

**Yellow-Faced Bee**  
*(Hylaeus mana)*

**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: Yellow-Faced Bee (*Hylaeus mana*)**

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**5-YEAR REVIEW**  
**Yellow-Faced Bee / *Hylaeus mana***

**1.0 GENERAL INFORMATION**

**1.1 Reviewers**

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John Vetter, Animal Recovery Coordinator, PIFWO

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**Lead Field Office:** Interior Region 12, Pacific Islands Fish and Wildlife Office, Honolulu, HI

**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 Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on January 7, 2021.

The review is based on the final rule to list the yellow-faced bee, the recovery outline for the island of O‘ahu signed on July 26, 2018, current published and unpublished materials, and expert opinions and knowledge on *Hylaeus mana*. The draft 5-year review was then reviewed by the Animal Recovery Coordinator and the Conservation and Restoration Team Manager before signature by the Field Supervisor.

**1.3 Background:**

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

[USFWS] U.S. Fish and Wildlife Service. 2019. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 91 species in Oregon, Washington, Hawai‘i, and American Samoa. Federal Register 84 (112): 27151–27154.

### 1.3.2 Listing history

#### Original Listing

**FR notice:** [USFWS] U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; endangered status for 49 species from the Hawaiian Islands. Federal Register 81 (190): 67786-67860.

**Date listed:** September 30, 2016

**Entity listed:** Species

**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:** N/A

**1.3.4 Review History:** N/A

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

#### **1.3.6 Current Recovery Plan or Outline**

[USFWS] U.S. Fish and Wildlife Service. 2018. Recovery outline for the island of O'ahu. U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i. 42 pp.

[https://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/Oahu\\_Recovery\\_Outline\\_20180726.pdf](https://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/Oahu_Recovery_Outline_20180726.pdf)

**Name of plan or outline:** Recovery outline for the island of O'ahu

**Date issued:** July 2018

**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

  X   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*

*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:**

No final recovery plan for *Hylaes mana* has been developed by the time of the completion of this 5-year review.

## 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:

No new information on the yellow-faced bee (*Hylaeus mana*) biology or life history has become known since the species was listed.

#### 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:

Little is known about the abundance, population trends, and demographic features of *Hylaeus mana*. This species is known only from lowland mesic forest dominated by native *Acacia koa* (koa) in the Ko'olau Mountains of O'ahu, at 1,400 feet (ft) (430 meters (m)). Few other *Hylaeus* species have been found in this type of forest on O'ahu (Daly and Magnacca 2003, p. 138). This type of native forest is increasingly rare and patchily distributed because of competition and encroachment into habitat by nonnative plants (Smith 1985, pp. 227–233; Juvik and Juvik 1998, p. 124; Wagner et al. 1999, pp. 66–67, 75). Decline of this forest type could lead to decline in populations and numbers of *H. mana*. Three additional population sites were discovered on O'ahu in 2012, including a new observation of the species at the original site (Magnacca and King 2013, pp. 17–18). The three new sites are within a narrow range of lowland mesic forest at 1,400 ft (430 m), bordered by nonnative plant habitat at lower elevations and wetter native forest habitat above (Magnacca and King 2013, pp. 17–18). *Hylaeus mana* was most often observed on *Santalum freycinetianum* var. *freycinetianum* ('iliahi), which suggests that *H. mana* may be closely associated with this plant species (Magnacca and King 2013, p. 18). Artificial nests for the three endangered montane *Hylaeus* species (*H. facilis*, *H. kuakea*, and *H. mana*) found on or near mitigation units for the Army were set out and checked at least once over the year of 2019-2020, but there were no sign of use by the yellow-faced bees. The nest blocks at 'Opae'ula, considered the most likely site to find yellow-faced bees since it has a relatively large concentration of *Santalum freycinetianum*, which *H. mana* appears to be a specialist on, were destroyed by a fire in late 2019, along with many of the *Santalum* trees (Army Natural Resources Program Oahu 2020, p. 195). Additional surveys may reveal more populations; however, the extreme rarity of this species, its absence from many survey sites, the fact that it was not discovered until very recently, and the limited range of its possible host plant, all suggest that few populations remain (Magnacca 2005g, in litt., p. 2; Magnacca and King 2013, pp. 17–18).

**2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):**

Apparent limits of the current yellow-faced bee population will likely reduce genetic diversity and cause inbreeding depression.

**2.3.1.4 Taxonomic classification or changes in nomenclature:**

No changes in taxonomic classification have occurred.

**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.):**

*Hylaeus mana* is known only from lowland mesic forest dominated by native *Acacia koa* (koa) in the Ko'olau Mountains of O'ahu, at 1,400 ft (430 m). Few other *Hylaeus* species have been found in this type of forest on O'ahu (Daly and Magnacca 2003, p. 138). This type of native forest is increasingly rare and patchily distributed because of competition and encroachment into habitat by nonnative plants (Smith 1985, pp. 227–233; Juvik and Juvik 1998, p. 124; Wagner et al. 1999, pp. 66–67, 75). Decline of this forest type could lead to decline in populations and numbers of *H. mana*. Three additional population sites were discovered on O'ahu in 2012, including a new observation of the species at the original site (Magnacca and King 2013, pp. 17–18). The three new sites are within a narrow range of lowland mesic forest at 1,400 ft (430 m), bordered by nonnative plant habitat at lower elevations and wetter native forest habitat above (Magnacca and King 2013, pp. 17–18). *Hylaeus mana* was most often observed on *Santalum freycinetianum* var. *freycinetianum* ('iliahi), which suggests that *H. mana* may be closely associated with this plant species (Magnacca and King 2013, p. 18). Artificial nests for the three endangered montane *Hylaeus* species (*H. facilis*, *H. kuakea*, and *H. mana*) found on or near mitigation units for the Army were set out and checked at least once over the year of 2019-2020, but there were no sign of use by the yellow-faced bees. The nest blocks at 'Opae'ula, considered the most likely site to find yellow-faced bees since it has a relatively large concentration of *Santalum freycinetianum*, which *H. mana* appears to be a specialist on, were destroyed by a fire in late 2019, along with many of the *Santalum* trees (Army Natural Resources Program Oahu 2020, p. 195). Additional surveys may reveal more populations; however, the extreme rarity of this species, its absence from many survey sites, the fact that it was not discovered until very recently, and the limited range of its possible host plant, all suggest that few populations remain (Magnacca 2005g, in litt., p. 2; Magnacca and King 2013, pp. 17–18).

**2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):**

Critical habitat has not been designated for *Hylaeus mana*.

## 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:

Degradation, modification, and destruction of native lowland mesic ecosystem in the Ko‘olau Mountains on O‘ahu threaten the existence of the yellow-faced bee. The factors that contribute to these detriments are introduced feral pigs (*Sus scrofa*), invasive plants, fires, drought, hurricanes, and existing regulatory mechanisms. The ongoing and likely increasing effects of global climate change (such as increasing temperature and changing rainfall patterns) are also likely to directly or indirectly impact the habitat of native yellow-faced bee in general (USFWS 2016, p. 67817).

Habitat destruction and modification by feral pigs leads to fragmentation of, and eventual loss of, foraging and nesting areas of *Hylaeus mana* (Daly and Magnacca 2003, pp. 217–229). Habitat destruction and modification by nonnative plants adversely impacts native plant species used by *H. mana* as a food source by modifying the availability of light, altering soil-water regimes, modifying nutrient cycling, altering the fire characteristics, and ultimately converting native dominated plant communities to nonnative plant communities. Nonnative plant species that modify and destroy habitat of *H. mana* include *Asystasia gangetica* (Chinese violet), *Atriplex semibaccata* (creeping saltbrush), *Cenchrus ciliaris* (buffelgrass), *Chloris barbata* (swollen fingergrass), *Digitaria insularis* (sourgrass), *Leucaena leucocephala* (white leadtree), *Melinis minutiflora* (molasses grass), *Pluchea indica* (Indian fleabane), *P. carolinensis* (sourbush), *Prosopis pallida* (kiawe), *Psidium cattleianum* (strawberry guava), *Schinus terebinthifolius* (peppertree), *Urochloa mutica* (buffalo grass), and *Rubus* spp. (blackberry). These species can outcompete native canopy species such as *Acacia koa*, the known preferred native canopy type of *H. mana* (GISD 2011, in litt.; State of Hawaii 2013, in litt. (S.C.R. No. 74); USFWS 2016, p. 67817).

Fire is a threat to *Hylaeus mana*, as it destroys native plant communities on which the species depends, and opens habitat for increased invasion by nonnative plants. Because of the greater frequency, intensity, and duration of fires that have resulted from the human alteration of landscapes and the introduction of nonnative plants, especially grasses, fires are now more destructive, including in lowland mesic ecosystems (Brown and Smith 2000, p. 172). A single grass-fueled fire often kills most native trees and shrubs in the area (D’Antonio and Vitousek 1992, p. 74) and could destroy food and nesting resources for *H. mana*. The numbers of wildfires and the acreages involved are increasing in the main Hawaiian Islands; however,

their occurrences and locations are unpredictable, and could affect habitat for yellow-faced bees at any time (Gima 1998, in litt.; Hamilton 2009, in litt.; Honolulu Advertiser 2010, in litt.; Pacific Disaster Center 2011, in litt.; USFWS 2016, p. 67817).

Random, naturally occurring events such as hurricanes and drought can modify and destroy habitat of *Hylaeus mana* by creating disturbed areas conducive to invasion by nonnative plants (Kitayama and Mueller-Dombois 1995, p. 671; Businger 1998, pp. 1–2; USFWS 2016, p. 67817).

The yellow-faced bee may be vulnerable to extinction due to anticipated environmental changes that may result from global climate change. Environmental changes that may affect this species are expected to include habitat loss or alteration and changes in disturbance regimes (e.g., storms and hurricanes). The probability of a species going extinct as a result of these factors increases when its range is restricted, habitat decreases, and population numbers decline (Intergovernmental Panel on Climate Change 2007, p. 8). The yellow-faced bee has limited environmental tolerances, limited ranges, restricted habitat requirements, small population sizes, and low numbers of individuals. Therefore, we would expect this species to be particularly vulnerable to projected environmental impacts that may result from changes in climate, and subsequent impacts to their habitats (Pounds et al. 1999, pp. 611-612; Still et al. 1999, p. 610; Benning et al. 2002, pp. 14246 and 14248).

#### **2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:**

As was stated in the Final Listing Rule we are not aware of any threats to the yellow-faced bee that are attributable to overutilization for commercial, recreational, scientific, or educational purposes (USFWS 2016, p. 67835).

#### **2.3.2.3 Disease or predation:**

Predation by nonnative animal species (ants and western yellow jacket wasps) poses a significant threat to the yellow-faced bee throughout its current and historical range for the reasons that follow. Predation by nonnative ants, including the big-headed ant (*Pheidole megacephala*), the yellow crazy ant (*Paratrechina longicornis*), Papuan thief ant (*Solenopsis papuana*), and tropical fire ant (*S. geminata*), on *Hylaeus* egg, larvae, and pupal stages is a threat to *Hylaeus mana* (Howarth 1985, p. 155; Gambino et al. 1987, p. 169; Hopper et al. 1996, p. 9; Holway et al. 2002, pp. 188, 209; Daly and Magnacca 2003, p. 9; Lach 2008, p. 155). The threat of ant predation on the yellow-faced bees is amplified by the fact that most ant species have winged reproductive adults and can quickly expand their range by establishing new colonies in suitable habitat (Staples and Cowie 2001, p. 55). In addition, these attributes allow some ants to destroy

otherwise geographically isolated populations of native arthropods (Nafus 1993, pp. 19, 22–23; USFWS 2016, p. 67841). Predation by nonnative western yellow jacket wasps (*Vespula pensylvanica*) is a threat to *H. mana* because the wasp is an aggressive, generalist predator, and occurs in great numbers in many habitat types, from sea level to over 8,000 ft (2,450 m), including areas where *H. mana* and other yellow-faced bees occur (Gambino et al. 1987, p. 169; USFWS 2016, p. 67817).

#### **2.3.2.4 Inadequacy of existing regulatory mechanisms:**

Existing regulatory mechanisms and agency policies do not address the primary threats to the yellow-faced bees and their habitat from nonnative ungulates. Competition with nonnative bees (honeybees, carpenter bees, sweat bees, and alien *Hylaeus* bees) for nectar and pollen is a threat to *Hylaeus mana* (Magnacca 2007, p. 188; Graham 2015, in litt.; Magnacca 2015, in litt.). The effects of climate change are likely to further exacerbate these threats (USFWS 2016, p. 67817).

#### **2.3.2.5 Other natural or manmade factors affecting its continued existence:**

Representation, resilience, and redundancy appears to be severely limited in the yellow-faced bee numbers of individuals is ongoing and is expected to continue into the future due to several factors. This species may experience reduced reproductive vigor due to inbreeding depression; it may experience reduced levels of genetic variability, leading to diminished capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence; a single catastrophic event (e.g., hurricane, drought, fire) may result in extirpation of remaining individuals and extinction of this species; and species with few known locations are less resilient to threats that might otherwise have a relatively minor impact on widely distributed species (USFWS 2016, p. 67850).

The small number of populations and individuals of *Hylaeus mana* makes this species more vulnerable to extinction because of the higher risks from genetic bottlenecks, random demographic fluctuations, and localized catastrophes such as hurricanes and drought (Daly and Magnacca 2003, p. 3; Magnacca 2007, p. 173; USFWS 2016, pp. 67817). Although we cannot predict the timing, extent, or magnitude of specific impacts, we do expect the effects of climate change to exacerbate the threats to *H. mana* described above. The small number of remaining populations limits this species' ability to adapt to environmental changes (USFWS 2016, p. 67817).

Ants compete for nectar (Reimer 1994, p. 17; 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) and nest sites (Krushelnycky et

al. 2005, pp. 6–7). Some ant species may affect yellow-faced bee species indirectly as well, by consuming seeds of native host plants, thereby reducing the plants’ recruitment and fecundity (Bond and Slingsby 1984, p. 1031; USFWS 2016, p. 67841). Competition with nonnative bees (honeybees, carpenter bees, sweat bees, and alien *Hylaeus* bees) for nectar and pollen is a threat to *Hylaeus mana* (Magnacca 2007, p. 188; Graham 2015, in litt.; Magnacca 2015, in litt.).

**Table. Threats to *Hylaeus kuakea* and the status of ongoing conservation or management actions.**

Threats	Listing Factor	Current Status	Conservation or Management Actions
Habitat modification by pigs	A	Ongoing	Ongoing habitat destruction and degradation of yellow-faced bee habitat caused by feral pigs promote the establishment and spread of nonnative plants.
Habitat modification by nonnative plants	A	Ongoing	Nonnative plants that displace native species, increase runoff, and modify the lowland mesic community lower or destroy the capability of the habitat to support viable populations of the yellow-faced bee.
Stochastic events	A	Ongoing	The apparent restriction of the yellow-faced bee to a few known individuals puts the species at risk of extinction from catastrophic events (fire, drought, hurricanes).
Climate change	A	Ongoing	Climate change is expected to affect lowland mesic ecosystems. Reduced genetic diversity of the remaining individuals may limit the ability of the yellow-faced bee to adapt.
Predation	C	Ongoing	Ants and western yellow jacket wasps pose threats to yellow-faced bee.
Inadequate habitat protection	D	Ongoing	Existing regulatory mechanisms and agency policies do not address the primary threats to the yellow-faced bees and their habitat from nonnative ungulates, nonnative plants, and invertebrate species.
Limited populations	E	Ongoing	Yellow-faced bee individuals were last observed in 2012 in the Ko‘olau Mountains of O‘ahu. The species appears to have low representation, resiliency, and redundancy.
Competition with nonnative invertebrates	E	Ongoing	Ants and nonnative bees pose threats to yellow-faced bee through competition for resources.

## 2.4 Synthesis

The yellow-faced bee, *Hylaeus mana*, is an endangered endemic species historically found on the island of O‘ahu. The genus *Hylaeus* is understudied and relatively poorly known. The biology of the yellow-faced bee is largely unknown

and most of what is known is based on scattered observations of a few specimens (Magnacca and Danforth 2006, p. 393). The known individuals are restricted to three locations in lowland mesic forest dominated by native *Acacia koa* in the Ko‘olau Mountains of O‘ahu, at 1,400 ft (430 m). Decline of this forest type could lead to decline in populations and numbers of *H. mana*. Additional surveys may reveal more populations; however, the extreme rarity of this species, its absence from many survey sites, the fact that it was not discovered until very recently, and the limited range of its possible host plant, all suggest that few populations remain (Magnacca 2005g, in litt., p. 2; Magnacca and King 2013, pp. 17–18).

Current threats to *Hylaeus mana* include the degradation, modification, and destruction of native lowland mesic ecosystem by introduced feral pigs, invasive plants, fires, drought, and hurricanes in the Ko‘olau Mountains on O‘ahu, predation by nonnative invertebrate species (ants and western yellow jacket wasps), existing regulatory mechanisms, limited number of individuals, competition for resources with other invertebrates, and the ongoing and likely increasing effects of global climate change (such as increasing temperature and changing rainfall patterns). A Recovery Outline that included *Hylaeus mana* was published in July 2018. Threats identified in the Final Listing Rule, the Recovery Outline, and this 5-Year Review are not sufficiently managed throughout the range of the species. Therefore, the yellow-faced bee meets the definition of endangered as it remains in danger of extinction throughout its range.

### 3.0 RESULTS

#### 3.1 Recommended Classification:

**Downlist to Threatened**

**Uplist to Endangered**

**Delist**

*Extinction*

*Recovery*

*Original data for classification in error*

**No change is needed**

#### 3.2 New Recovery Priority Number:

**Brief Rationale:**

#### 3.3 Listing and Reclassification Priority Number: N/A

**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

- Conduct targeted surveys for *Hylaeus mana* to determine the distribution of the species.
- Based on survey results, stabilize and protect extant populations of *Hylaeus mana* and develop and implement a recovery plan.
- Identify the primary habitat features and characteristics necessary for *Hylaeus mana* recovery.
- Identify and evaluate the primary biological characteristics necessary for *Hylaeus mana* recovery.
- Maintain and protect the habitat of *Hylaeus mana*.
- Eliminate or manage nonnative predators of *Hylaeus mana*.
- Survey, document, and manage threats to *Hylaeus mana*.

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**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Yellow-Faced Bee**  
***(Hylaeus mana)***

**Current Classification:** Endangered

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

Downlist to Threatened

Uplist to Endangered

Delist

No change needed

**Appropriate Listing/Reclassification Priority Number, if applicable:** \_\_\_\_\_

**Review Conducted By:**

Charmian Dang, Fish and Wildlife Biologist, PIFWO

John Vetter, Animal Recovery Coordinator, PIFWO

Megan Laut, Conservation & Restoration Team Manager, PIFWO

**FIELD OFFICE APPROVAL:**

for \_\_\_\_\_  
**Field Supervisor, Pacific Islands Fish and Wildlife Office**