, smooth, slightly lustrous; slightly swollen. Metanotum dull. Basal area of propodeum reticulately rugose over entire area; shiny between rugae; sides of propodeum with dense, long, pale brown, plumose.

**Metasoma.** Disk of T2 with distinct punctation consisting of minute, shallow pits about 2 pit widths apart; smoothly coriaceous, lustrous; with fine, short, pale, appressed hairs. T7 hair medium-length, brown, prostrate.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with broad, rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible yellowish brown to brown. Face with only a narrow yellow line at apex of clypeus or with a "U" or trident shape facial mark: clypeus with irregular transverse yellow mark, often extended basally in a narrow line as far as acme; paraocular

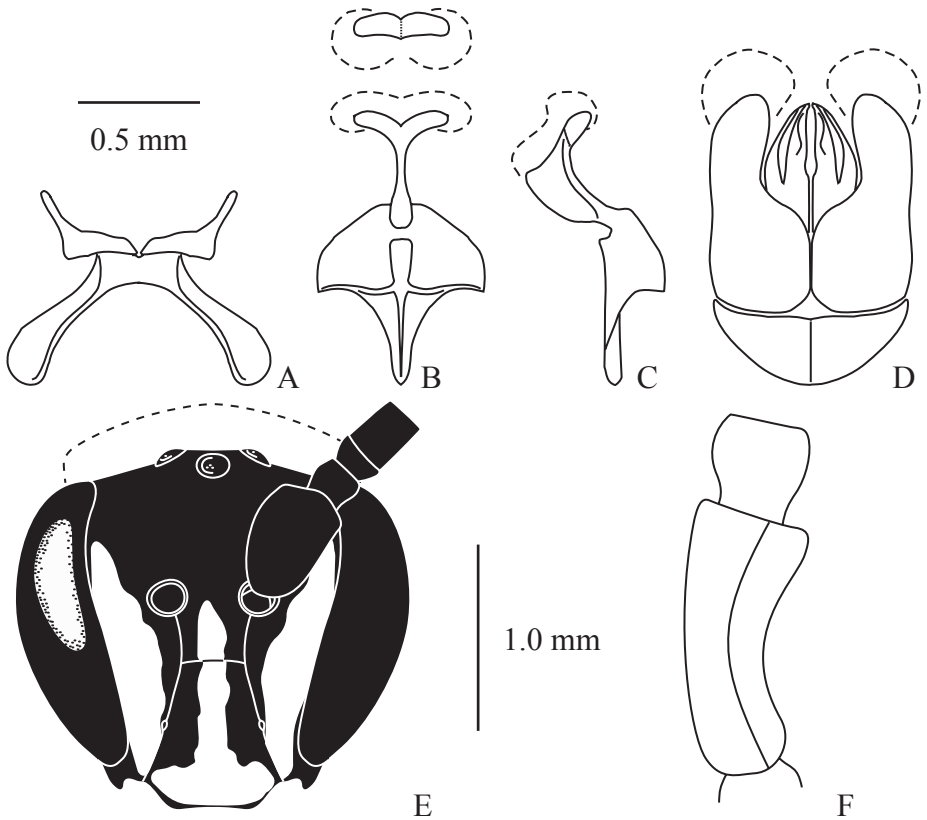


Fig. 13. *Hylaeus anomalus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

area with yellow band along the eye to well above antennal socket; scape unmarked but yellowish brown. Pronotum with transverse collar stripe complete; lobes unmarked. Legs orange to yellowish brown except hind tibia with obscure yellow stripe in basal third of segment. Abdominal terga with or without red on T1-3. Wings clear.

**Female. Head.** Malar space medium-length (ratio about 0.5 DMO). Upper paraocular area and frons with contiguous, subpolygonal pits uniformly across areas; a few longitudinal wrinkles at the middle; no frontal line evident. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended just to level of lateral ocellus. Vertex hair 20-30, pale brown, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct, nearly round pits, less than 1 pit width apart, ground minutely wrinkled, dull; hair medium-length (8-

16), plumose, pale yellow-brown. Mesepisternum with round or slightly distorted pits less than 1 pit width apart or contiguous, and yellow to brownish white, plumose hair; ground nearly smooth, lustrous. Hypoepimeron punctate, nearly smooth, lustrous; slightly swollen. Metanotum dull. Basal area of propodeum reticulately rugose over entire area; shiny between rugae.

**Metasoma.** Disk of T2 with distinct punctation consisting of minute, shallow pits about 2 pit widths apart; smoothly coriaceous, lustrous; with fine, short, pale, appressed hairs. T6 hair long, dark brown, erect.

**Color.** Head and antennae red; mesosoma black; metasoma with first segment red, the remainder dark reddish black. Face unmarked. Pronotum with ivory transverse collar stripe complete; lobes unmarked and black. Tegula with ivory spot. Legs red except: fore tibia with basal ivory spot; mid tibia with two-thirds ivory stripe; and hind tibiae with ivory stripe almost full length. Wings smoky.

**Perkins' collections. Oahu:** Honolulu, 2000 ft (BMNH); Tantalus (BPBM, OUMNH); Waimea, 1800 ft (BPBM).

**Recent collections.** None.

**Flower records.** *Acacia*, *Psychotria* sp.

**Remarks.** Colors of the integument and pubescence are based on old specimens. Fullaway (1918) describes the male with orange red legs and basal abdominal terga, but specimens we have seen have the legs yellowish brown and the terga reddish brown or without a distinct red color on the abdomen. The marks of the male are yellow; those of the female are ivory. Although most species with punctured terga have the scutum punctation relatively close, this species has the most extreme development of this character.

**References.** Perkins, 1907a:43 (record: Oahu, Tantalus); 1910:604 (key); 1913:82 (biogeography). Fullaway, 1918:397-398 (♂ ♀). Swezey, 1922:14 (nest: in *Pipturus* tree; odor of citronella; flower: *Psychotria* (referred to as *Straussia*); record: Oahu, Tantalus); 1954:39, 167 (nest: in twigs of *Boehmeria grandis* and *Pipturus*; record: Oahu, Tantalus). Meade-Waldo, 1923:35 (list). Williams, 1927:427 (nest: in dead twigs of *Pipturus* and *Boehmeria*; flower: *Acacia koa*).

### *Hylaeus (Nesoprosopis) anthracinus* (F. Smith)

(Fig. 14)

*Prosopis anthracina* F. Smith, 1853:23 (♂ ♀).

*Nesoprosopis anthracina*, Perkins, 1899:100-101 (♂ ♀; synonymy; Pl. 2, Fig. 17).

*Hylaeus (Nesoprosopis) anthracinus*, Meade-Waldo, 1923:34 (list, synonymy).

*Prosopis anthracina*, Daly, 1994:119 (lectotype ♀ BMNH 17a 172; Sandwich Islands; wing length, 4.1 mm).

*Prosopis rugiventris* Blackburn, 1886:146-148 (♂ ♀; key) (synonymy, Perkins 1899:100).

*Prosopis rugiventris*, Daly, 1994:113 (types not located).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings, black legs. Male face with oval yellow mark or lower face all yellow, not reaching above antennal sockets; scape

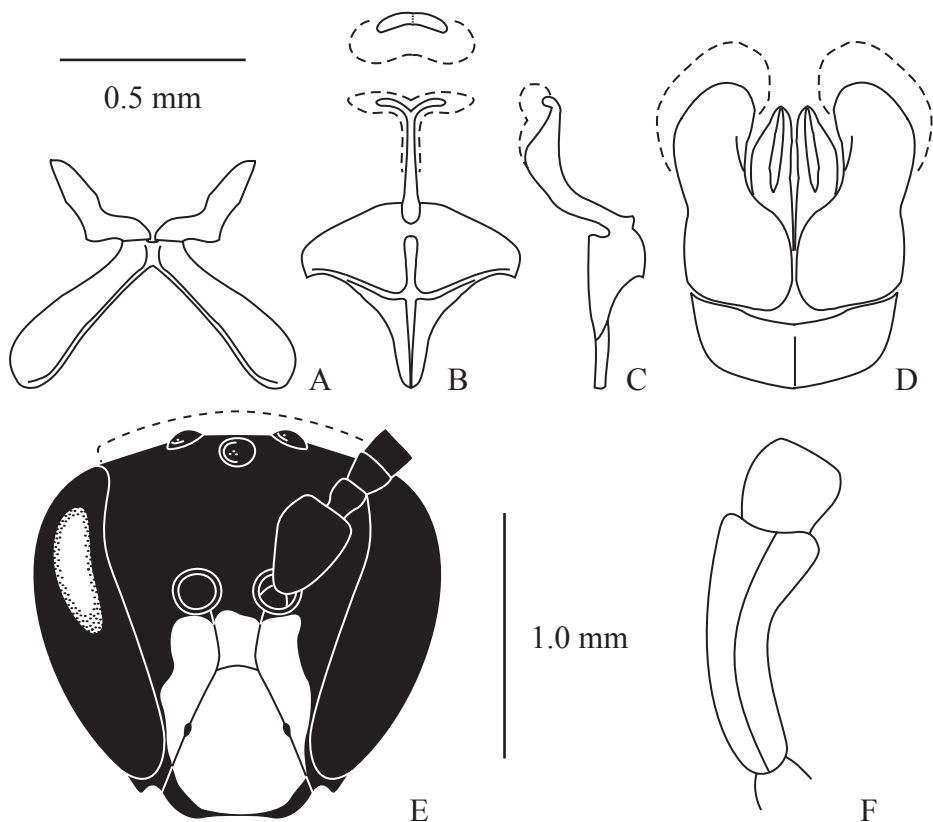


Fig. 14. *Hylaeus anthracinus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

moderately to strongly dilated. Female is entirely black. Usually occurs in company with *H. flavipes* or *H. longiceps*, from which the females can be distinguished by the black hairs on the apex of the abdomen and the unusual three-toothed mandible, a feature shared only with *H. flavifrons*. Closely related to *H. flavifrons*, from which the male differs in the less dilated scape, undilated process of S8, and usually smaller facial markings.

**Distribution.** Hawaii, Maui, Kahoolawe, Lanai, Molokai, and Oahu; coast and dry lowlands. No recent collections from Lanai.

**Male.** Measurements: Malar space, 5; eye, 148:113:110:77; clypeus, 77×74; frons, 28×26:95; interalveolar, 18:28:51:61, D 20; interocellar, 31:28:18:26, D 15; scape, 46×34; wing length, 4.3 mm, tip damaged (Maui, BPBM 3224).



**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons rather flat and uniformly covered with round, shallow pits about 1 pit width apart, interrupted at the middle in some bees by faint, incomplete frontal line; impunctate area above antennal sockets quite small, pits evident close to socket; ground minutely wrinkled, but smooth, lustrous. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately to strongly dilated, width more than half length, ratio about 0.7-0.9; in moderately dilated scapes lateral edge in frontal view nearly straight in middle and rounded only at ends, and in strongly dilated scapes lateral edge distinctly rounded (convex); moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with short, white, weakly plumose hair. Vertex hair 6-10, white, plumose.

**Mesosoma.** Scutum with distinct pits about 1-2 pit widths apart, ground of scutum and scutellum smoothly coriaceous, lustrous; hair short (4-6), white to pale brown, weakly plumose. Mesepisternum with distinct, shallow, round pits, about 1 pit width apart, and short, yellowish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron with few obscure pits, lustrous, slightly swollen. Metanotum minutely wrinkled, dull. Basal area of propodeum lineately rugose or somewhat reticulate to brow, shiny between rugae; ground below brow slightly granularly coriaceous, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, short, pale, appressed hairs spaced about one hair length apart. T7 hairs dark brown, medium-length, erect.

**Terminalia.** Lateral process of S7 tapered, broad, length much greater than width of hemisternite. Median process of S8 linear or slightly dilated just distal to flexure, apex bifurcate with narrow tips longer than broad. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with a single large spot: clypeus entirely yellow or nearly so; lower paraocular area with a stripe along sulci of variable width, usually relatively broad; supraclypeal area to acme yellow; scape unmarked. Pronotum unmarked. Legs dark brown to black, unmarked except pale area on fore tibia. Wings nearly clear to smoky.

**Female. Head.** Malar space medium-length (ratio about 0.5 DMO). Upper paraocular area and frons rather uniformly with round, shallow pits about 1 pit width apart, ground minutely wrinkled, slightly lustrous; fine frontal line may be evident. Apex of clypeus shallowly emarginate. Apex of mandible straight, with three small but usually distinct teeth (see Fig. 9B). Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 4-8, white, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct pits about 1-2 pit widths apart, ground of scutum and scutellum smoothly coriaceous, lustrous; hair very short (2-6), white to pale reddish brown, mostly simple. Mesepisternum with distinct, shallow, round pits, about 1 pit width apart, and medium-length, yellowish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron with few obscure pits, lustrous, slightly swollen. Metanotum minutely wrinkled, dull. Basal area of propodeum lineately rugose or somewhat reticulate to brow, shiny between rugae; ground below brow slightly granularly coriaceous, slightly lustrous to dull.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, short, pale, appressed hairs spaced about one hair length apart. T6 hair long and erect, dark brown.

**Color.** Head and mesosoma black; legs and metasoma dark brown; unmarked except with or without pale area on fore tibia. Wings nearly clear to smoky.

**Perkins' collections. Hawaii:** Kealakeakua Bay (OUMNH); Kona (BMNH, BPBM). **Maui:** Kaulawai (BPBM); "Maui" (BMNH, BPBM); Maui coast (OUMNH); Wailuku, sand hills (BPBM). **Lanai:** Manele (BPBM, OUMNH). **Molokai:** lower slopes, mtns (OUMNH); plains (BMNH, BPBM, OUMNH). **Oahu:** Honolulu (BPBM), coast (BPBM), mts. (BPBM); Waialua (BMNH); coast (BPBM); Waianae (BMNH, BPBM); Waikiki (BPBM, OUMNH).

**Recent collections. Hawaii:** South Point, coast. **Maui:** Kanaio Natural Area Reserve, 2000 ft; Manawainui West, coast. **Kahoolawe:** Pali o Kalapakea, 1000 ft. **Molokai:** Moomomi, coast. **Oahu:** Kaena Point Natural Area Reserve, coast.

**Flower records.** *Argemone glauca* (Maui), *Chamaesyce celastroides*, *C. degeneri*, *Myoporum*, *Scaevola sericea*, *Sesbania tomentosa*, *Sida*, *Tournefortia*\*

**Remarks.** This once-widespread species appears to have declined precipitously with the loss of coastal habitat, and now appears to be restricted to one or a few localities on each island. However, it appears to have a significant population on the small, uninhabited island of Kahoolawe. *Hylaeus anthracinus* is not closely related to the other species (e.g., *H. difficilis*) with an undilated S8 process and a single central facial mark. The female has three small teeth on the mandible, rather than two large, a unique feature shared only with its sister species, *H. flavifrons* (sometimes other species may appear similar due to wear). It typically occurs in company with *H. longiceps* or *H. flavipes*, from which the females can also be distinguished by the erect dark hairs of T6.

**References.** Blackburn and Cameron, 1886:149 (♂ ♀); 1887:208-209 (♂ ♀). Dalla Torre, 1896:14 (list). Perkins, 1899:104 (probable host of cleptoparasite: *N. hilaris*); 1907a:43 (record: Oahu, Tantalus); 1910:602 (key); 1913:64, 81 (biology, biogeography, morphology). Bridwell, 1919:148 (morphology). Beardsley and Tuthill, 1959:60 (record of *H. anthracinus* from Niihau is probably *H. flavifrons*; see remarks under *H. flavifrons*). Suehiro, 1986:41, 60 (record: Hawaii, Kona). Hopper and Daly, 1995:35 (record of *H. anthracinus* from Kauai is *H. solaris*). *Prosopis rugiventris*: Blackburn, 1887:206-208 (♂ ♀; key). Perkins, 1899:100 (synonym of *N. anthracina*). Meade-Waldo, 1923:34 (in synonymy).

### *Hylaeus (Nesoprosopis) assimulans* (Perkins)

(Fig. 15)

*Nesoprosopis assimulans* Perkins, 1899:101-102 (♂ ♀; Pl. 2, Fig. 19).

*Hylaeus (Nesoprosopis) assimulans*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis assimulans*, Daly, 1994:116 (lectotype ♂ BMNH 17a 165a; Lanai, Mts. Koele, 2000 ft, wing length, 5.6 mm).

*Nesoprosopis assimulans oahuensis* Perkins, 1899:102 (♂ ♀) (new synonymy).

*Hylaeus (Nesoprosopis) assimulans oahuensis*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis assimulans oahuensis*, Daly, 1994:116 (lectotype ♂ BMNH 17a 166b; Oahu, Waianae; wing length, 5.4 mm).

**DIAGNOSIS.** Medium to large bees with slightly smoky to smoky wings and short malar spaces. Male with unusual scape, slightly dilated, widest near the middle and smaller at both ends, and with short plumose hair along the median edge; distinguished from larger, more melanic sister species, *H. ombrias*, by larger facial marks with clypeus always marked and sometimes also the supraclypeal area, lineate rugosity mainly at front half of propodeum, and smoky, but not dark, wings. Female black and unmarked, closely resembling *H. longiceps* and *H. flavipes*; differing in sculpture of the frons (see key), and usually much larger.

**Distribution.** Maui, Lanai, and Oahu; coast and dry lowlands. No recent collections from Oahu.

**Male.** Measurements: Malar space, 8; eye, 157:118:112:86; clypeus, 78×82; frons, 29×27:106; interalveolar, 16:25:55:67, D 24; interocellar, 35:31:24:31, D 18; scape, 55×27; wing length, 5.6 mm (*H. assimulans* lectotype).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with indistinct, round pits about 1 pit width apart, some bees with very weak, parallel wrinkles curved from near lateral ocellus to along the eye; frons with pits becoming more distinct, smaller, and closer medially; middle area with pits contiguous, some pits distorted; central ground nearly smooth, slightly lustrous; no frontal line or other special sculpture at middle; impunctate, lustrous area above antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus straight or nearly so; supraclypeal area variable in shape, W/L ratio 0.8-1.0. Scape in frontal view slightly dilated, widest near the middle, width half of the length, ratio about 0.5; lateral edge in frontal view nearly straight; slightly arched in lateral view with maximum arch near the middle; no groove on underside; with short, yellowish white, plumose hair. Vertex hair 10-14, brown, plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground nearly smooth, slightly lustrous; hair short (4-6), yellowish white, plumose. Mesepisternum with shallow, indistinct pits about 1 pit width apart, and long, white, plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Metanotum dull. Basal area of propodeum with weak, sparse, irregular, lineate rugae halfway or more to brow, shiny between rugae, faintly reticulate behind; brow nearly smoothly coriaceous or minutely wrinkled, lustrous or slightly so.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous; with abundant, fine, short, pale, appressed hairs spaced about one hair length apart. Hairs of T7 pale brown, short, appressed.

**Terminalia.** Lateral process of S7 parallel-sided, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with medium-length, narrow, straplike tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face entirely yellow below the antennae, or the clypeus with narrow to broad black margins making three separate spots; the paraocular marks extended at sides in narrowing stripe to above or just below antennal sockets. Supraclypeal area sometimes with a yellow mark; scape unmarked. Pronotum unmarked. Legs dark brown to black except fore tibia with pale area and with or without obscure basal yellow spots on all tibiae. Wings slightly smoky to smoky.

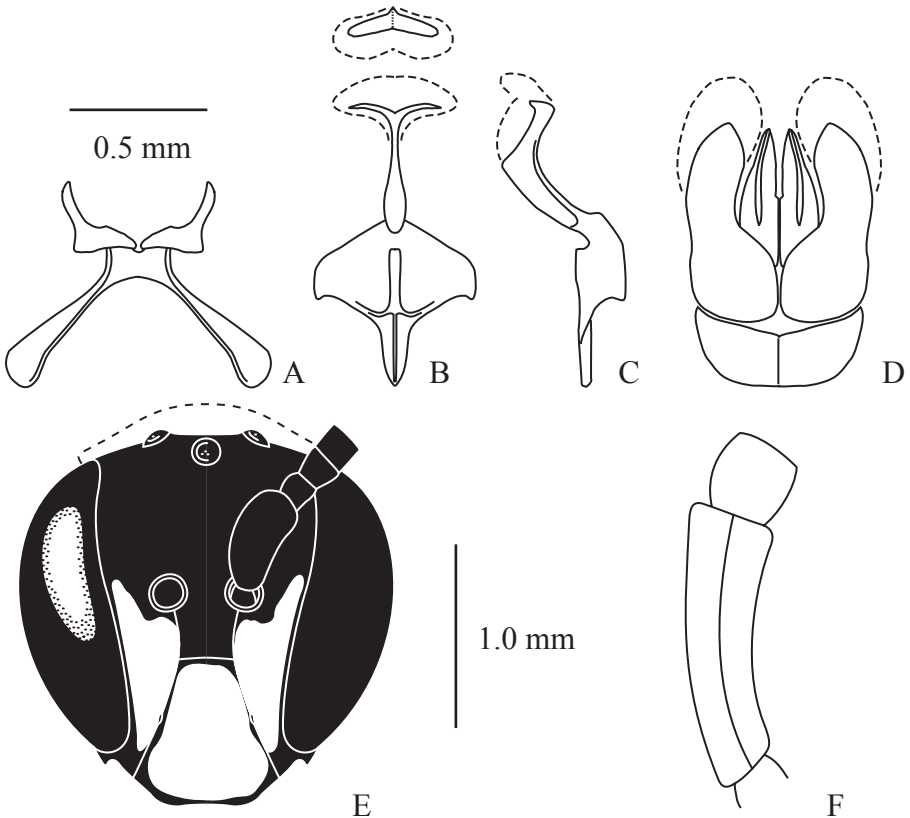


Fig. 15. *Hylaeus assimulans*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons with indistinct, round pits about 1 pit width apart across the areas; ground at sides with very weak, parallel wrinkles curved from near lateral ocellus to along the eye; central ground of frons medially with weak, transverse, parallel wrinkles; faint frontal line evident in some bees. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-8, pale brown, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with indistinct, minute, round pits about 2 or more pit widths apart, ground granular to smooth, dull to lustrous in some bees; hair short (4-6), white to pale brown, plumose. Mesepisternum with shallow, indistinct pits about 2 pit widths apart, and yellowish white, plumose hair; ground striate to nearly smooth, slightly lustrous. Hypoepimeron impunctate, smooth to weakly striate, slightly

lustrous; slightly swollen. Metanotum dull. Basal area of propodeum with irregular, somewhat sparse, lineate rugae halfway or more to brow; surface shiny between rugae; brow nearly smoothly coriaceous or minutely wrinkled, lustrous or slightly so.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous; with fine, very short, pale, appressed hairs spaced more than a hair length apart. T6 hair light yellowish brown, medium-length, appressed.

**Color.** Head and mesosoma dark brown to black; legs and metasoma dark brown; unmarked except fore tibia with pale area. Wings smoky.

**Perkins' collections.** **Hawaii:** Kona coast (BPBM). **Maui:** "Maui" (BPBM); Wailuku (BMNH, BPBM). **Lanai:** Awalua (BMNH, BPBM); Mts. Koele, 2000 ft (BMNH). **Oahu:** Kaala Mts., 500 ft (BPBM); "Oahu" (OUMNH); Waianae (BMNH, BPBM); w. coast, nr sea level (OUMNH); Waianae Mts (BMNH, BPBM).

**Recent collections.** **Maui:** Lahainaluna, 1800 ft; Waikapu, Kaohonua, 120 m. **Kahoolawe:** Kamohio, coast. **Lanai:** Polihua Rd., 1000 ft; Manele Rd., 600 ft.

**Flower records.** *Lipochaeta lobata*, *Sida*.

**Remarks.** Perkins characterized the populations on Oahu as having the males with yellow face marks often much reduced and the wings generally darker; the females with wings entirely infusate and iridescent in certain lights. He described this type as *H. assimulans oahuensis*.

Male *H. assimulans* and the sister species, *H. ombrias*, approximately resemble *H. niloticus* in color and overlap in body size. The sister species both have the greatest width of the scape near the middle; short, plumose hair along the median edge of the scape; and the median area immediately above the antennal sockets sparsely punctured to impunctate. *Hylaeus niloticus* has the greatest width of the scape near the apex, mostly simple hair along the median edge, and the median area above the antennal sockets densely punctured. Although *H. niloticus* is usually much smaller, small specimens of the others have been caught.

**References.** Perkins, 1899:104 (host of cleptoparasite: *N. hilaris*); 1910:604 (key); 1913:81 (host of *N. hilaris*). Giffard, 1908:180 (record: Lanai). Fullaway, 1918:394 (morphology). Suehiro, 1986:60 (record: Hawaii, Kona). *Hylaeus assimulans oahuensis*: Perkins, 1899:105 (host of cleptoparasite: *N. volatilis*); 1910:604 (key); 1913:81 (host of cleptoparasite: *N. volatilis*). Meade-Waldo, 1923:34 (list). Fullaway and Krauss, 1945:169-170 (biology of subgenus).

### *Hylaeus (Nesoprosopis) chlorostictus* (Perkins)

(Fig. 16)

*Nesoprosopis chlorosticta* Perkins, 1899:78-79 (♂ ♀).

*Hylaeus (Nesoprosopis) chlorostictus*, Meade-Waldo, 1923:33 (list).

*Nesoprosopis chlorosticta*, Daly, 1994:116 (lectotype ♂ BMNH 17a 156b; Kauai, Waimea, 2000 ft; wing length, 4.4 mm).

**DIAGNOSIS.** Medium-sized bees with smoky wings and short malar spaces. Male face with oval yellow mark divided by fine black sulci, legs marked with yellow, unusual lateral

process of S7 long and broad, sword-shaped, median process of S8 not dilated and with long narrow tips, unusual gonoforceps expanded apically beyond the penis valves. Female black and unmarked, distinguishable from all others by the unique line down the middle of the clypeus. Closely related to *H. facilis* and *H. simplex*.

**Distribution.** Kauai; coast, lowland and montane dry shrubland, dry and mesic forest.

**Male.** Measurements: Malar space, 6; eye, 141:120:111:76; clypeus, 69×69; frons, 31×28:95; interalveolar, 12:29:51:61, D 22; interocellar, 31:31:26:31, D 17; scape, 57×28; wing length, 4.7 mm (Kauai, Waimea, 2000 ft, BPBM 3286).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons with indistinct, round, shallow pits less than 1 pit width apart; ground minutely wrinkled, dull; median, impunctate, lustrous area just above antennal sockets; frontal line indistinct. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus arched. Scape in frontal view slightly dilated, width half length, ratio about 0.5; lateral edge in frontal view nearly straight or slightly concave; strongly arched in lateral view with maximum arch near middle of scape; no groove on underside; with medium-length, brownish white, weakly plumose hair along the median edge. Vertex hair 14-20, brown, plumose.

**Mesosoma.** Scutum with pits about 2 pit widths apart, ground minutely granularly coriaceous, dull; hair medium-length (8-12), pale brown, plumose. Scutellum with pits slightly larger, ground smoothly coriaceous, slightly lustrous. Mesepisternum with indistinct, shallow, round pits, about 1 pit width apart, and long, white, plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, lustrous, nearly flat. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae at front; brow granularly coriaceous, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, pale, appressed hairs spaced about one hair length apart. T7 hairs short, dark brown, prostrate.

**Terminalia.** Lateral process of S7 broad, sword-shaped, length much greater than width of hemisternite. Median process of S8 linear, apex bifurcate with long narrow tips. Apices of gonoforceps exceeding penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with a single large spot: clypeus entirely yellow or nearly so; lower paraocular area with a narrow yellow stripe along sulci below antennal socket; supraclypeal area to acme yellow; scape unmarked. Pronotum unmarked. Legs dark brown to black except: fore tibia with pale area, and with or without a trace of yellow at base; mid tibia variable, with or without a trace of yellow at base; hind tibia with basal yellow stripe less than half length; mid and hind basitarsi variable, with or without some yellow marking at base. Wings smoky.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons with round, shallow pits about 1 pit width apart or less, slightly smaller and closer toward the middle; ground minutely wrinkled, slightly lustrous; fine frontal line evident. Apex of clypeus distinctly emarginate. Clypeus with a faint longitudinal line down middle consisting of a depression or narrow impunctate area, most apparent near frontoclypeal sulcus and usually visible at low angles. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 14-24, brown, plumose.

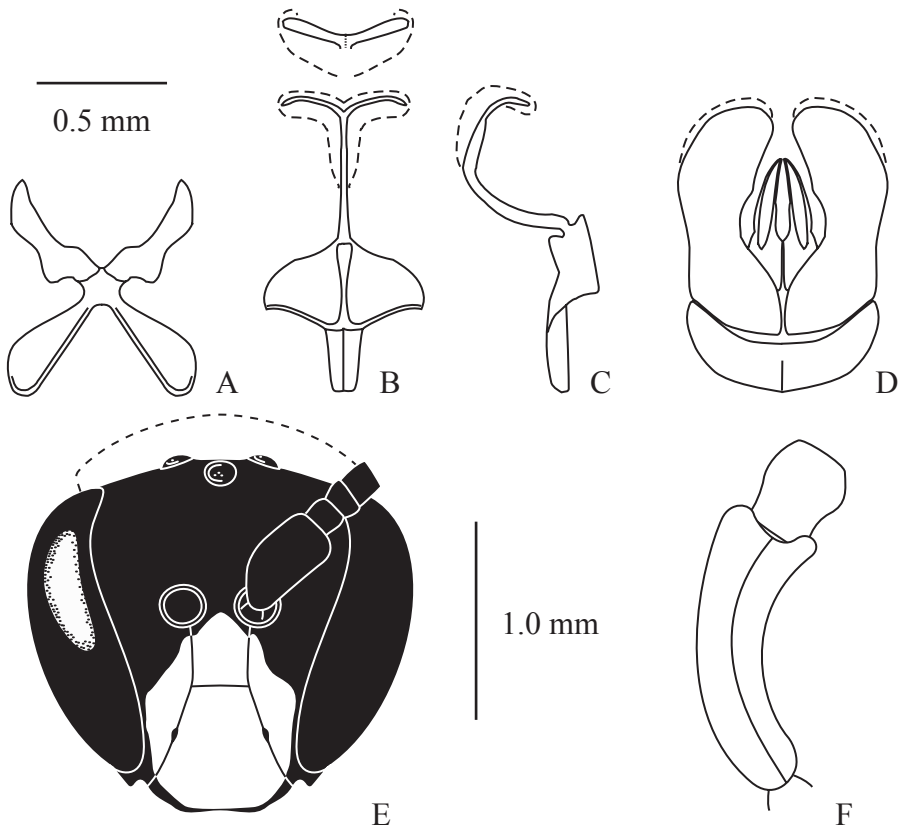


Fig. 16. *Hylaesus chlorostictus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with pits about 2 pit widths apart, ground minutely granularly coriaceous, dull; hair medium-length (8-12), pale brown, plumose. Scutellum with pits slightly larger, ground smoothly coriaceous, slightly lustrous. Mesepisternum with indistinct, shallow, round pits, about 1 pit width apart, and long, white, plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, lustrous, nearly flat. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae at front; brow smoothly coriaceous, lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, pale, appressed hairs spaced about one hair length apart. T6 hair short and dense, dark brown, prostrate.



**Color.** Head and mesosoma dark brown to black; legs and metasoma dark brown; unmarked. Wings smoky.

**Perkins' collections. Kauai:** Halemanu, 4000 ft (BPBM); "Kauai," 1500 ft (OUMNH); Lihue, nr (BPBM); Waimea, 2000 ft (BMNH, BPBM).

**Recent collections. Kauai:** Kokee Rd., 3600 ft; Paaiki Valley, 2700 ft; Milolii Rd., 2700 ft; Kukui Trail, 2600 ft; Polihale SP, coast.

**Flower records.** *Acacia*, *Claoxylon*, *Myoporum*, *Styphelia*.

**Remarks.** The measured male of *H. chlorostictus* has extreme ratios of "socket diameter/interantennal distance" at 1.9 and "antenna-eye distance/interantennal distance" at 2.6, indicating that the antennal sockets are extremely close together. The length ratio clypeus/subantennal sulcus at 2.3 is also unusually high.

**References.** Perkins, 1910:601 (key); 1913:64 (biogeography).

### *Hylaeus (Nesoprosopis) coniceps* (Blackburn)

(Fig. 17)

*Prosopis coniceps* Blackburn, 1886:145-146 ( $\sigma$  ♀; holotype  $\sigma$  BPBM 2339; Hawaii, Mauna Kea, 7000 ft; wing length, 4.3 mm).

*Nesoprosopis coniceps*, Perkins, 1899:91-92 ( $\sigma$  ♀).

*Hylaeus (Nesoprosopis) coniceps*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis coniceps*, Daly, 1994:113 (holotype  $\sigma$  confirmed).

*Nesoprosopis comes* Perkins, 1899:90-91 ( $\sigma$  ♀) (new synonymy).

*Hylaeus (Nesoprosopis) comes*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis comes*, Daly, 1994:116 (lectotype  $\sigma$  BMNH 17a 161a; Maui, Haleakala, 5000 ft; wing length, 4.7 mm).

**DIAGNOSIS.** Medium-sized bees with clear to slightly smoky wings. Male usually with yellow marks on the clypeus and sometimes lower paraocular areas (most Hawaii specimens with the latter). Distinct from other three-spot species by the combination of long scutum hair and lineately rugose propodeum; also usually with paraocular marks smaller than clypeal. Female black and unmarked; resembles *H. difficilis*, but with longer erect hairs on T6.

**Distribution.** Hawaii and Maui; widespread from montane mesic and wet forest to subalpine shrubland.

**Male.** Measurements: Malar space, 5; eye, 108:108:102:69; clypeus, 59×61; frons, 15×26:74; interalveolar, 18:26:44:54, D 17; interocellar, 26 33:18:33, D 13; scape, 39×24; wing length, 4.2 mm (Hawaii, Kau, 4000 ft, BPBM 3295).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with pits less than 1 pit width apart and ground with fine wrinkles along eye, medially on frons with pits closer, crowded and distorted in subpolygonal shapes; a large, dark, rhomboid spot at the middle caused by dense black hairs and very dense punctation; shiny area just below dark spot and above antennal socket. Lower paraocular depression very shallow. Frontoclypeal sulcus slightly arched. Scape in frontal view slightly to moderately dilated, width more than half length, ratio about 0.6-0.7; lateral edge in frontal view nearly straight; moderately



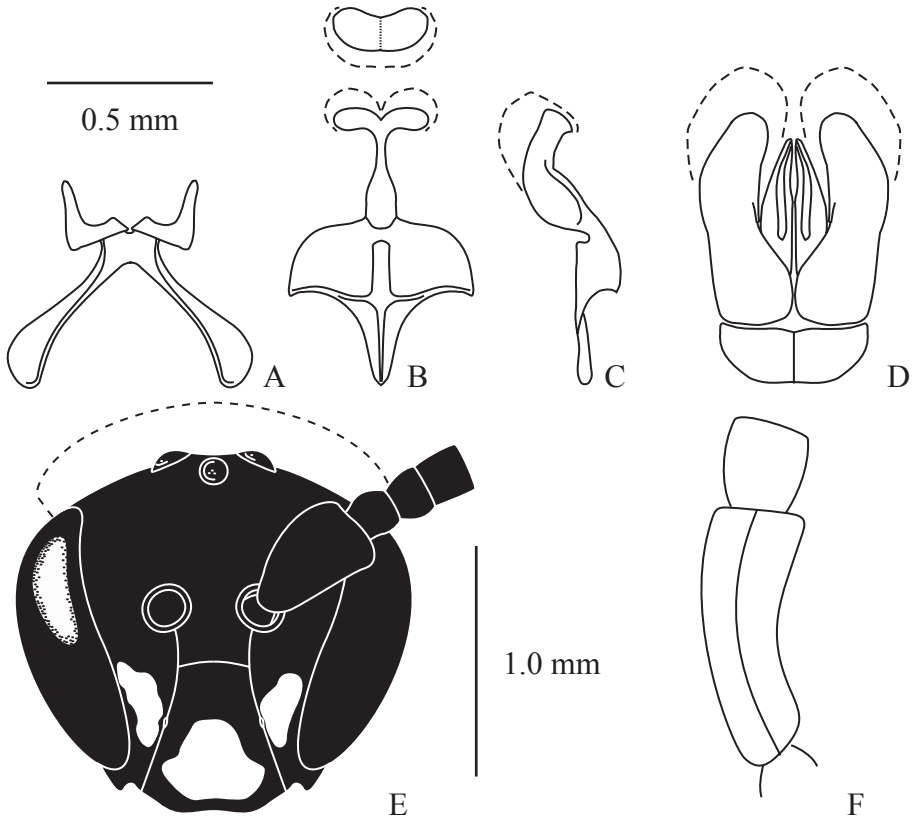


Fig. 17. *Hylaeus coniceps*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

arched in lateral view with maximum arch near middle of scape; underside of median edge with a groove; with long, pale brownish, simple hairs. Vertex hair 12-20, brown, simple.

**Mesosoma.** Scutum with pits 1-2 or more pit widths apart, ground dull; hair long (16-18), brown, weakly plumose. Scutellum with pits 1-2 or more pit widths apart, lustrous. Mesepisternum with indistinct, shallow, round pits, about 1-2 pit widths apart, and long, brownish white, plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, slightly lustrous, nearly flat. Metanotum dull. Basal area of propodeum with rather long anterior area; weakly lineate or irregular rugose halfway or more to brow, spaced 2-4 ruga widths apart; brow granularly coriaceous and slightly lustrous or dull.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T7 hair medium-length, brown, erect.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with broad tips. Apices of gonoforceps exceeding penis valves.

**Color.** Head and mesosoma black, metasoma dark brown to black. Labrum and mandible blackish brown to black. Face with one or three separate marks: clypeus with irregular, subapical yellow spot; lower paraocular area with yellow mark of varying size below antennal socket (if reduced, present only near apex of clypeus); Hawaii Island specimens almost always with three spots, Maui specimens usually with one spot or none. Supraclypeal area and scape unmarked. Pronotum unmarked. Legs dark brown to black except fore tibia with pale area, basitarsi with or without yellow marking, mid and hind terminal tarsal segments with or without yellow marking, hind tibia with or without obscure yellow spot at very base. Wings clear to slightly smoky.

**Female. Head.** Malar space short to medium-length (ratio about 0.4-0.5 DMO). Upper paraocular area and frons convex; upper paraocular area with nearly round pits less than 1 pit width apart, ground lustrous to shiny; frons with pits becoming crowded medially, contiguous and partly distorted, and at the middle a few, fine, longitudinal carinulae; frontal line, if any, distinct only near acme; small shiny area just above antennal socket. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended just to level of lateral ocellus. Vertex hair 12-20, brown, simple.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct pits 2 or more pit widths apart, ground slightly lustrous; hair medium to long (mostly 10-12 with scattered hairs up to 18), brown, simple. Scutellum with slightly larger pits, lustrous. Scutum and scutellum appear slightly flattened. Mesepisternum with indistinct, shallow, round pits, about 1-3 pit widths apart, and short, yellow-brownish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, slightly lustrous, nearly flat. Metanotum slightly lustrous. Basal area of propodeum dull to slightly lustrous with indistinct, weakly lineate rugae about halfway to brow, spaced 2-4 ruga widths apart; brow smooth to granularly coriaceous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T6 hair medium to long, dark brown, erect.

**Color.** Head and mesosoma black; metasoma dark brown to black; face, pronotum, and legs unmarked. Wings clear to slightly smoky.

**Perkins' collections.** *Nesoprosopis coniceps*: **Hawaii:** Kau (BPBM), 4000 ft (BMNH, BPBM); Kilauea (BPBM), 4000 ft (OUMNH); Olaa (BPBM). *N. comes*: **Maui:** Haleakala, 5000 ft (BMNH).

**Recent collections.** **Hawaii:** Kipuka Puauulu, 4000 ft; Earthquake Tr., 3800 ft; Kona Forest Unit of Hakalau National Wildlife Refuge camp, 5300 ft; Puu Waawaa, 4100 and 5500 ft; Saddle Road, 5400 ft; Puu Huluhulu (N. Hilo), 6700 ft. Kipuka Maunaiu, 1890 m. **Maui:** Lauulu Tr., 2010 m; Haleakala N. P. Service Area, 2073 m; Koolau Gap, 6200 ft; Puu Keokea, 7100 ft.

**Flower records.** *Chamaesyce olowaluana*, *Crocoshmia* × *crocoshmiflora*\*, *Geranium cuneatum*, *Metrosideros*, *Myoporum*, *Santalum paniculatum*, *Scaevola chamissoniana*, *Sophora*.

**Remarks.** Fullaway (1918:394-395) pointed out the possible synonymy of *H. coniceps* from Hawaii with *H. comes* from Maui. They are here considered as one species under the senior name, *H. coniceps*. As noted by Perkins (1899:92), bees from both islands are similar in structure. Perkins' key (1910:603) and his subsequent support of the distinction of the two species (1911:724) depended on the number of facial marks. Although the majority of bees on the two islands are as described by Perkins, bees have been taken recently on both islands that have only a clypeal mark (as described for *H. comes*) or a clypeal mark plus paraocular marks (as described for *H. coniceps*), or no marks at all. The small number of bees available for study from each island also exhibits overlapping variation in leg marking and propodeal sculpture. This is the only one of the three-spot species in which the paraocular spots are shorter than the clypeal spot (occasional particularly xanthic individuals may have the paraocular spots large).

See remarks for *H. dumetorum* and female *H. difficilis*.

**References.** Blackburn and Cameron, 1886:148 (key). Blackburn, 1887:205-206, 208 (♂ ♀; key). Dalla Torre, 1896:20 (list). Perkins, 1907b:97 (record: Hawaii, Kilauea); Perkins, 1910:603 (key); 1911:724 (variation). Fullaway, 1918:394-395 (♂ ♀; record: Hawaii, Kilauea). Meade-Waldo, 1923:34 (list). Suehiro, 1986:41, 60 (record: Hawaii, Kona). *Hylaeus comes*: Perkins, 1910:603 (key). Meade-Waldo, 1923:34 (list). Swezey and Williams, 1932:181 (record: Hawaii, Nauhi Gulch).

### *Hylaeus (Nesoprosopis) connectens* (Perkins)

(Fig. 18)

*Nesoprosopis connectens* Perkins, 1899:85-86 (♂).

*Hylaeus (Nesoprosopis) connectens*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis connectens*, Daly, 1994:116 (lectotype ♂ BMNH 17a 121; Maui, West Maui Mts., Iao Valley).

*Nesoprosopis koeae* Perkins, 1899:85 (♀) (new synonymy).

*Hylaeus (Nesoprosopis) koeae*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis koeae*, Daly, 1994:117 (lectotype ♀ BMNH 17a 120; Oahu, Honolulu; wing length, 4.7 mm).

*Nesoprosopis vicina* Perkins, 1899:84-85 (♀) (new synonymy).

*Hylaeus (Nesoprosopis) insulae* Meade-Waldo, 1923:34 (list; replacement name for *Nesoprosopis vicina* Perkins, a junior homonym of *Hylaeus vicinus* Sichel) (new synonymy).

*Prosopis trigona* Warncke, 1970:748 (unwarranted replacement name for *Nesoprosopis vicina* Perkins) (new synonymy)

*Nesoprosopis vicina*, Daly, 1994:119 (lectotype ♀ BMNH 17a 118; Hawaii, Puna; wing length, 4.6 mm).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings, unusual punctation of upper face with pits spaced about 1 pit width apart across face even at middle, supraclypeal area wider than long, basal area of propodeum lineately rugose in basal half and otherwise smooth to brow. Male with a single central facial mark, usually covering all or most of the

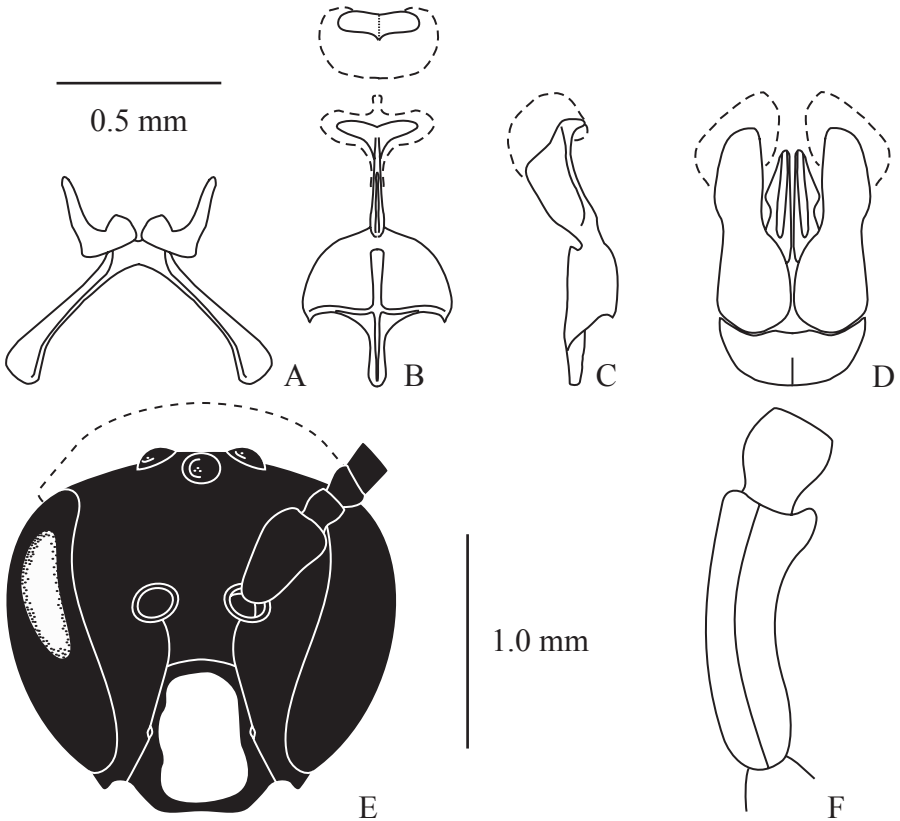


Fig. 18. *Hylaeus connectens*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

clypeus and supraclypeal area, sometimes including adjacent paraocular areas or reduced to only the middle of the clypeus. Females black with pronotal lobes marked or not, similar to *H. coniceps*, but scutum hair shorter.

**Distribution.** Hawaii, Maui, Lanai, Molokai (new record), Oahu, and Kauai (new record); montane mesic to wet forest, dry shrubland, coast (Kauai). No recent collections from Molokai.

**Male.** Measurements: Malar space, 5; eye, 117:111:102:69; clypeus, 62×62; frons, 18×29:80; interalveolar, 18:22:46:55, D 22; interocellar, 28:31:18:31, D 15; scape, 40×26; wing length, 4.3 mm (*H. connectens* lectotype).

**Head.** Malar space short (ratio about 0.3-0.4 DMO). Upper paraocular area and frons with mostly round, shallow pits about 1 pit width apart even near the middle, but pits

variable in size and shape, ground varying from minutely wrinkled and quite dull to smooth and lustrous between pits; a fine frontal line between median ocellus and acme that may be partly obscured by punctation or fine longitudinal wrinkles. Lower paraocular depression absent. Frontoclypeal sulcus straight or slightly arched. Supraclypeal area wider than long, W/L ratio 1.2-1.6. Impunctate area above antennal sockets very small or absent. Scape in frontal view slightly to moderately dilated, width more than half length, ratio about 0.6-0.7, widest subapically; lateral edge in frontal view nearly straight to concave; moderately arched in lateral view with maximum arch nearer to apex of scape; no groove on underside; and with medium-length, pale, weakly plumose hairs along median surface. Vertex hair 14-20, pale brown, weakly plumose.

**Mesosoma.** Scutum with distinct pits, about 1-2 pit widths apart, ground slightly lustrous; hair medium-length (6-12), reddish brown, plumose. Scutellum with pits slightly larger, lustrous. Mesepisternum with distinct, shallow round pits about 1 pit width apart, and yellowish white, plumose hair; ground smooth. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum dull or slightly lustrous. Basal area of propodeum lineately rugose to basal third or almost to brow, rugae spaced 2-6 ruga widths apart; brow smoothly coriaceous or slightly granular and slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T7 hair medium to long, black, erect.

**Terminalia.** Lateral process of S7 tapered, pale, length subequal to width of hemisternite. Median process of S8 straight along dorsal edge and without a flexure (one male from Lanai has a distinct arch; some others have a slight arch), moderately dilated, apex bifurcate with short to moderately long rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with a single large spot: clypeus entirely yellow or largely so, or with broad black margins; lower paraocular area unmarked or with yellow spot of variable size and shape adjacent to the clypeus; supraclypeal area unmarked or yellow up to acme. Scape unmarked. Pronotum usually unmarked, some specimens (especially from Kauai) with yellow on the pronotal lobes. Legs dark brown except pale area of fore tibia, and with or without the following marks: apex of fore femur, base of fore and mid tibiae, basal third of hind tibia, and mid and hind basitarsi; front tarsus sometimes yellow or light brown. Wings clear to smoky.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons with round, shallow pits about 1 pit width apart, mostly round pits even near the middle, ground minutely wrinkled and dull varying to smooth and lustrous between pits; a fine frontal line between median ocellus and acme that may be obscured by punctation and fine longitudinal wrinkles. Apex of clypeus nearly straight or shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 10-16, brown, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct pits about 2 pit widths apart, ground lustrous; hair variable, short to medium (4-12), reddish brown, simple. Scutellum with pits slightly larger and farther apart, lustrous. Mesepisternum with shallow pits, sometimes indistinct, about 1-2 pit widths apart, and yellowish white, plumose hair; ground smooth. Hypoepimeron sparsely punctured, nearly flat. Metanotum slightly lustrous. Basal area of propodeum lineately rugose halfway or more to brow, rugae spaced 2-6 ruga widths apart; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T6 hair dark brown, long to medium, erect.

**Color.** Body dark brown to black; unmarked. Legs brown to black; unmarked except with or without pale fore tibia and with or without obscure yellow spot at bases of tibiae. Kauai specimens sometimes with yellow on the pronotal lobes and basal third of hind tibia. Wings clear to smoky.

**Perkins' collections.** *Nesoprosopis connectens*, *N. koae*, and *N. vicina*: **Hawaii:** Hamakua, 3000 ft (BPBM, OUMNH); Kona, 5000 ft (BMNH); Olaa (BPBM); Puna (BMNH); Waimea, 4000 ft (BPBM). **Maui:** Haleakala, 2000 ft (BPBM); West Maui Mts, Iao Valley (BMNH, BPBM). **Oahu:** Honolulu, 2000 ft (BMNH, BPBM); Honolulu Mts., 1800 ft (BPBM); Tantalus (BPBM, OUMNH).

**Recent collections.** **Hawaii:** Kipuka Nene, 2900 ft; Ocean View Estates, 4500 ft; Puu Waawaa, 4200 ft. **Maui:** Waihee Ridge Trail, 2000 ft; Puu Kukui Rd., 2300 ft; Kahoma, 2100 ft. **Lanai:** Munro Trail, 3000 ft. **Oahu:** Aiea Trail, 1700 ft; Wiliwilinui Trail, 2000 ft; Papali Ridge, 1400 ft; Pahole Natural Area Reserve, 2000 ft; Palikea, 3000 ft; Puu Kaua, 2600 ft. **Kauai:** Polihale, coast; Paaikei Valley, 2700 ft; Kahuamaa Flat, 3800 ft.

**Other collections.** **Molokai:** Pukoo, 1600 ft, 2♂ 1♀ 27-X-1913 (W. M. Giffard) (BPBM).

**Flower records.** *Acacia*, *Bidens torta*, *Broussaisia arguta*, *Canavalia galeata*, *Chamaesyce multififormis*, *C. olowaluana*, *Claoxylon*, *Metrosideros*, *Myoporum* (Kauai), *Psychotria mariniana*, *Rubus rosifolius*\*, *Scaevola chamissoniana*, *S. gaudichaudiana*, *S. procera*, *Sophora*, *Styphelia*.

**Remarks.** Fullaway (1918:394, 396-397) pointed out the possible synonymy of *H. connectens* with *H. koae* and *H. vicinus*, now known as *H. insulae*. The three names are considered here to apply to one species. All the names were published in the same 1899 publication by Perkins. The name *H. connectens* was chosen because it is based on the only male type and is not involved in homonymy. Each of the three names was originally described from few specimens and only one sex: *H. connectens* based on a male from West Maui, *H. vicinus* based on a female from Hawaii and a junior homonym, and *H. koae* based on a female from Oahu. We have seen bees of both sexes from Hawaii, Maui (both sexes from the type locality of *H. connectens*), Lanai (male only), Oahu (both sexes from the type locality of *H. koae*), and Kauai. Allowing for geographic variation in color and punctuation, both sexes from all the islands are otherwise similar. Males are similar in body size, wide supraclypeal area, punctuation of the upper face, scape dilation and arch, propodeal sculpture, and terminalia. The female types of *H. koae* and *H. vicinus* and topotypical females of *H. connectens* are similar in body size and structural characters.

Based on small samples of mostly old specimens, bees from Oahu and Maui are more melanic and with smoky wings in comparison to those from Kauai and Hawaii with slightly smoky to clear wings. Males from Oahu and Maui have a wider supraclypeal area (W/L ratios 1.4-1.6,  $n = 11$ ), only the clypeus marked with yellow (varying from a broad, full mark to a small spot), and dark, unmarked legs (other than the usual pale fore tibia and rarely a basal yellow dot on the other tibiae). Males from Hawaii have a narrower

supraclypeal area (W/L ratios 1.2-1.3,  $n = 4$ ) and more extensive yellow marking: clypeus and supraclypeal area yellow with or without an additional mark in the lower paraocular area, and legs may have basal spots of yellow on the tibiae and basitarsi. Both males and females from Kauai may have marks on the pronotal lobes, and females may have marks on the legs.

**References.** *Hylaeus koeae*: Perkins, 1907a:43 (record: Oahu, Tantalus); 1910:603 (key); 1911:727 (Blackburn had series of mixed species). Timberlake, 1920:362 (probable parasitoid: *Nesencyrtus kaalae*). Cockerell, 1926:309 ( $\sigma$ ; record: Oahu, Mt. Tantalus). Beardsley, 1976:188, 209 (probable parasitoid: *Coelopenyrtus kaalae*). *Nesoprosopis vicina*: Perkins, 1907b:97 (record: Hawaii, Kilauea); 1910:603 (key).

### *Hylaeus (Nesoprosopis) crabronoides* (Perkins)

(Fig. 19)

*Nesoprosopis crabronoides* Perkins, 1899:94 ( $\text{♀}$ ; Pl. 2, Fig. 2).

*Hylaeus (Nesoprosopis) crabronoides*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis crabronoides*, Daly, 1994:116 (lectotype  $\text{♀}$  BMNH 17a 2752; Hawaii, Kilauea; wing length, 3.7 mm).

**DIAGNOSIS.** Very small elongate bees with clear wings. Male with three separate large yellow facial marks, yellow marks on the pronotal lobes and at the sides of the collar, and the basal third of the hind tibiae yellow. Female with unique swollen frons and unique elongate mesosoma. See remarks below for comparison with sister species *H. specularis*. Males are distinguishable from *H. specularis* by the rather thick head and lack of an impunctate area above the antennal socket.

**Distribution.** Hawaii; montane wet forest.

**Male.** Measurements: Malar space, 2; eye, 81:78:71:47; clypeus, 42×39; frons, 12×21:64; interalveolar, 10:15:37:44, D 10; interocellar, 22:25:17:25, D 11; scape, 29×17; wing length, estimated 3.3 mm (Hawaii, Olaa Small Tract, 3800 ft, KM-00-132).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper frons swollen. Upper paraocular area with pits less than 1 pit width apart, on frons smaller and crowded, distorted in subpolygonal shapes; a dark rhomboid spot in the center of the frons created by dense black hairs and very dense punctation; small shiny area just below spot and above antennal socket. Lower paraocular depression absent, surface flat. Frontoclypeal sulcus straight. Scape in frontal view slightly dilated, width more than half length, ratio about 0.6; lateral edge in frontal view nearly straight; slightly arched in lateral view with maximum arch near middle of scape; underside of median edge with a groove; with long, curved, yellowish white hair along median edge. Vertex hair 8-14, pale brown, simple.

**Mesosoma.** Scutum with pits 1-3 pit widths apart, ground granular to minutely wrinkled, slightly lustrous; hair medium-length (mostly 6, scattered long hairs), pale brown. Mesepisternum with indistinct, shallow pits 1-2 pit widths apart, long white plumose hair; ground coriaceous, lustrous. Hypoepimeron weakly punctate, coriaceous, lustrous, nearly

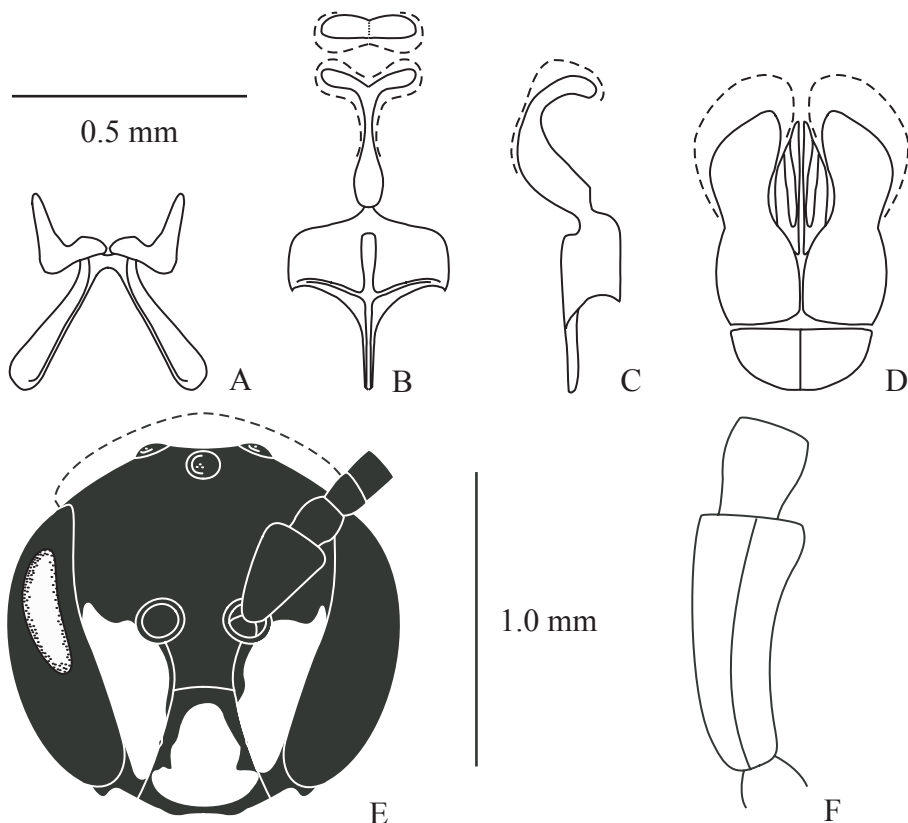


Fig. 19. *Hylaeus crabronoides*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

flat. Basal area of propodeum almost entirely smoothly coriaceous, sometimes a few short rugae at the front.

**Metasoma.** Elongate. Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart; T7 hairs long, brown, erect.

**Terminalia.** Lateral process of S7 tapered, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with elongate, narrow tips. Apices of gonoforceps subequal to penis valves, inwardly pointed.

**Color.** Head and mesosoma black; metasoma blackish brown. Labrum and mandible black (one specimen with obscure yellowish red marks on mandible). Face with three separate marks: clypeus largely yellow, with broad black basal and lateral margins; lower paracocular area with triangular yellow spot along the eye to level of antennal socket; supraclypeal area



and scape unmarked. Pronotum with transverse collar stripe at sides; lobes mostly yellow. Legs dark brown; fore femur and tibia with large pale area; small yellow marks on fore and mid femur at very apex, fore tibia with diffuse stripe in basal half along pale area; mid tibia with small spots at base and apex, sometimes connected by an obscure dorsal stripe; hind tibia yellow in basal third and sometimes narrowly at apex; fore and mid basitarsi yellowish brown; hind tarsus dark brown.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons strongly swollen, convex, clearly bulging out beyond eye at level of frontal sulcus in lateral view; upper paraocular area with minute round pits less than 1 pit width apart, ground shiny; frons with pits becoming crowded medially and partly distorted in shape near the middle; frontal line distinct only near acme; small shiny area just above antennal socket. Apex of clypeus shallowly emarginate. Dorsal end of facial foveae not extended to level of lateral ocelli. Vertex hair 6-10, pale brown, weakly plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Mesosoma elongate with dorsal surface depressed, long anterior area of propodeum nearly in same horizontal plane as the scutum and scutellum. Scutum with minute pits variable, distinct and round or poorly defined and obscured by sculpture of ground, 2 or more pit widths apart, ground slightly lustrous; hair extremely short (about 2, scattered longer ones up to 8), red-brown, simple. Scutellum with ground smoothly coriaceous and lustrous. Pubescence of mesepisternum yellowish white. Metanotum coriaceous and slightly lustrous. Hypoepimeron impunctate, nearly flat. Basal area of propodeum with long anterior area, short, lineately rugose at front; brow coriaceous and lustrous.

**Metasoma.** Narrow, elongate. Disk of T2 impunctate, smoothly coriaceous, but polished and shiny, with fine, pale, appressed hairs spaced about one hair length apart. T6 hairs long, dark brown, erect.

**Color.** Body dark brown. Face marks: clypeus unmarked or with an obscure subapical mark (clypeus of type is unmarked); lower paraocular area with yellow triangular stripe along the eye to slightly above level of antennal socket. Pronotum with transverse collar stripe interrupted medially; lobes yellow. Legs dark yellowish brown except: fore tibia with large pale area edged at base by diffuse yellow stripe; femora with minute yellow marks at very apices; fore and mid tibial bases with small basal yellow marks; hind tibia with basal yellow stripe up to nearly half the length of the segment. Wings clear.

**Perkins' collections. Hawaii:** Kau, 4000 ft (BMNH); Kilauea (OUMNH); field notes #638, #533 (BMNH).

**Recent collections. Hawaii:** Kona Forest Unit of Hakalau National Wildlife Refuge, South Boundary Rd., 4700 and 5200 ft; Olaa Small Tract, 3800 ft.

**Flower records.** *Cheirodendron*, *Myoporium*.

**Remarks.** *Hylaeus crabronoides* was described from a few females taken at Kilauea, Hawaii, at 4000 ft. The very small, distinctive females (forewing length of type, 3.7 mm) have unique features: frons greatly swollen with the fovea not reaching the level of the lateral ocelli; and a narrow, elongate body with the mesosoma depressed such that the scutum, scutellum, metanotum, and anterior area of the propodeum are almost in the same horizontal plane. It is closely related to *H. specularis*, in the company of which most of the

recent specimens have been collected. Females are easily distinguished by the swollen frons, whereas males are told by the unusually thick head (about half as long as wide in dorsal view, measured from the acme to the center of the occiput) and by the punctate area above the antennal sockets (versus smooth and shining). Both sexes can be separated from the much more common *H. dumetorum*; males by the arched scape, and females by the more lustrous upper frons and vertex.

**References.** Perkins, 1907b:97 (record: Hawaii, Kilauea); 1910:601 (key); 1913:lxix (extreme morphology).

***Hylaeus (Nesoprosopis) difficilis* (Perkins)**

(Fig. 20)

*Nesoprosopis difficilis* Perkins, 1899:80-81 (♂ ♀; Pl. 2, Fig. 11).

*Hylaeus (Nesoprosopis) difficilis*, Meade-Waldo, 1923:33 (list).

*Nesoprosopis difficilis*, Daly, 1994:116 (lectotype ♂ BMNH 17a 159b; Hawaii, Kau, 4000 ft; wing length, 4.7 mm).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings. Male face usually with oval yellow mark or mark on clypeus only, hemisternites of S7 broadly triangular or with a short process, process of S8 not dilated and apex simple or with very short bifurcations, gonoforceps subequal to penis valves. Female unmarked, hair of scutum long, of T6 medium-length and prostrate. Sister species of *H. laetus*; see remarks.

**Distribution.** Hawaii, Maui, Lanai, and Molokai; very widespread, found in lowland and montane dry shrubland and dry to wet forest, and at the coast on Hawaii Island.

**Male.** Measurements: Malar space, 6; eye, 113:105:92:64; clypeus, 59×61; frons, 20×23:82; interalveolar, 15:20:47:54, D 19; interocellar, 29:28:18|11:26, D 15; scape, 39×20; wing length, 4.0 mm (Hawaii, Kau, 4000 ft, BPBM 3311).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with round, shallow pits 1 pit width apart or less (some specimens with pits indistinct or almost totally obscured by minutely wrinkled to granular and dull ground; other specimens with relatively smooth ground, lustrous); below punctured area and along the eye with dense, minute, parallel wrinkles, rather smooth and lustrous; frons with pits medially closer, becoming contiguous, slightly distorted; fine frontal line sometimes present; shiny, median, depressed area just above prominent acme. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus straight or nearly so. Scape in frontal view slightly dilated, width about half length, ratio about 0.5; lateral edge in frontal view nearly straight or slightly concave; strongly arched in lateral view with maximum arch slightly toward apex of scape, thickness of scape in lateral view more or less uniform in basal two-thirds, expanded in width in apical third; no groove on underside; with long, yellowish to brownish white, simple hairs. Vertex hair 14-24, brown, mixed simple and plumose.

**Mesosoma.** Scutum with shallow pits about 2 pit widths apart, pits sometimes indistinct due to variable ground, minutely wrinkled to granular, dull to slightly lustrous; hair long (12-20), yellowish white to red-brown, plumose. Scutellum pits more distinct, ground

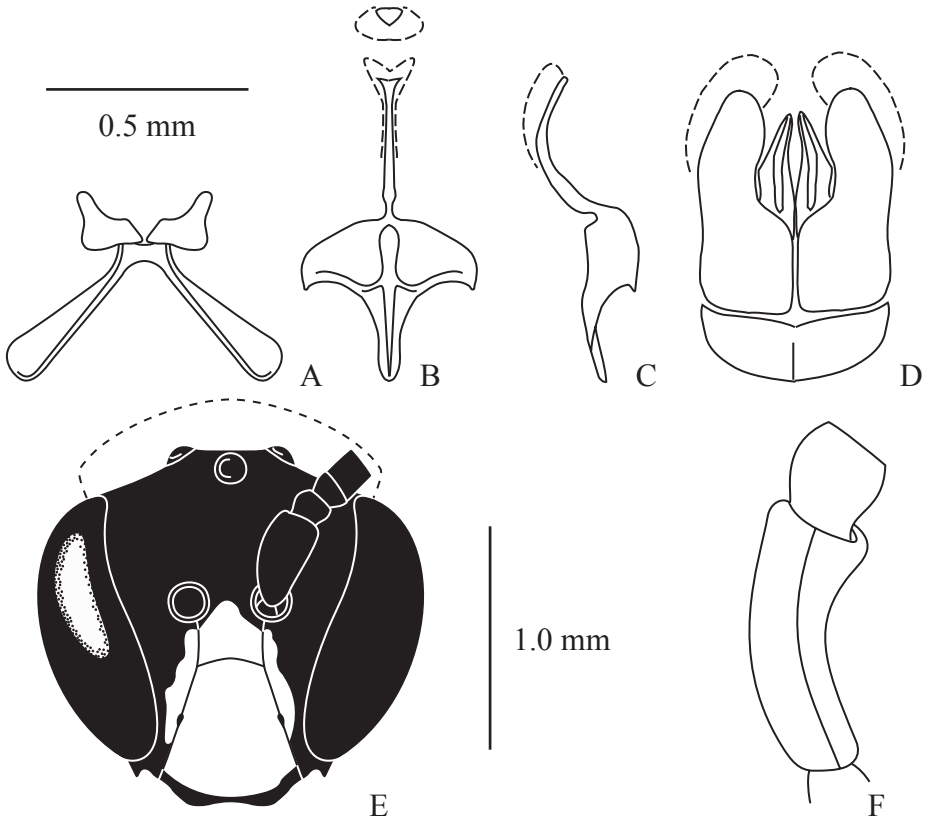


Fig. 20. *Hylaeus difficilis*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

slightly lustrous to lustrous. Mesepisternum with punctation varying from barely discernible to distinct, shallow, round pits, about 1 pit width apart, and long, yellowish white to white, plumose hair; ground minutely coriaceous, wrinkled or striate, slightly lustrous. Hypoepimeron impunctate, smooth to partly striate, slightly lustrous, nearly flat. Metanotum dull. Basal area of propodeum of some specimens lineately rugose to brow, 2-4 ruga widths apart varying to irregular, reticulately rugose to brow; often shiny between rugae; brow granularly coriaceous, dull to slightly lustrous; other specimens with lineate rugae not reaching brow, brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate; smoothly coriaceous, shiny, with bare areas or pale, short, appressed hairs spaced more than a hair length apart. T7 hairs short, golden to dark brown, appressed.

**Terminalia.** Lateral process of S7 tapered, acute, with length equal to width of hemisternite, and brown sclerotized color throughout; overall shape variable, broadly triangular or slightly L-shaped. Median process of S8 linear and with apex simple and hairy or a slight, triangular dilation at tip with short, slender, cuticular bifurcations with hairs (the hairs at tip of process may look like long bifurcations). Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with a single large spot: clypeus entirely yellow or nearly so; lower paraocular area yellow along sulcus below antennal socket but not contacting eye, in some specimens reduced to irregular stripe along suture; supraclypeal area to acme yellow (the supraclypeal and paraocular areas unmarked in some specimens); scape unmarked. Pronotum unmarked. Legs dark brown to black and unmarked except pale area on fore tibia, or with some or all of the following yellow marks: small spot at apex of fore femur, basal spot or stripe on fore tibia, basal small spot on mid tibia, basal stripe up to half length of hind tibia, all basitarsi with a stripe. Wings clear to smoky. Specimens from coastal populations and rare montane individuals may have marks on the pronotal collar and lobes, and on the labrum; such specimens usually have the maximum leg markings and broad paraocular marks similar to those of *H. anthracinus*.

**Female. Head.** Malar space medium (ratio about 0.5 DMO). Upper paraocular area with indistinct, round, shallow pits 1 pit width apart or less; ground minutely wrinkled to granular, dull; frons with pits medially closer, becoming contiguous, slightly distorted; fine frontal line sometimes present. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 12-20, brown, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with shallow pits about 2 pit widths apart, pits sometimes indistinct due to variable ground, minutely wrinkled to granular, dull to slightly lustrous; hair long (10-14), yellowish white to red-brown, plumose. Scutellum pits more distinct, ground slightly lustrous. Mesepisternum with punctation varying from barely discernible to distinct, shallow, round pits, about 1 pit width apart, and long, yellowish white to white, plumose hair; ground minutely coriaceous, wrinkled or striate, slightly lustrous. Hypoepimeron impunctate, smooth to partly striate, slightly lustrous, nearly flat. Metanotum dull. Basal area of propodeum lineately rugose to brow, 2-4 ruga widths apart varying to irregular, reticulately rugose to brow; brow granularly coriaceous, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate; smoothly coriaceous, shiny, with bare areas or pale, short, appressed hairs spaced more than a hair length apart. T6 hair medium-length, golden to dark brown, prostrate.

**Color.** Head and mesosoma black; metasoma dark brown. Legs dark brown to black; unmarked. Face and pronotum usually unmarked; coastal specimens sometimes with a small, irregular, subapical mark on clypeus or a small basal mark on mid tibia.

**Perkins' collections. Hawaii:** Kau, 4000 ft (BMNH, BPBM); Kilauea, 4000 ft (BPBM, OUMNH); Kona, 4000 ft (BMNH, BPBM), plateau, 4000 ft (BPBM), 5000 ft (BMNH, BPBM). **Maui:** Haleakala crater (BPBM); West Maui Mts. Iao Valley (BMNH, BPBM). **Lanai:** Halepaakai, 3000 ft (BMNH); "Lanai," 2000 ft (BMNH, BPBM); Mts. Koele,

2000 ft (BMNH). **Molokai:** Molokai Mts. (BPBM), lower slopes (BPBM), 3000 ft (BMNH, BPBM), 4000 ft (BPBM).

**Recent collections. Hawaii:** Devastation Trail, 3700 ft; Kipuka Ki, 4200 ft; Kipuka Nene, 2900 ft; 0.9 mi. SW of Mauna Loa Rd. (near Kipuka Maunaiu), 6000 ft; Kipuka Alala, 5700 ft; Puu Huluhulu (N. Hilo), 6700 ft; Puu Waawaa, 4100, 5500, and 6700 ft; Ocean View Estates, 2400 ft; Kaalualu, coast; South Point, coast; Kaloko-Honokohau National Historic Park, coast. **Maui:** Kahoma, 2100 ft; Puu Kukui Rd., 2300 ft; Hanaula, above Puu Anu, 915 m; Waikamoi Preserve boardwalk, 6400 ft; Kaupo Trail, 6000 ft; Koolau Gap, 6200 ft; Puu Keokea, 7100 ft; above Hosmer Grove, 2100 m; Kalepeamo, 2835 m; Kilohana Pali, 2800 m; Kipahulu Valley, Mauka Ridge, 1980 m; Oili Puu, 2050 m. **Lanai:** Munro Trail, 2800 and 3000 ft. **Molokai:** Kamakou Rd., 3200 ft; Puu Kolekole, 3400 and 3900 ft.

**Flower records.** *Acacia*, *Argyroxiphium sandwicense*, *Bidens menziesii*, *Chamaesyce celastroides*, *C. olowaluana*, *Cheirodendron*, *Dodonaea*, *Dubautia ciliolata*, *D. menziesii*, *D. scabra*, *Metrosideros*, *Myoporum*, *Santalum paniculatum*, *Sapindus saponaria*, *Scaevola sericea*, *Schinus terebinthifolius*\*, *Sophora*, *Styphelia*, *Tournefortia*\*, *Vaccinium reticulatum*.

**Remarks.** *Hylaeus difficilis* (Maui Nui and Hawaii) and *H. laetus* (Kauai to Hawaii) are broadly sympatric sister species that are closely similar in sculpture. Each species has variable yellow markings such that some specimens in each may be similar in appearance. In his key, Perkins (1910:602) distinguished the males on the basis of the apex of the median process of S8 (longish bifurcation in *H. laetus*, not so in *H. difficilis*; but sometimes *H. difficilis* may have a moderately long bifurcation) and the pubescence on the mesonotum (rather long in *H. difficilis*; short in *H. laetus*). Both species have a similarly marked face, including the clypeus, lower paraocular areas, and supraclypeal area in one large yellow mark or only the clypeus. *Hylaeus laetus* may or may not have an apical yellow spot on the prothoracic lobes and usually has basal stripes on the tibiae, up to half the length of the hind tibia, and yellow basitarsi. *Hylaeus difficilis* almost never has a spot on the lobes and usually has less yellow markings on the legs or none, but some specimens of *H. difficilis* may have similar leg marks. Coastal specimens from Hawaii may have marks on the prothoracic collar and lobes, as well as extensive marks on the legs. *Hylaeus difficilis* has the lateral process of S7 shorter, the apex narrow, and of a sclerotized brown color. In *H. laetus*, the lateral process is broad, translucent apically, and longer than the width of the hemisternite. Females can be separated by the shorter scutum hair of *H. laetus*.

In more montane areas *H. difficilis* may occur with *H. volcanicus* and *H. nivicola*, both of which have longer malar spaces. Males can also usually be told from the former species by the simple process of S8; while it may be prolonged into bifurcations that can be moderately long, those of *H. volcanicus* are always much longer. Females can be more difficult to separate, as the malar space of *H. volcanicus* is variable. The smaller bee *H. coniceps* also can be found with them. The males are distinctive, but the females are similar to *H. difficilis* and may be distinguished from that species by the smaller malar area and the longer, erect, black hairs of T6.

**References.** Perkins, 1899:105 (host of cleptoparasites: *N. sphecodoides*, *N. volatilis*); 1907a:43 (record: Oahu, Tantalus); 1907b:97 (record: Hawaii, Kilauea); 1910:602 (key); 1911:727 (Blackburn had series of mixed species); 1913:79, 82 (biology, biogeography). Fullaway and Giffard, 1919:51 (record: Maui, Olinda, 4200 ft). Swezey and Williams, 1932:181 (record: Hawaii, Nauhi Gulch; flower: *Sophora*, *Dubautia* [referred to as *Raillardia*]). Swezey, 1954:205 (flower: *Sophora chrysophylla*; record: Hawaii, Nauhi, 8000 ft). Suehiro, 1986:60 (record: Hawaii, Kona).

### *Hylaeus (Nesoprosopis) dimidiatus* (Perkins)

(Fig. 21)

*Nesoprosopis dimidiata* Perkins, 1899:96 (♂ ♀).

*Hylaeus (Nesoprosopis) dimidiatus*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis dimidiata*, Daly, 1994:116-117 (lectotype ♂ BMNH 17a 149; Hawaii, Kona, 4000 ft).

**DIAGNOSIS.** Small bees with clear wings, propodeum lineately rugose in basal third, nearly smooth to brow. Male with lower face yellow up to level of antennae or very narrowly above, pronotal collar at sides and lobes yellow, tibiae and tarsi marked with yellow. Lacking the scape mark of *H. hula*, and the mandibular mark of *H. kona*. Similar to specimens of *H. pele* with large face marks, but lacking a groove on the underside of the scape and with the propodeum sloping. Female with yellow marks on the lower paraocular areas, pronotal lobes and sides of collar, base of front and mid tibiae, and rather widely banded on hind tibiae; differing from similar species by the evenly spaced pits of the frons and sloping propodeum.

**Distribution.** Hawaii; montane mesic and dry forest.

**Male.** Measurements: Malar space, 3; eye, 99:95:86:59; clypeus, 49×52; frons, 18×25:72; interalveolar, 18:17:40:48, D 18; interocellar, 28:25:18:25, D 14; scape, 34×22; wing length, 3.3 mm (*H. dimidiatus* lectotype).

**Head.** Malar space short (ratio about 0.3-0.4 DMO). Upper paraocular area and frons to middle with very indistinct shallow pits about 1 pit width apart, pits obscured by minutely wrinkled ground, dull; frontal line indistinct; large impunctate, minutely wrinkled area above antennal socket. Lower paraocular depression absent. Frontoclypeal sulcus straight to slightly arched. Scape in frontal view slightly dilated, width more than half length, ratio about 0.5-0.6, triangular, greatest width near apex; lateral edge in frontal view nearly straight; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with medium-length, white, plumose hair. Vertex hair 10-16, yellowish white, plumose.

**Mesosoma.** Scutum with very indistinct shallow pits about 2 pit widths apart, pits obscured by minutely wrinkled ground, slightly lustrous; hair short (4-8), pale, plumose. Scutellum with larger, more distinct pits, lustrous. Mesepisternum with very indistinct pits about 2 pit widths apart, and long, yellowish white, plumose hair; ground smooth, lustrous.

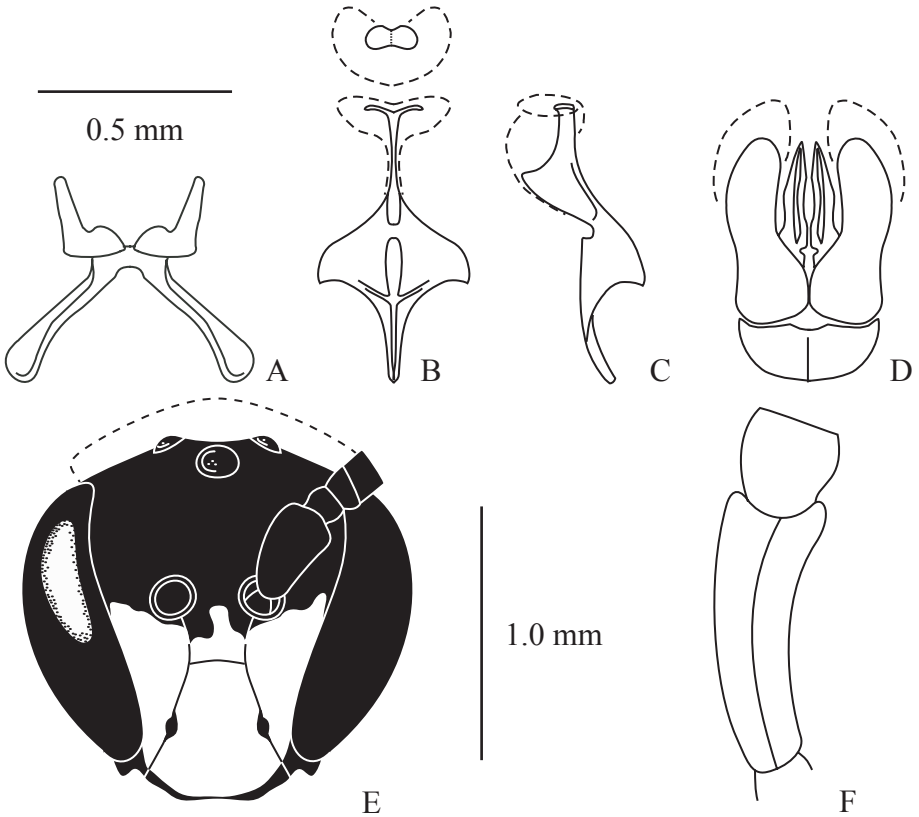


Fig. 21. *Hylaeus dimidiatus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

Hypoepimeron impunctate, slightly swollen, shiny. Metanotum minutely wrinkled, dull to slightly lustrous. Basal area of propodeum rather short and sloping with lineate rugae in basal third, spaced 2-3 rugae apart, shiny between rugae; smoothly coriaceous, lustrous to and including brow.

**Metasoma.** Disk of T2 impunctate, smooth, shiny, with fine, pale hairs spaced more than a hair length apart. T7 hair short to medium, red-brown, erect.

**Terminalia.** Lateral process of S7 tapered, pale, length greater than width of hemisternite. Median process of S8 dilated, apex bifurcate with short, rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with one large mark: clypeus entirely yellow or with very narrow lateral margins black; lower paraocular area yellow to



level of antennal socket or very narrowly above; supraclypeal area yellow to below antennal sockets; scape unmarked. Pronotum with transverse collar stripe interrupted medially; lobes yellow at least in part. Fore leg dark brown except: fore femur with apex yellow; fore tibia with dorsal yellow stripe up to full length; fore basitarsus entirely yellow and at least the basal mediotarsus yellow. Mid and hind legs dark brown to black except: mid femur with apex yellow; mid and hind tibiae with basal and apical yellow marks; basitarsi entirely yellow; at least the basal mediotarsus yellow. Wings clear.

**Female. Head.** Malar space short (ratio about 0.5 DMO). Upper paraocular area and frons with shallow, evenly spaced pits, about 1 pit width apart even near middle; ground granular and dull. Frontal line obscure. Apex of clypeus slightly emarginate. Dorsal end of facial fovea reaching level of lateral ocellus. Vertex hairs 10-14, yellowish white, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with shallow pits 2-3 pit widths apart, ground minutely granular and slightly lustrous; hair very short (2-4), pale brown, plumose. Scutellum similar, slightly more lustrous. Metanotum roughened, dull. Mesepisternum with shallow pits 1-2 pit widths apart, ground minutely granular, lustrous; with medium-length, pale brown, weakly plumose hair. Hypoepimeron impunctate, lustrous, hardly swollen. Basal area of propodeum with a few very short rugae at base, the remainder including the brow smoothly coriaceous, lustrous; brow rounded, not prominent.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, prostrate hairs spaced two hair lengths apart or more. T6 hairs long, brown, erect.

**Color.** Head and mesosoma black; metasoma dark brown. Face marked with yellow: paraocular area with yellow spots, sometimes reduced or absent. Pronotum with marks on lobes and interrupted transverse collar stripe. Legs black except: front tibia with large pale area and a dorsal yellow stripe one-third to half the length; mid tibia with basal quarter yellow; hind tibia with basal half yellow. Wings slightly smoky.

**Perkins' collections. Hawaii:** Kona, 4000 ft (BMNH).

**Recent collections. Hawaii:** Puu Waawaa, 4100 ft; Kipuka Alala, 5800 ft.

**Flower records.** *Chamaesyce olowaluana*.

**Remarks.** This is a rare species apparently restricted to dry to mesic forest in Kona; it and the sympatric *H. akoko* and *H. kona* are the only montane species from Hawaii that have never been collected at Kilauea. Despite appearances, genetic data clearly shows it to be the sister species of *H. connectens*. The identity of the female has been the subject of some confusion. Fullaway (1918) described it from a specimen caught with the male at Kahuku, believing Perkins' (1899) original association to be incorrect. Perkins stated (1899) that while he believed his specimen had come from the same place as the male, the locality label had been lost. The latter description appears to match *H. pele*, which occurs with *H. dimidiatus* in Kona; it is the only species with a smooth propodeum that has the apical hairs of the metasoma somewhat pale. The specimens on which the two descriptions were based could not be found. Recent specimens have been genetically confirmed, and agree with Fullaway's description.

**References.** Fullaway, 1918:395-396 (♀; record: Hawaii, Kahuku, Kau). Suehiro, 1986:60 (record: Hawaii, Kona).



*Hylaeus (Nesoprosopis) dumetorum* (Perkins)

(Fig. 22)

*Nesoprosopis dumetorum* Perkins, 1899:92-93 (♂ ♀).*Hylaeus (Nesoprosopis) dumetorum*, Meade-Waldo, 1923:34 (list).*Nesoprosopis dumetorum*, Daly, 1994:117 (lectotype ♂ BMNH 17a 163a; Hawaii, Puna, 2000 ft; wing length, 3.7 mm).

**DIAGNOSIS.** Small, elongate bees with clear wings. Males with three separate yellow marks on face, variably marked on pronotum and legs; distinguishable by the unarched scape. Females marked with narrow yellow stripes along the eyes, marks on the pronotal collar and lobes, and the basal quarter or less of the hind tibiae is yellow. Sister species of *H. angustulus*.

**Distribution.** Hawaii Island; widespread and common in montane wet and mesic forest.

**Male.** Measurements: Malar space, 3; eye, 101:95:87:64; clypeus, 51×54; frons, 18×24:73; interalveolar, 18:20:44:49, D 17; interocellar, 20:28:13:26, D 13; scape, 37×20; wing length, 4.0 mm (Hawaii, Kau, 4000 ft, BPBM 3342).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons with pits less than 1 pit width apart, crowded and distorted in subpolygonal shapes; a dark rhomboid spot at the middle due to dense black hairs and very dense punctation (may be less distinct in soiled specimens); shiny area just below spot and above antennal socket. Lower paraocular depression absent, surface flat. Frontoclypeal sulcus straight or nearly so. Scape in frontal view slightly dilated, width about half length, ratio about 0.5; lateral edge in frontal view nearly straight; median edge gently rounded, pubescent; underside of median edge without a narrow groove, but with a broad depression with granular sculpture; almost flat in lateral view. Vertex hair 10-18, brown, simple.

**Mesosoma.** Scutum with indistinct, minute, shallow pits more than 2 pit widths apart, ground dull coriaceous; hair short (4-6 with scattered longer hairs), red-brown, simple. Scutellum with slightly larger pits 1-2 pit widths apart, ground slightly lustrous. Mesepisternum with minute, indistinct pits 2-4 pit widths apart, and long, yellowish white, plumose hair; ground smoothly coriaceous, slightly lustrous to lustrous. Hypoepimeron impunctate, slightly swollen. Metanotum slightly lustrous. Basal area of propodeum with variable sculpture, sparse, short, linear or reticulate rugae at the front or nearly glabrous; brow smoothly coriaceous, lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T7 hair long, black, erect.

**Terminalia.** Lateral process of S7 parallel-sided, pale, length greater than width of hemisternite. Median process of S8 strongly dilated; apex bifurcate with broad tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma reddish brown to black; metasoma dark reddish brown to dark blackish brown. Labrum and mandible blackish brown to black. Face with three separate marks: clypeus with a subapical, irregular yellow spot (rarely absent); lower paraocular area with triangular yellow mark along the eye below antennal socket; supraclypeal area and scape unmarked. Pronotum usually unmarked, sometimes with a mark on the pronotal lobe and rarely the collar. Legs reddish brown to black except: fore tibia with pale area, with or without dorsal yellow stripe and fore femur with yellow mark at very apex; mid and

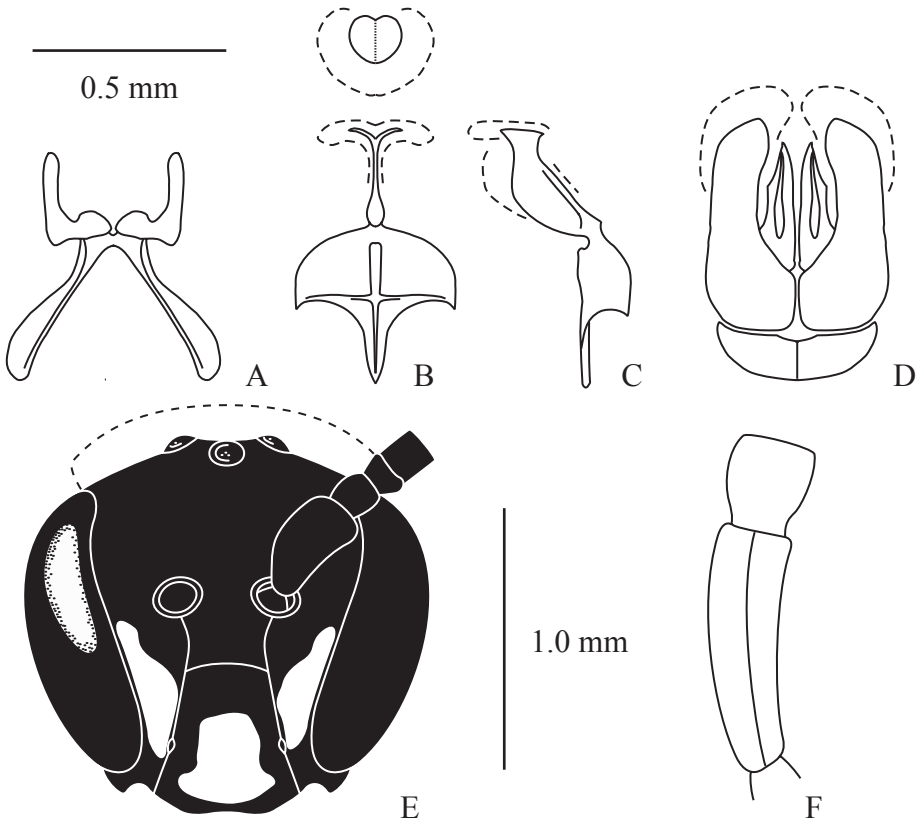


Fig. 22. *Hylaeus dumetorum*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

hind tibiae variable, with or without an obscure yellowish mark at extreme base. Wings clear to smoky.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons convex; upper paraocular area with nearly round pits less than 1 pit width apart, ground lustrous to shiny; frons with pits becoming crowded below the median ocellus and partly distorted in shape, and near the middle a few, fine, longitudinal carinulae; frontal line distinct only near acme; small shiny area just above antennal socket. Apex of clypeus shallowly to distinctly emarginate. Dorsal end of facial foveae extended just to level of lateral ocelli. Vertex hair 8-12, brown, simple.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with indistinct, minute, shallow pits more than 2 pit widths apart, ground dull to very dull; hair short (4-6) brown, weakly

plumose. Scutellum with pits 1-2 pit widths apart, ground slightly lustrous in some specimens. Mesepisternum with minute, indistinct pits 2-4 pit widths apart, and long, yellowish white, plumose hair; ground smoothly coriaceous, slightly lustrous to lustrous. Hypoepimeron impunctate, slightly swollen. Metanotum dull. Basal area of propodeum with sparse, obscure, lineate rugae at very front; brow smoothly coriaceous, lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T6 hair long, dark brown, erect.

**Color.** Head and mesosoma black; metasoma dark brown. Face marks: lower paraocular area with yellow stripe of variable width along the eye below antennal socket; clypeus and supraclypeal area unmarked. Pronotum with transverse collar stripe interrupted medially; lobes yellow at least in part. Tegula with or without yellow spot. Legs reddish brown to dark brown except: fore tibia with pale area combined with short yellow stripe at base; mid and hind tibia with yellow spot at base. Wings clear to smoky.

**Perkins' collections. Hawaii:** Hilo, 1800 ft (BMNH, BPBM); Kau, 4000 ft (BMNH, BPBM); Kilauea (BPBM, OUMNH); Olaa (BPBM); Puna, 2000 ft (BMNH, BPBM).

**Recent collections. Hawaii:** Byron's Ledge, 3800 ft; Halemaumau Trail, 3800 ft; Kona Forest Unit of Hakalau National Wildlife Refuge, South Boundary Rd., 4500-5200 ft; Kipuka Ki, 4200 ft; Kipuka Puauolu, 4000 ft; Kau Forest Reserve, Mountain House Rd., 3000 ft; Upper Waiakea FR, 3700 ft; Upper Hamakua Ditch, 3700 ft.

**Flower records.** *Alphitonia ponderosa*, *Buddleia asiatica*, *Cheirodendron*, *Crocasmia* × *crocosmiiflora*\*, *Dubautia scabra*, *Fragaria vesca*\*, *Hedyotis terminalis*, *Ilex anomala*, *Metrosideros*, *Myoporum*, *Myrica faya*\*, *Pisonia brunoniana*, *Psychotria hawaiiensis*, *Rubus rosifolius*\*, *Styphelia*.

**Remarks.** The most common wet and mesic forest species on Hawaii. Distinguishable from the other common species, *H. coniceps*, by the flat scape, short hairs of the scutum, and reduced rugosity of the propodeum. In males, the facial marks are distributed differently: *H. coniceps* often has the paraocular marks shorter than the clypeal mark, and if the marks are reduced the former disappear first; *H. dumetorum* has the paraocular marks longer than the clypeal (one melanic specimen lacks the clypeal mark). Females resemble *H. specularis*, but have the upper frons only slightly lustrous, with a narrower dull area at the middle, and the impunctate area laterad of the lateral ocellus distinctly coriaceous rather than almost smooth and brightly reflective. Sister species of *H. angustulus* of Maui Nui.

**References.** Perkins, 1907b:97 (record: Hawaii, Kilauea); 1910:602 (key); 1913:82 (biogeography). Fullaway, 1918:395 (record: Hawaii, Kilauea).

### *Hylaeus (Nesoprosopis) facilis* (F. Smith)

(Fig. 23)

*Prosopis facilis* F. Smith 1879a:683; 1879b:21 (♂ ♀).

*Nesoprosopis facilis*, Perkins, 1899:77-78 (♂ ♀; Pl. 2, Figs. 1, 8).

*Hylaeus (Nesoprosopis) facilis*, Meade-Waldo, 1923:33 (list).

*Prosopis facilis*, Daly, 1994:119-120 (lectotype ♂ BMNH 17a-154ab; Smith gave Maui as type locality, but Blackburn, 1886:143 and 1887:203, stated true locality is Oahu, Paoa Valley).

**DIAGNOSIS.** Medium-sized bees with smoky wings. Male face with oval yellow mark, legs not marked with yellow or obscurely so, unusual lateral process of S7 long and broad, median process of S8 not dilated and with long narrow tips, unusual gonoforceps expanded apically beyond the penis valves and with pubescence not extended around apex to inner angle. Closely related to *H. chlorostictus* and *H. simplex*.

**Distribution.** Maui, Molokai, Lanai, Oahu; coast to mountains, dry shrubland to wet forest. Only one recent collection, from Maui.

**Male.** Measurements: Malar space, 5; eye, 142:114:108:72; clypeus, 69×71; frons, 28×22:92; interalveolar, 12:25:49:62, D 22; interocellar, 29 29:22:31, D 17; scape, 55×28; wing length, 4.5 mm (*H. facilis* lectotype).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons rather flat, with long plumose hair, and with indistinct, mostly round, shallow pits 1 pit width or less apart even at the middle, ground minutely wrinkled, the wrinkles more or less parallel transversely across the middle and longitudinally at sides along eye, slightly lustrous; median, impunctate, lustrous area above antennal sockets, slightly depressed and sometimes with one or two minute holes at middle. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus slightly arched. Scape in frontal view slightly dilated, width half length, ratio about 0.5; lateral edge in frontal view nearly straight or slightly concave; strongly arched in lateral view with maximum arch near middle of scape; no groove on underside; with short to medium-length, pale brown, weakly plumose hair. Vertex hair 20-30, brown, plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground slightly granular and slightly lustrous; hair medium-length (12-20), brownish white, plumose. Scutellum with slightly larger pits, smoothly coriaceous, lustrous. Mesepisternum with distinct to indistinct, shallow, round pits, about 1 pit width apart, and long, yellowish white, plumose hair; ground minutely coriaceous or striate, slightly lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae; at brow and below granular or somewhat smoothly coriaceous, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with short, fine, pale, appressed hairs spaced about one hair length apart or more. T7 hair medium-length, brown, prostrate.

**Terminalia.** Lateral process of S7 broad, sword-shaped, length much greater than width of hemisternite. Median process of S8 linear, apex bifurcate with long, filamentous, densely hairy tips. Apices of gonoforceps exceeding penis valves, conspicuous even when retracted.

**Color.** Labrum and mandible blackish brown to black. Face with a single large spot not extended at the sides above the antennal sockets and with fine black sulci in “H” shape: clypeus entirely yellow or nearly so; lower paraocular area with a rather narrow yellow stripe below antennal socket and along sulci; supraclypeal area yellow to acme or below; scape unmarked. Pronotum unmarked. Legs dark brown to black except: fore tibia, and sometimes fore femur, with pale areas that may be yellowish along dorsal margins. Wings light smoky.

**Female. Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area with shallow, nearly round pits about 1 pit width apart, ground smooth, lustrous; frons with pits medially smaller, contiguous, slightly distorted; ground minutely wrinkled,

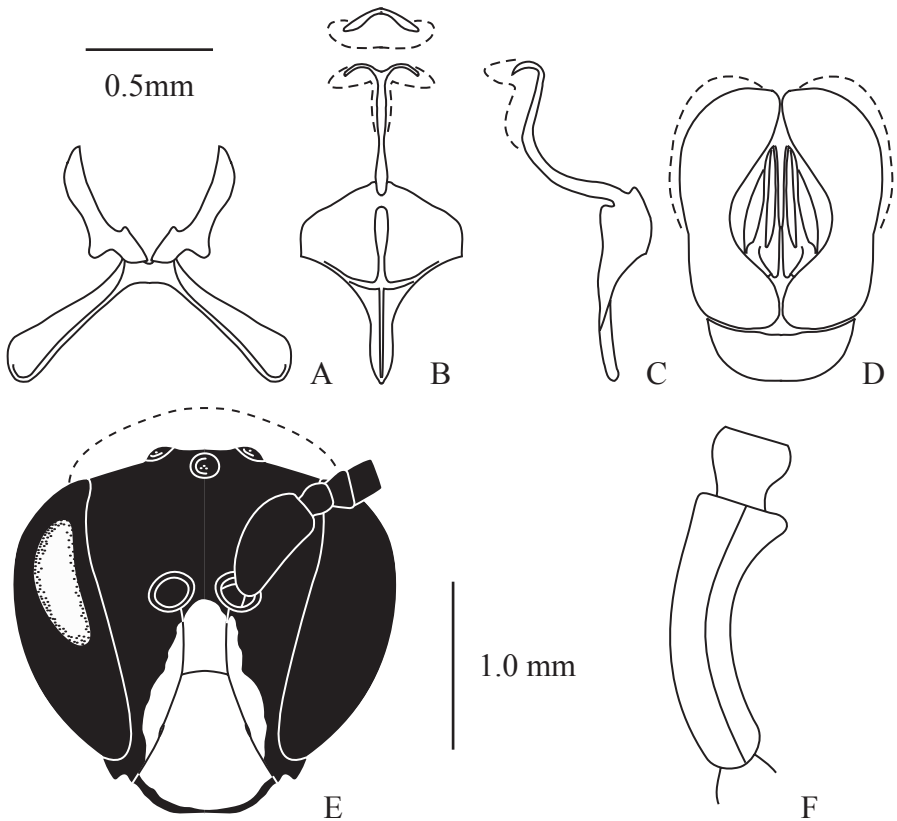


Fig. 23. *Hylaeus facilis*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

slightly lustrous; faint frontal line in some bees. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 20-30, brown, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with pits 1-2 pit widths apart, ground slightly granular and slightly lustrous; hair medium-length (12-24), pale yellowish brown, weakly plumose. Scutellum with slightly larger pits, smoothly coriaceous, lustrous. Mesepisternum with indistinct, shallow, round pits, about 1 pit width apart, and long, yellowish white, plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, smooth, slightly lustrous, nearly flat. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae; below brow smoothly coriaceous, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with short, fine, pale, appressed hairs spaced about one hair length apart. T6 hair medium, brown, prostrate.

**Color.** Head and mesosoma black; legs and metasoma dark brown; unmarked. Wings dark smoky.

**Perkins' collections. Maui:** Haleakala, 5000 ft (BPBM); Iao Valley (BMNH, BPBM); "Maui" (BMNH, BPBM); W. Maui Mtns, 2000 ft (BMNH, BPBM, OUMNH); Wailuku, on sandy isthmus (OUMNH). **Lanai:** center of island, forest above Koele, 2000 ft (OUMNH); Halepaakai, 3000 ft (BPBM); "Lanai," 2000 ft (BMNH, BPBM, OUMNH); Koele Mts. >2000 ft (BPBM). **Molokai:** E. mountains, 2000 ft (OUMNH); Molokai Mts., 3000 ft (BMNH, BPBM), >3000 ft (BPBM), 3500 ft (BPBM). **Oahu:** Honolulu (BMNH, BPBM), 2000 ft (BMNH, BPBM); Honolulu Mts. 1500 ft (OUMNH); Makana, Waianae, 3000 ft (BPBM); Kaala Mts., 2000 ft (BMNH, BPBM); "Oahu" (BPBM); Tantalus (BPBM); Waianae Mts., 2000 ft (BMNH, BPBM).

**Recent collections. Oahu:** Poamoho Trail, 6-XII-1975, G. Nishida. **Maui:** Kokomo, nr. Makawao 1500 ft.

**Flower records.** None.

**Remarks.** Colors of the female integument and pubescence are based on old specimens. Apparently the most common dryland species in Perkins' time, *H. facilis* and its sister species *H. simplex* seem to have almost completely disappeared, despite continued flourishing of *H. difficilis* and *H. laetus* in these habitats. Although it may (like other long-uncollected species) survive in numbers at unvisited locales, there is no question that it has been extirpated from much of its range. Females of this species and *H. simplex* tend to be slightly larger and with slightly shorter hair than *H. difficilis*, but cannot be reliably distinguished. However, given the steep decline in the former two species, any female keying to these three can be assumed to be *H. difficilis* unless an associated male is found.

**References.** Blackburn and Kirby, 1880:85 (records). Blackburn and Cameron, 1886:142-143, 148 (♂ ♀; key); 1887:202-203, 208 (♂ ♀; key). Dalla Torre, 1896:22 (list). Perkins, 1899:105 (host of cleptoparasite: *N volatilis*); 1907a:43 (record: Oahu, Tantalus); 1910:601 (key); 1911:727 (Blackburn had series of mixed species); 1913:64, 79 (biology, biogeography). Fullaway and Giffard, 1919:52 (record: Maui, Lahaina). Swezey and Bryan, 1929:297, 310-312 (nest: in dead twig, in dead twig of *Broussaisia arguta*, in hollow twig of *Clermontia grandiflora*, in beetle burrow in dead stem of *Smilax sandwicensis*; record: Molokai, E. Kawela, Kamiloloa, Waikolu). Krauss, 1944:94 (record: Molokai, Waikolu Valley; Maui, Hana). Swezey, 1954:203 (nest: in dead stem of *Smilax*; record: Molokai, Kainalu).

### *Hylaeus (Nesoprosopis) filicum* (Perkins)

(Fig. 24)

*Nesoprosopis filicum* Perkins, 1911:722 (♂; Hawaii, Kilauea).

*Hylaeus (Nesoprosopis) filicum*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis filicum*, Daly, 1994:116 (type not located).

**DIAGNOSIS.** Medium-sized bees with light smoky wings. Both sexes with unusual extremely dense punctation across the entire upper paraocular area and frons. Male face with three separate marks, those of paraocular areas extended above antennal sockets in narrow vittae; scape moderately dilated and strongly arched, with an apical knoblike expansion in lateral view; pronotum unmarked; process of S8 strongly dilated and with broad, round tips. Female with small paraocular marks and yellow marks on pronotal collar but not lobes. See diagnosis and remarks under *H. mimicus*.

**Distribution.** Hawaii; montane wet to mesic forest.

**Male.** Measurements: Malar space, 5; eye, 105:102:97:59; clypeus, 59×54; frons, 17×24:73; interalveolar, 17:23:44:49, D 18; interocellar, 28:28:18:28, D 15; scape, 39×27; wing length, 4.2 mm (Hawaii, Kilauea, 4000 ft, BPBM 3385).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with pits less than 1 pit width apart, crowded and distorted in subpolygonal shapes; a dark rhomboid spot at the middle created by dense black or dark brown hair and very dense punctation; shiny area just below spot and above antennal socket. Lower paraocular depression absent. Frontoclypeal sulcus straight to slightly arched. Impunctate area laterad of lateral ocellus shining. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view nearly straight; strongly arched in lateral view (under surface much more strongly arched than the upper) with maximum arch about two-thirds along, with an abrupt thickening at the apex; underside of median edge with a groove; with long, simple, brown hair. Vertex hair 16-24, brown, simple.

**Mesosoma.** Scutum with indistinct, shallow pits about 1 pit width apart, ground granular, dull; hair long (12-20), simple, brown. Scutellum with slightly larger pits, dull. Mesepisternum with shallow pits, about 1 pit width apart, and long, yellowish white, plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, smooth, lustrous, swollen. Metanotum dull. Basal area of propodeum with a rather long, slightly concave anterior area; sparse, weak, lineate rugae at base; brow smoothly coriaceous and lustrous, prominent.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, dark, erect hairs spaced about one hair length apart. T7 hair long, dark brown, erect.

**Terminalia.** Lateral process of S7 parallel-sided, length subequal to width of hemisternite. Median process of S8 strongly dilated, apex bifurcate with broad, round tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma dark brown to black; metasoma dark brown. Labrum and mandible blackish brown to black. Face with three separate marks: clypeus with variable apical mark, extending up to half length of plate; paraocular area yellow, extended at sides along the eye above antennal socket as narrow vitta; supraclypeal area unmarked; scape unmarked. Pronotum unmarked. Legs dark brown to black except fore tibia with pale area, apex of fore femur and all tibiae with or without a trace of yellow at base. Mid and hind tibia variable, with or without an obscure trace of yellow at base. Wings clear to light smoky.

**Female. Head.** Malar space long (ratio about 0.7 DMO). Upper paraocular area with mostly round pits less than 1 pit width apart; frons with pits becoming crowded medially,

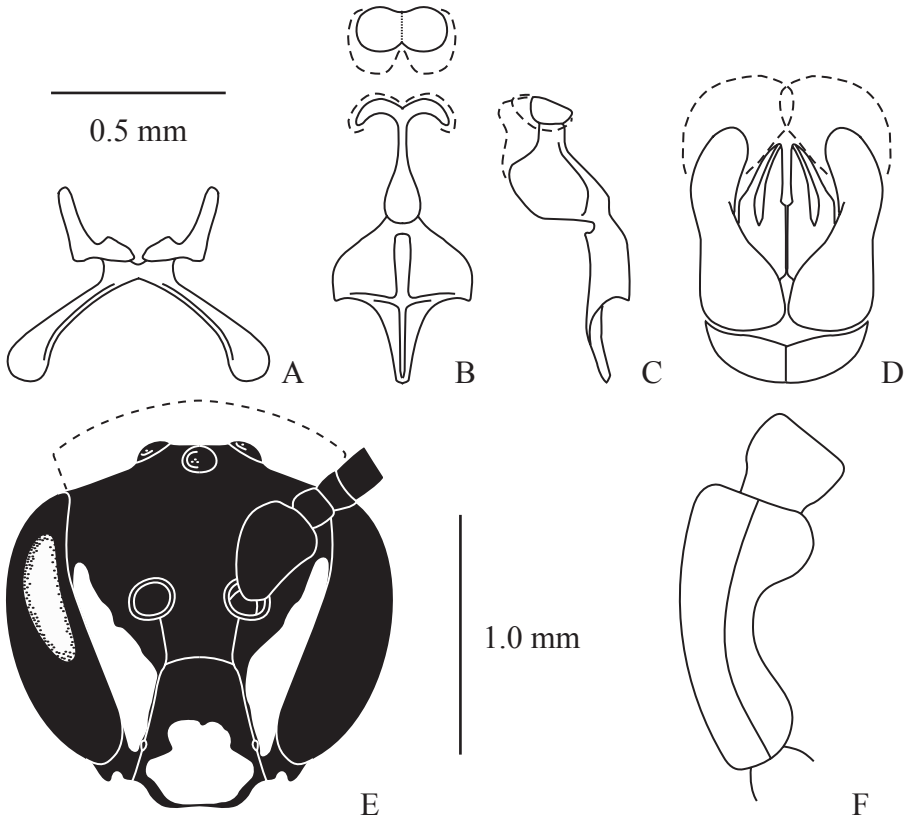


Fig. 24. *Hylaeus filicum*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

distorted, and obscured along middle by longitudinal wrinkles; slightly lustrous ground. Apex of clypeus distinctly emarginate. Dorsal end of facial foveae not extended to level of lateral ocelli. Vertex hair 12-24, brown, simple.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with shallow, indistinct pits 1-2 pit widths apart, ground granular dull to slightly lustrous; hair medium-length (8-16) simple, pale brown. Scutellum with pits slightly farther apart, slightly lustrous. Mesepisternum with barely discernible pits, about 2-3 pit widths apart, and long, yellowish white, weakly plumose hair; ground smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous, nearly flat. Metanotum slightly lustrous. Basal area of propodeum with sparse, weak, short rugae at very front, otherwise glabrous to brow; brow smoothly coriaceous and lustrous. Hypoepimeron impunctate, nearly flat.



**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, almost polished; fine, pale, semierect hair about one hair length apart. T6 hair long, brown, erect.

**Color.** Head and mesosoma dark brown to black; metasoma dark brown. Face marks: clypeus and supraclypeal area usually unmarked (clypeus rarely with an obscure subapical spot); lower paraocular area with narrow, irregular yellow stripe along the eye up to level of antennal sockets. Pronotum with transverse collar stripe interrupted medially; lobes unmarked. Legs dark brown except fore tibia with or without pale area and obscure basal yellow spot. Wings slightly smoky.

**Perkins' collections.** None. Type collected later by Perkins at Kilauea, Hawaii.

**Recent collections. Hawaii:** Puu Waawaa, 4100 ft; Kona Forest Unit of Hakalau National Wildlife Refuge, South Boundary Rd., 5200 ft.

**Flower records.** *Chamaesyce olowaluana*, *Myoporum*.

**Remarks.** Types have not been located. Despite the close resemblance of the males to *H. mimicus*, the females have much less facial coloring, and the species is probably more closely related to *H. haleakalae* of Maui Nui. Females in older Kilauea collections were often placed with males of *H. hula*, although the two species were apparently not collected together in that area.

**References.** Fullaway, 1918:396 (variation).

### *Hylaeus (Nesoprosopis) finitimus* (Perkins)

*Nesoprosopis finitima* Perkins, 1899:100 (♂ ♀).

*Hylaeus (Nesoprosopis) finitimus*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis finitima*, Daly, 1994:116 (lectotype ♀ BMNH 17a 168; Kauai, coast at Makaweli; wing length, 5.0 mm).

**DIAGNOSIS.** Medium-sized bees with clear wings (only female type available for study). Perkins (1899:100) described the male *H. finitimus* only as having "the face shaped and colored as in *H. longiceps* but with the punctuation of the scutum and scutellum distinctly finer." In his key (1910:602) *H. finitimus* has the face shorter and the supraclypeal area about as long as wide compared to *H. longiceps*, which has the face longer and the apical margin of the supraclypeal area much shorter than the sides. Female black and unmarked.

**Distribution.** Kauai; coast. No recent collections.

**Male.** No type or other specimens available (see diagnosis).

**Female. Head.** Malar space short (ratio about 0.4 DMO). Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Upper paraocular area with round pits about 1 pit width apart and ground minutely wrinkled; frons with pits becoming smaller, closer medially, slightly distorted; at middle, a few longitudinal wrinkles and frontal line incomplete.

**Mesosoma.** Pronotum with short, mossy plumose hair along collar between lobes. Scutum with distinct pits 1-2 pit widths apart, ground granular, slightly lustrous. Scutellum with pits slightly larger, ground lustrous. Mesepisternum with round pits about 1 pit width apart, and medium-length, yellowish white, weakly plumose hair; ground uneven, roughened,

slightly lustrous. Hypoepimeron impunctate, smooth, lustrous; nearly flat. Basal area of propodeum lineately rugose to brow and beyond, shiny surface between rugae that are 2-4 rugae apart; nearly smooth below brow.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, pale, appressed hairs spaced about one hair length apart.

**Color.** Head and mesosoma black; legs dark brown, metasoma dark reddish brown; unmarked except fore tibia with pale area. Wings yellowish clear.

**Perkins' collections. Kauai:** "Kauai" (BMNH).

**Recent collections.** None.

**Flower records.** None.

**Remarks.** Colors of the integument and pubescence are based on an old specimen. This species was not encountered in collecting at Polihale, an excellent coastal site for *Hylaeus* on Kauai; however, populations at such an arid site are highly cyclical, and it is possible that even if it occurs there, the three brief collecting trips may have missed it.

**References.** Perkins, 1910:602 (key).

### *Hylaeus (Nesoprosopis) flavifrons* (Kirby)

(Fig. 25)

*Prosopis flavifrons* Kirby, 1880:85 (♂; holotype ♂ BMNH 17a 170; Kauai; wing length, 3.7 mm).

*Nesoprosopis flavifrons*, Perkins, 1899:101 (♂ ♀; Pl. 2, Fig. 18).

*Hylaeus (Nesoprosopis) flavifrons*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis flavifrons*, Daly, 1994:114 (holotype ♂ confirmed).

**DIAGNOSIS.** Small bees with short malar spaces and clear wings. Male face with one large yellow mark extended at sides to level of antennal sockets and supraclypeal area; legs unmarked; scape unmarked or with narrow, pale lateral margin; unusual scape moderately to strongly dilated and strongly arched. Differs from its sister species, *H. anthracinus*, by the dilated S8; the facial marking also usually larger. Female black and unmarked; mandible with three teeth, a feature shared with *H. anthracinus*; distinguished from sympatric species by the combination of very short scutum hair and long, dark brown hair on T6.

**Distribution.** Kauai; coast.

**Male.** Measurements: Malar space, 5; eye, 128:108:102:67; clypeus, 64×67; frons, 23×22:86; interalveolar, 17:26:47:58, D 18; interocellar, 28:28:15:31, D 15; scape, 41×39; wing length, 3.8 mm (Kauai, BPBM 3387).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area with punctuation indistinct, pits about 1 pit width apart, partially obscured and distorted by weak parallel, minute wrinkles that curve from near the lateral ocellus to along the eye (pits more distinct and wrinkles weaker in some bees, in these the size and density of pits is rather uniform across the frons); frons with pits medially distinct, nearly round, about 1 pit width apart; ground medially smooth, lustrous; fine frontal line evident in some bees; impunctate, lustrous area above antennal sockets. Lower paraocular depression very shallow. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately to strongly dilated, width about

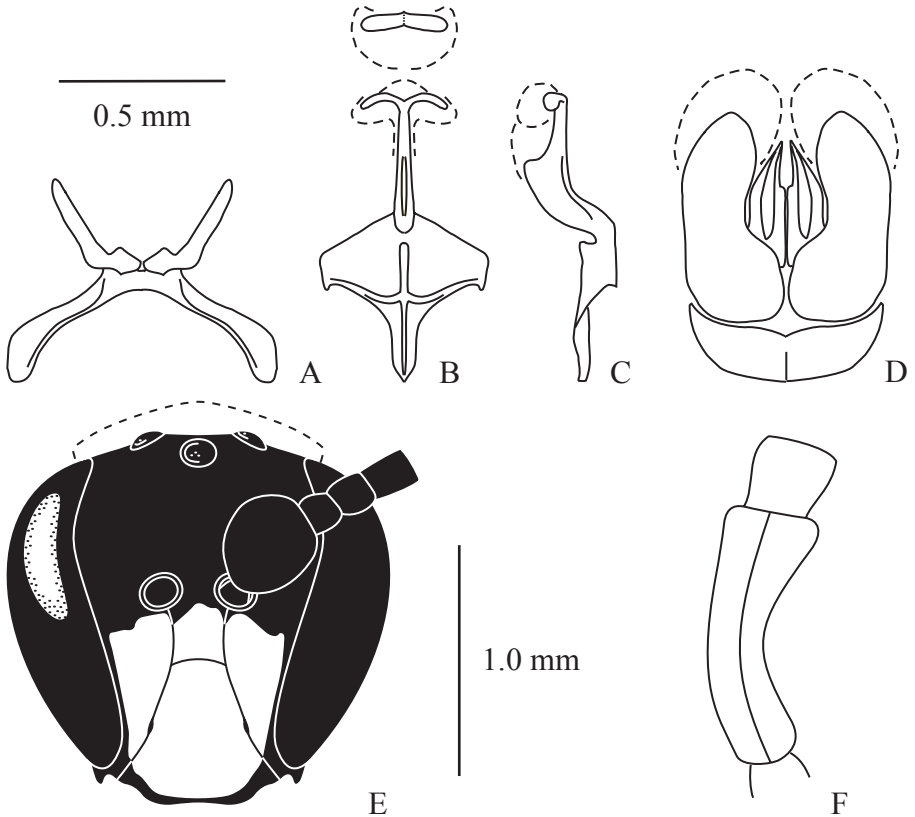


Fig. 25. *Hylaesus flavifrons*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

equal to length, ratio about 0.8-1.0; lateral edge in frontal view distinctly convex; strongly arched in lateral view with maximum arch near middle of scape; no groove on underside; with short to medium-length, white, plumose hair. Vertex hair 12-20, yellowish white, plumose.

**Mesosoma.** Scutum with distinct pits 1-2 pit widths apart, ground nearly smooth, slightly lustrous; hair short (about 6), white, plumose. Scutellum with pits slightly larger, ground smooth, lustrous. Mesepisternum with distinct, round pits about 1 pit width apart, and long, white, plumose hair; ground nearly smooth, lustrous. Hypoepimeron impunctate, smooth to weakly striate, lustrous; slightly swollen. Metanotum slightly lustrous. Basal area of propodeum irregularly lineate or reticulately rugose to brow; shiny between rugae; brow minutely wrinkled, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, pale, relatively long, appressed hairs spaced about one hair length apart or less. T7 hair short, dark brown, prostrate.

**Terminalia.** Lateral process of S7 parallel-sided, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with medium-length, narrow, straplike tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with one large mark with fine black sulci in "H" shape: clypeus entirely yellow or nearly so; lower paraocular area entirely yellow or nearly so to level of antennal socket, sometimes reduced to a broad stripe (c.f. *H. anthracinus*) or upper margin of mark at sides diffuse yellowish brown; supraclypeal area to acme yellow; scape unmarked or with narrow, pale lateral margin. Pronotum unmarked. Legs dark brown to black except fore tibia with pale area; unmarked. Wings clear.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with indistinct, shallow pits about 1 pit width apart; at sides weak parallel, minute wrinkles curved from near the lateral ocellus to along the eye, otherwise ground minutely wrinkled, slightly lustrous. Apex of clypeus shallowly emarginate. Mandible with three teeth (see Fig. 9B). Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 8-16, yellowish white, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with indistinct pits 1-2 pit widths apart, ground nearly smooth, slightly lustrous; hair short (4-6), pale, weakly plumose. Mesepisternum with shallow, round pits about 1 pit width apart, and short, white, plumose hair; ground nearly smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous; nearly flat. Metanotum slightly lustrous. Basal area of propodeum irregularly lineately rugose to brow; shiny between rugae; brow minutely wrinkled, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, pale, short, appressed hairs spaced about one hair length apart. T6 hair long, dark brown, prostrate.

**Color.** Head and mesosoma dark brown to black; legs and metasoma dark brown; unmarked except fore tibia with obscure pale area. Wings clear.

**Perkins' collections. Kauai:** "Kauai" (BPBM), coast (BPBM); Waimea (BPBM, OUMNH), 2000 ft (BMNH).

**Recent collections. Kauai:** Polihale State Park, coast. **Lehua:** West Horn, coast.

**Flower records.** *Portulaca oleraceae*\*, *Scaevola sericea*, *Sida*.

**Remarks.** Occurs in company with *H. chlorostictus*, *H. connectens*, *H. hostilis*, and *H. solaris* at Polihale beach on Kauai. Males are easily separated by the strongly dilated scape and the facial marks, in which the paraocular marks are broad and usually reach the eye but do not extend above the antennal sockets; females have very short scutum hair like *H. solaris*, but the hairs of T6 are dark rather than pale. A male collected from Lehua, an islet near Niihau, has reduced facial marks similar to *H. anthracinus* and is almost certainly responsible for the report of that species from Niihau by Beardsley and Tuthill (1959).

**References.** Blackburn and Cameron, 1886:144, 148 ( $\sigma$ ; key); 1887:203-204, 208 ( $\sigma$ ; key). Dalla Torre, 1896:23 (list). Perkins, 1910:603 (key); 1913:64, 81 (biology, morphology).

*Hylaeus (Nesoprosopis) flavipes* (F. Smith)

(Fig. 26)

*Prosopis flavipes* F. Smith, 1853:23 (♂; holotype ♂ BMNH 17a 153; Sandwich Islands; wing length, 4.0 mm).

*Nesoprosopis flavipes*, Perkins, 1899:99 (quotes Smith's description).

*Hylaeus (Nesoprosopis) flavipes*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis flavipes*, Daly, 1994:120 (holotype ♂ confirmed).

*Prosopis blackburni* F. Smith, 1879a:682; 1879b:20 (♂ ♀) (new synonymy).

*Nesoprosopis blackburni*, Perkins, 1899:97 (♂ ♀; Pl. 2, Fig. 16).

*Hylaeus (Nesoprosopis) blackburni*, Meade-Waldo, 1923:34 (list).

*Prosopis blackburni*, Daly, 1994:119 (lectotype ♂ BMNH 17a 2827ab; Maui, wing length, 3.7 mm).

**DIAGNOSIS.** Small to medium-sized bees with very short to short malar spaces and clear to slightly smoky wings. Male lower face entirely yellow, extended at sides in a broad stripe above antennal sockets, scape black or with an apical yellow spot or a yellow stripe extended the full length of the scape; tibiae and tarsi of all legs yellow with some subapical brown or orange spots on the tibiae visible in caudal view. Female black and usually unmarked (rare specimens may have small yellow marks in paraocular areas).

**Distribution.** Hawaii, Maui, Lanai (new record), and possibly Oahu; coast, and lowland and montane dry shrubland and forest. No recent collections from Maui.

**Male.** Measurements: Malar space, 5; eye, 137:108:100:74; clypeus, 66×69; frons, 25×24:93; interalveolar, 12:22:54:64, D 17; interocellar, 29:27:25:32, D 15; scape, 49×22; wing length, 4.3 mm (Hawaii, Hawaii Volcanoes N. P., Kalu, coast, 100 ft).

**Head.** Malar space very short to short (ratio about 0.2-0.3 DMO). Upper paraocular area with round pits about 1 pit width apart or more, frons with pits becoming closer and smaller medially; pits minute at middle, contiguous and slightly distorted; ground at sides with weak parallel wrinkles curved from near lateral ocellus to along the eye, ground smoother medially, lustrous; middle without special sculpture, no frontal line evident; impunctate, lustrous area above antennal sockets, extended medially to middle of frons in some bees. Lower paraocular depression very shallow to absent. Frontoclypeal sulcus straight or nearly so. Scape in frontal view weakly to slightly dilated, width half or less of length, ratio about 0.4-0.5; lateral edge in frontal view nearly straight or slightly concave; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with short to medium-length, yellowish white, weakly plumose hair. Vertex hair 10-14, yellowish white, plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground nearly smoothly coriaceous, lustrous; hair medium-length (8-10), yellowish white, plumose. Scutellum with pits slightly larger, ground smoothly coriaceous, lustrous. Mesepisternum with shallow, indistinct pits about 2 pit widths apart, and long, yellowish white, plumose hair; ground smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous; nearly flat. Metanotum slightly lustrous. Basal area of propodeum lineately rugose, rugae reaching from the base to between a quarter

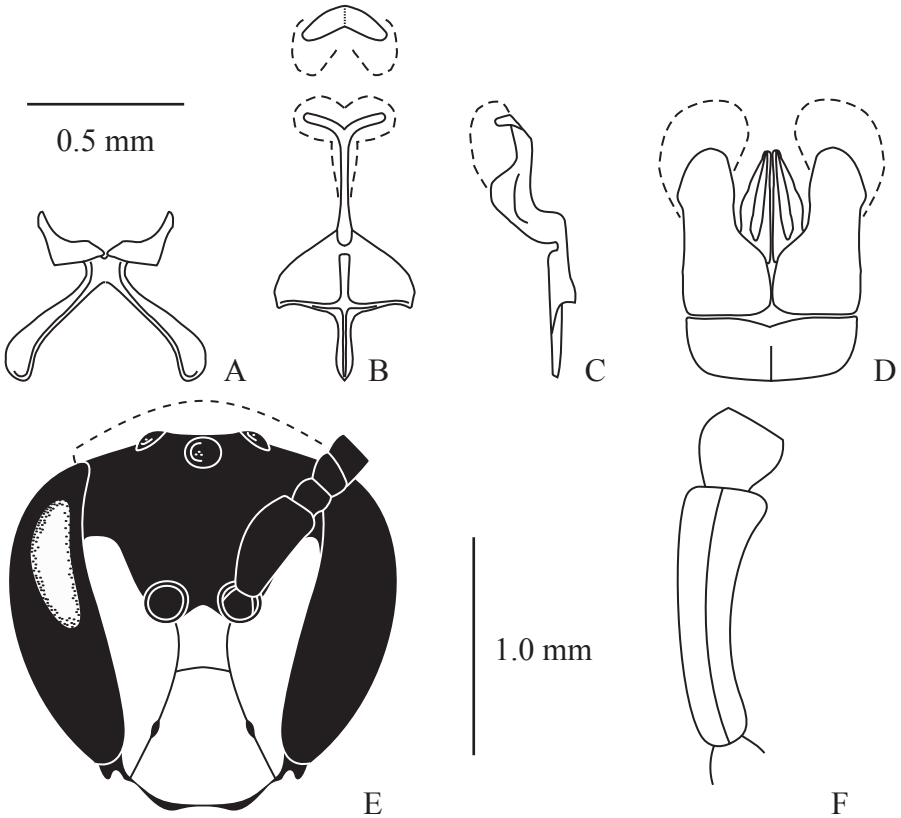


Fig. 26. *Hylaeus flavipes*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

and almost all the way to brow, some bees with only a few widely spaced rugae or sparsely reticulate, shiny between rugae; brow minutely wrinkled, dull.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, short, pale, suberect to appressed hairs spaced about one hair length apart. T7 hair short, golden, appressed.

**Terminalia.** Lateral process of S7 tapered, pale, length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with moderately long, narrow, rounded tips set at an angle to each other. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum yellow; mandible black or partly yellow. Face with one large mark with fine black sulci in "H" shape: clypeus entirely yellow; paraocular area yellow to well above

antennal socket; supraclypeal area to acme yellow. Scape in frontal view variable: entirely black or with an apical yellow spot, or a yellow stripe extended up to full length of scape. Flagellum orange to orange-brown beneath. With or without marks on pronotal collar (transverse collar stripe of well-separated, narrow, irregular lateral marks), pronotal lobes, and tegula. Femora brown to dark brown except marked yellow at very apex; tibiae yellow except in frontal view, usually with an obscure orange to brownish stain near midlength, and in caudal view with a large subapical orange to dark brown spot (especially visible on the mid and hind tibiae); basitarsi entirely yellow, basal mediotarsus yellow, and distal terminal tarsal segments yellowish brown. Wings clear.

**Female. Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area with distinct, round pits about 1 pit width apart or more, frons with pits closer medially, some contiguous near middle, but still distinct and mostly round; ground smooth, lustrous, especially at each side near the center of the frons; at middle, a few longitudinal wrinkles and a faint frontal line evident in some bees; a small, impunctate, lustrous area above antennal sockets. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-10, yellowish white, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground nearly smoothly coriaceous, slightly lustrous; hair short (4-6; specimens from montane areas on Hawaii may also have scattered long hairs up to 20), white, plumose. Scutellum with pits slightly larger, ground smoothly coriaceous, lustrous. Mesepisternum with shallow, indistinct pits about 1 pit width apart or more, and medium-length, yellowish white, plumose hair; ground smooth or very weakly striate, lustrous. Hypoepimeron impunctate, smooth, lustrous; nearly flat. Metanotum slightly lustrous. Basal area of propodeum lineately rugose to brow or nearly to brow, shiny between rugae; brow minutely wrinkled to nearly smooth, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, very short, pale, appressed hairs spaced more than a hair length apart. T6 hair short, light to golden brown, appressed.

**Color.** Head black, usually unmarked (rarely with small yellow spots in paraocular areas); mesosoma black; legs and metasoma dark brown; unmarked except fore tibia with pale area and with or without an obscure dorsal yellowish stripe. Wings clear to slightly smoky.

**Perkins' collections.** *H. blackburni*: **Maui:** Maui coast (BPBM); Iao Valley, far up (BPBM); Wailuku (BMNH, BPBM, OUMNH), sand hills (BPBM).

**Recent collections.** **Hawaii:** Kau Desert, 300 ft; Kalu, coast; Kaulana Bay, coast; South Point, coast; Puu Pa, 2600 ft; Kipuka Nene, 2900 ft; Kipuka Alala, 5800 ft; Hale Pohaku, 9000 ft. **Lanai:** Kahue, 1400 ft.

**Flower records.** *Dodonaea*, *Jacquemontia*, *Myoporum*, *Scaevola sericea*, *Sesbania tomentosa*, *Sida*, *Sophora*, *Styphelia*, *Tournefortia*\*, *Tribulus cistoides*.

**Remarks.** *Hylaeus flavipes* from Hawaii and *H. blackburni* from Maui and Lanai are treated here as one species under the senior name, *H. flavipes*. Male bees referred to these two species are similar in the extensive yellow marking of the face, yellow tibiae and tarsi of all legs, sculpture of the propodeum, and genitalia. In the past the males have been distinguished primarily by the color of the scape and mandible: black and unmarked in *H.*



*flavipes*, marked with yellow in *H. blackburni*. Recent collections reveal variation in the degree of melanism of male bees that largely invalidates this distinction. On Hawaii (South Point) the darkest males have the scape, mandible, and pronotal collar black; no yellow mark on the pronotal lobes; and the hind tibia marked with a small brown spot in front and a larger dark brown spot behind. The least melanic males have the scape with an apical yellow stripe extended up to half the length of the scape; yellowish areas on the mandible; yellow marks on the pronotal collar and lobe; and the hind tibia with a reddish spot in front and a smaller brown spot behind. Strict use of Perkins' key (1910:602) would identify both *H. flavipes* and *H. blackburni* from this one population. On Lanai and Maui, males are less melanic than those on Hawaii. Here males have a yellow stripe extended the entire length of the scape, the mandible partly or mostly yellow, pronotal lobes yellow, pronotal collar with or without a yellow spot, and hind tibia with an orange spot in front and an orange spot or brown spot behind; they are also usually smaller. Although some differentiation in color patterns exists between the populations on Hawaii and those on Maui and Lanai, we chose to treat the differences as geographic variation within one species.

Confusion has surrounded the taxonomy of these species. *Hylaeus flavipes* was described by Smith (1853) from one male labeled "Sandw. I. Beechey" and was stated to have a black scape. The male holotype is in The Natural History Museum, London, and matches the description. The collection was presumed to be from Oahu because the ship's naturalist was said to have prevented by illness from pursuing his research among the islands (see Introduction), yet we have seen no other specimens taken on Oahu. At least one other species collected by the Beechey expedition, *Odynerus obscurepunctatus*, was collected by Perkins only on Hawaii (Perkins 1899:60). Perkins (1899:99) assumed *H. flavipes* was from Oahu and did not mention other specimens from Oahu or elsewhere. Later, he recorded *H. flavipes* from the island of Hawaii and regarded the species as distinct from *H. blackburni* (1910:605). Fullaway (1918:396-397) offered a contrary opinion, stating without explanation "Flavipes=blackburni." He also recorded collections from Hawaii and described the male as often having a yellow spot on the scape. Although the type locality remains in question, the name *H. flavipes* has been associated with males from the island of Hawaii that have reduced or no yellow marking on the scape.

*Hylaeus blackburni* was described by Smith (1879a) from one male and one female labeled "Maui." The male was stated to have the scape with a yellow line in front. The male lectotype is in London and matches the description. However, the type was somehow mislabeled as *Prosopis simillima*, an error corrected by Houston (1981:27). Blackburn (1886:141-142) supplemented the description of *H. blackburni* and described considerable variation. Perkins (1899:97) identified bees in his own collection from Maui as *H. blackburni* and redescribed both sexes, stating that the male had the front half of the scape yellow. He commented that Blackburn must have had more than one species when he wrote about variation in *H. blackburni*.

Both *H. flavipes* and *H. ombrias* are typically coastal or lowland species that have established disjunct populations above 5000 ft in the Pohakuloa area of Hawaii. They may have formerly been continuous with populations on the Kona coast that are now extirpated. Individuals of both species from montane areas often have longer vertex and scutum hairs



than those from the lowlands. Males of *H. flavipes* from upland areas may have the paraocular marks in a narrowing stripe as in *H. niloticus* rather than the typical broad stripe, but can easily be distinguished from that species by the extensive leg markings as well as the dilated process of S8.

**References.** Blackburn and Cameron, 1886:149 ( $\sigma$ ; key); 1887:209 ( $\sigma$ ). Dalla Torre, 1896:23 (list). Perkins, 1910:602, 605 (key, record: Hawaii, coast). Fullaway, 1918:396, 397 ( $\sigma$  ♀; record: Hawaii, Honuapo, Hilea, Kau). *Hylaeus blackburni*: Blackburn and Kirby, 1880:85 (record). Blackburn and Cameron, 1886:139, 141-142, 148 ( $\sigma$  ♀; key); 1887:201-202, 208 ( $\sigma$  ♀; key). Dalla Torre, 1896:16 (list). Perkins, 1899:104 (host of cleptoparasite: *N. hilaris*); 1910:602 (key); 1913:79 (biogeography). Fullaway, 1918:396 (record: Lanai, coast).

### *Hylaeus (Nesoprosopis) fuscipennis* (F. Smith)

(Fig. 27)

*Prosopis fuscipennis* F. Smith, 1879a:682-683; 1879b:20-21 ( $\sigma$  ♀; holotype  $\sigma$  BMNH 17a 155; Oahu; wing length, 7.7 mm).

*Nesoprosopis fuscipennis*, Perkins, 1899:106-107 ( $\sigma$  ♀).

*Hylaeus (Nesoprosopis) fuscipennis*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis fuscipennis*, Daly, 1994:120 (holotype  $\sigma$  confirmed).

*Nesoprosopis fuscipennis obscuripes* Perkins, 1899:107 ( $\sigma$  ♀) (new synonymy).

*Hylaeus (Nesoprosopis) fuscipennis obscuripes*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis fuscipennis obscuripes*, Daly, 1994:117 (lectotype  $\sigma$  BMNH 17a 140; Maui, West Maui Mts., Iao Valley; wing length, 7.1 mm).

*Nesoprosopis fuscipennis swezeyi* Cockerell, 1926:308 ( $\sigma$  ♀; Oahu, Mt. Tantalus) (new synonymy).

*Nesoprosopis fuscipennis swezeyi*, Daly, 1994:114 (types not located).

*Nesoprosopis caeruleipennis* Perkins, 1899:107 ( $\sigma$  ♀) (new synonymy).

*Hylaeus (Nesoprosopis) caeruleipennis*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis caeruleipennis*, Daly, 1994:116 (lectotype  $\sigma$  BMNH 17a 138a; Molokai, Mts.; wing length, 7.9 mm).

**DIAGNOSIS.** Large bees with punctured terga, dark wings, and dark faces. Males with yellowish stripe on scape; both sexes with a complete or nearly complete transverse stripe on the pronotal collar, and no hump on second sternum as seen in lateral view. Sister species of *H. pubescens*, which has a hump on S2 and much more, redder hair on the apex of the metasoma.

**Distribution.** Maui, Lanai, Molokai, and Oahu; montane wet and mesic forest. No recent collections from Oahu.

**Male.** Measurements: Malar space, 6; eye, 179:146:151:102; clypeus, 97×90; frons, 33×44:113; interalveolar, 20:36:56:67, D 27; interocellar, 36:44:33:44, D 18; scape, 61×51; wing length, 7.5 mm (Maui, West Maui Mts, BPBM 3402).

**Head.** Malar space short (ratio about 0.3-0.4 DMO). Upper paraocular area with indistinct, shallow, somewhat distorted pits about 1 pit width apart, in some bees more or less separated by fine parallel wrinkles that curve across the sides of the frons from near the lateral ocellus to along the eye; frons with pits near the center relatively distinct, nearly round, and with diminished wrinkles; ground generally slightly lustrous, more lustrous near center; middle with some fine longitudinal wrinkles, with or without a fine, frontal line; no impunctate area above antennal sockets. Lower paraocular depression distinct. Frontoclypeal sulcus arched or nearly straight. Scape in frontal view moderately dilated, width more than half length, ratio about 0.8; lateral edge in frontal view variable, distinctly curved (convex) or forming a broad obtuse angle at middle, to nearly straight; strongly arched in lateral view with maximum arch near apex of scape; underside of median edge with a narrow groove; with medium-length, yellowish white, mostly simple hair. Vertex hair 12-20, white, mostly simple.

**Mesosoma.** Scutum with distinct pits 1-2 pit widths apart, ground slightly lustrous; hair medium-length (10-12), yellowish white, mostly simple. Scutellum with pits slightly larger, lustrous. Mesepisternum with distinct, round pits about 1 pit width apart, and long, yellowish white, plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron punctured in lower part, smooth, slightly lustrous; swollen. Metanotum dull. Basal area of propodeum slightly protuberant in middle, roughened overall by reticulate rugae except the posterior, vertical, coriaceous face; rugae and ground minutely wrinkled, slightly lustrous; lateral carina strong, terminated anterolaterally in a slightly protuberant area at each side of the area.

**Metasoma.** Disk of T2 with distinct punctuation, minute, shallow pits more than 2 pit widths apart, and fine, short, pale, appressed hair; ground smoothly coriaceous, shiny. T7 hair long, reddish brown, erect. T5-6 hair not particularly long and dense.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 strongly dilated, apex bifurcate with broad, rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face marks absent. Scape in frontal view with yellowish ivory stripe on lateral margin. Pronotum with ivory transverse collar stripe complete or nearly so; lobes unmarked. Legs dark brown to black except: fore femur with or without (obscure in *H. fuscipennis* holotype) ivory spot at apex; fore tibia with pale area and with or without a trace of ivory at base; mid tibia with or without a trace of ivory at base and subapex, mid basitarsus with some ivory marking; hind femur with or without apex ivory; hind tibia with ivory stripe in frontal view up to basal three-fourths of segment; hind basitarsus with some basal ivory marking. Wings smoky to dark brown; some bees with iridescence.

**Female. Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area with shallow, slightly distorted pits about 1 pit width apart and more or less separated by fine, parallel wrinkles; frons with pits more distinct and round, and wrinkles less evident medially; fine longitudinal wrinkles at middle, middle from median ocellus to acme not depressed; with or without a fine frontal line. Apex of clypeus shallowly emarginate. Apex

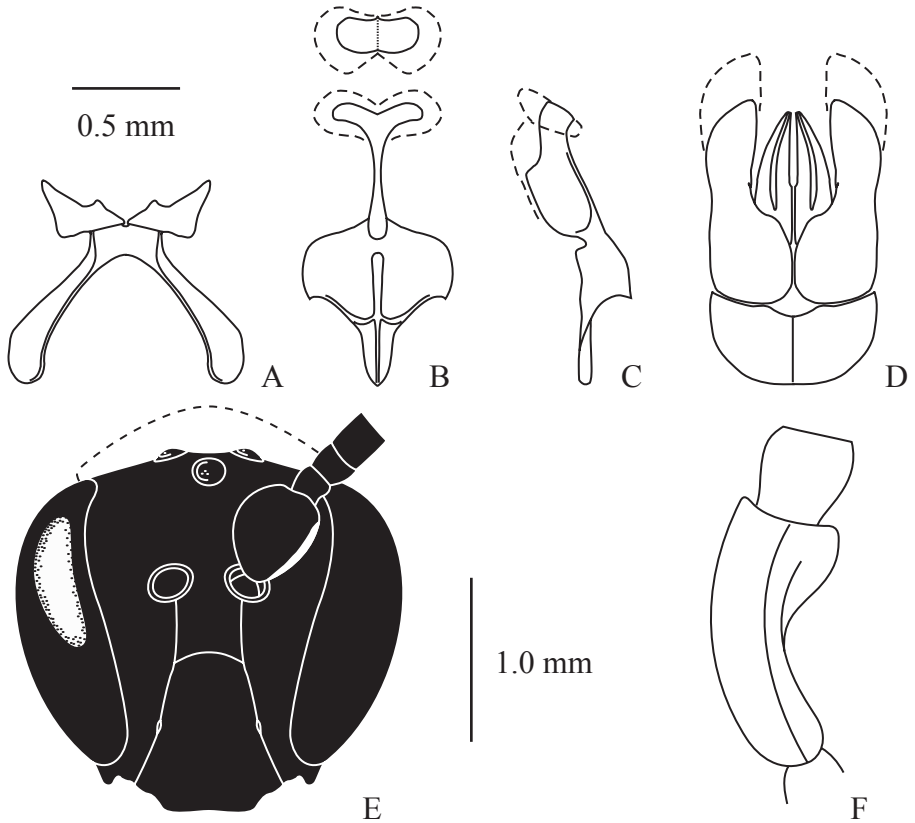


Fig. 27. *Hylaesus fuscipennis*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

of mandible with three teeth. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 12-20, yellowish white, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground slightly granularly coriaceous, slightly lustrous; hair long (14-20), white, weakly plumose. Scutellum with pits slightly larger, ground smoothly coriaceous, lustrous. Mesepisternum with distinct, round pits about 1 pit width apart, and long, yellowish white or brownish white, plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron punctured, smooth, lustrous; swollen. Metanotum dull. Basal area of propodeum slightly protuberant in middle, roughened overall by reticulate rugae except the posterior, vertical, coriaceous face; rugae and ground minutely wrinkled, slightly lustrous; lateral carina strong, terminated anterolaterally in a slightly protuberant area at each side of the area.

**Metasoma.** Disk of T2 with distinct punctation; minute, shallow pits more than 2 pit widths apart, and fine, short, pale, appressed hair; ground smoothly coriaceous, shiny. T6 hair long, reddish brown, erect. T4-5 hair not particularly long and dense.

**Color.** Body and legs black. Face and legs unmarked. Pronotum with ivory transverse collar stripe complete or nearly so; lobes unmarked. Wings smoky to dark brown; some bees with iridescence.

**Perkins' collections.** *Nesoprosopis fuscipennis*: **Oahu**: Honolulu Mts., 1500 ft (BPBM, OUMNH), 1800 ft (BPBM); Koolau Range (BPBM), 1500 ft (BMNH, BPBM), 2000 ft (BMNH, BPBM); Koolau Range, N.W., 1500 ft (BPBM); Pali (OUMNH); Tantalus (BPBM); Wahiawa, 1500 ft (BPBM); Waialua, 1800 ft (BPBM); Waianae Mts, 4000 ft (BMNH); Waimea Mts (BPBM). *N. fuscipennis obscuripes*: **Maui**: Iao Valley (BMNH, BPBM, OUMNH), far up valley (BPBM); West Maui Mts. (BMNH, BPBM, OUMNH). *N. caeruleipennis*: **Lanai**: center of Lanai, forest above Koele, 2000 ft (OUMNH); Halepaakai, 3000 ft (BPBM, OUMNH); "Lanai," 2000 ft (BMNH), 2600 ft (OUMNH); Mts. Koele, 2000 ft (BPBM, OUMNH), 2500 ft (BPBM). **Molokai**: "Molokai" (OUMNH), 3000 ft (BPBM), 4000 ft (BPBM). Molokai Mts., 3000 ft (BMNH, BPBM), 4000 ft (BMNH, BPBM).

**Recent collections.** **Maui**: Kaulalewelewe, 3000 ft; Puu Kukui Rd., 2200 ft; Kahoma, 2600 ft. **Lanai**: Munro Trail, 2800-3000 ft; Kaiholena Ridge, 2400 ft. **Molokai**: Kamakou Rd., 3200 ft; Puu Kolekole trail, 3600 ft.

**Flower records.** *Acacia confusa*\*, *Cheirodendron*, *Metrosideros*, *Psychotria mauiensis*, *Tetraplasandra oahuensis*.

**Remarks.** Perkins (1899:107) described *H. caeruleipennis* from Molokai and Lanai as structurally similar to *H. fuscipennis* from Oahu, but differing in having blue iridescent wings and dark tarsi. He also distinguished *H. fuscipennis* variety *obscuripes* from West Maui by violet iridescent wings and dark tarsi, noting that some from Oahu are similar whereas others lack the iridescence. Cockerell (1926) later named two males and a female from Mt. Tantalus with the antennae ferruginous beneath and the tarsi dark as a new mutation, *H. fuscipennis swezeyi*. The populations on Oahu, Molokai, Lanai, and Maui are structurally similar and are considered here to be one species under the senior name, *H. fuscipennis*, with variation in the color of wing iridescence, extent of ivory markings, and degree of cuticular melanization. Iridescent colors are still visible on bees collected by Perkins. The distal margins of the wings of bees from all islands may exhibit faint bands of red and green. Recently collected bees from Molokai and Lanai may have the distal margins blue and the center of the wing with magenta reflections, especially the underside. Bees from Oahu and Maui may lack color reflections or have magenta or violet reflections, just as described by Perkins. Variation in wing color in the same population of the sister species, *H. pubescens*, was noted by Perkins in his key (1910:604).

*Hylaeus pubescens* of Hawaii is the sister taxon to *H. fuscipennis* of Oahu and Maui Nui. Both sexes of both species have the propodeum similar in shape and sculpture. Males have a similar scape in frontal view with a broad, obtuse angle along the lateral edge and the median process of S8 strongly dilated. The second sternum of both sexes of *H. fuscipennis*, seen in lateral view, are evenly convex but without a distinct hump. *Hylaeus*

*pubescens* is distinguished by the second sternum with an angular protuberance at midlength. The protuberance may be slight or well developed, especially in females.

**References.** Blackburn and Kirby, 1880:85 (♂ ♀). Blackburn and Cameron, 1886:140, 148 (record, key); 1887:200, 208 (record, key). Dalla Torre, 1896:23 (list). Perkins, 1907a:43 (record: Oahu, Tantalus); 1910:604 (key); 1913:79 (biology; parasitoid: *Eupelmus*). Bridwell, 1919:135 (morphology). Cockerell, 1926:308-309 (record: Oahu, Mt. Tantalus). Beardsley, 1976:188, 209 (parasitoid: *Coelopenycirtus kaalae*). *Hylaeus fuscipennis obscuripes*: Perkins, 1907a:43 (record: Oahu, Tantalus); 1913:81 (parasitoid: *Eupelmus*). *Hylaeus caeruleipennis*: Perkins, 1910:604 (key). Cockerell, 1926:309 (comparison with *N. f. swezeyi*). Swezey and Bryan, 1929:295, 297, 306 (parasitoid: *Nesencyrtus kaalae*; nest: in rotten *Metrosideros collina polymorpha*; record: Molokai). Beardsley, 1976:188, 209 (parasitoid: *Coelopenycirtus kaalae*).

***Hylaeus (Nesoprosopis) gliddenae* Magnacca and Daly, new species**  
(Fig. 28)

**DIAGNOSIS.** Large bees with punctured terga and slightly smoky wings. Head and mesosoma black, metasoma red. Male with unusual narrow, linear marks along eyes and apex of clypeus; mandible and scape also marked with yellow. Female unknown. Sister species of *H. paradoxicus*, differing in the presence of face marks and other facial characters; see remarks.

**Distribution.** Hawaii; probably from montane mesic forest. Known only from one collection.

**Male.** Measurements: Malar space, 6; eye, 160:132:136:94; clypeus, 88×86; frons, 38×34:94; interalveolar, 24:30:46:60, D 26; interocellar, 34:32:28:38, D 18; scape, 56×42; wing length, 6.7 mm (holotype).

**Head.** Malar space short (ratio 0.3 DMO). Upper paraocular area with distinct pits about 1 pit width apart, ground slightly lustrous; frons with pits closer medially but not touching, ground dull. Lower paraocular depression indistinct. Face overall very flat, clypeus not convex longitudinally or laterally; frons also flat. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately dilated, width more than half length, ratio about 0.8; lateral edge in frontal view straight, moderately arched in lateral view, expanded posteroapically so that arch of underside is much stronger than that of upper surface; no groove on underside; with medium-length, yellowish white, mixed simple and weakly plumose hair. Vertex hair 20-30, white, weakly plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground granularly coriaceous, lustrous; hair medium-length to long (10-20), yellowish white, simple or weakly plumose. Scutellum with slightly larger pits evenly spaced about 1 pit width apart, ground similar to scutum. Mesepisternum with shallow but distinct pits about 1 pit width apart or less, and long, yellowish white, plumose hair; ground smooth, lustrous. Hypoepimeron shallowly punctate, slightly lustrous; swollen. Metanotum dull, roughened. Basal area of propodeum protuberant in middle, roughened overall by reticulate rugae except the posterior, vertical, coriaceous

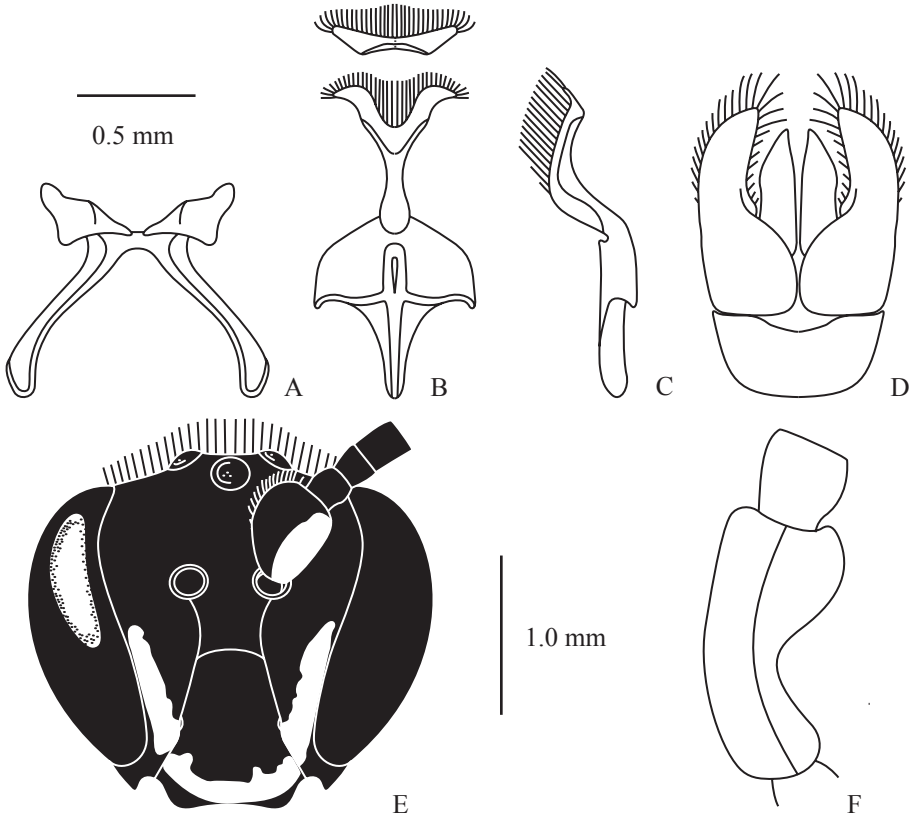


Fig. 28. *Hylaeus gliddenae*, new species, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E.

face; rugae and ground granular or minutely wrinkled, dull to slightly lustrous; lateral carina weak, terminating anterolaterally in a protuberant area.

**Metasoma.** Disk of T2 with distinct but weak punctuation, minute, shallow pits about 3 pit widths apart; ground smoothly coriaceous, lustrous; with fine, pale, short hair. T7 hair long, reddish brown, erect.

**Terminalia.** Lateral process of S7 broadly triangular, length less than width of hemisternite. Median process of S8 weakly dilated but rather broad, apex bifurcate in a Y shape with long tips; the more sclerotized dorsal bar of the process extends onto the bifurcations. Apices of gonoforceps slightly longer than penis valves, inwardly pointed.

**Color.** Anterior third of mandible yellow. Face with a U-shaped mark: paracocular areas with narrow stripes along the eyes, not quite reaching to antennal socket, connected by an apical mark on the clypeus. Scape in frontal view with the lateral third to half yellow.

Pronotum unmarked. Head and mesosoma black; metasoma red; T2 with an elongate black spot laterally behind spiracle. Legs dark brown, unmarked except pale area on fore tibia; anterior yellow marks on the basal third of the mid tibia and basal half of hind tibia; and all basitarsi with anterior yellow marks down most or all of their length. Wings slightly smoky.

**Female.** Unknown.

**Holotype** ♂ labeled "Kilauea, Hawaii, 7-16-34. O. H. Swezey collector. Nest in burrow of *Holcobius* in *Suttonia* [= *Myrsine*]" (BPBM).

**Flower records.** None.

**Etymology.** The species epithet *gliddena* is in honor of Catherine Glidden, formerly of Hawaii Volcanoes National Park, whose assistance was crucial to KM's study of *Hylaeus*.

**Remarks.** This species is unmistakable due to the red metasoma, shared only with *H. paradoxicus*, and the unusual facial marks. It is obviously the sister of that species; it also shares the unique extension of the sclerotized portion of the process of S8 onto the bifurcations, and the nearly triangular S7. It differs in a number of facial characters: the yellow marks on the face and mandibles and larger marks on the scape; a more strongly arched scape with the lateral edge straight rather than convex; the clypeus flat nearly to the apex rather than slightly convex ventrally; and the median ocellus much less prominent. It also has the sclerotized part of the S8 bifurcation longer and marks on the basitarsi and hind tibiae, and is considerably smaller than *H. paradoxicus*. The facial marks and discolored scape are similar to *H. anomalus*, and it may be an intermediate between the two. The female is probably similar to the female of *H. paradoxicus* and may not be distinguishable from a small individual of that species.

### *Hylaeus (Nesoprosopis) haleakalae* (Perkins)

(Fig. 29)

*Nesoprosopis haleakalae* Perkins, 1899:87-88 (♂ ♀).

*Hylaeus (Nesoprosopis) haleakalae*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis haleakalae*, Daly, 1994:117 (lectotype ♂ BMNH 17a 122; Maui, Haleakala, 5000 ft, wing length, 4.6 mm).

*Nesoprosopis neglecta* Perkins, 1899:89 (♀; holotype ♀ BMNH 17a 125; Molokai, Mts., 4500 ft; wing length, 5.8 mm) (new synonymy).

*Hylaeus (Nesoprosopis) neglectus*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis neglecta*, Daly, 1994:118 (holotype ♀ confirmed).

**DIAGNOSIS.** Medium-sized bees with smoky wings and punctured terga. Pubescence long all over body, legs mostly black with only traces, if any, of yellow marks, unusual basal area of propodeum deeply reticulately rugose to brow (less so in female). Male with three separate or adjacent facial marks, wide supraclypeal area, and middle of frons with black spot of dense punctures; unusual scape not arched and with long brown hair along median edge; long brown hair on vertex and scutum. Female black and marked only in some females by short yellow stripes in lower paraocular areas.

**Distribution.** Maui and Molokai; montane wet forest.



**Male.** Measurements. Malar space, 7; eye, 120:130:127:86; clypeus, 71×71; frons, 17×37:84; interalveolar, 22:28:49:61, D 22; interocellar, 32:42:22:39, D 15; scape, 47×29; wing length, 5.2 mm (Molokai, 4000+ ft, BPBM 3515).

**Head.** Malar space medium (ratio about 0.5 DMO). Upper paraocular area and frons with pits less than 1 pit width apart, crowded and distorted in subpolygonal shapes; a dark rhomboid spot at the middle created by dense dark brown hair and very dense punctation; shiny area just below spot and above antennal socket. Lower paraocular depression absent, surface nearly flat. Frontoclypeal sulcus nearly straight or arched; wide supraclypeal area. Scape in frontal view slightly dilated, width a little more than half length, ratio about 0.6; lateral edge in frontal view nearly straight; not arched in lateral view (but arched in median or posterior view); underside of median edge with a groove; and long, simple, pale to brown hair. Vertex hair 20-30 or more, brown, simple.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground slightly lustrous; hair long (14-20), reddish to dark brown, mostly simple. Scutellum with pits larger. Mesepisternum with distinct, round pits, about 1 pit width apart, and long, brownish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum reticulately rugose in entire anterior area and brow; areolae varying from large and deep with ground shiny to small and shallow with ground granular.

**Metasoma.** Disk of T2 with shallow pits; hair short, dark, erect, relatively dense, conspicuous in lateral view; pits and hair more conspicuous on T3-7. T6-7 hair long, black, erect.

**Terminalia.** Lateral process of S7 parallel-sided, length greater than width of hemisternite. Median process of S8 strongly dilated, apex bifurcate with broad tips. Apices of gonoforceps exceeding penis valves.

**Color.** Head and mesosoma black; metasoma dark brown to black. Labrum and mandible blackish brown to black. Face with three separate or adjacent marks: clypeal mark varying from a subapical, irregular yellow spot to entirely yellow; in the latter case the supraclypeal area sometimes with an irregular yellow mark; lower paraocular area with irregular triangular yellow mark along the eye below antennal socket, or completely filled in with color extending above antennal socket; supraclypeal area and scape unmarked. Pronotum unmarked. Legs dark brown to black except: fore femur with pale area and yellow apex; fore tibia with pale area and with only a trace of yellow at base; mid basitarsus with or without a trace of yellow at base; hind tibia and basitarsus with or without a trace of yellow at base. Wings smoky.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Face convex in lateral view. Upper paraocular area and frons convex; upper paraocular area with nearly round pits less than 1 pit width apart, ground lustrous to shiny; frons with pits becoming crowded medially and partly distorted in shape, and at the middle a few, fine, longitudinal carinulae; frontal line distinct only near acme; small shiny area just above antennal socket. Apex of clypeus distinctly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-30, brown, simple.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground slightly lustrous; hair long (14-20), red-brown, weakly plumose.



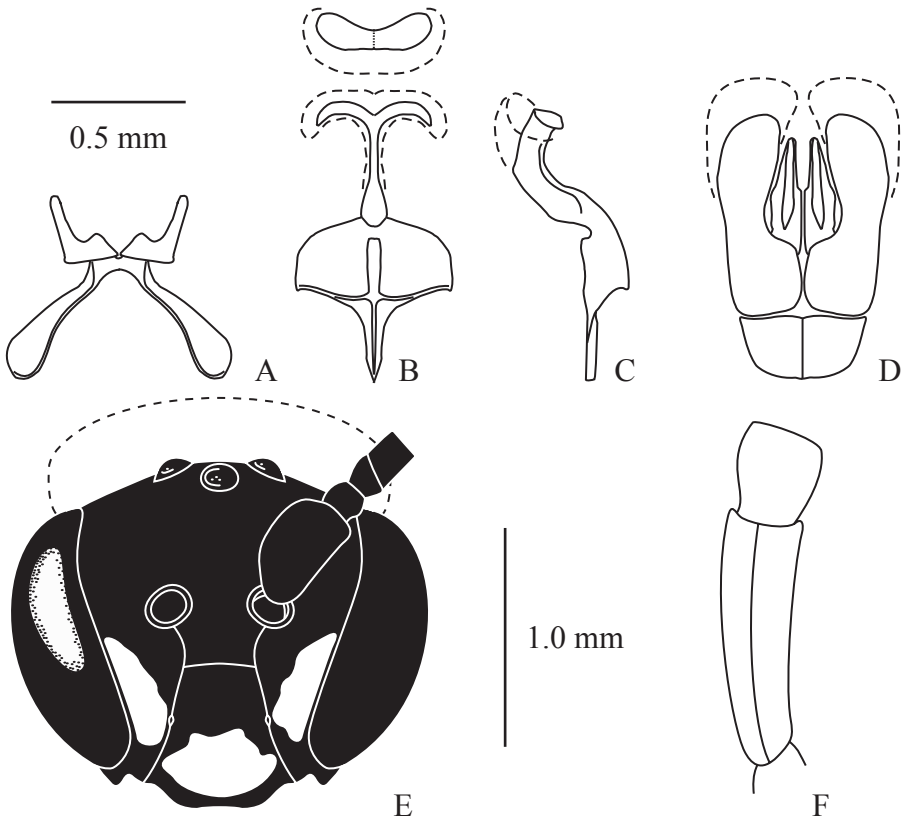


Fig. 29. *Hylaesus haleakalae*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

Mesepisternum with indistinct, round pits, about 1 pit width apart; ground minutely coriaceous, slightly lustrous. Hypoepimeron mostly impunctate, smooth, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum reticulately rugose on anterior area extended indistinctly to brow; rugosity less pronounced than in male.

**Metasoma.** Disk of T2 with some micropits at hair bases, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart; pits more distinct on T3-6. Hair of middle terga much less dense and conspicuous than in male. T6 hair long, black, strongly erect.

**Color.** Body and legs dark brown to black except fore tibia with pale area. Lower paraocular area with or without an obscure yellow stripe or trace along eye; clypeus and supraclipeal area unmarked. Pronotum unmarked. Wings smoky.

**Perkins' collections.** *Nesoprosopis haleakalae*: **Maui**: Haleakala, 4000 ft (BMNH, BPBM); 5000 ft (BMNH, BPBM); >5000 ft (BPBM). *N. neglecta*: **Molokai**: "Molokai," 4000 ft (BPBM, OUMNH); Molokai Mts., 4000 ft (BPBM); 4500 ft (BMNH).

**Recent collections.** **Maui**: Puu Kukui Tr., 3700 ft; Makawao Forest Reserve, 4300 ft. **Molokai**: West Kawela Gulch, 3600 ft; Kawela Rd., 3900 ft.

**Flower records.** *Cheirodendron*, *Metrosideros*, *Scaevola chamissoniana*.

**Remarks.** Fullaway (1918:394) pointed out the probable synonymy of *H. neglectus* from Molokai and *H. haleakalae* from Maui, both published simultaneously by Perkins in 1899. The two names are considered here to apply to one species. The name *H. haleakalae* is chosen because it is based on both sexes. Lacking a male, Perkins described *H. neglectus* from a single female and compared it to *H. laticeps*, now known as *H. unicus*. No mention was made of a relationship with *H. haleakalae*. It is now reasonable to conclude that *H. neglectus* is the female of *H. haleakalae*. Recent collections from the same places on Molokai include males referable to *H. haleakalae* and females referable to *H. neglectus*. Males on Maui and Molokai have the distinctive coarse, clathrate (latticed) rugosity described by Perkins for the propodeum of *H. haleakalae*. Females on both islands have a similar propodeal rugosity less deeply sculpted. The type female of *H. neglectus* and three other females from Molokai are similar to females of *H. haleakalae* from Maui, but lack the small facial marks seen in some *H. haleakalae*. In comparing specimens from Molokai, West Maui, and East Maui, in that order, trends are apparent of increasing facial markings in both sexes, stronger rugae with smoother areolae in the propodeum, and shorter bifurcations of the process of S8.

**References.** Perkins, 1910:602 (key). Swezey, 1931:502 (nest: in dead stem of *Rubus hawaiiensis*; record: Maui, Olinda); 1954:183 (nest: dead stem of *Rubus hawaiiensis*; record: Maui, Olinda).

### *Hylaeus (Nesoprosopis) hilaris* (F. Smith)

(Fig. 30)

*Prosopis hilaris* F. Smith, 1879a:683; 1879b:21 (♂; holotype ♂ BMNH 17a 171; Maui; wing length, 4.1 mm).

*Nesoprosopis hilaris*, Perkins, 1899:103-104 (♂ ♀; cleptoparasite of *N. blackburni*, *N. assimulans*, probably *N. anthracina*).

*Hylaeus (Nesoprosopis) hilaris*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis hilaris*, Daly, 1994:120 (holotype ♂ confirmed).

**DIAGNOSIS.** Medium-sized cleptoparasitic bees with clear wings, red basal terga, and unusual pale hair bands on apical terga (may be indistinct or lost by abrasion). Male lower face entirely yellow, extended at sides in a broad stripe above antennal sockets, scape moderately dilated and pale yellow. Female paraocular areas not marked, face and antennae more or less red, clypeus emarginate, fore tarsus with straight hair. See discussion of cleptoparasites in remarks.

**Distribution.** Maui, Lanai, and Molokai; coast. No recent collections from Maui or Lanai.

**Male.** Measurements: Malar space, 3; eye, 146:123:118:82; clypeus, 69×72; frons, 28×23:97; interalveolar, 18:28:56:67, D 20; interocellar, 31:31:28:38, D 18; scape, 51×34; wing length, 4.7 mm, tip damaged (Maui, Wailuku, BPBM 3424).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area with round pits about 1 pit width apart; frons with pits becoming smaller medially, closer (some pits contiguous) at middle, but still distinct and nearly round; ground generally smooth and lustrous across areas; no frontal line or other special sculpture at middle; impunctate, lustrous area above antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus straight or nearly so. Scape in frontal view moderately dilated, widest subapically, width more than half length, ratio about 0.6-0.7; lateral edge in frontal view nearly straight; slightly arched in lateral view with maximum arch near middle of scape; no groove on underside; with short, white, plumose hair. Vertex hair 12-20, yellowish white, plumose.

**Mesosoma.** Scutum with distinct pits about 1 pit width apart, ground smooth to slightly granular, slightly lustrous; hair short (4-8), white, plumose. Lateral margin of front coxa with very narrow carina (see Fig. 8C), not expanded or produced. Mesepisternum with shallow, indistinct pits about 1 pit width apart, and medium-length, white, plumose hair; ground nearly smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Metanotum slightly lustrous. Basal area of propodeum short, flat, without definite brow; sculpture variable, reticulately rugose at front and shiny between rugae, becoming weakly reticulate and dull apically; varying to sparsely lineately rugose (some bees with transverse rugae) and shiny between rugae, nearly smooth apically.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, simple, appressed hairs spaced about one hair length apart; T2-6 in unworn specimens with transverse apical bands of plumose hair, forming thin white fasciae. T7 hair short, golden yellow, prostrate.

**Terminalia.** Lateral process of S7 tapered, length greater than width of hemisternite. Median process of S8 weakly dilated, apex bifurcate, tips medium-length, narrow, and straplike. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum yellowish brown to brown; mandible yellow at base. Face with one large mark divided by fine black sulci: clypeus entirely yellow or nearly so, supraclypeal area to acme yellow, paraocular area entirely yellow, with a broad mark extended above antennal socket; scape in frontal view mostly yellow, flagellum yellow-brown; some bees with additional small yellowish spot below the median ocellus. Pronotum with or without yellow transverse collar stripe at each side; lobes yellowish brown; tegulae with or without a yellow spot. Legs yellow to yellowish brown except femora and trochanters darker, brown to black; fore tibia with indistinct pale area; hind tibia with or without diffuse yellowish stripe at base, slightly darker subapically. Head and mesosoma dark brown to blackish brown; metasoma variable: basal 1-3 segments red and apical segments dark reddish brown or reddish black, or all segments reddish brown. Wings clear.

**Female. Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons surfaces with indistinct, shallow round pits about 1 pit width apart; ground nearly smooth and lustrous; faint frontal line at middle; impunctate, lustrous area above antennal sockets. Apex of clypeus deeply emarginate. Dorsal end of facial fovea below level of lateral ocellus.

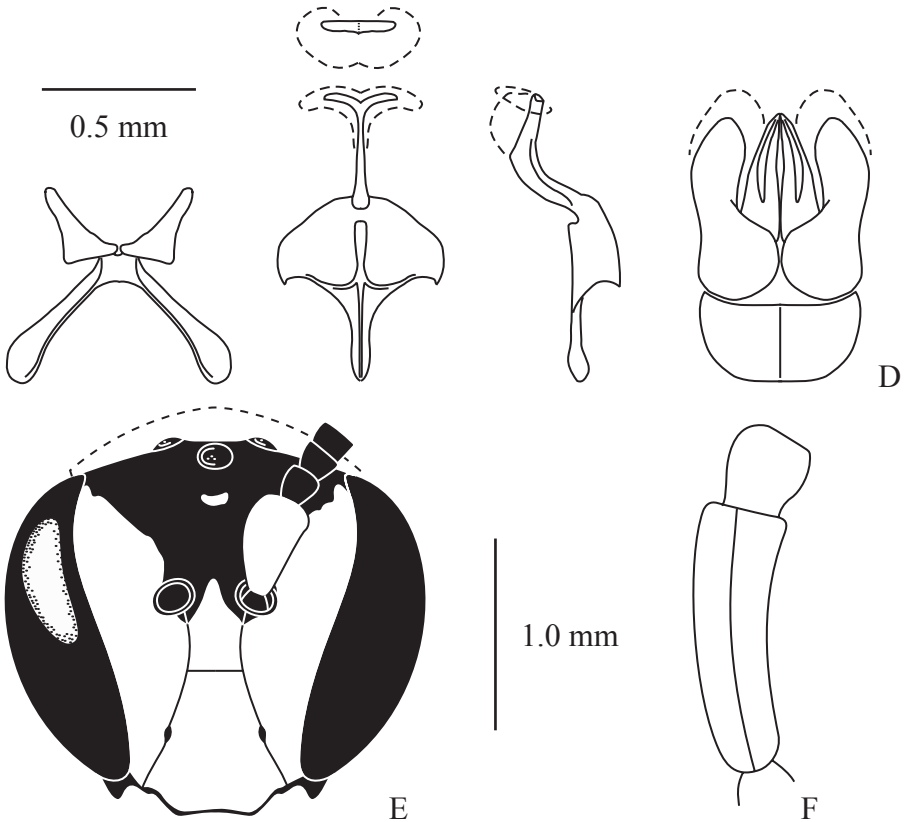


Fig. 30. *Hylaeus hilaris*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Mesosoma.** Fore tarsus with hair straight (see Fig. 8B). Scutum with distinct pits about 1 pit width apart, ground nearly smooth, slightly lustrous; hair short (4-6), yellowish white, mostly simple. Lateral margin of front coxa with very narrow carina (see Fig. 8C), not expanded or produced. Mesepisternum with distinct, round pits about 1 pit width apart, and short, white, weakly plumose hair; ground minutely wrinkled, dull. Hypoepimeron impunctate, weakly striate, indistinctly lustrous, slightly swollen. Metanotum indistinctly lustrous. Basal area of propodeum short, flat, without definite brow; irregularly lineately rugose at front, shiny between rugae, becoming weakly reticulate, rough, and duller apically.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with very short, fine, pale, simple, appressed hairs spaced more than a hair length apart; T2 with a very narrow, inconspicuous, transverse apical band of somewhat thicker hair; T3-5 with distinct yellowish

white, thin apical fascia of slightly thicker, denser hair. T6 hair long, apparently simple, golden yellow, prostrate.

**Color.** Head and mesosoma dark brown to black; metasoma reddish brown. Face without distinct marks, but clypeus and scape yellowish brown, paraocular areas reddish brown. Pronotum with lobes yellowish brown, but without distinct mark. Fore legs yellowish brown, mid legs darker yellowish brown, hind legs brown to dark brown at base; unmarked. Apical terga with thin, apical bands of white, plumose hair. Wings clear.

**Perkins' collections. Maui:** "Maui" (BPBM); sand hills (BPBM); Wailuku (BMNH, BPBM); sandy isthmus (OUMNH). **Lanai:** "Lanai" (BMNH, BPBM).

**Recent collections. Molokai:** Moomomi, coast.

**Flower records.** None.

**Remarks.** Colors of the integument and pubescence of the female are based on an old specimen. Perkins (1899:106; 1913:lxxx) discovered five species in which the females have short, straight hair on the fore tarsi and considered them closely allied: *H. hilaris*, *H. hostilis*, *H. inquilina*, *H. sphecodoides*, and *H. volatilis*. He associated the straight tarsal hair with cleptoparasitic habits. At least the basal metasomal segments of both sexes are typically red to reddish brown in *H. hilaris* and *H. hostilis*, but the segments of *H. sphecodoides* and *H. volatilis* may be reddish brown or entirely black in melanic individuals (see remarks for *H. volatilis*). The metasoma of *H. inquilina* is always black. Red on the terga is not unique to this group; some unrelated nonparasitic species, such as *H. paradoxicus* or *H. anomalus*, also have red terga. Curiously, red terga have evolved repeatedly in different lineages of other cleptoparasitic bees (Michener 2000:31). Females of all the Hawaiian cleptoparasites have the general area of the frons and vertex slightly swollen or convex. With the exception of *H. inquilina*, female cleptoparasites have a distinctly emarginate clypeus, the facial foveae do not or just barely reach the level of the lateral ocelli, and the fore coxae have a lamellate carina (Fig. 8D; *H. hilaris* also lacks the lamellate carina). All are usually found in dry habitats – *H. hilaris* is restricted to the coast and *H. inquilina* to montane areas, while the remaining three species may be found at nearly all elevations – and appear to parasitize only ground-nesting species. *Hylaeus chlorostictus*, *H. difficilis*, *H. hirsutulus*, *H. laetus*, *H. nivicola*, and *H. volcanicus* are probably the primary hosts in the mountains, and *H. assimulans*, *H. chlorostictus*, *H. flavifrons*, *H. flavipes*, and *H. longiceps* serve as hosts at the coast.

**References.** Blackburn and Kirby, 1880:85 (record). Blackburn and Cameron, 1886:147-148 (♀; key); 1887:207-208 (♀; key). Dalla Torre, 1896:24 (list). Perkins, 1910:604 (key); 1913:79, 81 (biogeography; cleptoparasite of *N. assimulans*, *N. longiceps*, and *N. blackburni*). Fullaway, 1918:396 (record: Molokai).

### *Hylaeus (Nesoprosopis) hirsutulus* (Perkins)

(Fig. 31)

*Nesoprosopis hirsutula* Perkins, 1899:79-80 (♂ ♀; Pl. 2, Fig. 10).

*Hylaeus (Nesoprosopis) hirsutulus*, Meade-Waldo, 1923:33 (list).

*Nesoprosopis hirsutula*, Daly, 1994:117 (lectotype ♂ BMNH 17a-158b; Kauai, Halemanu, 4000 ft; wing length, 5.2 mm).

**DIAGNOSIS.** Medium-sized bees with dark smoky wings. Male face with an ivory or yellow mark (clypeus and supraclypeal area, with or without lower paraocular areas), unusual lateral process of S7 very short, median process of S8 not dilated, apex simple; unusual gonoforceps expanded apically beyond penis valves. Female black and unmarked. Sister species of *H. perkinsianus*; see treatment of that species.

**Distribution.** Kauai; widespread, from dry shrubland to wet forest, mountains and lowlands, but not common.

**Male.** Measurements: Malar space, 3; eye, 138:133:110:81; clypeus, 68×74; frons, 23×36:95; interalveolar, 20:28:60:67, D 23; interocellar, 31:41:18:31, D 17; scape, 54×25; wing length, 5.3 mm (Kauai, Halemanu, 4000 ft, BPBM 3430).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons with distinct, round, shallow pits less than 1 pit width apart; ground minutely wrinkled, dull; median, impunctate, lustrous area just above antennal sockets; faint frontal line evident. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus straight. Scape in frontal view slightly dilated, width half length, ratio about 0.5; lateral edge in frontal view slightly concave; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with long, pale brown, mostly simple hair along the median edge. Vertex hair 12-22, brown, weakly plumose.

**Mesosoma.** Scutum with pits about 2 pit widths apart, ground rather smoothly coriaceous, slightly lustrous; hair long (approximately 14), brownish white, weakly plumose. Scutellum with pits slightly larger. Mesepisternum with indistinct, round pits, about 1 pit width apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron mostly impunctate, smooth, slightly lustrous, slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae at front; brow granular to smoothly coriaceous, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, pale, appressed hairs spaced about one hair length apart. T7 hair short to medium, black, prostrate.

**Terminalia.** Lateral process of S7 very short, blunt, length less than width of hemisternite. Median process of S8 linear, apex simple or nearly so. Apices of gonoforceps exceeding penis valves, with very long curled hairs.

**Color.** Labrum and mandible blackish brown to black. Face with one large mark: clypeus entirely yellow or with narrow apical margin black; lower paraocular area variable, with or without a narrow yellow stripe along sulci, supraclypeal area to acme yellow; scape unmarked. Pronotum unmarked. Legs dark brown to black except: fore tibia with pale area and basal yellow spot or short stripe; mid tibia with or without a spot of yellow at base; hind tibia with basal yellow stripe less than half length of segment. Wings dark smoky.

**Female. Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons with round, shallow pits about 1 pit width apart or less, slightly closer toward the middle; ground smooth or minutely wrinkled, slightly lustrous; fine frontal line evident. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 20-30, brown, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with pits about 2 pit widths apart, ground minutely granularly coriaceous, slightly lustrous; hair medium-length (8-16), white, weakly plumose. Scutellum with pits slightly larger, ground smoothly coriaceous,

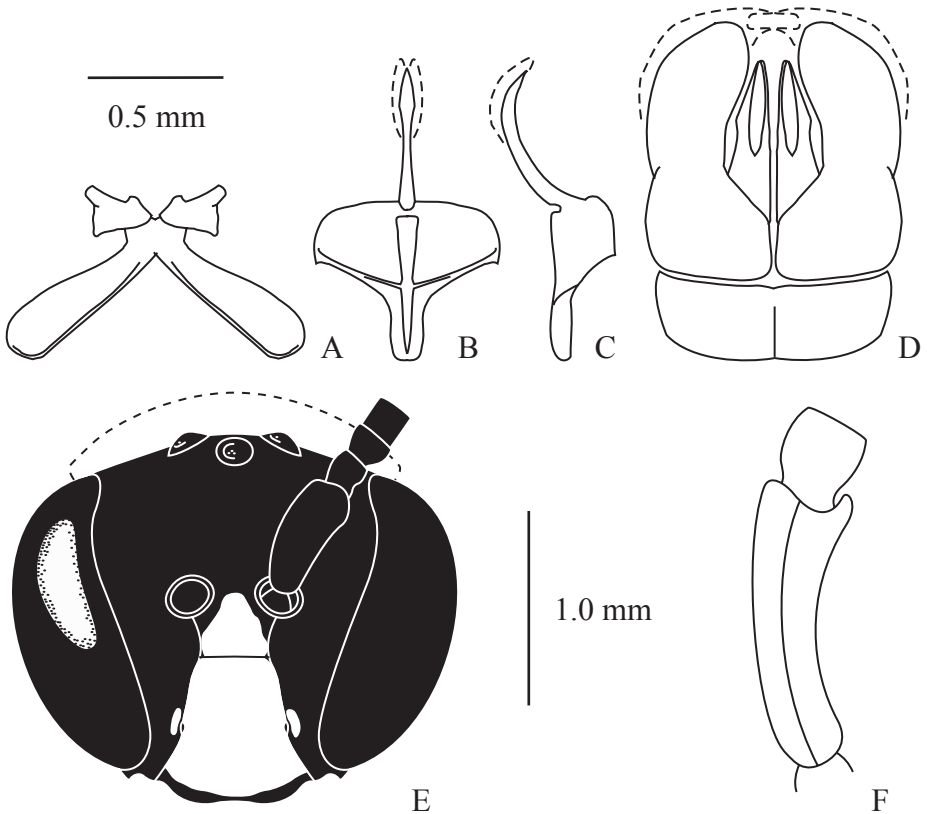


Fig. 31. *Hylaesus hirsutululus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

lustrous. Mesepisternum with distinct, round pits, about 1 pit width apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous to striate, slightly lustrous. Hypoepimeron mostly impunctate, smooth, slightly lustrous, slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae at front; brow smoothly coriaceous, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, pale, appressed hairs spaced about one hair length apart. T6 hair short-plumose, long, brown, prostrate.

**Color.** Head and mesosoma black; legs and metasoma very dark brown to black; unmarked. Wings dark smoky.

**Perkins' collections. Kauai:** Halemanu, 4000 ft (BMNH, BPBM, OUMNH), 4000 ft (field note #501) (OUMNH); "Kauai," 4000 ft (BPBM); Koholuamano (field note #522), 4000 ft (BMNH, BPBM, OUMNH); Makaweli, 2000 ft (BMNH); Waimea, 4000 ft (BPBM).

**Recent collections. Kauai:** Alakai Wilderness, 4600 ft; Mohihi Trail, 3900 ft; Nualolo Cliff Trail, 2800 ft.

**Flower records.** *Chamaesyce atrococca*, *Metrosideros*, *Styphelia*.

**Remarks.** The measured male of *H. hirsutulus* has an extreme ratio "interocellar distance/diameter of median ocellus" at 1.5 and a very high ratio "ocellus-eye distance/interocellar distance" at 1.3. The ratios indicate that the lateral ocelli are unusually close together with respect to the diameter of the median ocellus and are well separated from the eyes.

**References.** Perkins, 1910:601 (key).

### *Hylaeus (Nesoprosopis) hostilis* (Perkins)

(Fig. 32)

*Nesoprosopis hostilis* Perkins, 1899:104-105 (♂ ♀; cleptoparasite of *N. laeta*; Pl. 2, Figs. 4, 20).

*Hylaeus (Nesoprosopis) hostilis*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis hostilis*, Daly, 1994:117 (lectotype ♂ BMNH 17a 167b; Kauai, Waimea, 3000 ft).

**DIAGNOSIS.** Small cleptoparasitic bees with slightly smoky wings and red basal terga. Male lower face entirely yellow, extended at sides in a broad stripe above antennal sockets, scape slightly dilated and in frontal view yellowish on lateral margin. Female clypeus emarginate, fore tarsus with straight hair, paraocular areas with triangular ivory marks.

**Distribution.** Kauai; coast, montane dry shrubland and mesic forest.

**Male.** Measurements: Malar space, 2; eye, 114:98:92:63; clypeus, 53×55; frons, 18×20:78; interalveolar, 10:24:45:57, D 20; interocellar, 24:27:22:27, D 14; scape, 39×25; wing length, 3.8 mm (*H. hostilis* lectotype).

**Head.** Malar space very short (ratio about 0.1 DMO). Upper paraocular area with indistinct pits about 1 pit width apart; frons with pits becoming distinct medially, smaller, closer, ground smooth and lustrous, at middle with dense, minute pits, dull; indistinct frontal line evident; small impunctate area above antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus straight or nearly so. Scape in frontal view slightly dilated, width a little more than half length, ratio about 0.6; lateral edge in frontal view nearly straight; slightly arched in lateral view with maximum arch near base of scape; no groove on underside; with very short, white, weakly plumose hair. Vertex hair 4-10, white, plumose.

**Mesosoma.** Scutum with distinct pits about 1 pit width apart, ground smooth, lustrous; hair very short (about 4), white, plumose. Lateral margin of front coxa with carina lamellate (see Fig. 8D; sometimes weakly developed). Mesepisternum with indistinct, shallow pits about 1 pit width apart, and medium-length, white, plumose hair; ground smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Metanotum slightly lustrous. Basal area of propodeum irregularly lineately rugose to reticulate at front, becoming more reticulate near brow, shiny between rugae at front; brow weakly reticulately rugose, dull.



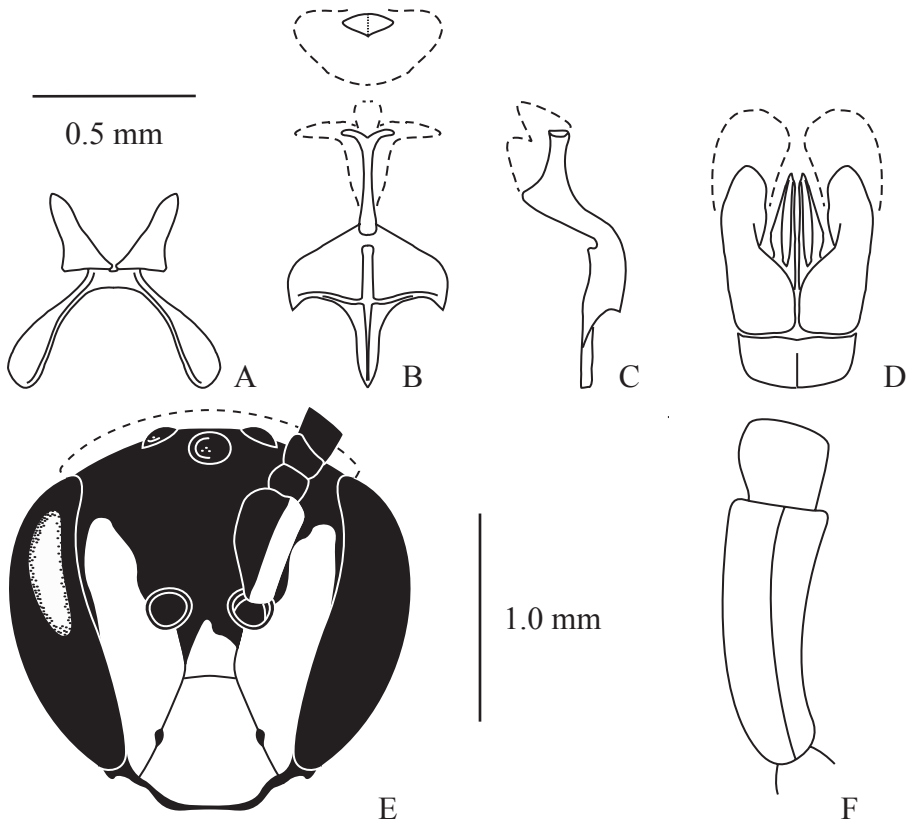


Fig. 32. *Hylaeus hostilis*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Metasoma.** Disk of T2 impunctate; smoothly coriaceous, lustrous; with short, pale, appressed hairs spaced about one hair length apart or more. T7 hair short, pale brown, appressed.

**Terminalia.** Lateral process of S7 tapered, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with short, narrow, acute tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible yellow to brown. Face with a large mark, with fine black sulci in an “H” shape, and conspicuous tentorial pits: clypeus entirely yellow or nearly so; paraocular area yellow, extended in a broad stripe well above antennal socket; supraclypeal area to acme yellow. Scape in frontal view yellowish on lateral margin. Pronotum with

lobes obscurely yellowish brown. Head black, with or without a yellow spot just behind the eye above the mandible; mesosoma black, with or without scattered irregular red areas, especially around pronotal lobes, at base of pronotum, and around base of hind leg; tegula, humeral plate, and base of costa clear yellow. Two or three basal segments of metasoma red; apical segments dark reddish brown. Legs dark brown except fore tibia with pale area, fore tarsus yellow to brown, all tibiae with obscure yellowish brown basal marks and all femora with similar apical marks. Wings slightly smoky.

**Female. Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons with distinct, shallow, round pits about 1 pit width apart, ground smooth to minutely wrinkled, lustrous to dull; minute, longitudinal wrinkles at middle; faint frontal line evident. Apex of clypeus deeply emarginate. Dorsal end of facial foveae not extended to level of lateral ocelli. Vertex hair 4-10, white, plumose.

**Mesosoma.** Fore tarsus with hair short, straight (see Fig. 8B). Scutum with distinct (indistinct in some bees) pits about 1 pit width apart, ground nearly smooth, lustrous; hair short (4-6), white, plumose. Lateral margin of front coxa with carina lamellate (see Fig. 8D). Mesepisternum with indistinct, round pits about 1 pit width apart, and short, yellowish white, weakly plumose hair; ground nearly smooth, lustrous. Hypoepimeron impunctate, nearly smooth to weakly striate, lustrous; slightly swollen. Metanotum slightly lustrous. Basal area of propodeum irregularly lineately rugose at front, becoming reticulate near brow, shiny between rugae; brow weakly reticulately rugose, slightly lustrous.

**Metasoma.** Disk of T2 impunctate; smoothly coriaceous, shiny; some bees largely bare or with very short, pale, appressed hairs spaced more than a hair length apart. T6 hair reddish or light brownish white, medium-length, prostrate.

**Color.** Head and mesosoma with various parts red, reddish brown, or dark brown; metasoma with T1-3 entirely orange, the remainder red to reddish brown. Labrum and mandibles reddish or yellowish brown. Face marks somewhat similar to those of male, but conspicuous yellow color confined to paraocular areas: clypeus and supraclypeal area brownish to reddish yellow; paraocular areas with irregular, narrowing yellow stripe to above antennal sockets; scape yellowish brown in frontal view. Pronotum with collar and lobes reddish or yellowish brown. Propodeum reddish except basal area below brow and lateral face. Tegula, humeral plate, and base of costa clear yellow. Legs brown to dark brown except: fore femur at apex and segments distad yellowish brown; mid and hind tibiae with obscure basal reddish or yellowish marks; mid and hind femora red apically; all trochanters red ventrally. Wings slightly smoky.

**Perkins' collections.** ?**Hawaii:** Kilauea (4174, BPBM). **Kauai:** Halemanu, 4000 ft (BPBM); Kauai, 4000 ft (OUMNH); Makaweli, 2-3000 ft (BPBM); Waialeale, Koholuamano (=Kaholuamano) (field note #522) (BPBM); Waimea, 3000 ft (BMNH, BPBM); 4000 ft (BMNH, BPBM).

**Recent collections.** **Kauai:** Polihale State Park, coast; Nualolo Cliff Trail, 2800 ft; Awaawapuhi Trail, 3400 ft.

**Flower records.** *Scaevola sericea*, *Styphelia*.

**Remarks.** See discussion of cleptoparasites under *H. hilaris*.

**References.** Perkins, 1910:604 (key). Hopper and Daly, 1995:35 (record: coastal Kauai).

*Hylaeus (Nesoprosopis) hula* (Perkins)

(Fig. 33)

*Nesoprosopis hula* Perkins, 1911:721-722 (♂ ♀; Hawaii, Kilauea; flower: *Myoporum*).*Hylaeus (Nesoprosopis) hula*, Meade-Waldo, 1923:35 (list).*Nesoprosopis hula*, Daly, 1994:116 (types not located).

**DIAGNOSIS.** Medium-sized bees with clear to slightly smoky wings. Male with unusual face rather flat, yellow clypeus and lower paraocular areas, unusual yellow stripe along lateral edge of scape; pronotum and legs variably marked. Female with narrow, irregular yellow stripe along the eye up to level of antennal sockets; pronotal lobes and sometimes collar marked; supraclypeal area relatively long, about twice as wide as long.

**Distribution.** Hawaii; montane mesic forest.

**Male.** Measurements: Malar space, 10; eye, 113:105:97:68; clypeus, 64×59; frons, 23×24:79; interalveolar, 18:20:44:51, D 19; interocellar, 29:29:18:26, D 14; scape, 39×27; wing length, 4.1 mm (Hawaii, Kilauea, 4000 ft, BPBM 3442).

**Head.** Malar space medium-length (ratio about 0.7 DMO). Upper paraocular area with mostly round pits less than 1 pit width apart, partly obscured by minutely wrinkled, slightly lustrous ground; frons with pits becoming smaller and closer medially. Lower paraocular depression very shallow. Frontoclypeal sulcus arched; lateral epistomal sulcus with a distinct bend laterad at the tentorial pits. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view nearly straight; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with long, yellowish white, mostly simple hair mainly along median edge. Vertex hair 12-20, pale brown, mixed simple and weakly plumose.

**Mesosoma.** Scutum with shallow indistinct pits 1-2 pit widths apart, ground granular, dull to slightly lustrous; hair long (12-16), pale brown, weakly plumose. Scutellum with pits slightly farther apart, slightly lustrous. Mesepisternum with barely discernible pits, about 2-3 pit widths apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum slightly lustrous. Basal area of propodeum with short basal rugae reaching from the base to between one-third and halfway to brow; remainder including brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; fine, pale, semierect hair about one hair length apart. T7 hair short to medium, red-brown, erect.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with rather long, straplike tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with three partly separated marks: clypeus mostly yellow except dark narrow margin along epistomal sulcus above tentorial pits; lower paraocular area largely yellow below antennal socket (in some males the paraocular mark is partly divided longitudinally by a discolored streak); supraclypeal area with or without some yellow marking. Scape in frontal view with yellow stripe on lateral margin. Pronotum with transverse collar stripe interrupted medially or absent; lobes yellow at least in part. Fore leg dark brown to black except: tibia with pale area plus dorsal,

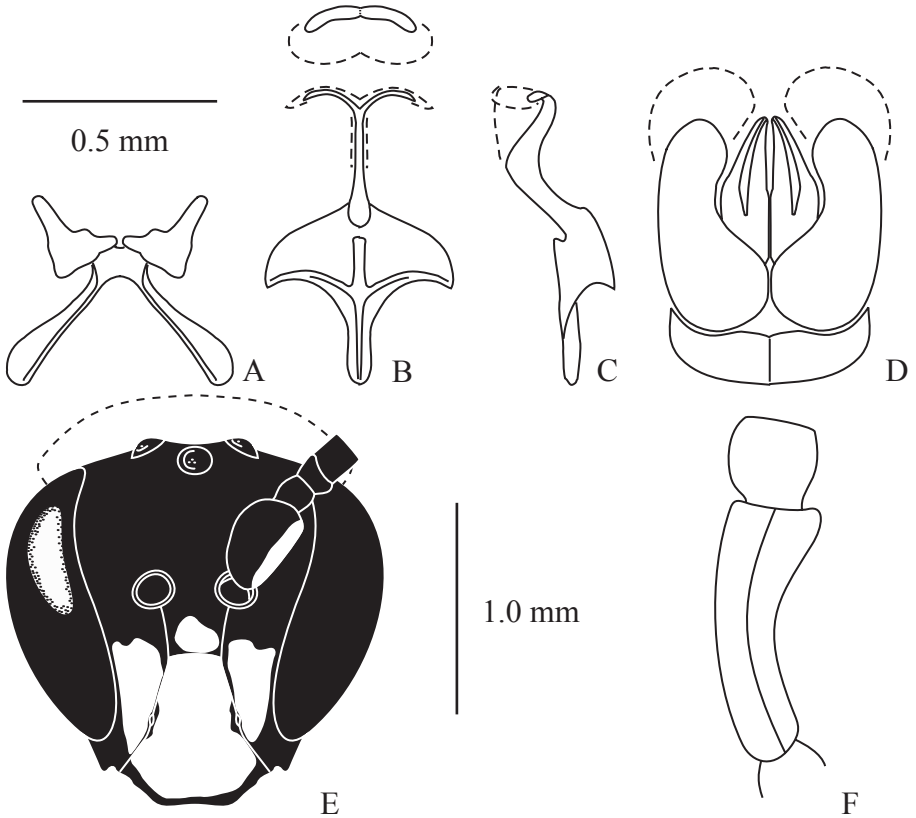


Fig. 33. *Hylaeus hula*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

basal yellow stripe; basitarsus mostly yellow; basal mediotarsus yellow to light brown. Mid and hind legs dark brown to black except: tibiae with basal and apical yellow marks (latter smaller and sometimes absent on the hind leg); basitarsi mostly yellow; basal mediotarsus yellow to light brown. Wings clear.

**Female. Head.** Malar space long (ratio 0.8-0.9 DMO). Upper paraocular area and frons with evenly spaced round pits 1 pit width apart or slightly less, closer only around the median ocellus; ground coriaceous and lustrous laterally, minutely granular and slightly lustrous in center; frons somewhat swollen, bulging slightly between ocelli and antennal sockets; frontal line distinct. Apex of clypeus distinctly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Supraclypeal area relatively long, W/L ratio about 1.9. Vertex hair 12-20, pale brown, weakly plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with shallow, indistinct pits 2-3 pit widths apart, ground minutely granular, slightly lustrous; hair short to medium (6-12), yellowish white. Scutellum with pits slightly larger, lustrous. Mesepisternum with shallow, indistinct pits, 1-2 pit widths apart, and medium-length, yellowish white, plumose hair; ground minutely granular, slightly lustrous. Hypoepimeron with indistinct pits, strongly lustrous, slightly swollen. Metanotum slightly lustrous. Basal area of propodeum lineately rugose halfway or less to brow; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or more. T6 hair dark brown to black, long, erect.

**Color.** Body dark brown to black; unmarked. Face with paraocular stripe from tentorial pit to antennal socket. Pronotal lobes marked, with or without marks on collar. Legs brown to black except pale area on fore tibia and marks at bases of tibiae: up to basal third of fore, basal quarter of mid, and basal half of hind. Wings slightly smoky.

**Perkins' collections.** None. Type collected later by Perkins at Kilauea, Hawaii.

**Recent collections. Hawaii:** Tree Molds, 4000 ft; Puu Waawaa, 4100 ft.

**Flower records.** *Chamaesyce olowaluana*, *Myoporum*, *Santalum paniculatum*.

**Remarks.** Many collections have females of *H. filicum* placed with males of *H. hula*, despite having not been taken together. They may have been associated based on abundance, as specimens of female *H. hula* and male *H. filicum* are much less common in these collections.

**References.** None.

### *Hylaeus (Nesoprosopis) inquilina* (Perkins)

(Fig. 34)

*Nesoprosopis inquilina* Perkins, 1899:102-103 (♂ ♀; cleptoparasite of other bee species).

*Hylaeus (Nesoprosopis) inquilina*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis inquilina*, Daly, 1994:117 (lectotype ♂ BMNH 17a-169a; Hawaii, Kau, 4000 ft; wing length, 4.9 mm).

**DIAGNOSIS.** Medium-sized cleptoparasitic bees with clear wings and body black without red basal terga (unlike other cleptoparasites). Male lower face almost entirely yellow, extended at sides in a broad stripe above antennal sockets, unique scape moderately dilated and with lateral edge in frontal view distinctly concave. Female foretarsus with straight hair, clypeus shallowly emarginate (unlike other female cleptoparasites).

**Distribution.** Hawaii; montane dry shrubland and forest.

**Male.** Measurements: Malar space, 6; eye, 134:118:108:82; clypeus, 63×69; frons, 27×27:100; interalveolar, 13:27:59:69, D 22; interocellar, 33:31:28:36, D 15; scape, 54×37; wing length, 4.5 mm (Hawaii, Kau, 4000 ft, BPBM 3450).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area rather uniformly punctured with round pits less than 1 pit width apart; frons with pits becoming contiguous medially, ground minutely wrinkled, dull; frontal line not evident; median impunctate, lustrous

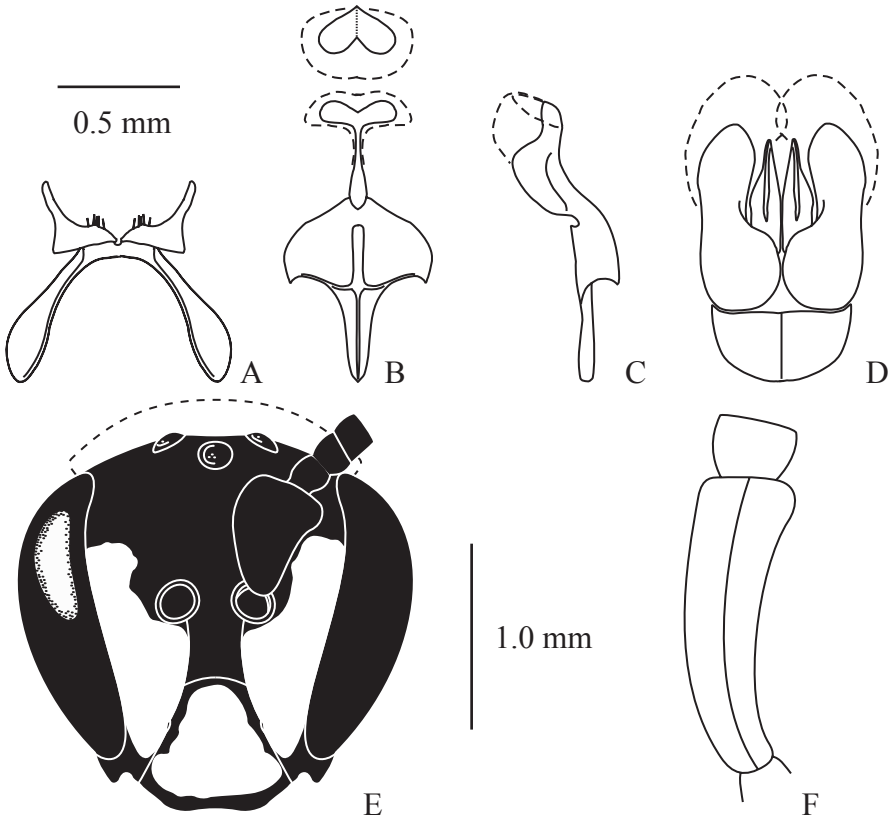


Fig. 34. *Hylaeus inquilina*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

area just above antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus straight. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view strongly concave, apex forming subacute angle; moderately arched in lateral view with maximum arch nearer base of scape; no groove on underside; with medium-length, yellowish white, simple to weakly plumose hair. Vertex hair 12-24, pale brown, simple.

**Mesosoma.** Scutum with minute, indistinct pits about 1 pit width apart, ground minutely wrinkled, dull; hair medium-length (10-12), brownish white, weakly plumose. Mesepisternum with indistinct pits about 1 pit width apart, and short to long, white, plumose hair; ground minutely wrinkled, slightly lustrous. Hypoepimeron mostly impunctate, smooth; slightly swollen. Metanotum dull. Basal area of propodeum short, narrow, rather flat and

without definite brow, roughened overall with lineate rugae at front, becoming weaker and reticulate distad, lustrous between rugae at front.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, short, pale, appressed hair, a hair length apart or more; in some bees, terga with longer, white hair at sides, creating thin fasciae (may be lost through abrasion). T7 hair very short, pale brown, appressed.

**Terminalia.** Lateral process of S7 tapered, pale, length subequal to width of hemisternite; hemisternites with short erect setae. Median process of S8 strongly dilated, apex bifurcate with short, rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with clypeus entirely yellow or with narrow margins black; paraocular area yellow to well above antennal socket in a broad stripe; supraclypeal area black or obscurely yellow below acme; scape unmarked. Pronotum unmarked. Legs entirely dark brown to black except fore tibia with pale area or legs obscurely marked: fore femur with obscure apical spot, combined with yellowish dorsal stripe extended full length of segment; fore basitarsus yellow; mid tibia variable, with small basal and obscure apical yellow spots or with only a trace of yellow at base; hind tibia variable, with basal yellow spot. Wings clear.

**Female. Head.** Malar space medium-length (ratio about 0.5 DMO). Upper paraocular area and frons rather uniformly punctured with round pits about 1 pit width apart, ground smooth coriaceous to minutely wrinkled, lustrous; middle with a few fine, longitudinal wrinkles, frontal line not evident. Apex of clypeus very shallowly emarginate. Dorsal end of facial foveae reaching just below or just up to level of lateral ocelli. Vertex hair 10-20, yellowish white, simple.

**Mesosoma.** Fore tarsus with hair short, straight (see Fig. 8B). Scutum with shallow, minute pits about 2 pit widths apart, ground nearly smoothly coriaceous, slightly lustrous; hair short (4-6), brownish white, simple. Mesepisternum with indistinct, shallow pits about 2 pit widths apart, and short, yellowish white, weakly plumose hair; ground smooth to minutely wrinkled, slightly lustrous. Hypoepimeron mostly impunctate, smooth; slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose about halfway to brow, wrinkled behind, shiny between rugae at front; brow minutely wrinkled, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, short, pale, appressed hair, spaced a hair length apart or more. T6 hair light reddish brown, medium-length, appressed.

**Color.** Head and mesosoma black; legs dark brown, with or without obscure marks at bases of tibiae; metasoma dark brown, unmarked. Wings clear.

**Perkins' collections. Hawaii:** Kau, 4000 ft (BMNH, BPBM); Kilauea (BPBM), 4000 ft (OUMNH); Kau district (OUMNH).

**Recent collections. Hawaii:** Kipuka Nene, 2900 ft; south of Bird Park, 1230 m; near Tree Molds, 4000 ft; Mauna Loa Rd., 2050 m; Mauna Loa, 6000 ft; Kipuka Alala, 5800 ft.

**Flower records.** *Myoporum*, *Styphelia*.

**Remarks.** This species is basal among the cleptoparasites and differs from all the others in several respects, the most obvious being the lack of any red markings (*H. volatilis* and *H. sphaecodoides* may have melanic individuals). It is usually found in open scrubland on

recent lava flows, and presumably primarily parasitizes the sympatric *H. difficilis* and *H. volcanicus*. See discussion of cleptoparasites under *H. hilaris*.

**References.** Perkins, 1907b:97 (record: Hawaii, Kilauea); 1910:603 (key).

***Hylaeus (Nesoprosopis) kauaiensis* (Perkins)**

(Fig. 35)

*Nesoprosopis kauaiensis* Perkins, 1899:90 (♂ ♀).

*Hylaeus (Nesoprosopis) kauaiensis*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis kauaiensis*, Daly, 1994:117 (lectotype ♂ BMNH 17a 162a; Kauai, Mts. Waimea, 4000 ft; wing length, 4.5 mm).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings, propodeum with well-separated, lineate rugae in basal half or less, otherwise smooth to brow. Male with broad whitish yellow mark partly divided by epistomal sulci; arched frontoclypeal suture; unusual wide supraclypeal area, W/L ratios 1.6-1.9; shiny paraocular depression; process of S8 without flexure. Female marked with yellow in lower paraocular areas and at sides of pronotal collar, pronotal lobes unmarked; closely resembling *H. mutatus*, but with longer hair on scutum and always lacking marks on pronotal lobes.

**Distribution.** Kauai; montane wet and mesic forest.

**Male.** Measurements: Malar space, 3; eye, 120:120:115:69; clypeus, 61×69; frons, 23×38:82; interalveolar, 23:26:54:61, D 20; interocellar, 31:35:20:31, D 17; scape, 39×29; wing length, 4.5 mm (Kauai, Waimea, 2000+ ft, BPBM 3469).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons with nearly round pits about 1 pit width apart, pits nearly round even near the middle, ground minutely wrinkled and slightly lustrous between pits; middle between median ocellus and acme with dense, contiguous pits, but without distinctive sculpture. Lower paraocular depression distinct, but shallow; shiny along eye. Frontoclypeal sulcus strongly arched; supraclypeal area much wider than long, W/L ratios 1.6-1.9. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view distinctly sinuous; strongly arched in lateral view with maximum arch near apex of scape; underside of median edge with a narrow line or groove; with medium-length, brownish, simple hair. Vertex hair 16-30, brown, simple.

**Mesosoma.** Scutum with pits about 1 pit width apart, ground slightly lustrous; hair medium to long (mostly 8-12, with scattered hairs up to 20), reddish brown, mostly simple. Scutellum with slightly larger pits, slightly lustrous. Mesepisternum with round, shallow pits about 1 pit width apart, ground smooth and lustrous and with long, brownish, plumose hair. Hypoepimeron with small pits, smooth, shiny; swollen. Metanotum slightly lustrous. Basal area of propodeum lineately rugose in basal half or less, spaced 2-4 rugae widths apart; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T1 with shallow, indistinct pits, smoothly coriaceous, lustrous, with fine, brown, appressed hairs spaced about one hair length apart or less. T2-7 with shallow but distinct pits (more obvious on posterior terga); hair short, dark, erect hair, and relatively dense, conspicuous in lateral view. T7 hair short, dark brown, prostrate.



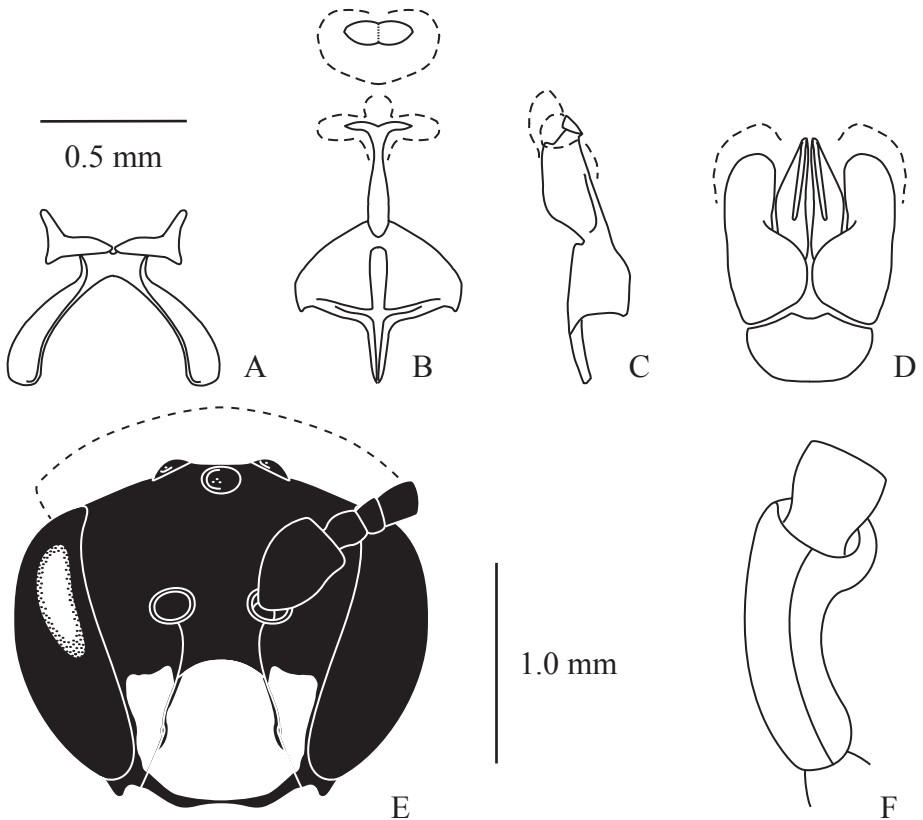


Fig. 35. *Hylaesus kauaiensis*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 straight along dorsal edge, no flexure, strongly dilated, apex bifurcate with short tips. Apices of gonoforceps slightly shorter than penis valves.

**Color.** Head and mesosoma black; metasoma dark brown. Labrum and mandible blackish brown to black. Face with clypeus largely yellow except around edges; lower paraocular area more or less filled in by yellow spot, usually not extended above clypeus. Supraclypeal area and scape unmarked. Pronotum with transverse collar stripe interrupted medially; lobes unmarked. Legs brown except pale area of fore tibia; unmarked. Wings slightly smoky.

**Female. Head.** Malar space very short (ratio about 0.1 DMO). Upper paraocular area and frons with nearly round pits about 1 pit width apart, pits nearly round even near the middle, ground minutely wrinkled and slightly lustrous between pits; middle between median

ocellus and acme with a fine frontal line. Apex of clypeus slightly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-30, brown, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits, 1-2 pit widths apart, ground dull; hair mixed, short to long (lower layer about 6, long hairs 12-20), red-brown, simple. Scutellum with slightly larger pits, lustrous. Metanotum dull. Mesepisternum with shallow pits 2-3 pit widths apart, ground smooth, lustrous; with long, yellowish white plumose hair. Hypoepimeron impunctate, nearly flat. Basal area of propodeum lineately rugose about halfway to brow, spaced about 2-4 ruga widths apart; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or more; hair brownish white to brown at apex of metasoma. T3-6 with shallow pits, less conspicuous than in male. T6 hair long, dark brown, erect.

**Color.** Head and mesosoma black; metasoma nearly black. Face with yellow line next to eye in lower paraocular area below the level of the antennal socket; clypeus and supraclypeal area unmarked. Pronotum with yellow transverse collar stripe interrupted medially; lobes unmarked. Legs nearly black except with pale area on fore tibia. Wings clear to smoky.

**Perkins' collections. Kauai:** "Kauai," 4000 ft (OUMNH); Waimea, >2000 ft (BPBM), 3-4000 ft (May), 4000 ft (IV, VI) (BMNH); Waimea Mts., >3000 ft (BPBM).

**Recent collections. Kauai:** Mt. Kahili, 2500 ft; Alakai Swamp Trail, 3600 ft, Kahuamaa Flat, 3800 ft; Mohihi Trail, 4000 ft.

**Flower records.** *Metrosideros*, *Scaevola procera*, *Styphelia*.

**Remarks.** Fullaway (1918:394) pointed out the possible synonymy of *H. kauaiensis* with *H. unicus* and *H. binominatus*, known then as *N. laticeps*. However, the process of S8 is without a flexure and the gonoforceps are slightly shorter than the penis valves in *H. kauaiensis*, whereas the other two taxa, synonymized below under *H. unicus*, have the process of S8 with a flexure and the gonoforceps subequal to the penis valves. The apex of the metasoma of female *H. kauaiensis* has conspicuous dense, erect hair as in *H. haleakalae*.

**References.** Perkins, 1910:603 (key). Swezey, 1954:177 (nest: in *Tetraplasandra* (referred to as *Pterotropia*) twig; record: Kauai, Halemanu).

### *Hylaeus (Nesoprosopis) kokeensis* Magnacca and Daly, new species (Fig. 36)

**DIAGNOSIS.** Small bees with clear to slightly smoky wings. Males with the face entirely yellow (sometimes the margin of the clypeus black), mark extended narrowly above the antennae; usually with marks on pronotal collar and lobes; unusual yellow mark on median plate of forewing (Fig. 3). Lateral process of S7 longer than the width of the hemisternite, making it distinctly L-shaped; S8 dilated, without flexure, triangular. Female with long paraocular marks along eye, and a clypeal mark. Most similar to *H. mimicus* from Oahu and *H. filicum* from Hawaii; distinguishable from them by the gently arched scape and the median plate.

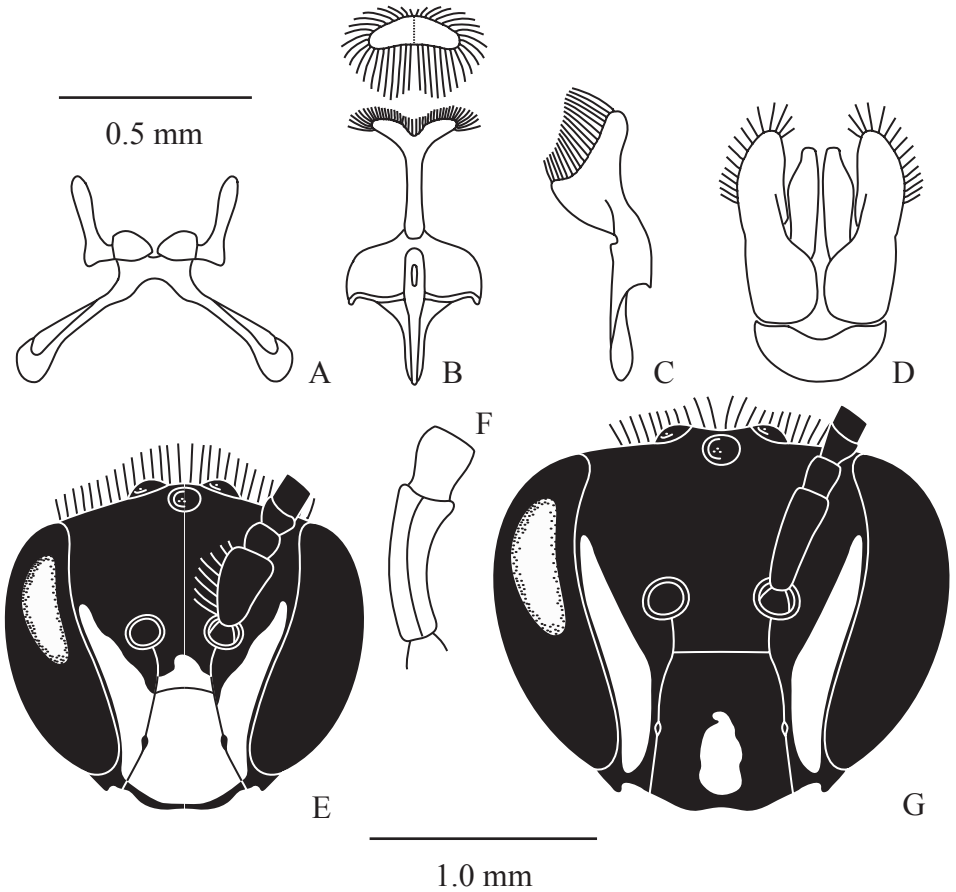


Fig. 36. *Hylaeus kokeensis*, new species, male (A-F) and female (G). A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Male face with left scape. F. Male scape, lateral view. G. Female face with left scape. 0.5 mm scale for A-D; 1 mm scale for E and G.

**Distribution.** Kauai; montane mesic forest.

**Male.** Measurements: Malar space, 3; eye, 108:100:83:58; clypeus, 53×54; frons, 18×21:73; interalveolar, 18:18:42:50, D 13; interocellar, 25:28:20:24, D 15; scape, 35×20; wing length, 3.5 mm (holotype).

**Head.** Malar space short (ratio about 0.2-0.3 DMO). Upper paraocular area distinctly striate. Frons with slightly distorted polygonal pits, contiguous in center, becoming more separated laterally, still less than 1 pit width apart; ground minutely wrinkled and slightly lustrous in upper paraocular area, surface appearing dull between antennae (ground not

evident). Lower paraocular depression very shallow, indistinct. Frontoclypeal sulcus straight or slightly arched; supraclypeal area wider than long, W/L ratios 1.1-1.5. Scape in frontal view slightly dilated, ratio about 0.6, greatest width near apex; lateral edge in frontal view straight; moderately arched in lateral view with maximum arch around middle; underside of median edge with an indistinct, shallow groove; long, pale brown, simple hair along median edge. Vertex hair 16-30, pale brown, mostly simple.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground slightly lustrous; hair medium-length (6-10), pale brown, weakly plumose. Scutellum with slightly larger pits, slightly lustrous. Mesepisternum with round, shallow pits about 1 pit width apart, ground smooth and lustrous, and with long, brownish white, plumose hair. Hypoepimeron with few indistinct pits, minutely granular, slightly lustrous; nearly flat. Metanotum slightly lustrous. Basal area of propodeum with a few very short rugae at base (up to 1/3 the distance to brow, often nearly absent), the remainder including the brow smoothly coriaceous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or more. Hair of T7 dark brown, medium to long, erect.

**Terminalia.** Lateral process of S7 parallel-sided, with apex rounded, length greater than width of hemisternite. Median process of S8 not or only very slightly arched, the dorsal surface nearly in line with the sternite; strongly dilated, peaked in middle, triangular in lateral view, apex bifurcate with short, broad tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma black; metasoma dark brown. Labrum and mandible dark brown to black. Face entirely yellow except sometimes narrow apical and lateral margins of clypeus; paraocular marks extended narrowly above antennal sockets; supraclypeal area sometimes yellow. Pronotal lobes marked with yellow; with or without an interrupted yellow stripe on collar and marks on tegulae. Median plate of forewing yellow. Legs black except for the following: front tibia with pale area and yellow mark at base; small yellow spot at apex of front femur; mid tibia narrowly yellow, and hind tibia about a third to half yellow at base; with or without a small spot at the apex of the mid tibia anteriorly; all basitarsi yellow, the remaining tarsi brown. Melanic individuals with basitarsal and hind tibial markings reduced to basal spots. Wings clear to slightly smoky.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area weakly striate above antennal sockets (much less conspicuous than in male), slightly lustrous. Frons with slightly distorted polygonal pits, contiguous in center, becoming more distant laterally, up to 1 pit width apart near eye; ground minutely wrinkled and slightly lustrous. Middle between median ocellus and acme with a frontal line. Apex of clypeus distinctly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 12-20, pale brown, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with small, shallow pits 2-3 pit widths apart, ground dull; hair short (4-6), pale brown, plumose. Scutellum with slightly larger pits, slightly lustrous. Metanotum dull. Mesepisternum with shallow pits 1-2 pit widths apart, ground smooth, lustrous; with long, yellowish white plumose hair. Hypoepimeron weakly punctate, nearly flat. Basal area of propodeum, including brow, smoothly coriaceous and lustrous, or with a few extremely short rugae at base.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or more. Hair of T6 dark brown, medium-length, erect.

**Color.** Clypeus with a longitudinal, apical mark occupying up to the middle third laterally and extended back about halfway; sometimes reduced to a narrow stripe. Broad lateral marks, not quite filling in area between clypeus and eye, extended along eye beyond antennal bases. Median plate of forewing yellow. Wings clear to slightly smoky.

**Holotype** ♂ labeled “Kauai, Awaawapuhi Trail, 3400', on *Chamaesyce atrococca*. K. Magnacca, 4 July 2000, KM-00-079” (CUIC).

**Allotype** ♀ with identical data (CUIC).

**Paratypes.** Kauai, Awaawapuhi Trail, 3400', 5 ♀ 3-VII-2000, 4 ♂ 4 ♀ 4-VII-2000, on *Chamaesyce atrococca* (KM-00-071,00-79) (CUIC); 2 ♂ 2 ♀ 4-VII-2000 (BPBM); Kokee Rd., 3600', 2 ♀ 24-VIII-1999, on *Acacia koa* (KM-99-227) (CUIC).

**Flower records.** *Acacia*, *Chamaesyce atrococca*.

**Etymology.** The species epithet *kokeensis* refers to Kokee, the region of Kauai where the types were collected.

**Remarks.** This species is notable for the yellow mark on the median plate at the base of the forewing; the only other species that has this is *H. kona* from Hawaii, which has a distinctively shaped scape with a conspicuous groove on the underside. A large series was collected from a single *Chamaesyce* bush, but it was not encountered elsewhere in the same vicinity, except for a few individuals caught several miles away the previous year on *Acacia koa*. It probably occurs throughout the mesic zone in the Kokee area.

### *Hylaeus (Nesoprosopis) kona* (Blackburn)

(Fig. 37)

*Prosopis kona* Blackburn, 1886:144-145, 148 (♂ ♀; key).

*Nesoprosopis kona*, Perkins, 1899:82 (♂ ♀).

*Hylaeus (Nesoprosopis) kona*, Meade-Waldo, 1923:33 (list).

*Nesoprosopis kona*, Daly, 1994:114 (lectotype ♂ BPBM 2595; Hawaii, western slopes of Mauna Loa, about 6000 ft; wing length to distal end of marginal cell 3.6 mm).

**DIAGNOSIS.** Small bees with clear wings and with median plate at wing base yellow (Fig. 3). The last is a feature shared only with *H. kokeensis*. Male face yellow, extended in narrow vittae above the antennal sockets; yellow marks on mandible, pronotal collar at sides and lobes, legs with tibiae and basitarsi yellow except dark brown bands on mid and hind tibiae; scape with a very distinct groove on underside, and usually a mark on the lateral edge. Female with long yellow stripe along eye, yellow marks on pronotal collar and lobes, and tegulae.

**Distribution.** Hawaii; montane dry forest and subalpine shrubland.

**Male.** Measurements: Malar space, 6; eye, 105:98:91:61; clypeus, 51×51; frons, 20×22:72; interalveolar, 13:20:39:49, D 13; interocellar, 32:26:22:27, D 13; scape, 37×27; wing length, 3.8 mm (Hawaii, Kipuka Alala, 5800 ft).

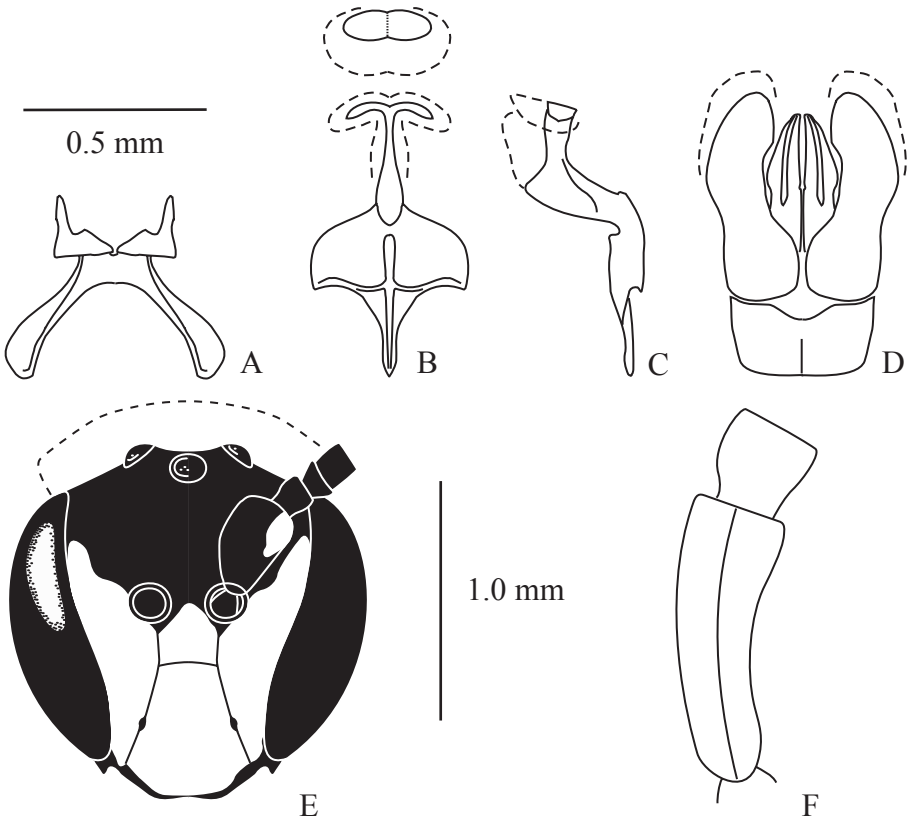


Fig. 37. *Hylaeus kona*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Head.** Malar space short to medium (ratio about 0.4-0.5 DMO). Lower half of upper paraocular area and frons striate, impunctate up to base of facial fovea; upper half with shallow pits up to 1 pit width apart near eye; frons medially with smaller, more distinct, contiguous pits and a patch of pale hair at the middle; large, lustrous impunctate areas above the antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus straight to slightly arched. Scape in frontal view slightly to moderately dilated, width more than half length, ratio about 0.6-0.7; lateral edge in frontal view nearly straight, median edge convex, reaching maximum width just past middle and narrowing slightly at apex; weakly to moderately arched in lateral view with maximum arch near middle of scape; underside of median edge with a very distinct groove; with long, yellowish white, mostly simple hair along the median edge. Vertex hair 16-24, brownish white, weakly plumose.

**Mesosoma.** Scutum with minute pits about 2 pit widths apart, ground slightly lustrous; hair long (12-20), yellowish white to pale brown, simple. Scutellum slightly lustrous. Mesepisternum with indistinct pits, about 1 pit width apart, and long, yellowish white, plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum with rather long anterior area; weak, short, lineate rugae at very base; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous and lustrous; pale, fine, appressed hairs spaced about one hair length apart. T7 hair medium to long, brown, erect.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with moderately long, round tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma dark brown to black; metasoma dark brown. Labrum black, mandible with a yellow spot or all yellow. Face with one large mark extended at sides to above antennal sockets: clypeus entirely yellow or lateral margins narrowly black; paraocular area yellow to above antennal socket in narrowed vitta; supraclypeal area to acme yellow; scape usually with a yellow spot near apex of lateral edge. Pronotum with transverse collar stripe variable, interrupted medially or with well-separated, small, lateral marks; lobes yellow. Tegula with or without a yellow spot; median plate at wing base yellow (rarely an obscure yellow-brown). Legs dark brown except: fore tibia with pale area plus long dorsal yellow stripe; mid and hind tibiae with long basal and shorter apical yellow marks, sometimes connected by a dorsal stripe; all femora with apex yellow; all basitarsi yellow, terminal tarsal segments becoming brownish toward apex. Wings slightly smoky.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area impunctate and weakly striate dorsad to facial fovea, upper half with round pits 1 pit width apart or less. Frons with round pits 1 pit width apart or less, closer in middle; very small or no impunctate area above antennae; ground minutely wrinkled, slightly lustrous; middle slightly depressed, with faint frontal line. Apex of clypeus strongly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-26, white, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with minute, indistinct pits 1-3 pit widths apart, ground granularly coriaceous, dull; hair long (10-14), brownish white, simple. Scutellum with pits slightly larger. Mesepisternum with indistinct, shallow, nearly round pits 1 pit width apart, and long, plumose, white hair; ground nearly smoothly coriaceous, lustrous. Hypoepimeron impunctate, ground smoothly coriaceous, lustrous, nearly flat. Metanotum dull. Basal area of propodeum with a few short rugae at base, the remainder smoothly coriaceous, almost shining.

**Metasoma.** Disk of T2 impunctate, lustrous, with very short, appressed hairs spaced about one hair length apart. T6 hair long, golden brown, erect.

**Color.** Head and mesosoma black; metasoma dark brown. Face with a long stripe along the eye, from bottom of fovea almost to base of mandible. Pronotal collar with interrupted stripe, pronotal lobe and tegula with a yellow spot; median plate yellow. Legs dark brown except: fore tibia with pale area plus long dorsal yellow stripe; mid and hind tibiae with long basal and shorter apical yellow marks, sometimes connected by a dorsal stripe; all

femora with apex yellow; all basitarsi yellow, terminal tarsal segments becoming brownish toward apex. Wings slightly smoky.

**Perkins' collections. Hawaii:** Kona (specimens not located).

**Recent collections. Hawaii:** Kipuka Alala, 5800 ft. Poikahi, 3-VI-1969, 2 ♀, ex *Sophora chrysophylla*, C. J. Davis. Halepiula, 1 ♂ 3 ♀, 21-XI-1962, in *Sophora chrysophylla*, C. J. Davis.

**Flower records.** *Bidens menziesii*, *Chamaesyce olowaluana*, *Sophora*.

**Remarks.** This species appears to be restricted to high-elevation areas of Mauna Kea and Hualalai. It is very similar to the sympatric *H. dimidiatus*, with similar marks on the face, metasoma, and legs. The former has a distinctively shaped scape with the median edge strongly convex and a conspicuous groove underneath, and marks on the mandible, median plate, and sometimes the tegula. *Hylaeus dimidiatus* has a nearly triangular scape, moderately dilated but with the median edge not strongly convex, and unmarked mandible, median plate, and tegula.

**References.** Blackburn, 1887:204-205, 208 (♂ ♀; key). Dalla Torre, 1896:26 (list). Perkins, 1910:603 (key). Fullaway, 1918:393 (record: Hawaii, Kilauea, Kau). Suehiro, 1986:60 (record: Hawaii, Kona).

### *Hylaeus (Nesoprosopis) kuakea* Magnacca and Daly, new species (Fig. 38)

**DIAGNOSIS.** Small bees with slightly smoky wings. Male with a single ivory mark on the clypeus and narrowly in the adjacent paraocular area; median frons with dense, small pits, distinctly more so than in paraocular area; hair of vertex and scutum long. Process of S8 arched, very weakly dilated. Female unknown. Very similar to *H. anthracinus*; distinguished by the denser, more distinct punctation of the frons, longer hairs, and generally narrower paraocular marks.

**Distribution.** Oahu; lowland mesic forest.

**Male.** Measurements: Malar space, 8; eye, 134:110:100:68; clypeus, 70×56; frons, 28×26:88; interalveolar, 16:22:52:64, D 16; interocellar, 28:30:26:34, D 15; scape, 44×32; wing length, 4.2 mm (holotype).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area largely impunctate along eye, towards middle with round, shallow pits less than 1 pit width apart, extended down nearly to antennal sockets; ground minutely wrinkled, slightly lustrous. Frons with pits deeper, more distinct, with a large dark area of small, dense, nearly contiguous pits. Lower paraocular depression variable, distinct or not. Frontoclypeal sulcus arched. Scape in frontal view moderately dilated, W/L ratio about 0.7-0.8; lateral edge in frontal view nearly straight in middle and rounded only at ends; weakly arched in lateral view; no groove on underside; with medium-length, white, weakly plumose hair. Vertex hair 16-24, yellowish white, plumose.

**Mesosoma.** Scutum with distinct pits about 1 pit width apart, ground minutely granular, slightly lustrous; hair medium-length (8-12), white, plumose. Mesepisternum with distinct,



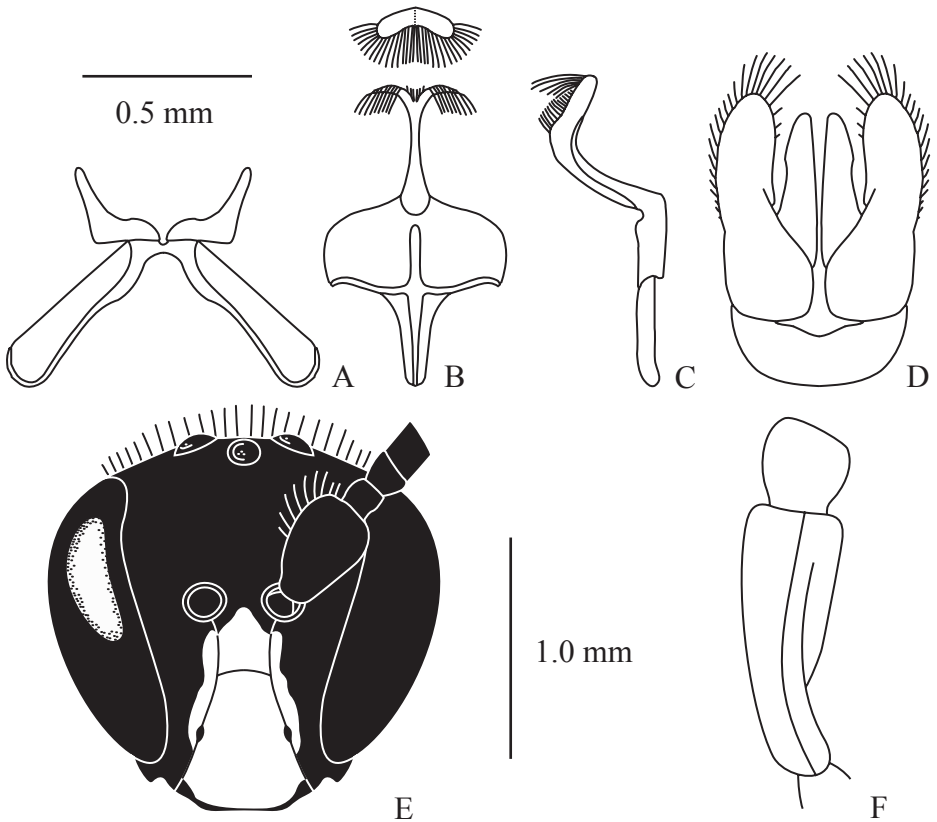


Fig. 38. *Hylaeus kuakea*, new species, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E.

shallow, round pits, about 1 pit width apart, and long, white, weakly plumose hairs; ground minutely coriaceous, lustrous. Hypoepimeron weakly punctured, shiny, slightly swollen. Metanotum minutely wrinkled, dull. Basal area of propodeum reticulate to brow, shiny between rugae; ground below brow minutely granular, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, shiny; with fine, short, pale, appressed hairs spaced about one hair length apart. T7 hairs medium-length, brown, prostrate.

**Terminalia.** Lateral process of S7 tapered, L-shaped, length slightly greater than width of hemisternite. Median process of S8 very weakly dilated, with a short peak at flexure, apex bifurcate with narrow tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with a single large spot: clypeus entirely ivory, lower paraocular area with a narrow stripe along clypeal suture,

supraclypeal area to acme ivory; scape unmarked. Pronotum unmarked. Legs dark brown to black, unmarked except small, obscure pale area on front tibia. Wings slightly smoky.

**Female.** Unknown.

**Holotype** ♂ labeled “HI: Oahu Is, Honouliuli Preserve, Moho Gulch Ridge, 1900', over ground. D. Hopper, 1 August 1997, KM-00-001” (CUIC).

**Flower records.** None.

**Etymology.** The species epithet *kuakea* is from the Hawaiian word meaning pale or bleached, in reference to the white color of the facial marks.

**Remarks.** Only two specimens are known, from a single locality in the Waianae Mountains. One specimen is the holotype; the other was used for genetic analysis.

### *Hylaeus (Nesoprosopis) kukui* Magnacca and Daly, new species

(Fig. 39)

**DIAGNOSIS.** Medium-sized bees with slightly smoky wings. Male with a distinctive parallel-sided ivory stripe down the middle of the face and long hair on the scutum; moderately dilated scape with an orange mark, unusual pale orange S6 and gonoforceps. Female unmarked except for prothoracic collar.

**Distribution.** Maui; montane wet forest.

**Male.** Measurements: Malar space, 2; eye, 139:134:122:78; clypeus, 75×94; frons, 24×32:87; interalveolar, 22:30:48:58, D 20; interocellar, 29:32:22:43, D 18; scape, 50×40; wing length, 5.7 mm (holotype).

**Head.** Malar space very short (ratio about 0.1-0.2 DMO). Upper paraocular area and frons with relatively deep, polygonal pits, almost contiguous in middle, only slightly farther apart near eye (less than 1 pit width apart), ground minutely wrinkled, slightly lustrous; a dull patch of dense and rough sculpture present about midway between each antennal socket and lateral ocelli; middle with a fine frontal line that may be partly obscured by punctuation and sculpture. Lower paraocular depression distinct, extended above antennal socket, shiny and striate next to eye. Frontoclypeal sulcus straight. Supraclypeal area slightly wider than long (W/L ratio 1.1-1.3). Scape in frontal view moderately dilated, ratio about 0.8; lateral edge convex; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with long, dark brown, mostly simple hair. Vertex hair 20-30, dark brown, simple.

**Mesosoma.** Scutum with pits uniformly about 1 pit width apart, ground slightly lustrous; hair long (10-20), dark brown, mostly simple. Mesepisternum with distinct, round pits about 1 pit width apart, and long, pale brown, weakly plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron weakly punctured, smooth, slightly lustrous; swollen. Metanotum dull. Basal area of propodeum strongly reticulately rugose over entire anterior area and brow, areolae large, ground shiny.

**Metasoma.** Disk of T2 with indistinct punctuation, fairly densely covered with fine, dark, appressed hair, less than 1 hair length apart. Pits more distinct on T3-7. T7 hair long, dark brown, prostrate.

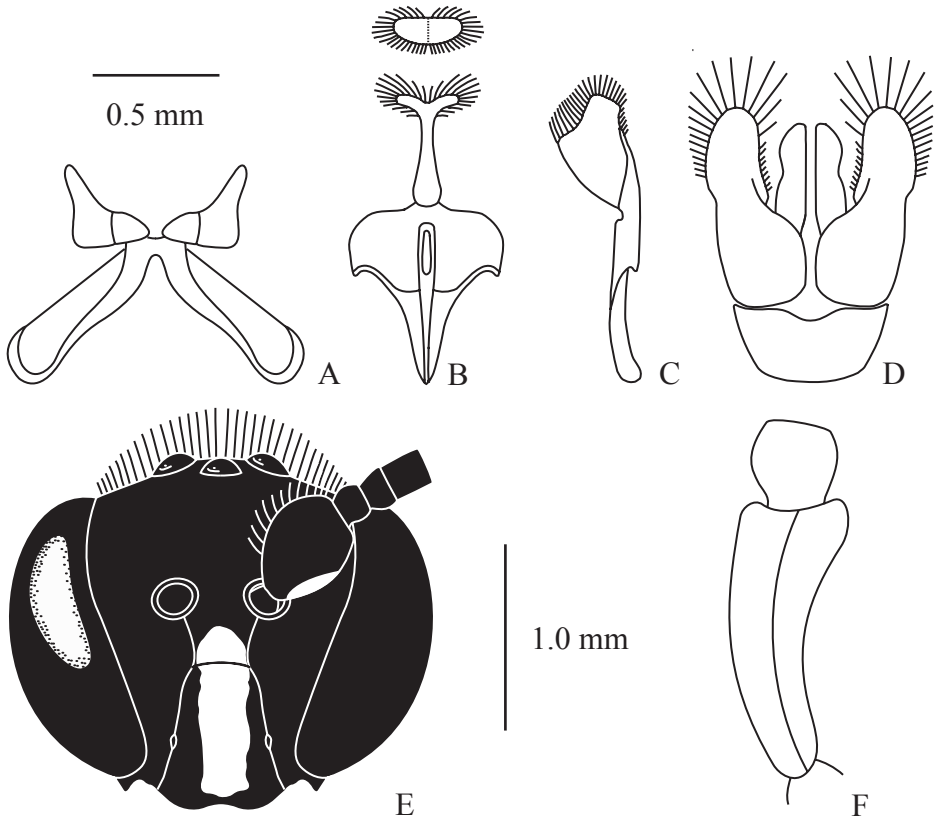


Fig. 39. *Hylaeus kukui*, new species, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 strongly dilated, humped in lateral view, without a distinct flexure, apex bifurcate with moderately broad tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma black, metasoma dark brown. Labrum and mandible blackish brown to black. Face with a single mark: clypeus with a more or less parallel-sided ivory stripe, extended onto the supra-clypeal area; mark sometimes narrow or reduced to an obscure smudge; paraocular area unmarked. Scape with an orange mark at the base of the lateral edge, absent or indistinct in some individuals with facial mark reduced. Pronotal collar with or without an interrupted transverse ivory stripe. Legs dark brown to black except: fore tibia with pale area and small yellow mark at base; fore femur orange at apex; mid tibia with yellow spot at base, with or without a small spot at the apex; hind tibia with or without an orange mark at base; all basitarsi obscure orange. S6 and ventral surface of

gonoforceps conspicuously pale orange, S6 with or without two or four obscure gray-brown spots. T7 with a large median orange spot. Wings slightly smoky.

**Female. Head.** Malar space very short (ratio about 0.1 DMO). Upper paraocular area and frons with relatively deep, polygonal pits, almost contiguous in middle, only slightly farther apart near eye (still less than 1 pit width apart), ground minutely wrinkled, slightly lustrous; middle with a fine frontal line that may be partly obscured by punctation and sculpture. Apex of clypeus distinctly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-30, dark brown, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct, evenly spaced pits about 1 pit width apart, ground dull; hair mostly medium-length (6-8, with scattered long hairs to 20), dark brown, simple. Mesepisternum with distinct, round pits about 1 pit width apart, and pale brown, mostly simple hair; ground smooth, slightly lustrous. Hypoepimeron punctured, smooth, slightly lustrous; swollen. Metanotum dull. Basal area of propodeum reticulately rugose over entire anterior area and brow; areolae large at front, smaller around brow, ground lustrous.

**Metasoma.** Disk of T2 with shallow, indistinct punctation and fine, pale, appressed hair. Pits more distinct on T3-6. T6 hair long, dark brown, appressed.

**Color.** Body and legs dark brown to black except pronotal collar with or without interrupted transverse ivory stripe, and fore tibia with obscure pale area. Wings slightly smoky.

**Holotype** ♂ labeled "HI: Maui Is, Puu Kukui Trail, 3000', over ground. K. Magnacca, 11 August 2000, KM-00-170" (CUIC).

**Allotype** ♀ with identical data (CUIC).

**Paratypes.** Maui, Puu Kukui Trail, 3000', over ground, 3 ♂ 11-VIII-2000 (KM-00-170) (CUIC). Kipahulu Valley, Camp 2, 1250 m, 7 ♂ 1 ♀ 13-17-VIII-1967, N. Wilson; Hana, 10 ♂ 2 ♀ 7-V-1920, E. H. Bryan Jr. (BPBM).

**Flower records.** None.

**Etymology.** The species epithet *kukui* refers to the summit of West Maui, named after the candlenut tree.

**Remarks.** This species is related to *H. muranus* of Hawaii, but lacks the transverse scape and any trace of iridescence on the abdomen. All of KM's specimens were caught flying in a small area under a low fern; a long series from East Maui exists at the Bishop Museum. It appears to occur widely in the wet forests of Maui.

### *Hylaeus (Nesoprosopis) laetus* (Perkins)

(Fig. 40)

*Nesoprosopis laeta* Perkins, 1899:81-82 (♂ ♀).

*Hylaeus (Nesoprosopis) laetus*, Meade-Waldo, 1923:33 (list).

*Nesoprosopis laeta*, Daly, 1994:117 (lectotype ♂ BMNH 17a 134a; Oahu, Waianae Mts.; wing length, 4.0 mm).

**DIAGNOSIS.** Medium-sized bees with clear to dark smoky wings. Male face usually with oval yellow mark extending onto paraocular area, or mark on clypeus only, scape slightly

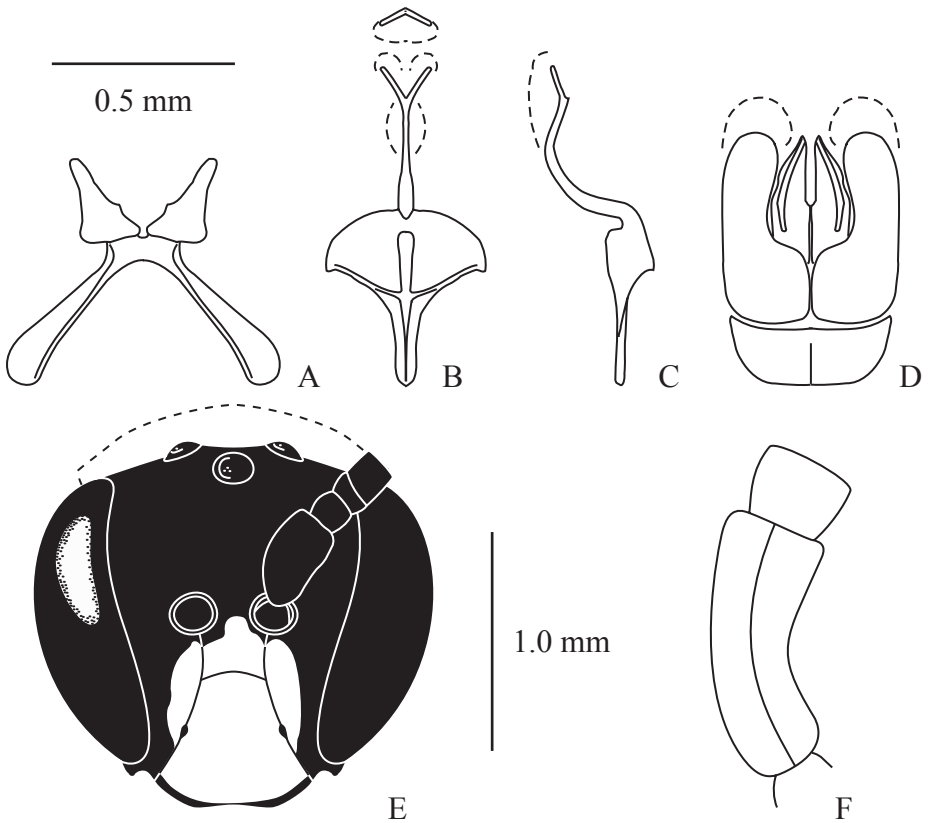


Fig. 40. *Hylaeus laetus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

dilated and moderately to strongly arched, legs marked with yellow, lateral process of S7 longer than width of hemisternite; median process of S8 not dilated and with long, narrow tips, apices of gonoforceps subequal to penis valves. Female black with pronotal lobes yellow or unmarked; hair of scutum short. Sister species of *H. difficilis*; see remarks for that species.

**Distribution.** Hawaii, Maui, Lanai, Oahu, and Kauai; found primarily in both lowland and montane dry shrubland, less commonly in mesic and wet forest.

**Male.** Measurements: Malar space, 5; eye, 124:110:100:72; clypeus, 65×64; frons, 19×24:83; interalveolar, 15:23:50:59, D 19; interocellar, 32:28:22:28, D 15; scape, 39×20; wing length, 4.3 mm (Oahu, Waianae Mts., 2000 ft, BPBM 3471).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area with indistinct, round, shallow pits 1 pit width apart or less (some specimens with pits almost totally obscured by minutely wrinkled, slightly lustrous ground; other specimens with relatively smooth lustrous ground); dense, minute, parallel wrinkles below punctured area and along the eye, and ground rather smooth and lustrous; frons with pits closer, more distinct, contiguous medially, slightly distorted; fine frontal line present in some specimens; shiny, median, depressed area just above prominent acme. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus slightly arched. Scape in frontal view slightly dilated, width about half length, ratio about 0.5; lateral edge in frontal view nearly straight or slightly concave; moderately to strongly arched in lateral view with maximum arch near middle of scape; width of scape in lateral view more or less uniform in basal half, expanded gradually in width in apical half; no groove on underside; with medium-length, pale brown, weakly plumose hair. Vertex hair 12-20, pale brown to brown, plumose.

**Mesosoma.** Scutum with small, shallow pits about 2 pit widths apart, ground slightly lustrous; hair medium-length (8-12), white to pale brown, plumose. Scutellum with pits more distinct, ground lustrous. Mesepisternum with indistinct to barely discernible pits, about 1-2 pit widths apart, and long, brownish to yellowish white, plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, lustrous, nearly flat. Metanotum dull. Basal area of propodeum lineately rugose about halfway or more to brow, spaced 2-4 ruga widths apart or more, often shiny between rugae; brow granular to relatively smoothly coriaceous, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate; smoothly coriaceous, lustrous, with pale, short, appressed hairs spaced more than a hair length apart. T7 hair short, yellowish white to red-brown, prostrate.

**Terminalia.** Lateral process of S7 tapered, apex translucent, length greater than width of hemisternite. Median process of S8 linear and with a slight triangular dilation at tip, and rather long, very slender, cuticular bifurcations with hairs (the slender bifurcations easily confused with hairs at tip of process or may be broken and lost). Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with a single large spot: clypeus entirely yellow or, if other marks missing, then with only a central spot; lower paraocular area yellow along sulci below antennal socket, or unmarked; supraclypeal area to acme yellow or unmarked; scape unmarked. Pronotum with lobes yellow, or only an apical dot, or unmarked. Legs dark brown to black except pale area on fore tibia and variable amounts of the following yellow marks: fore leg with basal stripe up to most of length of tibia; basitarsus mostly yellow or at least a basal trace; and terminal tarsal segments yellow to brown. Mid leg with basal stripe up to half length of tibia and sometimes combined with a subapical mark; basitarsus mostly yellow or at least a basal trace; and terminal tarsal segments yellow to brown. Hind leg with tibia entirely yellow in basal half, sometimes combined with subapical mark, or yellow extended full length in frontal view and in caudal view, dark in apical half; basitarsus mostly yellow or at least a basal trace; and terminal tarsal segments yellow to brown. Wings clear to smoky.

**Female. Head.** Malar space short to medium (ratio about 0.3 to 0.5 DMO). Upper paraocular area with indistinct, round, shallow pits 1 pit width apart or less; ground minutely wrinkled, slightly lustrous; in some specimens, frons with pits closer, medially contiguous, slightly distorted; fine frontal line sometimes present. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-14(-20), brown, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with shallow pits about 2 pit widths apart, ground slightly lustrous; hair medium-length (6-10), yellowish white, plumose. Mesepisternum with indistinct to barely discernible pits, about 2 pit widths apart, and medium-length, yellowish white, plumose hair; ground minutely coriaceous or slightly striate, lustrous. Hypoepimeron impunctate, lustrous, nearly flat. Metanotum slightly lustrous. Basal area of propodeum coarsely lineately rugose about halfway to brow, spaced 2-4 ruga widths apart, rugae weaker near brow; brow smoothly coriaceous, lustrous.

**Metasoma.** Disk of T2 impunctate; smoothly coriaceous, lustrous, with pale, short, appressed hairs spaced more than a hair length apart. T6 hair medium-length, light brown, prostrate.

**Color.** Head and mesosoma black; metasoma dark brown. Face unmarked. Pronotum with lobes yellow or unmarked. Legs dark brown to black, unmarked or with obscure or distinct basal yellow spots on tibiae, largest on hind tibia. Wings smoky to dark smoky.

**Perkins' collections. Hawaii:** Kilauea (BMNH). **Lanai:** Koele, 2000 ft (OUMNH); "Lanai" (BPBM). **Molokai:** "Molokai" (BPBM); Molokai Mts., 3000 ft (BMNH, BPBM); Plains (BMNH, BPBM). **Oahu:** Honolulu, 2000 ft (BPBM); Honolulu Mts., 1500 ft (BPBM); Kaala, 2000 ft (OUMNH); Tantalus (BPBM); Waianae (BMNH), coast (BPBM), coast, field note #672 (OUMNH); Waianae Mts. (BPBM), 2000 ft (BMNH, BPBM, OUMNH). **Kauai:** Halemanu, 4000 ft (field note #501) (BMNH, BPBM, OUMNH); "Kauai" (OUMNH); Makaweli, >2000 ft (BPBM), 2000 ft (BMNH, BPBM); Waimea, 2000 ft (BMNH, BPBM), >2000 ft (BPBM).

**Recent collections. Hawaii:** Hilina Pali Rd., 2000 ft; Kipuka Nene, 2900 ft; Puu Waawaa, 4100 ft; Kipuka Alala, 5800 ft; Humuula Saddle, 6800 ft. **Maui:** Lahainaluna, 1800 ft; Kahoma, 2100 ft. **Lanai:** Kahue, 1400 ft; Garden of the Gods, 1400 ft. **Oahu:** Pahole Natural Area Reserve, 2000 ft. **Kauai:** Alakai Swamp Trail, 3600 and 4000 ft; Kokee Rd., 3600 ft; Nualolo Cliff Trail, 2800 ft; Paaiki Valley, 2700 ft.

**Flower records.** *Acacia*, *Bidens menziesii*, *B. sandvicensis*, *Chamaesyce atrococca*, *C. multiformis*, *C. olowaluana*, *Claoxylon*, *Dodonaea*, *Metrosideros*, *Myoporum*, *Plantago lanceolata*\*, *Santalum freycinetianum*, *S. paniculatum*, *Scaevola procera*, *Sesbania tomentosa*, *Sida*, *Sophora*, *Styphelia*.

**Remarks.** This species occurs in many of the same habitats as *H. difficilis*, but is more commonly found at lower elevations (below 4000 ft). See remarks for *H. difficilis*.

**References.** Perkins, 1899:105 (host of cleptoparasite: *N. hostilis*); 1910:602 (key); 1913:82 (biogeography). Fullaway, 1918:393 (record: Hawaii, Kau, Kilauea). Illingworth, 1928:46 (record: Lanai).

*Hylaeus (Nesoprosopis) longiceps* (Perkins)

(Fig. 41)

*Nesoprosopis longiceps* Perkins, 1899:98 (♂ ♀; Pl. 2, Fig. 3).*Hylaeus (Nesoprosopis) longiceps*, Meade-Waldo, 1923:34 (list).*Nesoprosopis longiceps*, Daly, 1994:118 (lectotype ♂ BMNH 17a 160ab; Maui, Wailuku; wing length, 4.3 mm).

**DIAGNOSIS.** Medium-sized bees with clear to slightly smoky wings. Male lower face entirely yellow, extended at sides in a broad stripe above antennal sockets, unusual supraclypeal area very long and narrow, scape weakly dilated (*H. solaris* from Kauai has a similar long supraclypeal area, but the scape is dilated). Female black and unmarked.

**Distribution.** Maui, Molokai, Lanai, and Oahu; coast and dry lowlands.

**Male.** Measurements: Malar space, 6; eye, 159:115:102:74; clypeus, 79×69; frons, 31×22:105; interalveolar, 13:23:58:67, D 23; interocellar, 35:26:20:28, D 18; scape, 51×20; wing length, 4.2 mm (Maui, Wailuku, BPBM 3508).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area with distinct, round pits 1-2 pit widths apart, ground nearly smooth, slightly lustrous; frons with pits still distinct, smaller, contiguous and distorted, and merging at the middle into a localized depression of dull, rough ground above the antennal sockets; otherwise no special sculpture, frontal line not evident; impunctate area above antennal sockets very small. Lower paraocular depression very shallow or absent. Frontoclypeal sulcus straight. Scape in frontal view not dilated or very weakly dilated, width less than half length, ratio about 0.3-0.4; lateral edge in frontal view nearly straight or slightly concave; slightly arched in lateral view with maximum arch near middle of scape; no groove on underside; with short, yellowish white, plumose hair. Vertex hair 8-16, yellowish white, plumose.

**Mesosoma.** Scutum with distinct pits about 1 pit width apart, ground nearly smooth, slightly lustrous; hair medium-length (8-10), white to pale brown, plumose. Scutellum with pits slightly larger in some bees, lustrous. Mesepisternum with shallow pits about 1 pit width apart, and medium-length, white, plumose hair; ground nearly smooth, lustrous. Hypoepimeron large, impunctate or obscurely punctured, smooth, lustrous; slightly swollen. Metanotum dull to slightly lustrous. Basal area of propodeum lineately rugose to brow, shiny between rugae, brow nearly smooth, lustrous; varying to reticulately rugose to brow, large shiny areolae at front, brow weaker reticulately rugose, shiny between rugae.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with very short, fine, pale, appressed hairs spaced about one hair length apart or less. T7 hair short, golden brown, appressed.

**Terminalia.** Lateral process of S7 tapered, pale, length greater than width of hemisternite. Median process of S8 weakly dilated and rather thick, apex bifurcate with long, narrow, rounded, sparsely hairy tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black, labrum with or without a yellow spot. Face with one large mark: clypeus entirely yellow or nearly so; paraocular area yellow to above antennal socket; supraclypeal area to acme yellow; scape unmarked or with a yellow spot or line on the lateral edge. Pronotum unmarked or with a yellow spot on lobe;



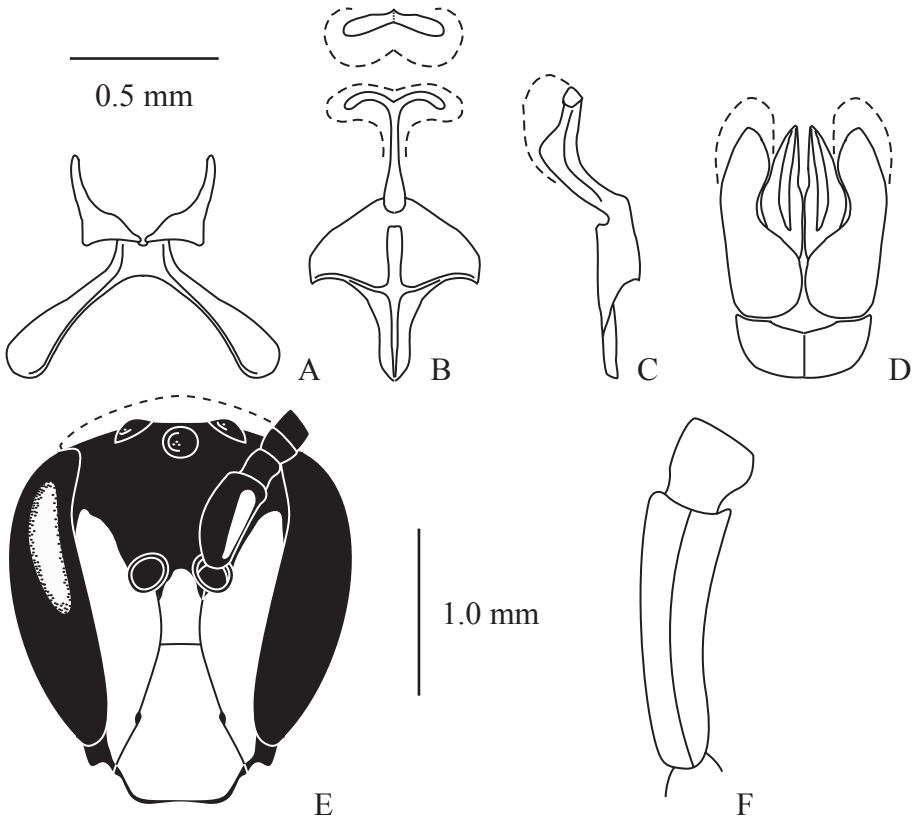


Fig. 41. *Hylaesus longiceps*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

tegula with or without a yellow spot. Legs dark brown to blackish brown except: fore tibia with pale area and yellow spots at base and apex that may be connected by a dorsal yellowish stripe, tarsus yellow, brownish apically; mid and hind tibiae with small yellow marks at base and apex; mid and hind tarsi yellow, brownish apically. Wings clear.

**Female. Head.** Malar space medium (ratio about 0.6 DMO). Upper paraocular area with distinct, round pits 1-2 pit widths apart, ground nearly smooth, slightly lustrous; frons with pits still distinct, medially smaller, contiguous, and distorted; at the middle, with or without a few longitudinal wrinkles or a faint, fine frontal line. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-8, pale brown, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits about 1 pit width apart, ground nearly smooth, slightly lustrous; hair short (4, relatively even, occasional

hairs to 8), white, plumose. Scutellum with pits slightly larger in some bees, lustrous. Mesepisternum with shallow pits about 1 pit width apart, and yellowish white, weakly plumose hair; ground nearly smooth, lustrous. Hypoepimeron large, impunctate, smooth to very weakly striate, lustrous; slightly swollen. Metanotum dull to slightly lustrous. Basal area of propodeum lineately rugose or reticulate to brow, shiny between rugae, some bees with sparse rugae; brow nearly smooth to granularly coriaceous, slightly lustrous to dull.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with short or very short, fine, pale, appressed hairs spaced a hair length apart or more. T6 hair long, golden brown, appressed.

**Color.** Head and mesosoma brown to black; metasoma brown to dark blackish brown. Face and pronotum unmarked. Legs dark brown; unmarked or with a small yellow spot at base of front tibia. Wings nearly clear to slightly smoky.

**Perkins' collections.** **Maui:** Haleakala, 2000 ft (BPBM); "Maui" (BPBM); Wailuku (BMNH, BPBM, OUMNH); sand hills (BPBM). **Lanai:** "Lanai" (BPBM); Manele (BMNH, BPBM). **Molokai:** Kaunakakai (OUMNH); Molokai coast and plains (BMNH, BPBM); Molokai Mts. (BPBM); West end of Molokai (BPBM). **Oahu:** Waianae (OUMNH).

**Recent collections.** **Maui:** Waiehu dune, 200 ft. **Lanai:** Kahue, 1400 ft; Polihua Rd., 1000 ft; Shipwreck Beach, coast. **Molokai:** Moomomi, coast. **Oahu:** Kaena Point Natural Area Reserve, coast.

**Flower records.** *Chamaesyce degeneri*, *Myoporum*, *Santalum ellipticum*, *Scaevola coriacea* (Maui), *S. sericea*, *Sesbania tomentosa*, *Sida*, *Vitex rotundifolia*.

**Remarks.** The supraclypeal area is variable in shape, but consistently longer than wide (8 bees, W/L ratios 0.6-0.8), and the face is unusually long and narrow overall. Only *H. solaris* has a similarly narrow face; while it also has similar facial markings, the two species are not closely related.

**References.** Perkins, 1910:602 (key); 1911:727 (Blackburn had series of mixed species); 1913:79 (morphology). Fullaway, 1918:396 (record: Oahu, Makapuu; Lanai).

### *Hylaeus (Nesoprosopis) mana* Magnacca and Daly, new species

(Fig. 42)

**DIAGNOSIS.** Very small bees with clear wings. Male face nearly all yellow, only supraclypeal area and narrow margins of clypeus black, the yellow marks extended above antennal sockets; scape weakly dilated, about twice as long as wide, weakly arched. Median process of S8 swollen at base, the remainder weakly dilated and strongly arched. Female with long, broad paraocular marks, a transverse clypeal mark, and marks on pronotal collar, lobes, and tegulae. Both sexes with extensive yellow marks on legs.

**Distribution.** Oahu; mesic forest. Known from only one collection.

**Male.** Measurements: Malar space, 2; eye, 80:76:68:46; clypeus, 38×42; frons, 12×14:60; interalveolar, 12:16:36:42, D 12; interocellar, 22:20:12:22, D 10; scape, 30×14; wing length, 2.9 mm (holotype).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area with distinct pits about 1 pit width apart, denser and almost touching in the median frons; ground strongly

lustrous in upper paraocular area, less so on frons; a large dark patch between acme and median ocellus formed by dense punctation and dull sculpture, covered with pale, appressed hairs. Lower paraocular depression very shallow, indistinct. Frontoclypeal sulcus slightly arched or nearly straight; supraclypeal area wider than long, W/L ratio 1.2-1.4. Scape in frontal view hardly dilated, ratio about 0.5, greatest width near apex; lateral edge in frontal view mostly straight, with a slight knob at the apex; weakly arched in lateral view; underside of median edge with an indistinct, shallow groove; long, pale, simple hair along median edge. Vertex hair 8-12, pale brown, simple.

**Mesosoma.** Scutum with shallow pits 2-3 pit widths apart, ground minutely granular, slightly lustrous; hair uneven, short to medium-length (4-12), pale, mostly simple. Scutellum smoother, more lustrous. Mesepisternum with shallow, indistinct pits about 1-3 pit widths apart, ground strongly lustrous, with long, white, plumose hair. Hypoepimeron impunctate, shiny, slightly swollen. Metanotum slightly lustrous. Basal area of propodeum with a few very short rugae at base or none, the remainder including the brow smoothly coriaceous, lustrous; dorsal surface long, as long as scutellum. Lateral carinae indistinct, evident only posteriorly.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, prostrate hairs spaced more than a hair length apart. Hair of T7 brown, medium to long, erect.

**Terminalia.** Lateral process of S7 parallel-sided, length greater than width of hemisternite; hemisternite L-shaped. Median process of S8 swollen at base, the remainder narrow and strongly arched, apex at about the level of the disk of S8 and bifurcate, with long, straplike tips. Apices of gonoforceps exceeding penis valves, inwardly pointed.

**Color.** Labrum and mandible dark brown to black. Face with three nearly contiguous spots: clypeus nearly all yellow except narrow margins of clypeus; paraocular marks extended narrowly above antennal sockets; supraclypeal area black. Pronotum with an interrupted transverse stripe on collar and marks on lobes and tegulae. Legs black except: front tibia with large pale area and a dorsal yellow stripe the entire length; mid tibia with basal quarter to third, and apical quarter, yellow; hind tibia with basal half and narrow apical ring yellow; marks on apices of all femora; all basitarsi yellow. Wings clear.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with evenly spaced pits, about 1 pit width apart even at center below median ocellus, but with a small area of slightly denser punctation halfway between acme and ocellus; ground almost smooth, strongly lustrous. Middle between median ocellus and acme with a faint frontal line. Apex of clypeus distinctly emarginate. Dorsal end of facial fovea not reaching level of lateral ocellus. Vertex hair 6-8, pale brown, simple.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with shallow pits 2-3 pit widths apart, ground minutely granular and weakly lustrous; hair short (2-6; but specimen abraded), pale, simple. Scutellum smoother, more lustrous. Metanotum dull. Mesepisternum with shallow, indistinct pits 1-2 pit widths apart, ground smooth, strongly lustrous; with medium-length, white, weakly plumose hair. Hypoepimeron impunctate, strongly lustrous, slightly swollen. Basal area of propodeum with a few very short rugae at base or none, the remainder including the brow smoothly coriaceous, lustrous; dorsal surface long, as long as scutellum. Lateral carinae indistinct, evident only posteriorly.

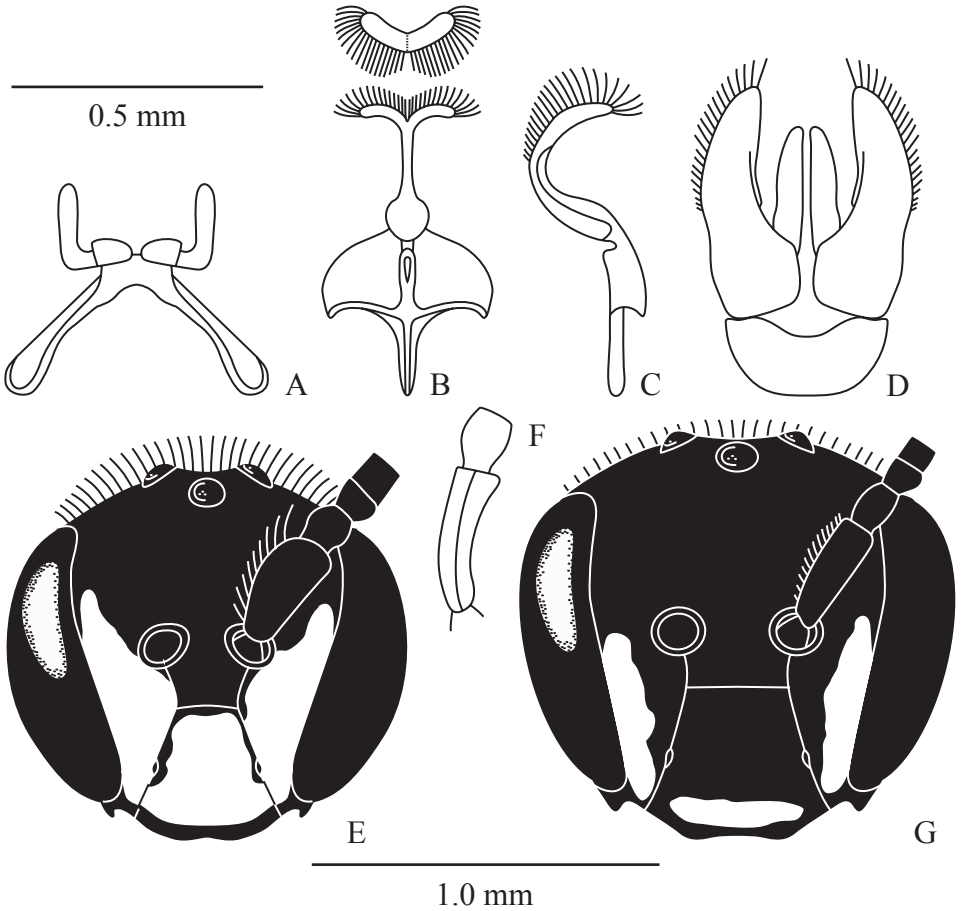


Fig. 42. *Hylaeus mana*, new species, male (A-F) and female (G). A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Male face with left scape. F. Male scape, lateral view. G. Female face with left scape. 0.5 mm scale for A-D; 1 mm scale for E and G.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, prostrate hairs spaced about one hair length apart or more. Hair of T6 long, brown, erect.

**Color.** Head and mesosoma black; metasoma dark brown. Face marked with yellow: clypeus with a transverse apical mark (possibly sometimes absent); paraocular area with a broad stripe, extended along eye up to antennal socket. Pronotum with marks on lobes and interrupted transverse collar stripe; tegula with a yellow spot. Legs black except: front tibia with large pale area and a dorsal yellow stripe half the length; mid tibia with basal and apical quarters yellow; hind tibia with basal half and narrow apical ring yellow; marks on

apices of all femora; all of front and base of middle basitarsus yellow. Wings clear. Metasomal terga and sterna 1-5 with thin cuticle apically and laterally, creating the appearance of orange bands.

**Holotype** ♂ labeled "Oahu, Manana Trail, 1400', on *Santalum freycinetianum*. K. Magnacca, 3 Mar 2002, KM-02-043" (CUIC).

**Allotype** ♀ with identical data (CUIC).

**Paratype**. 1 ♂ with identical data (BPBM).

**Flower records.** *Santalum freycinetianum*.

**Etymology.** The species epithet *mana* is from the Hawaiian word meaning forked, referring to the facial marks; it also means spiritual power, which this tiny creature must possess to have made itself known through a chance collection shortly before publication of this volume.

**Remarks.** This is the smallest species of Hawaiian *Hylaeus*. The only collection came from a habitat (mesic koa forest) and plant (*Santalum*) where few bees have been found on Oahu. The weakly arched scape with a poorly developed groove suggests that it may be related to *H. dumetorum* of Hawaii. Males can immediately be distinguished from the sympatric *H. mimicus* and *H. specularis* by the shape of S8, which is hardly dilated and strongly arched; all three males of *H. mana* have similar facial marks with more yellow than either of those species. Females can be distinguished by the evenly, more widely spaced pits of the frons, and the transverse rather than longitudinal clypeal mark (*H. specularis* may occasionally have a transverse clypeal mark as well).

### *Hylaeus (Nesoprosopis) mauiensis* (Perkins)

(Fig. 43)

*Nesoprosopis mauiensis* Perkins, 1899:94-95 (♂ ♀).

*Hylaeus (Nesoprosopis) mauiensis*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis mauiensis*, Daly, 1994:118 (lectotype ♂ BMNH 17a 148; Maui, Haleakala, 5000 ft).

**DIAGNOSIS.** Small bees with clear wings. Male with small, irregular yellow marks only in paraocular areas; legs unmarked; basal area of propodeum with rather long base and at very front with short, linear rugae spaced about 3 rugae apart; brow smooth. Female described by Perkins (1899:95) had a narrow yellow line along eye margins, yellow marks at each side of collar, and basal area of propodeum unsculptured.

**Distribution.** Maui; montane wet forest. No recent collections.

**Male.** Measurements: Malar space, 3; eye, 92:92:83:54; clypeus, 45×40; frons, 15×18:69; interalveolar, 14:18:40:43, D 17; interocellar, 26:28:18:28, D 15; scape, 32×23; wing length, 3.6 mm (*H. mauiensis* lectotype).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area with shallow, round pits about 1 pit width apart, ground minutely roughened with parallel wrinkles curved from near median ocellus to along eye; on frons pits closer and contiguous; at middle pits dense, contiguous, indistinct, distorted, and with a small dark spot of hairs just above and

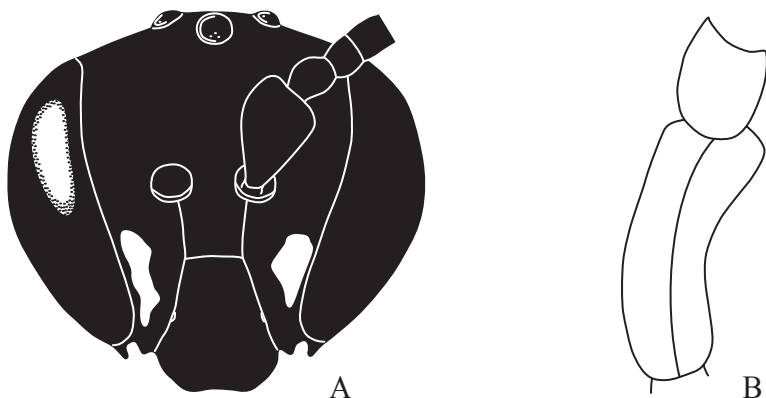


Fig. 43. *Hylaeus maiiensus*, male. A. Face with left scape. B. Scape, lateral view.

between impunctate areas above the antennal sockets; no median groove. Lower paraocular depression absent. Frontoclypeal sulcus straight. Scape moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view straight; moderately arched in lateral view with maximum arch near middle of scape.

**Mesosoma.** Scutum with indistinct, minute pits, 2-3 pit widths apart, ground granular, slightly lustrous. Scutellum smooth, lustrous. Mesepisternum largely impunctate with sparse, simple hairs less than a hair length apart, ground smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Metanotum mostly smooth, slightly lustrous. Basal area of propodeum with rather long base; at very front with short, linear rugae spaced about 3 rugae apart; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; mostly bare, otherwise with fine, pale, appressed hairs spaced about one hair length apart.

**Terminalia.** Lateral process of S7 parallel-sided, with length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with broad, rounded tips of moderate length. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma black; metasoma dark brown. Face with irregular yellow stripes in paraocular areas not reaching level of antennal sockets; clypeus, frons and scape unmarked. Pronotum unmarked. Legs dark brown except fore tibia with pale area. Wings clear.

**Female.** Specimen not located. Described by Perkins (1899:95) as follows. "Female, with a narrow yellow line along the margins of the eyes, and one on each side of the hind margin of the prothorax yellow; head above the antennae with the surface shining (except narrowly in the middle), finely and closely punctured; mesothorax dull, and very finely punctured; scutellum also dull, finely and somewhat remotely punctured; anterior area of

the propodeum with only the fine general surface rugulosity and shining in certain aspects; wings clear and iridescent.”

**Perkins' collections. Maui:** Haleakala, 5000 ft (BMNH).

**Recent collections.** None.

**Flower records.** None.

**Remarks.** Known only from the male type specimen and the description of a female.

**References.** Perkins, 1910:603 (key).

### *Hylaeus (Nesoprosopis) melanothrix* (Perkins)

(Fig. 44)

*Nesoprosopis melanothrix* Perkins, 1899:86-87 (♂ ♀; Pl. 2, Fig. 14; nest in *Metrosideros* and *Psychotria* [referred to as *Straussia*]).

*Hylaeus (Nesoprosopis) melanothrix*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis melanothrix*, Daly, 1994:118 (lectotype ♂ BMNH 17a 119b; Maui, Haleakala, 5000 ft; wing length, 5.4 mm).

**DIAGNOSIS.** Medium-sized bees with dark smoky wings; long brown body hair; unusual propodeum with basal area strongly sloping, brow indistinct, and sculpture, if any, weak at very front, otherwise smooth, lustrous. Male with unique scape deeply arched with lateral apex expanded. Female black and unmarked; long malar space in comparison to relatively small ocellus (0.8 DMO).

**Distribution.** Maui; montane wet forest. No recent collections.

**Male.** Measurements: Malar space, 6; eye, 120:123:110:70; clypeus, 61×59; frons, 23×26:87; interalveolar, 18:26:50:54, D 20; interocellar, 33:36:20:36, D 14; scape, 44×30; wing length, 4.5 mm (Maui, Haleakala, 5000 ft, BPBM 3509).

**Head.** Malar space short (ratio about 0.4 DMO). Apex of clypeus shallowly emarginate. Upper paraocular area and frons with pits less than 1 pit width apart, crowded and distorted in subpolygonal shapes, and at the middle a patch of long, dark hairs, but no dark rhomboid spot of dense hairs; shiny area between patch and antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view slightly to distinctly concave; strongly arched in lateral view with maximum arch near apex of scape; underside of median edge with a groove; with medium-length, brown, simple hair on the frontal surface. Vertex hair 20-40, dark brown, simple.

**Mesosoma.** Scutum with shallow pits 1-2 pit widths apart (pits less distinct on some bees), ground slightly lustrous; hair long (14-28), simple, brown. Scutellum with pits slightly larger, ground slightly lustrous. Mesepisternum with indistinct pits, about 1 pit width apart, and long, brownish, weakly plumose hair; ground minutely coriaceous, lustrous. Hypoepimeron impunctate, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum strongly sloping, nearly glabrous or with sparse, weak, lineate rugae at base; brow indistinct, smoothly coriaceous and lustrous.

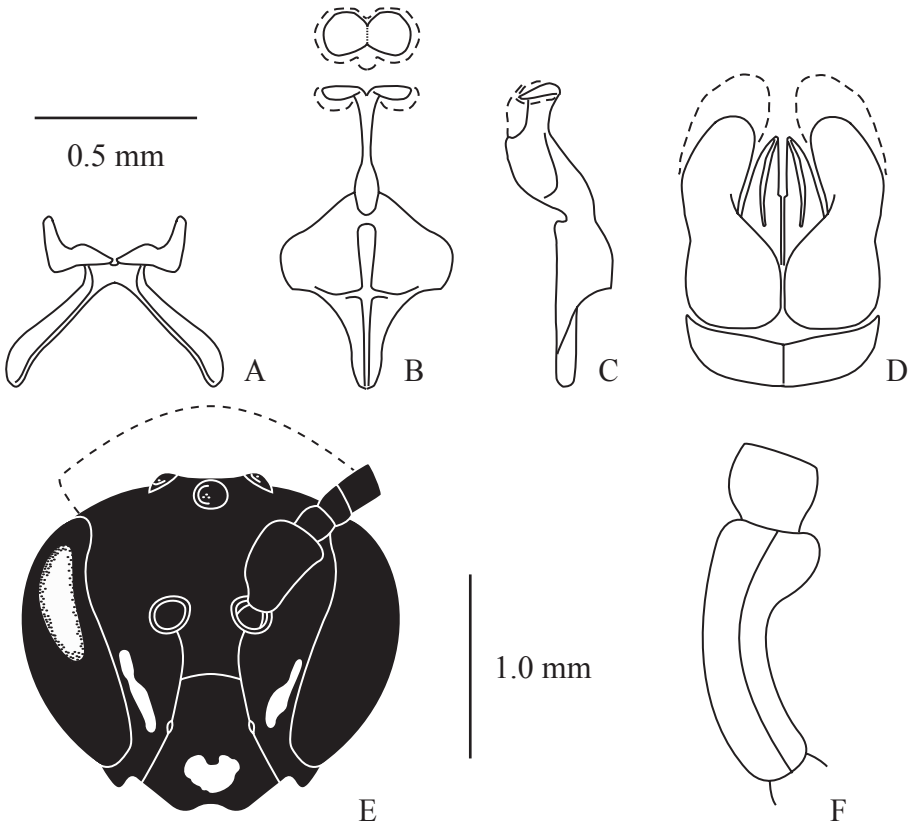


Fig. 44. *Hylaeus melanothrix*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T7 hair medium-length, brown, erect.

**Terminalia.** Lateral process of S7 tapered, with length less than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma dark brown to black; metasoma dark brown. Labrum and mandible blackish brown to black. Face with three separate marks: clypeus with irregular, subapical yellow spot or at least a trace; lower paraocular area with irregular yellow stripe along the eye below antennal socket; supraclypeal area and scape unmarked. Pronotum unmarked. Legs dark brown to black; unmarked except pale area on fore tibia. Wings dark smoky.



**Female. Head.** Malar space long in comparison to relatively small ocellus (ratio about 0.8 DMO). Upper paraocular area and frons convex; upper paraocular area with nearly round pits less than 1 pit width apart, ground lustrous to shiny; frons with pits crowded medially and partly distorted in shape, and at the middle a few, fine, longitudinal carinulae; frontal line distinct above acme; small shiny area just above antennal socket. Apex of clypeus shallowly to deeply emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 20-40, dark brown, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground lustrous; hair medium-length (8-16), mostly simple, brown. Scutellum similar, pits slightly larger. Mesepisternum with distinct pits, about 1-2 pit widths apart, and long, brownish white, weakly plumose hair; ground minutely coriaceous, lustrous. Hypoepimeron impunctate, lustrous, nearly flat. Metanotum dull. Basal area of propodeum strongly sloping, nearly glabrous or with sparse, weak, lineate rugae at base; brow indistinct, smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, but polished and shiny, with sparse, fine, pale, appressed hairs spaced more than a hair length apart. T6 hair long, dark brown, erect.

**Color.** Body and legs black; unmarked. Wings dark brown.

**Perkins' collections. Maui:** Haleakala, 4000 ft (BMNH), 5000 ft (BMNH, BPBM, OUMNH), >5000 ft (BPBM).

**Recent collections.** None.

**Flower records.** None.

**Remarks.** The measured male has the extreme ratio "interocellar distance/diameter of median ocellus" at 2.4, indicating that the lateral ocelli are far apart relative to the diameter of the median ocellus. However, the ratio "ocellus-eye/interocellar distance" at 1.1, indicating the position of the lateral ocelli relative to the eye, is not at all exceptional.

**References.** Perkins, 1910:603 (key); 1913:79 (nest).

***Hylaeus (Nesoprosopis) mimicus* Magnacca and Daly, new species**  
(Fig. 45)

**DIAGNOSIS.** Small bees with slightly smoky wings. Male face with three marks separated by dark margins of clypeus, extended narrowly along eye; scape strongly arched, almost angled, with a groove underneath. Female with long, broad paraocular marks; a triangular clypeal mark; and marks on pronotal collar, lobes, and tegulae. See remarks for similar species.

**Distribution.** Oahu; montane mesic and wet forest.

**Male.** Measurements: Malar space, 3; eye, 102:96:83:57; clypeus, 54×47; frons, 16×26:72; interalveolar, 17:20:44:56, D 15; interocellar, 25:26:19:28, D 13; scape, 35×24; wing length, 3.7 mm (holotype).

**Head.** Malar space short (ratio about 0.2 DMO). Upper paraocular area and frons with slightly distorted pits, very small and nearly contiguous in center; ground minutely wrinkled

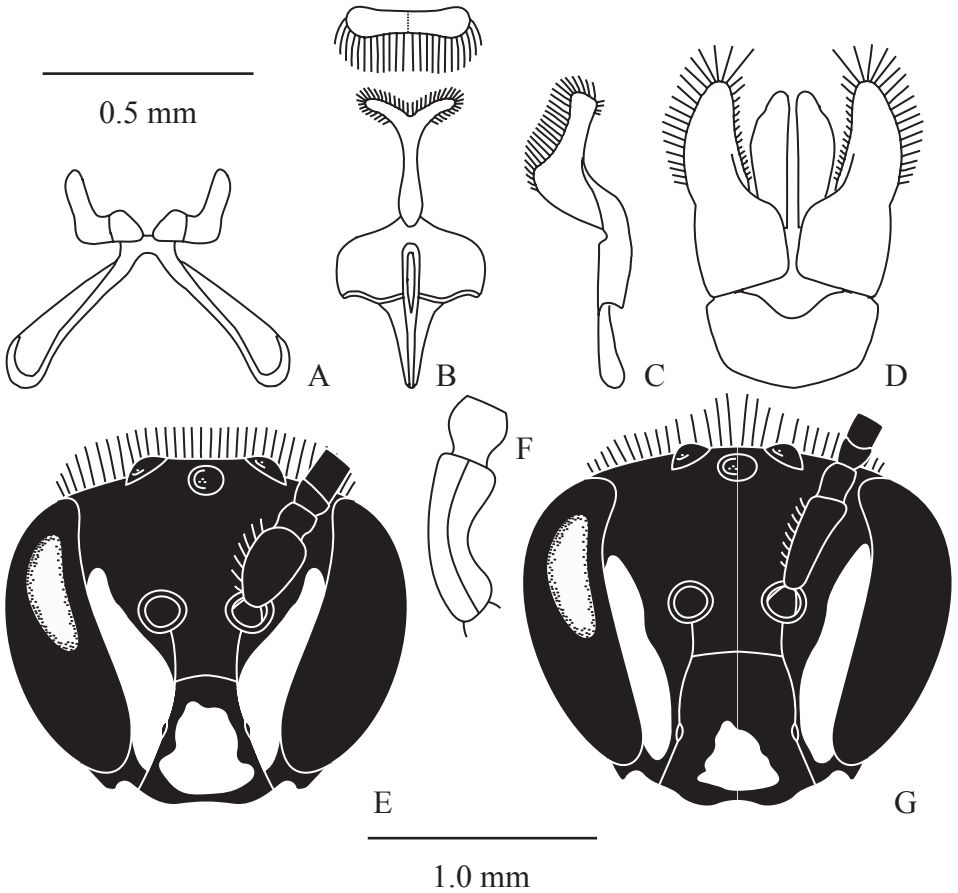


Fig. 45. *Hylaeus mimicus*, new species, male (A-F) and female (G). A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Male face with left scape. F. Male scape, lateral view. G. Female face with left scape. 0.5 mm scale for A-D; 1 mm scale for E and G.

and lustrous in upper paraoocular area, less so on frons; large dark patch between antennae and median ocellus formed by dense punctation and sculpture. Lower paraoocular depression very shallow, indistinct. Frontoclypeal sulcus arched; supraclypeal area much wider than long, W/L ratio 1.2-1.6. Scape in frontal view slightly dilated, ratio about 0.6, greatest width near apex; lateral edge in frontal view slightly concave; strongly arched in lateral view with maximum arch around middle; underside of median edge with a groove; medium-length, pale brown, simple hair along median edge. Vertex hair 16-24, brown, simple.

**Mesosoma.** Scutum with shallow, indistinct pits 2-3 pit widths apart, ground granular, dull; hair medium-length (8-12), pale brown, mostly simple. Scutellum with slightly larger

pits, slightly lustrous. Mesepisternum with round, shallow pits about 1-2 pit widths apart, ground smooth and lustrous, with long, brownish white, plumose hair. Metanotum slightly lustrous. Basal area of propodeum with few very short rugae at base or none, the remainder including the brow smoothly coriaceous, lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced more than a hair length apart. Hair of T7 black, medium-length, erect.

**Terminalia.** Lateral process of S7 parallel-sided, with length greater than width of hemisternite. Median process of S8 moderately dilated, with a distinct flexure, apex bifurcate with rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible dark brown to black. Face with three separate spots: clypeus largely yellow except broad basal and lateral margins; paraocular marks extended narrowly above antennal sockets; supraclypeal area black. Pronotum variable, with or without interrupted transverse stripe on collar and marks on lobes. Legs black except: front tibia with large pale area; all tibiae with yellow spots at bases of tibiae; base of fore basitarsus and apex of femur with yellow marks; mid and hind basitarsi with or without marks of various sizes. Wings slightly smoky.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with slightly distorted polygonal pits, nearly contiguous in center, more separated laterally, up to 1 pit width apart near eye; ground minutely wrinkled, somewhat obscuring pits; slightly lustrous. Middle between median ocellus and acme with an obscure frontal line. Apex of clypeus distinctly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-24, brown, mixed simple and plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with small, shallow pits 2-3 pit widths apart, ground dull; hair medium (8-10), pale brown, simple. Scutellum with slightly larger pits, slightly lustrous. Metanotum dull. Mesepisternum with shallow pits 1-2 pit widths apart, ground smoothly coriaceous, lustrous; with long, yellowish white, plumose hair. Hypoepimeron weakly punctate, nearly flat. Basal area of propodeum, including brow, smoothly coriaceous and lustrous (brow almost shining), with or without a few extremely short rugae at base.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or more. T6 hair long, dark brown, erect.

**Color.** Head and mesosoma black; metasoma dark brown. Face with three separate yellow marks: clypeus with a more or less triangular apical mark, occupying about the middle half laterally and extended back about halfway; paraocular area with a broad stripe, not quite filling in area between clypeus and eye, extended along eye beyond antennal socket. Pronotum with marks on lobes and interrupted transverse collar stripe; tegula with a yellow spot. Legs black except: front tibia with pale area and dorsal yellow stripe, front basitarsus and apex of front femur yellow; mid and hind tibiae with yellow spots at base; mid and hind basitarsi with or without yellow marks. Wings slightly smoky.

**Holotype** ♂ labeled "Oahu, Aiea Trail, 1700', on *Acacia koa*. K. Magnacca, 2 Jun 2000, KM-00-012" (CUIC).

**Allotype** ♀ labeled “Oahu, Aiea Trail, 1900', on *Psychotria mariniana*. K. Magnacca, 14 Aug 2000, KM-00-179” (CUIC).

**Paratypes.** Oahu, Aiea Trail, 1 ♂ 14-VIII-2000, on *Ilex anomala* (KM-00-175); 4 ♂ 14-VIII-2000, on *Psychotria mariniana* (KM-00-179) (CUIC). Aiea Trail, 3 ♂ 14-VIII-2000, on *Scaevola gaudichaudiana* (KM-00-173); Wiliwilinui Trail, 1800', 2 ♂ 1 ♀ 26-VII-1999, on *Scaevola gaudichaudiana* (KM-99-167); Opaepa, 1 ♂ 30-III-1913, O. H. Swezey (BPBM).

**Flower records.** *Acacia*, *Ilex anomala*, *Metrosideros*, *Psychotria mariniana*, *Scaevola gaudichaudiana*.

**Etymology.** The species epithet *mimicus* refers to the close resemblance of this species to *H. filicum* on distant Hawaii.

**Remarks.** This species may be responsible for purported records of *H. filicum* from Oahu, as it is very similar. It can be distinguished by the much shorter hair on the mesonotum and vertex (that of *H. filicum* measures 12-20). It also lacks the unusual bulge at the apex of the scape that causes that of *H. filicum* to be much more strongly arched on the lower surface than the upper. The upper frons of *H. mimicus* appears dark due to close sculpture, but it lacks the conspicuous rhomboid patch of dark hairs found in *H. filicum* and other related species. The amount of yellow on the face of the female is unusual, and similar to that of *H. kokeensis*, which has a yellow median plate in both sexes. It is widely present on leeward ridges of the Koolau Mountains, but appears to be less abundant than *H. connectens* and *H. unicus*, the two species most commonly collected there.

### ***Hylaeus (Nesoprosopis) muranus* (Warncke), new combination**

(Fig. 46)

*Nesoprosopis insignis* Perkins, 1899:110-111 (♂ ♀; Pl. 2, Fig. 24).

*Hylaeus (Nesoprosopis) insignis*, Meade-Waldo, 1923:35 (list).

*Prosopis murana* Warncke, 1970:747 (replacement name for *Nesoprosopis insignis* Perkins, junior homonym of *Hylaeus insignis* Forster)

*Nesoprosopis insignis*, Daly, 1994:117 (lectotype ♂ BMNH 17a 144b; Hawaii, Kau, 4000 ft; wing length, 6.3 mm, tip damaged).

**DIAGNOSIS.** Large bees with dark wings and reticulately rugose propodeum. Male with unique scape extremely dilated, nearly oval (similar to *H. satelles*; see remarks). Female entirely dark, with faint blue reflections on the metasoma.

**Distribution.** Hawaii; montane wet forest.

**Male.** Measurements: Malar space, 10; eye, 172:172:169:108; clypeus, 102×95; frons, 26×40:110; interalveolar, 31:41:69:77, D 27; interocellar, 38:49:28:49, D 20; scape, 61×90; wing length, 7.4 mm (Hawaii, Kilauea, Auto Road, 4000 ft; BPBM 3447).

**Head.** Malar space medium-length (ratio about 0.5 DMO). Upper paraocular area and frons with shallow, round or slightly distorted pits less than 1 pit width apart, pits about the same size and spacing from the sides to near the middle, ground minutely wrinkled, lustrous; middle with a fine frontal line that may be partly obscured by adjacent punctuation and fine longitudinal wrinkles. Lower paraocular depression distinct, extended above antennal socket,

and shiny next to eye. Frontoclypeal sulcus arched. Scape in frontal view extremely dilated, much wider than long, ratio about 1.5; nearly oval in frontal view; frontal surface unevenly convex and uniformly covered with fine pits about 1 pit width apart; strongly arched in lateral view with maximum arch near apex of scape; underside with a broad, shallow pit; with medium-length, yellowish white, mostly simple hair. Vertex hair 20-30 or more, white, simple.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground slightly lustrous; hair long (10-22), yellowish white, mostly simple. Mesepisternum with distinct, round pits about 1 pit width apart, and long, yellowish white, weakly plumose hair; ground smooth, slightly lustrous. Hypoepimeron punctured, smooth, slightly lustrous; swollen. Metanotum dull. Basal area of propodeum reticulately rugose over entire anterior area and brow, areolae rather large, ground shiny.

**Metasoma.** Disk of T2 with indistinct, minute, shallow punctation 1-2 pit widths apart, somewhat obscured by smoothly coriaceous, lustrous ground; fine, pale, appressed hair. T7 hair long, dark brown, prostrate.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 strongly dilated, dilation membranous, and apex bifurcate with broad tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma black, metasoma dark brown. Labrum and mandible blackish brown to black. Face with or without single small mark: clypeus variable, a short triangle, a ragged yellow streak, or no marks; paraocular area and supraclypeal area unmarked; scape unmarked. Pronotum unmarked. Legs reddish brown to black except fore tibia and femur with obscure pale areas. Wings dark brown.

**Female. Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area and frons with shallow, round or slightly distorted pits less than 1 pit width apart, pits about the same size and spacing from the sides to near the middle, ground minutely wrinkled, lustrous; middle with a fine frontal line that may be partly obscured by adjacent punctation and fine longitudinal wrinkles. Apex of clypeus very shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-30, white, simple.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground slightly lustrous; hair long (12-20), white, simple. Mesepisternum with distinct, round pits about 1 pit width apart, and yellowish white, mostly simple hair; ground smooth, slightly lustrous. Hypoepimeron punctured, smooth, slightly lustrous; swollen. Metanotum dull. Basal area of propodeum reticulate rugose over entire anterior area and brow (rugae weaker than in male), areolae rather large, ground shiny.

**Metasoma.** Disk of T2 with shallow, indistinct punctation about 1 pit width apart, somewhat obscured by smoothly coriaceous and lustrous surface; fine, pale, appressed hair, somewhat denser along apical margin in a faint fascia; tergum 1 with faint apical band of appressed pale hair. T6 hair long, black, erect.

**Color.** Body and legs dark brown to black except fore tibia with obscure pale area, metasoma with faint metallic blue reflection. Wings dark brown.

**Perkins' collections. Hawaii:** Kau, 4000 ft (BMNH); Kilauea (BPBM).

**Recent collections. Hawaii:** Volcano, Old Japanese Schoolhouse, 3750 ft; Puu Puai, 3700 ft.

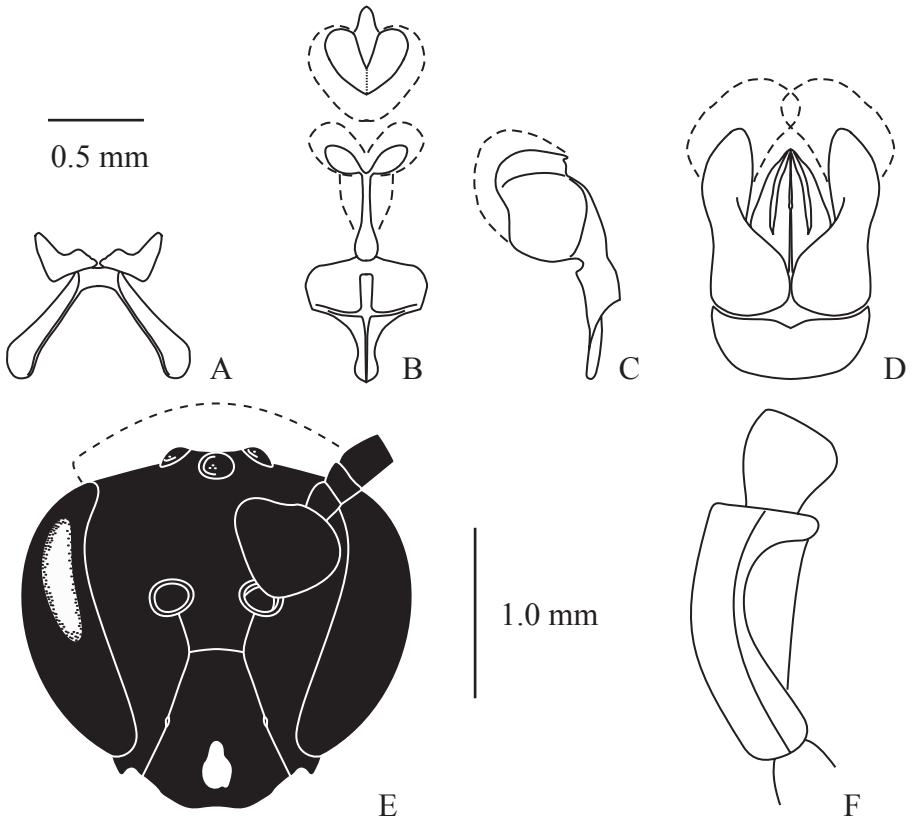


Fig. 46. *Hylaeus muranus*, new combination, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Flower records.** *Cheirodendron*, *Metrosideros*.

**Remarks.** *Hylaeus muranus*, from Hawaii, and *H. satelles*, from Maui Nui, are sister taxa and differ in several morphological details. Both are members of the group with dark wings, the metasomal terga finely punctured, and relatively large body size (forewing length: *H. muranus*, ♂ 6.2-7.4 mm,  $n = 3$ ; ♀ 7.1-7.8 mm,  $n = 11$ ; *H. satelles*, ♂ 6.2-6.9 mm,  $n = 3$ ; ♀ 6.9-7.7 mm,  $n = 4$ ). Males of the two species have in common a distinct lower paraocular depression that is shiny along the eye; unmarked legs; a slender, reddish brown metasoma; and the scape strongly dilated. *Hylaeus satelles* has the scape slightly less dilated and circular in profile compared to the much wider and oval profile of the scape of *H. muranus*. The scape of *H. muranus* is the most extreme dilation seen among species in the Islands. In both sexes of *H. satelles*, the propodeum is sparsely sculptured with linear

rugae at the base, if at all, whereas *H. muranus* is reticulately rugose over most of the basal area of the propodeum. Based on old specimens, the female of *H. satelles* has reddish yellow facial marks and light brownish pubescence on the mesosoma. The female of *H. muranus* has the face black and with pale, whitish pubescence. It also has faint bluish reflections on the metasoma and is somewhat less robust than *H. satelles*. Both sexes of *H. muranus* have the upper paraocular area and frons with shallow round pits about 1 pit width apart or less, whereas *H. satelles* has smaller, distorted, denser pits less than 1 pit width apart.

**References.** Perkins, 1907b:97 (record: Hawaii, Kilauea); 1910:604 (key); 1913:82 (biogeography).

### *Hylaeus (Nesoprosopis) mutatus* (Perkins)

(Fig. 47)

*Nesoprosopis mutata* Perkins, 1899:93 (♂ ♀).

*Hylaeus (Nesoprosopis) mutatus*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis mutata*, Daly, 1994:118 (lectotype ♂ BMNH 17a 164; Kauai, Waimea, 2000+ ft).

**DIAGNOSIS.** Small bees with very short malar spaces and clear to slightly smoky wings. Male face with two or three separate marks; process of S8 undilated and with apex simple, gonoforceps subequal to penis valves. Female face with narrow linear yellow stripes at each side along eye margin up to the level of the antennal sockets; pronotum sometimes with large yellow marks on lobes and stripe at each side on collar. The female is similar to *H. kauaiensis* and *H. specularis*; it differs from the former in the length of the scutum hair and propodeal sculpture, and from the latter in the punctuation of the frons. *Hylaeus mutatus* also may have the pronotal lobes marked, which *H. kauaiensis* never does. The single female *H. specularis* from Kauai has the lobes unmarked, but females from Hawaii have such marks.

**Distribution.** Kauai; mesic to wet forest.

**Male.** Measurements: Malar space, 3; eye, 110:92:88:57; clypeus, 53×49; frons, 18×24:73; interalveolar, 20:16:45:51, D 18; interocellar, 24:27:20:31, D 14; scape, 35×20; wing length, 3.6 mm (*H. mutatus* lectotype).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons uniform to the middle with indistinct, round pits about 1 pit width or less apart, and with minutely wrinkled ground partly obscuring pits, slightly lustrous; faint or no frontal line; small impunctate area above antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus slightly or not arched. Scape in frontal view variable, weakly to moderately dilated, width more than half length, ratio about 0.5-0.7; lateral edge in frontal view straight; moderately arched in lateral view with maximum arch near the middle of the scape (contrary to key of Perkins 1910:602); no groove on underside; with medium-length, yellowish white, simple hair. Vertex hair 12-20, yellowish white to pale brown, weakly plumose.

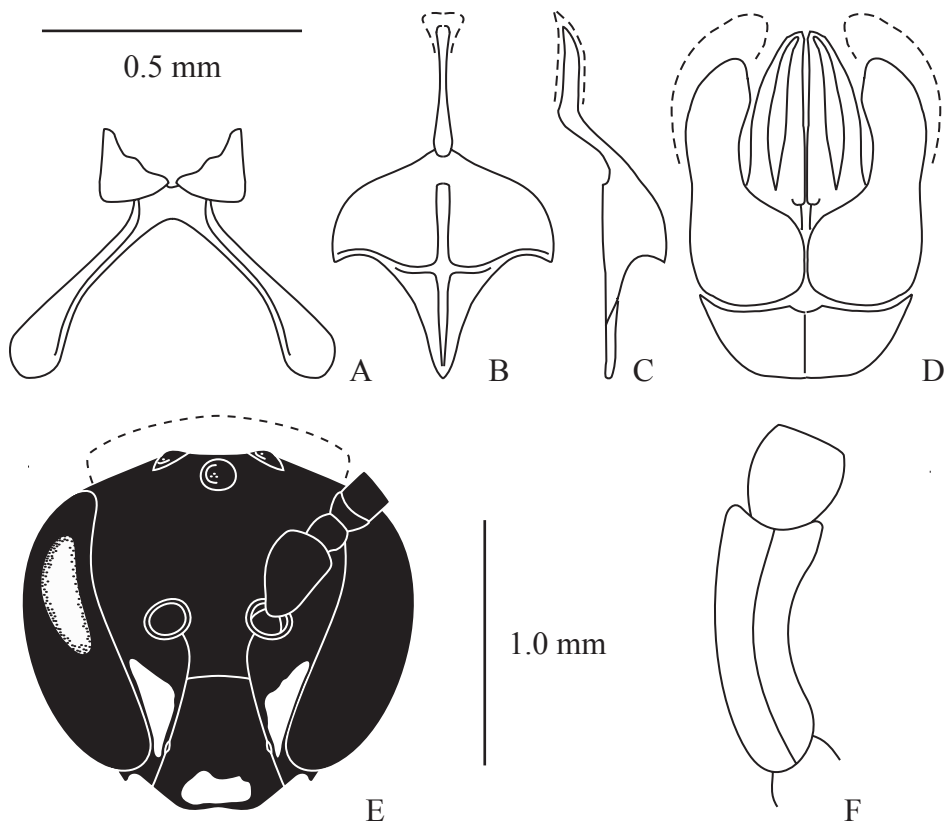


Fig. 47. *Hylaeus mutatus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Mesosoma.** Scutum with minute pits 2-3 pit widths apart, ground minutely coriaceous, slightly lustrous; hair short (4-8), yellowish white to pale brown, simple. Metanotum dull to smooth and lustrous. Mesepisternum with distinct, fine, round pits about 2 pit widths apart, and yellowish white, plumose hair; ground smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Basal area of propodeum with weak, short rugae at front, spaced 3-4 rugae apart, otherwise smooth and lustrous to brow.

**Metasoma.** T2 impunctate; smoothly coriaceous, shiny, with fine, pale, appressed hairs spaced a hair length apart. T7 hair long, dark brown to black, erect.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 not or very weakly dilated at base, slightly obtusely angled at midlength, apex simple and with short pubescence. Apices of gonoforceps equal or shorter than penis valves.



**Color.** Labrum and mandible black. Head and mesosoma black; metasoma black to dark brown. Face with 2 or 3 separate marks: clypeus variable, entirely black or with an irregular small subapical spot or with very small subapical spots; lower paraocular areas with triangular marks almost reaching to antennal sockets or shorter. Pronotum unmarked or with very small yellow spot at apex of lobes. Legs black to dark brown, unmarked except fore tibia with pale area. Wings clear to slightly smoky.

**Female. Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons uniform to the middle with round pits about 1 pit width apart and with minutely wrinkled ground, slightly lustrous; faint frontal line; small impunctate area above antennal sockets. Apex of clypeus slightly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 10-16, white, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with minute pits about 2 pit widths apart, ground minutely coriaceous, slightly lustrous; hair short (2-6), white, simple. Mesepisternum with fine round pits about 2 pit widths apart, and yellowish white, plumose hair; ground smooth, lustrous. Hypoepimeron impunctate, smooth, lustrous, not swollen. Metanotum dull. Basal area of propodeum with weak, short rugae at front, spaced 3-4 rugae apart, otherwise smooth and lustrous to brow.

**Metasoma.** Disk of T2 impunctate; smoothly coriaceous, shiny, with fine, short, pale, appressed hairs spaced more than a hair length apart. T6 hair long, dark brown, erect.

**Color.** Labrum and mandible black. Face with narrow linear yellow stripes at each side of lower paraocular areas, extended along eye margin from the level of the antennal sockets to between half and all the way to bottom of eye. Pronotum with or without large yellow mark on lobes and with a stripe at each side on collar. Head and mesosoma black; metasoma black. Legs black, unmarked except fore tibia with pale area. Wings clear.

**Perkins' collections. Kauai:** Waimea, 2000 ft (BMNH).

**Recent collections. Kauai:** Awaawapuhi Trail, 3400 ft; Kahuamaa Flat, 3800 ft; Makaha Rd., 3500 ft; Kuia Valley, 2400 ft; Paaiki Valley, 2700 ft.

**Flower records.** *Antidesma platyphyllum*, *Chamaesyce atrococca*, *Claoxylon*, *Styphelia*.

**Remarks.** Perkins, in his key (1910:602), placed *H. mutatus* with species having the scape flat; however, it is distinctly arched.

**References.** Perkins, 1910:602 (key).

***Hylaeus (Nesoprosopis) nalo* Magnacca and Daly, new species**  
(Fig. 48)

**DIAGNOSIS.** Moderately large bees with slightly smoky wings. Head rather large compared to wing length, with deep paraocular depressions. Median process of S8 very weakly dilated, not swollen; hemisternite of S7 narrow, distinctly longer than wide; apices of gonoforceps shorter than penis valves, broadly rounded. Female unknown.

**Distribution.** Oahu; habitat unknown. Known from only one collection.

**Male.** Measurements: Malar space, 8; eye, 156:128:124:88; clypeus, 76×78; frons, 26×30:96; interalveolar, 16:32:56:68, D 22; interocellar, 32:28:26:32, D 18; scape, 52×34; wing length, 5.1 mm (holotype).

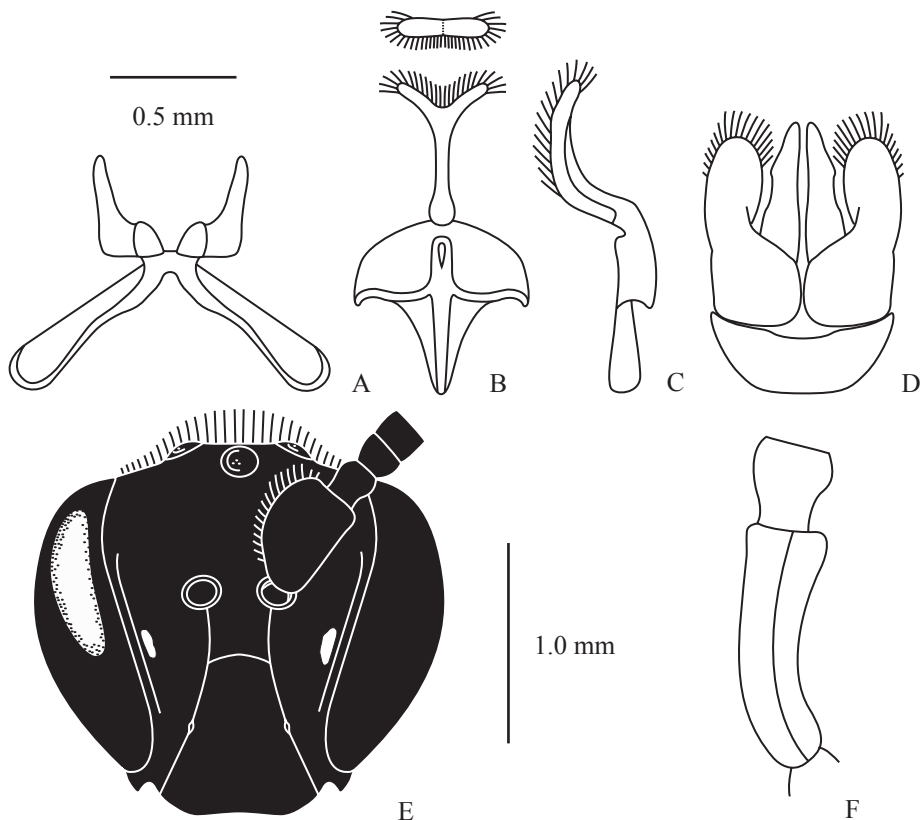


Fig. 48. *Hylaeus nalo*, new species, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E.

**Head.** Malar space medium (ratio 0.5 DMO). Upper paraocular area with deep, distinct pits less than 1 pit width apart, smaller and denser on the frons, somewhat distorted near middle; ground lustrous. Lower paraocular depression deep, distinct in frontal view; deepest near eye. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately dilated, width more than half length, ratio about 0.6; lateral edge in frontal view slightly concave, slightly arched in lateral view; no groove on underside; with medium-length, reddish brown hair. Vertex hair 14-20, pale brown, plumose.

**Mesosoma.** Scutum with distinct but shallow pits 1-2 pit widths apart, ground minutely coriaceous, slightly lustrous; hair medium-length to long (12-18), even (varying over area, rather than hairs of different lengths mixed together), golden brown, densely plumose. Scutellum of holotype missing. Mesepisternum with shallow but distinct pits about 1 pit

width apart or less, and long, brown, plumose hair; ground minutely granular, slightly lustrous. Hypoepimeron shallowly punctate, lustrous; slightly swollen. Metanotum dull. Basal area of propodeum with irregular, widely spaced rugae, smooth coriaceous and shiny in between; granular with close reticular rugae below brow.

**Metasoma.** Disk of T2 with faintly visible pits and fine, golden, short hairs a hair length apart or less. T7 hair short, brown, prostrate.

**Terminalia.** Lateral process of S7 L-shaped, length distinctly greater than width of hemisternite. Median process of S8 very weakly dilated, arched, apex bifurcate with long, straplike tips. Apices of gonoforceps slightly shorter than penis valves, rounded.

**Color.** Head and mesosoma black; metasoma dark reddish brown to black. Labrum and mandible black. Face of type with small, obscure, yellowish brown marks laterad of subantennal sulci; probably distinct yellow paraocular marks may be present or absent. Scape unmarked; prothorax unmarked. Legs dark brown to black, unmarked except pale area on fore tibia. Wings slightly smoky.

**Female.** Unknown.

**Holotype** ♂ labeled "Oahu, Mar. 1914. J. F. Illingworth, collector." (BPBM).

**Flower records.** None.

**Etymology.** The species epithet *nalo* is the Hawaiian word meaning lost or forgotten, referring to the species having languished unrecognized for decades and to the continuing lack of knowledge of its collection site and habitat. *Nalo* is also the Hawaiian word for a wasp or fly; a honey bee is *meli nalo*.

**Remarks.** The lack of any other species with deep paraocular depressions on Oahu should make this species immediately identifiable. That together with the weakly dilated S8 and poorly developed facial marks suggest that it may be related to *H. takumiae*. Unfortunately the type label gives no specific locality. It most likely inhabits montane areas, but the paraocular depressions, shape of S8, and dark but prostrate T7 hair could indicate a relationship with the coastal *H. psammobius*.

### *Hylaeus (Nesoprosopis) niloticus* (Warncke), new combination

(Fig. 49)

*Nesoprosopis obscurata* Perkins, 1899:99 (♂ ♀).

*Hylaeus (Nesoprosopis) obscuratus*, Meade-Waldo, 1923:34 (list).

*Prosopis nilotica* Warncke, 1970:748 (replacement name for *Nesoprosopis obscurata* Perkins, junior homonym of *Prosopis obscurata* Schenck)

*Nesoprosopis obscurata*, Daly, 1994:118 (lectotype ♂ BMNH 17a 151a; Hawaii, Kona; wing length, 4.8 mm, tip damaged).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings. Male scape weakly dilated and moderately arched; face with one large mark extended at the sides well above antennal sockets as a narrow stripe next to eye, and with supraclypeal area partly yellow or entirely black. Female black and unmarked.

**Distribution.** Hawaii, Lanai, and Molokai; coast and dry lowlands. No recent collections.

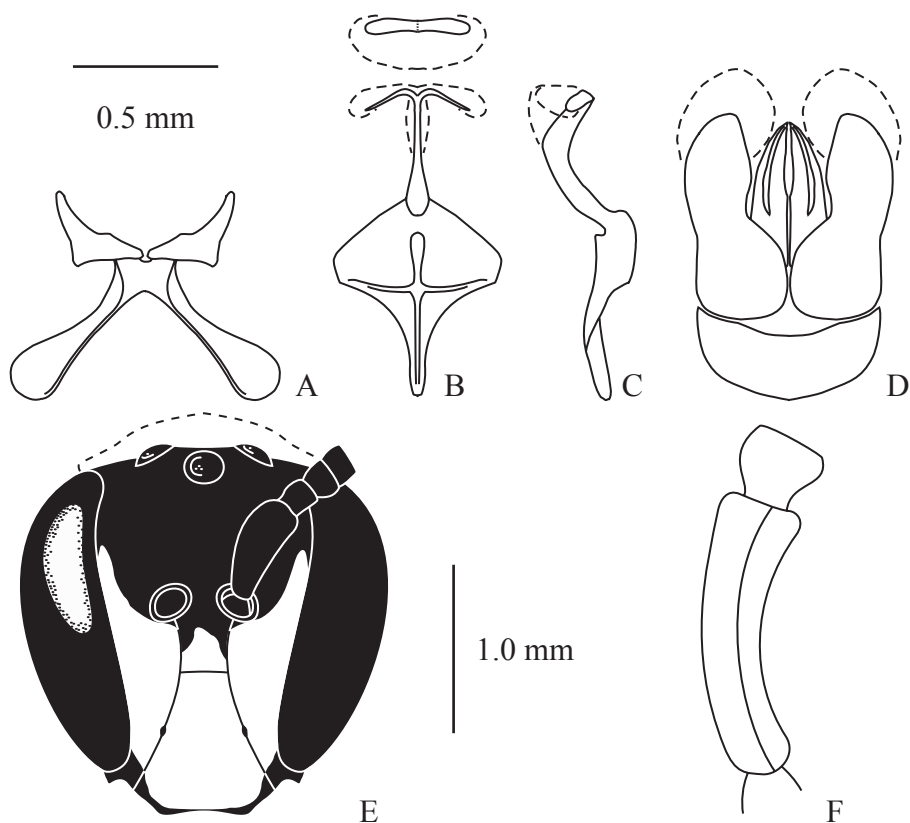


Fig. 49. *Hylaeus niloticus*, new combination, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Male.** Measurements: Malar space, 7; eye, 161:120:110:79; clypeus, 79×72; frons, 26×26:102; interalveolar, 15:27:59:69, D 20; interocellar, 36:27:26:31, D 18; scape, 56×24; wing length, 5.0 mm (Molokai, Mts., BPBM 3521).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with round pits about 1 pit width apart; frons with pits closer medially and smaller; ground smooth and lustrous; at middle pits much smaller, contiguous, distorted and separated by a few linear wrinkles, dull; no frontal line evident; very small impunctate area above antennal sockets. Lower paraocular depression very shallow. Frontoclypeal sulcus straight or nearly so. Scape in frontal view weakly dilated, greatest width near apex, width half or less length, ratio about 0.4; lateral edge in frontal view nearly straight; moderately arched in lateral view with maximum arch near middle of scape; with short, yellowish white, mostly simple hair. Vertex hair 10-16, brownish white, weakly plumose.

**Mesosoma.** Scutum with pits about 1 pit width apart, ground smooth, lustrous; hair medium-length (6-14), yellowish white, weakly plumose. Mesepisternum with indistinct, shallow, round pits about 1 pit width apart, and medium-length, yellowish white, plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Metanotum dull to slightly lustrous. Basal area of propodeum with widely spaced, lineate rugae to brow, shiny between rugae; brow weakly rugose, ground nearly smooth, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with medium-length to short, fine, pale, appressed hairs spaced less than a hair length apart. T7 hairs short, golden, appressed.

**Terminalia.** Lateral process of S7 tapered, pale, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with long, narrow, apically rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with one large mark with sulci and tentorial pits black: clypeus and paraocular area entirely yellow, extended at the sides to well above antennal sockets as a narrow stripe next to eye; supraclypeal area partly yellow or entirely black; scape unmarked. Pronotum unmarked. Legs brown to black except: fore tibia with pale area, with or without a small, basal yellow spot; fore basitarsus yellowish to brown; mid and hind leg unmarked. Wings clear to slightly smoky.

**Female. Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area with round pits about 1 pit width apart; frons with pits closer medially and smaller; ground smooth and lustrous; at middle pits much smaller, contiguous, but still nearly round, lustrous; faint frontal line evident; no impunctate area above antennal sockets. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-10(-16), yellowish white, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with pits about 1 pit width apart, ground smooth, lustrous; hair short (4-6), white, simple. Mesepisternum with indistinct, shallow, round pits about 1 pit width apart, and short, yellowish white, plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous; slightly swollen. Metanotum dull to slightly lustrous. Basal area of propodeum with irregular lineate rugae to brow, spaced 2-4 rugae apart, surface shiny between rugae; brow weakly rugose, ground nearly smooth, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with short, fine, pale, appressed hairs spaced about one hair length apart. T6 hair long, golden, appressed.

**Color.** Head and mesosoma black; legs and metasoma dark brown; unmarked. Wings smoky.

**Perkins' collections. Hawaii:** Kona (BMNH, OUMNH), coast (BPBM). **Molokai:** Molokai Mts. (BMNH, BPBM), 2000 ft (BPBM).

**Recent collections.** None.

**Flower records.** None.

**Remarks.** Colors of integument and pubescence are based on old specimens. The new name *Prosopis nilotica* was proposed by Warncke (1970), who considered *Prosopis* to be

the correct name of the genus; his reason for naming a Hawaiian species “nilotica” (i.e., of the Nile) is unclear. Warncke also proposed the new name *P. murana* for *H. insignis* (both are homonyms of names that Meade-Waldo [1923] considered synonyms of other species), as well as unwarranted names for *H. laticeps*, *H. nivalis*, and *H. vicinus*, homonyms already corrected by Meade-Waldo (1923). See remarks for *H. assimulans*.

**References.** Perkins, 1910:602 (key); 1911:727 (Blackburn had series of mixed species). Fullaway, 1918:396 (record: Hawaii, Kawaihae, Kilauea). Suehiro, 1986:41, 60 (record: Hawaii, Kona).

### *Hylaeus (Nesoprosopis) nivicola* Meade-Waldo

(Fig. 50)

*Nesoprosopis nivalis* Perkins, 1899:83-84 (♂ ♀; Pl. 2, Fig. 13; flower: *Styphelia*).

*Hylaeus (Nesoprosopis) nivicola* Meade-Waldo, 1923:34 (list; replacement name for

*Nesoprosopis nivalis* Perkins, a junior homonym of *Hylaeus nivalis* Morawitz).

*Prosopis farinosa* Warncke, 1970:748 (unwarranted replacement name for *Nesoprosopis nivalis* Perkins) (new synonymy)

*Nesoprosopis nivalis*, Daly, 1994:118 (lectotype ♂ BMNH 17a 136a; Maui, Haleakala, 9000 ft; wing length, 5.0 mm).

**DIAGNOSIS.** Medium-sized bees with wings clear to slightly smoky and with unique extremely long malar spaces. Male with unique ridge just below antennal sockets; face with clypeus and supraclypeal area yellow and with small yellow marks in adjacent paraocular areas. Female black and unmarked. See remarks.

**Distribution.** Maui; occurring only around Haleakala crater, common in alpine and subalpine dry shrubland down to 6000 ft.

**Male.** Measurements: Malar space, 18; eye, 138:128:108:87; clypeus, 72×69; frons, 28×26:102; interalveolar, 14:26:59:69, D 23; interocellar, 31:36:27:36, D 15; scape, 46×34; wing length, 4.9 mm (Maui, Haleakala, 9000 ft, BPBM 3520).

**Head.** Malar space extremely long (ratio about 1.2 DMO). Upper paraocular area with fine pits less than 1 pit width apart, crowded into subpolygonal shapes and more or less aligned in concentric rows separated by minute wrinkles, slightly lustrous; below punctured area and along the eye are dense, minute, parallel wrinkles; frons dull, with pits smaller and denser along middle; fine frontal line may be evident, with a minute, central, elliptical hole in some bees; median, impunctate, slightly lustrous area above antennal sockets. Lower paraocular depression distinct, deep along eye, with dense, minute, parallel wrinkles and bordered by an elevated, rounded ridge beneath antennal socket. Frontoclypeal sulcus arched. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view distinctly rounded (convex); moderately arched in lateral view with maximum arch near middle or slightly toward apex of scape; no groove on underside; with long, yellowish white, simple hair. Vertex hair 20-30 or more, pale brown, simple.

**Mesosoma.** Scutum with fine pits about 1 pit width apart, ground minutely wrinkled, dull to slightly lustrous; hair long (14-30), yellowish white to pale brown, plumose. Mesepisternum with long, white, plumose hair; pits variable, indistinct or relatively distinct,

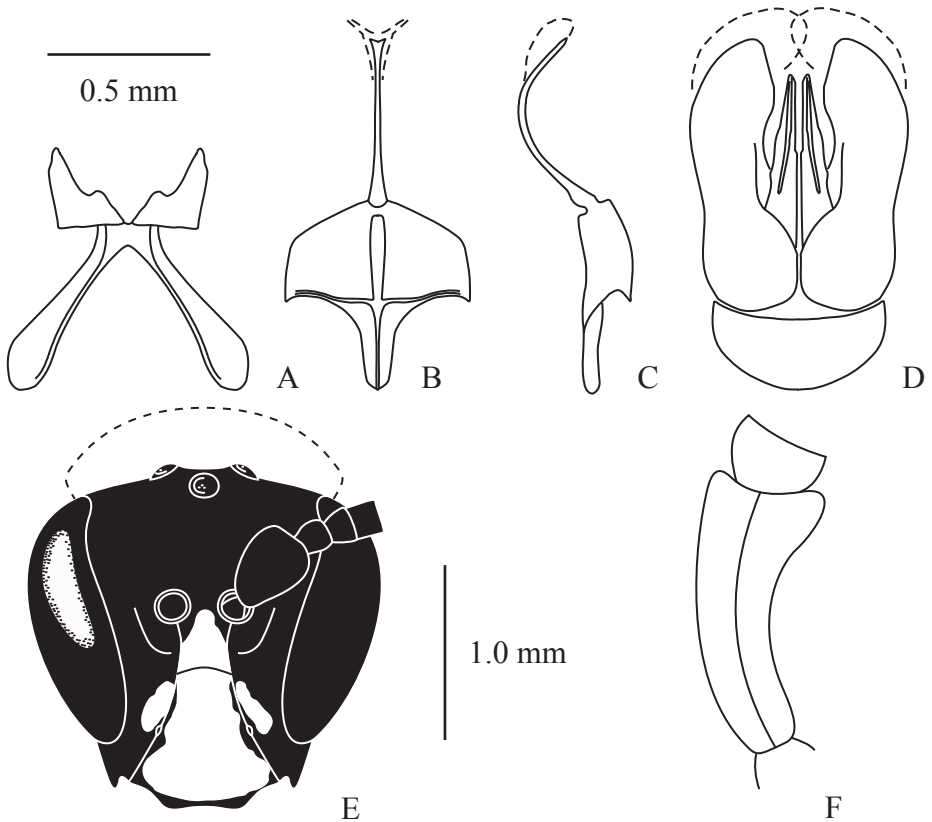


Fig. 50. *Hylaeus nivicola*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

round, shallow, 1 pit width apart or less; ground variable, minutely roughened, wrinkled or striate, dull to slightly lustrous. Hypoepimeron impunctate, smooth to striate. Metanotum dull. Basal area of propodeum lineately rugose at the front, shiny between rugae, becoming reticulate near brow; brow granularly coriaceous, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous to shiny, with very fine, short, pale hair more than a hair length apart. T7 hair medium-length, golden, appressed.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 linear and with apex simple or nearly so, not distinctly bifurcate. Apices of gonoforceps longer than penis valves, but not pointed or strongly curved inward.

**Color.** Body black. Labrum and mandible blackish brown to black. Face with clypeus and supraclypeal area entirely yellow or nearly so; lower paraocular area variable, stripe of

yellow below antennal socket and along sulcus (at least partly separated from clypeal mark by narrow black line) or area unmarked; scape unmarked. Pronotum unmarked. Fore leg dark brown to black except tibia with pale area and basal yellow spot. Mid leg dark brown to black except tibia unmarked or with obscure or distinct small yellow spot at very base, basitarsus variable, with or without some yellow marking. Hind leg dark brown to black except tibia with yellow stripe in basal third to half, basitarsus with yellow marking on basal half or more. Wings clear to slightly smoky.

**Female. Head.** Malar space extremely long (ratio about 1.1 DMO). Upper paraocular area and frons with fine pits less than 1 pit width apart, crowded into subpolygonal shapes and more or less aligned in concentric rows separated by minute wrinkles; fine frontal line in some bees. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-24, pale brown, simple.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with pits 1-2 pit widths apart, ground slightly lustrous; hair long (12-30), pale brown, plumose. Scutellum of some bees with pits more than 2 pit widths apart. Mesepisternum with pits relatively distinct compared to male, round, shallow, 1 pit width apart or less, with long, white, plumose hair; ground variable, minutely wrinkled or striate, dull to slightly lustrous. Hypoepimeron impunctate, smooth to striate. Metanotum dull. Basal area of propodeum lineately rugose at front, often long, parallel rugae, spaced close together in some specimens, shiny between rugae, becoming weaker and reticulate near or beyond brow; brow granularly coriaceous, slightly lustrous to dull.

**Metasoma.** Disk of T2 impunctate, lustrous to polished, with bare areas or extremely short, very fine, appressed hair. T6 hair medium-length, pale brown, appressed.

**Color.** Body and legs black; unmarked. Wings clear.

**Perkins' collections. Maui:** Haleakala, 6000 ft (BMNH, BPBM), >6000 ft (BPBM), 7000 ft (BPBM), 7-10,000 ft (BPBM), 9000 ft (BMNH, BPBM), 9 to 10,000 ft (BMNH), crater, 8000 ft (OUMNH).

**Recent collections. Maui:** Haleakala Science City, 3010 m; near White Hill, 2860 m; Kalahaku, 2835 m; Kalepeamo, 2835 m; Kuiki, 2170 m; Lelewi, 2710 m; Haleakala N. P. Service Area, 2073 m; Laie flats, 2060 m; Lauulu Tr., 2015 m; near Kapalaoa Cabin, 2195 m; Sliding Sands Tr., 9000 ft; Halemau Tr., 7800 ft; Puu Keokea, 7100 ft; Koolau Forest Reserve, 2158 m.

**Flower records.** *Argyroxiphium sandwicense*, *Coprosma montana*, *Dodonaea*, *Dubautia menziesii*, *Geranium cuneatum*, *Oenothera* sp., *Sophora*, *Styphelia*.

**Remarks.** *Hylaeus nivicola*, from the high slopes and crater of Maui's Haleakala Volcano, and *H. volcanicus*, from Hawaii and Maui, are sister taxa. They are sympatric in the crater of Haleakala. Both sexes have in common malar spaces longer than those of the allied *H. laetus* and *H. difficilis* (see also remarks for *H. difficilis*); and both have the similar lineately rugose anterior area of the propodeum. Males have in common the depressed paraocular area and similar facial marks with conspicuous black tentorial pits (paraocular area less depressed and tentorial pits inconspicuous in the allied *H. laetus* and *H. difficilis*). Males of *H. nivicola* are distinguished by the much longer malar space (the longest of any species in the Islands), rounded ridge beneath the antennal socket (absent in *H. volcanicus*), more strongly dilated scape with convex lateral margin in frontal view (only slightly dilated and



with the margin slightly concave in *H. volcanicus*), and the simple apex of the median process of S8 (bifurcate with long filamentous tips in *H. volcanicus*). Females of *H. nivicola* have a longer malar space, more densely punctured frons with subpolygonal pits, and reddish yellow hair at the tip of the metasoma (malar space shorter; frons with mostly round pits; pale, yellowish hair at the apex of the metasoma in *H. volcanicus*).

**References.** Perkins, 1910:601 (key); 1913:80 (flower: *Styphelia*, referred to as *Cyathodes*). Swezey, 1936:139 (flower: silversword; record: Maui, Haleakala Crater). Beardsley, 1980:40 (record: Maui, Haleakala).

### *Hylaeus (Nesoprosopis) ombrias* (Perkins)

(Fig. 51)

*Nesoprosopis ombrias* Perkins, 1910:604-605 (♂ ♀; key).

*Hylaeus (Nesoprosopis) ombrias*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis ombrias*, Daly, 1994:118 (lectotype ♂ BPBM; Hawaii, S. Kona, 3000 ft; wing length, 6.4 mm).

**DIAGNOSIS.** Large bees with dark smoky wings and terga without punctuation (unusual for bees of this size). Male with unusual scape, slightly dilated, widest near the middle and smaller at both ends, and with short, plumose hair along the median edge; face with two or three separate yellow marks (in paraocular areas and with or without a mark on the clypeus, no supraclypeal mark), otherwise body and legs black and unmarked; distinguished from the smaller, less melanic, sister species, *H. assimulans*, by reduced facial marks (none on supraclypeal area, sometimes none on clypeus), lineate to reticulate rugosity often to brow of propodeum, and darker wings. Female black and unmarked, upper frons granular.

**Distribution.** Hawaii; coast and montane dry shrubland and forest.

**Male.** Measurements: Malar space, 5; eye, 169:137:128:92; clypeus, 84×84; frons, 28×31:109; interalveolar, 18:31:61:72, D 26; interocellar, 36:36:23:38, D 18; scape, 61×29; wing length, 6.3 mm (Hawaii, S. Kona, 3000 ft, BPBM 3525).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with round pits less than 1 pit width apart; ground minutely wrinkled, dull; a small, dark, median area of smaller, much denser pits; shiny area below dark spot and above antennal sockets. Lower paraocular depression very shallow. Frontoclypeal sulcus straight to slightly arched. Scape in frontal view slightly dilated and widest at middle, width half length, ratio about 0.5; lateral edge in frontal view nearly straight; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with short, brownish white, plumose hair. Vertex hair 10-18, brown, plumose.

**Mesosoma.** Scutum with shallow, indistinct pits 1-2 pit widths apart, ground lustrous; hair medium-length (8-12), yellowish white, plumose. Scutellum with pits distinct and larger, ground lustrous. Mesepisternum with barely discernible to indistinct pits, about 1 pit width apart, and medium-length, yellowish white, plumose hair; ground minutely coriaceous, slightly dull. Hypoepimeron impunctate, slightly lustrous, slightly swollen.

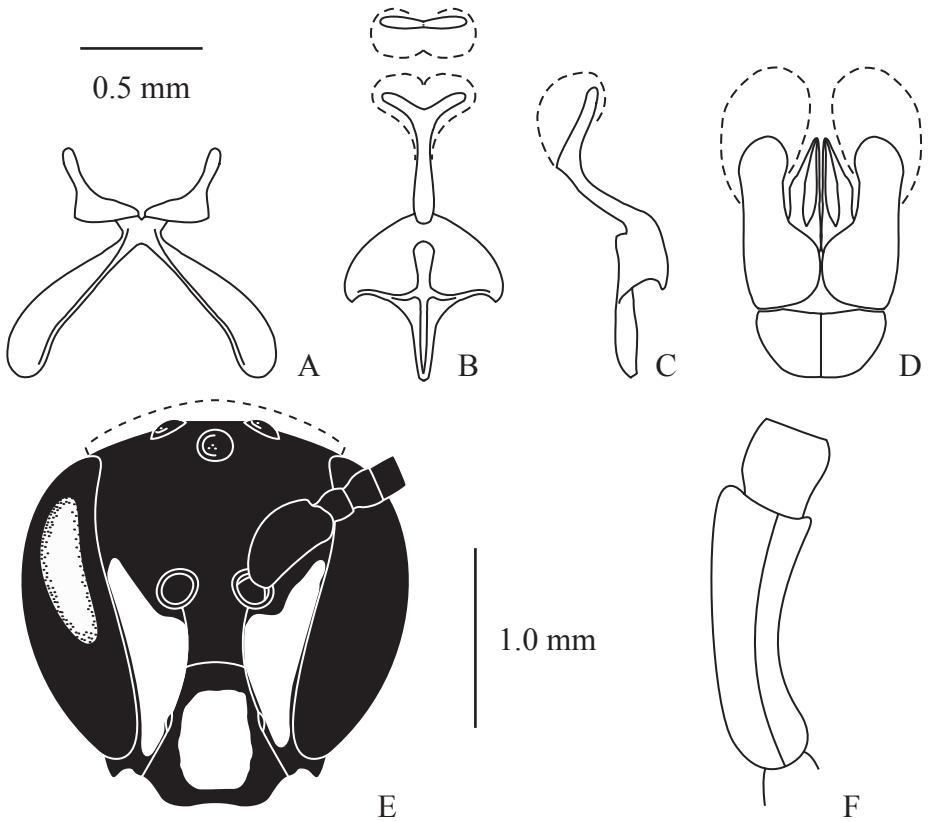


Fig. 51. *Hylaeus ombrias*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

Metanotum reticulately rugose, slightly lustrous. Basal area of propodeum with larger lineate and smaller reticulate rugae to brow; brow granularly coriaceous and slightly lustrous.

**Metasoma.** Disk of T2 impunctate (unusual for bee of this large size), smoothly coriaceous, and lustrous; fine, pale, appressed hairs spaced about one hair length apart. T7 hair medium-length, golden, appressed.

**Terminalia.** Lateral process of S7 tapered, length greater than width of hemisternite. Median process of S8 weakly dilated at flexure with a slight peak, apex bifurcate with narrow straplike tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma black; metasoma dark brown. Labrum and mandible blackish brown to black. Face with two or three separate marks: clypeus with or without a yellow mark, supraclypeal area unmarked; lower paraocular area with semi-triangular yellow mark

along the eye up to or above level of antennal socket; scape unmarked. Pronotum unmarked. Legs dark brown to black; unmarked except fore tibia with pale area. Wings dark smoky.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with distinct, round pits about 1 pit width or more apart, ground minutely wrinkled along eye, face slightly dull; frons with similar pits round and uncrowded, slightly smaller medially and with ground minutely wrinkled; at middle, pits may or may not be obscured by minutely wrinkled ground parallel to midline; frontal line distinct. Apex of clypeus distinctly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-10 (up to 20 in some montane specimens), brown, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with poorly defined minute pits, 1-2 pit widths apart and obscured by sculpture of ground; hair white to pale brown, short (4-6), plumose. Mesepisternum with barely discernible to indistinct pits, about 1 pit width apart, and short, brownish to white, weakly plumose hair; ground minutely coriaceous to strongly striate, slightly dull. Hypoepimeron impunctate, slightly lustrous, slightly swollen. Metanotum reticulately rugose, slightly lustrous. Basal area of propodeum with sculpture variable, reticulate or lineately rugose to brow.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with short, fine, pale, appressed hairs spaced about one hair length apart. T6 hair medium-length, brown, appressed.

**Color.** Body black. Legs black; unmarked except fore tibia with pale area. Face and pronotum unmarked. Wings dark smoky.

**Perkins' collections. Hawaii:** Kona, S. (OUMNH), 1800 ft, 2000 ft, 3000 ft (BPBM).

**Recent collections. Hawaii:** Ahumoa, 5900 ft; Kipuka Kalawamana, 5000 ft; Puu Waawaa, 4200 ft; South Point, coast.

**Flower records.** *Bidens menziesii*, *Chamaesyce olowaluana*, *Scaevola sericea*, *Sida*, *Tribulus cistoides*.

**Remarks.** See remarks for *H. assimulans* and *H. flavipes*.

**References.** Suehiro, 1986:60 (record: Hawaii, Kona).

### *Hylaues (Nesoprosopis) paradoxicus* (Perkins)

(Fig. 52)

*Nesoprosopis paradoxica* Perkins, 1899:111-112 (♂ ♀; Pl. 2, Figs. 7, 25; nest: *Sophora*).

*Hylaues (Nesoprosopis) paradoxicus*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis paradoxica*, Daly, 1994:118 (lectotype ♂ BMNH 17a 141b; Hawaii, Kona, 4000 ft; wing length, 8.0 mm).

*Nesoprosopis erythrodemas* Perkins, 1899:112 (♀; holotype ♀ BMNH 17a 147; Hawaii, Kau, 4000 ft; wing length, 7.8 mm) (new synonymy).

*Hylaues (Nesoprosopis) erythrodemas*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis erythrodemas*, Daly, 1994:117 (holotype confirmed).

**DIAGNOSIS.** Large bees with punctured terga, dark wings, and unique body color: head and mesosoma black and metasoma red. Sister species of *H. gliddenae*; see remarks for that species.

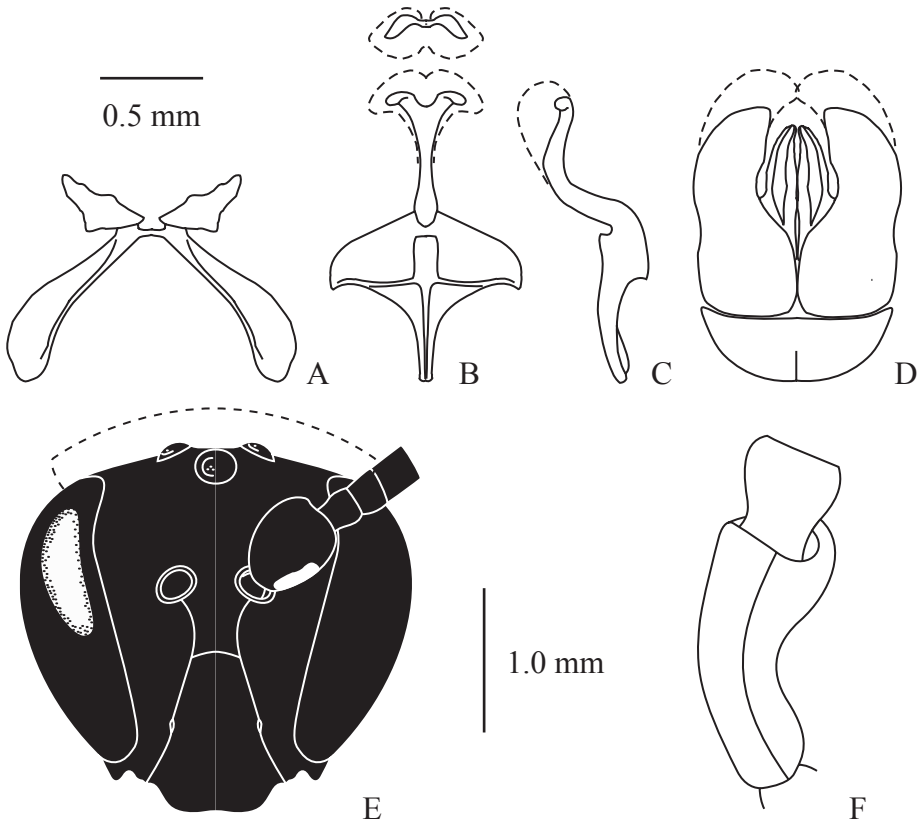


Fig. 52. *Hylaeus paradoxicus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Distribution.** Hawaii; montane dry and mesic forest.

**Male.** Measurements: Malar space, 13; eye, 187:159:156:113; clypeus, 110×102; frons, 33×38:115; interalveolar, 26:38:61:72, D 28; interocellar, 40 44:36:49, D 20; scape, 63×54; wing length, 8.0 mm (Hawaii, Kona, 4000 ft, BPBM 3528).

**Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area with indistinct, shallow pits about 1 pit width apart; frons slightly concave, with pits smaller medially, contiguous, distorted, and near the middle pits obliterated by fine, parallel, longitudinal wrinkles; impunctate, lustrous area above antennal sockets with median depression or shallow hole at middle. Lower paraocular depression shallow. Frontoclypeal sulcus slightly arched or nearly straight. Scape in frontal view moderately dilated, width more than half length, ratio about 0.8; lateral edge in frontal view distinctly convex; strongly

arched in lateral view with maximum arch near middle of scape; no groove on underside; with medium-length, yellowish white, mixed simple and weakly plumose hair. Vertex hair 20-30, white, weakly plumose.

**Mesosoma.** Scutum with distinct pits 1-2 pit widths apart, ground slightly granularly coriaceous, slightly lustrous; hair medium-length to long (10-20), yellowish white, weakly plumose. Scutellum with slightly larger pits, smoothly coriaceous, lustrous. Mesepisternum with distinct, round pits about 1 pit width apart, and medium-length, yellowish white, plumose hair; ground smooth, lustrous. Hypoepimeron punctured, smooth, lustrous, swollen. Metanotum dull. Basal area of propodeum protuberant in middle, roughened overall by reticulate rugae except the posterior, vertical, coriaceous face; rugae and ground granular or minutely wrinkled, dull to slightly lustrous; lateral carina strong, terminating anterolaterally in a protuberant area.

**Metasoma.** Disk of T2 with distinct punctuation, minute, shallow pits about 2 pit widths apart; ground smoothly coriaceous, lustrous; with fine, pale, short hair. T7 hair long, black, erect.

**Terminalia.** Lateral process of S7 tapered, with length less than width of hemisternite. Median process of S8 linear, apex bifurcate with rather long, straplike tips. Apices of gonoforceps longer than penis valves; gonoforceps rather narrow and with long, apical, plumose hair.

**Color.** Labrum and mandible blackish brown to black. Face unmarked. Scape in frontal view with obscure yellow stripe on lateral margin. Pronotum unmarked or with well-separated lateral marks on collar. Head and mesosoma black; metasoma red; T2 with an elongate black spot laterally behind spiracle. Legs dark brown to black; unmarked except pale area on fore tibia, all tarsi with or without reddish markings. Wings dark smoky.

**Female. Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area with distinct, round pits about 1 pit width or more apart, ground smoothly coriaceous and shiny; frons with pits smaller medially, but still round and uncrowded, ground minutely wrinkled and lustrous; middle from median ocellus to acme depressed about midway, and at this point the fine frontal line distinct and wide to acme. Apex of clypeus shallowly emarginate. Mandible weakly three-toothed, the two anterior (dorsal) teeth poorly separated. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 20-30, white, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground smoothly coriaceous, lustrous; hair medium-length to long (10-20), yellowish white, weakly plumose. Scutellum similar, with slightly larger pits. Mesepisternum with distinct, round pits about 1 pit width apart, and medium-length, yellowish white, plumose hair, dense on sides of propodeum; ground smooth, lustrous. Hypoepimeron punctured, smooth, lustrous, swollen. Metanotum dull. Basal area of propodeum peculiarly shaped with somewhat protuberant, short, anterior area bearing rather weak, widely spaced, lineate rugae to brow; rugae, spaces between rugae, and ground below brow slightly granularly coriaceous, slightly lustrous; weak lateral carinulae terminating anterolaterally in a protuberant area.

**Metasoma.** Disk of T2 with distinct punctuation; minute, shallow pits about 2 or more pit widths apart; ground smoothly coriaceous, shiny; with fine, pale, short hair; T6 hair dark reddish brown to black.

**Color.** Head and mesosoma black; metasoma red. Legs dark brown; unmarked except fore tibia with pale area. Face and pronotum unmarked. Wings dark smoky.

**Perkins' collections.** *Nesoprosopis paradoxica*: **Hawaii**: Kilauea (BPBM); Kona, 4000 ft (BMNH, BPBM, OUMNH); Kona, N., 3-4000 ft (BPBM); Kona, S., 2000 ft (BPBM). *N. erythrodemas*: **Hawaii**: Kau, 4000 ft (BMNH); Kilauea (BPBM); 4000 ft (BPBM, OUMNH).

**Recent collections.** **Hawaii**: Puu Waawaa, 4100 ft; Kipuka Alala, 5800 ft.

**Flower records.** *Chamaesyce olowaluana*, *Myoporum*.

**Remarks.** We conclude that *H. erythrodemas* is a rare, shiny red, female variant and a synonym of *H. paradoxicus*. We chose the latter name because it is based on a male type. Female *H. erythrodemas* are nearly identical to female *H. paradoxicus*. Examination of the holotype female of *H. erythrodemas* confirms some of the differences mentioned by Perkins: body less robust, propodeum with much weaker rugosity, metasoma red, second tergum sparsely punctured (also much smaller pits), and second sternum strongly raised. The shape of the face and propodeum, however, appear the same as *H. paradoxicus*, and other specimens identified as *H. erythrodemas* are less distinctly different in the characters listed by Perkins. Both nominal taxa are known only from Hawaii: *H. erythrodemas* was described from Kau at 4000 ft and *H. paradoxicus* from Kona at 4000 ft. *Hylaeus erythrodemas* is known only from the female, whereas both males and females are known for *H. paradoxicus*. Specimens identified by Perkins as *H. erythrodemas* are: 3 ♀ Kilauea (BPBM); 1 ♀ Kilauea, 4000 ft (OUMNH); ♀ holotype, Kau, 4000 ft (BMNH). Specimens available of *H. paradoxicus* are: many ♂♂ and a few ♀♀ from Kilauea, 4000 ft; Kilauea Dry Forest, 4000 ft; Kona, 4000 ft; N. Kona, 3000 ft; and S. Kona, 2000 ft (BPBM); 1 ♂ 1 ♀ Kona, 4000 ft (OUMNH); ♂ lectotype, Kona, 4000 ft (BMNH). It is evident that specimens identified as *H. paradoxicus* are widespread and sympatric with those identified as *H. erythrodemas*. All recent specimens have come from Kona.

**References.** Perkins, 1910:604 (key); 1913:79 (morphology). Suehiro, 1986:61 (record: Hawaii, Kona). *Hylaeus erythrodemas*: Perkins, 1907b: 97 (record: Hawaii, Kilauea).

### *Hylaeus (Nesoprosopis) pele* (Perkins)

(Fig. 53)

*Nesoprosopis pele* Perkins, 1911:723-724 (♂; Hawaii, Kilauea).

*Hylaeus (Nesoprosopis) pele*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis pele*, Daly, 1994:116 (type not located).

**DIAGNOSIS.** Small bees with clear to slightly smoky wings. Male face with three large, but separate marks, almost filling the clypeus and the lower paraocular areas below the antennal sockets; scape moderately dilated and with long hair along median edge; frons with indistinct, small patch of pale hair; legs and pronotal lobes may be marked with yellow, but not the pronotal collar. Female face unmarked or with short, irregular yellow marks along eyes; mid and hind tibia with or without yellow marks at bases; pronotum black.

**Distribution.** Hawaii; dry shrubland and dry and mesic forest.

**Male.** Measurements: Malar space, 3; eye, 86:83:76:51; clypeus, 47×42; frons, 15×20:64; interalveolar, 10:17:39:47, D 12; interocellar, 20:27:15:25, D 11; scape, 29×22; wing length, 3.3 mm (Hawaii, Kipuka Alala, 5800 ft, KM-99-141).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons somewhat convex, paraocular area with nearly round pits about 1-2 pit widths apart or more, on frons pits closer to about 1 pit width apart, at middle pits contiguous and slightly distorted; ground smoothly coriaceous, shiny, especially where pits are sparse below ocelli, less so in paraocular area above antennal sockets; small patch of erect, pale hairs at middle; impunctate, lustrous area above antennal sockets. Frontal line absent. Lower paraocular area with slight depression. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately dilated, width more than half length, ratio about 0.8; lateral edge in frontal view nearly straight; moderately arched in lateral view with maximum arch near middle of scape; underside of median edge with a groove; with long, simple, yellowish white hair. Vertex hair 6-16, yellowish white, simple.

**Mesosoma.** Scutum nearly impunctate, only minute shallow pits visible in certain lights, 2-4 pit widths apart, pits obscured by granular ground, dull in comparison with back of head and brow of propodeum; although pits are obscure, the cuticular surface of scutum at sides when seen in certain lights is uneven, with small, faint depressions associated with pits; hair medium-length (6-12), yellowish white, weakly plumose. Mesepisternum virtually impunctate, only minute pits visible 2-4 pit widths apart and with long, yellowish white, plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous, swollen. Metanotum finely wrinkled, dull to slightly lustrous. Basal area of propodeum minutely wrinkled or roughened at basal quarter to half, becoming smoothly coriaceous and shiny at brow; brow prominent.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, shiny; with short, fine, pale, appressed hairs spaced more than a hair length apart or more. T7 hair long, red-brown, erect.

**Terminalia.** Lateral process of S7 tapered, narrow, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with moderately long, rounded tips, about half as broad as long. Apices of gonoforceps longer than penis valves.

**Color.** Labrum and mandible black. Face with three separate yellow marks: clypeus not quite filled with an irregular mark, leaving black margin; lower paraocular area with mark up to level of antennal socket; supraclypeal area and scape unmarked. Highly marked specimens may have the clypeus almost entirely yellow and paraocular marks extended slightly above antennal sockets. Pronotum unmarked or with very small spots on lobes. Legs dark brown to black except: fore tibia and apex of fore femur with pale areas that may be yellow along dorsal margins in some specimens, fore basitarsus yellow; mid tibia with or without small yellow spots at base and apex, mid basitarsus yellow to partly yellow; hind tibia with or without yellow mark in basal third, hind basitarsus yellow to black. Wings slightly smoky to clear and iridescent.

**Female. Head.** Malar space medium-length (ratio about 0.5 DMO). Upper paraocular area and frons somewhat convex, with nearly round pits about 1-2 pit widths apart, ground

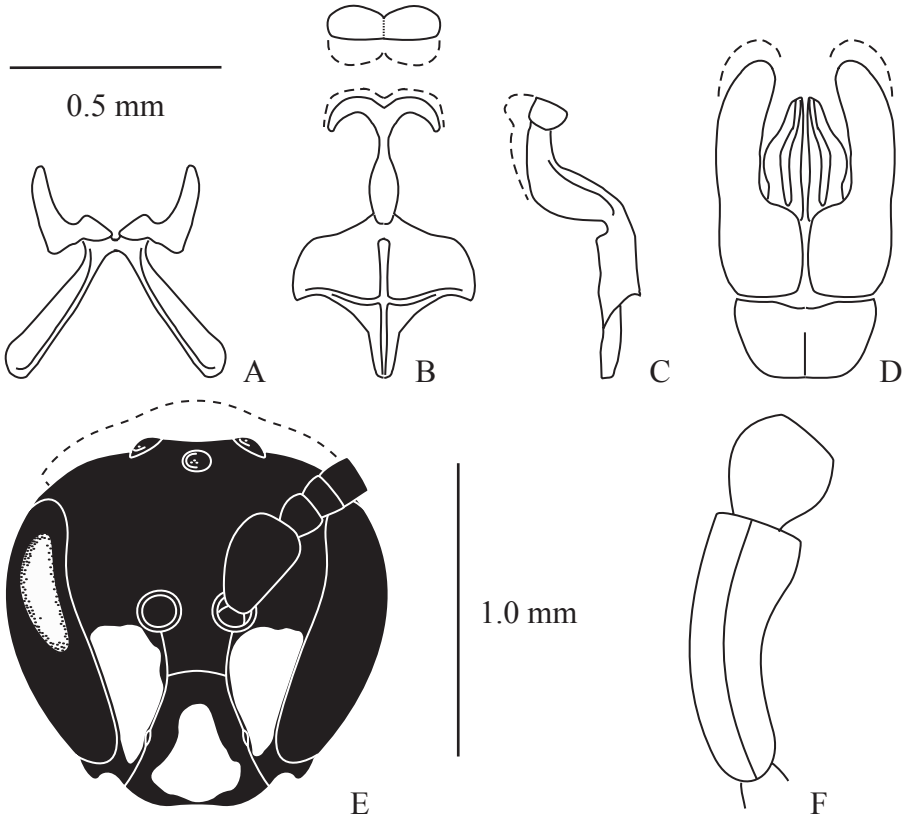


Fig. 53. *Hylaeus pele*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

smoothly coriaceous, lustrous; at middle pits obscured by minutely wrinkled ground along faint frontal line; small impunctate, minutely wrinkled area above antennal sockets. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea not or barely extended to level of lateral ocellus. Vertex hair 6-10, yellowish white, simple.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum virtually impunctate, only minute pits visible, 2-4 pit widths apart, obscured by granular ground, slightly lustrous (dull in comparison with top of head and brow of propodeum); hair short (2-6, few longer to 10), white. Mesepisternum virtually impunctate, only minute pits visible, 2-4 pit widths apart and with long, yellowish white, plumose hair; ground smoothly coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum finely wrinkled, dull to slightly lustrous. Basal area of propodeum minutely wrinkled or roughened at basal



half, becoming smooth and shiny at brow, or basal area almost all smooth; brow prominent. Dorsum of mesosoma slightly depressed, almost flat in lateral view.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, shiny; with short, fine, pale, appressed hairs spaced more than a hair length apart. T6 hair long, light brown, erect.

**Color.** Body black and legs blackish brown to black except: lower paraocular area with or without short, irregular yellow mark along eye; fore tibia and apex fore femur with pale areas; mid and hind tibia with or without yellow mark at base. Wings clear, iridescent.

**Perkins' collections.** None. Type collected later by Perkins at Kilauea, Hawaii.

**Recent collections. Hawaii:** Kipuka Nene, 2900 ft; Kipuka Puauulu, 3900 ft; Mauna Loa Rd., 4100 ft; Puu Waawaa, 4100 ft; Kipuka Alala, 5700 ft; Ahumoa, 5900 ft; Puu Huluhulu (N. Hilo), 6700 ft.

**Flower records.** *Bidens menziesii*, *Chamaesyce olowaluana*, *Crocospia × crocosmiiiflora*\*, *Myoporum*, *Sophora*.

**Remarks.** The type of *H. pele*, taken at Kilauea, has not been located. Males collected at Kilauea and Kona generally match the Latin description, some with more yellow on the face and legs than Perkins describes (as well as sometimes marks on the pronotal lobes). The species is relatively common throughout the drier upper slopes of Mauna Loa and Mauna Kea as well as at Kipuka Nene.

**References.** None.

### *Hylaeus (Nesoprosopis) perkinsianus* (Timberlake)

(Fig. 54)

*Nesoprosopis perkinsiana* Timberlake, 1926:22-23 (♂ ♀; holotype ♂ BPBM 226; Nihoa, summit 856 ft, flower: probably *Sida*; length of bodies of 4♂ was 6-7 mm).

**DIAGNOSIS.** Medium-sized bees with clear wings. Male face with yellow mark (clypeus and supraclypeal area, with or without mark in lower paraocular areas) divided by fine black sulci, unusual lateral process of S7 very short, median process of S8 not dilated and apex simple; unusual gonoforceps expanded apically beyond penis valves. Female black and unmarked. Sister species of *H. hirsutulius*; see remarks.

**Distribution.** Nihoa; probably occurs over the entire island. Timberlake (1926:23) and Beardsley (1966:166) records; no recent collections.

**Male.** Measurements: Malar space, 5; eye, 142:120:115:79; clypeus, 74×74; frons, 19×28:95; interalveolar, 19:27:55:64, D 20; interocellar, 32:32:26:33, D 18; scape, 54×25; wing length, 5.2 mm (Nihoa Island, BPBM 3531).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with round, shallow pits less than 1 pit width apart; ground minutely wrinkled, slightly lustrous; median, impunctate, lustrous area just above antennal sockets; frontal line evident. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus straight. Scape in frontal view slightly dilated, width equal to half length, ratio about 0.5; lateral edge in frontal view concave; moderately arched in lateral view with maximum arch near middle of scape; no

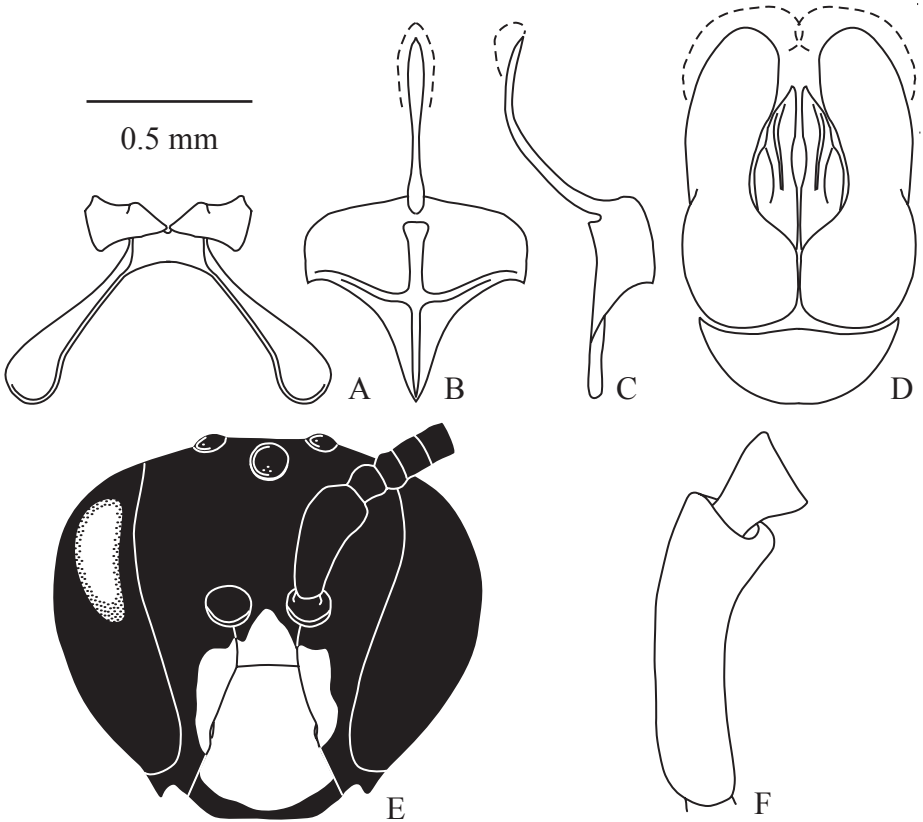


Fig. 54. *Hylaeus perkinsianus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-D.

groove on underside; with medium, brownish white, plumose hair. Vertex hair long, pale brown, plumose.

**Mesosoma.** Scutum with round pits about 2 pit widths apart, ground smoothly coriaceous, slightly lustrous; hair short (6-10), brownish white, plumose. Scutellum with pits slightly larger, smoothly coriaceous, lustrous. Mesepisternum with distinct, round pits, about 1 pit width apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous to striate, slightly lustrous. Hypoepimeron mostly impunctate, smooth, slightly lustrous, slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae at front; brow granularly coriaceous, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with short, fine, pale, appressed hairs spaced more than a hair length apart. T7 hair short, light brown, prostrate.

**Terminalia.** Lateral process of S7 very short, blunt, with length less than width of hemisternite. Median process of S8 linear and with apex simple. Apices of gonoforceps exceeding penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with one large mark with fine black sulci in "H" shape: clypeus entirely yellow or nearly so; lower paraocular area with or without a narrow yellow stripe along sulci and not extended above antennal sockets; supraclypeal area to acme yellow; scape unmarked. Pronotum unmarked. Legs dark brown to black and unmarked except fore tibia with pale area and hind tibia with or without obscure basal spot. Wings nearly clear.

**Female.** Not examined; according to Timberlake (1926:23) the female is very similar to the female of *H. hirsutulus*, except that the wings are subhyaline instead of fuscous.

**Perkins' collections.** None.

**Recent collections.** Beardsley (1966:166) from Nihoa.

**Flower records.** *Sida*.

**Remarks.** Timberlake (1926:22) stated that *H. perkinsianus* was closely allied to *H. hirsutulus* from Kauai, a conclusion supported here. The males of the two forms are very similar (short to very short malar space, wide face, similar facial marks, scape slightly dilated and moderately arched, linear process of S8 with simple apex) and share the very short lateral processes on S7 not found in other species. Timberlake observed differences in the configuration of the apices of the gonoforceps: narrower and rounded apically in *H. perkinsianus*; broader and slightly angular apically in *H. hirsutulus*. The legs of *H. perkinsianus* are unmarked or with only obscure yellow spots at the tibial bases and the wings nearly clear, whereas *H. hirsutulus* has at least a large, basal yellow mark on the hind tibia and dark smoky wings. We confirm Timberlake's observations and treat *H. perkinsianus* as a distinct species until additional studies prove otherwise.

**References.** Bryan, 1926:9 (record: Nihoa). Williams, 1927:429 (record: Nihoa). Beardsley, 1966:166 (record: Nihoa). Daly, 1994:120 (list).

### *Hylaeus (Nesoprosopis) perspicuus* (Perkins)

(Fig. 55)

*Nesoprosopis perspicua* Perkins, 1899:109 (♂ ♀; Pl. 2, Fig. 5; flower record: *Straussia*).

*Hylaeus (Nesoprosopis) perspicuus*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis perspicua*, Daly, 1994:118 (lectotype ♂ BMNH 17a 143b; Kauai, Makaweli, 2000 ft).

**DIAGNOSIS.** Large bees with punctured terga, dark wings, tibiae mostly white, and with a unique broad, white pronotal collar.

**Distribution.** Kauai; montane mesic and wet forest. No recent collections.

**Male.** Measurements: Malar space, 6; eye, 179:151:151:99; clypeus, 92×86; frons, 28×40:111; interalveolar, 28:32:65:74, D 26; interocellar, 34:40:34:43, D 20; scape, 55×37; wing length, 6.3 mm (*H. perspicuus* lectotype).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area at side with pits less than 1 pit width apart; across frons to middle with pits medially smaller, contiguous,

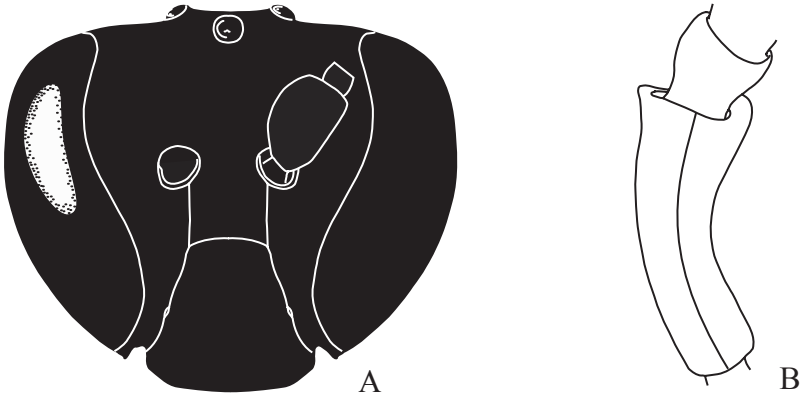


Fig. 55. *Hylaeus perspicuus*, male. A. Face with left scape. B. Scape, lateral view.

distorted, subpolygonal; ground obscured by punctation; small impunctate area above antennal socket. No frontal line. Upper face with long, yellowish white, plumose hair. Lower paraocular depression absent. Frontoclypeal sulcus slightly arched. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view nearly straight; moderately arched in lateral view with maximum arch near middle of scape.

**Mesosoma.** Scutum with distinct pits about 1 pit width apart, ground nearly smooth, lustrous. Scutellum with slightly larger pits, smooth, lustrous. Mesepisternum with distinct, shallow pits less than 1 pit width apart, and light brownish white, weakly plumose hair; ground nearly smooth, lustrous. Hypoepimeron obscurely punctured in lower half, smooth, lustrous, swollen. Basal area of propodeum convex in middle, weakly reticulately rugose nearly to brow area, shiny between rugae; brow indistinct, nearly smooth, lustrous. Lateral carina without an anterolateral protuberance.

**Metasoma.** Disk of T2 with punctation; smoothly coriaceous, lustrous; with bare areas otherwise with fine, pale, appressed hairs spaced about one hair length apart.

**Terminalia.** Lateral process of S7 parallel-sided (not dissected and partly hidden from view), with length probably greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with moderately long, straplike, rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Head and mesosoma dark blackish brown; metasoma dark reddish brown. Face unmarked except scape with lateral margin yellowish. Pronotum with collar exceptionally broad, entirely ivory; lobes dark. Legs reddish brown, fore tibia with pale area, fore and mid tibiae marked full length with ivory stripe, hind tibia ivory, except in caudal view with dark spot in apical half. Wings dark smoky.

**Female. Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons with shallow, slightly distorted pits, less than 1 pit width apart and more or less

aligned in rows separated by fine, parallel wrinkles (wrinkles stronger or weaker in different bees); at the sides the wrinkles curve broadly outward from near the lateral ocellus to along the eye, on the frons the pattern radiates upward and outward from between the antennal sockets; ground shiny between wrinkles; middle with fine longitudinal wrinkles and incomplete fine frontal line; middle depressed from median ocellus to acme. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct, fine pits 1-2 pit widths apart, ground granularly coriaceous, dull; hair medium-length (8-12), white, mostly simple. Scutellum slightly lustrous. Mesepisternum with distinct, round pits about 1 pit width apart, and short to medium-length, white, weakly plumose hair; ground roughened to weakly striate, slightly lustrous. Hypoepimeron punctured, the pits partially obscured by striate ground. Metanotum dull. Basal area of propodeum broadly convex, roughened overall by reticulate rugae except the posterior, vertical, coriaceous face; ground shiny between rugae; lateral carina strong, terminating anterolaterally in a slightly protuberant area.

**Metasoma.** Disk of T2 with distinct punctation; minute, shallow pits more than 2 pit widths apart; smoothly coriaceous, shiny; with very short, fine, pale, appressed hair. S2 without protuberance. T6 hair long, dark brown, erect.

**Color.** Body black. Face unmarked. Pronotum with collar broad, ivory transverse collar stripe complete; lobes unmarked. Legs blackish brown except: pale area on fore tibia; fore and mid tibiae marked full length with ivory stripe, hind tibia ivory except in caudal view with dark spot in apical half. Pale golden hairs dorsoapically on all tibiae. Wings dark smoky, some with reddish iridescence on the underside.

**Perkins' collections. Kauai:** Makaweli, 2000 ft (BMNH, BPBM, OUMNH), >2000 ft (BPBM).

**Recent collections.** None.

**Flower records.** None.

**Remarks.** The most beautiful of the Hawaiian *Hylaeus*. Colors of the integument and pubescence are based on old specimens.

**References.** Perkins, 1910:604 (key); 1913:82 (biogeography).

### *Hylaeus (Nesoprosopis) psammobius* (Perkins)

(Fig. 56)

*Nesoprosopis psammobia* Perkins, 1911:724-725 (♂ ♀).

*Hylaeus (Nesoprosopis) psammobius*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis psammobia*, Daly, 1994:118 (lectotype ♀ BPBM; Hawaii, Hilo coast; wing length, 4.2 mm).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings. Male face with yellow mark (clypeus, lower paraocular areas) below antennae partly divided by brown cuticle along sulci, unique lower paraocular depression bordered along eye by a narrow, low ridge, and unique median process of S8 dilated at base, but very slender in distal half and with long tips. Female face with or without three separate small marks (clypeus with subapical yellow

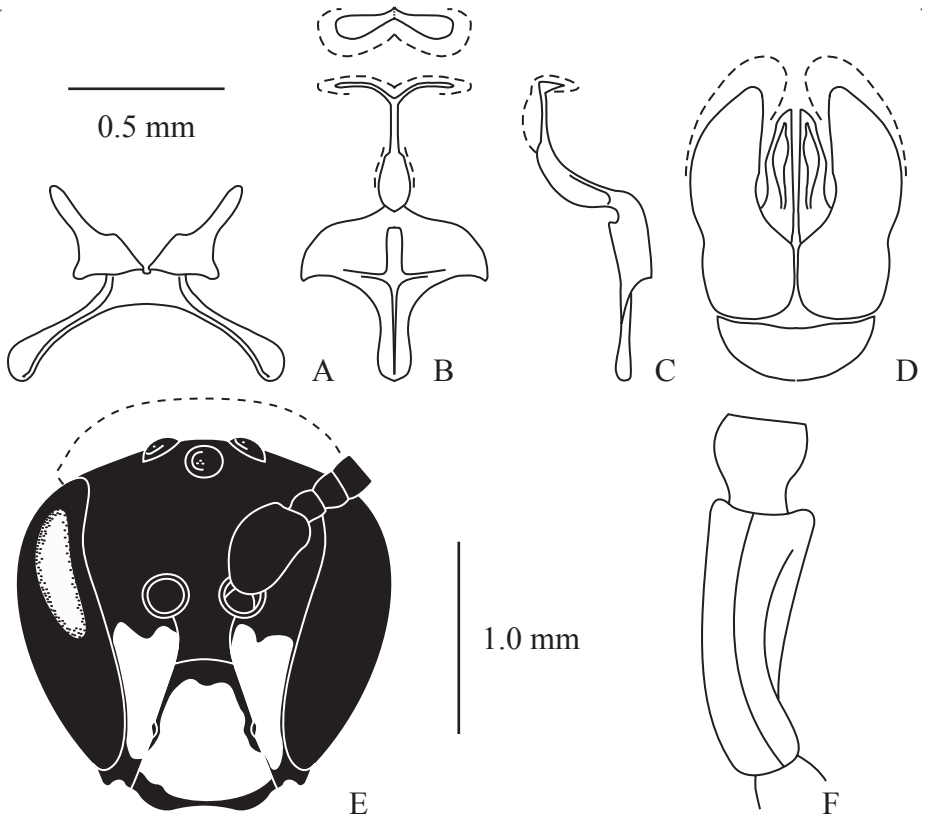


Fig. 56. *Hylaeus psammobius*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

stripe and yellow stripes along the eyes); legs with hind tibia with or without obscure yellow spot at very base.

**Distribution.** Hawaii and Maui (new record); coast. Very rare; no recent collections from Hawaii.

**Male.** Measurements: Malar space, 6; eye, 135:113:103:74; clypeus, 69×69; frons, 22×25:87; interalveolar, 15:25:49:59, D 15; interocellar, 32:29:22:29, D 16; scape, 44×32; wing length, 4.3 mm (Hana, Maui, DOA).

**Head.** Malar space short (ratio about 0.4 DMO). Upper half of upper paraocular area and frons uniformly with distinct, nearly round pits less than 1 pit width apart and with ground smooth, lustrous; at middle pits smaller, contiguous, slightly distorted; frontal line faint or absent. Lower half impunctate, area above antennal sockets shiny, extended dorsally

about half distance to median ocellus; lateral impunctate area with fine oblique ridges. Paraocular depression distinct, extended above antennal sockets and bordered along eye by a narrow, low ridge. Frontoclypeal sulcus nearly straight. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view straight; moderately arched in lateral view with maximum arch near the middle of the scape; underside of median edge with a narrow line; with medium-length, pale brown, mostly simple hair. Vertex hair 12-20, brown, mixed simple and weakly plumose.

**Mesosoma.** Scutum with distinct pits 1 pit width apart or less, ground granular, dull to slightly lustrous; hair medium-length (8-16), pale brown, weakly plumose. Scutellum with pits slightly larger, ground slightly lustrous. Metanotum dull. Mesepisternum with distinct, round pits about 1 pit width apart, and long, yellowish white, plumose hair; ground minutely wrinkled, slightly lustrous. Hypoepimeron shallowly punctate, minutely granular, slightly lustrous, slightly swollen. Basal area of propodeum reticulately rugose or areolate to and including brow, granular between rugae.

**Metasoma.** Disk of T2 impunctate; minutely smoothly coriaceous, lustrous, metasoma distinctly hairy with fine, pale, moderately long, prostrate hairs spaced a hair length apart, longer and denser at sides, especially on T1. T7 hair short, brown, mostly prostrate.

**Terminalia.** Lateral process of S7 tapered, slender, longer than width of hemisternite. Median process of S8 weakly dilated or swollen at base and very narrow in distal half, apex bifurcate with long, rounded tips that are narrow at base and broad at apex. Apices of gonoforceps somewhat pointed, longer than penis valves.

**Color.** Labrum and mandible dark brown. Facial marks appearing as 3 partly separate yellow marks, clypeus yellow except for narrow black margin along sulci at base and sides, lower paraocular areas with triangular marks almost reaching to antennal sockets, supraclypeal area with or without obscure yellow spot. Prothorax unmarked or with very small, narrow marks on lobes. Head and mesosoma black; metasoma blackish brown. Legs black to dark brown, unmarked except fore tibia with pale area, mid and hind tibiae with obscure basal yellow dot. Wings slightly smoky.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with distinct, mostly round pits less than 1 pit width apart; ground smooth and shiny; at middle pits smaller and some contiguous, some weak longitudinal wrinkles at midline, with or without frontal line. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-12, brown, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits about 1 pit width or less apart, ground slightly lustrous; hair medium (mostly even, about 6, a few longer to 12), pale yellowish brown, mixed weakly and densely plumose. Scutellum with slightly larger pits 1-2 pit widths apart, ground lustrous. Mesepisternum with indistinct, round pits, about 1 pit width or less apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron obscurely punctured, slightly lustrous, not swollen. Metanotum slightly lustrous. Basal area of propodeum lineately rugose or slightly reticulately rugose to brow, spaced 2-4 or more ruga widths apart, shiny between rugae; brow minutely wrinkled and slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, shiny; fine, pale, appressed hairs spaced about one hair length apart. T6 hair medium-length, brown, erect.

**Color.** Head and mesosoma dark brown to black (sometimes clypeus a lighter shade of brown than rest of head); metasoma dark brown. Face unmarked or with up to three small marks: clypeus with or without irregular, transverse, subapical yellow stripe; lower paraocular area with or without irregular yellow stripe along the eye, not extended above level of antennal socket; supraclypeal area and scape unmarked. Legs dark brown except fore tibia with pale area and obscure yellow spot at very base; hind tibia with or without obscure yellow spot at very base. Wings clear to slightly smoky.

**Perkins' collections. Hawaii:** Hilo coast (BPBM, OUMNH).

**Other collections. Hawaii:** Hilo coast, 3 ♀ VI-03 (Perkins, BPBM 3558); 1 ♂ 14-VI-?, 1 ♀ VIII-08 (W. M. Giffard, DOA). **Maui:** Hana, 1 ♂ 10-VI-1943 (N. L. H. Krauss, DOA).

**Recent collections. Maui:** Eleilei Point, coast.

**Flower records.** *Bacopa monnieri*, *Sesuvium portulacastrum*.

**Remarks.** Windward coastal habitat is severely degraded, and it is possible that this species may be extirpated on Hawaii. However, it may still survive in small patches of native vegetation. Other bees have not been observed visiting the plants it was found at on Maui, *Bacopa* and *Sesuvium*, and it may be necessary to look in different areas than those where other coastal bees are typically found. The scutum pits are unusually close together, a character usually only found in the "punctured terga" species (but also in *H. longiceps*).

**References.** None.

### *Hylaeus (Nesoprosopis) pubescens* (Perkins)

(Fig. 57)

*Nesoprosopis pubescens* Perkins, 1899:107-108 (♂ ♀; Pl. 2, Fig. 21).

*Hylaeus (Nesoprosopis) pubescens*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis pubescens*, Daly, 1994:118 (lectotype ♂ BMNH 17a 139a; Hawaii, Hilo, 2000 ft; wing length, 7.6 mm).

**DIAGNOSIS.** Large bees with punctured terga, dark wings, face without marks; complete, incomplete, or no transverse stripe on the pronotal collar. Males with yellowish stripe on scape; and, especially in the female, a unique hump on second sternum seen in lateral view (see also remarks for sister species, *H. fuscipennis*).

**Distribution.** Hawaii; most often found in montane wet to mesic forest, occasionally in dry shrubland.

**Male.** Measurements: Malar space, 7; eye, 179:146:143:101; clypeus, 100×90; frons, 35×40:113; interalveolar, 20:36:59:72, D 28; interocellar, 33:41:38:49, D 19; scape, 61×49; wing length, 7.6 mm (Hawaii, N. Kona, BPBM 3548).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area with somewhat distorted pits less than 1 pit width apart and separated by fine parallel wrinkles that curve across the sides of the frons from the lateral ocellus to along the eye; frons with pits relatively distinct, nearly round, and with diminished wrinkles; ground generally slightly



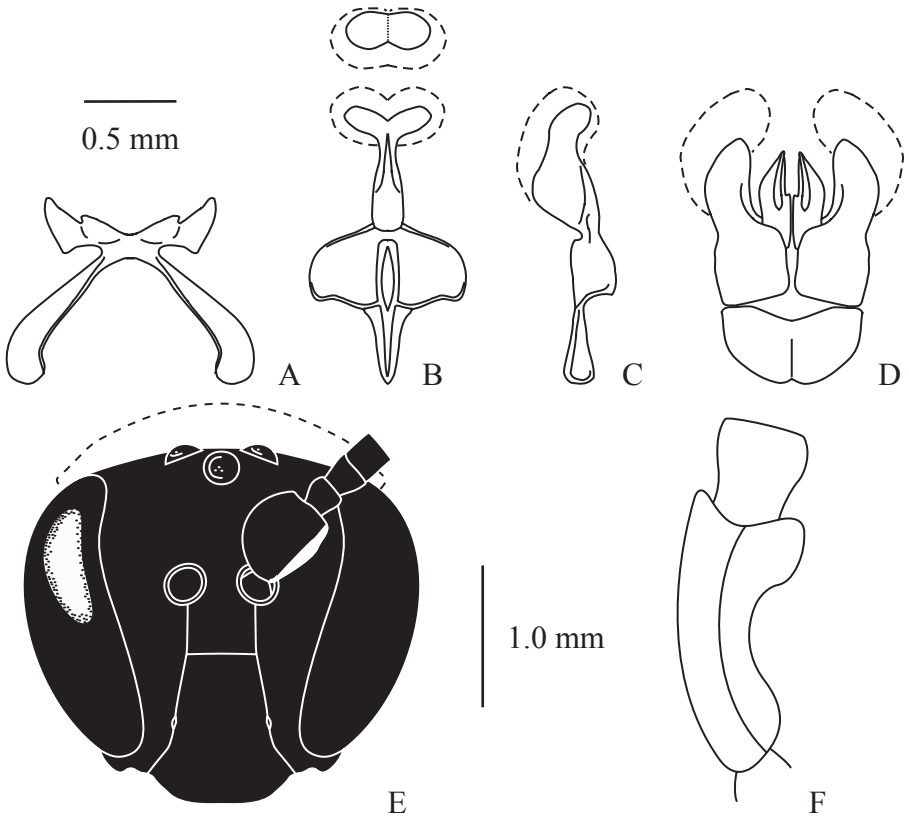


Fig. 57. *Hylaesus pubescens*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

lustrous, more lustrous near center; middle with some fine longitudinal wrinkles, with or without a fine frontal line; no impunctate area above antennal sockets. Lower paracocular depression distinct, shallow to moderate. Frontoclypeal sulcus arched or nearly straight. Scape in frontal view moderately dilated, width more than half length, ratio about 0.8; lateral edge in frontal view distinctly curved (convex) or forming a broad obtuse angle in the middle; strongly arched in lateral view with maximum arch near middle of scape; underside of median edge with a groove; with medium-length to long, yellowish white, mostly simple hair. Vertex hair 20-30, white, mostly simple.

**Mesosoma.** Scutum with distinct pits 1 pit width apart or less, ground minutely granular, dull to slightly lustrous; hair medium to long (8-14, few longer to 20), yellowish white, mixed simple and weakly plumose. Scutellum with pits slightly larger, lustrous.

Mesepisternum pits distinct, round, less than 1 pit width apart, and long, yellowish white, plumose hair; ground smooth to minutely wrinkled, lustrous. Hypoepimeron punctured, smooth, distinctly swollen. Metanotum dull. Basal area of propodeum slightly protuberant in middle, roughened overall by reticulate rugae except the posterior, vertical, coriaceous face, or roughened over entire surface; rugae and ground minutely wrinkled, slightly lustrous, some spaces between rugae shiny; lateral carina strong, terminating anterolaterally in a protuberant area.

**Metasoma.** Disk of T2 with distinct punctation; fine pits 1-2 pit widths apart, and fine, pale, appressed hairs denser, longer, plumose, and white at posterolateral margins; ground smoothly coriaceous, lustrous. T5-7 hair long, golden to orange-brown, prostrate.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 strongly dilated, apex bifurcate with broad, rounded tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face unmarked; scape in frontal view with yellowish stripe on lateral margin. Pronotum with ivory transverse collar stripe variable, complete to absent; lobes unmarked. Legs dark brown to black except: fore tibia with pale area and with or without a basal ivory mark; all femora with or without obscure apical marks; mid tibia in frontal view with small basal ivory mark and sometimes with obscure apical ivory mark; mid basitarsus with basal ivory mark; hind tibia in frontal view with basal ivory mark up to half length of segment, and sometimes with obscure apical ivory mark; hind basitarsus with basal ivory mark up to full length of segment. Wings dark smoky, some bees with red and green iridescence along distal margins, reddish or reddish and bluish iridescence in center, especially the undersides.

**Female. Head.** Malar space medium (ratio about 0.6-0.7 DMO). Upper paraocular area with shallow, slightly distorted pits about 1 pit width apart or less, some bees with more or less fine parallel wrinkles that curve across the sides of the area from near the lateral ocellus to along the eye; frons with pits more distinct and round and with wrinkles less evident; fine longitudinal wrinkles at middle, middle from median ocellus to acme not depressed; with or without a fine frontal line. Apex of clypeus distinctly emarginate. Apex of mandible with three teeth. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 20-30, white, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground slightly granularly coriaceous, dull to slightly lustrous; hair white, medium to long (10-20), weakly plumose. Scutellum with pits slightly larger, ground smoothly coriaceous, lustrous. Mesepisternum with pits distinct, round, less than 1 pit width apart, and medium-length, yellowish white or brownish white, weakly plumose hair; ground smooth to minutely wrinkled, lustrous. Hypoepimeron punctured, smooth, swollen. Metanotum dull. Basal area of propodeum protuberant in middle, roughened overall by reticulate rugae except the posterior, vertical, coriaceous face; rugae and ground minutely wrinkled, slightly lustrous, some spaces between rugae shiny; lateral carina strong, terminating anterolaterally in a protuberant area.

**Metasoma.** Disk of T2 with distinct punctation; minute pits 1 or more pit widths apart, and fine, pale, appressed hairs becoming denser, longer, plumose, and brownish white at

posterolateral margins; ground smoothly coriaceous, lustrous. Sternum 2 with low, median protuberance. T5-6 hair long, golden to orange-brown, prostrate.

**Color.** Body and legs dark brown to black. Face and legs unmarked. Pronotum with narrow transverse ivory collar stripe variable: nearly complete, interrupted, obscure, or absent; lobes unmarked. Wings dark smoky, some bees with red and green iridescence along distal margins, reddish iridescence medially, especially the undersides.

**Perkins' collections. Hawaii:** Hilo, 2000 ft (BMNH, BPBM), 1800 ft (BPBM); Kau, 4000 ft (BMNH, BPBM); Kilauea (BPBM), 4000 ft (OUMNH); Kona, N. (BPBM), 4000 ft (BPBM); Kona, S., 2500 ft (BPBM); Olaa, 1500 ft (BPBM); Waimea, Kohala Mts., 4000 ft (BPBM); Puna, 2000 ft (BMNH).

**Recent collections. Hawaii:** Kau Desert Trail head, 930 m; Devastation Trail, 3700 ft; Hilina Pali Rd., 3300 ft; Mauna Loa Strip Road, 1200 m; Kipuka Ki, 4100 ft; Olaa Forest Reserve, 915 m; Olaa Small Tract, 3800 ft; Puu Waawaa, 4100 ft; Kona Forest Unit of Hakalau National Wildlife Refuge camp, 5300 ft; Kau Forest Reserve, Mountain House Rd., 3000 ft; Upper Hamakua Ditch, 3700 ft.

**Flower records.** *Cheirodendron*, *Hypochoeris radicata*\*, *Metrosideros*, *Myoporum*, *Psychotria hawaiiensis*, *Santalum paniculatum*, *Tibouchina urvilleana*\*

**Remarks.** This is the most abundant of the large species, commonly found throughout the island of Hawaii in wet and mesic forest. It is strongly associated with *Metrosideros*. The dense hair at the apex of the metasoma is conspicuous and distinctive.

**References.** Perkins, 1907b: 97 (record: Hawaii, Kilauea); 1910:604 (key). Bridwell, 1919:135 (morphology). Timberlake, 1919a: 225 (parasitoid: *Nesencyrtus kaalae*; record: Hawaii, Kilauea); 1919b: 185 (parasitoid: *Nesencyrtus kaalae*; record: Hawaii, Kilauea). Cockerell, 1926:308 (record: Hawaii, Volcano House). Williams, 1927:428-429 (nest: figure, in decayed *Metrosideros polymorpha*; parasitoid: *Nesencyrtus kaalae*; record: Hawaii, Kilauea, 4000 ft). Swezey, 1954:125 (nest: beetle burrows in *Metrosideros collina polymorpha*). Beardsley, 1976:188, 209 (parasitoid: *Coelopencyrtus kaalae*). Daly and Coville, 1982:75-81 (description of larva; trap nests; nest: in beetle burrows in *Leptospermum scoparium* and *Acacia koa*; flower: *Hypochoeris radicata*; parasitoid: *Coelopencyrtus kaalae* and *C. sexramosus*; inquiline: *Afrocypholaelaps africana*; record: Hawaii, Kilauea). Suehiro, 1986:61 (record: Hawaii, Kona).

### *Hylaeus (Nesoprosopis) rugulosus* (Perkins)

(Fig. 58)

*Nesoprosopis rugulosa* Perkins, 1899:84 (♀).

*Hylaeus (Nesoprosopis) rugulosus*, Meade-Waldo, 1923:34 (list).

*Prosopis ovatula* Warncke, 1970:748 (unwarranted replacement name for *Nesoprosopis rugulosa* Perkins) (new synonymy)

*Nesoprosopis rugulosa*, Daly, 1994:118 (lectotype ♀ BMNH 17a 2750; Hawaii, Kau, 4000 ft; wing length, 4.8 mm).

**DIAGNOSIS.** Medium-sized bees with smoky wings and basal area of propodeum reticulately rugose to brow. Male black and unmarked except pale area on fore tibia;

supraclypeal area much wider than long, large shiny area above antennal sockets; scape moderately dilated even at base; gonoforceps uniquely truncate at apex. Female black and unmarked; with unique mandible straight across at apex, as wide or wider at apex than at articulation.

**Distribution.** Hawaii; montane wet forest.

**Male.** Measurements: Malar space, 5; eye, 140:123:123:78; clypeus, 66×69; frons, 22×35:91; interalveolar, 17:27:54:64, D 17; interocellar, 32:33:29:32, D 16; scape, 44×29; wing length, 4.5 mm (Hawaii, Kipuka Nene, 2900 ft).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with round pits less than 1 pit width apart, even near the middle, but at the very middle becoming smaller, contiguous, and distorted, and obscuring part of frontal line; ground minutely wrinkled and slightly lustrous between pits. Large impunctate, shiny area above antennal socket. Lower paraocular depression distinct, especially evident along subantennal sulci. Frontoclypeal sulcus slightly arched. Supraclypeal area much wider than long; W/L ratio about 1.7. Scape in frontal view moderately dilated and wide even near base, width more than half length, ratio about 0.7; lateral edge in frontal view straight; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with long, yellowish white, weakly plumose hair. Vertex hair 16-24, brownish white, mixed simple and plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground lustrous; hair medium-long (10-20), pale brown, weakly plumose. Scutellum with slightly larger pits, ground lustrous. Mesepisternum with indistinct, shallow, round pits, about 1 pit width apart, and long, white, plumose hair; ground minutely coriaceous, lustrous. Hypoepimeron impunctate, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum reticulately rugose to brow; shiny between rugae; brow wrinkled coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale brownish, appressed hairs spaced about one hair length apart or less. T7 hair short, brown, prostrate.

**Terminalia.** Lateral process of S7 tapered, narrow, and with length slightly longer than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with narrow, rounded tips. Apices of gonoforceps truncate, subequal to penis valves.

**Color.** Head and mesosoma black; metasoma brownish black. Labrum and mandible black. Face and scape unmarked; antenna yellow to brown beneath. Pronotum unmarked. Legs black; unmarked except fore tibia with pale area and fore basitarsi dull orange yellow. Wings smoky and slightly iridescent.

**Female. Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area and frons rather uniformly punctured with round pits less than 1 pit width apart; ground minutely wrinkled, slightly lustrous; middle slightly depressed, with faint frontal line. Apex of clypeus nearly straight. Dorsal end of facial fovea extended to level of lateral ocellus. Mandible straight across at apex, widest at apex (Fig. 9C). Vertex hair 16-24, brownish white, mixed simple and plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with minute, shallow pits 2 or more pit widths apart, ground slightly, granularly coriaceous, slightly lustrous; hair medium

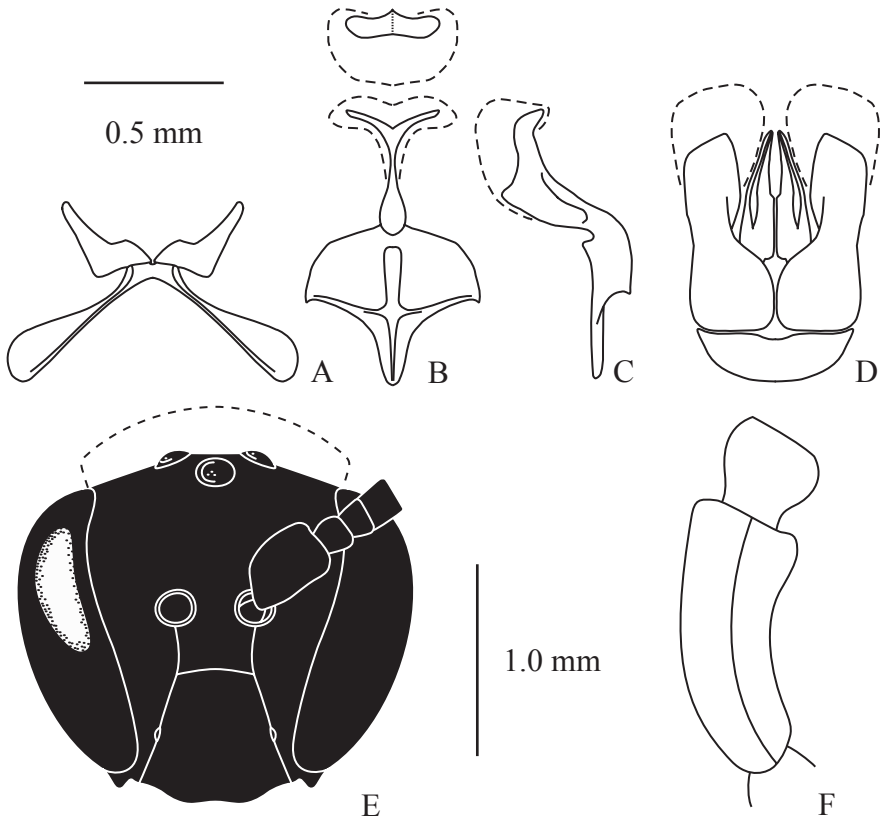


Fig. 58. *Hylaeus rugulosus*, new combination, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

to long (8-20), pale brown, simple. Scutellum with pits slightly larger. Mesepisternum with indistinct, shallow, nearly round pits 1 pit width apart, and medium-length, weakly plumose, white hair; ground nearly smoothly coriaceous, slightly lustrous. Hypoepimeron obscurely punctured, ground smoothly coriaceous, lustrous, nearly flat. Metanotum dull. Basal area of propodeum rather swollen, convex, with short anterior area, reticulately rugose to brow with some long, transverse rugae; weakly rugose beyond brow.

**Metasoma.** Disk of T2 impunctate, lustrous, with very short, appressed hairs spaced more than a hair length apart. T6 hair medium-length, black, erect.

**Color.** Head and mesosoma black; legs dark brown; unmarked. Wings clear to smoky.

**Perkins' collections. Hawaii:** Kau, 4000 ft (BMNH); Kilauea (BPBM).

**Recent collections. Hawaii:** Napau Trail, 2800 ft; Kipuka Nene, 2900 ft; Puu Puai, 3700 ft; below 3-Tree Kipuka, 1890 m.

**Flower records.** *Metrosideros*.

**Remarks.** This species has been rarely collected, but a large series was recently collected around a stone structure, apparently a nesting site. As pointed out by Snelling (1975), the Nearctic species often known as *Hylaeus rugulosus* (now regarded as a synonym of *H. modestus citrinifrons*) is correctly spelled *H. rugulosus* (Cockerell, 1896).

**References.** Perkins, 1907b: 97 (record: Hawaii, Kilauea). Fullaway, 1918:393-394 (♂).

### *Hylaeus (Nesoprosopis) satelles* (Blackburn)

(Fig. 59)

*Prosopis satellus* Blackburn, 1886:140-141, 148 (♂; holotype ♂ BPBM 2340, Maui, Haleakala, about 5000 ft; wing length, 6.5 mm, tip damaged. Blackburn used both *P. satellus* and *P. satelles*; Perkins, 1899, as first reviser, used *P. satelles*).

*Nesoprosopis satelles*, Perkins, 1899:109-110 (♂ ♀; Pl. 2, Fig. 23).

*Hylaeus (Nesoprosopis) satelles*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis satelles*, Daly, 1994:114 (holotype ♂ confirmed).

**DIAGNOSIS.** Large bees with punctured terga, dark wings, and propodeum sparsely sculptured. Male with scape extremely dilated, circular. Similar to *H. muranus*; see remarks for that species.

**Distribution.** Maui, Lanai, and Molokai; montane wet forest. No recent collections.

**Male.** Measurements. Malar space, 8; eye, 154:146:146:97; clypeus, 92×81; frons, 23×33:97; interalveolar, 26:33:59:67, D 26; interocellar, 33:41:26:33, D 18; scape, 54×61; wing length, 6.3 mm (Lanai, Halepaakai, 3000 ft; BPBM 3560).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons with shallow, slightly distorted pits less than 1 pit width apart, pits about the same size and spacing from the sides to near the middle, ground minutely wrinkled, sometimes shiny, generally lustrous; at middle a fine frontal line that may be partly obscured by adjacent punctuation. Lower paraocular depression distinct, extended above antennal socket, and shiny next to eye. Frontoclypeal sulcus slightly arched. Scape extremely dilated, wider than long, ratio about 1.1; nearly circular in frontal view; frontal surface unevenly convex and uniformly covered with fine pits less than 1 pit width apart; strongly arched in lateral view with maximum arch near middle of scape; with medium-length, yellowish brown, simple hair. Vertex hair medium-length, yellowish brown, mostly simple.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground lustrous; hair medium-length (8-12), yellowish white, mostly simple. Mesepisternum with distinct, round pits about 1 pit width apart, and medium-length, pale yellowish brown, simple and weakly plumose hair; ground smooth, lustrous. Hypoepimeron indistinctly punctured, smooth, lustrous, swollen. Metanotum punctuation obscure, dull. Basal area of propodeum at the center of the front with sparse, short, lineate rugae and at the sides of the front, a few longer, oblique, lineate rugae (rugae stronger in Molokai specimen); brow smoothly coriaceous and lustrous.

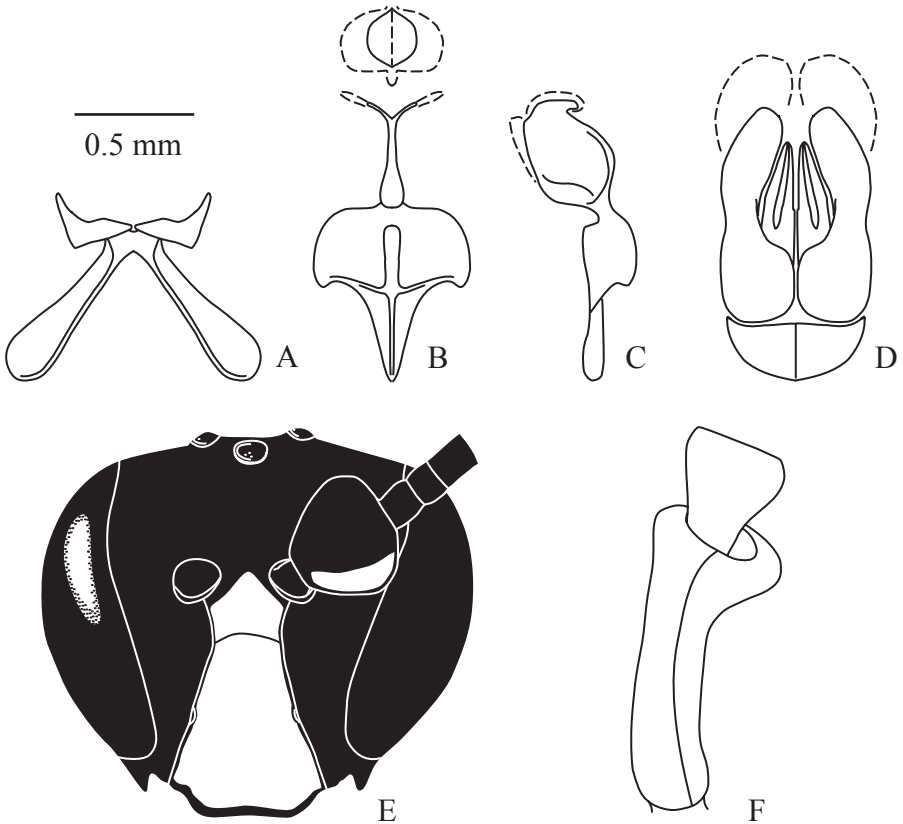


Fig. 59. *Hylaeus satelles*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

**Metasoma.** Disk of T2 with minute, shallow pits about 1 pit width apart, smoothly coriaceous and lustrous; fine, pale, appressed hair. T7 hair long, brown, erect, simple.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 strongly dilated, dilation membranous, apex bifurcate with broad tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesonotum dark brown to black; pleura, propodeum, and metasoma reddish brown to dark reddish brown. Labrum and mandible dark reddish brown to black. Face marks variable: clypeus entirely reddish yellow or only at apex; paraoxular areas unmarked; and supraclypeal area reddish yellow to acme or obscurely so. Scape variable, dark or with the lateral margin reddish yellow. Pronotum unmarked. Legs reddish brown to dark brown except fore femur, tibia, and basitarsus with pale areas. Wings dark brown.

**Female. Head.** Malar space medium-length (ratio about 0.5 DMO). Upper paraocular area and frons with shallow, slightly distorted pits less than 1 pit width apart, pits about the same size and spacing from the sides to near the middle, ground minutely wrinkled or sometimes shiny, generally lustrous; middle with a fine frontal line that may be partly obscured by adjacent punctation. Apex of clypeus very shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground lustrous; hair medium to long (8-16), yellowish white, mostly simple. Mesepisternum with distinct, round pits about 1 pit width apart, and brownish white, plumose hair; ground smooth, lustrous. Hypoepimeron distinctly punctured, smooth, lustrous, swollen. Metanotum slightly lustrous. Basal area of propodeum nearly glabrous or with weak, lineate rugae less than halfway to brow; brow smooth coriaceous, lustrous.

**Metasoma.** Disk of T2 with minute, shallow pits about 1 pit width apart, smoothly coriaceous and lustrous; fine, pale, appressed hair, slightly denser along apical margin. T6 hair mostly simple except minutely plumose at sides, long, black, erect.

**Color.** Body dark reddish brown to black. Face marks: clypeus and (in some specimens) adjacent supraclypeal area reddish yellow. Scape almost entirely reddish yellow, or marked only along lateral edge. Legs dark brown except: fore femur and tibia with pale areas. Wings dark brown.

**Perkins' collections. Maui:** Haleakala, 5000 ft (BMNH, BPBM). **Lanai:** center of Lanai, forests above Koele, 2000 ft (OUMNH); Halepaakai, 3000 ft (BMNH, BPBM); "Lanai," 2000 ft (BMNH, BPBM, OUMNH); Mts. Koele, 2000 ft (BMNH, BPBM), >2000 ft (BPBM). **Molokai:** "Molokai," 4000 ft (OUMNH); Molokai Mts., 4000 ft (BPBM), >4000 ft (BMNH, BPBM), east, 4000 ft (OUMNH).

**Recent collections.** None.

**Flower records.** None.

**Remarks.** Colors of the integument and pubescence are based on old specimens. Perkins' specimens from Molokai are darker (entire mesosoma dark brown) than those from Lanai.

**References.** Blackburn, 1887:200-201, 208 (♂, key). Dalla Torre, 1896:32 (list). Perkins, 1910:604 (key); 1913:79 (ecology). Fullaway, 1918:396 (record: Maui, Iao Valley).

### *Hylaeus (Nesoprosopis) setosifrons* (Perkins)

(Fig. 60)

*Nesoprosopis setosifrons* Perkins, 1899:108-109 (♂ ♀; Pl. 2, Fig. 22; flower: *Metrosideros*, *Rubus*, *Santalum*).

*Hylaeus (Nesoprosopis) setosifrons*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis setosifrons*, Daly, 1994:119 (lectotype ♂ BMNH 17a 142a; Hawaii, Kau, 4000 ft; wing length, 6.2 mm).

**DIAGNOSIS.** Large bees with punctured terga and dark wings. Male scape moderately dilated, face with ivory marks in lower paraocular areas and sometimes subapically on clypeus. Female pronotal collar with transverse ivory stripe complete or interrupted; tibiae



with ivory stripes; basitarsi with or without ivory stripes. Both sexes with unusual dark, erect setae on face, almost all body hair black.

**Distribution.** Hawaii; montane mesic and wet forest.

**Male.** Measurements: Malar space, 10; eye, 148:141:136:97; clypeus, 87×82; frons, 26×35:100; interalveolar, 23:31:54:64, D 26; interocellar, 29:41:18:31, D 17; scape, 49×39; wing length, 6.0 mm (Hawaii, Hilo, 2000 ft, BPBM 3574).

**Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area with shallow, somewhat indistinct, round pits 1 pit width or less apart; frons with pits smaller medially, closer, shallower, but mostly round; ground minutely, irregularly wrinkled among pits and across the middle, dull; very small impunctate area above antennal socket. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus slightly arched. Face with unusual dark, erect setae. Scape in frontal view moderately dilated, width more than half length, ratio about 0.8; lateral edge in frontal view slightly convex; moderately arched in lateral view with maximum arch near middle of scape; no groove on underside; with long, brown, mostly plumose hair. Vertex hair 20-30, black, mostly simple.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground granularly coriaceous, slightly lustrous; hair long (12-20 or more, somewhat shorter in small specimens), black, mostly simple. Scutellum with slightly larger pits, smoothly coriaceous, lustrous. Mesepisternum with indistinct, shallow pits about 1 pit width apart, and long, brown, weakly plumose hair; ground nearly smooth, slightly lustrous. Hypoepimeron punctured, nearly smooth, slightly lustrous. Metanotum dull. Basal area of propodeum convex in middle but not distinctly protuberant; irregularly roughened or lineately rugose almost to brow, rugae spaced 2-4 rugae apart; shiny between rugae; ground of brow and below varying from smoothly coriaceous and lustrous to wrinkled and dull. Lateral carina strong; without an anterolateral protuberance.

**Metasoma.** Disk of T2 with punctuation of indistinct, shallow pits more than 2 pit widths apart; smoothly coriaceous, lustrous; with very short, fine, brown, appressed hair. T7 hair long, black, prostrate to erect.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with broad, rounded tips. Apices of gonoforceps slightly longer than penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with two or three marks: clypeus unmarked or with an apical transverse stripe; lower paraocular area largely or entirely ivory from just below antennal socket; supraclypeal area and scape unmarked. Pronotum unmarked. Legs dark brown to black except: fore tibia with pale area combined with irregular dorsal yellowish stripe; mid tibia with a basal ivory or yellowish trace, basitarsus with basal ivory or yellowish marking; hind tibia with irregular ivory stripe in basal half, often extended to apex dorsally. Pubescence generally dark brown to black, except on propodeum and legs. Wings dark smoky with faint red and green iridescence along distal margins.

**Female. Head.** Malar space medium-length (ratio about 0.6 DMO). Upper paraocular area and frons with shallow, slightly distorted pits, less than 1 pit width apart and more or less aligned in rows separated by fine, parallel wrinkles (wrinkles stronger or weaker in

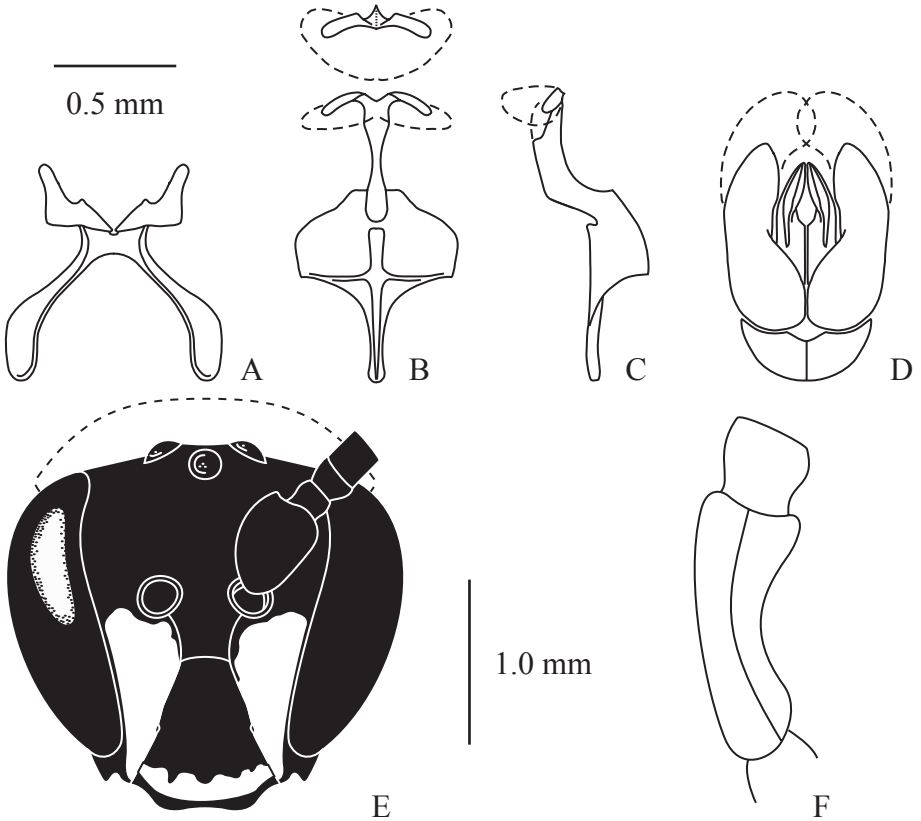


Fig. 60. *Hylaeus setosifrons*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

different bees); at the sides the wrinkles curve broadly outward from near the lateral ocellus to along the eye, whereas on the frons the pattern radiates upward and outward from between the antennal sockets; middle with fine longitudinal wrinkles with or without a fine frontal line; middle from median ocellus to acme slightly depressed. Apex of clypeus shallowly emarginate. Face with unusual dark, erect setae. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 20-30, black, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground granularly coriaceous, dull; hair long (14-20 or more), black, mostly simple. Scutellum with slightly larger pits, smoothly coriaceous ground, slightly lustrous. Mesepisternum variable with distinct or indistinct, shallow pits about 1 pit width apart, and brownish white, plumose hair; ground variable, nearly smooth, minutely wrinkled to weakly

striate, slightly lustrous. Metanotum dull. Basal area of propodeum broadly convex, roughened overall by irregularly lineate or reticulate rugae except the posterior, vertical, coriaceous face; rugae and ground minutely wrinkled, dull or slightly lustrous; lateral carina strong, terminating anterolaterally in a slightly protuberant area. Hypoepimeron punctured, the pits partially obscured by minute, parallel, longitudinal wrinkles.

**Metasoma.** Disk of T2 with distinct punctation; minute, shallow pits more than 2 pit widths apart; smoothly coriaceous, shiny; with very short, fine, light brown, appressed hair. T6 hair long, black, erect.

**Color.** Head and mesosoma black; metasoma dark brown to black. Face unmarked. Pronotum with ivory transverse collar stripe complete or interrupted; lobes unmarked. Legs dark brown except: pale area on fore tibia plus ivory stripe nearly full length of segment; fore basitarsus with or without ivory at base; mid and hind tibiae and hind basitarsus with ivory stripe nearly full length of segments; mid basitarsus at base with or without ivory marks. Wings dark smoky, some with red or bluish iridescence.

**Perkins' collections. Hawaii:** Hilo, 2000 ft (BPBM); Kau, 4000 ft (BMNH, BPBM); Kilauea (BPBM), 4000 ft (OUMNH); Kona, 2000 ft, 3000 ft, 4000 ft (BPBM); Kona, N. (OUMNH), 3000 ft (OUMNH).

**Recent collections. Hawaii:** Mauna Loa Estates, 3600 ft; Tree Molds, 4000 ft; Earthquake Trail, 4000 ft; Volcano, Old Japanese Schoolhouse, 3750 ft.

**Flower records.** *Cheirodendron*, *Metrosideros*, *Psychotria hawaiiensis*, *Rubus* sp., *Santalum paniculatum*.

**Remarks.** This species is widely distributed in the wet and mesic forest around Kilauea, but is uncommon. Nearly all of the body hair is black, and the erect clypeal hair is distinctive.

**References.** Perkins, 1907b: 97 (record); 1910:604 (key); 1913:81 (parasitoid: *Eupelmus*). Fullaway, 1918:398 (comparison with *N. anomala*). Suehiro, 1986:61 (record: Hawaii, Kona).

### *Hylaeus (Nesoprosopis) simplex* (Perkins)

(Fig. 61)

*Nesoprosopis simplex* Perkins, 1899:79 (♂ ♀; Pl. 2, Fig. 9).

*Hylaeus (Nesoprosopis) simplex*, Meade-Waldo, 1923:33 (list).

*Nesoprosopis simplex*, Daly, 1994:119 (lectotype ♂ BMNH 17a 157b; Hawaii, Kau, 4000 ft; wing length, 5.0 mm).

**DIAGNOSIS.** Medium-sized bees with smoky wings. Male face with oval yellow mark divided by fine black sulci, legs unmarked, unusual lateral process of S7 long and broad, median process of S8 not dilated and with narrow tips, unusual gonoforceps expanded apically beyond the penis valves and with pubescence extended around apex to inner angle. Female black and unmarked. Closely related to *H. chlorostictus* and *H. facilis*.

**Distribution.** Hawaii; lowland and montane dry shrubland and mesic forest. No recent collections.

**Male.** Measurements: Malar space, 7; eye, 143:123:115:79; clypeus, 69×69; frons, 29×28:100; interalveolar, 17:27:54:64, D 22; interocellar, 32:31:23:28, D 17; scape, 51×27; wing length, 4.8 mm (Hawaii, Puna, 1000 ft, BPBM 3593).

**Head.** Malar space short (ratio about 0.4 DMO). Upper paraocular area and frons rather flat and with indistinct, mostly round, shallow pits 1-2 pit widths apart even at the middle, ground minutely wrinkled, the wrinkles more or less parallel transversely across the middle and longitudinally at sides along eye, slightly lustrous; median, impunctate, slightly depressed, lustrous area above antennal sockets. Lower paraocular depression distinct, but shallow. Frontoclypeal sulcus straight to slightly arched. Scape in frontal view slightly dilated, width half length, ratio about 0.5; lateral edge in frontal view nearly straight; strongly arched in lateral view with maximum arch near middle or slightly toward apex of scape; no groove on underside; with medium-length, pale yellowish brown, weakly plumose hair. Vertex hair 16-30, brown, plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground slightly granular and slightly lustrous; hair medium-length (12-20), pale yellowish brown, plumose. Scutellum with slightly larger pits, smoothly coriaceous, lustrous. Mesepisternum with indistinct, shallow pits about 1 pit width apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous to striate, slightly lustrous. Hypoepimeron impunctate, nearly smooth, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose to brow, shiny between rugae, weakly reticulate at brow; brow below smoothly coriaceous, slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with short, fine, pale, appressed hairs spaced more than a hair length apart. T7 hair medium-length, brown, prostrate.

**Terminalia.** Lateral process of S7 broad, sword-shaped, length much greater than width of hemisternite. Median process of S8 linear, apex bifurcate with long, filamentous, densely hairy tips. Apices of gonoforceps exceeding penis valves.

**Color.** Labrum and mandible yellowish brown to brown. Face with a single large spot not extended at the sides above the antennal sockets and with fine black sulci in "H" shape: clypeus entirely yellow or nearly so; lower paraocular area yellow below antennal socket and along sulci; supraclypeal area to acme yellow; scape unmarked. Pronotum unmarked. Legs dark brown except: fore tibia with pale area, with or without obscure basal yellow spots or stripes on all tibiae and fore basitarsus. Wings smoky.

**Female. Head.** Malar space medium-length (ratio about 0.5 DMO). Upper paraocular area and frons with indistinct, mostly round pits about 1 pit width apart; ground minutely wrinkled, slightly lustrous; fine frontal line in some bees. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 14-24, brown, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with pits 1-2 pit widths apart, ground granularly coriaceous, slightly lustrous; hair medium-length (10-14) yellowish white, plumose. Scutellum with pits slightly larger, smoothly coriaceous, lustrous. Mesepisternum with indistinct pits about 1 pit width apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous to striate, slightly lustrous. Hypoepimeron impunctate,

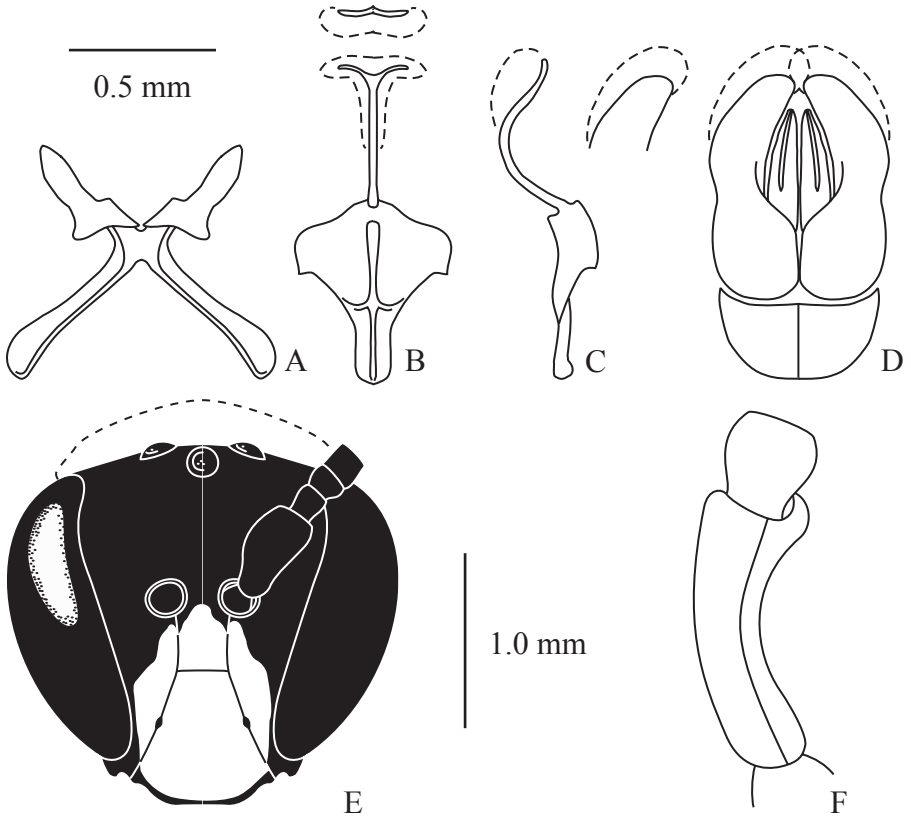


Fig. 61. *Hylaeus simplex*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

nearly smooth, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose to brow; shiny between rugae; brow granular to smoothly coriaceous, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, with fine, short, pale hair more than a hair length apart. T6 hair medium-length, brown, prostrate.

**Color.** Head and mesosoma black; legs and metasoma dark brown; unmarked. Wings dark smoky.

**Perkins' collections. Hawaii:** Hamakua, 2000 ft (BPBM); Hilo (BMNH, BPBM), 4000 ft (BPBM); Kau (BPBM), 4000 ft (BMNH, BPBM); Kilauea (BPBM), 4000 ft (OUMNH); Kona (BPBM), 4000 ft (BMNH, BPBM); Kona, N., 3000 ft (BPBM); Puna (BPBM), 2000 ft (BMNH, BPBM, OUMNH).

**Recent collections.** None.

**Flower records.** None.

**Remarks.** Colors of the integument and pubescence are based on old specimens. See remarks for *H. facilis*.

**References.** Perkins, 1907b: 97 (record: Hawaii, Kilauea); 1910:601 (key). Fullaway, 1918:393 (record: Hawaii, Hilea, Kau, Honuapo, Kilauea-Honuapo auto road). Suehiro, 1986:41, 61 (record: Hawaii, Kona).

***Hylaeus (Nesoprosopis) solaris* Magnacca and Daly, new species**

(Fig. 62)

**DIAGNOSIS.** Medium-sized bees with clear wings. Male with the face entirely yellow, broadly above antennal sockets, with or without a mark on the dilated scape; supraclypeal area longer than wide. Female black, unmarked; differing from the sympatric *H. flavifrons* and *H. connectens* by the short, golden hair of T6, and from *H. chlorostictus* by the very short pubescence of the scutum.

**Distribution.** Kauai; coast.

**Male.** Measurements: Malar space, 11; eye, 148:100:92:71; clypeus, 78×68; frons, 29×18:94; interalveolar, 13:23:49:58, D 20; interocellar, 29:20:16:25, D 15; scape, 44×32; wing length, 4.2 mm (holotype).

**Head.** Malar space long (ratio about 0.8 DMO). Upper paraocular area and frons with distinct, round pits, up to 1 pit width apart, smaller and closer in middle but not contiguous; ground smoothly coriaceous and lustrous over entire area; large impunctate area above antennal socket. Lower paraocular depression very shallow, indistinct. Frontoclypeal sulcus nearly straight; supraclypeal area much longer than wide, W/L ratio 0.6. Scape in frontal view moderately dilated, W/L ratio 0.7-0.8, greatest width just past middle; lateral edge in frontal view straight or very slightly concave; moderately arched in lateral view with maximum arch around middle; underside of median edge with a long, narrow line; long, yellowish white, simple hair along median edge. Vertex hair 6-10, white to pale brown, plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground smoothly coriaceous, slightly lustrous; hair medium-length (8-12), white, plumose. Scutellum with slightly larger pits, slightly lustrous. Mesepisternum with round, shallow pits about 1 pit width apart, ground smoothly coriaceous and slightly lustrous, and with long, brownish white, plumose hair. Metanotum roughened, slightly lustrous. Basal area of propodeum irregularly, lineately rugose at front, shining between rugae, reticulate behind, brow minutely granular, lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or more. T6 hair long, yellowish to golden, prostrate.

**Terminalia.** Lateral process of S7 tapered, broadly triangular, length subequal to width of hemisternite. Median process of S8 long, strongly arched, evenly but weakly dilated; apex bifurcate, tips long, bent dorsad. Apices of gonoforceps subequal to penis valves.

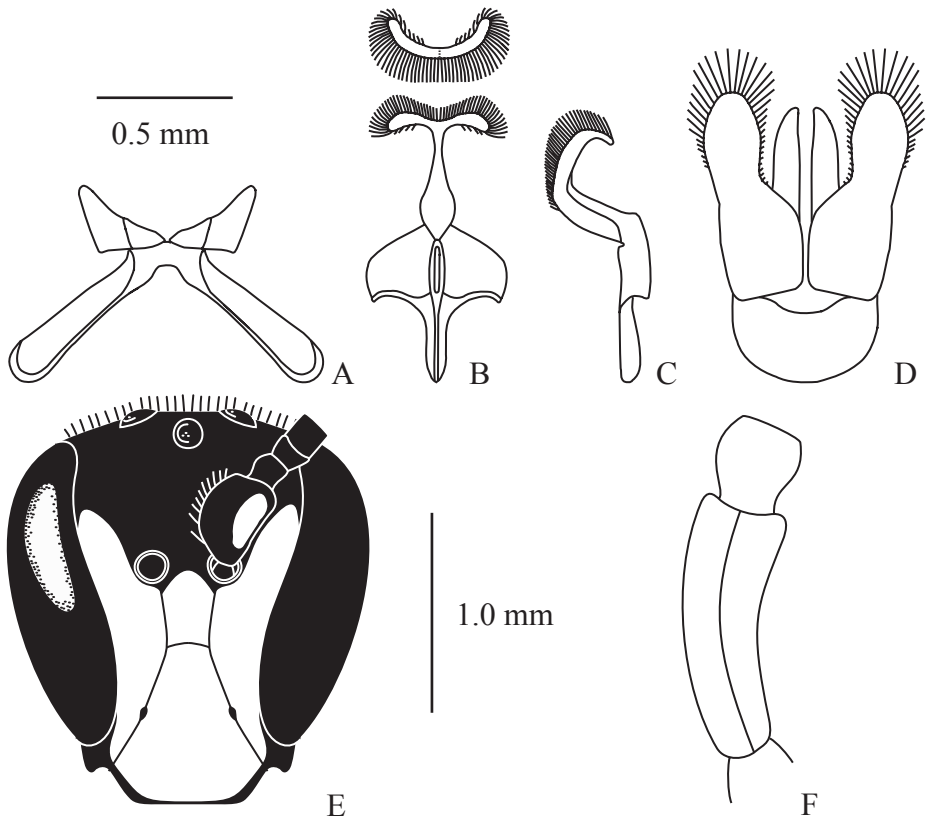


Fig. 62. *Hylaeus solaris*, new species, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E.

**Color.** Labrum and mandible dark brown to black. Face with a single large mark: clypeus entirely yellow, with paraocular marks extended above antennal sockets in a broad line; supraclypeal area yellow. Scape with or without a broad stripe or spot on lateral half. Pronotum unmarked. Legs black except for pale area of front tibia, with or without small spots at bases of all tibiae. Wings clear.

**Female. Head.** Malar space long (ratio about 0.8 DMO). Upper paraocular area and frons with distinct, round pits, up to 1 pit width apart, evenly spaced, smaller and closer only at middle; ground smoothly coriaceous and lustrous over entire area; impunctate area above antennal socket small. Upper portion of frontal line faint, forming a distinct groove up to halfway between acme and median ocellus. Apex of clypeus slightly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 4-8(-12), yellowish white, plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with distinct pits 1-2 pit widths apart, ground slightly lustrous; hair short (6-8), yellowish white, plumose. Scutellum with slightly larger pits, slightly lustrous. Metanotum granular, dull. Mesepisternum with shallow pits 1-2 pit widths apart, ground smoothly coriaceous, lustrous; with short to medium, yellowish white, plumose hair. Hypoepimeron weakly punctate, striate, nearly flat; weakly separated from mesepisternum. Basal area of propodeum irregularly, lineately rugose at front, shining between rugae, reticulate behind, brow minutely granular, lustrous.

**Metasoma.** Disk of T2 impunctate, almost smooth, shiny, with fine, pale, appressed hairs spaced about one hair length apart or more. T6 hair short, golden, prostrate.

**Color.** Head, mesosoma, metasoma, and legs black, except antennal flagellum light brown to bright yellow underneath, front tibia with small pale area.

**Holotype** ♂ labeled "Kauai, Polihale State Park, coastal dunes, on *Scaevola sericea*. K. Magnacca, 25 Aug 1999, KM-99-234" (CUIC).

**Allotype** ♀ with identical data (CUIC).

**Paratypes.** Kauai, Polihale State Park, coast, 3 ♂ 4 ♀ 25-VIII-1999, on *Scaevola sericea* (KM-99-234) (CUIC); 2 ♂ 2 ♀ with identical data (BPBM); Keonelo Bay, coast just inland east of Hyatt Regency Hotel, 3 ♂ 2 ♀ 19-VIII-1989, J. A. Powell (UCB).

**Flower records.** *Scaevola sericea*, *Sida fallax*.

**Etymology.** The species epithet *solaris* refers to the intense sun of the coastal habitat in which the bees were collected, and to the bright yellow facial markings.

**Remarks.** The relative abundance of this species at easily accessible locations makes it surprising that it has not been collected before. However, its numbers at Polihale (as is the case with other *Hylaeus* there) appear to be extremely seasonal. Like other coastal species, it is restricted in range; it is currently known only from Polihale and Keonelo Bay. *Hylaeus solaris* shares with *H. inquilina* short vertex hair, broad paraocular stripes, and weakly reticulate propodeum.

### *Hylaeus (Nesoprosopis) specularis* (Perkins)

(Fig. 63)

*Nesoprosopis specularis* Perkins, 1899:93-94 (♀; holotype ♀ BMNH 17a 2751; Hawaii, Kilauea; wing length, 3.8 mm).

*Hylaeus (Nesoprosopis) specularis*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis specularis*, Daly, 1994:119 (holotype ♀ confirmed).

*Nesoprosopis homoeochroma* Perkins, 1911:722-723 (♂; type not located; Hawaii, Kilauea) (new synonymy).

*Hylaeus (Nesoprosopis) homoeochromus*, Meade-Waldo, 1923:35 (list).

*Nesoprosopis homoeochroma*, Daly, 1994:116 (type not located).

**DIAGNOSIS.** Small bees with slightly smoky wings. Male face with three nearly separate marks (clypeus except the basal and lateral edges and paraocular areas up to or slightly above antennal sockets, but not the supraclypeal area); frons with dark spot in middle; scape moderately dilated and with long hair along median edge; pronotum and legs marked



with yellow. Closely related to *H. crabronoides*, but without a thick head and with a large impunctate area above antennal socket. Female face with lower paraocular area with irregular triangular yellow mark along the eye and up to level of antennal socket, rarely with a transverse apical mark on the clypeus; pronotum with yellow stripes on collar at sides and yellow lobes; legs with small, basal yellow spots on tibiae. Similar to *H. dumetorum*, but with the upper frons smooth and lustrous; see remarks for that species.

**Distribution.** Hawaii, Oahu (new record), and Kauai (new record), possibly Maui; montane wet to mesic forest.

**Male.** Measurements: Malar space, 3; eye, 90:90:83:52; clypeus, 47×46; frons, 15×17:70; interalveolar, 15:18:41:49, D 15; interocellar, 24:26:13:23, D 13; scape, 32×23; wing length, 3.6 mm, estimated (Hawaii, Kilauea, 4000 ft, BPBM 3602).

**Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area at the sides with nearly round pits less than 1 pit width apart; frons with pits becoming crowded medially and distorted in subpolygonal shapes; a dark rhomboid spot at the middle created by dense black or dark brown hairs and very dense punctation; large impunctate shiny area just below spot and above antennal socket. Lower paraocular depression shallow, sometimes indistinct. Frontoclypeal sulcus nearly straight. Scape in frontal view moderately dilated, width more than half length, ratio about 0.7; lateral edge in frontal view nearly straight; slightly arched in lateral view with maximum arch near middle of scape; underside of median edge with a groove; with long, simple, pale brownish hair. Vertex hair 10-22, pale brown, simple.

**Mesosoma.** Scutum with indistinct, shallow pits about 2 pit widths apart, ground granular, dull; hair medium-length (8-14), pale brown, simple. Scutellum pits slightly larger, ground smoothly coriaceous and slightly lustrous. Mesepisternum with indistinct to barely discernible pits about 1-2 pit widths apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum slightly lustrous. Basal area of propodeum with rather long anterior area; sparse, weak, lineate rugae at front and extended about a quarter or less to brow, brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, shiny, with fine, pale, appressed hairs spaced about one hair length apart. T7 hair long, dark brown, erect.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with short, rounded tips. Apices of gonoforceps longer than penis valves, curved inward.

**Color.** Labrum and mandible blackish brown to black. Face with three marks: clypeus largely yellow except dark margin basally along epistomal sulcus above tentorial pits; paraocular area largely yellow to level of antennal socket or slightly above; supraclypeal area and scape unmarked. Pronotum with transverse collar stripe interrupted medially; lobes yellow. Fore leg dark brown except femur with apex yellow; tibia with pale area and dorsal yellow stripe; basitarsus mostly yellow; terminal tarsal segments yellowish brown to light brown. Mid leg dark brown to black except: femur with very apex yellow; tibia with basal and sometimes distal yellow spots; basitarsus mostly yellow. Hind leg dark brown to black except: tibia with yellow stripe in basal third; basitarsus yellow in basal half. Some

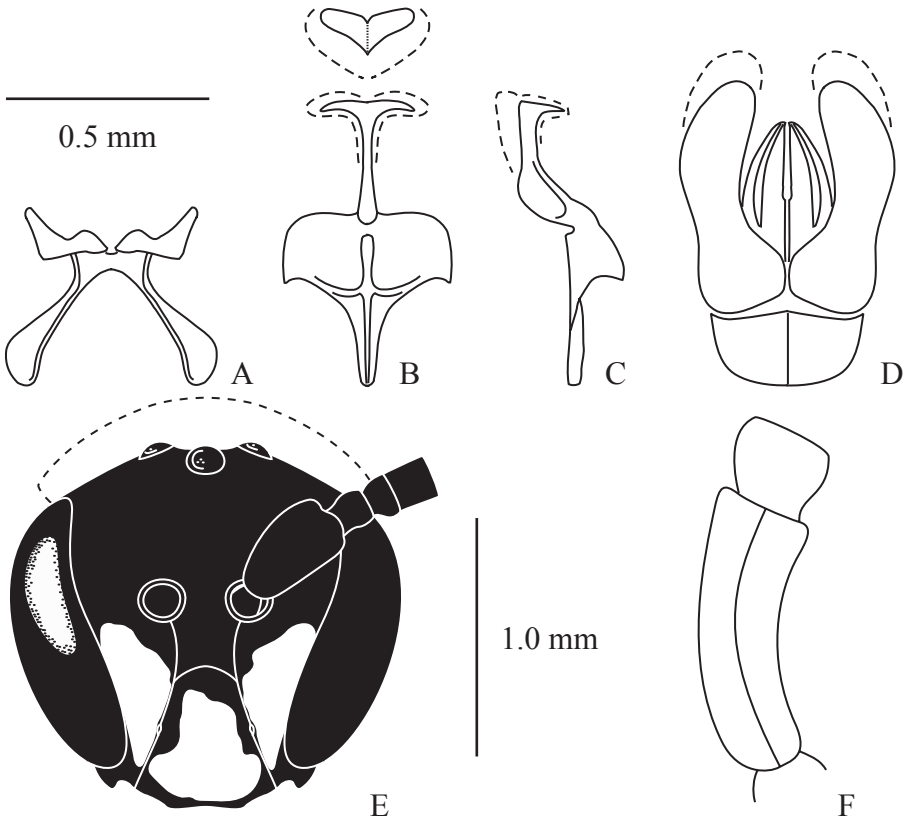


Fig. 63. *Hylaeus specularis*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

Kauai specimens lack marks on lobes and have leg markings reduced to obscure spots. Wings slightly smoky.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons convex; upper paraocular area with nearly round pits less than 1 pit width apart, ground lustrous to shiny; frons with pits crowded medially and partly distorted in shape, ground distinctly duller between antennal sockets and median ocellus, and at the middle a few fine, longitudinal carinulae; frontal line, if any, distinct only near acme; small shiny area just above antennal socket. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-12(-20), pale brown, simple.

**Mesosoma.** Fore tarsus with hair apically curved. Scutum with indistinct, shallow pits about 2 pit widths apart, ground granular, dull to slightly lustrous; hair short (4-10), brown,

simple. Scutellum pits slightly larger, ground smoothly coriaceous and slightly lustrous. Mesepisternum with barely discernible pits about 2-3 pit widths apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous, lustrous. Hypoepimeron impunctate, smooth, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum with sparse, weak, lineate rugae at front and extended about a quarter or less to brow; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart. T6 hair long, dark brown, erect.

**Color.** Head and mesosoma dark brown to black; metasoma dark brown to black. Face marks: clypeus with or without thin, apical, transverse stripe; lower paraocular area with irregular triangular yellow mark along the eye and up to level of antennal socket; supraclypeal area unmarked. Pronotum with transverse collar stripe yellow, interrupted medially; lobes yellow. Legs dark brown except fore tibia with pale area; tibiae with small, basal yellow spots (lacking in Kauai specimens). Wings slightly smoky.

**Perkins' collections. Hawaii:** Kilauea (BMNH).

**Recent collections. Hawaii:** Kona Forest Unit of Hakalau National Wildlife Refuge, South Boundary Rd., 5200 ft; camp, 5300 ft. **Maui?:** W. Maui, Honokohau, 900 m, 26-II-1972, J. L. Gressitt (BPBM). **Oahu:** Manana Trail, 1800 ft. **Kauai:** Awaawapuhi Trail, 3800 ft; Na Pali Kona Forest Reserve, 4100 ft.

**Flower records.** *Cheirodendron*, *Claoxylon*, *Metrosideros*, *Myoporum*, *Scaevola procera*.

**Remarks.** Both Perkins (1911:723) and Fullaway (1918:395) commented on the possible synonymy of *H. specularis*, described from the female taken at Kilauea, and *H. homoeochromus*, described later from the male taken at Kilauea. The only type available is that of *H. specularis*. *Hylaeus homoeochromus* is treated here as a junior synonym because males and females that match the descriptions of the respective taxa have been collected together by D. T. Fullaway and KM, and have been genetically associated. Two females from Maui appear to be this species, although the impunctate area next to the lateral ocellus is not as shiny as in other specimens. Regardless of their identity, the recent discovery of this species on Kauai and Oahu means that it almost certainly inhabits Maui Nui as well. Males from Kauai have consistently broader, more curved, and more pointed gonoforceps than Hawaii specimens. Males from Oahu were not available to compare. Although found on many islands, it appears to be local and rare on all.

See also remarks for *H. crabronoides* and *H. dumetorum*.

**References.** Perkins, 1907b: 97 (record: Hawaii, Kilauea). *Hylaeus homoeochromus*: Meade-Waldo, 1923:35 (list).

### *Hylaeus (Nesoprosopis) sphecodoides* (Perkins)

(Fig. 64)

*Nesoprosopis sphecodoides* Perkins, 1899:105-106 (♂ ♀; cleptoparasite of *H. difficilis*).

*Hylaeus (Nesoprosopis) sphecodoides*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis sphecodoides*, Daly, 1994:119 (lectotype ♂ BMNH 17a-137b; Hawaii, Kau, 4000 ft; wing length, 4.5 mm).

**DIAGNOSIS.** Medium-sized cleptoparasitic bees with clear to slightly smoky wings and with or without red basal terga. Male face with three separate yellow marks (clypeus, paraocular areas), malar space very short, scape slightly dilated. Female face black or dark reddish, paraocular areas not marked, clypeus emarginate, frons with indistinct punctures, fore tarsus with straight hair. See discussion of cleptoparasites under *H. hilaris*.

**Distribution.** Hawaii; coastal to montane dry shrubland and dry to mesic forest.

**Male.** Measurements: Malar space, 3; eye, 120:106:102:72; clypeus, 56×61; frons, 22×23:88; interalveolar, 15:26:54:61, D 18; interocellar, 28:31:23:31, D 15; scape, 46×24; wing length, 4.4 mm (Hawaii, Kau, 4000 ft, BPBM 3604).

**Head.** Malar space very short (ratio about 0.2-0.3 DMO). Upper paraocular area with indistinct, round pits 1-2 pit widths apart, may be obscured by minute, parallel wrinkles; frons with pits more distinct medially, smaller, and contiguous; middle dull with dense pits; with or without fine frontal line; large impunctate areas above antennal sockets. Lower paraocular depression absent. Frontoclypeal sulcus straight. Scape in frontal view slightly dilated, width half length, ratio about 0.5; lateral edge in frontal view nearly straight; slightly arched in lateral view; no groove on underside; with medium-length, white, weakly plumose hair. Vertex hair 6-10, white, plumose.

**Mesosoma.** Scutum with pits about 1 pit width apart or less, ground slightly lustrous; hair short (6-8), white, plumose. Scutellum similar. Lateral carina of front coxa lamellate, produced into a short spine (Fig. 8D). Mesepisternum with indistinct, shallow pits about 1 pit width apart, and long, white, plumose hair; ground nearly smooth, slightly lustrous. Hypoepimeron impunctate or with weak punctation, smooth, slightly lustrous, slightly swollen. Metanotum slightly lustrous. Basal area of propodeum lineately or reticulately rugose to poorly defined brow, shiny between rugae at front; brow minutely wrinkled, dull.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, very short, pale, appressed hairs spaced more than a hair length apart. T7 hair short, yellowish white to pale brown, prostrate.

**Terminalia.** Lateral process of S7 parallel-sided, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with short, triangular tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible blackish brown to black. Face with three separate marks: clypeus with large, central yellow spot surrounded by dark cuticle; lower paraocular area mostly yellow below antennal socket or extended in a narrowing stripe to just above socket; supraclypeal area and scape unmarked. Pronotum unmarked. Head and mesosoma black; metasoma with basal 1-2 segments reddish brown and apical segments dark brown or entire metasoma dark blackish brown to light brown. Legs dark brown to blackish brown, unmarked except pale area on fore tibia and pale brown fore basitarsus; tibiae and tarsi may be reddish brown. Wings clear to slightly smoky.

**Female. Head.** Malar space very short (ratio about 0.2 DMO). Upper paraocular area with shallow, indistinct pits about 1 pit width apart, ground with or without minute parallel wrinkles; in some bees, frons with pits smaller medially, closer, and obscure at middle, in other bees pits distinct near middle; with or without a fine frontal line; large impunctate

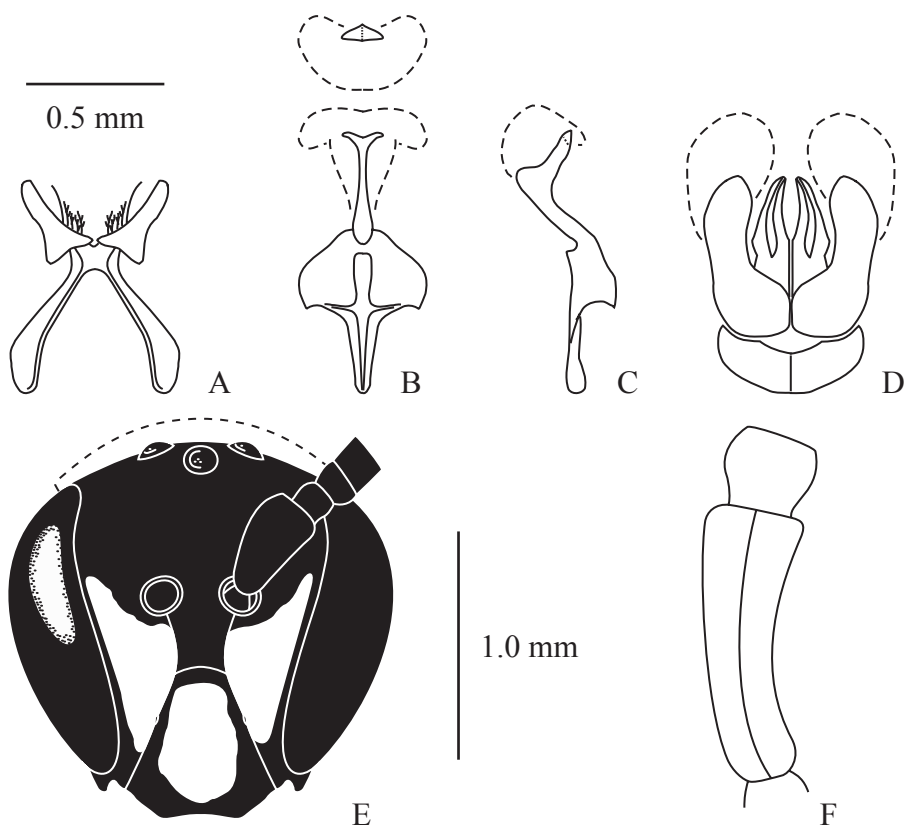


Fig. 64. *Hylaeus sphecodoides*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

areas above antennal sockets. Apex of clypeus deeply emarginate. Dorsal end of facial foveae not or barely extended to level of lateral ocelli. Vertex hair 6-10, white, plumose.

**Mesosoma.** Fore tarsus with hair short, straight (see Fig. 8B). Scutum with pits about 1 pit width apart, ground slightly granular, making pits less distinct, dull to slightly lustrous; hair short (2-6), white, plumose. Lateral carina of front coxa lamellate, produced into a short spine. Mesepisternum with indistinct or distinct, shallow pits about 1 pit width apart, and yellowish white, plumose hair; ground nearly smooth to minutely wrinkled, slightly lustrous. Hypoepimeron impunctate, ground with minute, parallel, longitudinal wrinkles; nearly flat. Metanotum dull. Basal area of propodeum lineately rugose to poorly defined brow, shiny between rugae at front; brow minutely wrinkled, dull.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous; with fine, extremely short, pale, appressed hairs many hair lengths apart. T6 hair medium to long, light brown, prostrate.

**Color.** Head and mesosoma dark reddish brown to black; metasoma with basal 2 segments somewhat pale or reddish brown and apical segments dark to light brown. Face and pronotum unmarked. Legs brown to dark brown except pale area on fore tibia; unmarked. Wings clear to slightly smoky.

**Perkins' collections. Hawaii:** Kau, 4000 ft (BMNH, BPBM, OUMNH); Kilauea (BPBM, OUMNH); Kona, 4000 ft (BMNH, BPBM).

**Recent collections. Hawaii:** Kipuka Nene, 2900 ft; Keauhou Ranch, 4500 ft; Kipuka Alala, 6100 ft; South Point, coast.

**Flower records.** None.

**Remarks.** *Hylaeus sphecodoides* and *H. volatilis* have melanic forms with no red on the metasomal terga and, in *H. volatilis*, entirely black with no yellow marks (see remarks for that species). See also discussion of cleptoparasites under *H. hilaris*.

**References.** Perkins, 1907b: 97 (record: Hawaii, Kilauea); 1910:603 (key). Suehiro, 1986:61 (record: Hawaii, Kona).

***Hylaeus (Nesoprosopis) takumiae* Magnacca and Daly, new species**  
(Fig. 65)

**DIAGNOSIS.** Medium-sized bees with an unusual shiny area between the lateral ocellus and eye, unusually long malar space, and clear wings. Male face without marks or only a subapical yellow spot on clypeus, and unusual extremely dilated scape. Female black and unmarked. See remarks.

**Distribution.** Maui; subalpine dry shrubland.

**Male.** Measurements: Malar space, 12; eye, 120:118:105:76; clypeus, 64×69; frons, 25×25:88; interalveolar, 15:25:51:64, D 15; interocellar, 25:35:20:34, D 16; scape, 39×42; wing length, 4.3 mm (holotype).

**Head.** Malar space long (ratio about 0.8 DMO). Upper paraocular area with sparse, scattered, nearly round pits and minutely striate, lustrous ground; frons to middle distinctly different with small dense pits, distorted, and contiguous, with dull ground; densely punctured area extended ventrally to antennal sockets; frontal line mostly obscured by dense pits; conspicuous impunctate, shiny area between lateral ocelli and eye. Lower paraocular area with distinct depression, impunctate, and with oblique, minute, parallel wrinkles. Clypeus with shallow pits 1 pit width apart. Upper clypeus distinctly duller than lower. Frontoclypeal sulcus arched; supraclypeal area as wide as long; clypeus protuberant, subapically convex in lateral view. Frons with long, dark brown hair. Scape in frontal view extremely dilated, cordiform, width greater than length, ratio about 1.1; lateral edge in frontal view strongly convex; moderately arched in lateral view, excavated underneath and with no groove, with maximum arch near middle of scape; with long, dark brown, simple hairs. Vertex hair 24-40, dark brown, mostly simple.

**Mesosoma.** Scutum with distinct, round pits about 1-3 pit widths apart, ground smoothly coriaceous, lustrous; hair very long (20-30 or more), brown, weakly plumose. Scutellum with pits less distinct, ground lustrous. Mesepisternum with indistinct pits about 1-2 pit widths apart, and long, brownish white to brown, plumose hair; ground minutely roughened, lustrous. Hypoepimeron obscurely punctured in lower half, swollen, lustrous. Metanotum minutely roughened, slightly lustrous. Basal area of propodeum reticulately rugose or areolate to brow, shiny between rugae; densely roughened at and below brow, but lustrous.

**Metasoma.** Disk of T2 without distinct punctation, smooth, shiny, with short, pale hairs more than a hair length apart. T7 hair long, relatively sparse, dark brown, erect.

**Terminalia.** Lateral process of S7 tapered, length subequal to width of hemisternite. Median process of S8 somewhat swollen in basal half, angled at midlength, slender in distal half, apex bifurcate with moderately long, narrow tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma black; metasoma dark reddish brown to black. Labrum and mandible black. Face usually unmarked (one bee with small, subapical yellow mark on clypeus); scape unmarked; antennal flagellum reddish yellow to pale yellow beneath, prothorax unmarked. Legs dark brown to black, unmarked except pale area on fore tibia. Wings clear, iridescent.

**Female. Head.** Malar space long (ratio about 0.8). Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Upper paraocular area with nearly round pits less than 1 pit width apart, on frons becoming medially smaller, distorted, contiguous; frontal line obscured by dense pits; conspicuous impunctate, shiny area between lateral ocelli and eye. Vertex hair 20-40, dark brown, weakly plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct pits about 1-3 pit widths apart, ground smoothly coriaceous, lustrous; hair very long (14-30), brown, weakly plumose. Scutellum with pits less distinct, ground lustrous. Mesepisternum with indistinct pits about 1-2 pit widths apart, and yellowish white, plumose hair; ground minutely roughened, lustrous. Hypoepimeron obscurely punctured in lower half, swollen, lustrous. Metanotum minutely roughened, slightly lustrous. Basal area of propodeum reticulately rugose or areolate to brow, shiny between rugae.

**Metasoma.** Disk of T2 without distinct punctation, smoothly coriaceous, lustrous, with fine, short, pale hairs spaced more than a hair length apart. T6 hair long, dark brown, erect.

**Color.** Face, scape, and pronotum unmarked. Legs dark brown to black, with or without obscure pale area on fore tibia. Wings clear.

**Holotype** ♂ labeled "Maui, Haleakala National Park, Haleakala West slope, 2865 m, 13-Jun-1997, R. Takumi" (CUIC).

**Allotype** ♀ labeled "Maui Co., Haleakala NP, malaise 2500 m, 20-Jun to 2-Jul-1991, R. Takumi" (CUIC).

**Paratypes.** Maui. Haleakala NP, NW slope between Leleiwi Trail to overlook and Halemau Trail, 2500 m, malaise trap, 1 ♂ 4 ♀ 14-20-VI, 1 ♂ 12 ♀ 20-VI to 2-VII, 1 ♂ 5 ♀ 2-5-VII, 5 ♀ 5-12-VII, 7 ♀ 12-24-VII-1991 (RT) (CUIC). Sliding Sands Tr., 2600-3000 m, 4 ♂ 17-VI-1986, F. G. Howarth; Puu Maile, 7500 ft, 2 ♂ 21-VI-1976, J. W. Beardsley; Kapalaoa, 7280 ft, 2 ♂ 18-VI-1976, J. W. Beardsley; S. of Holua, 7300 ft, 1 ♂ 4-VI-1977, A. Hara; West Kaupo Gap, 5700 ft, 1 ♂ 7-VI-1977, G. Teves (BPBM).

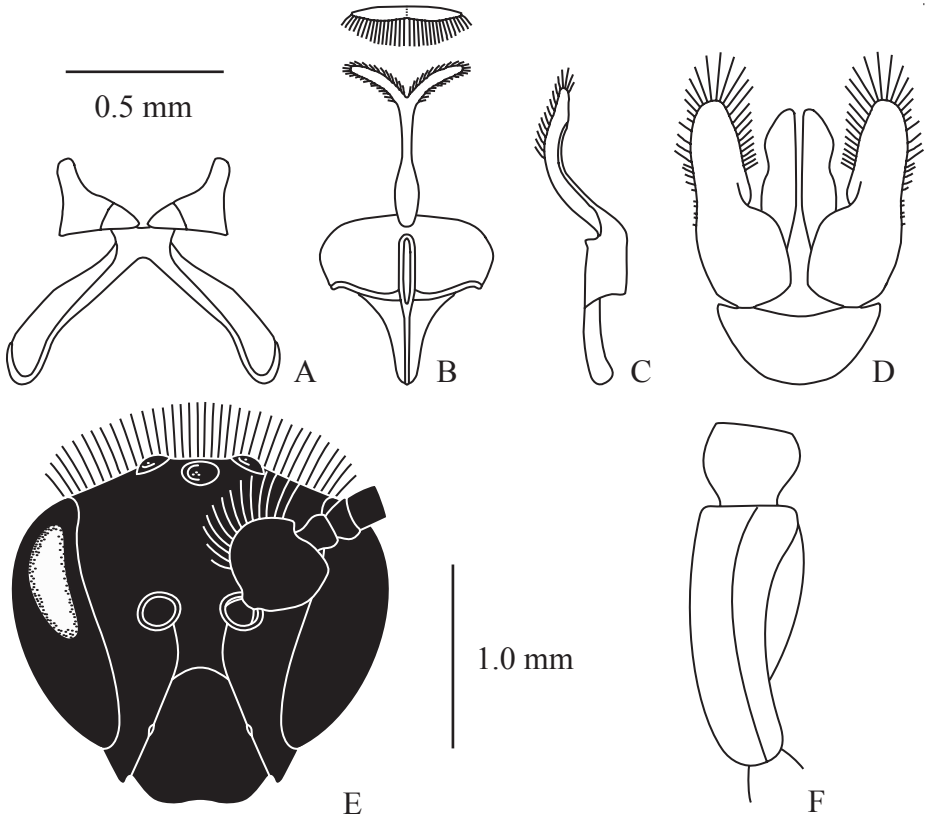


Fig. 65. *Hylaeus takumiae*, new species, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E.

**Flower records.** *Coprosma montana*, *Styphelia*.

**Etymology.** The species epithet *takumiae* is in honor of the collector, Raina Takumi.

**Remarks.** This species is an inhabitant of the subalpine shrubland of East Maui. It has been collected on the outer northwest slopes of Haleakala as well as within the summit crater at Kapalaoa Cabin. It is an unusually fast flier, much more so than the more common *H. nivicola*, and this may be part of the reason it was not collected earlier.

Common species of similar body size that occur in this general area are *H. difficilis*, *H. nivicola*, *H. volcanicus*, and the cleptoparasite *H. volatilis*. Both sexes of *H. takumiae* are distinguished from these species by an impunctate, polished, shiny area between the lateral ocellus and eye. Both sexes of the other listed species have the ocellular areas minutely textured and usually dull. The malar space of *H. takumiae* is long, with a ratio of about 0.8 DMO and is similar to that of *H. volcanicus* (the malar space of *H. nivicola* is longer and



the malar space of the other species is usually shorter). The females of *H. takumiae* have the basal area of the propodeum reticulately rugose, whereas those of *H. volcanicus* have the basal area lineately rugose. Males of *H. takumiae* are distinguished from the other listed species by the extremely dilated, cordiform scape (all other species listed have much less dilated scapes). However, *H. satelles*, not recently collected in this area, has a similarly dilated scape in the male and shiny areas next to the lateral ocelli in both sexes. Both sexes of *H. satelles* are larger in body size, with punctured metasomal terga, dark wings, and short malar areas.

***Hylaeus (Nesoprosopis) unicus* (Perkins)**

(Fig. 66)

*Nesoprosopis unica* Perkins, 1899:88 (♂; holotype ♂ BMNH 17a 123; Oahu, Honolulu Mt., 2000 ft).

*Hylaeus (Nesoprosopis) unicus*, Meade-Waldo, 1923:34 (list).

*Nesoprosopis unica*, Daly, 1994:116 (holotype confirmed).

*Nesoprosopis laticeps* Perkins, 1899:88-89 (♂ ♀; Pl. 2, Fig. 15) (new synonymy).

*Hylaeus (Nesoprosopis) binominatus* Meade-Waldo, 1923:34 (list; replacement name for *Nesoprosopis laticeps* Perkins, a junior homonym of *Hylaeus laticeps* Morawitz) (new synonymy).

*Prosopis avara* Warncke, 1970:747 (unwarranted replacement name for *Hylaeus laticeps* Perkins) (new synonymy)

*Nesoprosopis laticeps*, Daly, 1994:117 (lectotype ♂ BMNH 17a 124b; Molokai, Mts., 4000 ft; wing length, 5.4 mm).

**DIAGNOSIS.** Medium-sized bees with clear to smoky wings and unique, extremely wide supraclypeal area. Male face black or with yellow mark in lower paraocular area or also clypeus; scape moderately dilated and with lateral margin concave and unusual maximum arch near apex. Female black and unmarked or with small yellow marks on paraocular areas and sides of pronotal collar.

**Distribution.** Maui (new record), Lanai, Molokai, and Oahu; montane wet and mesic forest.

**Male.** Measurements: Malar space, 3; eye, 108:114:108:66; clypeus, 55×65; frons, 15×34:74; interalveolar, 25:22:46:52, D 22; interocellar, 31:34:22:31, D 18; scape, 39×28; wing length, 4.7 mm (*H. unicus* holotype).

**Head.** Malar space very short to short (ratio about 0.2-0.3 DMO). Upper paraocular area and frons with nearly round pits about 1 pit width apart, pits closer but still nearly round near middle, ground minutely wrinkled and slightly lustrous between pits; middle area between median ocellus and acme with faint frontal line or only a few fine longitudinal wrinkles. No distinct impunctate area above antennal socket. Lower paraocular depression distinct, but shallow. Supraclypeal area much wider than long, W/L ratios 1.8-2.6. Frontoclypeal sulcus arched. Scape in frontal view slightly to moderately dilated, width more than half length, ratios about 0.6-0.8, widest near apex; lateral edge in frontal view straight or slightly concave and slightly angled at apex; strongly arched in lateral view with

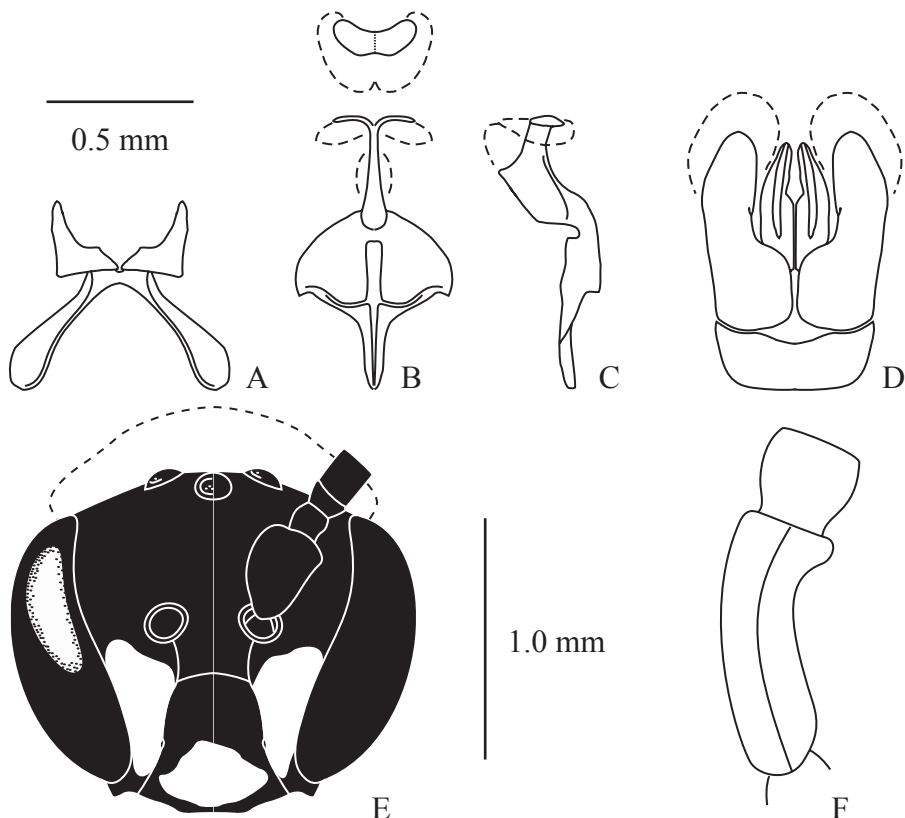


Fig. 66. *Hylaeus unicus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

maximum arch nearer apex of scape, apex expanded; no groove on underside; with long, brown, mostly simple hair. Vertex hair 16-30, brown, mostly simple.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground dull; hair medium to long (8-16), brown, mostly simple. Scutellum with very slightly larger pits, ground slightly lustrous in contrast to scutum. Mesepisternum with indistinct, shallow, round pits, about 1 pit width apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum with sparse, lineate to nearly reticulate rugae extended about halfway to brow; brow smoothly coriaceous and lustrous to shiny.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or less. T7 hair long, brown, erect.

**Terminalia.** Lateral process of S7 tapered, with length subequal to width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with broad tips. Apices of gonoforceps subequal to penis valves.

**Color.** Head and mesosoma black; metasoma dark brown to blackish brown. Labrum and mandible blackish brown to black. Facial marks highly variable: unmarked (Maui Nui); or with small triangular mark in lower paraocular area below level of antennal socket, with or without a subapical clypeal mark (Maui Nui); or with lower paraocular area largely or entirely yellow below antennal socket and clypeal mark large, up to entire apical half of clypeus except margins (Oahu). Supraclypeal area and scape unmarked. Pronotum unmarked or with small yellow marks at sides of collar. Legs black, fore tibia and apex of fore femur with pale area; small, obscure yellow spot at base of fore tibia, up to half length in some specimens; small subapical yellow mark on mid tibia present in some specimens; obscure yellowish marks at bases of mid and hind tibiae present in some specimens; basitarsi with or without yellow marks. S6 pale yellow. Wings clear to smoky.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with nearly round pits about 1 pit width apart, pits mostly evenly spaced and nearly round even near the middle, ground minutely wrinkled and slightly lustrous between pits; no impunctate area above antennal socket; faint frontal line. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 14-20(-24), brown, weakly plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct pits, 1-2 pit widths apart, ground dull; hair medium-length (6-12), brown, simple. Scutellum with pits slightly larger, ground lustrous in contrast to scutum. Mesepisternum with indistinct, shallow, round pits, about 1-2 pit widths apart, and long, yellowish white, weakly plumose hair; ground minutely coriaceous, slightly lustrous. Hypoepimeron impunctate, lustrous, slightly swollen. Metanotum dull. Basal area of propodeum weakly lineately rugose less than halfway to brow; brow smoothly coriaceous and lustrous.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, lustrous, with fine, pale, appressed hairs spaced about one hair length apart or less. T6 hair long, dark brown to black, erect.

**Color.** Head and mesosoma black; metasoma and legs blackish brown; unmarked or with small yellow stripes on lower paraocular areas and sides of pronotal collar. Wings smoky.

**Perkins' collections.** *Nesoprosopis laticeps*: **Lanai**: Halepaakai, 3000 ft (BPBM); Koele Mts., <3000 ft (BPBM), 3000 ft (BMNH, BPBM, OUMNH); "Lanai," 2000 ft (BMNH). **Molokai**: "Molokai," 4500 ft (OUMNH); Molokai Mts., 4000 ft (BMNH). *N. unica*: **Oahu**: Honolulu, 2000 ft (BMNH); Pauoa Valley, head of (BPBM); Waialua, 1800 ft (BPBM).

**Recent collections.** **Maui**: Puu Kukui Rd., 2300 ft; Haelaau Cabin, 3000 ft; Puu Kukui Tr., 3700 ft. **Lanai**: Munro Trail, 3000 ft. **Molokai**: Kawela intake, 3600 ft; Pepeopae boardwalk, 4000 ft; Kamakou Rd., 3200 ft. **Oahu**: Puu Kaua, 2600 ft; Wiliwilinui Trail, 2000 ft; Papali Ridge, 1500 ft; Koolau Summit Trail, 2300 ft; Mt. Kaala, 4000 ft.

**Flower records.** *Acacia*, *Cheirodendron*, *Dubautia laxa*, *Metrosideros*, *Psychotria fauriei*, *Scaevola chamissoniana*, *S. gaudichaudiana*, *Tetraplasandra oahuensis*.

**Remarks.** Fullaway (1918:394) pointed out the possible synonymy of *H. kauaiensis* with *H. unicus* and *H. binominatus*, known then as *N. laticeps*. Although clearly allied, *H. kauaiensis* is structurally distinct from bees referred to the other two names. However, *H. unicus* described from Oahu and *H. binominatus* from Lanai and Molokai are considered here to apply to one species under the name *H. unicus*. This name has page precedence and is not involved in homonymy. Males are closely similar in the extreme width of the supraclypeal area; shape, dilation, and arch of the scape; propodeal sculpture; and terminalia. On Oahu males are less melanic: a large or small spot on the clypeus, large triangular marks on the paraocular areas, marks at the sides of the pronotal collar, yellowish marks at the bases of the mid and hind tibiae and tarsi, and wings slightly smoky (the figure is of an Oahu specimen). Some females from Oahu have small yellow stripes on the paraocular areas, marks at the sides of the pronotal collar, and smoky wings. On Maui and Lanai the face of males is entirely dark or with triangular marks or traces of yellow in the paraocular areas; no marks on the pronotum or legs; and smoky wings. Females are unmarked and with smoky wings.

**References.** Perkins, 1910:603 (key). Swezey, 1913:198 (record: Oahu, Punaluu); 1922:14 (nest: in *Pipturus* twig; parasitoid: *Eupelmus* near *E. euprepes*; record: Oahu, Tantalus); 1954:167 (nest: in *Pipturus*; record: Oahu, Tantalus). *Nesoprosopis laticeps*: Perkins, 1910:603 (key); 1913:79 (biogeography).

### *Hylaeus (Nesoprosopis) volatilis* (F. Smith)

(Fig. 67)

*Prosopis volatilis* F. Smith, 1879a: 683-684; 1879b: 21-22 ( $\sigma$ ; holotype  $\sigma$  BMNH 17a 152, "Kauai," but see Blackburn and Cameron [1886:148], who stated that Oahu is correct type locality and Perkins [1899:105] does not record collections from Kauai; wing length, 4.2 mm).

*Nesoprosopis volatilis*, Perkins, 1899:105 ( $\sigma$  ♀; cleptoparasite of *N. assimulans oahuensis*, *N. facilis*, *N. difficilis*).

*Hylaeus (Nesoprosopis) volatilis*, Meade-Waldo, 1923:34 (list).

*Hylaeus volatilis* Houston, 1981:50 (resolution of error involving the type label of *N. volatilis* on the wrong specimen).

*Nesoprosopis volatilis*, Daly, 1994:120 (holotype confirmed).

**DIAGNOSIS.** Medium-sized cleptoparasitic bees with clear to slightly smoky wings and with or without red basal terga. Male face marks variable from no marks to entire lower face yellow (clypeus, supraclypeal area, and paraocular areas) and extended above antennal sockets in narrowing stripe, scape slightly dilated. Female face black or dark reddish, paraocular areas not marked, clypeus emarginate, frons with distinct punctures, fore tarsus with straight hairs. See discussion of cleptoparasites under *H. hilaris*.

**Distribution.** Maui, Lanai, Molokai, and Oahu; coastal to subalpine dry shrubland. Recent collections only from Maui.

**Male.** Measurements: Malar space, 4; eye, 146:125:120:79; clypeus, 70×67; frons, 24×26:100; interalveolar, 18:29:61:69, D 18; interocellar, 28:36:28:38, D 15; scape, 51×29; wing length, 4.9 mm (Oahu, Waianae, 2000 ft, BPBM 3639).

**Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area with round pits 1-2 pit widths apart, ground with minute parallel wrinkles (bees with stronger wrinkles have indistinct pits); frons with pits becoming contiguous medially and smaller, ground smoother, middle not distinguished by wrinkles or a frontal line; frons slightly lustrous overall; large, impunctate, lustrous area above antennal sockets. General area of vertex and frons slightly swollen and gently convex. Lower paraocular depression absent. Frontoclypeal sulcus nearly straight to slightly arched. Scape in frontal view slightly dilated, width a little more than half length, ratio about 0.6; lateral edge in frontal view straight to slightly concave; slightly arched in lateral view; no groove on underside; with short, yellowish white, mixed simple and plumose hair. Vertex hair 8-14, white, plumose.

**Mesosoma.** Scutum with pits 1-2 pit widths apart, ground smoothly coriaceous, slightly lustrous; hair short (6-8), white, plumose. Scutellum with slightly larger pits, slightly lustrous. Lateral carina of front coxa lamellate, produced into a short spine. Mesepisternum with distinct, round pits about 1 pit width apart, and long, white, plumose hair; ground smoothly coriaceous, slightly lustrous. Hypoepimeron impunctate, smooth, swollen. Metanotum dull. Basal area of propodeum short, rather flat and without definite brow, roughened overall with lineate rugae at front, becoming more indistinct and reticulate distad, shiny between rugae at front.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, shiny; with fine, short, pale, appressed hairs spaced about one hair length apart; without bands of hairs. T7 hair short, brown, appressed.

**Terminalia.** Lateral process of S7 parallel-sided, length greater than width of hemisternite. Median process of S8 moderately dilated, apex bifurcate with short, triangular tips. Apices of gonoforceps subequal to penis valves.

**Color.** Labrum and mandible yellowish brown to brown, or black in melanic bees. Face variable, with a single large spot, three separated marks, two marks only on paraocular areas, or unmarked: clypeus entirely yellow to unmarked; paraocular area entirely yellow extended in narrow vitta to well above antennal socket, or only small spot, or unmarked; supraclypeal area variable, from unmarked to yellow to acme; scape with yellowish lateral margin or unmarked. Metasoma with two basal segments and base of third segment red and apical segments dark brown, or metasoma entirely black in melanic bees. Pronotum unmarked. Legs dark brown to black except: fore tibia with pale area with or without yellowish, dorsal stripe; fore basitarsus yellowish brown to light brown, or black in melanic bees; all tibiae with reddish areas at base. Wings clear to slightly smoky.

**Female. Head.** Malar space short (ratio about 0.3 DMO). Upper paraocular area and frons with round pits 1-2 pit widths apart; bees from Oahu and some from Maui have ground with minute, parallel, dull wrinkles and indistinct pits at sides and near the middle, pits more distinct in the intervening area; some bees from Maui have distinct pits with lustrous, smooth ground across areas; with or without a fine frontal line; large, impunctate,

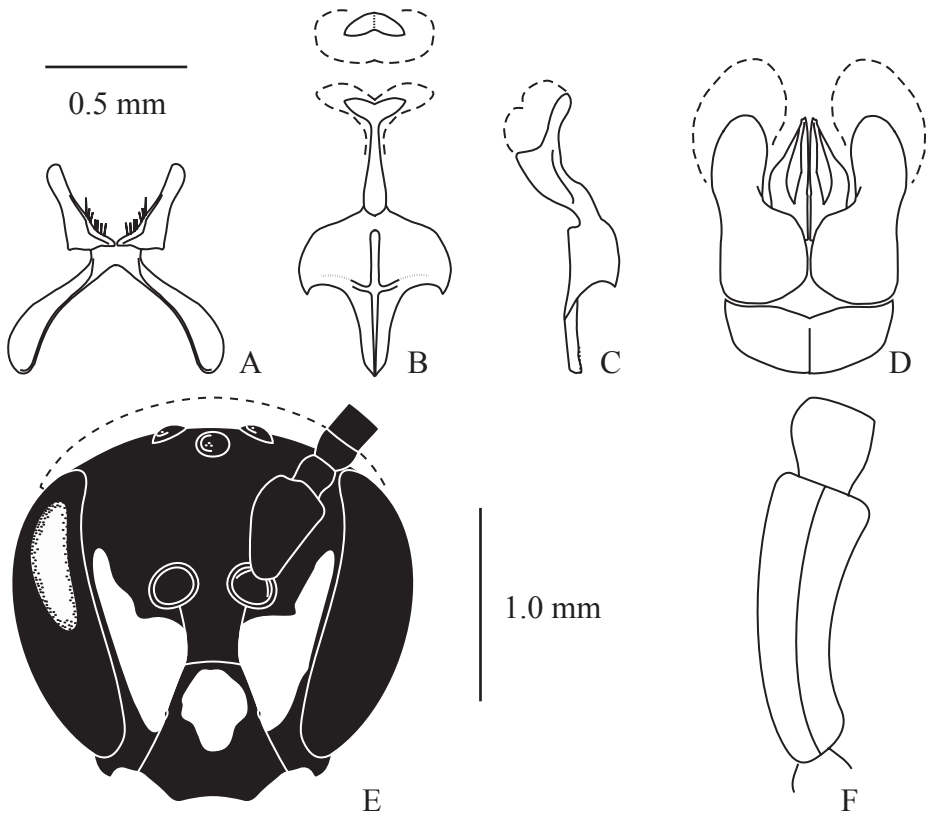


Fig. 67. *Hylaeus volatilis*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

lustrous area above antennal sockets. Apex of clypeus deeply emarginate. Dorsal end of facial foveae not extended to level of lateral ocelli. Vertex hair 4-8, white, plumose.

**Mesosoma.** Fore tarsus with hairs short, straight (see Fig. 8B). Scutum with pits 1-2 pit widths apart, ground smoothly coriaceous, slightly lustrous; hair very short (2-4), white, simple. Lateral carina of front coxa lamellate, produced into a distinct spine. Mesepisternum with round pits about 1 pit width apart, and medium-length, yellowish white, plumose hair; pits distinct in some bees with smooth ground, in other bees pits partly obscured by minutely roughened, wrinkled or striate ground; dull to slightly lustrous. Hypoepimeron impunctate, striate, slightly swollen. Metanotum dull. Basal area of propodeum short, rather flat and without definite brow, roughened overall with lineate rugae at front, becoming less distinct and reticulate distad, shiny between rugae at front.

**Metasoma.** Disk of T2 impunctate, smoothly coriaceous, shiny; with fine, extremely short, pale, appressed hairs many hair lengths apart; without bands of hairs. T6 hair long, light brown or brown, appressed.

**Color.** Head and mesosoma black; metasoma with basal two or three segments red and apical segments reddish brown or entirely dark reddish brown (nearly black) in melanic bees. Face marks: clypeus, lower paraocular areas, supraclypeal area, mandibles, and lateral margin of scape an obscure reddish color, or face entirely black in melanic bees. Pronotum unmarked. Legs without yellow marks, dark brown to black except: fore tibia with pale area, fore legs yellowish brown, brown, or black, all tarsi reddish brown. Wings clear to slightly smoky.

**Perkins' collections. Maui:** E side Haleakala, 7-10,000 ft (OUMNH); Iao Valley (BPBM), far up (BPBM); "Maui" (BPBM); Wailuku (BMNH, BPBM), sandy isthmus (OUMNH). **Lanai:** Lanai, 2000 ft (BMNH). **Molokai:** Kaulawai (BPBM); Molokai, far west end (BPBM); Molokai Mts., 3000 ft (BMNH, BPBM, OUMNH); Molokai, plains (BPBM). **Oahu:** Honolulu (BPBM), 2000 ft (BMNH); Honolulu Mts., 1500 ft (BPBM); Waianae (OUMNH), 2000 ft (BPBM); Waianae, Makana coast (BPBM); Waianae Mts, 2000 ft (BMNH, BPBM), 2-3000 ft (BPBM).

**Recent collections. Maui:** Haleakala N. P. Visitor Center, 2975 m; above Hosmer Grove, 2100 m; Kalahaku, 2835 m; Kuiki, 2170 m; Kaluaiki, 2225 m; Laie, 2040 m; Lauulu Trail., 1955 m; Oili Puu, 2040 m; Paliku, 1830-1950 m; Puu Maile, 2195 m; Waikane, 2010 m; Halemauu Tr., 7800-8000 ft; Waikamoi Preserve boardwalk, 6400 ft; Puu Keokea, 7100 ft; Kaupo Tr., 5500 ft; Lahainaluna, 1800 ft.

**Flower records.** *Styphelia*.

**Remarks.** *Hylaeus volatilis* exhibits considerable variation in body size and the pattern of yellow marks. Perkins (1913:lxxix) noted that *H. volatilis* ranges from coasts to 9000 ft in the mountains. He also observed that cleptoparasites may vary in size according to the size of the host's provisions and could be exceptionally large when the hosts were large (1913:lxxxi; see also Michener 2000:30). Collections of this species on Haleakala yielded bees ranging in size (wing length) from 4.0 to 5.1 mm and with one male at 3.5 mm. At Haleakala, the common probable hosts are *H. difficilis*, *H. nivicola*, *H. takumiae*, and *H. volcanicus*, all of which are about the same size. The cleptoparasites in this area exhibit variation in the extent of melanism. Males range from individuals with yellow marks and red basal terga to melanic individuals that are almost entirely dark brown to black. Among 41 males collected during 1991-1997, the faces of 6 (15%) are marked with at least some yellow on the paraocular areas (extended up along the eye in well-defined, narrow stripe above the level of the antennal socket or more frequently reduced to an obscure spot at each side); less commonly also on the clypeus as a central spot; and with the basal 1 to 3 metasomal segments partly red. Intermediate bees (16, or 39%) have the face black or nearly so and with at least the basal metasomal tergum partly red. Melanic bees (19, or 46%) have the face and metasoma black; many retain a small red spot laterally on T1. Regardless of the degree of melanism, males have the following features in common: subglabrous metasomal terga without pubescent margins; basal half of the propodeal area with coarse rugae, mainly linear and longitudinal, with the ground flat and shiny between



rugae; apical half of the propodeal area less shiny with finely reticulate rugae; S7 with long lateral processes; median process of the S8 moderately dilated and pubescent at the flexure and the slender apex bifid with short, pubescent tips; and similar male genitalia with long, apical, weakly plumose hair. Among 36 females collected during 1991-1997, 7 (19%) have the clypeus, and rarely also the lower paraocular areas to the level of the antennae, a diffuse red color; the mandibles, scape, and fore tibia (both in frontal view) and up to 3 basal metasomal segments are partly red. Intermediate females (28, or 78%) have the face and scape black or nearly so, reddish fore tibiae, and up to 2 basal metasomal segments red. The single melanic female has only the fore tibiae reddish. All females have an emarginate clypeus, and as in the males, the coarse sculpture on the basal half of the propodeum and subglabrous metasoma.

See discussion of cleptoparasites under *H. hilaris*.

**References.** Blackburn and Kirby, 1880:85 (record). Blackburn and Cameron, 1886:148 (record, key); 1887:207-208 (record, key). Dalla Torre, 1896:35 (list). Perkins, 1907a: 43 (record: Oahu, Tantalus); 1910:604 (key); 1913:79 (biogeography). Michener, 1965:129 (list; see Houston, 1981:50). Beardsley, 1980:40 (record: Maui, Haleakala).

### *Hylaeus (Nesoprosopis) volcanicus* (Perkins)

(Fig. 68)

*Nesoprosopis volcanica* Perkins, 1899:83 (♂ ♀; Pl. 2, Fig. 12).

*Hylaeus (Nesoprosopis) volcanicus*, Meade-Waldo, 1923:33 (list).

*Nesoprosopis volcanica*, Daly, 1994:119 (lectotype ♂ BMNH 17a 135a; Hawaii, Kau, 4000 ft; wing length, 4.9 mm).

**DIAGNOSIS.** Medium-sized bees with clear wings. Male with long malar space, scape slightly dilated, face with oval yellow mark (clypeus, supraclypeal area, lower paraocular areas) divided by fine black sulci, lateral process of S7 narrow, and median process of S8 not dilated and with long narrow tips. Female with medium to long malar space; black and unmarked. For similar species, see remarks for *H. nivicola* and *H. difficilis*.

**Distribution.** Hawaii and Maui; dry montane and subalpine shrubland, usually on recent lava flows.

**Male.** Measurements: Malar space, 12; eye, 131:118:108:77; clypeus, 69×69; frons, 26×24:91; interalveolar, 15:23:54:61, D 22; interocellar, 31:33:23:33, D 15; scape, 46×22; wing length, 4.6 mm (Hawaii, Kau, 4000 ft, BPBM 3653).

**Head.** Malar space long (ratio about 0.8-1.0 DMO). Upper paraocular area and frons with nearly round pits less than 1 pit width apart, ground minutely wrinkled, dull; minute, parallel wrinkles down along the eye; median, impunctate, slightly lustrous area above antennal sockets, with a minute, central, elliptical hole in some bees. Lower paraocular depression distinct. Frontoclypeal sulcus arched. Scape in frontal view slightly dilated, width half length, ratio about 0.5; lateral edge in frontal view nearly straight or slightly concave; slightly arched in lateral view with maximum arch near middle of scape; no groove on underside; with medium-length, yellowish white, mixed simple to weakly plumose hair. Vertex hair 16-20, brown, simple to weakly plumose.



**Mesosoma.** Scutum with indistinct pits 1-2 pit widths apart, ground minutely wrinkled, dull to slightly lustrous; hair long (16-30), yellowish white, mixed simple to plumose. Mesepisternum with pits indistinct, round, shallow, 1 pit width apart or less; with long, white, plumose hair; ground minutely roughened, wrinkled, or striate; dull to slightly lustrous. Hypoepimeron impunctate, smooth to weakly striate. Metanotum dull. Basal area of propodeum lineately rugose to brow or beyond, or lineate at front to reticulate at brow or beyond, shiny between rugae at front; brow granularly coriaceous or with minute, reticulate rugae, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, lustrous; fine, pale, appressed hairs spaced more than a hair length apart. T7 hair short, golden, appressed.

**Terminalia.** Lateral process of S7 tapered, with pale apex, length subequal to or greater than width of hemisternite. Median process of S8 linear, apex bifurcate with long, filamentous tips. Apices of gonoforceps subequal to penis valves.

**Color.** Body black. Labrum and mandible blackish brown to black. Face with a single large spot: clypeus entirely yellow or nearly so; lower paracocular area variable, stripe of yellow below antennal socket and along sulcus or area unmarked; supraclypeal area to acme yellow or unmarked; scape unmarked. Pronotum unmarked. Legs dark brown to black except pale area on fore tibia and, at most, obscure basal yellowish spots on tibiae. Wings clear.

**Female. Head.** Malar space medium to long (ratio about 0.6-0.9 DMO). Upper paracocular area and frons with round, shallow pits 1 pit width apart or less; ground minutely wrinkled, slightly lustrous; minute longitudinal wrinkles at middle (sometimes obscuring pits) or fine frontal line sometimes present. Apex of clypeus shallowly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 16-20, brown, plumose.

**Mesosoma.** Fore tarsus with hairs apically curved. Scutum with distinct pits 1-2 pit widths apart, ground minutely wrinkled, slightly lustrous; hair long (12-20), pale brown, plumose. Scutellum with pits slightly farther apart, ground smooth, lustrous. Mesepisternum with pits relatively distinct compared to male (may be indistinct if ground highly roughened), round, shallow, 1 pit width apart or less; with medium-length, yellowish white, plumose hair; ground minutely wrinkled or striate, dull to slightly lustrous. Hypoepimeron impunctate, smooth to weakly striate; slightly swollen. Metanotum dull. Basal area of propodeum lineately rugose to brow or beyond, or lineate at front to reticulate at brow or beyond, shiny between rugae at front; brow granularly coriaceous or with minute reticulate rugae, dull to slightly lustrous.

**Metasoma.** Disk of T2 impunctate, lustrous, with fine, short, pale, appressed hairs spaced more than a hair length apart. T6 hair light brown to golden, medium-length, appressed.

**Color.** Body and legs black; unmarked. Wings clear.

**Perkins' collections. Hawaii:** Kau, 4000 ft (BMNH, BPBM); Kilauea (BPBM); 4000 ft (OUMNH); Kona, 5000 ft (BMNH). **Mau:** Haleakala, 9000 ft (OUMNH); crater (BMNH, BPBM).

**Recent collections. Hawaii:** Footprints, 900 m; Kipuka Nene, 2900 ft; Napau Trail, 3000 ft; Devastation Trail, 3700 ft; Kipuka Puauu, 4000 ft; Kulani Cone, 5100 ft; Kipuka Maunaiu, 1890 m; Mauna Loa tr. 16, 6000 ft; Hualalai summit, 8000 ft. **Mau:** Science City, 3010 m; near Haleakala N. P. Visitor Center, 9750 ft; Laie flats, 2040 m; Oili Puu,

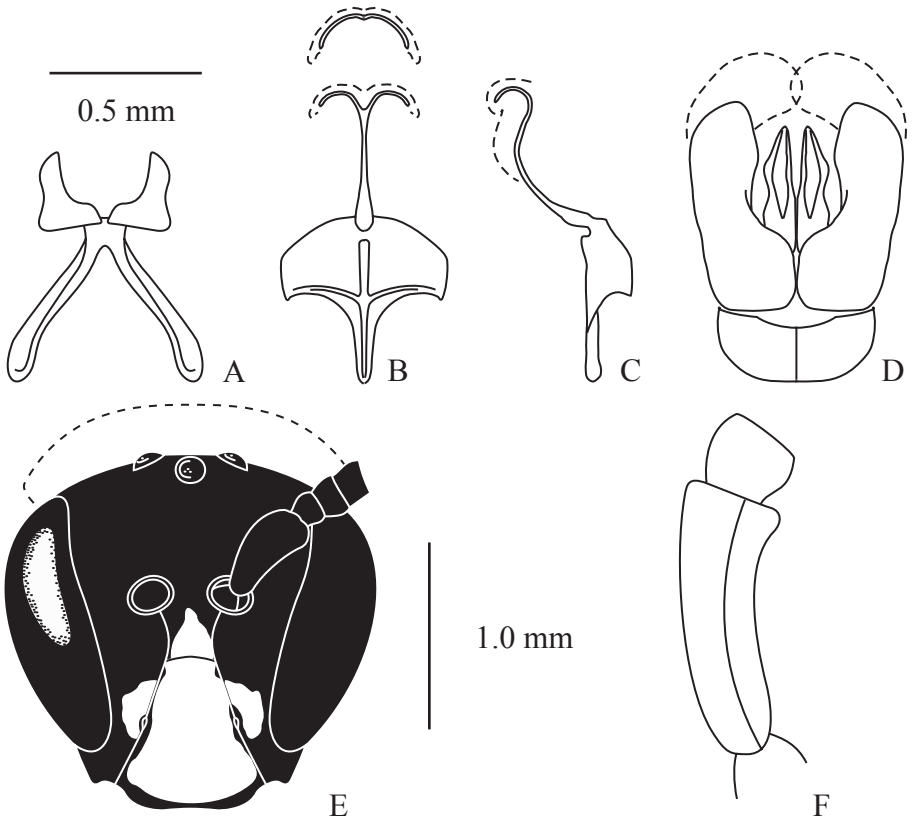


Fig. 68. *Hylaeus volcanicus*, male. A. Seventh sternum, ventral view. B. Eighth sternum, ventral view, and apex, caudal view. C. Eighth sternum, lateral view. D. Genitalia, dorsal view. E. Face with left scape. F. Scape, lateral view. 0.5 mm scale for A-D; 1 mm scale for E. Extent of pubescence shown by dashed lines in B-E.

2020 m; Paliku, 1950 m; Sliding Sands Tr., 2500 m; Waikane, 2010 m; Holua Cabin, 7200 ft; Halemauu Tr., 7800-8000 ft; Lauulu Tr., 8000 ft; Kalapawili Ridge, 7400 ft; Kaupo Tr., 5500 ft; Kilohana, 2800 m; Kipahulu Valley, Mauka Ridge, 1980 m; Puu Keokea, 7100 ft; Lihau, 4000 ft.

**Flower records.** *Coprosma* sp., *Dodonaea*, *Dubautia menziesii*, *Dubautia* × *Argyroxiphium*, *Metrosideros*, *Myoporum*, *Sophora*, *Styphelia*.

**Remarks.** See remarks for *H. nivicola* and *H. difficilis*.

**References.** Perkins, 1907b: 97 (record: Hawaii, Kilauea); 1910:602 (key); 1913:81 (morphology). Cockerell, 1926:308 (record: Hawaii, Volcano House). Kobayashi, 1974:399 (possible pollinator of *Argyroxiphium sandwicense*; record: Maui, Haleakala). Beardsley, 1980:40 (record: Maui, Haleakala).

*Hylaeus (Nesoprosopis) species A*

**DIAGNOSIS.** Small bees with smoky wings. Female unmarked, with dark, erect hair on T6 and the basal area of the propodeum rugose only on the basal half to third; pronotal collar with strong "shoulders," lateral portions prominent. Wing length, 4.6 mm.

**Distribution.** Molokai; montane wet forest.

**Male.** Unknown.

**Female. Head.** Malar space medium (ratio about 0.5). Upper paraocular area and frons with distinct, evenly spaced pits about 1 pit width apart, distorted laterally by longitudinal striations that curve around the antennal sockets; minutely granular and slightly lustrous from antennal sockets about halfway to median ocellus, dorsal and lateral areas smoothly coriaceous and strongly lustrous; frontal line distinct, forming a distinct groove just above acme. Apex of clypeus weakly emarginate. Dorsal end of facial fovea extended to level of lateral ocellus. Vertex hair 6-10, pale brown, weakly plumose.

**Mesosoma.** Fore tarsus with hair apically curved. Lateral area of pronotal collar prominent in dorsal view, almost tuberculate. Scutum with distinct but shallow pits 1-3 pit widths apart, ground unusually coarsely granular, dull; hair mostly rubbed off (the few remaining are 2-6). Scutellum slightly lustrous, with slightly larger pits. Metanotum dull. Mesepisternum with small, shallow, indistinct pits 1-3 pit widths apart; hair yellowish white, simple, short (long hairs may have been rubbed off); ground minutely granular, lustrous. Hypoepimeron impunctate, lustrous, slightly swollen. Basal area of propodeum with relatively strong rugae extending a third to halfway to the brow; remainder including brow smoothly coriaceous.

**Metasoma.** Disk of T2 impunctate, lightly striate, slightly lustrous, with short, pale hairs, about one hair length apart or less. T6 hair long, brown, erect.

**Color.** Body and legs dark brown to black except pale area on front tibia, apical yellow mark on front femur, and small obscure orange-brown discolorations at the bases of all tibiae.

**Recent collections. Molokai:** West Kawela Gulch, 3700 ft.

**Flower records.** *Scaevola chamissoniana*, *Melicope* sp. (see remarks).

**Remarks.** A single specimen of this species was collected in West Kawela Gulch on Molokai. Because it lacks any distinctive features and no male is available, it is not being formally described or named; the description above is included to allow identification of specimens. It is very similar to *H. pele*, with short body hairs and a strongly convex face; it differs most noticeably in the more sloping dorsal surface of the propodeum with a less prominent brow. It is also somewhat larger than that species, which is rarely over 4.0 mm in wing length. Although the specimen was caught flying around a flowering *Scaevola* shrub, it carried a full load of pollen from *Melicope*, an extremely unusual floral host.

**NOMINA DUBIA**

The following names are without doubt *Ectemnius* names mistakenly confused with *Nesoprosopis*. See, for example, Takumi (1999).

“*Nesoprosopis rubrocaudatus* Blackburn and Cameron,” Suehiro, 1986:41.

“*Nesoprosopis attripennis* Perkins,” Suehiro, 1986:60.

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## APPENDIX

## Records of Recent Collections

The following are records of recent collections by A. Asquith (AA), H. V. Daly (HD), C. J. Davis (CD), C. Ewing (CE), D. Foote (DF), C. Fritzler (CF), P. Gambino (PG), J. Giffin (JG), S. Gon III and U. Kahele (SG), D. Hopper (DH), M. Lopezaraiza (ML), K. Magnacca (KM), A. C. Medeiros (AM), S. Montgomery (SM), G. Nishida (GN), H. Oppenheimer (HO), R. P. Papp (RP), D. Polhemus (DP), J. Powell (JP), J. Rosenheim (JR), V. L. Scott (VS), R. Takumi (RT), and K. R. Wood (KW). Abbreviations for collection sites are: FR = Forest Reserve; HALE = Haleakala National Park, Maui; HAVO = Hawaii Volcanoes National Park, Hawaii; KFU = Kona Forest Unit of Hakalau National Wildlife Refuge, Hawaii; NAR = Natural Area Reserve; NHP = National Historic Park; PKW = Puu Kukui Watershed; PTA = Pohakuloa Training Area, Hawaii; SP = State Park, TNC = The Nature Conservancy. Abbreviations for islands are: H = Hawaii; K = Kauai; Kh = Kahoolawe; L = Lanai; Ma = Maui; Mo = Molokai; O = Oahu.

Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>akoko</i>	H	Puu Waawaa	4100 ft	1		1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>andrenoides</i>	K	Pihea Trail		3		9 Aug 1996	beating <i>Metrosideros</i> , night	CE
<i>andrenoides</i>	K	Alakai Swamp Trail	3600 ft	2	1	21 Aug 1999	<i>Psychotria maritima</i>	KM
<i>andrenoides</i>	K	Mohihi Trail	3700 ft	1	1	21 Aug 1999	<i>Chamaesyce atrococca</i>	KM
<i>andrenoides</i>	K	Paaiki Valley	2700 ft	1	1	2 Jul 2000	<i>Claoxylon sandwicense</i>	KM
<i>andrenoides</i>	K	Mohihi Trail	4000 ft	1	1	8 Jul 2000	<i>Cheirodendron trigynum</i>	KM
<i>angustulus</i>	Ma	Makawao FR	3700 ft	2	1	10 Aug 2002	on <i>Melicope</i> leaves	KM
<i>angustulus</i>	Ma	Makawao FR	4000 ft	3		10 Aug 2002	on <i>Cheirodendron</i> leaves	KM
<i>angustulus</i>	Ma	Makawao FR	4300 ft	1		10 Aug 2002	<i>Rubus penetrans</i>	KM
<i>anthracinus</i>	H	South Point	coast	1		17 Jul 1999	<i>Scaevola sericea</i>	KM
<i>anthracinus</i>	H	South Point	coast	7	1	18 Jul 1999	<i>Scaevola sericea</i>	KM
<i>anthracinus</i>	H	South Point	coast	3		1 Mar 2002	<i>Sida fallax</i>	KM
<i>anthracinus</i>	H	South Point	coast	3	1	1 Mar 2002	<i>Tournefortia argentea</i>	KM
<i>anthracinus</i>	Ma	Manawainui west	coast	6	1	23 Jun 1999	<i>Sida fallax</i>	KM
<i>anthracinus</i>	Ma	Kanaio NAR	2000 ft	1		23 Jun 1999	<i>Argemone glauca</i>	KM
<i>anthracinus</i>	Kh	Pali O Kalapakea	1000 ft	2	2	14 Jan 2002	<i>Chamaesyce celastroides</i>	KW
<i>anthracinus</i>	Mo	Moomomi Preserve	coast	4	1	26 Jun 1999	<i>Scaevola sericea</i>	KM
<i>anthracinus</i>	Mo	Moomomi Preserve	coast	1	2	2 Aug 1999	<i>Scaevola sericea</i>	KM
<i>anthracinus</i>	Mo	Moomomi Preserve	coast	3	4	4 Jun 2001	<i>Scaevola sericea</i>	KM
<i>anthracinus</i>	Mo	Moomomi Preserve	coast	3	2	4 Jun 2001	over ground	KM
<i>anthracinus</i>	O	Kaena Point NAR	coast	1		12 Jun 1999	over ground	KM
<i>anthracinus</i>	O	Kaena Point NAR	coast	3	5	12 Jun 1999	<i>Sida fallax</i>	KM
<i>anthracinus</i>	O	Kaena Point NAR	coast	1	1	3 Jun 2000	on net	KM
<i>anthracinus</i>	O	Kaena Point NAR	coast	3	3	2 Mar 2002	<i>Myoporum sandwicense</i>	KM
<i>anthracinus</i>	O	Kaena Point NAR	coast	1	2	2 Mar 2002	<i>Sida fallax</i>	KM
<i>assimulans</i>	Ma	Lahainaluna	1800 ft	1	1	3 Aug 1999	<i>Sida fallax</i>	KM
<i>assimulans</i>	Ma	Waikapu, Kaohonua	120 m	4		15 Jan 2000	<i>Lipochaeta lobata</i>	HO
<i>assimulans</i>	Kh	Kamohio	coast	1		17 Feb 1997	under <i>Prosopis</i>	DF
<i>assimulans</i>	L	Manele Rd.	600 ft	1		17 Jun 1999	<i>Sida fallax</i>	KM
<i>assimulans</i>	L	Polihua Rd.	1000 ft	2		17 Jun 1999	<i>Sida fallax</i>	KM
<i>chlorostictus</i>	K	Kokee Rd.	3600 ft	3	1	24 Aug 1999	<i>Acacia koa</i>	KM
<i>chlorostictus</i>	K	Kokee Rd.	3600 ft	1		24 Aug 1999	<i>Styphelia tameiameia</i>	KM
<i>chlorostictus</i>	K	Polihale SP	coast	8	3	25 Aug 1999	<i>Myoporum sandwicense</i>	KM
<i>chlorostictus</i>	K	Paaiki Valley	2700 ft	1		2 Jul 2000	<i>Claoxylon sandwicense</i>	KM

Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>chlorostictus</i>	K	Nualolo Trail	3200 ft	1	1	3 Jul 2000	over ground	KM
<i>chlorostictus</i>	K	Kukui Trail	2600 ft	2	1	5 Jul 2000	over ground	KM
<i>coniceps</i>	H	Kipuka Maunaiu	1890 m	1		17 Jul 1989		PG
<i>coniceps</i>	H	16 mi W Hilo, Hwy 200	4500 ft	3	5	11 Jun 1994	sweeping ferns	VS
<i>coniceps</i>	H	Escape Rd.	3900 ft		1	7 Jan 1999	<i>Metrosideros polymorpha</i>	KM
<i>coniceps</i>	H	Saddle Rd.	5400 ft	3	4	10 Jul 1999	<i>Myoporum sandwicense</i>	KM
<i>coniceps</i>	H	Earthquake Trail	4000 ft	1		21 Jul 1999	<i>Crocoshia</i> × <i>crocoshiiiflora</i>	KM
<i>coniceps</i>	H	Kipuka Puauulu	4000 ft	3	2	22 Jul 1999	<i>Crocoshia</i> × <i>crocoshiiiflora</i>	KM
<i>coniceps</i>	H	Earthquake Trail	4000 ft	3		8 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>coniceps</i>	H	Tree Molds	4000 ft	6	3	10 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>coniceps</i>	H	Crater Rim Trail	3800 ft	1		9 Jun 2000		KM
<i>coniceps</i>	H	Kipuka Puauulu	3900 ft	1		19 Jul 2000	<i>Myoporum sandwicense</i>	KM
<i>coniceps</i>	H	KFU camp	5300 ft	2	1	3 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>coniceps</i>	H	KFU South Bound. Rd.	4700 ft	1		3 Aug 2000	on <i>Cheirodendron</i> leaves	KM
<i>coniceps</i>	H	KFU South Bound. Rd.	5200 ft		1	3 Aug 2000	<i>Metrosideros polymorpha</i>	KM
<i>coniceps</i>	H	KFU 5500' transect	5600 ft	1	2	3 Aug 2000	<i>Geranium cuneatum</i>	KM
<i>coniceps</i>	H	Puu Huluhulu, N. Hilo	6700 ft	1		27 May 2001	over ground	KM
<i>coniceps</i>	H	Puu Waawaa	5500 ft	1		30 May 2001	<i>Myoporum sandwicense</i>	KM
<i>coniceps</i>	H	HAVO boundary	4000 ft	1		26 Jul 2002	<i>Santalum paniculatum</i>	KM
<i>coniceps</i>	H	Puu Waawaa	4100 ft	4	1	1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>coniceps</i>	Ma	Haleakala NW slope	2500 m	7	8	24 Jul 1991	malaise trap 6/20-7/24	RT
<i>coniceps</i>	Ma	Lauulu Trail	2010 m		2	18 Feb 1998		RT
<i>coniceps</i>	Ma	HALE Service Area	2073 m	2	1	6 Nov 1998	malaise trap 10/30-11/6	RT
<i>coniceps</i>	Ma	Koolau Gap	6200 ft	1		6 Aug 1999	<i>Metrosideros polymorpha</i>	KM
<i>coniceps</i>	Ma	HALE Service Area	6740 ft	3		20 Mar 2000	malaise trap	RT
<i>coniceps</i>	Ma	Kaupo Trail	6000 ft	1		28 Jun 2000	<i>Scaevola chamissoniana</i>	KM
<i>coniceps</i>	Ma	Puu Keokea	7100 ft		1	20 May 2001	<i>Sophora chrysophylla</i>	KM
<i>connectens</i>	H	Kipuka Nene	2900 ft	1		28 Jun 1998	over ground	KM
<i>connectens</i>	H	Kipuka Nene	2900 ft		1	13 Jan 1999	red pan trap	KM
<i>connectens</i>	H	Kipuka Nene	2900 ft		1	13 Jan 1999	yellow pan trap	KM
<i>connectens</i>	H	Ocean View Estates	4500 ft		1	11 Jul 2000	over ground	KM
<i>connectens</i>	H	Kipuka Nene	2900 ft	1	1	28 Feb 2002	<i>Sophora chrysophylla</i>	KM
<i>connectens</i>	H	Puu Waawaa cone	3820 ft	1		5 Oct 2002	<i>Claoxylon sandwicense</i>	JG
<i>connectens</i>	H	Kipuka Nene	2900 ft	2		28 Feb 2002	<i>Styphelia tameiameiae</i>	KM
<i>connectens</i>	Ma	Waihee Ridge Trail	2000 ft	3	2	5 Aug 1999	<i>Scaevola chamissoniana</i>	KM
<i>connectens</i>	Ma	Puu Kukui Rd.	2600 ft	4		23 Jun 2000	<i>Scaevola chamissoniana</i>	KM
<i>connectens</i>	Ma	Puu Kukui Rd.	2300 ft	1		23 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>connectens</i>	Ma	Kahoma	2100 ft		1	22 May 2001	over ground	KM
<i>connectens</i>	L	Munro Trail	3000 ft	1		16 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>connectens</i>	O	Puu Kaua	2400 ft	1		11 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>connectens</i>	O	Wiliwilinui Trail	2000 ft	2		13 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>connectens</i>	O	Wiliwilinui Trail	1800 ft	2	1	26 Jul 1999	<i>Scaevola gaudichaudiana</i>	KM
<i>connectens</i>	O	Puu Kaua	2600 ft	1	1	29 Jul 1999	<i>Scaevola gaudichaudiana</i>	KM
<i>connectens</i>	O	Palikea	3000 ft		1	30 Jul 1999	<i>Broussaisia arguta</i>	KM
<i>connectens</i>	O	Aiea Trail	1700 ft	2	1	2 Jun 2000	<i>Acacia koa</i>	KM
<i>connectens</i>	O	Aiea Trail	1700 ft	2		2 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>connectens</i>	O	Lanipo Trail	1500 ft		1	13 Aug 2000	<i>Scaevola gaudichaudiana</i>	KM
<i>connectens</i>	O	Aiea Trail	1700 ft	1	1	14 Aug 2000	<i>Scaevola gaudichaudiana</i>	KM
<i>connectens</i>	O	Aiea Trail	1700 ft	2	1	14 Aug 2000	<i>Styphelia tameiameiae</i>	KM
<i>connectens</i>	O	Aiea Trail	1900 ft	1		14 Aug 2000	<i>Psychotria mariniana</i>	KM
<i>connectens</i>	O	Papali Ridge	1400 ft	1		16 Aug 2000	<i>Scaevola gaudichaudiana</i>	KM
<i>connectens</i>	O	Papali Ridge	1400 ft	1		16 Aug 2000	<i>Metrosideros polymorpha</i>	KM
<i>connectens</i>	O	Papali Ridge	1400 ft	2	1	16 Aug 2000	<i>Chamaesyce multififormis</i>	KM
<i>connectens</i>	O	Pahole NAR	2000 ft	1		8 Jun 2001	<i>Chamaesyce multififormis</i>	KM
<i>connectens</i>	O	Pahole NAR	2100 ft	1		8 Jun 2001	<i>Bidens torta</i>	KM

Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>connectens</i>	O	Pahole NAR	2400 ft	1		18 Feb 2002	<i>Acacia koa</i>	KM
<i>connectens</i>	O	Pahole NAR	2200 ft	2	1	18 Feb 2002	<i>Bidens torta</i>	KM
<i>connectens</i>	O	Pahole NAR	2400 ft	1	5	18 Feb 2002	<i>Canavalia galeata</i>	KM
<i>connectens</i>	O	Pahole NAR	2400 ft	2	1	18 Feb 2002	<i>Rubus rosifolius</i>	KM
<i>connectens</i>	O	Manana Trail	1800 ft	1		19 Feb 2002	<i>Scaevola gaudichaudiana</i>	KM
<i>connectens</i>	K	Kahuamaa Flat	3800 ft	1		24 Aug 1999	<i>Scaevola procera</i>	KM
<i>connectens</i>	K	Polihale SP	coast	2	1	25 Aug 1999	<i>Myoporum sandwicense</i>	KM
<i>connectens</i>	K	Paaiki Valley	2700 ft	1		2 Jul 2000	<i>Claoxylon sandwicense</i>	KM
<i>connectens</i>	K	Paaiki Valley	2700 ft		1	3 Jul 2000	<i>Styphelia tameiameia</i>	KM
<i>crabronoides</i>	H	Olaa Small Tract	3800 ft	1		30 Jul 2000	on ferns	KM
<i>crabronoides</i>	H	KFU South Bound. Rd.	5200 ft	1		2 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>crabronoides</i>	H	KFU South Bound. Rd.	4700 ft		4	3 Aug 2000	on <i>Cheirodendron</i> leaves	KM
<i>crabronoides</i>	H	KFU South Bound. Rd.	5200 ft	1	3	3 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>crabronoides</i>	H	Holcano	3600 ft	3		29 Jul 2002	<i>Cheirodendron trigynum</i>	KM
<i>difficilis</i>	H	Kona Coast SP	coast	17	18	12 Jun 1994	<i>Tournefortia argentea</i>	VS
<i>difficilis</i>	H	Kipuka Nene	2900 ft	1	4	28 Jun 1998	over ground	KM
<i>difficilis</i>	H	Mauna Loa summit	13677 ft	1		14 Jun 1998	over ground	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft	1		5 Jul 1998	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	H	Mauna Loa Rd.	4200 ft	1	1	2 Jan 1999	over ground	KM
<i>difficilis</i>	H	Kipuka Ki	4200 ft		1	3 Jan 1999	yellow pan trap	KM
<i>difficilis</i>	H	Mauna Loa Rd.	4100 ft		2	3 Jan 1999	yellow pan trap	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft		9	3 Jan 1999	<i>Sophora chrysophylla</i>	KM
<i>difficilis</i>	H	Kipuka Maunaiu	6000 ft	7	15	4 Jan 1999	over ground	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft		48	4 Jan 1999	yellow pan trap	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft		1	4 Jan 1999	red pan trap	KM
<i>difficilis</i>	H	Keanakakoi	3700 ft		1	8 Jan 1999	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	H	Devastation Trail	3700 ft		1	8 Jan 1999	<i>Vaccinium reticulatum</i>	KM
<i>difficilis</i>	H	Makaopuhi Crater	2900 ft	1	1	12 Jan 1999	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft		4	13 Jan 1999	red pan trap	KM
<i>difficilis</i>	H	KFU South Bound. Rd.	5000 ft		2	8 Jul 1999	<i>Myoporum sandwicense</i>	KM
<i>difficilis</i>	H	KFU South Bound. Rd.	5000 ft		7	8 Jul 1999	over ground	KM
<i>difficilis</i>	H	Saddle Rd.	5400 ft	3	4	10 Jul 1999	<i>Myoporum sandwicense</i>	KM
<i>difficilis</i>	H	Kipuka Kalawamana	5000 ft	1	1	13 Jul 1999	<i>Bidens menziesii</i>	KM
<i>difficilis</i>	H	Kipuka Alala	6100 ft		1	13 Jul 1999	over ground	KM
<i>difficilis</i>	H	Kipuka Alala	6100 ft		2	13 Jul 1999	<i>Santalum paniculatum</i>	KM
<i>difficilis</i>	H	Kipuka Alala	5700 ft	3	1	14 Jul 1999	<i>Bidens menziesii</i>	KM
<i>difficilis</i>	H	Kipuka Alala	5800 ft	2	2	14 Jul 1999	<i>Chamaesyce olowaluana</i>	KM
<i>difficilis</i>	H	Kipuka Alala	5800 ft		9	14 Jul 1999	yellow pan trap	KM
<i>difficilis</i>	H	Kaalualu	coast	3	3	17 Jul 1999	<i>Tournefortia argentea</i>	KM
<i>difficilis</i>	H	South Point	coast	9	7	17 Jul 1999	<i>Scaevola sericea</i>	KM
<i>difficilis</i>	H	Kaalualu	coast		4	25 Jul 1999	<i>Myoporum sandwicense</i>	KM
<i>difficilis</i>	H	Lae O Milo	coast	4	3	25 Jul 1999	<i>Chamaesyce celastroides</i>	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft	1	1	13 Aug 1999	over ground	KM
<i>difficilis</i>	H	Kaloko NHP	coast		1	14 Aug 1999	<i>Myoporum sandwicense</i>	KM
<i>difficilis</i>	H	Kaloko NHP	coast	1	2	15 Aug 1999	<i>Schinus terebinthifolius</i>	KM
<i>difficilis</i>	H	Kaloko NHP	coast	5	3	15 Aug 1999	<i>Tournefortia argentea</i>	KM
<i>difficilis</i>	H	Ahumoa	5900 ft	1	7	15 Aug 1999	<i>Bidens menziesii</i>	KM
<i>difficilis</i>	H	Naulu Trail	2900 ft	1	10	11 Mar 2000	over ground	DF
<i>difficilis</i>	H	Kipuka Ki	4200 ft	3	3	6 Jun 2000	<i>Sapindus saponaria</i>	KM
<i>difficilis</i>	H	Kipuka Ki	4200 ft		2	6 Jun 2000	<i>Dodonaea viscosa</i>	KM
<i>difficilis</i>	H	Crater Rim Trail	3800 ft		2	9 Jun 2000		KM
<i>difficilis</i>	H	Kipuka Ki	4200 ft	2	3	12 Jun 2000	<i>Sapindus saponaria</i>	KM
<i>difficilis</i>	H	Kipuka Ki	4200 ft	1	1	12 Jun 2000	<i>Dodonaea viscosa</i>	KM
<i>difficilis</i>	H	Ocean View Estates	4500 ft		2	11 Jul 2000	over ground	KM
<i>difficilis</i>	H	Ocean View Estates	2400 ft	1		11 Jul 2000	over ground	KM

Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>difficilis</i>	H	Kaloko	coast	4	3	13 Jul 2000	<i>Tournefortia argentea</i>	KM
<i>difficilis</i>	H	Hawaii Volcano Obs.	4100 ft	1		24 Jul 2000	<i>Dubautia ciliolata</i>	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft	1	1	26 Jul 2000	<i>Sophora chrysophylla</i>	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft	3	1	26 Jul 2000	over ground	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft	1	1	26 Jul 2000	<i>Styphelia tameiameiae</i>	KM
<i>difficilis</i>	H	Crater Rim Trail	4000 ft		4	28 Jul 2000	<i>Dodonaea viscosa</i>	KM
<i>difficilis</i>	H	Byron's Ledge	3800 ft		1	29 Jul 2000	<i>Styphelia tameiameiae</i>	KM
<i>difficilis</i>	H	Kilauea Caldera	3600 ft	2		29 Jul 2000	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	H	KFU camp	5300 ft	1	4	2 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>difficilis</i>	H	KFU South Bound. Rd.	4700 ft	4	2	3 Aug 2000	on <i>Cheirodendron</i> leaves	KM
<i>difficilis</i>	H	KFU South Bound. Rd.	5200 ft	2	1	3 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>difficilis</i>	H	Volcano	3750 ft	1	5	5 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>difficilis</i>	H	Volcano	3750 ft	3	6	6 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>difficilis</i>	H	Puu Huluhulu, N. Hilo	6700 ft	3	6	27 May 2001	<i>Myoporum sandwicense</i>	KM
<i>difficilis</i>	H	Puu Huluhulu, N. Hilo	6700 ft	4	3	27 May 2001	over ground	KM
<i>difficilis</i>	H	Ahumoa	5900 ft	2		27 May 2001	over ground	KM
<i>difficilis</i>	H	Saddle Rd.	6200 ft	4	2	27 May 2001	<i>Acacia koa</i>	KM
<i>difficilis</i>	H	Saddle Rd.	6200 ft		1	27 May 2001	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	H	Puu Waawaa	6200 ft	6		30 May 2001	<i>Styphelia tameiameiae</i>	KM
<i>difficilis</i>	H	Puu Waawaa	5500 ft	2		30 May 2001	<i>Myoporum sandwicense</i>	KM
<i>difficilis</i>	H	Kipuka Nene	2900 ft	1	7	28 Feb 2002	<i>Sophora chrysophylla</i>	KM
<i>difficilis</i>	H	South Point	coast	21	41	1 Mar 2002	<i>Tournefortia argentea</i>	KM
<i>difficilis</i>	H	Hilina Pali Rd.	3300 ft	2	12	12 Jul 2002	<i>Dubautia scabra</i>	KM
<i>difficilis</i>	H	Puu Waawaa	4100 ft	3	7	1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>difficilis</i>	Ma	Kipahulu Valley	1980 m	5		21 May 1998		RT
<i>difficilis</i>	Ma	Kilohana Pali	2800 m	1		13 Aug 1998	<i>Dubautia menziesii</i>	RT
<i>difficilis</i>	Ma	Sliding Sands Trail	2500 m	2	1	4 Nov 1998	<i>Dubautia menziesii</i>	RT
<i>difficilis</i>	Ma	Kalepeamo	2835 m	1		14 Dec 1998		RT
<i>difficilis</i>	Ma	Sliding Sands Trail	9000 ft	1		27 Dec 1998	over ground	KM
<i>difficilis</i>	Ma	Kilohana Pali	2740 m	1		9 Mar 1999		RT
<i>difficilis</i>	Ma	Kilohana Pali	9400 ft	4	2	22 Jun 1999	over ground	KM
<i>difficilis</i>	Ma	Waikamoi Preserve	6400 ft	3	4	4 Aug 1999	over ground	KM
<i>difficilis</i>	Ma	Koolau Gap	6200 ft	3	3	6 Aug 1999	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	Ma	above Hosmer Grove	2100 m	1		12 Jun 2000		RT
<i>difficilis</i>	Ma	PKW fence	2200 ft	4		22 Jun 2000	over ground	KM
<i>difficilis</i>	Ma	Puu Kukui Rd.	2300 ft	3		22 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	Ma	Puu Kukui Rd.	2300 ft	5	2	23 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	Ma	Sliding Sands Trail	8650 ft	3		26 Jun 2000	<i>Styphelia tameiameiae</i>	KM
<i>difficilis</i>	Ma	Lauula Trail	6600 ft	1	3	27 Jun 2000	<i>Sophora chrysophylla</i>	KM
<i>difficilis</i>	Ma	Lauula Trail	8000 ft	1	1	27 Jun 2000	over ground	KM
<i>difficilis</i>	Ma	Kaupo Trail	6000 ft	1	2	28 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	Ma	Kaupo Trail	6000 ft	1		28 Jun 2000	<i>Acacia koa</i>	KM
<i>difficilis</i>	Ma	Kaupo Trail	5500 ft	8	5	28 Jun 2000	over ground	KM
<i>difficilis</i>	Ma	Halemauu Trail	7000 ft		1	29 Jun 2000	<i>Argyroxiphium sandwicense</i>	KM
<i>difficilis</i>	Ma	Laie flats	2040 m	1		26 Jul 2000		RT
<i>difficilis</i>	Ma	Oili Puu	2050 m	2		27 Jul 2000		RT
<i>difficilis</i>	Ma	Hanaula, above Puu Anu	915 m	15	3	25 Feb 2000		RT
<i>difficilis</i>	Ma	Puu Keokea	7100 ft	2		20 May 2001	<i>Styphelia tameiameiae</i>	KM
<i>difficilis</i>	Ma	Puu Keokea	7100 ft	3		20 May 2001	<i>Sophora chrysophylla</i>	KM
<i>difficilis</i>	Ma	Puu Keokea	7100 ft	7	7	20 May 2001	<i>Dodonaea viscosa</i>	KM
<i>difficilis</i>	Ma	Puu Keokea	7100 ft	4		20 May 2001	over ground	KM
<i>difficilis</i>	Ma	Kahoma	2200 ft	1		21 May 2001	over ground	KM
<i>difficilis</i>	L	Lihua		4		19 Aug 1998		SG
<i>difficilis</i>	L	Munro Trail	3000 ft		1	16 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	L	Munro Trail	2800 ft	2		7 Aug 1999	<i>Metrosideros polymorpha</i>	KM



Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>difficilis</i>	Mo	Kamakou Rd.	3200 ft	3	3	27 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	Mo	Puu Kolekole	3400 ft	3	3	28 Jun 1999	over ground	KM
<i>difficilis</i>	Mo	Kamakou Rd.	3900 ft	17	5	2 Jun 2001	<i>Metrosideros polymorpha</i>	KM
<i>difficilis</i>	Mo	Kamakou Rd.	3900 ft	1	3	2 Jun 2001	over ground	KM
<i>difficilis</i>	Mo	Puu Kolekole	3900 ft		3	3 Jun 2001	yellow pan trap	KM
<i>dimidiatus</i>	H	Kipuka Alala	5800 ft	2		14 Jul 1999	<i>Chamaesyce olowaluana</i>	KM
<i>dimidiatus</i>	H	Puu Waawaa	4100 ft	8	5	1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>dumetorum</i>	H	KFU South Bound. Rd.	5000 ft		2	8 Jul 1999	<i>Myoporum sandwicense</i>	KM
<i>dumetorum</i>	H	Kipuka Puauulu	4000 ft	2		12 Jul 1999	<i>Myoporum sandwicense</i>	KM
<i>dumetorum</i>	H	Kipuka Puauulu	4000 ft	2	3	22 Jul 1999	<i>Crocosmia</i> × <i>crocosmiflora</i>	KM
<i>dumetorum</i>	H	Kipuka Ki	4200 ft	1		12 Jun 2000	<i>Myoporum sandwicense</i>	KM
<i>dumetorum</i>	H	Kipuka Puauulu	3900 ft		1	24 Jul 2000	<i>Myoporum sandwicense</i>	KM
<i>dumetorum</i>	H	Kipuka Puauulu	3900 ft	3		24 Jul 2000	<i>Nestegis sandwicensis</i>	KM
<i>dumetorum</i>	H	Kipuka Puauulu	3900 ft	5		24 Jul 2000	<i>Psychotria hawaiiensis</i>	KM
<i>dumetorum</i>	H	Byron's Ledge	3800 ft	2	6	29 Jul 2000	on <i>Hedychium</i> leaves	KM
<i>dumetorum</i>	H	Byron's Ledge	3800 ft	1		29 Jul 2000	<i>Styphelia tameiameia</i>	KM
<i>dumetorum</i>	H	Byron's Ledge	3800 ft	2		29 Jul 2000	<i>Myrica faya</i>	KM
<i>dumetorum</i>	H	Byron's Ledge	3800 ft	1		29 Jul 2000	<i>Fragaria vesca</i>	KM
<i>dumetorum</i>	H	Halemaumau Trail	3700 ft	3	3	29 Jul 2000	<i>Rubus rosifolius</i>	KM
<i>dumetorum</i>	H	Halemaumau Trail	3800 ft	3		29 Jul 2000	<i>Ilex anomala</i>	KM
<i>dumetorum</i>	H	nr. Kilauea Field Station	3900 ft	2	1	30 Jul 2000	<i>Dubautia scabra</i>	KM
<i>dumetorum</i>	H	Olaa Small Tract	3800 ft	1		30 Jul 2000	on ferns	KM
<i>dumetorum</i>	H	KFU South Bound. Rd.	4500 ft	1	2	2 Aug 2000	on <i>Cheirodendron</i> leaves	KM
<i>dumetorum</i>	H	KFU South Bound. Rd.	4700 ft	1		3 Aug 2000	on <i>Cheirodendron</i> leaves	KM
<i>dumetorum</i>	H	KFU South Bound. Rd.	5200 ft	1		3 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>dumetorum</i>	H	Mountain House Rd.	3000 ft	1	1	25 May 2001	<i>Metrosideros polymorpha</i>	KM
<i>dumetorum</i>	H	Upper Waiakea FR	3600 ft	4	8	26 May 2001	<i>Hedyotis terminalis</i>	KM
<i>dumetorum</i>	H	Upper Hamakua Ditch	3700 ft	1		29 May 2001	<i>Metrosideros polymorpha</i>	KM
<i>dumetorum</i>	H	Olaa Koa Unit	3800 ft	1		27 Feb 2002	<i>Cheirodendron trigynum</i>	KM
<i>dumetorum</i>	H	Kipuka Puauulu	4000 ft	1		31 Jul 2000	<i>Alphitonia ponderosa</i>	KM
<i>dumetorum</i>	H	Kipuka Puauulu	4000 ft	1		31 Jul 2000	<i>Pisonia brunoniana</i>	KM
<i>facilis</i>	Ma	Kokomo		1		25 Oct 1990		PG
<i>filicum</i>	H	KFU South Bound. Rd.	5200 ft		2	3 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>filicum</i>	H	Puu Waawaa	4100 ft	2	1	1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>flavifrons</i>	K	Polihale	coast	2	2	17 Jan 1999	<i>Sida fallax</i>	KM
<i>flavifrons</i>	K	Polihale SP	coast	5	4	25 Aug 1999	<i>Scaevola sericea</i>	KM
<i>flavifrons</i>	Ni	Lehua, West Horn	coast	1	1	19 Feb 2002	<i>Portulaca oleraceae</i>	KW
<i>flavipes</i>	H	Kau, Kaulana Bay	coast	1		22 Mar 1993	<i>Sida fallax</i>	JP
<i>flavipes</i>	H	Kau Desert	300 ft	1		9 Aug 1995	<i>Sesbania tomentosa</i>	DH
<i>flavipes</i>	H	Kalu	100 ft	1		22 Aug 1995	<i>Sesbania tomentosa</i>	DH
<i>flavipes</i>	H	Puu Pa	2600 ft	1		7 Nov 1996		SM
<i>flavipes</i>	H	Kipuka Nene	2900 ft	2		5 Jul 1998	red pan trap	KM
<i>flavipes</i>	H	Kipuka Nene	2900 ft		7	5 Jul 1998	<i>Sesbania tomentosa</i>	KM
<i>flavipes</i>	H	Kipuka Nene	2900 ft		8	5 Jul 1998	red pan trap	KM
<i>flavipes</i>	H	Kipuka Nene	2900 ft	1		3 Jan 1999	over ground	KM
<i>flavipes</i>	H	Hale Pohaku	9000 ft	1		10 Jul 1999	<i>Sophora chrysophylla</i>	KM
<i>flavipes</i>	H	Kipuka Nene	2900 ft	4		11 Jul 1999	over ground	KM
<i>flavipes</i>	H	Kaaluulu	coast	1	2	17 Jul 1999	<i>Sida fallax</i>	KM
<i>flavipes</i>	H	South Point	coast	1		18 Jul 1999	<i>Scaevola sericea</i>	KM
<i>flavipes</i>	H	Kipuka Nene	2900 ft	2	1	26 Jul 2000	<i>Sophora chrysophylla</i>	KM
<i>flavipes</i>	H	South Point	coast	2	3	28 May 2001	<i>Jacquemontia ovalifolia</i>	KM
<i>flavipes</i>	H	South Point	coast	6		28 May 2001	<i>Sida fallax</i>	KM
<i>flavipes</i>	H	South Point	coast	6	40	28 May 2001	<i>Scaevola sericea</i>	KM
<i>flavipes</i>	H	Kipuka Nene	2900 ft	1		28 Feb 2002	<i>Dodonaea viscosa</i>	KM
<i>flavipes</i>	H	Kipuka Nene	2900 ft	3		28 Feb 2002	<i>Styphelia tameiameia</i>	KM



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<i>flavipes</i>	H	Kipuka Nene	2900 ft	1		28 Feb 2002	over ground	KM
<i>flavipes</i>	H	South Point	coast	2	9	1 Mar 2002	<i>Tribulus cistoides</i>	KM
<i>flavipes</i>	H	South Point	coast	4	1	1 Mar 2002	<i>Jacquemontia ovalifolia</i>	KM
<i>flavipes</i>	H	South Point	coast	3		1 Mar 2002	<i>Sida fallax</i>	KM
<i>flavipes</i>	H	South Point	coast	3	3	1 Mar 2002	over ground	KM
<i>flavipes</i>	H	South Point	coast	2		1 Mar 2002	<i>Tournefortia argentea</i>	KM
<i>flavipes</i>	L	Kahue	1400 ft	6	2	7 Aug 1999	<i>Myoporum sandwicense</i>	KM
<i>flavipes</i>	L	Kahue	1400 ft	3		24 Jun 2000	<i>Myoporum sandwicense</i>	KM
<i>flavipes</i>	L	Kahue	1400 ft	9	7	6 Jun 2001	<i>Myoporum sandwicense</i>	KM
<i>flavipes</i>	L	Kahue	1400 ft	1		6 Jun 2001	<i>Sida fallax</i>	KM
<i>fuscipennis</i>	Ma	Haelaau Cabin	3000 ft	2	3	21 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>fuscipennis</i>	Ma	PKW fence	2200 ft	1		22 Jun 2000	<i>Acacia confusa</i>	KM
<i>fuscipennis</i>	Ma	Haelaau Cabin	3000 ft	1	1	23 Jun 2000	on <i>Cheirodendron</i> leaves	KM
<i>fuscipennis</i>	Ma	Puu Kukui Rd.	2300 ft	2		23 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>fuscipennis</i>	Ma	Kaulalewelewe	3000 ft		2	10 Aug 2000	<i>Metrosideros polymorpha</i>	KM
<i>fuscipennis</i>	Ma	Kahoma	2600 ft	2		22 May 2001	<i>Metrosideros polymorpha</i>	KM
<i>fuscipennis</i>	L	Munro Trail	3000 ft	2	1	16 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>fuscipennis</i>	L	Munro Trail	2800 ft	1	1	7 Aug 1999	<i>Metrosideros polymorpha</i>	KM
<i>fuscipennis</i>	L	Kaiholena Ridge	2400 ft	1		5 Jun 2001	<i>Cheirodendron trigynum</i>	KM
<i>fuscipennis</i>	L	Munro Trail	2900 ft		1	7 Jun 2001	<i>Tetraplasandra oahuensis</i>	KM
<i>fuscipennis</i>	L	Kaiholena Ridge	2700 ft	1	1	7 Jun 2001	<i>Tetraplasandra oahuensis</i>	KM
<i>fuscipennis</i>	Mo	Puu Kolekole	1200 m		1	16 Jul 1989		JR
<i>fuscipennis</i>	Mo	Kamakou Rd.	3200 ft	2	2	27 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>fuscipennis</i>	Mo	East Kawela Gulch	3600 ft	1		2 Jun 2001	over ferns	KM
<i>fuscipennis</i>	Mo	East Kawela Gulch	3600 ft	1		3 Jun 2001	<i>Psychotria mauiensis</i>	KM
<i>haleakalae</i>	Ma	Puu Kukui Trail	3700 ft	2	3	8 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>haleakalae</i>	Ma	Puu Kukui Trail	3700 ft	2	2	10 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>haleakalae</i>	Ma	Puu Kukui Trail	3400 ft	2	11	Aug 2000	on <i>Cheirodendron</i> leaves	KM
<i>haleakalae</i>	Ma	Makawao FR	3700 ft		1	10 Aug 2002	on <i>Melicope</i> leaves	KM
<i>haleakalae</i>	Ma	Makawao FR	4300 ft	4		10 Aug 2002	<i>Cheirodendron trigynum</i>	KM
<i>haleakalae</i>	Mo	Kamakou Rd.	3200 ft	1	1	27 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>haleakalae</i>	Mo	West Kawela Gulch	3600 ft	2	2	28 Jun 1999	<i>Scaevola chamissoniana</i>	KM
<i>haleakalae</i>	Mo	Kamakou Rd.	3900 ft	3		2 Jun 2001	<i>Metrosideros polymorpha</i>	KM
<i>haleakalae</i>	Mo	West Kawela Gulch	3700 ft	2	3	2 Jun 2001	<i>Scaevola chamissoniana</i>	KM
<i>haleakalae</i>	Mo	Kawela Rd.	3900 ft	1	1	2 Jun 2001	<i>Cheirodendron trigynum</i>	KM
<i>haleakalae</i>	Mo	East Kawela Gulch	3600 ft	1		2 Jun 2001	over ferns	KM
<i>haleakalae</i>	Mo	Kawela Rd.	3900 ft	1	1	3 Jun 2001	over ferns	KM
<i>hilaris</i>	Mo	Moomomi dunes	coast	1		26 Aug 1989		JR
<i>hilaris</i>	Mo	Moomomi Preserve	coast	1		30 Jun 1999	over ground	KM
<i>hirsutulus</i>	K	Alakai Wilderness		1	1	2 Nov 1999	<i>Metrosideros</i>	DH
<i>hirsutulus</i>	K	Nualolo Cliff Trail	2800 ft	5		3 Jul 2000	<i>Styphelia tameiameiae</i>	KM
<i>hirsutulus</i>	K	Milolii Rd.	2700 ft		1	7 Jul 2000	over ground	KM
<i>hirsutulus</i>	K	Mohihi Trail	3900 ft	1		8 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>hostilis</i>	K	Polihale SP	coast	4		25 Aug 1999	<i>Scaevola sericea</i>	KM
<i>hostilis</i>	K	Awaawapuhi Trail	3400 ft	1		3 Jul 2000	over ground	KM
<i>hostilis</i>	K	Nualolo Cliff Trail	2800 ft	1	1	3 Jul 2000	<i>Styphelia tameiameiae</i>	KM
<i>hostilis</i>	K	Awaawapuhi Trail	3400 ft	1	1	4 Jul 2000	over ground	KM
<i>hula</i>	H	Tree Molds	4000 ft	5		10 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>hula</i>	H	Tree Molds	4000 ft	1		10 Jul 2002	<i>Santalum paniculatum</i>	KM
<i>hula</i>	H	HAVO boundary fence	4000 ft	1		26 Jul 2002	<i>Santalum paniculatum</i>	KM
<i>hula</i>	H	Puu Waawaa	4100 ft	2	1	1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>inquilina</i>	H	south of Bird Park	1230 m	1	6	4 Aug 1989		PG
<i>inquilina</i>	H	Kipuka Alala	5800 ft	1		9 Mar 1992	<i>Myoporum sandwicense</i>	GN
<i>inquilina</i>	H	Mauna Loa Rd.	2050 m	2	1	21 Mar 1993		JP
<i>inquilina</i>	H	0.9 mi. S Mauna Loa Rd.	6000 ft	2	1	4 Jan 1999	over ground	KM

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<i>inquilina</i>	H	Kipuka Nene	2900 ft		1	13 Jan 1999	over ground	KM
<i>inquilina</i>	H	near Tree Molds	4000 ft	1		11 Jun 2000	over ground	KM
<i>kauaiensis</i>	K	Mt. Kahili	2500 ft	3	9	1 Oct 1997	malaise trap Aug.-Oct.	AA
<i>kauaiensis</i>	K	Alakai Swamp Trail	3700 ft	2		3 Jul 1999	<i>Metrosideros polymorpha</i>	KM
<i>kauaiensis</i>	K	Alakai Swamp Trail	3700 ft	2		3 Jul 1999	<i>Scaevola procera</i>	KM
<i>kauaiensis</i>	K	Na Pali-Kona FR	4100 ft	2	1	4 Jul 1999	<i>Scaevola procera</i>	KM
<i>kauaiensis</i>	K	Alakai Swamp Trail	3700 ft	1		5 Jul 1999	<i>Metrosideros polymorpha</i>	KM
<i>kauaiensis</i>	K	Alakai Swamp Trail	3600 ft	1		21 Aug 1999	<i>Scaevola procera</i>	KM
<i>kauaiensis</i>	K	Alakai Swamp Trail	3600 ft	1	2	21 Aug 1999	<i>Metrosideros polymorpha</i>	KM
<i>kauaiensis</i>	K	Kahuamaa Flat	3800 ft	1		24 Aug 1999	<i>Styphelia tameiameiae</i>	KM
<i>kauaiensis</i>	K	Mohihi Trail	4000 ft	2		8 Jul 2000	<i>Metrosideros polymorpha</i>	KM
<i>kokeensis</i>	K	Kokee Rd.	3600 ft		4	24 Aug 1999	<i>Acacia koa</i>	KM
<i>kokeensis</i>	K	Kokee Rd.	3600 ft	1		24 Aug 1999	yellow sticky card	KM
<i>kokeensis</i>	K	Awaawapuhi Trail	3400 ft		11	3 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>kokeensis</i>	K	Awaawapuhi Trail	3400 ft	8	12	4 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>kokeensis</i>	K	Awaawapuhi Trail	3400 ft		1	8 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>kona</i>	H	Kipuka Alala	5700 ft	1		14 Jul 1999	<i>Bidens menziesii</i>	KM
<i>kona</i>	H	Kipuka Alala	5800 ft	9		14 Jul 1999	<i>Chamaesyce olowaluana</i>	KM
<i>kuakea</i>	O	Moho Gulch Ridge	1900 ft	2		1 Aug 1997	over ground	DH
<i>kukui</i>	Ma	Puu Kukui Trail	3000 ft	6	1	11 Aug 2000	over ground	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft		1	28 Jun 1998	over ground	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft	1		5 Jul 1998	<i>Metrosideros polymorpha</i>	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft	1		3 Jan 1999	over ground	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft	1	2	4 Jan 1999	yellow pan trap	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft	1	1	13 Jan 1999	yellow pan trap	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft	1		13 Jan 1999	yellow pan trap	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft		5	11 Jul 1999	over ground	KM
<i>laetus</i>	H	Kipuka Kalawamana	5000 ft	6	7	13 Jul 1999	<i>Bidens menziesii</i>	KM
<i>laetus</i>	H	Kipuka Alala	6100 ft		1	13 Jul 1999	over ground	KM
<i>laetus</i>	H	Kipuka Alala	5800 ft	1	1	14 Jul 1999	<i>Chamaesyce olowaluana</i>	KM
<i>laetus</i>	H	Kipuka Alala	5400 ft	2	6	14 Jul 1999	yellow pan trap	KM
<i>laetus</i>	H	Ahumoa	5900 ft	3		15 Aug 1999	<i>Bidens menziesii</i>	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft		3	26 Jul 2000	over ground	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft		6	26 Jul 2000	over ground	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft	1	2	26 Jul 2000	<i>Styphelia tameiameiae</i>	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft		8	28 Feb 2002	<i>Dodonaea viscosa</i>	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft		1	28 Feb 2002	<i>Sophora chrysophylla</i>	KM
<i>laetus</i>	H	Kipuka Nene	2900 ft	1	4	28 Feb 2002	<i>Styphelia tameiameiae</i>	KM
<i>laetus</i>	H	Hilina Pali Rd.	2000 ft		6	12 Jul 2002	<i>Plantago lanceolata</i>	KM
<i>laetus</i>	H	Hilina Pali Rd.	2500 ft	3	1	12 Jul 2002	<i>Myoporum sandwicense</i>	KM
<i>laetus</i>	H	Hilina Pali Rd.	2500 ft	3	1	12 Jul 2002	<i>Metrosideros polymorpha</i>	KM
<i>laetus</i>	H	HAVO boundary fence	4000 ft		1	26 Jul 2002	<i>Santalum paniculatum</i>	KM
<i>laetus</i>	H	Puu Waawaa	4100 ft	3	4	1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>laetus</i>	H	Humuula Saddle	6800 ft	1		1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>laetus</i>	Ma	Lahainaluna	1800 ft	3	5	3 Aug 1999	<i>Santalum freycinetianum</i>	KM
<i>laetus</i>	Ma	Lahainaluna	1800 ft		5	3 Aug 1999	<i>Sida fallax</i>	KM
<i>laetus</i>	Ma	Kahoma	2100 ft		1	23 May 2001	over ground	KM
<i>laetus</i>	L	Lihua			4	19 Aug 1998		SG
<i>laetus</i>	L	nr. Puu Maua			1	19 Aug 1998		SG
<i>laetus</i>	L	Kanepuu Pres., Kahue	1600 ft	7	6	15 Jun 1999	<i>Sida fallax</i>	KM
<i>laetus</i>	L	Garden of the Gods	1400 ft	3		17 Jun 1999	over ground	KM
<i>laetus</i>	L	Kahue	1400 ft	12	9	7 Aug 1999	<i>Myoporum sandwicense</i>	KM
<i>laetus</i>	L	Kahue	1400 ft	1		24 Jun 2000	<i>Myoporum sandwicense</i>	KM
<i>laetus</i>	L	Kahue	1400 ft	10	1	6 Jun 2001	<i>Myoporum sandwicense</i>	KM
<i>laetus</i>	L	Kahue	1400 ft	1	1	6 Jun 2001	<i>Sida fallax</i>	KM

Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>laetus</i>	L	Kaiholena Ridge	2600 ft		1	7 Jun 2001	<i>Metrosideros polymorpha</i>	KM
<i>laetus</i>	O	Pahole NAR	2000 ft		1	8 Jun 2001	<i>Chamaesyce multiformis</i>	KM
<i>laetus</i>	K	Black Pipe Trail	3500 ft	1		2 Jul 1999	<i>Styphelia tameiameiae</i>	KM
<i>laetus</i>	K	Iliau Loop	3000 ft	10	2	5 Jul 1999	<i>Bidens sandwicensis</i>	KM
<i>laetus</i>	K	Alakai Swamp Trail	3600 ft	1	1	21 Aug 1999	<i>Metrosideros polymorpha</i>	KM
<i>laetus</i>	K	Alakai Swamp Trail	3600 ft		1	21 Aug 1999	over ground	KM
<i>laetus</i>	K	Kokee Rd.	3600 ft	1		24 Aug 1999	<i>Acacia koa</i>	KM
<i>laetus</i>	K	Kokee Rd.	3600 ft	4	1	24 Aug 1999	<i>Styphelia tameiameiae</i>	KM
<i>laetus</i>	K	Milolii Rd.	2600 ft	1		24 Aug 1999	<i>Styphelia tameiameiae</i>	KM
<i>laetus</i>	K	Paaiki Valley	2700 ft	2	1	2 Jul 2000	<i>Claoxylon sandwicense</i>	KM
<i>laetus</i>	K	Milolii Rd.	3050 ft	3		2 Jul 2000	<i>Acacia koa</i>	KM
<i>laetus</i>	K	Awaawapuhi Trail	3400 ft	2	1	3 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>laetus</i>	K	Nualolo Cliff Trail	2800 ft	2	1	3 Jul 2000	<i>Styphelia tameiameiae</i>	KM
<i>laetus</i>	K	Mohihi Trail	3900 ft	3	2	8 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>longiceps</i>	Ma	Waiehu dune	100 ft	4	2	5 Aug 1999	<i>Scaevola coriacea</i>	KM
<i>longiceps</i>	Ma	Waiehu dune	100 ft	1		21 May 2001	over ground	KM
<i>longiceps</i>	L	Polihua Rd.	1000 ft	1	1	15 Jun 1999	<i>Sida fallax</i>	KM
<i>longiceps</i>	L	Polihua Rd.	1000 ft	5	5	17 Jun 1999	<i>Sida fallax</i>	KM
<i>longiceps</i>	L	Kahue	1400 ft	1	2	7 Aug 1999	<i>Sida fallax</i>	KM
<i>longiceps</i>	L	Shipwreck Beach	coast	2		6 Jun 2001	<i>Scaevola sericea</i>	KM
<i>longiceps</i>	Mo	Moomomi Preserve	coast	2	1	26 Jun 1999	<i>Scaevola sericea</i>	KM
<i>longiceps</i>	Mo	Moomomi Preserve	coast	1	2	30 Jun 1999	<i>Scaevola sericea</i>	KM
<i>longiceps</i>	Mo	Moomomi Preserve	coast	1	1	2 Aug 1999	<i>Scaevola sericea</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast	3	6	12 Jun 1999	<i>Sesbania tomentosa</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast	9	4	12 Jun 1999	<i>Scaevola sericea</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast	2	2	3 Jun 2000	<i>Sesbania tomentosa</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast		3	3 Jun 2000	on net	KM
<i>longiceps</i>	O	Kaena Point NAR	coast	6	17	2 Mar 2002	<i>Sesbania tomentosa</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast	4	12	2 Mar 2002	<i>Myoporum sandwicense</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast	2	5	2 Mar 2002	<i>Sida fallax</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast		1	2 Mar 2002	<i>Santalum ellipticum</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast	1	2	2 Mar 2002	<i>Chamaesyce degeneri</i>	KM
<i>longiceps</i>	O	Kaena Point NAR	coast		1	2 Mar 2002	<i>Vitex rotundifolia</i>	KM
<i>mana</i>	O	Manana Trail	1400 ft	3	1	3 Mar 2002	<i>Santalum freycinetianum</i>	KM
<i>mimicus</i>	O	Wiliwilinui Trail	2000 ft	1		13 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>mimicus</i>	O	Wiliwilinui Trail	1800 ft	2	1	26 Jul 1999	<i>Scaevola gaudichaudiana</i>	KM
<i>mimicus</i>	O	Aiea Trail	1700 ft	3		2 Jun 2000	<i>Acacia koa</i>	KM
<i>mimicus</i>	O	Aiea Trail	1700 ft	3		14 Aug 2000	<i>Scaevola gaudichaudiana</i>	KM
<i>mimicus</i>	O	Aiea Trail	1900 ft	1		14 Aug 2000	<i>Ilex anomala</i>	KM
<i>mimicus</i>	O	Aiea Trail	1900 ft	1	1	14 Aug 2000	<i>Metrosideros polymorpha</i>	KM
<i>mimicus</i>	O	Aiea Trail	1900 ft	4	1	14 Aug 2000	<i>Psychotria mariniana</i>	KM
<i>muranus</i>	H	Volcano	3750 ft		4	5 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>muranus</i>	H	Volcano	3750 ft		10	6 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>muranus</i>	H	Volcano	3750 ft		2	29 Jul 2002	<i>Cheirodendron trigynum</i>	KM
<i>muranus</i>	H	Puu Puai	3700 ft	1		10 Jul 2002	<i>Metrosideros polymorpha</i>	ML
<i>mutatus</i>	K	Kahuamaa Flat	3800 ft	4		24 Aug 1999	<i>Styphelia tameiameiae</i>	KM
<i>mutatus</i>	K	Makaha Rd.	3500 ft	1		24 Aug 1999	<i>Styphelia tameiameiae</i>	KM
<i>mutatus</i>	K	Paaiki Valley	2700 ft	3	1	2 Jul 2000	<i>Claoxylon sandwicense</i>	KM
<i>mutatus</i>	K	Awaawapuhi Trail	3400 ft	1		3 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>mutatus</i>	K	Awaawapuhi Trail	3400 ft	6	3	4 Jul 2000	<i>Chamaesyce atrococca</i>	KM
<i>mutatus</i>	K	Kuia Valley	2400 ft	1		7 Jul 2000	<i>Antidesma platyphyllum</i>	KM
<i>nivicola</i>	Ma	Haleakala W slope	8400 ft		1	29 Jul 1984	<i>Styphelia tameiameiae</i>	AM
<i>nivicola</i>	Ma	Haleakala W slope	6800 ft		1	8 May 1985	in silk tube nest under rock	AM
<i>nivicola</i>	Ma	Holua Cabin	7200 ft	1		6 Jun 1985	<i>Oenothera</i>	CF
<i>nivicola</i>	Ma	Haleakala Crater	7600 ft		1	25 Aug 1986	<i>Argyroxiphium sandwicense</i>	AM

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<i>nivicola</i>	Ma	Haleakala NW slope	2080 m		5	22 May 1991		PG
<i>nivicola</i>	Ma	below Halemau Trail	2300 m	4		20 Jun 1991		RT
<i>nivicola</i>	Ma	above Halemau Trail	2600 m	1	2	20 Jun 1991		RT
<i>nivicola</i>	Ma	Haleakala NW slope	2500 m	35	51	24 Jul 1991	malaise trap 6/14-7/24	RT
<i>nivicola</i>	Ma	Halemau Trail		1	5	27 May 1992		RT
<i>nivicola</i>	Ma	Halemau Trail	7840 ft	4	14	7 Sep 1993	basking and on flowers	HD
<i>nivicola</i>	Ma	Halemau Trail	7840 ft		1	7 Sep 1993	<i>Geranium cuneatum</i>	HD
<i>nivicola</i>	Ma	Holua Trail	8000 ft		1	18 Jun 1995		DH
<i>nivicola</i>	Ma	base of Puu Maile	2195 m		1	25 Jun 1996		RT
<i>nivicola</i>	Ma	Sliding Sands Trail	2590 m		1	25 Jun 1996		RT
<i>nivicola</i>	Ma	Paliku	1830 m		1	26 Jun 1996		RT
<i>nivicola</i>	Ma	Mamane Hill	2255 m	1		28 Jun 1996	<i>Styphelia tameiameia</i>	RT
<i>nivicola</i>	Ma	Halemau Trail	2440 m		1	28 Aug 1996		RT
<i>nivicola</i>	Ma	near HALE visitor center	9750 ft		1	11 Sep 1996	<i>Dubautia menziesii</i>	RT
<i>nivicola</i>	Ma	near Kilohana Peak	2880 m		1	12 Sep 1996		RT
<i>nivicola</i>	Ma	Mees Solar Observ.	3050 m		1	16 Sep 1996	<i>Dubautia menziesii</i>	RT
<i>nivicola</i>	Ma	above Halemau Trail			1	25 Sep 1996		RT
<i>nivicola</i>	Ma	Sliding Sands Trail	2500 m		1	27 Oct 1996		RT
<i>nivicola</i>	Ma	near Kapalaoa Cabin	2195 m	2		11 Feb 1997		RT
<i>nivicola</i>	Ma	Silversword Loop	2195 m	1	2	14 Feb 1997	<i>Styphelia tameiameia</i>	RT
<i>nivicola</i>	Ma	Halemau switchbacks	2195 m	1	1	3 Mar 1997		RT
<i>nivicola</i>	Ma	Halemau Trail	2250 m	4	3	3 Mar 1997		RT
<i>nivicola</i>	Ma	Puu Maile	2195 m		1	10 Mar 1997		RT
<i>nivicola</i>	Ma	Kalahaku	2835 m	2		14 Mar 1997	<i>Styphelia tameiameia</i>	RT
<i>nivicola</i>	Ma	Kilohana Peak	2890 m	3	1	14 Mar 1997		RT
<i>nivicola</i>	Ma	below Kilohana Peak	2500 m	5	9	4 Apr 1997	<i>Styphelia tameiameia</i>	RT
<i>nivicola</i>	Ma	Laie	2040 m	1	1	7 Apr 1997		RT
<i>nivicola</i>	Ma	Lauulu Trail	2440 m	5	4	15 May 1997		RT
<i>nivicola</i>	Ma	Kaluaiki	2195 m		2	27 May 1997		RT
<i>nivicola</i>	Ma	Lauulu Trail	2465 m	5	6	27 May 1997		RT
<i>nivicola</i>	Ma	Haleakala W slope	2900 m	4	1	13 Jun 1997		RT
<i>nivicola</i>	Ma	HALE offices	2073 m	1	3	17 Jun 1997		RT
<i>nivicola</i>	Ma	near White Hill	2860 m		9	15 Jul 1997	<i>Argyroxiphium sandwicense</i>	RT
<i>nivicola</i>	Ma	Kuiki	2170 m	1	3	7 Aug 1997		RT
<i>nivicola</i>	Ma	Haleakala NW slope	2310 m		1	12 Aug 1997		RT
<i>nivicola</i>	Ma	Science City	3010 m		1	13 Aug 1997		RT
<i>nivicola</i>	Ma	Laie flats	2060 m		2	19 Aug 1997		RT
<i>nivicola</i>	Ma	Na Mana o ke Akua	2194 m	2	1	21 Aug 1997		RT
<i>nivicola</i>	Ma	Paliku	1950 m	1	1	25 Sep 1997		RT
<i>nivicola</i>	Ma	near Mees Obs.	3010 m		1	28 Oct 1997		RT
<i>nivicola</i>	Ma	wash below Kapalaoa	2165 m	1	1	13 Jan 1998		RT
<i>nivicola</i>	Ma	Lauulu Trail	2015 m		1	14 Jan 1998		RT
<i>nivicola</i>	Ma	Kalepeamo	2835 m	1		14 Dec 1998	<i>Styphelia tameiameia</i>	RT
<i>nivicola</i>	Ma	Sliding Sands Trail	9000 ft	1	1	27 Dec 1998	over ground	KM
<i>nivicola</i>	Ma	Lelewi	2710 m		1	16 Apr 1999	<i>Styphelia tameiameia</i>	RT
<i>nivicola</i>	Ma	Halemau Trail	8000 ft	3	2	12 May 1999	over ground	RT
<i>nivicola</i>	Ma	Haleakala NW slope	2250 m		1	12 May 1999		RT
<i>nivicola</i>	Ma	Halemau Trail	8000 ft	5	2	19 Jun 1999	over ground	KM
<i>nivicola</i>	Ma	Supply Trail	6800 ft	16	25	25 Jun 1999	yellow pan trap	KM
<i>nivicola</i>	Ma	HALE HQ	7200 ft	1	1	3 Aug 1999	<i>Argyroxiphium sandwicense</i>	KM
<i>nivicola</i>	Ma	HALE Service Area	2073 m	10	4	29 Feb 2000	malaise trap 2/24-2/29	RT
<i>nivicola</i>	Ma	Halemau Trail	7900 ft	2		18 Jun 2000	<i>Styphelia tameiameia</i>	KM
<i>nivicola</i>	Ma	Halemau Trail	7900 ft		2	18 Jun 2000	over ground	KM
<i>nivicola</i>	Ma	Halemau Trail	7900 ft	1		25 Jun 2000	over ground	KM
<i>nivicola</i>	Ma	Lauula Trail	8000 ft	4	1	27 Jun 2000	over ground	KM

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<i>nicivola</i>	Ma	Puu Keokea	7100 ft	6	8	20 May 2001	<i>Styphelia tameiameia</i>	KM
<i>nicivola</i>	Ma	Puu Keokea	7100 ft	2	7	20 May 2001	<i>Sophora chrysophylla</i>	KM
<i>nicivola</i>	Ma	Puu Keokea	7100 ft	1		20 May 2001	<i>Dodonaea viscosa</i>	KM
<i>ombrias</i>	H	Kipuka Kalawamana	5000 ft	10	3	13 Jul 1999	<i>Bidens menziesii</i>	KM
<i>ombrias</i>	H	South Point	coast	3	3	17 Jul 1999	<i>Sida fallax</i>	KM
<i>ombrias</i>	H	South Point	coast		1	18 Jul 1999	<i>Scaevola sericea</i>	KM
<i>ombrias</i>	H	Ahumoa	5900 ft	1		15 Aug 1999	<i>Bidens menziesii</i>	KM
<i>ombrias</i>	H	South Point	coast	1		28 May 2001	<i>Scaevola sericea</i>	KM
<i>ombrias</i>	H	South Point	coast	3	1	1 Mar 2002	<i>Tribulus cistoides</i>	KM
<i>ombrias</i>	H	South Point	coast	1	1	1 Mar 2002	<i>Sida fallax</i>	KM
<i>ombrias</i>	H	Puu Waawaa	4300 ft	1		26 Sep 2002	<i>Chamaesyce olowaluana</i>	JG
<i>paradoxicus</i>	H	Kipuka Alala	5800 ft	5	1	14 Jul 1999	<i>Chamaesyce olowaluana</i>	KM
<i>paradoxicus</i>	H	Puu Waawaa	4100 ft	2		1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>paradoxicus</i>	H	Puu Waawaa	4100 ft	1		1 Aug 2002	<i>Myoporum sandwicense</i>	KM
<i>pele</i>	H	Mauna Loa Rd.	4100 ft	2	1	2 Jan 1999	<i>Sophora chrysophylla</i>	KM
<i>pele</i>	H	Kipuka Nene	2900 ft		1	4 Jan 1999	yellow pan trap	KM
<i>pele</i>	H	Kipuka Kalawamana	5000 ft	1		13 Jul 1999	<i>Bidens menziesii</i>	KM
<i>pele</i>	H	Kipuka Alala	5700 ft	5	2	14 Jul 1999	<i>Bidens menziesii</i>	KM
<i>pele</i>	H	Kipuka Alala	5800 ft	5	1	14 Jul 1999	<i>Chamaesyce olowaluana</i>	KM
<i>pele</i>	H	Kipuka Puuulu	4000 ft	2		22 Jul 1999	<i>Crocoshmia</i> × <i>crocoshmiflora</i>	KM
<i>pele</i>	H	Ahumoa	5900 ft	1	3	15 Aug 1999	<i>Bidens menziesii</i>	KM
<i>pele</i>	H	Kipuka Puuulu	3900 ft	5		19 Jul 2000	<i>Myoporum sandwicense</i>	KM
<i>pele</i>	H	Kipuka Puuulu	3900 ft	1		24 Jul 2000	<i>Myoporum sandwicense</i>	KM
<i>pele</i>	H	Kipuka Nene	2900 ft	1	2	26 Jul 2000	<i>Sophora chrysophylla</i>	KM
<i>pele</i>	H	Kipuka Nene	2900 ft	2		26 Jul 2000	over ground	KM
<i>pele</i>	H	Puu Huluhulu, N. Hilo	6700 ft	1		27 May 2001	<i>Myoporum sandwicense</i>	KM
<i>pele</i>	H	Kipuka Nene	2900 ft	1	7	28 Feb 2002	<i>Sophora chrysophylla</i>	KM
<i>pele</i>	H	Puu Waawaa	4100 ft	3		1 Aug 2002	<i>Chamaesyce olowaluana</i>	KM
<i>psammobius</i>	Ma	Eleilei Bay	coast	7	6	8 Aug 2002	<i>Sesuvium portulacastrum</i>	KM
<i>psammobius</i>	Ma	Eleilei Bay	coast	3	1	8 Aug 2002	<i>Bacopa monnieri</i>	KM
<i>pubescens</i>	H	Kau Desert trailhead	930 m		1	6 Dec 1988		PG
<i>pubescens</i>	H	Kilauea Iki rim	966 m	4	1	13 Apr 1989		PG
<i>pubescens</i>	H	Kilauea Iki rim	966 m	3		25 Apr 1989		PG
<i>pubescens</i>	H	Thurston Lava Tube			1	9 Jun 1989		PG
<i>pubescens</i>	H	Bird Park	1230 m		1	5 Jul 1989		PG
<i>pubescens</i>	H	Bird Park	1230 m	3		25 Jul 1989		PG
<i>pubescens</i>	H	Olaa Tract			1	21 Oct 1989		PG
<i>pubescens</i>	H	Kilauea Field Station	1175 m		1	2 Oct 1990		PG
<i>pubescens</i>	H	Lua Manu crater	3700 ft	1	1	1 Jan 1999	<i>Metrosideros polymorpha</i>	KM
<i>pubescens</i>	H	Kilauea Field Station	3800 ft		1	1 Jan 1999	nest in <i>Metrosideros</i>	KM
<i>pubescens</i>	H	Tree Planting Rd.	4200 ft	1		5 Jan 1999	<i>Metrosideros polymorpha</i>	KM
<i>pubescens</i>	H	Devastation Trail	3700 ft	3	2	8 Jan 1999	<i>Metrosideros polymorpha</i>	KM
<i>pubescens</i>	H	Hilina Pali Rd.	3300 ft		1	11 Jan 1999	red pan trap	KM
<i>pubescens</i>	H	Kilauea Iki	3900 ft	1		5 Jun 1999	over ground	KM
<i>pubescens</i>	H	Tree Molds	4000 ft		1	9 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>pubescens</i>	H	Tree Molds	4000 ft		1	10 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>pubescens</i>	H	Olaa Small Tract	3800 ft		1	15 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>pubescens</i>	H	Kipuka Puuulu	3900 ft		1	24 Jul 2000	<i>Nestegis sandwicensis</i>	KM
<i>pubescens</i>	H	Kilauea Caldera	3600 ft		1	29 Jul 2000	<i>Metrosideros polymorpha</i>	KM
<i>pubescens</i>	H	Olaa, Wright Rd.	3800 ft		1	30 Jul 2000	<i>Cheirodendron trigynum</i>	KM
<i>pubescens</i>	H	KFU camp	5300 ft		1	2 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>pubescens</i>	H	Volcano	3750 ft		2	6 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>pubescens</i>	H	Mountain House Rd.	3000 ft		1	25 May 2001	<i>Metrosideros polymorpha</i>	KM
<i>pubescens</i>	H	Mountain House Rd.	3000 ft		1	25 May 2001	<i>Tibouchina urvilleana</i>	KM
<i>pubescens</i>	H	Upper Hamakua Ditch	3700 ft		1	25 May 2001	<i>Metrosideros polymorpha</i>	KM



Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>pubescens</i>	H	Olaa Koa Unit	3800 ft	3		27 Feb 2002	over ferns	KM
<i>pubescens</i>	H	Kipuka Puauulu	4000 ft	1		31 Jul 2002	<i>Psychotria hawaiiensis</i>	KM
<i>pubescens</i>	H	South Kona FR	4700 ft	1		4 Aug 2002	<i>Myoporum sandwicense</i>	KM
<i>rugulosus</i>	H	below 3-Tree Kipuka	1890 m	1		9 Jul 1989	<i>Metrosideros polymorpha</i>	PG
<i>rugulosus</i>	H	Kipuka Nene	2900 ft	1		16 May 1998	yellow pan trap	KM
<i>rugulosus</i>	H	Kilauea Military Camp	4000 ft		1	12 Jul 2002	<i>Metrosideros polymorpha</i>	ML
<i>rugulosus</i>	H	Napau Trail	2900 ft	5	9	14 Jul 2002	around stones	KM
<i>rugulosus</i>	H	Puu Puai	3700 ft		1	26 Jul 2002	<i>Metrosideros polymorpha</i>	ML
<i>setosifrons</i>	H	Earthquake Trail	4000 ft	1		9 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>setosifrons</i>	H	Tree Molds	4000 ft	1		9 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>setosifrons</i>	H	Tree Molds	4000 ft	1		10 Aug 1999	<i>Santalum paniculatum</i>	KM
<i>setosifrons</i>	H	Mauna Loa Est.	3600 ft		1	20 May 2000		DF
<i>setosifrons</i>	H	Volcano	3750 ft		1	5 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>setosifrons</i>	H	Kipuka Puauulu	4000 ft	1		31 Jul 2002	<i>Psychotria hawaiiensis</i>	KM
<i>solaris</i>	K	Keonelo Bay	coast	3	2	19 Aug 1989		JP
<i>solaris</i>	K	Polihale SP	coast	1		2 Feb 1994	<i>Sida fallax</i>	DH
<i>solaris</i>	K	Polihale SP	coast	10	11	25 Aug 1999	<i>Scaevola sericea</i>	KM
<i>specularis</i>	H	KFU South Bound. Rd.	5000 ft	1		8 Jul 1999	<i>Myoporum sandwicense</i>	KM
<i>specularis</i>	H	KFU South Bound. Rd.	5200 ft	6		2 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>specularis</i>	H	KFU camp	5300 ft	1		3 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>specularis</i>	H	KFU South Bound. Rd.	5200 ft	8	4	3 Aug 2000	<i>Myoporum sandwicense</i>	KM
<i>specularis</i>	O	Manana Trail	1600 ft		1	19 Feb 2002	<i>Metrosideros polymorpha</i>	KM
<i>specularis</i>	K	Na Pali-Kona FR	4100 ft	1		4 Jul 1999	<i>Scaevola procera</i>	KM
<i>specularis</i>	K	Awaawapuhi Trail	3800 ft	3	1	4 Jul 2000	<i>Claoxylon sandwicense</i>	KM
<i>specularis</i>	K	Awaawapuhi Trail	3800 ft	3		5 Jul 2000	<i>Claoxylon sandwicense</i>	KM
<i>sphecodoides</i>	H	Kipuka Nene	2900 ft	6		11 Jul 1999	over ground	KM
<i>sphecodoides</i>	H	Kipuka Alala	6100 ft		1	13 Jul 1999	over ground	KM
<i>sphecodoides</i>	H	Kipuka Nene	2900 ft	1		26 Jul 2000	over ground	KM
<i>sphecodoides</i>	H	South Point	coast		1	1 Mar 2002	over ground	KM
<i>sphecodoides</i>	H	Keauhou Ranch	4500 ft	2		29 Jun 2002	<i>Cheirodendron trigynum</i>	KM
<i>takumiae</i>	Ma	Haleakala NW slope	2500 m	7	36	24 Jul 1991	malaise trap 6/14-7/24	RT
<i>takumiae</i>	Ma	Haleakala W slope	2865 m	1		13 Jun 1997		RT
<i>unicus</i>	Ma	Kipahulu Valley	945 m		1	7 Jan 1997		RT
<i>unicus</i>	Ma	Puu Kukui Rd.	2300 ft	3		22 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	Ma	Haelaau Cabin	3000 ft	1		23 Jun 2000	<i>Cheirodendron trigynum</i>	KM
<i>unicus</i>	Ma	Puu Kukui Rd.	2300 ft	3	1	23 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	Ma	Puu Kukui Trail	3700 ft	2	2	8 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>unicus</i>	Ma	Puu Kukui Trail	3700 ft	5	5	10 Aug 2000	<i>Cheirodendron trigynum</i>	KM
<i>unicus</i>	Ma	Puu Kukui Trail	3200 ft	1		11 Aug 2000	<i>Dubautia laxa</i>	KM
<i>unicus</i>	Ma	Makawao FR	4300 ft	2		10 Aug 2002	<i>Cheirodendron trigynum</i>	KM
<i>unicus</i>	L	Munro Trail	3000 ft	4	5	16 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	L	Munro Trail	3000 ft		1	16 Jun 1999	<i>Scaevola chamissoniana</i>	KM
<i>unicus</i>	L	Munro Trail	2900 ft	1		7 Jun 2001	<i>Tetraplasandra oahuensis</i>	KM
<i>unicus</i>	Mo	Kamakou Rd.	3200 ft	1		27 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	Mo	West Kawela Gulch	3600 ft		2	28 Jun 1999	<i>Scaevola chamissoniana</i>	KM
<i>unicus</i>	Mo	Kamakou Rd.	3900 ft	1		2 Jun 2001	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	Mo	Pepeopae boardwalk	4000 ft	1	1	2 Jun 2001	over ferns	KM
<i>unicus</i>	O	Mt. Kaala	4000 ft	2		1 Oct 1997	nest in <i>Bidens torta</i> twig	DH
<i>unicus</i>	O	Wiliwilinui Trail	2000 ft	3	3	13 Jun 1999	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	O	Wiliwilinui Trail	1800 ft	1	1	26 Jul 1999	<i>Scaevola gaudichaudiana</i>	KM
<i>unicus</i>	O	Puu Kaua	2600 ft	3	1	29 Jul 1999	<i>Scaevola gaudichaudiana</i>	KM
<i>unicus</i>	O	Koolau Summit Trail	2300 ft	1		1 Jun 2000	<i>Psychotria fauriei</i>	KM
<i>unicus</i>	O	Papali Ridge	1500 ft	2		4 Jun 2000	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	O	Aiea Trail	1900 ft		2	14 Aug 2000	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	O	Aiea Trail	1900 ft	1		14 Aug 2000	<i>Tetraplasandra oahuensis</i>	KM

Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>unicus</i>	O	Papali Ridge	1400 ft	1		16 Aug 2000	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	O	Manana Trail	1600 ft		4	19 Feb 2002	<i>Metrosideros polymorpha</i>	KM
<i>unicus</i>	O	Manana Trail	1800 ft	1	2	19 Feb 2002	<i>Acacia koa</i>	KM
<i>unicus</i>	O	Manana Trail	1800 ft	1		19 Feb 2002	<i>Scaevola gaudichaudiana</i>	KM
<i>unicus</i>	O	Manana Trail	1600 ft		1	3 Mar 2002	<i>Metrosideros polymorpha</i>	KM
<i>volatilis</i>	Ma	Haleakala NW slope	2080 m	1		22 May 1991		PG
<i>volatilis</i>	Ma	below Halemauu Trail	2300 m	1		20 Jun 1991		RT
<i>volatilis</i>	Ma	above Halemauu Trail	2600 m	1		20 Jun 1991		RT
<i>volatilis</i>	Ma	Haleakala NW slope	2500 m	9	13	24 Jul 1991	malaise trap 6/14-7/24	RT
<i>volatilis</i>	Ma	Haleakala N slope	2150 m		1	13 Aug 1991		PG
<i>volatilis</i>	Ma	Halemauu Trail		1	2	27 May 1992		RT
<i>volatilis</i>	Ma	near Halemauu Trail	7840 ft	1		7 Sep 1993		HD
<i>volatilis</i>	Ma	Paliku	1830 m		1	26 Jun 1996		RT
<i>volatilis</i>	Ma	near Halemauu Trail	2375 m	1		1 Oct 1996		RT
<i>volatilis</i>	Ma	Puu Maile	2195 m		1	10 Mar 1997		RT
<i>volatilis</i>	Ma	Kalahaku	2835 m	1		14 Mar 1997	<i>Styphelia tameiameia</i>	RT
<i>volatilis</i>	Ma	Laie	2040 m		3	7 Apr 1997		RT
<i>volatilis</i>	Ma	Waikane	2010 m		2	8 Apr 1997		RT
<i>volatilis</i>	Ma	Kaluaike	2225 m	1	1	15 May 1997		RT
<i>volatilis</i>	Ma	Lauulu Trail	1955 m	1	2	27 May 1997		RT
<i>volatilis</i>	Ma	Lauulu Trail	2465 m	2	1	27 May 1997		RT
<i>volatilis</i>	Ma	Kuiki	2170 m	4	3	7 Aug 1997		RT
<i>volatilis</i>	Ma	Paliku	1950 m	1		25 Sep 1997		RT
<i>volatilis</i>	Ma	Oili Puu	2040 m		1	6 Aug 1998		RT
<i>volatilis</i>	Ma	Halemauu Trail	8000 ft	2	1	12 May 1999	over ground	RT
<i>volatilis</i>	Ma	Haleakala NW slope	2250 m		1	12 May 1999		RT
<i>volatilis</i>	Ma	Halemauu Trail	8000 ft	2	6	19 Jun 1999	over ground	KM
<i>volatilis</i>	Ma	Halemauu Trail	7800 ft	8	4	23 Jun 1999	over ground	KM
<i>volatilis</i>	Ma	Supply Trail	6800 ft	1	1	25 Jun 1999	yellow pan trap	KM
<i>volatilis</i>	Ma	Lahainaluna	1800 ft		1	3 Aug 1999	over ground	KM
<i>volatilis</i>	Ma	Waikamoi Preserve	6400 ft		1	4 Aug 1999	over ground	KM
<i>volatilis</i>	Ma	below Halemauu Trail	2370 m	1		5 Aug 1999		RT
<i>volatilis</i>	Ma	Lauulu Trail	2130 m	2		9 Sep 1999		RT
<i>volatilis</i>	Ma	HALE Service Area	6800 ft	1		20 Mar 2000	malaise trap	RT
<i>volatilis</i>	Ma	HALE visitor center	2975 m	1		28 May 2000		RT
<i>volatilis</i>	Ma	Laie flats	2040 m	2		31 May 2000		RT
<i>volatilis</i>	Ma	above Hosmer Grove	2100 m		1	12 Jun 2000		RT
<i>volatilis</i>	Ma	near Koolau	2250 m	3	1	12 Jun 2000		RT
<i>volatilis</i>	Ma	Halemauu Trail	7900 ft	1		25 Jun 2000	over ground	KM
<i>volatilis</i>	Ma	Lauula Trail	8000 ft	1		27 Jun 2000	over ground	KM
<i>volatilis</i>	Ma	Kalapawili Ridge	7400 ft	1	1	27 Jun 2000	over ground	KM
<i>volatilis</i>	Ma	Kaupo Trail	5500 ft	1	2	28 Jun 2000	over ground	KM
<i>volatilis</i>	Ma	Puu Keokea	7100 ft	2		20 May 2001	over ground	KM
<i>volcanicus</i>	H	Mauna Loa Rd.	1850 m	2		5 Apr 1989		PG
<i>volcanicus</i>	H	Mauna Loa Rd.	1850 m	1		9 Jul 1989		PG
<i>volcanicus</i>	H	below 3-Tree Kipuka	1890 m		1	9 Jul 1989	<i>Metrosideros polymorpha</i>	PG
<i>volcanicus</i>	H	Kipuka Maunaiu	1890 m	1	2	17 Jul 1989		PG
<i>volcanicus</i>	H	below 3-Tree Kipuka	1890 m	2	1	17 Jul 1989	<i>Metrosideros polymorpha</i>	PG
<i>volcanicus</i>	H	Mauna Loa Rd.	1850 m	3		25 Jul 1989		PG
<i>volcanicus</i>	H	Mauna Loa Rd.	2018 m		3	25 Jul 1989		PG
<i>volcanicus</i>	H	south of Bird Park	1230 m	2		4 Aug 1989		PG
<i>volcanicus</i>	H	Footprints Trail	900 m		1	30 Dec 1989		PG
<i>volcanicus</i>	H	Kipuka Maunaiu	1890 m		6	31 Dec 1989		PG
<i>volcanicus</i>	H	Hualalai summit	8000 ft	1		20 Apr 1992	<i>Coprosma</i> sp.	SM
<i>volcanicus</i>	H	Mauna Loa Rd.	2050 m	2	5	21 Mar 1993		JP

Species	Is.	Locality	Elev.	M	F	Date	Flower/Notes	Coll.
<i>volcanicus</i>	H	Mauna Loa Rd.	4200 ft	1		2 Jan 1999	over ground	KM
<i>volcanicus</i>	H	0.9 mi. S Mauna Loa Rd.	6000 ft	4		4 Jan 1999	over ground	KM
<i>volcanicus</i>	H	Devastation Trail	3700 ft	3		8 Jan 1999	<i>Styphelia tameiameiae</i>	KM
<i>volcanicus</i>	H	Kipuka Nene	2900 ft	1	1	13 Jan 1999	yellow pan trap	KM
<i>volcanicus</i>	H	Kulani Cone	5100 ft	2		14 Jan 1999	boggy area	KM
<i>volcanicus</i>	H	Kilauea Iki	3900 ft	1		5 Jun 1999	over ground	KM
<i>volcanicus</i>	H	Kilauea Iki	3900 ft		1	8 Jun 1999	over ground	KM
<i>volcanicus</i>	H	Kipuka Nene	2900 ft	1		13 Aug 1999	over ground	KM
<i>volcanicus</i>	H	near Tree Molds	4000 ft	1		11 Jun 2000	over ground	KM
<i>volcanicus</i>	H	Kipuka Puauulu	3900 ft	1		24 Jul 2000	<i>Myoporum sandwicense</i>	KM
<i>volcanicus</i>	H	Crater Rim Trail	4100 ft		2	24 Jul 2000	<i>Dodonaea viscosa</i>	KM
<i>volcanicus</i>	H	Byron's Ledge	3800 ft	2		29 Jul 2000	<i>Styphelia tameiameiae</i>	KM
<i>volcanicus</i>	H	Puu Waawaa	6200 ft		1	30 May 2001	<i>Dodonaea viscosa</i>	KM
<i>volcanicus</i>	H	Puu Waawaa	6200 ft	4	3	30 May 2001	over ground	KM
<i>volcanicus</i>	H	Napau Trail	3000 ft	1		14 Jul 2002	<i>Metrosideros polymorpha</i>	KM
<i>volcanicus</i>	Ma	Holua Cabin	7200 ft	1		6 Jun 1985	<i>Styphelia tameiameiae</i>	CF
<i>volcanicus</i>	Ma	Haleakala Crater	7600 ft		1	25 Aug 1986	<i>Dubautia</i> × <i>Argyroxiphium</i>	AM
<i>volcanicus</i>	Ma	Halemauu Trail		4		27 May 1992		RT
<i>volcanicus</i>	Ma	Lihau summit	4000 ft	1		8 May 1993		DP
<i>volcanicus</i>	Ma	base of Puu Maile	2195 m	1		25 Jun 1996		RT
<i>volcanicus</i>	Ma	Mamane Hill	2255 m	1	1	28 Jun 1996	<i>Styphelia tameiameiae</i>	RT
<i>volcanicus</i>	Ma	near Oili Puu	2050 m	1	1	8 Jul 1996		RT
<i>volcanicus</i>	Ma	Halemauu Trail	2440 m	1		28 Aug 1996		RT
<i>volcanicus</i>	Ma	near HALE visitor center	9750 ft		3	11 Sep 1996	<i>Dubautia menziesii</i>	RT
<i>volcanicus</i>	Ma	Upper Koolau Gap		2		11 Sep 1996		RT
<i>volcanicus</i>	Ma	above Halemauu Trail			1	25 Sep 1996		RT
<i>volcanicus</i>	Ma	Sliding Sands Trail	2500 m		3	27 Oct 1996		RT
<i>volcanicus</i>	Ma	Halemauu Trail	2250 m	1		3 Mar 1997		RT
<i>volcanicus</i>	Ma	Waikane	2010 m	1		8 Apr 1997		RT
<i>volcanicus</i>	Ma	Lauulu Trail	1955 m	2	2	27 May 1997		RT
<i>volcanicus</i>	Ma	Sliding Sands Trail	2500 m		3	18 Jun 1997	<i>Sophora chrysophylla</i>	RT
<i>volcanicus</i>	Ma	Kuiki	2170 m	1		7 Aug 1997		RT
<i>volcanicus</i>	Ma	Science City	3010 m		2	13 Aug 1997		RT
<i>volcanicus</i>	Ma	Laie flats	2060 m	1		19 Aug 1997		RT
<i>volcanicus</i>	Ma	Kaupo Trail	1950 m	4		20 Aug 1997		RT
<i>volcanicus</i>	Ma	Crystal Cave	2285 m	1		25 Sep 1997		RT
<i>volcanicus</i>	Ma	Paliku	1950 m	1		25 Sep 1997		RT
<i>volcanicus</i>	Ma	Lauulu Trail	2015 m	1		14 Jan 1998		RT
<i>volcanicus</i>	Ma	Oili Puu	2020 m	1		15 Jan 1998	<i>Styphelia tameiameiae</i>	RT
<i>volcanicus</i>	Ma	Kipahulu Valley	1980 m		2	21 May 1998		RT
<i>volcanicus</i>	Ma	Paliku	1950 m	1		4 Nov 1998		RT
<i>volcanicus</i>	Ma	Sliding Sands Trail	2500 m		1	4 Nov 1998	<i>Dubautia menziesii</i>	RT
<i>volcanicus</i>	Ma	Kuiki	2250 m	2		17 Jan 1999		RT
<i>volcanicus</i>	Ma	Halemauu Trail	8000 ft	1		12 May 1999	over ground	RT
<i>volcanicus</i>	Ma	Kilohana	2800 m		1	1 Jun 1999		RT
<i>volcanicus</i>	Ma	Halemauu Trail	7800 ft	1		23 Jun 1999	over ground	KM
<i>volcanicus</i>	Ma	Holua Cabin	2155 m		1	1 Oct 1999		RT
<i>volcanicus</i>	Ma	Halemauu Trail	7900 ft	1		25 Jun 2000	over ground	KM
<i>volcanicus</i>	Ma	Lauula Trail	8000 ft	2		27 Jun 2000	over ground	KM
<i>volcanicus</i>	Ma	Kalapawili Ridge	7400 ft	1		27 Jun 2000	over ground	KM
<i>volcanicus</i>	Ma	Kaupo Trail	5500 ft	2		28 Jun 2000	over ground	KM
<i>volcanicus</i>	Ma	Halemauu Trail	7900 ft	1	1	29 Jun 2000	<i>Styphelia tameiameiae</i>	KM
<i>volcanicus</i>	Ma	Laie flats	2040 m		1	26 Jul 2000		RT
<i>volcanicus</i>	Ma	Puu Keokea	7100 ft	1		20 May 2001	over ground	KM
sp. A	Mo	West Kawela Gulch	3700 ft		1	2 Jun 2001	<i>Scaevola chamissoniana</i>	KM



## INDEX

The index is divided in four parts: *Hylaeus* species-group names; Arthropod enemies and associates; Plants used as nesting substrates; and Flower visitation records. Species-group names in bold face indicate valid taxa revised in this volume and the pages for their taxonomic treatments. Exotic plants are indicated with an asterisk (\*).

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