

5-YEAR REVIEW

Short Form Summary

Species Reviewed: Flying earwig Hawaiian damselfly (*Megalagrion nesiotes*)

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):

Charmian Dang, 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 18, 2023. The review was based on a review of current, available information since the last 5-year review for the flying earwig Hawaiian damselfly (*Megalagrion nesiotes*) (USFWS 2018, entire). The evaluation by Charmian Dang, 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/3001>.

Review Analysis:

Please refer to the Recovery Outline for Two Hawaiian Damselflies (USFWS 2011, entire), the Recovery Plan for 50 Hawaiian Archipelago Species (USFWS 2022b, entire), and the previous 5-year review for the flying earwig Hawaiian damselfly published on September 12, 2018 (available at <http://ecos.fws.gov/ecp/species/3001>) 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 flying earwig Hawaiian damselfly as endangered.

The flying earwig Hawaiian damselfly is currently known from a single population from east Maui, which was last observed in 2005 (USFWS 2010, pp. 35991–35992). Numerous surveys were conducted from 1993 through 2008 at several of its historically occupied sites (USFWS 2010, p. 35992; USFWS 2018, p. 7). The species was not observed during the 2009–2010 surveys at 40 wade-able sites of 25 perennial streams on Maui (Wolff 2012, p. 22; USFWS 2018, p. 7). In May of 2015, 10 sites were surveyed

along the entire length of the Waioni Stream corridor west of Hāna, Maui with no observation of the species (D. Polhemus 2015, pers. comm.; USFWS 2018, p. 7). In September of 2017, surveys in the Waioni Steam catchment from above Hāna Road to the seaward terminus were surveyed; no flying earwig Hawaiian damselfly were observed (Polhemus 2017, p. 8; USFWS 2018, pp. 7–8). A one-hour survey was conducted in April of 2022 at East Wailua Iki Stream, where the flying earwig Hawaiian damselfly was sighted in the 1990s; the species was not observed (Polhemus 2023, in litt., entire).

New status information:

Currently, there is no recent minimum population estimate of the flying earwig Hawaiian damselfly, which was last observed in 2005 by Foote (2008, entire).

New threats:

Habitat poisoning is a potential threat to the flying earwig Hawaiian damselfly. Exposure to pesticide contamination can cause acute and chronic poisoning and lead to the mortality of non-target aquatic organisms (Gulliya et al. 2021, p. 10134; USFWS 2022a, p. 15). Pesticides applied to the aquatic environment during collection of Tahitian prawns (*Macrobrachium lar*) can poison and cause mortality to all aquatic life (HDLNR 2018, entire; HDLNR 2020, entire; USFWS 2022a, p. 15). In one stream where pesticide was used for Tahitian prawn collection, anecdotal evidence indicates that the orangeblack Hawaiian damselfly (*Megalagrion xanthomelas*) has not been documented since pesticide application (Magnacca 2022, in litt., entire; USFWS 2022a, p. 15). 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 (USFWS 2022a, p. 15).

A predatory, freshwater invertebrate, *Hydra vulgaris*, is a threat to Hawaiian damselflies. Water studies by State of Hawai‘i Department of Land and Natural Resources Division of Forestry and Wildlife Hawai‘i Invertebrate Program have shown *Hydra* 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 that includes *Moina* and *Culex* larvae (Haines 2022, in litt., entire; USFWS 2022a, p. 16).

Management actions:

The area in east Maui where the last known observation of the flying earwig Hawaiian damselfly occurred is within the Ko‘olau Forest Reserve (owned primarily by the State of Hawai‘i) and is fully zoned for conservation (Higashi et al. 2009, pp. 6, 9; USFWS 2022a, p. 18). There is currently no ungulate proof fencing around the area of the last known sighting on the flying earwig Hawaiian damselfly. Although there are both active and future proposed ungulate control activities in the upper watershed areas where ungulate numbers have reached an all-time low, feral pigs still remain in fairly high numbers at multiple “hotspot” areas (The Nature Conservancy 2014, p. 12; USFWS 2022a, p. 18).

Table 1. Status and trends of the flying earwig Hawaiian damselfly from listing through current 5-year review.

| Date | No. Adult Wild Individuals | Downlisting Criteria Identified in Recovery Plan | Downlisting Criteria Completed? |
|-------------------------|----------------------------|---|---------------------------------|
| 2010 (listing) | Unknown | No recovery plan developed yet. | N/A |
| 2011 (recovery outline) | Unknown | | No |
| 2018 (5-year review) | Unknown | Recovery outline developed. | No |
| 2022 (species report) | Unknown | Recovery outline developed. | No |
| 2022 (recovery plan) | Unknown | <p>1. Existing populations of each damselfly species are identified and stabilized. Each of the three damselfly species should be represented by at least 10 populations geographically distributed in their respective habitats among islands where they have been historically observed. Populations should be well distributed on an island such that an island population is unlikely to be extirpated by a catastrophic event. For each population, a population index based on repeated surveys with consistent methodology must indicate stable to increasing indices over at least 5 consecutive years immediately prior to downlisting being considered for the species.</p> | No |
| | | <p>2. Habitats at each population site in <i>Downlisting Criterion 1</i> provide sufficient breeding habitat to support the damselflies, and measures are in place to protect the sites from ungulates, fire, and other forms of degradation in perpetuity.</p> | No |
| | | <p>3. For each population site in <i>Downlisting Criterion 1</i>, threats from predation, competition, and invasive species have been monitored for the 5 most recent years, and results based on at least</p> | No |

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|--|--|---|--|
| | | 3 years of the most recent data indicate that (a) nonnative predators are absent, or (b) that predation and competition are occurring at a level that will not result in significant long-term effects on damselfly population indices. All major threats to individual damselflies and habitat are managed, and measures are in place to prevent the introduction of new nonnative predators, competitors, or disease to the populations in <i>Downlisting Criterion 1</i> . Monitoring and management plans are completed and implemented for each damselfly species. | |
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Table 2. Threats to the flying earwig Hawaiian damselfly and ongoing conservation efforts.

| Threat | Listing Factor | Current Status | Conservation/Management Efforts |
|--|-----------------------|-----------------------|--|
| Agriculture/urban development | A | Ongoing | Agriculture, timber harvest, and urban development continue to pose a threat to flying earwig Hawaiian damselfly habitat through encroachment and modification of water resources. |
| Stream alteration | A | Ongoing | Ongoing and extensive stream diversion and channelization continue to degrade the quantity and quality of flying earwig Hawaiian damselfly habitat and needed seeps. |
| Habitat modification by pigs | A | Ongoing | Ongoing habitat destruction and degradation caused by feral pigs in remaining tracts of uluhe fern-dominated riparian habitat promote the establishment and spread of nonnative plants. |
| Habitat modification by nonnative plants | A | Ongoing | Nonnative plants that displace uluhe, increase runoff, and modify the riparian community lower or destroyed the capability of the habitat to support viable populations of the flying earwig Hawaiian damselfly. |

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|-------------------------------|---|---------|---|
| Habitat poisoning | A | Ongoing | Exposure to pesticide contamination can cause acute and chronic poisoning and lead to the mortality of all life stages of the flying earwig Hawaiian damselfly. |
| Stochastic events | A | Ongoing | The apparent restriction of the flying earwig Hawaiian damselfly to one population puts the species at risk of extinction from catastrophic events. |
| Climate change | A | Ongoing | Climate change is expected to affect water levels in stream corridors. Reduced genetic diversity of the remaining population may limit the ability of the flying earwig Hawaiian damselfly to adapt. |
| Overcollection | B | Unknown | Historically, the flying earwig Hawaiian damselfly was collected by hobbyists. |
| Predation | C | Ongoing | In addition to ants, bullfrogs, and <i>Hydra vulgaris</i> , the establishment of coqui frogs on Maui poses a threat to flying earwig Hawaiian damselfly adults and naiads. |
| Inadequate habitat protection | D | Ongoing | The State of Hawai‘i considers all natural flowing surface water (streams, springs, and seeps) as State property (Hawai‘i Revised Statutes 174c 1987). However, the State’s Water Commission has not consistently enforced State Water Code regulations to protect flying earwig Hawaiian damselfly stream and seep habitat. This dewatering may threaten the species if it proves to be dependent on seeps, streams, or the wet banks within the stream corridor where it has been observed. |
| Limited populations | E | Ongoing | Flying earwig Hawaiian damselfly individuals were last observed in 2005 at one site. The species appears to have low representation, resiliency, and redundancy. |

Syntheses:

The flying earwig Hawaiian damselfly, *Megalagrion nesiotes*, is an endangered endemic species historically found on the islands of Hawai‘i and Maui, but now believed to be

limited to a single population on Maui, which was last observed in 2005. The current population of the species is unknown. Numerous surveys have been conducted from 1996 through 2008, 2009 through 2010, 2015, and 2017 with no observations of the species (USFWS 2018, p. 7). A one-hour survey was conducted in April of 2022 at East Wailua Iki Stream, where the flying earwig Hawaiian damselfly was sighted in the 1990s; the species was not observed (Polhemus 2023, in litt., entire).

Downlisting and delisting objectives are provided in the recovery plan for the flying earwig Hawaiian damselfly (USFWS 2022b, p. xi). To be downlisted, at least 10 populations with stable population indices must exist; suitable habitats supporting at least 10 populations with stable population indices are protected; and habitat and threats are managed, monitoring and management plans are completed and implemented, and measures are in place to prevent the introduction of new threats. To be delisted, 10 years of systematic surveys must indicate significant increases in population indices and distribution of the 10 populations; suitable habitats supporting the 10 years of systematic surveys indicating significant increases in population indices and distribution of the 10 populations are protected; and habitat and threats are managed, monitoring of population status and threats are ongoing, and measures are in place to prevent the introduction of new threats.

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, habitat poisoning by pesticide contamination, nonnative predatory ant species, coqui frogs, bullfrogs, and *Hydra vulgaris*, climate change, catastrophic events such as hurricane, landslides, or drought, and lack of population representation, resiliency, and redundancy due to its apparent low population count. 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 flying earwig 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 the flying earwig Hawaiian damselfly to determine the distribution of the species.
- Based on survey results, stabilize and protect extant populations of the flying earwig Hawaiian damselfly and implement the recovery plan.
- Identify the primary habitat features and characteristics necessary for the flying earwig Hawaiian damselfly recovery.
- Identify and evaluate the primary biological characteristics necessary for the flying earwig Hawaiian damselfly recovery.
- Maintain and protect the habitat of the flying earwig 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 the flying earwig Hawaiian damselfly.

- Survey, document, and manage threats to the flying earwig Hawaiian damselfly.

References:

See previous 5-year review and recovery plan for additional references.

Gulliya, S., R. Kumar, M.S. Sankhla, R. Kumar and S.S. Sonone. 2021. Impact of Pesticide Toxicity in Aquatic Environment. *Biointerface Research in Applied Chemistry*. 1:10131–10140.

[HDLNR] State of Hawai‘i Department of Land and Natural Resources. 2018. Graduation Season Tahitian Prawns Warning Issued; Poison Used in some Hawai‘i Island Streams to Harvest Prawns. Available online at: <https://dlnr.hawaii.gov/docare/news/nr18-077d/>.

[HDLNR] State of Hawai‘i Department of Land and Natural Resources. 2020. Prawn Lovers Cautioned About Poisoned Tahitian Prawns on Hawai‘i Island. Available online at: <https://dlnr.hawaii.gov/blog/2020/10/01/nr20-155/>.

Higashi, G., Parham, J., Lapp, E., Hau, S., Kuamo‘o, D., Nishiura, L., Shindo, T., Sakihara, T., Shimoda, T., Nishimoto, R., and D. Polhemus. 2009. Report on Wailua Iki East stream Maui, Hawai‘i. Report for the Commission on Water Resource Management, Department of Land and Natural Resources, State of Hawai‘i.

The Nature Conservancy. 2014. Waikamoi Preserve East Maui Irrigation (EMI) Addition: Long-Range Management Plan Fiscal Years 2015–2020. Pages 1–29.

[USFWS] U.S. Fish and Wildlife Service. 2018. Flying earwig Hawaiian damselfly (*Megalagrion nesiotes*) 5-Year Review Summary and Evaluation. Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i, 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 Hawai‘i. *Federal Register* 86 (120):33726–33728.

U.S. Fish and Wildlife Service. 2022a. Species report for the flying earwig Hawaiian damselfly (*Megalagrion nesiotes*). Pacific Islands Fish and Wildlife Office, Pacific Islands Interior Region 12, Portland OR. 31 pp.

[USFWS] U.S. Fish and Wildlife Service. 2022b. Recovery Plan for 50 Hawaiian Archipelago Species). Pacific Islands Fish and Wildlife Office, Pacific Islands Region 1, Portland OR. 207 pp.

In Litteris References

Haines, W. 2022. Electronic mail message regarding *Hydra vulgaris* predation on *Megalagrion* spp. naiads and their prey. September 6, 2022. 1 p

Magnacca, K.N. 2022. Email to James Breeden, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office. Hawaiian damselflies and pesticide use in streams. August 30, 2022.

Polhemus, D. 2023. Electronic mail message regarding *Megalagrion nesiotes* survey in April of 2022. (May 19, 2023). 1 pp.

U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW on the flying earwig Hawaiian damselfly
(*Megalagrion nesiotes*)

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

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