

## 5-YEAR REVIEW

### Short Form Summary

**Species Reviewed:** Pe‘e pe‘e maka‘ole or Kauai Cave Wolf Spider (*Adelocosa anops*)

**Current Classification:** Endangered

#### **FR Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5- Year Status Reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48):14240-14243.

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

#### **Name of Reviewer(s):**

Emma Gosliner, Fish and Wildlife Biologist, PIFWO

John Vetter, Animal Recovery Coordinator, PIFWO

Megan Laut, Conservation & Restoration Team Manager, 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 in April 2022. The review was based on a review of current, available information since the last 5-year review for the pe‘e pe‘e maka‘ole (Kaua‘i cave wolf spider (*Adelocosa anops*)) (USFWS 2017, entire). The evaluation by Emma Gosliner, Fish and Wildlife Biologist, was reviewed by John Vetter, the Animal Recovery Coordinator, and Megan Laut, the Recovery Program 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: <https://ecos.fws.gov>.

#### **Review Analysis:**

Please refer to the previous 5-year review for Kaua‘i cave wolf spider (*Adelocosa anops*) published on September 5, 2017 (available at [https://ecos.fws.gov/docs/tess/species\\_nonpublish/2407.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/2407.pdf)) for a complete review of the species’ status, threats, and management efforts. No new threats or significant new information regarding the species’ biological status have come to light since listing to warrant a change in the Federal listing status of the pe‘e pe‘e maka‘ole as endangered.

This obligate cave-dwelling arthropod in the wolf spider Lycosidae family is endangered and endemic to the island of Kaua‘i. The current status and trends for the Kaua‘i cave wolf spider are provided in Table 1 below. For this review, information from limited survey data through 2020 was used. Threats to the species continue, including human visitation to caves, development, and invasive species.

New status information:

- No new populations have been observed since the previous 5-year review.

New threats:

- There are no new threats known at this time.

New management actions:

- Surveys / monitoring – Surveys (ranging from quarterly to annually) continue to be conducted at Koloa Cave 1 and 2, Cave 1927C, Cave 3179, Cave 3075, 3075B and Cave 3017C, Kiahuna Mauka Cave, Makauwahi Sinkhole, and the Quarry Cave from (USFWS, unpublished data 2006 through 2020). This monitoring was primarily carried out to assess population trends in caves and assess recovery actions (under recovery priority 1, action 3.1; USFWS 2006b). It also provided valuable information to determine if manipulation of cave climate can be used to improve habitat (under recovery priority 3, action 3.6; USFWS 2006b). Surveys have not been conducted in the Kiahuna Makai Cave since 2004, when the new landowner denied permission to the Service to monitor the cave due to liability concerns.
- Protect caves from unauthorized human entry – Monitoring the maintenance (e.g., painting, replacing locks) of the locking gates at Koloa Cave 1 and 2, Kiahuna Mauka Cave, and Quarry Cave and checking integrity of gates during survey visits.
- Updated Kauai Islandwide Recovery Plan, Final Revision 1, August 27, 2021
  - Outlines four criteria for downlisting and delisting the species.

**Syntheses:**

Surveys conducted since completion of the last 5-year review for this species reconfirm that the Kaua'i cave wolf spider is only known to be regularly observed in a single cave system. Efforts planned to map new caves in the Koloa District were put on hold due to COVID-19 restrictions and staffing limitations.

A revised recovery plan was published in 2021 outlining the downlisting and delisting criteria for this species. To be downlisted to threatened, there must be nine caves with populations spread across the known range, that meet the four delisting criteria:

- Each population contains representatives from all age classes and has a balanced sex ratio;
- Each population demonstrates a stable or increasing trend over a 10-year monitoring period;
- Each population is protected from nonnative, predatory species; human visitation or vandalism of caves (dumping area, party site); pesticides; development or other damaging land uses such as quarrying, filling, or diversion of rainwater into caves from impervious surfaces such as roads; and
- Caves and their surrounding above-ground habitat are managed and protected from future development, disturbance to cave interiors via gating, and restoring vegetation over the cave.

Populations within individual caves have declined to the point that detections are rare. For this species, recovery criteria cannot be met unless (1) additional caves are found that support populations of the Kauaʻi cave wolf spider, (2) the spider is reintroduced to caves with suitable habitat, or (3) the spider naturally increases its range because of conservation measures, including healthy populations of their prey, the Kauaʻi cave amphipod (USFWS 2021, pp. 65). The downlisting goals for this species have not been met (Table 1), not all threats are being managed, and some threats may be increasing (Table 2). Therefore, the peʻe peʻe makaʻole meets the definition of endangered as it remains in danger of extinction throughout its range.

Currently, the Kauaʻi cave wolf spider is only known to regularly occupy a single cave system, referred to here as Koloa Cave 1 located in the southwest corner of the range of the cave arthropods. Since semiregular monitoring first began in 1996, this cave has routinely contained 16 to 28 spiders per monitoring visit and up to 41 individuals in one survey. As recently as 2019, 36 spiders were observed (USFWS, unpubl. data 1996-2020). In an adjacent Koloa Cave 2, about 200 to 300 meters (260 to 390 feet) away, there is a single record from 1998 of an adult cave wolf spider being present, and three were observed in a 2020 survey visit (USFWS, unpubl. data 1996-2020).

In addition, individual spiders were observed for the first time in Cave 3075C (USFWS, unpubl. data 2006-2020). Juvenile spiders were found in the cave in 2006, 2007, 2013, and 2015. Adult spiders were observed in the cave in 2007 and 2013. A population of the Kauaʻi cave wolf spider was not detected in this cave until air blocks were installed to increase humidity in the cave as part of a cave preservation management plan in cooperation with Kukuiula Development Company (Hawaii), LLC. A juvenile spider was observed in Cave 3075 in 2019 and surveyors noted that the barrier is still up and in good condition (USFWS unpubl. data 2006-2020).

Annual to biannual monitoring visits have been conducted from 1998 through 2004 at Kiahuna Makai Cave. One to four individuals were observed per visit through October 1999, after which no wolf spiders have been observed in this cave (USFWS, unpubl. data 1996-2011). Surveys have not been conducted since 2004, when the new landowner denied permission to the Service to monitor the cave due to liability concerns.

The cave wolf spider has been recorded in Kiahuna Mauka Cave, located approximately 883 meters (2,896 feet) from Kiahuna Makai Cave. The cave wolf spider has been observed on seven occasions: a juvenile spider in 1996, a juvenile spider in 1997, two adult spiders during a single monitoring visit in 1998, an adult spider in March 2004, two adult spiders and a juvenile spider in October 2004, an adult spider in February 2005, and an adult spider in 2019 (USFWS, unpubl. data 1996-2020). The reappearance of wolf spiders in this cave suggests the ability of these spiders to recolonize caves when conditions become suitable.

The Quarry Cave, a coastal cave derived from calcareous marine deposits, is located in the southeast corner of the range of the cave arthropods. This cave is located within a large limestone bench that follows the coastline. There have been sporadic visits to the

dark zone of this cave (as recently as April 2019) where the cast skin of one wolf spider was observed in a previous visit (F. Howarth, pers. comm. 2002, M. Richardson, pers. comm, 2022).

**Recommendations for Future Actions:**

- Human interaction monitoring and management – Protect known populations and their subterranean habitats from human-caused destruction or degradation, including environmental contaminants.
- Existing population management and restoration – Improve or enhance occupied caves through landscaping measures designed to increase subterranean food resources.
- Habitat requirements research – Conduct research to address essential conservation needs to the species, including non-damaging mark recapture studies.
- Surveys / inventories – Conduct surveys for additional occupied habitat or restorable cave habitat.
- Reintroduction / translocation – Determine the potential for translocation of animals.
- Existing population management and restoration – Protect occupied caves or caves with suitable habitat.
- Outreach and education – Conduct public outreach to facilitate better public understanding of and support for conservation of this species (USFWS 2021, pp.1494).

Table 1. Status and trends of *Adelocosa anops* from listing through current 5-year review.

<b>Date</b>	<b>No. Adult Wild Individuals</b>	<b>Downlisting Criteria Identified in Recovery Plan</b>	<b>Downlisting Criteria Completed?</b>
2000 (listing)	Unknown	Nine self-sustaining, stable or increasing populations over 10-year period	No
		All threats to nine populations are controlled	Partially
		Habitat associated with nine populations is conserved	No
2003 (critical habitat)	Unknown	Nine self-sustaining, stable or increasing populations over 10-year period	No
		All threats to nine populations are controlled	Partially
		Habitat associated with nine populations is conserved	Partially
2006 (Recovery plan & 5-year)	Unknown	Nine self-sustaining, stable or increasing populations over 10-year period	No

review)			
		All threats to nine populations are controlled	Partially
		Habitat associated with nine populations is conserved	Partially
2016 (5-year review)	Unknown	Nine self-sustaining, stable or increasing populations over 10-year period	No
		All threats to nine populations are controlled	Partially
		Habitat associated with nine populations is conserved	Partially
2021 Recovery plan, first revision)	Unknown	Nine self-sustaining, stable or increasing populations over 10-year period	No
		All threats to nine populations are controlled	Partially
		Habitat associated with nine populations are managed and protected	Partially
2022 (5-yr review)	Unknown	Nine self-sustaining, stable or increasing populations over 10-year period	No
		All threats to nine populations are controlled	Partially
		Habitat associated with nine populations are managed and protected	Partially

Table 2. Threats to *Adelocosa anops* and ongoing conservation efforts.

<b>Threat</b>	<b>Listing Factor</b>	<b>Current Status</b>	<b>Conservation/Management Efforts</b>
Agricultural and urban development loss or degradation of habitat	A	Ongoing	Partial: continued cave preservation management through partnerships with private landowners;
Climate change loss or degradation of habitat –prolonged drought	A	Ongoing	None
Invasive plant species degradation of habitat	A	Ongoing	Partial: vegetation cleared around Cave 1927C and continued maintenance of above ground native plant

Threat	Listing Factor	Current Status	Conservation/Management Efforts
			restoration at the Quarry Cave and Kiahuna Mauka Cave in partnership private landowners
Predation by non-native species	C	Ongoing	Partial: monitor occurrence of predators in caves during survey efforts
Human visitation to and use of caves	A, E	Ongoing	Partial: maintain integrity of locking gates at Koloa Cave 1 and 2, Kiahuna Mauka Cave, and Quarry Cave
Bio-control agents – living organisms used to control pests	A	Ongoing	None
Environmental contamination – runoff and recharge containing pesticides	E	Ongoing	None
Stochastic events— Reduced numbers due to flooding	E	Ongoing	None

**References:**

*See previous 5-year reviews for additional references.*

[USFWS] U.S. Fish and Wildlife Service. 2017. Kauai Cave Wolf Spider (*Adelocosa anops*) 5- year review summary and evaluation. U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i. 12 pp.

[USFWS] U.S. Fish and Wildlife Service. 2021. Kauai Islandwide Recovery Plan, first revision. US Fish and Wildlife Service, Portland, OR 2416 pp.

**U.S. FISH AND WILDLIFE SERVICE**  
SIGNATURE PAGE for 5-YEAR REVIEW of  
Pe'e pe'e maka'ole or Kauai Cave Wolf Spider (*Adelocosa anops*)

**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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Date \_\_\_\_\_