# Hilaris yellow-faced bee
# (*Hylaeus hilaris*)

# 5-Year Review
# Summary and Evaluation

**U.S. Fish and Wildlife Service**
**Pacific Islands Fish and Wildlife Office**
**Honolulu, Hawai‘i**

# 5-YEAR REVIEW
**Species reviewed: hilaris yellow-faced bee (*Hylaeus hilaris*)**

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# 5-YEAR REVIEW
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## 1.0 GENERAL INFORMATION

### 1.1 Reviewers:

Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, Pacific Islands Fish and Wildlife Office (PIFWO)
John Vetter, Animal Recovery Coordinator, PIFWO
Megan Laut, Conservation and Restoration Team Manager, PIFWO

**Lead Regional Office:**
Interior Region 12, Portland Regional Office, Portland Oregon

**Lead Field Office:**
Interior Region 12, PIFWO, Honolulu, Hawaiʻi

**Cooperating Field Office(s):**
N/A

**Cooperating Regional Office(s):**
N/A

### 1.2 Methodology used to complete the review:

This review was conducted by staff of the U.S. Fish and Wildlife Service (Service) at the Pacific Islands Fish and Wildlife Office of, beginning in November 2020. The review was based on the final rule listing this species; peer reviewed scientific publications; unpublished field observations by the Service, State of Hawaiʻi, and other experienced biologists; unpublished survey reports; notes and communications from other qualified biologists; as well as a review of current, available information. The evaluation completed by Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, was reviewed by John Vetter, Animal Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

### 1.3 Background:

#### 1.3.1 FR Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2019a. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews for 91 species in Oregon, Washington, Hawaii, and American Samoa. Federal Register 84:27152–27154.

### 1.3.2 Listing history:

Original Listing
**FR notice:** [USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; Determination of endangered status for 49 species from the Hawaiian Islands. Federal Register 81:67786–67860.
**Date listed:** September 30, 2016
**Entity listed:** *Hylaeus hilaris* (hilaris yellow-faced bee)
**Classification:** Endangered

Revised Listing, if applicable
**FR notice:** N/A
**Date listed:** N/A
**Entity listed:** N/A
**Classification:** N/A

### 1.3.3 Associated rulemakings:
**FR notice:** N/A

### 1.3.4 Review History:
This is the first 5-year review for *Hylaeus hilaris*.

### 1.3.5 Species' Recovery Priority Number at start of this 5-year review:
5

### 1.3.6 Current Recovery Plan or Outline:
**Name of plan or outline:** Recovery Outline for the Islands of Maui, Molokaʻi, Kahoʻolawe, and Lānaʻi (Maui Nui) (USFWS 2019b)
**Date issued:** October 31, 2019
**Dates of previous revisions, if applicable:** N/A

# 2.0 REVIEW ANALYSIS

## 2.1 Application of the 1996 Distinct Population Segment (DPS) policy

### 2.1.1 Is the species under review a vertebrate?
____**Yes**
__X_**No**

### 2.1.2 Is the species under review listed as a DPS?
____**Yes**
____**No**

### 2.1.3 Was the DPS listed prior to 1996?
____**Yes**
____**No**

**2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?**

____**Yes**
____**No**

**2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?**

____**Yes**
____**No**

**2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?**

____**Yes**
____**No**

## 2.2 Recovery Criteria

**2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?**

____**Yes**
__X_**No**

**2.2.2 Adequacy of recovery criteria.**

**2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?**

____**Yes**
____**No**

**2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?**

____**Yes**
____**No**

**2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:**
The Draft Recovery Plan for 44 Species from the Islands of Maui, Molokaʻi, Kahoʻolawe, and Lānaʻi (Maui Nui) that includes hilaris yellow-faced bees is scheduled to be finalized in 2021.

## 2.3 Updated Information and Current Species Status

### 2.3.1 Biology and Habitat

#### 2.3.1.1 New information on the species' biology and life history:

In general, *Hylaeus* species are small to medium sized bees with forewing lengths of about 0.12 to 0.31 inches (in) (3 to 8 millimeters [mm]), slender bodies that are usually black, short-bilobed tongues, and two submarginal cells in the forewing (Daly and Magnacca 2003, p. 12). Males of most of the *Hylaeus* species and females of several species have yellow marks on their face, hence the common name "yellow-faced bees." *Hylaeus* bees, in general, lack the elongated hairs on the hind legs that other bee genera use to carry pollen externally. The lack of these hairs gives them a wasp-like appearance. But, yellow-faced bees can be distinguished from wasps by the presence of branched hairs on the body that are longest on the sides of the thorax. Hilaris yellow-faced bee is considered one of the most colorful of the *Hylaeus* species. It is a medium sized bee, relative to other yellow-faced bees. The face of a male is almost entirely yellow with a yellow stripe continuing above the antennal sockets. Males have slightly smoky to smoky wings and a red abdomen with white bands of hair on the abdominal segments. The adult female has a reddish to brownish face and antennae; the abdomen is dark with bands of hair on the segments. The frons (central forehead) and vertex (tip of the head) of the female are slightly swollen (Daly and Magnacca 2003, p. 106). A more detailed description of the species is provided by Daly and Magnacca (2003, pp. 103-106). Characteristics of the egg, larva, and pupa stages of the hilaris yellow-faced bee are unknown (Magnacca 2005, entire).

Hilaris yellow-faced bee is one of five native *Hylaeus* species in Hawai‘i thought to be a cleptoparasite (Perkins 1899, p. 106; Daly and Magnacca 2003 in litt., p.8; Magnacca 2005, entire). A female cleptoparasite does not build or provision her own nest. Rather, she enters the nests of other *Hylaeus* species and lays her own eggs. Unlike cleptoparasitic yellow-faced bees, most female yellow-faced bees have abundant curved hairs on the foreleg that function in gathering pollen for nest provisioning. The female grooms the pollen off her head and these curved hairs on her forelegs and transfers it to her internal crop for transport to her nest. The rest of the pollen is discarded (Michener 2000, p. 84). Transport of the pollen in the internal crop, rather than on external, abundant elongated hairs on the hindleg, is unique to bees in the subfamily Hylaeinae (Michner 2000, p. 15). In contrast, cleptoparasitic females, including hilaris yellow-faced bee females, have short, straight hairs on the foreleg (Daly and Magnacca 2003, p. 105). Perkins (1899, p. 106) hypothesized that these straight hairs are associated with the cleptoparasitic habits of hilaris yellow-faced bees; as this species lacks the need to provision her nests with pollen.

Hawaiian *Hylaeus* species group within two categories: ground-nesting species that require relatively dry conditions and stem-nesting species found within wetter areas (Daly and Magnacca 2003, p. 11). Historically, hilaris yellow-faced bees were known from coastal strand habitat on Maui, Lānaʻi, and Molokaʻi. It is believed hilaris yellow-faced bees were distributed along much of the coast of these three islands because its primary presumed nest hosts (*Hylaeus anthracinus, Hylaeus assimulans, Hylaeus flavipes,* and *Hylaeus longiceps*) occurred throughout this coastal habitat (Daly and Magnacca 2003, p. 106). The *Hylaeus* species that are cleptoparasitized by hilaris yellow-faced bees are believed to be limited to ground or crevice nesting species (Daly and Magnacca 2003, p. 106; Magnacca 2007, p. 187). For ground-nesting species, nesting substrate is a stronger constraint on habitat suitability than food plants. They need relatively dry conditions for nesting, but can forage in adjacent habitats (Daly and Magnacca 2003, p. 11).

Bees in the family Colletidae are referred to as plasterer bees because they line their nests with a cellophane-like membrane secreted from their salivary and Dufour's gland (Espelie et al. 1992, entire; Daly and Magnacca 2003, p. 9). The female yellow-faced bee lines and provisions her own nest, even if nesting in aggregations, hence the name solitary bees (Daly and Magnacca 2003, p. 9). After lining the nest, the female lays her eggs. Prior to sealing the nest, the female provides her brood (young) with a mass of semiliquid nectar and pollen left alongside her eggs (Daly and Magnacca 2003, p. 9).

Within the nest, the general life cycle for yellow-faced bees is as follows: eggs hatch and develop into grub-like larvae. As larvae grow, they molt through three successive stages. During this time, the larvae consume the nectar and pollen provisions left for them by the female (Daly and Magnacca 2003, p. 9; Michener 2000, p. 24). After the third molt, the larvae change into pupae (a resting form). It is in this stage that they metamorphose (i.e. undergo change) and emerge as adults. The brood cycle from egg to adult takes about 30 to 60 days (Graham 2015 in litt., entire), during which time, the solitary females do not provide parental care or defend their brood. In the case of the female hilaris yellow-faced bee, she apparently lays her own egg or eggs in the occupied nests of other ground nesting yellow-faced bee species (Perkins 1899, p. 106; Zimmerman 1970, pp. 36–37; Daly and Magnacca 2003, entire; Magnacca 2007, entire).

The needs of the egg, larval, and pupal stages to survive are largely unknown. The female hilaris yellow-faced bee selects the nest in which to lay her egg. Interactions between the cleptoparasitic hilaris yellow-faced bee larva with the life stages of the host or provisions of the nest is unknown. Body size of a resulting adult cleptoparasite may be correlated with the host nest provisions (Michner 2000, p. 30; Daly and Magnacca 2003, pp. 9–10). Essentially, larger host species provide more food and produce larger cleptoparasites; smaller provisions of smaller host species produce smaller cleptoparasites.

Our knowledge of longevity and breeding behaviors of hilaris yellow-faced bee individuals is limited. Based on Daly and Magnacca (2003, p. 7–8), *Hylaeus* females, in general, appear to live longer than males. An adult male of the wood nesting species *Hylaeus pubescens* survived 74 days (Daly and Coville 1982, p. 76), but little else is known about average longevity of the coastal species. Females mate as young adults and store the sperm for the rest of their lives (Daly and Magnacca 2003, pp. 7–8). The capability of the female to store sperm may be advantageous for cleptoparasitic species because time of breeding may not align with nest availability.

Hawaiian *Hylaeus* species are dependent on relatively few species of native Hawaiian plants for their nutritional needs (Daly and Magnacca 2003, entire; Magnacca 2007, p. 185). In coastal sites, the most "favored" pollen sources are *Euphorbia* spp. (‘akoko), *Dodonaea viscosa* (‘a‘ali‘i), *Myoporum sandwicense* (naio), *Sida fallax* (‘ilima), and nonnative *Heliotropium foertherianum* (tree heliotrope) (Daly and Magnacca 2003, pp. 231–234; Magnacca 2007, p. 186). All of the most used pollen types collected by Hawaiian yellow-faced bees are the dominant or codominant plants in the native coastal shrub land. In addition, rare species such as *Sesbania tomentosa* (‘ōhai) are regularly visited where they are found (Magnacca 2007). Adult yellow-faced bees consume pollen and nectar, but their exact nutritional needs are not known. According to Magnacca (2007), coastal nesting bees are almost exclusively found in areas dominated by a variety of native shrub and herb species, including ‘akoko, ‘ilima, and *Jacquemontia sandwicensis* (pā‘ū o Hi‘iaka), rather than a single species. *Scaevola taccada* (naupaka kahakai), for example, is common and widespread in the coastal strand habitat, yet yellow-faced bees are apparently not capable of surviving solely on this species (Magnacca 2007, p. 187). The favored food sources of hilaris yellow-faced bee adults are not known because they have never been observed at flowers. As a cleptoparasite, a female does not provision a nest with pollen, rather, she relies on nests already provisioned by other species of *Hylaeus*. Thus, the diet of hilaris yellow-faced bee larval stages is comprised of the pollen and nectar collected and deposited in the nest by the female host (Daly and Magnacca 2003, entire; Magnacca 2007, entire).

The pollen types collected by the four yellow-faced bee hosts most likely cleptoparasitized by hilaris yellow-faced bee appear to be almost exclusively from native plant species, with the exception of introduced tree heliotrope (Daly and Magnacca 2003, pp. 231–234). The use of the nonnative tree heliotrope is possibly due to the decline in abundance of the related native *Heliotropium* spp. (hinahina; Daly and Magnacca 2003, p. 11). Analysis of pollen loads shows that coastal yellow-faced bees, in particular, use many different native plants as food sources, not only seasonally but also at any given time (Magnacca 2007, entire). The presence of diverse native pollen sources that support the cleptoparasites hosts and are used for provisioning the nests parasitized by hilaris yellow-faced bees are a necessary part of the suitable habitat for hilaris yellow-faced bee reproduction. Adult hilaris yellow-faced bees likely visit these plants or other natives found in the coastal strand or adjacent habitats for their own nutritional needs. The strong dependence of hilaris yellow-faced bees and its nest hosts on suitable native plants, to the near-complete exclusion of exotic plant species (with the exception of tree heliotrope), requires their foraging habitat be comprised of suitable native plants.

**2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:**

In the early 1900's, yellow-faced bee species were ubiquitous throughout the islands (Perkins 1912, p. 688). On Maui, hilaris yellow-faced bees were collected on four occasions between 1879 and 1899. Two specimens collected by Smith (1879, p. 683) and Blackburn and Kirby (1880, p. 85) are from an unspecified location on Maui (Daly and Magnacca, p. 106). Another specimen labeled "Wailuku sand hills" is from an area that supported a diverse yellow-faced bee fauna that included two cleptoparasitic species, hilaris yellow-faced bees and *Hylaeus volatilis*, as well as the likely host species *Hylaeus anthracinus*, *Hylaeus assimulans*, *Hylaeus flavipes*, and *Hylaeus longiceps* (Perkins 1899, pp. 103–104; Daly and Magnacca 2003, pp. 103–106). These dunes are now developed or covered with nonnative vegetation including *Prosopis pallida* (kiawe); native plants are scarce, and bees are absent (Magnacca 2007, p. 182). Perkins also collected hilaris yellow-faced bees from the "sandy isthmus"; presumably, this was a coastal area south of Wailuku that separates east and west Maui (Daly and Magnacca 2003, p. 106). This area is now mixed use (developed and agriculture) and no longer provides suitable habitat for hilaris yellow-faced bees or its hosts. After the 1930s, collection of *Hylaeus* species lapsed for about 70–100 years. The hilaris yellow-faced bee has not been collected on Maui since 1912. The species was absent from all of its historical population sites revisited by researchers between 1998 and 2006 on Maui (Magnacca 2007, p. 181). Hilaris yellow-faced bees was also not observed in 2003 when 10 additional sites with potentially suitable habitat and host presence were surveyed (Daly and Magnacca 2003, pp. 103, 106). Areas of native vegetation exist on the north coast of West Maui and northeastern coasts of East Maui, but have not been investigated (Magnacca 2007, p. 182). However, absence of hilaris yellow-faced bees from areas where other coastal or lowland yellow-faced bee hosts have been collected suggests hilaris yellow-faced bee may have been extirpated from Maui.

Though no historical record of collections on Kahoʻolawe exist, yellow-faced bees have been collected on this island, which is undergoing native plant restoration. The island has not been searched widely. However, *Hylaeus assimulans* was collected in 1997 and *Hylaeus anthracinus* in 2002; both can be hosts of *Hylaeus hilaris,* though there are no records of hilaris yellow-faced bee from the island (Magnacca 2007, p. 182).

On Lānaʻi, Perkins (1899, p. 106) found *Hylaeus hilaris* on the southern coast habitat at Mānele. It is now the site of the ferry landing from Lahaina and a small boat harbor and is close to a major resort development. The area was searched in 1999, but little native vegetation is present aside from naupaka kahakai, and no yellow-faced bees were found (Magnacca 2007, entire). The nonnative sweat bee, *Lasioglossum impavidum*, a competitor of yellow-faced bees, was collected at the site in 2000 by K. Magnacca (Snelling 2003, p. 351). Large areas of remote sandy beach habitat on the north and east coasts have not been thoroughly searched, though much of the area has few native plants remaining. Two hilaris yellow-faced bee host species (*Hylaeus anthracinus* and *Hylaeus longiceps*) are known to exist on the island. Recent records of them have primarily come from lowland dry forest and shrubland where hilaris yellow-faced bees have never been collected (Bustamente 2020 in litt., entire; Magnacca 2019 in litt., entire). Hilaris yellow-faced bees were not found in surveys at Mānele, Polihua beach and Shipwreck beach between 1993 and 2006, though its nest hosts were found near Mānele Road and Shipwreck beach (Daly and Magnacca 2003, pp. 106, 217; Magnacca 2007, pp. 177, 181). Absence of hilaris yellow-faced bee from areas where other coastal or lowland nest hosts have been collected suggests hilaris yellow-faced bee may have been extirpated from Lānaʻi. (Daly and Magnacca 2003, p. 106; Magnacca 2005, p.2; Magnacca 2007, p. 181; USFWS 2016, p. 67814).

On Molokaʻi, hilaris yellow-faced bees were first recorded by Fullaway (1918, p. 396). Only two collections of the species have been made since 1930, each of one male: one by J. Rosenheim in 1989 and one by K. Magnacca in 1999 (Daly and Magnacca 2003, pp. 222; Magnacca 2007, p. 181). These collections were made on the northwestern coast of Molokaʻi at the Moʻomomi Preserve, protected and managed by The Nature Conservancy of Hawaiʻi. Currently, the only known population of hilaris yellow-faced bees is located at Moʻomomi Preserve on Molokaʻi, where it was last observed in 1999. This site is part of a large area of calcified dunes, some of which are dominated by native plants and others by nonnatives. Populations of *Hylaeus anthracinus* and *Hylaeus longiceps* are present here.

**2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):**
The diversity of habitat and the breadth of genetic diversity is strongly influenced by the current and historic biogeographical range of hilaris yellow-faced bees and its hosts. While there are no historic population estimates, qualitative accounts of hilaris yellow-faced bee indicate that they were likely rare in their habitat, because of the nature of cleptoparasitic populations relative to their hosts. We have no historical genetic information, and thus cannot determine how much genetic variation has been lost since humans arrived in Hawaiʻi. The mobility of yellow-faced bees provides a means of short-range connectivity between populations, which, in turn, can support genetic exchange and representation. However, genetic exchange is severely limited by only having one known population. It is highly likely that traits have been lost over time given the reduction in range and populations of the species. Representation for hilaris yellow-faced bees is conferred by having stable to increasing populations that embody the existing full genetic diversity dispersed throughout its full coastal ranges on Molokaʻi, Lānaʻi, and Maui. A single, small extant population on Molokai provides extremely low representation.

**2.3.1.4 Taxonomic classification or changes in nomenclature:**
*Hylaeus hilaris* is the most recent taxonomic treatment for this species (Daly and Magnacca 2003, pp. 103–106).

**2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):**
See section 2.3.1.2 above for historic and current spatial distribution of the species. Historically, hilaris yellow-faced bees was known from dry, coastal habitat on Maui, Lānaʻi, and Molokaʻi (Daly and Magnacca 2003, pp. 103–106). This species is believed to have occurred along much of the coast of these three islands because the hosts it cleptoparasitizes, *Hylaeus anthracinus, Hylaeus assimulans, Hylaeus flavipes,* and *Hylaeus longiceps*, occurred there. Based on the most recent surveys, hilaris yellow-faced bee occurs only on Molokaʻi at the Moʻomomi Preserve (Daly and Magnacca 2003, pp. 222; Magnacca 2007, p. 181). Habitat degradation and loss, rarity of suitable host nests for cleptoparasitization, predation by ants and wasps, and competition for food resources have likely extirpated the populations that occurred on Maui and Lānaʻi. The remaining known population at Moʻomomi Preserve is at imminent risk of extirpation due to its apparent low numbers, severely reduced habitat

range, rarity of its hosts, and threats from predation, stochastic, and catastrophic events. Abundance of individuals in the populations is unknown, but is likely very low, given the size of the habitat area.

Habitat loss and degradation have contributed significantly to population declines of hilaris yellow-faced bees and its hosts. Native coastal habitat is one of the rarest habitats on each island (Cuddihy and Stone 1990, pp. 94–95; Wagner et al. 1999, pp. 45, 54; Magnacca 2007, p. 180; Kim et al. 2020, entire). The coastal strand, dunes, and adjacent dry lowland habitat ecosystem have been modified, degraded, or lost by land use conversion (e.g. development, agriculture, road building), invasion by nonnative species, fire, and environmental changes (Cuddihy and Stone 1990, pp. 94–95; Wagner et al. 1999, entire; Kim et al. 2020, entire). Nesting and foraging resources are becoming increasingly rare and fragmented (Cuddihy and Stone 1990, entire; Magnacca 2005, entire). As a result, hilaris yellow-faced bees and its hosts on which it depends for reproduction have disappeared from much of the historical habitat they once occupied on Molokaʻi, Lānaʻi, and Maui.

**2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):**
The majority of lowland habitats below 1,969 feet (ft) (600 meters [m]) once occupied by hilaris yellow-faced bees are now dominated by invasive plant species that are replacing native flora (Cuddihy and Stone 1990, pp. 73-74; Wagner et al. 1999, p. 52; Mascaro et al. 2008, entire; Kim et al. 2020, entire). Most of the coastal habitats of the main Hawaiian islands lack significant amounts of native foraging plants besides naupaka kahakai, which cannot support yelow-faced bee populations on its own (Magnacca 2007, p. 187).

### 2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

**2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range (Factor A):**
*Ungulates and degradation of habitat*—Nonnative animals such as feral pigs (*Sus scrofa*), goats (*Capra hircus*), horses (*Equus ferus caballus*), axis deer (*Axis axis*), and cattle (*Bos taurus*), are considered one of the primary factors underlying degradation of native vegetation in the Hawaiian Islands. These habitat changes remove food sources and nesting sites for *Hylaeus hilaris* and its *Hylaeus* hosts (Stone 1985, pp. 262–263; Cuddihy and Stone 1990, pp. 60–66, 73). The browsing, grazing, and trampling by these mammals degrade native plant communities and facilitate the invasion of exotic plants by spreading their seeds and creating disturbed areas where seeds could germinate (Hobdy 1993, p. 207). Specific threats to the yellow-faced bee habitat posed by introduced

ungulates are: (1) crushing or trampling of ground nests; (2) trampling and grazing effects on the plants used by yellow-faced bees for pollen and nectar; (3) ungulate paths leading to mechanical damage of host plant roots and substrate erosion; and (4) creation of open, disturbed areas facilitating weedy plant invasion and the establishment of nonnative plants from dispersed fruits and seeds, which results in the conversion of a native community to one dominated by nonnative vegetation.

*Invasive, nonnative plants*— Habitat destruction and modification by nonnative plants, such as *Asystasia gangetica* (Chinese violet), *Atriplex semibaccata* (saltbush), *Cenchrus ciliaris* (buffelgrass), *Chloris barbata* (swollen fingergrass), *Digitaria insularis* (sourgrass), *Leucaena leucocephala* (koa haole), *Melinis minutiflora* (molasses grass), *Pluchea indica* (Indian fleabane), *Pluchea carolinensis* (sourbush), *Prosopis pallida* (kiawe), *Schinus terebinthifolius* (Brazilian peppertree), and *Verbesina encelioides* (golden crown-beard) represent a serious and ongoing threat to the hilaris yellow-faced bees and its nest hosts (USFWS 2016, entire). Such nonnative plants adversely affect microhabitat by modifying the availability of light, altering soil-water regimes, modify nutrient cycling processes, altering fire characteristics of native plant habitat, outcompeting natives, and inhibiting the growth of native plant species (Vitousek 1987, p. 224). Each of these effects can convert native-dominated plant communities to nonnative plant communities (Cuddihy and Stone 1990, p. 74). This conversion has negative effects on the host plants that yellow-faced bees feed upon and use for provisioning their nests. While some yellow-faced bees have been observed on the nonnative tree heliotrope, yellow-faced bees are almost exclusively dependent on native plants for pollen and nectar. The conversion of native plant communities to nonnative communities can also alter or remove ground nesting sites. The loss of native plant species from dry lowland habitats is one of the main causes of decline of yellow-faced bees (Sakai et al. 2002, pp. 276, 291).

*Drought*—Drought can modify and destroy habitat of hilaris yellow-faced bees and its yellow-faced bee nest hosts (Magnacca 2007, pp. 181, 183). The dry coastal habitat already incurs cyclical droughts, which in turn effects vegetation flushes and food availability. Though rare, the yellow-faced bee hosts of hilaris yellow-faced bees may survive in small numbers and increase once conditions improve. However, the inherently smaller population of a cleptoparasite makes it more likely to die out during a time of poor weather and lack of resources for reproduction and survival (Magnacca 2007, p. 181). Drought also creates disturbed areas conducive to invasion by nonnative plants and eliminates food and nesting resources (Kitayama and Mueller-Dombois 1995, p. 671; Businger 1998, pp. 1–2; Magnacca 2015 in litt., entire). Droughts lead to an increase in the number of forest and brush fires (Giambelluca et al. 1991, p. v), causing a reduction of native plant cover and habitat (D'Antonio and Vitousek 1992, pp. 77-79). Such environmental events can be particularly devastating to hilaris yellow-faced bees and its nest hosts because they persist in low numbers and have restricted geographic ranges. Stochastic events such as hurricanes, floods, and droughts could extirpate the small population that is only known from one location on one island.

*Fire*—Fire is a threat to hilaris yellow-faced bees and its nest hosts because it destroys native coastal and lowland plant communities on which these yellow-faced bees depend and opens habitat for increased invasion by nonnative plants. Human alteration of landscapes and the introduction of nonnative plants, especially grasses, has led to greater frequency, intensity, and duration of fires (Brown and Smith 2000, p. 172). Grass-fueled fire often kills most native trees and shrubs (D'Antonio and Vitousek 1992, p. 70, 73–74). The dry coastal and neighboring lowland dry ecosystems of hilaris yellow-faced bees and its nest hosts are highly vulnerable to fire, which destroy food and nesting resources for hilaris yellow-faced bee. The number and size of wildfires are increasing in the main Hawaiian Islands; however, their occurrences and locations are unpredictable, and could affect the remaining habitat of yellow-faced bees at any time (USFWS 2016, entire; USFWS 2019b, entire). Fire poses a risk to hilaris yellow-faced bees and its nest hosts because these species and their habitat are located in or near areas that were burned previously, or in areas considered at risk because of fire due to the cumulative and compounding effects of drought and the presence of highly flammable nonnative grasses (USFWS 2016, entire).

**2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes (Factor B):**
Not known to be a threat.

**2.3.2.3 Disease or predation (Factor C):**
*Disease*— Disease has been suggested as a threat, as pathogens carried by nonnative bees, wasps, and ants could be transmitted to hilaris yellow-faced bees and its *Hylaeus* hosts through shared food sources (Graham 2015 in litt., entire). However, we have no confirmed reports of this type of disease transmission.

*Western yellow-jacket wasp*— Predation by nonnative western yellow jacket wasps (*Vespula pensylvanica*) is a threat to hilaris yellow-faced bees and its *Hylaeus* hosts. This wasp species is an aggressive generalist predator that will opportunistically prey upon yellow-faced bees, although they are not its primary prey source (Gambino et al. 1987, entire). In temperate climates, *V. pensylvanica* has an annual life cycle; but in Hawaiʻi colonies often persist through a second year. This allows them to have larger numbers of individuals per colony (Gambino et al. 1987, entire) and thus, a greater impact on prey populations. Most colonies are found between elevations of 1,969 to 3,445 ft (600 to 1,050 m), but they can be found down to sea level where hilaris yellow-faced bees and its nest hosts occur (Gambino et al. 1987, p. 169; Graham 2015 in litt., entire). Although hilaris yellow-faced bees are a very rare solitary bee, the presence of *V. pensylvanica* colonies near a yellow-faced bee nest may extirpate a local population.

*Ants*— Several nonnative ant species have a deleterious effect on the native Hawaiian invertebrate fauna including yellow-faced bees (Perkins 1913, entire; Gagne 1979, entire; Cole et al. 1992, entire; Reimer 1993, entire; Daly and Magnacca 2003, p. 10; Krushelnycky et al. 2005, entire; Krushelnycky et al. 2017, entire). Yellow-faced bee populations are drastically reduced in ant-infested areas (Stone and Loope 1987, entire; Cole et al. 1992, entire; Reimer 1993, p. 17).

Big-headed ants (*Pheidole megacephala*), yellow crazy ants (*Anoplolepis gracilipes*), Papuan thief ants (*Solenopsis papuana*), and tropical fire ants (*Solenopsis geminata*) are aggressive, generalist predators (preying on a variety of species) that occur in the coastal habitat. Ground-nesting species such as hilaris yellow-faced bees are particularly vulnerable to predation by nonnative ants (Cole et al. 1992, entire). Ants are primarily a threat to the brood (i.e. egg, larvae, and pupal stages) of yellow-faced bees because the brood are immobile, nests are easily accessible in or near the ground, and are undefended. In general, big-headed ants and yellow crazy ants are ubiquitous in the lowland and coastal habitat of hilaris yellow-faced bees. Both of these ant species are abundant and will colonize native and nonnative plant communities (Reimer 1993, entire; Holway et al. 2002, pp. 188, 209). The threat of ant predation on hilaris yellow-faced bee is intensified by the fact that most ant species have winged reproductive adults and can quickly establish new colonies in suitable habitats (Staples and Cowie 2001, p. 55). This attribute allows ants to access and potentially destroy otherwise geographically isolated populations of native arthropods (Nafus 1993, pp. 19, 22–23). With few exceptions, native insects have been eliminated in habitats where big-headed ants are present (Perkins 1913, p. xxxix; Gagne 1979, p. 81; Gillespie and Reimer 1993, p. 22). Consequently, nonnative ant species represent a significant threat to the remaining population of hilaris yellow-faced bees (Reimer 1993, p. 14, 17; Daly and Magnacca 2003, pp. 9–10).

**2.3.2.4 Inadequacy of existing regulatory mechanisms:**
Existing State and Federal regulatory mechanisms are not effectively preventing introduction and spread of nonnative species from outside the State of Hawaiʻi, or within the State, between islands and watersheds. Predation by nonnative invertebrate species such as introduced ants, and habitat-altering, nonnative plant species and ungulates pose major ongoing

threats to the yellow-faced bees. The State's current management of nonnative game mammals is inadequate to prevent the degradation and destruction of the native plants and habitat used by yellow-faced bee.

Nonnative feral ungulates pose a threat to hilaris yellow-faced bees through destruction and degradation of the species' habitat and herbivory of its pollen and nectar hosts. Regulatory mechanisms are inadequate to address this threat (USFWS 2013, p. 64679). The State of Hawaiʻi provides game mammal (feral pigs and goats, axis deer, and mouflon sheep) hunting opportunities on State-designated public hunting areas on the island of Hawaiʻi (State of Hawaiʻi Department of Land and Natural Resources [HDLNR] 2015, pp. 19–21 and 66–77). The State's management objectives for game animals range from maximizing public hunting opportunities to support sustained yield in some areas to completely removing game animals by State staff, or their designees, in other areas (HDLNR 2015, entire).The State's current management of nonnative game mammals is inadequate to prevent the degradation and destruction of habitat of the yellow-faced bee.

Currently, four agencies are responsible for inspection of goods arriving in Hawaiʻi (USFWS 2013, p. 64679). The Hawaiʻi Department of Agriculture inspects domestic cargo and vessels and focuses on pests of concern to Hawaiʻi, especially insects or plant diseases not yet known to be present in the State. The U.S. Department of Homeland Security's Customs and Border Protection is responsible for inspecting commercial, private, and military vessels and aircraft and related cargo and passengers arriving from foreign locations (USFWS 2013, p. 64679). The U.S. Department of Agriculture-Animal and Plant Health Inspection Service-Plant Protection and Quarantine inspects propagative plant material, provides identification services for arriving plants and pests, and conducts pest risk assessments among other activities (USFWS 2013, pp. 64679–64680). The Service inspects arriving wildlife products, enforces the injurious wildlife provisions of the Lacey Act (18 U.S.C. 42; 16 U.S.C. 3371 *et seq*.), and prosecutes CITES (Convention on International Trade in Wild Fauna and Flora) violations (USFWS 2013, p. 64680). The State of Hawaiʻi allows the importation of most plant taxa, with limited exceptions (USFWS 2013, p. 64680). It is likely that the introduction of most nonnative invertebrate pests to the State has been and continues to be accidental and incidental to other intentional and permitted activities. Many invasive weeds established on Hawaiʻi have currently limited but expanding ranges. Resources available to reduce the spread of these species and counter their negative ecological effects are limited. Control of established pests is largely focused on a few invasive species that cause significant economic or environmental damage to public and private lands, and comprehensive control of an array of invasive pests remains limited in scope (USFWS 2013, pp. 64680–64681).

**2.3.2.5 Other natural or manmade factors affecting its continued existence (Factor E):**

*Competition*— In addition to predation, nonnative ants also compete with yellow-faced bees for nectar resources (Howarth 1985, p. 155; Hopper et al. 1996, p. 9; Holway et al. 2002, pp. 188, 209; Daly and Magnacca 2003, p. 9; Lach 2008, p. 155; Magnacca 2015 in litt., entire). Native yellow-faced bees are less likely to land on flowers occupied by big-headed ants (Krushelnycky et al. 2005, p. 9; Magnacca 2015 in litt., entire).

Competition from nonnative bees for food resources is a potential threat to hilaris yellow-faced bees and its yellow-faced bee hosts (Magnacca 2007, p. 188; Graham 2015 in litt., entire; Magnacca 2015 in litt., entire). Most nonnative bees inhabit areas dominated by invasive vegetation and thus, are not competing with yellow-faced bee species (Daly and Magnacca 2003, pp. 12-13). European honeybee (*Apis mellifera*) is one of the exceptions; this social species is often very abundant in areas with native vegetation and aggressively competes with yellow-faced bees for nectar and pollen (Magnacca 2007, p. 188; Snelling 2003, p. 345).

Other nonnative bee species present in areas of native vegetation include carpenter bees (*Ceratina* spp.), sweat bees (*Lasioglossum* spp.), and the nonnative *Hylaeus albonitens* (Magnacca 2007, entire; Magnacca et al. 2013, entire; Snelling 2003, entire). Although the impact of competition for nectar and pollen from these nonnative bee species has not been studied, these bees may have a significant impact on the hosts of hilaris yellow-faced bees through competition for pollen, because they are similar in size and probably visit similar flowers (Magnacca 2007, p. 189).

*Limited populations and individuals*—Like most native island biota, the yellow-faced bees are particularly sensitive to disturbances due to low number of individuals, low population numbers, and small geographic ranges. *Hylaeus anthracinus, Hylaeus assimulans, Hylaeus flavipes,* and *Hylaeus longiceps* are the likely hosts of hilaris yellow-faced bees because they are ground and crevice nesters (Daly and Magnacca 2003, p. 106). Because of the obligate relationship of hilaris yellow-faced bees with these hosts, hilaris yellow-faced bee distribution is determined by the remaining populations of these four species. The rarity of these hosts, in number of populations, abundance of individuals, and range further exacerbates the cleptoparasite's ability to reproduce. As a result of having extremely low numbers, hilaris yellow-faced bees may experience: reduced reproductive vigor due to inbreeding depression; reduced levels of genetic variability leading to diminished capacity to respond and adapt to environmental changes; and increased vulnerability to localized catastrophes such as hurricanes, tsunami, and drought (Daly and Magnacca 2003, p. 3;

Magnacca 2007, p. 173; Magnacca 2015 in litt., entire). Together these may result in population extirpation and extinction of this species.

Because of limited numbers of individuals and a single known population, a catastrophic event (e.g., hurricane, drought) may result in extirpation of the extant population and extinction of this species. Species with only one known location, such as hilaris yellow-faced bees, lack resilience to threats that might otherwise have a relatively minor impact on widely distributed species. For example, the reduced availability of nest hosts and substrate or an increase in predation of the yellow-faced bee that might be absorbed in a widely distributed species could result in a significant decrease in survivorship or reproduction of a species with limited distribution and populations. The extremely limited distribution of this species thus magnifies the severity of the impact of the other threats.

The persistence of hilaris yellow-faced bee is significantly hampered by having only one small wild population on Molokaʻi, the rarity of host nests throughout its range, and the shrinking geographic range of the species (Daly and Magnacca 2003, pp. 103, 106; Magnacca 2005 in litt., p. 2; Magnacca 2007, p. 181). These circumstances make this species extremely vulnerable to extinction due to a variety of natural and anthropogenic caused factors. The demographic structure needed to support cleptoparasitic yellow-faced bees or their hosts is unknown. Though yellow-faced bee females can store sperm for their lifetime, small populations are particularly vulnerable to reduced mating encounters and reproductive vigor caused by inbreeding depression. They may suffer a loss of genetic variability over time due to random genetic drift, resulting in decreased evolutionary potential and ability to cope with environmental change (Lande 1988, entire).

*Stochastic events*—Stochastic events such as hurricanes, earthquakes, and tsunamis can result in the direct loss of hilaris yellow-faced bee individuals, its nest hosts, nests, and foraging resources due to wind, rain, flooding and tidal surge. The coastal habitat on which yellow-faced bees are dependent is extremely vulnerable to storm surge and flooding associated with severe storms, hurricanes and tsunamis. Indirect effects include creating disturbed areas conducive to invasion by nonnative plants, which outcompete the native plants (Harrington et al. 1997, pp. 539–540; Mitchell et al. 2005, p. 4–3). This would further decrease the remaining native-plant-dominated habitat area that supports hilaris yellow-faced bees (Bellingham et al. 2005, p. 681). Stochastic events may also alter microclimatic conditions (e.g., opening the tree canopy leading to an increase in habitat temperature, soil erosion, and decreasing soil moisture) so that the habitat no longer supports the native host plants necessary for nectar and pollen or provides nesting substrates. In addition, stochastic events can exacerbate the impacts of other threats such as habitat destruction and modification by ungulates, erosion, invasion by nonnative predators, and increased competition for foraging resources. Because small populations are demographically vulnerable to extinction caused by random fluctuations in population size and sex ratio, random and stochastic events such as hurricanes pose the threat of immediate extinction of a species with a very small and geographically restricted distribution such as hilaris yellow-faced bees (Lande 1988, p. 1,455).

*Changes in environmental conditions*— Climate change has the potential to adversely affect hilaris yellow-faced bees. The species is only known to reproduce in the coastal habitat where its hosts are present. Sea level rise may further reduce the already small amount of remaining coastal habitat. The coastal and lowland dry habitats that hilaris yellow-faced bees and its hosts use for nesting and foraging may be affected by changes in temperature, humidity, precipitation, and the frequency and severity of storms. These stressors may change the coastal and lowland habitats of Maui, Lānaʻi, and Molokaʻi, rendering them unsuitable for hilaris yellow-faced bees and its hosts (Kim et al. 2020, entire) and exacerbating the threats described above.

**Conservation Actions**

*Endangered Species Act*—In 2016, the Service determined endangered status under the Endangered Species Act of 1973 (Act), as amended, for 49 species from the Hawaiian Islands including hilaris yellow-faced bees (USFWS 2016, entire). The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The long-term goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Conservation measures provided to species listed as endangered or threatened under the Act include recognition of threatened or endangered status, recovery planning, requirements for Federal protection, and prohibitions against certain activities. The Act encourages cooperation with the States and requires that recovery actions be carried out for all listed species. The Act and its implementing regulations in addition set forth a series of general prohibitions and exceptions that apply to all endangered wildlife and plants. For plants listed as endangered, the Act prohibits the malicious damage or destruction on areas under Federal jurisdiction and the removal, cutting, digging up, or damaging or destroying of such plants in knowing violation of any State law or regulation, including State criminal trespass law. Certain exceptions to the prohibitions apply to agents of the Service and State conservation agencies. The Service may issue permits to carry out otherwise prohibited activities involving endangered or threatened wildlife and plant species under certain circumstances. With regard to endangered plants, a permit must be issued for scientific purposes or for the enhancement of propagation or survival. For federally listed species unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act, is prohibited. In addition, damaging or destroying any of the listed species is violation of the Hawai‘i State law prohibiting the take of listed species. The State of Hawai’i’s endangered species law (HRS, Section 195-D) is automatically invoked when a species is Federally listed, and provides supplemental protection, including prohibiting take of listed species and encouraging conservation by State government agencies. Hylaeus facilis occurs on State and private lands.

*Land Protection and Conservation*—The one known population of hilaris yellow-faced bees occurs on the northwestern coast of Moloka‘i at Mo‘omomi Preserve on lands protected and managed by The Nature Conservancy of Hawai‘i. The bee fauna of the coast and dunes at the preserve includes two of the hilaris yellow-faced bees’ hosts, *Hylaeus anthracinus* and *Hylaeus longiceps* (Daly and Magnacca 2003, pp. 55, 135; Magnacca 2007, entire). The coastal lands consist of native beach flora bordered by a mix of native and exotic trees. Though no directed species-specific conservation actions are ongoing, the habitat is protected from development but is susceptible to fire and invasion by nonnative plants and invertebrate species. Such susceptibility requires continuous management by The Nature Conservancy.

**Table 1.** Number of populations and individuals of hilaris yellow-faced bees from listing to this 5-year review.

| Date | Number of Populations | Number of Individuals |
|---|---|---|
| 2016 listing | ≥1 | unknown |
| 2020 species report | ≥1 | unknown |
| 2021 5-year review | ≥1 | unknown |

**Table 2 –** Status of threats to hilaris yellow-faced bees from listing through the current 5-year review.

| Threat | Listing Factor | Current Status | Conservation/Management Efforts |
|---|---|---|---|
| Agriculture and urban development | A | Ongoing | Partial—The only known population of hilaris yellow-faced bees is located at Mo‘omomi Preserve and dunes on Moloka‘i, where it was last observed |

| Threat | Listing Factor | Current Status | Conservation/Management Efforts |
|---|---|---|---|
| | | | in 1999. The preserve is protected and managed by the Nature Conservancy of Hawaiʻi. This site is part of a large area of calcified dunes, some of which are dominated by native plants and others by nonnatives. |
| Ungulates | A | Ongoing | Partial—ungulate control occurs at the Moʻomomi Preserve on Molokaʻi. |
| Invasive nonnative plants | A | Ongoing | Partial—control and removal of nonnative invasive plants is ongoing at Moʻomomi Preserve on Molokaʻi. |
| Fire | A | Ongoing | Partial—habitat within the Moʻomomi Preserve on Molokaʻi is managed for wildfire |
| Stochastic events (drought, hurricane, tsunami) | A | Ongoing | None |
| Disease (potential) | B | Ongoing | None |
| Predation by nonative wasps | C | Ongoing | None |
| Predation by ants | C | Ongoing | None |
| Inadequate existing regulatory mechanisms | D | Ongoing | Partial—restrictions on transport of invasive species to the islands are insufficient to prevent introduction of invasive species and diseases; regulatory mechanisms are inadequate to address the threat of ungulate destruction of hilaris yellow-faced bees. |
| Competition from nonnative bees | E | Ongoing | None |
| Lack of sufficient food resources | E | Ongoing | None |
| Lack of nesting resources | E | Ongoing | None |
| Limited numbers | E | Ongoing | None |
| Not in captive rearing | E | Ongoing | None |
| Climate change | E | Ongoing | None |

### 2.4 Synthesis

The hilaris yellow-faced bee is a member of the family Colletidae. Hilaris, which means lively, is cleptoparasitic on other species of yellow-faced bee and the female lays her eggs in the nests of other ground or crevice nesting *Hylaeus* species. Hilaris yellow-faced bees are completely dependent on locating nests with compatible hosts for its reproduction. Historically, hilaris yellow-faced bees were known from dry, coastal habitat on Maui, Lānaʻi, and Molokaʻi, where its nest hosts occurred. This species is believed to have occurred along much of the coast of these three islands where the hosts it cleptoparasitizes, *Hylaeus anthracinus, Hylaeus assimulans, Hylaeus flavipes,* and *Hylaeus longiceps*, occurred. The ground nesting species upon which hilaris yellow-faced bees depends for reproduction are themselves rare; all but *H. flavipes* are listed as endangered.

Based on the most recent surveys, hilaris yellow-faced bee occurs only on Molokaʻi at the Moʻomomi Preserve and dunes where it was last observed in 1999. Habitat degradation and loss, rarity of suitable host nests for cleptoparasitization, predation by ants and wasps, and competition for food resources have likely extirpated the populations that occurred on Maui and Lānaʻi. The remaining known population at Moʻomomi Preserve (Molokaʻi) is at imminent risk of extirpation due to its apparent low numbers, severely reduced habitat range, rarity of its nest hosts, and threats from predation, stochastic, and catastrophic events.

The favored food sources of hilaris yellow-faced bee adults are not known because they have never been observed at flowers. As a cleptoparasite, hilaris yellow-faced bees do not provision a nest with pollen, rather, it relies on nests already provisioned by other species of yellow-faced bees. Thus, the diet of hilaris yellow-faced bee larval stages is comprised of the pollen and nectar collected and deposited in the nest by the female host. In coastal sites, the most "favored" pollen sources are ʻakoko, ʻaʻaliʻi, naio, ʻilima, ʻōhai and nonnative tree heliotrope. All of the most used pollen types collected by yellow-faced bees are the dominant or codominant plants in the native coastal shrub land.

There is little information about demographics or rate of mating encounter, other than to confirm the species is rare. Upon successfully mating, a mated female needs to find a provisioned nest. Nests that have already produced a brood would likely lack the provisions necessary for hilaris yellow-faced bees to complete development. The species also depends on a suitable habitat free from threats. Moʻomomi Preserve is protected, but the population and its habitat is vulnerable to fire and other stochastic events such as drought, hurricane, or tsunami. This coastal habitat also requires active management to prevent degradation of the habitat by nonnative plants and invertebrates, such as ants. Unprotected areas not occupied by hilaris yellow-faced bee or its host species are shrinking in size due to development, drought, and encroachment by nonnative plants and predators, such as ants and yellow-jacket wasps. The known population is vulnerable to a catastrophic event such as flooding or tsunami in their coastal habitat.

The stability and growth rate of the remaining population is not known. In recent decades, the species has been absent at most sites previously occupied on each isalnd. We have no historical genetic information, and thus cannot determine how much genetic variation has been lost since humans arrived in Hawaiʻi. The diversity of habitat and the breadth of genetic diversity is strongly influenced by the current and historic biogeographical range of hilaris yellow-faced bees. The mobility of yellow-faced bees provides a means of short-range connectivity between populations, which in turn, can support genetic exchange and representation. However, genetic exchange is likely limited by the isolation of the one known population. Exchange between possible undocumented populations in Maui Nui is probably extremely rare. It is possible that traits have been lost over time given the reduction in habitat range.

In summary, the primary factors that pose serious and ongoing threats to the species, its host *Hylaeus* species, its plant hosts, and its habitat range include the following: habitat degradation and destruction, nonnative ungulates and plants, drought, fire, predation, inadequate regulatory mechanisms to address nonnative species, natural disasters, limited numbers of populations and individuals, competition, potential environmental changes, and the interaction of these threats. Initial management actions benefitting the species have been extremely limited. A recovery plan is expected to be finalized by 2022.

## 3.0 RESULTS

### 3.1 Recommended Classification:

**____Downlist to Threatened**
**____Uplist to Endangered**
**____Delist**
____*Extinction*
____*Recovery*
____*Original data for classification in error*
**__X__No change is needed**

### 3.2 New Recovery Priority Number:

**Brief Rationale:**

### 3.3 Listing and Reclassification Priority Number:

**Reclassification (from Threatened to Endangered) Priority Number:____**
**Reclassification (from Endangered to Threatened) Priority Number:____**
**Delisting (regardless of current classification) Priority Number:____**

**Brief Rationale:**

## 4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Develop measurable downlisting and delisting criteria for the recovery of hilaris yellow-faced bees.
- Identify habitats that may support hilaris yellow-faced bees and survey for extant individuals and populations.
- Conduct studies on the range, demography, and dispersal of hilaris yellow-faced bees.
- Develop microclimate models and identify suitable habitat based on historical and existing species distribution and potential future climate conditions.
- Identify and prioritize management units that are necessary for hilaris yellow-faced bees recovery.
- Ensure long-term protection of management units.
- Identify threats specific to management units.
- Construct and maintain ungulate fences around management units where needed.
- Remove ungulates from fenced areas.
- Control or eradicate habitat-modifying invasive plants from management units.
- Provide wildfire protection as necessary.
  - Develop management-unit specific fire management plans and infrastructure, and initiate management actions to reduce the likelihood of fire, especially in coastal, dry, and mesic habitats.
  - Assess the need for fire management plans in habitats affected by climate change.
- Protect management units from human disturbance as necessary.
- Conduct surveys, focused on likely source areas (e.g., airports, docks), and control newly discovered pest or invasive species prior to their dispersal to management units.
- Control other threats to management units as appropriate.
- Monitor management and use results to adapt management actions.
- Develop and implement control programs for nonnative ants (e.g. big-headed ant, yellow crazy ant, Papuan thief ant, and tropical fire ant).
- Develop and implement control programs for nonnative western yellow jacket wasps.
- Monitor populations to detect disease, assess impacts, and control outbreaks as soon as possible, if needed.
- Control other threats to hilaris yellow-faced bees as appropriate.
- Establish a captive rearing program for Hylaeus hilaris and establish populations from appropriate genetic sources.
- Determine if translocation is appropriate for hilaris yellow-faced bees.
- Identify areas within management units appropriate for translocating individuals.
- If translocation is appropriate, develop and implement translocation plans according to IUCN Reintroduction Guidelines (2013).
- Select populations for translocation.
- Prepare reintroduction sites.
- Translocate genetically appropriate individuals into managed sites.

- Develop tools to enhance habitat and species survival and reproduction.
- Develop tools to inform actions that will improve hilaris yellow-faced bee viability.
- Conduct research on threats to species' viability.
- Develop tools for monitoring population growth and status.
- Conduct population viability analyses for each population.
- Conduct studies on the optimization of conservation translocation survival and success.
- Implement the Hawaiʻi interagency biosecurity plan to prevent the influx of new pests and invasive species into Hawaiʻi and habitats of hilaris yellow-faced bees.
- Identify, develop, and support alliances and partnerships to plan and implement hilaris yellow-faced bee habitat restoration and management to benefit and recover the species.

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**U.S. FISH AND WILDLIFE SERVICE**
**5-YEAR REVIEW for hilaris yellow-faced bee**
**(*Hylaeus hilaris*)**

**Current Classification:** Endangered

**Recommendation resulting from the 5-Year Review:**

____Downlist to Threatened
____Uplist to Endangered
____Delist
_X__No change needed

**Appropriate Listing/Reclassification Priority Number, if applicable**: _______

**Review Conducted By:**
Diane Sether, Ph.D., Invertebrate and Wildlife Biologist, PIFWO
John Vetter, Animal Recovery Coordinator, PIFWO
Megan Laut, Conservation and Restoration Team Manager, PIFWO

**FIELD OFFICE APPROVAL:**

MEGAN LAUT Digitally signed by MEGAN LAUT
Date: 2021.05.12 10:52:56 -10'00'

for ________________________________________________
**Field Supervisor, Pacific Islands Fish and Wildlife Office**