5-YEAR REVIEW

Short Form Summary

Species Reviewed: Blackline Hawaiian damselfly (*Megalagrion nigrohamatum nigrolineatum*)

Current Classification: Endangered

FR Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews for 77 Species in Oregon, Washington, Idaho, and Hawai‘i. Federal Register 86 (120):33726–33728.

Lead Region/Field Office: Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer(s):

Elyse Sachs, Fish and Wildlife Biologist, PIFWO

John Vetter, Animal Recovery Coordinator, PIFWO

Methodology used to complete this 5-year review: This review was conducted by staff of the PIFWO of the U.S. Fish and Wildlife Service (USFWS), beginning on May 1, 2023. The review was based on a review of current, available information since the last 5-year review for the blackline Hawaiian damselfly (*Megalagrion nigrohamatum nigrolineatum*) (USFWS 2019, entire). The evaluation by Elyse Sachs, Fish and Wildlife Biologist, was reviewed by John Vetter, the Animal Recovery Coordinator, and acting Recovery Team Manager.

Background:

For information regarding the species' listing history and other facts, please refer to the USFWS Environmental Conservation Online System database for threatened and endangered species at *http://ecos.fws.gov/ecp/species/6650*.

Review Analysis:

Please refer to the Recovery Outline for the Island of O‘ahu (USFWS 2018, entire) and the previous 5-year review for the blackline Hawaiian damselfly published on August 5, 2019 (available at *http://ecos.fws.gov/ecp/species/6650*) for a complete review of the species' status, threats, and management efforts. No new threats or no new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of the blackline Hawaiian damselfly as endangered.

The blackline Hawaiian damselfly is endemic to the island of O‘ahu. Until recently, this species was extirpated from the Wai‘anae mountains and limited to scattered colonies in the Ko‘olau mountains. The species was reported to have occurred on the island of Hawai‘i as well, but there is no recorded proof of this (Polhemus and Asquith, 1996, p. 73).

New status information:
The population size of the blackline Hawaiian damselfly is not known, but they are fairly widespread in the Koʻolau mountains. USFWS biologist Dan Polhemus completed numerous surveys for native Hawaiian damselflies from 2021-2022 that targeted areas where this species had been detected previously. The results are summarized in the table below (Polhemus, 2022, pp. 6, 27-32, 45, 47).

Table 1. Blackline Hawaiian damselfly occurrence and abundance during surveys in the Koʻolau Mountains of Oʻahu, 2021-2022.

Location	Date	Number Seen	Notes
Uwau Stream Site 3	May 31, 2021	Moderately abundant	Males perching and defending territories on midstream rocks and prominent projecting sticks.
Maunawili Site 4	February 7, 2021	One male	
Maunawili Site 5	January 17, 2021	Several males	
Maunawili Site 7	April 11, 2021 April 9, 2022	Several males seen on both survey dates	Species may occur along the the entire reach of the stream in this area.
Maunawili Site 10	April 11, 2021	Abundant; at least 8 individuals observed in a half hour, including a mating pair	Appears to be the largest population occurring in Maunawili Valley
Maunawili Site 12	January 8, 2021	Moderately abundant with mating pairs observed	
Maunawili Site 14	May 15, 2022	Two males	
Kalihi Site 6	January 16, 2022	Moderately abundant; at least 4 males seen at one time	

The Army Natural Resources (ARNPO) conducted a two-day Survey in the South Kaukōnāhua Drainage, where hundreds of blackline Hawaiian damselflies were observed along all surveyed habitats. The damselflies were most abundant along narrow side drainages off the main Kaukōnāhua stream corridor (Walter, 2022, p. 1).

In June 2022, the State of Hawaiʻi Division of Fish and Wildlife (DOFAW) began captive rearing of blackline Hawaiian damselflies (Haines, 2022, in litt.). A single small batch of eggs were collected from Maunawili in the Koʻolau mountain range, of which 39

naiads hatched. Only three of these naiads were reared to adulthood, likely because of a pathogen during the late-instar naiad phase. From this initial generation, two more generations were reared and eventually all released at a stream in the Waiʻanae Kai Forest Reserve in the Waiʻanae Mountains in February 2023. The final naiads from this most recent generation are still being reared and will be released, totaling approximately 140 total individuals released from the captive rearing program. The next step will be to gather a more genetically diverse group of founders from multiple blackline Hawaiian damselfly populations and continue to release the reared individuals to the Waiʻanae mountain range (Haines, 2023, in litt.).

New threats:

- Pathogens (yet unidentified) are likely to be a threat to native damselflies, as they are suspected of playing a role in population decline of the orangeblack Hawaiian damselfly (*Megalagrion xanthomelas*) at Tripler Army Medical Center (Haines, 2023, *in litt.*).
- Habitat poisoning is a potential threat to native Hawaiian damselflies. Exposure to pesticide contamination can cause acute and chronic poisoning and lead to the mortality of non-target. Hawaiian damselfly larvae and eggs can be exposed to pesticide contaminated water through direct contact. In addition, secondary poisoning can occur to Hawaiian damselfly adults and larvae through bioaccumulation by the consumption of contaminated prey. Hawaiian damselfly adults, naiads, and eggs may be directly exposed to pesticide through contaminated water; adults and naiads may also be exposed (USFWS 2022, p. 15).
- An invasive cnidarian (*Hydra vulgaris*) has been identified preying on damselfly naiads and could be a major threat to native damselflies. This cnidarian appears to be fairly widespread on Oʻahu. Scientists from UC Berkeley (the Gillespie-Roderick lab) are working on detection protocols for Hydra using eDNA to assess how widespread *H. vulgaris* is, and whether native damselflies can coexist with *H. vulgaris* (Haines, 2023, *in litt.*).
    - Water studies by State of Hawaiʻi Department of Land and Natural Resources Division of Forestry and Wildlife Hawaiʻi Invertebrate Program have shown *H. vulgaris* is a threat to the orangeblack Hawaiian damselfly population located at Tripler Army Medical Center. This common aquarium system pest appears to be preying on damselfly naiads in addition to their other prey (USFWS 2022, p. 16).

New management actions:

- Monitoring and surveys – Ongoing surveys are being conducted by the U.S. Fish and Wildlife Service, ANRPO, and DOFAW under various permits to observe and monitor populations of native Hawaiian damselflies on Oʻahu, including the blackline Hawaiian damselfly.
- Reintroductions – DOFAW is working under a USFWS Recovery Permit to conduct captive rearing and reintroduction efforts of the blackline Hawaiian damselfly. The goal of this captive rearing is to reestablish the species in the Waiʻanae mountains, where the the species is believed to have been extirpated.

Table 2. Status and trends of blackline Hawaiian damselfly from listing through current 5-year review.

Date	No. Adult Wild Individuals	Downlisting Criteria Identified in Recovery Plan	Downlisting Criteria Completed?
2012 (listing)	Unknown	No recovery plan developed yet.	No
2018 (recovery outline)	< 1,000 from 17 populations	Recovery outline developed.	No
2019 (5-year review)	< 1,000 from 17 populations	Recovery outline developed.	No
2023 (5-yr review)	< 1,000 from 17 populations	Recovery outline developed	No

Table 3. Threats to blackline Hawaiian damselfly and ongoing conservation efforts.

Threats	Listing Factor	Current Status	Conservation or Management Actions
Agriculture/urban development	A	Ongoing	None. Agriculture and urban development continue to pose a threat to the blackline Hawaiian damselfly's habitat through encroachment and modification of water resources.
Stream alteration	A	Ongoing	None. Ongoing and extensive stream diversion and channelization continues to degrade the quantity and quality of the blackline Hawaiian damselfly's habitat and needed seeps.
Habitat modification by pigs	A	Ongoing	None. Ongoing habitat destruction and degradation of riparian habitat caused by feral pigs promote the establishment and spread of nonnative plants.
Habitat modification by nonnative plants	A	Ongoing	None. Nonnative plants that displace native species, increase runoff, and modify the riparian community lower or destroy the capability of the habitat to support viable populations of the blackline Hawaiian damselfly.
Stochastic events	A	Ongoing	None. The apparent restriction of the blackline Hawaiian damselfly to 12 small populations puts the species at risk of extinction from catastrophic events.
Climate change	A	Ongoing	None. Climate change is expected to affect water levels in stream corridors. Reduced genetic diversity of the remaining populations may limit the ability of the blackline Hawaiian damselfly to adapt.
Predation	C	Ongoing	None. Ants, bullfrogs, *Hydra vulgaris* and nonnative fish pose threats to the blackline Hawaiian damselfly adults and naiads.
Inadequate habitat protection	D	Ongoing	None. The State of Hawai‘i considers all natural flowing surface water (streams, springs, and seeps) as State property (Hawai‘i Revised Statues 174c, 1987). However, the State's Water Commission has not consistently enforced State Water Code regulations to protect the native Hawaiian damselfly's stream and seep habitat. This dewatering may threaten the blackline Hawaiian damselfly if it proves to be dependent on stream corridors where it has been observed.
Limited populations	E	Ongoing	None. This species has been extirpated from one of the mountain ranges on O‘ahu where it occurred. It is now found in scattered populations, some of which are small and isolated.
Habitat Poisoning	E	New	None.

Syntheses:
There is currently no downlisting criteria for the blackline Hawaiian damselfly species, but a Recovery Plan will be developed in the future that will include recovery criteria for the species.

The current population of the species is unknown, but numerous individuals have been observed since the last 5-year review published in 2019. The key threats to the species are agriculture and urban development that encroach and modify water resources, stream diversion and channelization that continues to degrade the quantity and quality of the species habitat, modification of the species habitat by pigs and nonnative plants, nonnative predatory species, catastrophic events such as hurricane, landslides, or drought, climate change, habitat poisoning, and lack of population representation, resiliency, and redundancy due to its apparent limited populations. Currently, existing regulations are inadequate to protect this species from introduction of nonnative species and to maintain their aquatic and riparian habitat. These threats are not managed. Therefore, the Blackline Hawaiian damselfly continues to meet the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Conduct targeted surveys for blackline Hawaiian damselfly to determine the distribution of the species.
- Based on survey results, stabilize and protect extant populations of blackline Hawaiian damselfly and develop and implement a recovery plan.
- Identify the primary habitat features and characteristics necessary for blackline Hawaiian damselfly recovery.
- Identify and evaluate the primary biological characteristics necessary for blackline Hawaiian damselfly recovery.
- Maintain and protect the habitat of blackline Hawaiian damselfly.
- Refine and calibrate the indices for invertebrate communities that are used for monitoring programs to improve stream habitat.
- Eliminate or manage nonnative predators of blackline Hawaiian damselfly.
- Survey, document, and manage threats to blackline Hawaiian damselfly.
- Eliminate or manage use of pesticides and other pathogens in areas where blackline Hawaiian damselfly may occur.
- Continue and expand captive rearing and reintroduction programs to establish new populations in areas where the species has become extirpated.

References:
See previous 5-year reviews for additional references.

Polhemus, D.A. 2022. Megalagrion Damselfly Surveys in the Koʻolau Mountains of Oʻahu 2021-2022. Final Report. Prepared for Hawaiʻi Department of Land and Natural Resources, Division of Forestry and Wildlife, Natural Area Reserves System, Honolulu. 71 pp.

Polhemus, D.A. and A. Asquith. 1996. Hawaiian damselflies: a field identification guide. Bishop Museum Press, Honolulu. Page 73.

[USFWS] U.S. Fish and Wildlife Service. 2018. Recovery Outline for the Island of Oʻahu. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaiʻi, 42 pp.

[USFWS] U.S. Fish and Wildlife Service. 2019. Oceanic Hawaiian Damselfly (*Megalagrion oceanicum*) 5-Year Review Summary and Evaluation. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaiʻi, 18 pp.

[USFWS] U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews for 77 Species in Oregon, Washington, Idaho, and Hawaiʻi. Federal Register 86 (120):33726–33728.

[USFWS] U.S. Fish and Wildlife Service. 2022. Species Report for the Pacific Hawaiian Damselfly (*Megalagrion pacificum*). Pacific Islands Fish and Wildlife Office, Honolulu, Hawaiʻi, 36 pp.

Walter, R. 2022. Schofield Barracks East Range (SBE) Damselfly Surveys. Unpublished Report. 3 pp.

***In Litteris*:**

Haines, W. 2022. Electronic mail message regarding *Megalagrion nigrohamatum nigrolineatum* surveys and captive rearing (November 2, 2022). 1 pp.

Haines, W. 2023. Electronic mail message regarding *Megalagrion nigrohamatum nigrolineatum* surveys, captive rearing, and new threats to *Megalagrion* species (June 12, 2023). 1 pp.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW on Blackline Hawaiian damselfly
(*Megalagrion nigrohamatum nigrolineatum*)

Pre-1996 DPS listing still considered a listable entity? ___N/A____

Recommendation resulting from the 5-year review:

_____ Delisting
_____ Reclassify from Endangered to Threatened status
_____ Reclassify from Threatened to Endangered status
____X____ No Change in listing status

Review Conducted By:
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