

Kaua`i `ō`ō
(*Moho braccatus*)

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: Kaua'i 'ō'ō (*Moho braccatus*)

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5-YEAR REVIEW

Kaua`i `ō`ō (*Moho braccatus*)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

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Lead Field Office:

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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 (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) beginning on July 6, 2005. The evaluation of the status of the species was prepared by the lead PIFWO biologist and reviewed by the Hawaiian Birds Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and acting Assistant Field Supervisor for Endangered Species, and Deputy Field Supervisor, before submission to the Field Supervisor for approval.

Information used to conduct this review was obtained from the following sources: the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006), Birds of North America species account, No. 535 (Sykes *et al.* 2000), Hawaiian Forest Bird Survey (Scott *et al.* 1986), Hawai`i Rare Bird Search 1994 to 1996 (Reynolds and Snetsinger 2001), and the most recent Hawaiian forest bird surveys on the island of Kaua`i in 2005. Information from these sources was used to determine the species' historical distribution, recovery criteria, threats, most recent documented sightings, and extinction probability. The Birds of North America species account (Sykes *et al.* 2000) and the peer-reviewed Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006) summarized all early scientific information gathered about the species, while the Hawaiian Forest Bird Survey (Scott *et al.* 1986), the Hawai`i Rare Bird Search 1994 to 1996, which was conducted specifically to search for extremely rare and potentially extinct Hawaiian forest birds, and periodic forest bird surveys performed on a five-year rotating cycle on each of the main Hawaiian islands, provided the most recent

information about the continued presence of the species in areas where it was known historically. The above sources constitute the most recent, complete, and scientifically reliable information available for the evaluation of the taxon's current status.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

USFWS. Endangered and threatened wildlife and plants; Initiation of 5-year reviews of the Mariana Fruit Bat (*Pteropus mariannus mariannus*), Mariana Crow (*Corvus hawaiiensis*), Laysan Duck (*Anas laysanensis*), Kauai Akialoa (Honeycreeper) (*Hemignathus procerus*), Large Kauai Thrush (*Myadestes myadestinus*), Kauai Oo (Honeyeater) (*Moho braccatus*), Ou (Honeycreeper) (*Psittirostra psittacea*), Molokai Creeper (*Paroreomyza flammea*), Molokai Thrush (*Myadestes lanaiensis rutha*), Kauai Cave Wolf Spider (*Adelocosa anops*) Kauai Cave Amphipod (*Spelaeorchestia koloana*), *Alsinidendron obovatum* (No Common Name), *Amaranthus brownii* (No Common Name), *Chamaesyce celastroides* var. *kaenana* (Akoko), *Chamaesyce deppeana* (Akoko), *Chamaesyce herbstii* (Akoko), *Chamaesyce skottsbergii* var. *kalaeloana* (Ewa Plains Akoko), *Clermontia pyrularia* (Oha Wai), *Cyanea grimesiana* ssp. *obatae* (No Common Name), *Cyanea pinnatifida* (Haha), *Cyanea st.-johnii* (Haha), *Cyanea superba* (Haha), *Cyanea truncata* (Haha), *Cyrtandra dentata* (Haiwale), *Gouania vitifolia* (No Common Name), *Hedyotis degeneri* (No Common Name), *Hibiscadelphus woodii* (Hau Kuahiwi), *Castilleja levisecta* (Golden paintbrush), Fender's Blue Butterfly (*Icaricia icarioides fenderi*), *Erigeron decumbens* var. *decumbens* (Willamette Daisy), *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's Lupine), *Lomatium bradshawii* (Bradshaw's Desert Parsley), and *Sidalcea nelsoniana* (Nelson's Checker-mallow). Federal Register 70(128):38972-38975.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1967. Office of the Secretary, Native Fish and Wildlife, Endangered Species. Federal Register 32(48):4001.

Date listed: March 11, 1967

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:

1.3.4 Review History:

Species status [FY 2008 Recovery Data Call (September 2008)]:
Uncertain

Recovery achieved:

1 (0-25%) (FY 2008 Recovery Data Call)

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

4

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Revised Recovery Plan for Hawaiian Forest Birds

Date issued: September 22, 2006

Dates of previous revisions, if applicable:

July 1983 (USFWS. 1983. Kauai Forest Birds Recovery Plan. Region 1, Portland, OR. 69 pages.).

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
 No

2.1.2 Is the species under review listed as a DPS?

Yes
 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 criteria?

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:

Downlisting criteria:

Criterion 1. The species occurs in two or more viable populations or a viable metapopulation that represent the ecological, morphological, behavioral, and genetic diversity of the species (Factors A, C, and E).

This criterion has not been met. It is not known whether the species still exists.

Criterion 2. Either a) quantitative surveys show that the number of individuals in each isolated population or in the metapopulation has been stable or increasing for 15 consecutive years, or b) demographic monitoring shows that each population or the metapopulation exhibits an average intrinsic growth rate (λ) not less than 1.0 over a period of at least 15 consecutive years; and total population size is not expected to decline by more than 20 percent within the next 15 consecutive years for any reason (Factors A, C, and E).

This criterion has not been met. Survey efforts have not been adequate to determine with confidence whether the species still exists.

Criterion 3. Sufficient recovery habitat is protected and managed to achieve Criteria 1 and 2 (Factors A and C).

This criterion has not been fully met. The remote Alaka'i Wilderness is protected and managed; however, most habitat (>90 percent) where the species might occur is unfenced and vulnerable to damage by feral ungulates.

Criterion 4. The mix of threats that were responsible for the decline of the species have been identified and controlled (Factors A, C, and E).

This criterion has not been fully met. Most threats have been identified including disease, predation, and habitat damage by feral ungulates. However, each of these threats is only partly controlled. The threat from disease has been partly controlled by protecting forest habitat in some areas from feral pigs that create mosquito breeding sites, but mosquitoes are known to fly several kilometers in forested habitats and thus may still threaten forest birds even in pristine forest. Predator control and ungulate removal has been implemented in some areas where the species may still occur, but not in the entire suitable habitat area for the species.

The taxon may be delisted when the downlisting criteria described above have been satisfied for at least 30 consecutive years.

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.

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:

There is no new information regarding abundance, population trends, demographic features, or demographic trends as the species has not been seen since 1989 on Kaua'i and 1987 on Hawai'i.

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

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

There has been no change in taxonomy or nomenclature.

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.):

No new information.

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

Habitat degradation resulting from the invasion of nonnative weeds has dramatically changed the forest structure and integrity. Two hurricanes in 1982 and 1992 severely disrupted portions of high quality native forest, and have made space for the germination and expansion of noxious weeds such as *Hedychium flavescens* (yellow ginger), *Erigeron karvinskianus* (daisy fleabane), *Tibouchina urvilleana* (glorybush), *Lonicera japonica* (Japanese honeysuckle), and others (USFWS 2006).

2.3.1.7 Other:

Not applicable.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

As with several other endangered Kaua'i forest birds, the Kaua'i 'ō'ō was once considered a very common species in the lowlands as well as in upland forests. The rather sudden decline in numbers noted during the first two decades of the 20th century (Munro 1944, pages 83 to 85) points to a limiting factor that had an acute impact on the species. Unfortunately, the Kaua'i 'ō'ō is now so rare, or possibly extinct, that identification of threats and reasons for its decline are difficult.

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Habitat destruction by agricultural development reduced the Kaua'i 'ō'ō's lowland range, but does not explain the sudden decline noted in the interior uplands as well. The use of large old-growth snags for nesting and the paucity of any large-timbered forests after the turn of the century may have limited the Kaua'i 'ō'ō's ability to find suitable nest sites, particularly after two hurricanes struck Kaua'i in 1982 and 1992. Other impacts on their habitat, such as forest damage by feral pigs (*Sus scrofa*), goats (*Capra hircus*), and the spread of nonnative invasive plants, likely had a supplemental negative impact on the species.

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

Overutilization is not known to be a current threat.

2.3.2.3 Disease or predation:

After the turn of the century, many of the native lowland birds disappeared as a large number of nonnative birds were introduced. Some of these nonnative species may have harbored foreign diseases or parasites for which the Kaua'i 'ō'ō had little or no immunity. The mosquito vector of blood-borne diseases such as avian malaria (*Plasmodium relictum*) and

avian pox (*Poxvirus avium*) was already well established, and could have brought about a rapid decline of a highly susceptible endemic bird. The fact that other species in the same genus, *Moho*, on other islands suffered a similar fate during approximately the same period suggests disease as a major limiting factor, coupled with the fact that the last Kaua'i 'ō'ō were found only at higher mosquito-free elevations.

The use of cavity nests by this species may also make it more susceptible to foraging rats known to be numerous in Hawai'i's forests. Nonnative Polynesian rats (*Rattus exulans*) are presumed to have become established in the islands with the arrival of the first Polynesian settlers (Tomich 1969, pages 42 to 45). The black rat (*Rattus rattus*) evidently established itself in Hawai'i after the advent of the European explorers in the late 1700s. The demise of many of Hawai'i's forest birds seemed coincident with the arrivals of various new nonnative fauna, yet the Kaua'i 'ō'ō decline was apparently quite sudden, suggesting a particular susceptibility to a single potent limiting factor.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Goat, pig, and deer (*Axis axis*) hunting is allowed year-round or during certain months, depending on the area (Hawaii Department of Land and Natural Resources 1999). However, public hunting does not adequately control the numbers of goats and pigs (on Kaua'i) to eliminate this threat to this species' habitat.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

This species now occurs in such low numbers and in such restricted ranges, if it exists at all, that it is threatened by natural processes, such as inbreeding depression and demographic stochasticity, and by natural and man-made factors such as hurricanes, wildfires, and periodic vegetation die-back (USFWS 2006). Impacts of nonnative birds are not well understood, but include aggressive behavior towards native bird species, possible competition for food, nest sites, and roosting sites, and possibly supporting elevated predator population levels.

2.4 Synthesis

Reevaluation of conclusions regarding extinction probability based on the 1994 to 1996 Hawai'i Rare Bird Search (Reynolds and Snetsinger 2001) and reexamination of data from the Hawaiian Forest Bird Survey (Scott *et al.* 1986) and surveys by John Sincock from 1968 to 1973 (USFWS 1983) indicates that the species' status is best described as uncertain.

The last documented sighting of this species occurred in 1981 when Scott *et al.* (1986, pages 103 to 105) discovered one pair of Kaua'i 'ō'ō during the Hawaiian

Forest Bird Survey, and the last well-documented audio detection of this species occurred in 1987 (Pyle 1988).

John Sincock conducted the first extensive surveys from 1968 to 1973 along stream and ridge transects within three areas of the Alaka`i Swamp: the “North Alaka`i,” “South East Alaka`i,” and “South West Alaka`i” which contained almost all habitat area (approx. 7,800 hectares (19,274 acres)) considered essential for endangered forest birds on Kaua`i, and where rare species most likely would continue to be found (USFWS 1983). During these surveys, Sincock estimated populations of Kaua`i `ō`ō to be 29 with a standard error (S.E.) of 20 for the Southeast Alaka`i and 7 with a S.E. of 7 for the Southwest Alaka`i study areas. The Hawaiian Forest Bird Survey survey area in 1986 overlapped areas Sincock had surveyed and included areas where Kaua`i `ō`ō were detected, but encompassed only approximately one-quarter (1,700 hectares (4,200 acres)) of the total area surveyed by John Sincock (Scott *et al.* 1986, pages 16 and 39). Study areas for the Hawai`i Rare Bird Search in 1994 to 1996 consisted of four major drainages within the Alaka`i Swamp, the Koai`e, Mōhihi-Waiakōali-Koali, Halehaha-Halepa`akia, and North Kawaikōi within the essential habitat area defined by Sincock (USFWS 1983). However, Reynolds and Snetsinger's (2001) survey did not include some areas of suitable habitat along the perimeter and inside the essential habitat boundary described by Sincock and approximately 800 hectares (1,976 acres) of private lands (approx. 14 percent of the essential habitat area) along the southern boundary of the Alaka`i Swamp. Therefore, approximately 25 percent of the essential habitat area for Kaua`i `ō`ō as defined by Sincock has not been surveyed since 1968 to 1973 (USFWS 1983).

Reynolds and Snetsinger (2001) determined probability of detecting one bird from a randomly distributed population of n individuals as a function of the effective search area on either side of their search transects using the effective detection distance for each species calculated from Hawaiian Forest Bird Survey data. They also developed an extinction probability for their survey data as a function of the number of independent visits made to search for the missing species, the number of sightings, and the probability of detection. Vocalizations of this species are distinctive and unlikely to be overlooked. Based on data collected during the Hawai`i Rare Bird Search, the extinction probability for this species was estimated to be ≥ 0.95 (Reynolds and Snetsinger 2001). However, Reynolds and Snetsinger (2001) state that although they searched habitat with historical records and/or high native-species diversity to increase their chances for rare bird detections, similar habitat with rare bird detections existed outside their search areas. Therefore, determination of extinction probability by Reynolds and Snetsinger (2001) should be considered valid only for the areas surveyed, which covers approximately 75 percent of the habitat area where the species, if it still exists, is most likely to occur.

As Reynolds and Snetsinger (2001) describe, there are instances where rare Hawaiian birds have been rediscovered after they were presumed extinct or have been found in larger populations than expected. Given the only partial coverage by the Hawaiian Forest Bird Survey and Hawai`i Rare Bird Search of suitable habitats where the

species may still exist, additional search effort is needed to confirm the status of the Kaua'i 'ō'ō. In addition, the extremely difficult terrain of the Alaka'i Wilderness on Kaua'i and the wet weather make surveys difficult, and numerous steep valleys on Kaua'i create small pockets of habitat where the species could potentially persist.

3.0 RESULTS

3.3 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: N/A

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

Given the low survey effort for this species, recent only partial coverage of habitat areas where the species may still persist, and the difficulty of detecting forest birds in remote mountainous habitats in Hawai'i, the species' biological status is uncertain. This determination is based on reexamination of data from the 1994 to 1996 Hawai'i Rare Bird Search (Reynolds and Snetsinger 2001), in particular portions of suitable habitat for Kaua'i 'ō'ō not included in this survey. Although results of the 1994 to 1996 Hawai'i Rare Bird Search and the most recent forest bird surveys on Kaua'i in 2005 suggest the Kaua'i 'ō'ō may be extinct, additional targeted searches for this species are needed to confirm this assessment. Therefore, PIFWO recommends the following actions:

- Conduct intensive searches for the Kaua'i 'ō'ō on Kaua'i using similar methodologies as those employed during the 1994 to 1996 Hawai'i Rare Bird Search (Reynolds and Snetsinger 2001). Include areas not surveyed during the 1994 to 1996 Hawai'i Rare Bird Search in these surveys.

Deploy autonomous recording units, or ARUs (Fitzpatrick 2002) in suitable habitats for this species. These field recording units record vocalizations of forest birds. The recordings can then be analyzed using computer programs to determine if the target species is present in the area. Use of this technology would greatly increase the amount of search time for this species.

5.0 REFERENCES

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- [USFWS] U.S. Fish and Wildlife Service. 1983. *Kauai Forest Birds Recovery Plan*. Region 1, Portland, OR. 69 pages.
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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Kaua'i 'ō'ō (*Moho braccatus*)

Current Classification: E

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:

Jay Nelson, Fish and Wildlife Biologist
Eric VanderWerf, (former) Hawaiian Birds Recovery Coordinator
Marilet A. Zablan, Recovery Program Leader and acting Assistant Field Supervisor for Endangered Species
Gina Shultz, Deputy Field Supervisor

Approved:  Date 29 July 2009
Acting Field Supervisor, Pacific Islands Fish and Wildlife Office