O`ahu `Elepaio
(*Chasiempis sandwichensis ibidis*)

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: O`ahu `Elepaio (*Chasiempis sandwichensis ibidis*)

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5-YEAR REVIEW
O`ahu `Elepaio/ *Chasiempis sandwichensis ibidis*

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia, (503) 231-2071

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 March 8, 2007. The Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006) and recent surveys of populations in the Wai`anae and Ko`olau Mountains (VanderWerf 2006, U.S. Army 2007, VanderWerf 2008) provided most of the updated information on the current status of *Chasiempis sandwichensis ibidis*. The evaluation of the status of the species was prepared by the lead PIFWO biologist and reviewed by the Vertebrate 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.

1.3 Background:

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

USFWS. 2007. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 71 species in Oregon, Hawaii, Commonwealth of the Northern Mariana Islands, and Territory of Guam. Federal Register 72(45): 10547-10550.

1.3.2 Listing history

Original Listing
FR notice: USFWS. 2000. Final rule to list as endangered the O`ahu `Elepaio from the Hawaiian islands and determination of whether designation of critical habitat is prudent. Federal Register 65(75):20760-20769.
Date listed: April 18, 2000
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:

USFWS. 2001. Determination of critical habitat for the Oahu Elepaio (*Chasiempis sandwichensis ibidis*); final rule. Federal Register 66(237):63752-63782.

1.3.4 Review History:

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

Recovery achieved:
2 (26-50%) (FY 2008 Recovery Data Call)

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

3

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: N/A

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?

__X_ ***Yes***
__-__ ***No***

2.1.2 Is the species under review listed as a DPS?

____ ***Yes***
__X_ ***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***
__X_ ***No***

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X_ ***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?

_X_ ***Yes***
____ ***No***

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

__X_ ***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:

The O`ahu `elepaio may be downlisted from endangered to threatened when all of the following four criteria have been met:

(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, and viable populations exist in Waikāne/Kahana, southern Ko`olau, central Ko`olau, southern Wai`anae, Schofield Barracks West Range, and Mākaha/Wai`anae Kai recovery areas.

This criterion has not been met. Some populations are declining and others are not viable.

(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 growth rate (λ or lambda) 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.

This criterion has not been met; overall the O`ahu `elepaio is in decline.

(3) Sufficient recovery area is protected and managed to achieve criteria 1 and 2 above.

Sufficient recovery area is protected; however, some areas are not adequately managed.

(4) The threats that were responsible for the decline of the species have been identified and controlled.

Threats responsible for the decline of O`ahu `elepaio have been identified, but have not been adequately controlled.

The O`ahu `elepaio may be delisted (removed from the Federal list of endangered species) when all four of the criteria above have been met for a 30-year period.

2.3 Updated Information and Current Species Status

The O`ahu `elepaio is a small (12.5 grams (0.4 ounces) average weight, 15 centimeters (5.9 inches) total body length) monarch flycatcher (Monarchidae; VanderWerf 1998, page 1). It is dark brown above and white below, with light brown streaks on the breast. The tail is long (6.5 cm, 2.6 inches) and often cocked up at an angle. Adults have conspicuous white wing bars, a white rump, and white tips on the tail feathers that are often displayed. The throat is white with black markings in both sexes, but males tend to have more black than females, especially on the chin (USFWS 2006, page 2-2).

Before humans arrived, forest covered about 127,000 hectares (313,690 acres) on O`ahu, and it is likely that `elepaio formerly inhabited much of that area (USFWS 2006, page 2-6). Reports by early naturalists indicate that `elepaio were once widespread and abundant on O`ahu, and the historical range of the O`ahu `elepaio included most forested parts of the island (USFWS 2006, page 2-8). Nonetheless, despite its adaptability, the O`ahu `elepaio has declined seriously since humans arrived in Hawai`i around 400 A.D., and it has disappeared from many areas where it was formerly common (VanderWerf *et al.* 2001, page 14; USFWS 2006, page 2-8).

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:

In the year 2000, there were approximately 1,980 O`ahu `elepaio distributed in 6 relatively large populations and several small population remnants (USFWS 2006, page 2-8). At that time the number of birds was divided almost evenly between the Wai`anae Mountains in the west and the Ko`olau Mountains in the east, with three relatively large populations in each mountain range. Although the central Ko`olau population covers the largest area, `elepaio are sparsely distributed in much of this region and the number of birds is smaller than in more dense populations. Several tiny population remnants consisting entirely of males remained in both the Wai`anae and Ko`olau mountains, but since there was no chance of reproduction without females and population rescue by immigration is

unlikely, these relicts likely will disappear as the last adult birds die (USFWS 2006, page 2-9).

Recent surveys (VanderWerf 2006, 2008; U.S. Army 2007) show the `elepaio has continued to decline: The current `elepaio population in the southern Wai`anae Range is much lower than the estimate made in the 1990s (VanderWerf *et al.* 2001, page 12; VanderWerf 2006, page 5). The highly skewed sex ratio in 2006, with surplus of males, indicates the population was larger in the recent past, since there presumably were equal numbers of males and females at hatching (VanderWerf 2006, page 5). The shortage of females and lack of fledglings indicates nest predation has been the main cause of decline (VanderWerf and Smith 2002, page 79). For example, although the rodent control program in Wailupe Valley (Southern Ko`olau) continues to be effective and has resulted in increases in nest success and survival of adult females, the number of `elepaio pairs in the valley has declined slightly in each of the past several years, some pairs now occupy areas that once encompassed two or even three territories, and at least two territories at the bottom of the valley are now vacant (VanderWerf 2008, page 4). Surveys of the Mākua Action Area and Mākaha Valley (U.S. Army 2007, pages 4-1-1 to 4-1-5) show a disturbing range-wide population decline over the last 10 years, respectively, for the Mākua Action Area, from 15 territory-holding birds to six banded birds and only two breeding pairs, and the Mākaha Valley, from 123 birds to less than half this total number of individuals (VanderWerf *et al.*, page 12; U.S. Army 2007, page 4-1-3)

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:

No new information.

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.):

Based on the dates when `elepaio were last observed in various locations, the decline of O`ahu `elepaio began in three areas, the northern Ko`olau Mountains, the northern slope of Mt. Ka`ala in the northern Wai`anae Range, and near Konahuanui in the south-central Ko`olau Mountains.

Perhaps not coincidentally, these are also the three areas with highest rainfall on O`ahu, suggesting mosquito-borne diseases may have played an important role in the decline (USFWS 2006, page 2-11). The O`ahu `elepaio currently occupies only about 4 percent of its presumed prehistorical range, and it has declined by roughly 96 percent since humans arrived in Hawai`i (USFWS 2006, page 2-8). The total geographic area of all current populations is approximately 5,451 hectares (13,464 acres) (USFWS 2006, page 2-8). In 1975, `elepaio inhabited approximately 20,900 hectares (51,623 acres) on O`ahu, almost four times the area of the current range (VanderWerf *et al.* 2001, page 14), thus the range of the `elepaio has declined by roughly 75 percent in the last 25 years (USFWS 2006, page 2-8).

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

See 2.3 above.

2.3.1.7 Other:

N/A

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

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

Much of the historical decline of the O`ahu `elepaio can be attributed to habitat loss, especially at low elevations. Fifty-six percent of the original prehistoric range has been developed for urban or agricultural use, and no `elepaio remain in these developed areas (USFWS 2006, page 2-10). Habitat loss thus has been a major cause of decline, but `elepaio are adaptable, and moderate habitat alteration in the form of gradual replacement of native forest with alien forest has not limited their distribution. Moreover, several areas of O`ahu that recently supported large `elepaio populations and still contain suitable native forest habitat are unoccupied, demonstrating that habitat loss is not the only threat. `Elepaio were observed regularly into the 1970s or early 1980s at Poamoho, Schofield-Waikāne, Mānana, and other areas, but they have disappeared from all these areas even though the forest is still largely intact (VanderWerf *et al.* 2001, page15).

2.3.2.2 Overutilization for commercial, recreational, scientific, or

educational purposes:

Not a limiting factor at this time.

2.3.2.3 Disease or predation:

Recent declines in O`ahu `elepaio populations are due to a combination of low adult survival and low reproductive success. The two main causes of reduced survival and reproduction on O`ahu are nest predation by alien black rats (*Rattus rattus*) and diseases, particularly avian pox (*Poxvirus avium*), which is carried by the introduced southern house mosquito (*Culex quinquefasciatus*). In a 10-year study of mosquito-borne diseases from 1995-2005, VanderWerf *et al*. (2006, page 773) found that each year 20% ± 4% of O`ahu `Elepaio had active lesions likely caused by pox, and an additional 16% ± 4% had deformities and missing toes indicative of healed pox lesions. Prevalence of malaria was 87% over all years combined. Pox prevalence varied among years, and was associated with annual rainfall, presumably due to greater abundance of mosquito breeding sites in wet years. Severity of infection varied considerably among birds, and infections involving three or more toes, the feet, or the head were less common in birds with healed lesions than those with active lesions, suggesting such infection resulted in mortality more often. Annual survival of `elepaio with active avian pox lesions (65 percent) was lower than annual survival of `elepaio with no pox symptoms (80 percent; USFWS 2006, page 2-11). Avian malaria (*Plasmodium relictum*) is known to be a serious threat to many Hawaiian forest birds (Warner 1968, page 106; van Riper *et al.* 1986, page 338; Atkinson *et al.* 1995, page S65), but its effect on `elepaio has not been quantified.

Black rats are the main predator on O`ahu `elepaio nests, though feral cats may also occasionally prey on adults and nests. An experiment in which automatic cameras were wired to artificial nests containing quail eggs showed that a black rat was the predator in all 10 predation events documented (VanderWerf 2001, page 454). All predation events occurred at night, and most occurred on the first night artificial nests were placed in the field, indicating predation pressure was very high (USFWS 2006, page 2-12).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Current regulatory mechanisms are adequate: The O`ahu `elepaio was federally listed as endangered on April 18, 2000 (USFWS 2000), and thus receives regulatory protection under the Federal Endangered Species Act. Species listed under the Federal Endangered Species Act are automatically

added to the State of Hawai`i list of endangered species, and are thus also protected by State regulations. Critical habitat for the O`ahu `elepaio was designated on December 10, 2001 (USFWS 2001).

2.3.2.5 Other natural or manmade factors affecting its continued existence:

The remaining `elepaio populations are small and isolated, comprising 6 core populations that contain between 100 and 500 birds, and numerous small remnants, most of which contain fewer than 10 birds (USFWS 2006, page 2-12). Even if the threats responsible for their decline were controlled, the existing populations would still be threatened with extinction because their small sizes and restricted distributions make them vulnerable to a variety of natural processes, including reduced reproductive vigor caused by inbreeding depression, loss of genetic variability and evolutionary potential over time due to random genetic drift, stochastic fluctuations in population size and sex ratio, and natural disasters such as hurricanes and fires (USFWS 2006, page 2-12).

O`ahu `elepaio also are threatened by human actions, such as the potential introduction of the brown tree-snake (*Boiga irregularis*) from the Mariana Islands, which has devastated the avifauna on Guam (USFWS 2006, page 2-13). A study of the effects of noise from military training showed that O`ahu `elepaio at U.S. Army Schofield Barracks are not affected by noise from military training (USFWS 2006, page 2-13). However, fires ignited by military training activities are a serious long-term threat to `elepaio, and have reduced the amount of suitable habitat for `elepaio, including areas designated as critical habitat for the O`ahu `elepaio at Schofield Barracks and Mākua Military Reservation (USFWS 2003, page 162). Firebreak roads exist to help prevent the spread of fires into mesic forest occupied by `elepaio, but fires regularly start beyond the firebreaks, and each fire removes additional habitat, which is replaced by non-native fire-adapted plants that are not used by `elepaio, such as *Eucalyptus robusta* and *Melaleuca quinquenervia*.

2.4 Synthesis

Recent surveys confirm the continued population decline of O`ahu `elepaio despite efforts to minimize threats, primarily rodent control, needed to reduce rodent predation on nesting females. Habitat loss and modification, avian disease, and predation by introduced mammals are thought to have caused the O`ahu `elepaio population to become endangered, and these factors continue to limit `elepaio today.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
__ _ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ 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

Habitat Protection. Protection of remaining forest habitat on O`ahu is fundamental to the survival and recovery of the `elepaio. Although `elepaio are adaptable, they are forest birds and require some form of forest in which to forage and nest. Suitable habitat for recovery of O`ahu `elepaio includes wet, mesic, and dry forest consisting of native and/or introduced plant species, but higher population density can be expected in closed canopy riparian forest with a continuous canopy and dense understory.

Predator Control. Control of alien predators, especially rats, has been shown to be an effective method of increasing reproductive success and survival of female `elepaio (VanderWerf and Smith 2002, pages 76-77). Rodent control programs should be continued and expanded by whatever methods are available. Ground-based methods of rodent control using snap traps and diphacinone bait stations have been effective on a small scale, but are labor intensive. Recovery of the O`ahu `elepaio likely will require large-scale rat control, which can be achieved more efficiently through aerial broadcast methods.

Disease Research. No areas of O`ahu are of sufficient elevation to be free from disease-carrying mosquitoes, and all populations of O`ahu `elepaio appear to be affected by

disease. Reducing mosquito numbers by removing breeding sites or treating them with larvicides would be extremely difficult due to the abundance of breeding sites. The best long-term method of reducing the threat from disease may be to investigate disease resistance or tolerance and its genetic basis. If disease-resistant or tolerant birds can be identified, translocation or captive propagation and release of these birds might help populations recover more quickly and perhaps obviate the need to control mosquitoes. Controlling rodents also may lessen the threat from disease by providing birds that have greater natural immunity a greater chance of reproducing, thereby increasing the proportion of resistant birds more quickly (USFWS 2006, page 2-17).

Population Surveys and Monitoring. To determine whether the overall recovery strategy is effective and whether the recovery criteria have been met, it will be necessary to conduct range-wide population surveys and monitor demography of populations. Standard survey routes should be established to determine distribution and measure population density. Surveys should be conducted at least once every five years to address whether the recovery criteria have been met, and annually if possible to more closely examine population trends and assess efficacy of management actions. Demographic monitoring will require mist-netting, banding, and resighting of birds to measure survival rate, nest searching to measure reproductive success, and data analysis. Setting a goal of demographic persistence highlights the need for monitoring and helps ensure that threats have been adequately managed and population increases are not transient.

Captive Propagation. Captive propagation and release of O`ahu `elepaio are not necessary for recovery at this time because the number of O`ahu `elepaio remaining in the wild is relatively large and recovery can be achieved more cost-effectively through habitat management. Moreover, the threats that caused the decline of `elepaio have not been corrected in most areas, and no suitable release sites are currently available. However, captive propagation and/or rear and release of O`ahu `elepaio may become necessary in the future if habitat management alone proves insufficient to allow recovery, and would be especially valuable if genetically disease-resistant birds can be identified for use as breeding stock.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of O`ahu `Elepaio (*Chasiempis sandwichensis ibidis*)

Current Classification: ___E___

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
___ Delist
__X_ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
Jay Nelson, Fish and Wildlife Biologist
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Marilet A. Zablan, Recovery Program Leader and acting Assistant Field Supervisor for Endangered Species
Gina Shultz, Deputy Field Supervisor

Approved: _____ Date 31 July 2009
Acting Field Supervisor, Pacific Islands Fish and Wildlife Office