

5-YEAR REVIEW

Short Form Summary

Species Reviewed: Hawai'i 'ākepa (*Loxops coccineus coccineus*)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawai'i, Palau, Guam, and the Northern Mariana Islands. Federal Register 83(88):20088-20092.

Lead Region/Field Office:

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai'i

Name of Reviewer(s):

Jay Nelson, 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 Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on December 2, 2019. The review was based on a review of current, available information since the last 5-year review for Hawai'i 'ākepa (USFWS 2015). The evaluation by Jay Nelson, Fish and Wildlife Biologist, was reviewed by John Vetter, Animal Recovery Coordinator.

Background:

For information regarding the species listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species at: <http://ecos.fws.gov/ecp/>.

Review Analysis:

Please refer to the previous 5-year reviews for Hawai'i 'ākepa (*Loxops coccineus coccineus*), published on August 20, 2015, and August 27, 2010 (available at: http://ecos.fws.gov/docs/five_year_review/doc4574.pdf and http://ecos.fws.gov/docs/five_year_review/doc3853.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of Hawai'i 'ākepa.

The Hawai'i 'ākepa is a small, sexually dichromatic Hawaiian honeycreeper endemic to Hawai'i Island. Adult males are bright orange, while females are greyish green with a yellow breast-band. The bill is conical and generally pale yellow in color (USFWS 2006).

New status information:

- The Hawai'i 'ākepa occurs as five disjunct populations in the north and central windward Hawai'i, Ka'ū, Kona, and Hualālai regions on Hawai'i (Gorresen *et al.*

2009). In 1977, the total population of Hawai‘i ‘ākepa was estimated 13,892 (95% CI $\pm 1,825$) birds (Scott *et al.* 1986). In 2016, total population was estimated 16,248 (95% CI 10,074 - 25,198) birds (Judge *et al.* 2018). Hawai‘i ‘ākepa is known for distributional anomalies across apparently suitable habitat particularly between open canopy montane woodland and old-growth closed-canopy *Metrosideros polymorpha* (‘ōhi‘a) forest, likely due to differences in nest-site and food availability (Judge *et al.* 2018). The recent population estimate of Hawai‘i ‘ākepa is encouraging because it suggests that numbers have remained stable for approximately 40 years since global surveys for this species were first conducted in the late 1970s and early 1980s (Scott *et al.* 1986; Judge *et al.* 2018). Hawai‘i ‘ākepa is likely increasing on Hakalau Forest NWR (Camp *et al.* 2016) and were detected at 1,280 meters (4,200 feet) elevation during surveys for Hawaiian forest birds in 2012, suggesting possible range expansion into middle elevation native forests on the refuge (Kendall and Gordon 2012). However, the species is likely decreasing in central windward Hawai‘i, decreasing at Hualālai and potentially extirpated from central Kona regions (Gorresen *et al.* 2009).

New threats:

- Climate change destruction or degradation of habitat – Hawaiian honeycreepers are known to be highly susceptible to introduced avian disease, particularly avian malaria (*Plasmodium relictum*) (Atkinson *et al.* 1995; Atkinson *et al.* 2000; Banko and Banko 2009). According to some climate change projections, temperature increases could present an additional threat specific to Hawaiian forest birds by causing an increase in the elevation below which regular transmission of avian malaria occurs, potentially reducing the remaining suitable habitat for these species. In Hawai‘i, the threshold temperature for transmission of avian malaria has been estimated to be 13 degrees Celsius (55 degrees Fahrenheit), whereas peak *P. relictum* prevalence in wild mosquitoes occurs in mid-elevation forest where the mean ambient summer temperature is 17 degrees Celsius (64 degrees Fahrenheit) (Benning *et al.* 2002). Benning *et al.* (2002) used GIS simulation to show that an increase in temperature of 2 degrees Celsius (3.6 degrees Fahrenheit), which is within the range predicted by some climate models (*e.g.*, ICAP 2010; IPCC 2013), would result in 100 years in a nearly 100 percent decrease in the land area where malaria transmission currently is only periodic. Lia *et al.* (2015) assessed how global climate change will affect future malaria risk for native Hawaiian bird populations and expect high elevation areas to remain mosquito free only to mid-century due to combined factors of increased rainfall and increasing temperatures. If climate change were to reduce the remaining suitable habitat for Hawai‘i ‘ākepa as predicted, it would likely contribute to the extinction of this species over time.

New management actions:

- Surveys/inventories – Forest bird surveys were conducted on Hawai‘i from 2016-2019 in areas with current and historical occurrence of Hawai‘i ‘ākepa.
- Disease control research – Scientists from the Hawai‘i Department of Land and Natural Resources, the U.S. Fish and Wildlife Service, and universities of Hawai‘i and Michigan are partnering with American Bird Conservancy, the Hawai‘i

Department of Health, the Coordinating Group on Alien Pest Species, and the Nature Conservancy to adapt “Incompatible Insect Technique” to suppress reproduction in mosquitoes, *Culex quinquefasciatus*. *Culex quinquefasciatus*, or the southern house mosquito, is the carrier of avian malaria in Hawai‘i. Incompatible insect technique functions like birth control by making it impossible for male mosquitoes to produce viable offspring. Most mosquitoes carry a type of bacteria called *Wolbachia* in their system. Males and females must carry the same strain to reproduce. By giving lab-reared mosquitoes a different strain of *Wolbachia*, any eggs produced with wild mosquitoes would not hatch.

Synthesis:

Recent surveys and population estimates (Gorresen *et al.* 2009; Judge *et al.* 2018) confirm that the Hawai‘i ‘ākepa population is stable overall and possibly increasing in Hakalau Forest NWR (Table 1). Hawai‘i ‘ākepa is likely decreasing in central windward Hawai‘i, and decreasing at Hualālai and potentially extirpated from central Kona regions (Gorresen *et al.* 2009). Although the species is stable overall, its range is contracting, thus the Hawai‘i ‘ākepa still meets the definition of endangered. In addition, all threats are not being sufficiently managed throughout all of the populations (Table 2).

Recommendations for Future Actions:

- Surveys/inventories – Continued monitoring of Hawai‘i ‘ākepa is important to determine species response to management actions and effects of climate change.
- Threats – disease control research – Of particular concern to the continued survival of many Hawaiian forest birds (particularly Hawaiian honeycreepers) is avian disease. Existing tools and approaches including local control of mosquitoes at their breeding sites have proved largely ineffective in addressing this problem given mosquito dispersal distance and the abundance of mosquito breeding sites in most wet native forest habitats (LaPointe *et al.* 2009). Opportunities are emerging however based on new genetic tools as part of the fields of synthetic biology and genomic technology that have the potential to assist Hawaiian forest birds in developing genetic resistance to avian disease, including incompatible insect technique (*Wolbachia* - sterile male technique) and transgenic or genetically modified mosquitoes (LaPointe *et al.* 2009). Several of these techniques have achieved proof-of-principle in laboratory studies, while other transgenic insect techniques, including self-sustaining technologies to achieve long-term transmission control are anticipated to advance to field testing in the near future. We encourage continued research in the fields of genomic technologies and genetically modified mosquitoes for disease control and their field application as a conservation strategy for Hawaiian forest birds.
- Habitat and natural process management and restoration –
 - We recommend continued habitat management in areas where the species currently exists (USFWS 2006).
 - Hawaiian forest birds susceptible to avian disease may become extinct following a drastic reduction in disease free habitat, but ultimately forest birds might expand into higher elevations maintaining disease free refugia for some species. Acquisition and management of transmission-free high-elevation

habitat is crucial to the preservation and restoration of native Hawaiian forest birds (Lapointe *et al.* 2009). As a long-term contingency against a warming scenario, we recommend securing deforested and pasture lands on Hawai‘i at high elevations adjacent to protected refugia and managing these areas for forest growth to provide suitable habitat for Hawai‘i ‘ākepa and other Hawaiian forest birds.

Table 1. Trends in status of Hawai‘i ‘ākepa since listing.

Date	Number wild individuals	Number released	Key Recovery Actions	Actions Accomplished
1970 (listing)	Rare	0	See below	
1977 (Hawaii Forest Bird Survey)	13,892 \pm 1,825 (95% CI)	0	See below	
1983 (first recovery plan)	Approximately 14,000 birds	0	Improve habitat conditions; decrease threat of avian disease; monitor populations;	Improve habitat conditions – Yes Decrease threat of avian disease – Yes Monitor populations – Yes
2006 (revised recovery plan)	Approximately 14,000 birds	0	Improve habitat conditions; decrease threat of avian disease; monitor populations;	Improve habitat conditions – Yes Decrease threat of avian disease – Yes Monitor populations – Yes
2007	Approximately 14,000 birds	12	Improve habitat conditions; decrease threat of avian disease; monitor populations;	Improve habitat conditions – Yes Decrease threat of avian disease – Yes Monitor populations – Yes
2010 (5-year review)	Approximately 12,000 birds	0	Improve habitat conditions; decrease threat of avian disease; monitor populations;	Improve habitat conditions – Yes Decrease threat of avian disease – Yes Monitor populations – Yes

Date	Number wild individuals	Number released	Key Recovery Actions	Actions Accomplished
2015 (5-year review)	Approximately 12,000 birds	0	Improve habitat conditions; decrease threat of avian disease; monitor populations;	Improve habitat conditions – Yes Decrease threat of avian disease – Yes Monitor populations – Yes
2020 (5-year review)	16,248 (95% CI 10,074 - 25,198) birds	0	Improve habitat conditions; decrease threat of avian disease; monitor populations;	Improve habitat conditions – Yes Decrease threat of avian disease – Yes Monitor populations – Yes

Table 2. Threats to Hawai'i 'ākepa and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, E	Ongoing	Partially, some habitat areas fenced
Invasive introduced plants	A, E	Ongoing	Partially, some habitat areas managed
Low numbers	E	Ongoing	Partially, captive propagation and release and forest protection
Climate change	A, E	Increasing	Partially, forest protection at middle elevations and reforestation in some high elevation areas, research into incompatible insect technique

References:

See previous 5-year review for a full list of references (USFWS 2010).

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for _____ Date _____
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