

COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT  
UNIVERSITY OF HAWAII AT MANOA  
Department of Botany  
Honolulu, Hawaii 96822  
(808) 948-8218

Clifford W. Smith, Unit Director  
Associate Professor of Botany

Technical Report 23  
EVALUATION OF RARE AND ENDANGERED  
BIRD RESEARCH PROGRAMS FOR  
HAWAII'S NATIONAL PARKS  
Charles H. Lamoureux

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## TABLE OF CONTENTS

Abstract . . . . .	iii
I. Introduction . . . . .	1
II. Review of Previous Work . . . . .	15
III. Work on endangered birds now underway in Hawai'i . . . . .	17
1. Agencies involved . . . . .	17
2. Recovery teams . . . . .	18
3. Research on status in the past and probable causes of decline . . . . .	18
4. Research on present status and current inventory . . . . .	20
5. Research on the factors now limiting population sizes . . . . .	20
IV. Research recommended for National Park Service support . . . . .	22
A. Ongoing . . . . .	22
1. Research on status in the past and probable causes of decline . . . . .	22
2. Research on present status and current inventory . . . . .	23
3. Research on the factors now limiting population sizes . . . . .	23
B. Proposed . . . . .	24
V. Special Problems . . . . .	26
1. The Hawaiian Crow ('Alalā) . . . . .	26
2. Development of facilities for captive propagation of endangered birds . . . . .	26
Acknowledgements . . . . .	29
Literature Cited . . . . .	30
Appendix 1 . . . . .	33

## ABSTRACT

The objective of this project was to formulate a plan for a comprehensive research program to study the rare and endangered birds found in Hawai'i's national parks, with emphasis on the research needed to develop sound resource management policies.

Ongoing research is described and the additional research needed to develop a comprehensive program is identified. Suggestions are offered for meeting these research needs, and the appropriate role of the National Park Service in supporting such research is discussed.

Two problems of special concern to the National Park Service are addressed:

1. It is recommended that one or more NPS representatives in Hawai'i be appointed to the Fish and Wildlife Service recovery team for the Hawaiian Crow, since Hawaii Volcanoes National Park should be involved in the recovery program.
2. It seems unlikely that large-scale propagation projects, involving captive breeding populations with subsequent release of offspring, will play a significant role in the preservation of endangered Hawaiian birds, especially the honeycreeper. Therefore, it is recommended that NPS resources not be used for construction of extensive facilities for captive propagation projects.

## I. INTRODUCTION

The National Park Service (NPS) has had a long-standing interest in research on endemic Hawaiian birds, and has supported such research at least as far back as the early 1940's when Paul Baldwin was an NPS employee working at what is now Hawaii Volcanoes National Park (Baldwin 1953). With increasing awareness of the need for protection of endangered species by both government and the private sector, special interest has been generated in recent years in studies of endangered species, and in 1974 Banko and Baker (Hawaii Volcanoes National Park 1974) proposed that a research station be established in Hawaii Volcanoes National Park to study Hawaiian endangered birds. The current situation regarding endangered species of birds in Hawai'i, and particularly in national parks in Hawai'i, is summarized in Tables 1-3, and suggests that the NPS has a major role to play in this matter.

Recognition of the rare and endangered birds in Hawaiian national parks led to the realization that these animals presented an especially difficult situation for the resource managers. Their position was made even more difficult by changing endangered species legislation and regulations. Although the legal situation is still in a state of flux, the general outlines are clear, and it is evident that resource management policies will have to be directed strongly toward the protection of endangered species and the critical habitats in which they occur. Yet at present in Hawai'i

TABLE 1. Current Status of Native Birds of Hawaii and their Representation in National Parks.

Family/Common Name	Scientific Name	Status	Distribution
ENDEMIC: Eleven families containing 44 species (with subspecies, a total of 67 taxa)			
ANATIDAE			
* , † Nēnē (Hawaiian Goose)	<i>Branta sandvicensis</i>	ENDANGERED	Hawai'i, introduced Maui
Koloa (Hawaiian Duck)	<i>Anas wyvilliana</i>	ENDANGERED	Originally all main islands except Lāna'i and Kaho'olawe; now Kaua'i only
Laysan Duck	<i>Anas laysanensis</i>	ENDANGERED	Laysan
ACCIPTRIDAE			
* 'Io (Hawaiian Hawk)	<i>Buteo solitarius</i>	ENDANGERED	Hawai'i
RALLIDAE			
Laysan Rail	<i>Porzana palmeri</i>	EXTINCT	Laysan; introduced Midway, where established until release of rats
Hawaiian Rail	<i>Pennula sandvicensis</i>	EXTINCT	Hawai'i and Moloka'i
Hawaiian Gallinule	<i>Gallinula chloropus sandvicensis</i>	ENDANGERED	Formerly all main islands except Ni'ihau and Lāna'i; now Kaua'i, O'ahu, and Moloka'i

**SOURCE:** Modified from D.B. Marshall, *Special Report: Birds of Hawaii*. Supplement to Endangered Species Technical Bulletin, Vol. 1, No. 5, Nov. 1976. US Fish and Wildlife Service, as modified and reprinted in 'Elepaio, Vol. 37, No. 10, pp. 108-109, 122, April 1977.

**NOTE:** Column at left margin represents presence in National Parks:

\* = Currently known to occur in Hawaii Volcanoes National Park.

† = Currently known to occur in Haleakala National Park.

TABLE 1--Continued

Family/Common Name	Scientific Name	Status	Distribution
RALLIDAE Hawaiian Coot	<i>Fulica americana alai</i>	ENDANGERED	All main islands except Lāna'i
RECURVIROSTRIDAE Hawaiian Stilt	<i>Himantopus himantopus knudseni</i>	ENDANGERED	Ni'ihau, Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i
STRIGIDAE *,† Pueo (Short-eared Owl)	<i>Asio flammeus sandwichensis</i>		All main islands
CORVIDAE * 'Alalā (Hawaiian Crow) <sup>1</sup>	<i>Corvus tropicus</i>	ENDANGERED	Hawai'i
TURDIDAE 'Āmaui (Hawaiian Thrush)	<i>Phaeornis obscurus</i>		
'Āmaui O'ahu race	<i>P.o. oahuensis</i>	EXTINCT	O'ahu
Oloma'o Lāna'i race	<i>P.o. lanaiensis</i>	EXTINCT	Lāna'i
Oloma'o Moloka'i race	<i>P.o. rutha</i>	ENDANGERED	Moloka'i
Kāma'o Kaua'i race (large Kaua'i Thrush)	<i>P.o. myadestina</i>	ENDANGERED	Kaua'i
* 'Ōma'o Hawai'i race	<i>P.o. obscurus</i>		Hawai'i
Puaiohi (Small Kaua'i Thrush)	<i>P. palmeri</i>	ENDANGERED	Kaua'i

TABLE 1--Continued

Family/Common Name	Scientific Name	Status	Distribution
SYLVIIDAE			
Laysan Millerbird	<i>Acrocephalus familiaris familiaris</i>	EXTINCT	Laysan
Nihoa Millerbird	<i>Acrocephalus familiaris kingi</i>	ENDANGERED	Nihoa
MUSCICAPIDAE			
'Elepaio	<i>Chasiempis sandwichensis</i>		
Kaua'i race	<i>C. s. sclateri</i>		Kaua'i
O'ahu race	<i>C. s. gayi</i>		O'ahu
* Hawai'i race	<i>C. s. sandwichensis</i>		Hawai'i
MELIPHAGIDAE			
Kaua'i 'Ō'ō	<i>Moho braccatus</i>	ENDANGERED	Kaua'i
O'ahu 'Ō'ō	<i>Moho apicalis</i>	EXTINCT	O'ahu
Moloka'i 'Ō'ō	<i>Moho bishopi</i>	EXTINCT	Moloka'i
Hawai'i 'Ō'ō	<i>Moho nobilis</i>	EXTINCT	Hawai'i
Kioea	<i>Chaetoptila angustipluma</i>	EXTINCT	Hawai'i
DREPANIDIDAE			
'Amakihi	<i>Loxops virens</i>		
Kaua'i race	<i>L. v. stejnegeri</i>		Kaua'i

TABLE 1--Continued

Family/Common Name	Scientific Name	Status	Distribution
DREPANIDIDAE			
'Amakihi	<i>Loxops virens</i>		
O'ahu race	<i>L.v. chloris</i>		O'ahu
† Maui, Moloka'i, Lāna'i race	<i>L.v. wilsoni</i>		Maui, Moloka'i, Lāna'i
* Hawai'i race	<i>L.v. virens</i>		Hawai'i
'Anianiau	<i>Loxops parva</i>		Kaua'i
Greater 'Amakihi	<i>Loxops sagittirostris</i>	EXTINCT	Hawai'i
Creeper	<i>Loxops maculata</i>		
Kaua'i race	<i>L.m. bairdi</i>		Kaua'i
O'ahu race	<i>L.m. maculata</i>	ENDANGERED	O'ahu
Moloka'i race	<i>L.m. flammea</i>	ENDANGERED	Moloka'i
Lāna'i race	<i>L.m. montana</i>	EXTINCT	Lāna'i
† Maui race	<i>L.m. newtoni</i>		Maui
* Hawai'i race	<i>L.m. mana</i>	ENDANGERED	Hawai'i
'Ākepa	<i>Loxops coccinea</i>		
Kaua'i race	<i>L.c. caeruleirostris</i>		Kaua'i
O'ahu race	<i>L.c. rufa</i>	EXTINCT	O'ahu



TABLE 1--Continued

	Family/Common Name	Scientific Name	Status	Distribution
	DREPANIDIDAE			
	'Ākepa	<i>Loxops coccinea</i>		
†	Maui race	<i>L.c. ochracea</i>	ENDANGERED	Maui
*	Hawai'i race	<i>L.c. coccinea</i>	ENDANGERED	Hawai'i
	'Akialoa	<i>Hemignathus obscurus</i>		
	O'ahu race	<i>H.o. ellisianus</i>	EXTINCT	O'ahu
	Lāna'i race	<i>H.o. lanaiensis</i>	EXTINCT	Lāna'i
	Hawai'i race	<i>H.o. obscurus</i>	PRESUMED EXTINCT	Hawai'i
	Kaua'i 'Akialoa	<i>Hemignathus procerus</i>	ENDANGERED	Kaua'i
	Nuku-pu'u	<i>Hemignathus lucidus</i>		
	Kaua'i race	<i>H.l. hanapepe</i>	ENDANGERED	Kaua'i
	O'ahu race	<i>H.l. lucidus</i>	EXTINCT	O'ahu
†	Maui race	<i>H.l. affinis</i>	ENDANGERED	Maui
*	'Akiapola'au	<i>Hemignathus wilsoni</i>	ENDANGERED	Hawai'i
†	Maui Parrotbill	<i>Pseudonestor xanthophrys</i>	ENDANGERED	Maui

TABLE 1--Continued

Family/Common Name	Scientific Name	Status	Distribution
DREPANIDIDAE 'Ō'ū	<i>Psittirostra psittacea</i>	ENDANGERED	Kaua'i, Hawai'i (formerly O'ahu, Moloka'i, Lāna'i, and Maui)
Laysan and Nihoa Finches	<i>Psittirostra cantans</i>		
Laysan Finch	<i>P.c. cantans</i>	ENDANGERED	Laysan, introduced Midway and Pearl and Hermes Reef (gone on Midway now because of rats)
Nihoa Finch	<i>P.c. ultima</i>	ENDANGERED	Nihoa, introduced French Frigate Shoals
Palila	<i>Psittirostra bairdii</i>	ENDANGERED	Hawai'i
Greater Koa Finch	<i>Psittirostra palmeri</i>	EXTINCT	Hawai'i
Lesser Koa Finch	<i>Psittirostra flaviceps</i>	EXTINCT	Hawai'i
Grosbeak Finch	<i>Psittirostra kona</i>	EXTINCT	Hawai'i
† Po'o Uli <sup>2</sup>	<i>Melamprosops phaeosoma</i>	ENDANGERED	Maui
'Apapane	<i>Himatione sanguinea</i>		
*,+ 'Apapane	<i>H.s. sanguinea</i>		All six main islands
Laysan Honeyeater	<i>H.s. freethii</i>	EXTINCT	Laysan

TABLE 1--Continued

Family/Common Name	Scientific Name	Status	Distribution
DREPANIDIDAE			
† Crested Honeycreeper	<i>Palmeria dolei</i>	ENDANGERED	Maui, Moloka'i
'Ula-'ai-hāwane	<i>Ciridops anna</i>	EXTINCT	Hawai'i
* , † 'I'iwi	<i>Vestiaria coccinea</i>		Kaua'i, O'ahu, Moloka'i, Maui, Hawai'i, extirpated Lāna'i
Mamo	<i>Drepanis pacifica</i>	EXTINCT	Hawai'i
Black Mamo	<i>Drepanis funerea</i>	EXTINCT	Moloka'i
INDIGENOUS SPECIES: Eight families containing 23 species <sup>3</sup>			
DIOMEDEIDAE			
Black-footed Albatross <sup>4</sup>	<i>Diomedea nigripes</i>		
Laysan Albatross <sup>4</sup>	<i>Diomedea immutabilis</i>		
PROCELLARIIDAE			
Wedge-tailed Shearwater	<i>Puffinus pacificus chlororhynchus</i>		
Christmas Shearwater	<i>Puffinis nativitatis</i>		
'A'o (Newell's Shearwater) <sup>4,5</sup>	<i>Puffinis puffinus newelli</i>	THREATENED	

TABLE 1--Continued

Family/Common Name	Scientific Name	Status	Distribution
PROCELLARIIDAE			
*,+ 'Ua'u (Hawaiian Petrel) <sup>4</sup>	<i>Pterodroma phaeopygia sandwichensis</i>	ENDANGERED	
Bonin Petrel	<i>Pterodroma hypoleuca hypoleuca</i>		
PROCELLARIIDAE			
Bulwer's Petrel	<i>Bulweria bulwerii</i>		
HYDROBATIDAE			
Harcourt's Storm Petrel <sup>6</sup>	<i>Oceanodroma castro cryptoleucura</i>		
Sooty Storm Petrel	<i>Oceanodroma tristrami</i>		
PHAETHONTIDAE			
*,+ Koa'e-kea (White-tailed Tropicbird) <sup>4</sup>	<i>Phaethon lepturus dorotheae</i>		
Red-tailed Tropicbird	<i>Phaethon rubricauda rothschildi</i>		
SULIDAE			
Blue-faced Booby	<i>Sula dactylatra personata</i>		
Brown Booby	<i>Sula leucogaster plotus</i>		
Red-footed Booby	<i>Sula sula rubripes</i>		

TABLE 1--Continued

Family/Common Name	Scientific Name	Status	Distribution
FREGATIDAE			
Great Frigatebird	<i>Fregata minor palmerstoni</i>		
LARIDAE			
Sooty Tern	<i>Sterna fuscata oahuensis</i>		
Gray-backed Tern	<i>Sterna lunata</i>		
Blue-gray Noddy	<i>Procelsterna cerulea saxatilis</i>		
Common Noddy (Brown Noddy)	<i>Anous stolidus pileatus</i>		
*,+ White-capped Noddy (Black Noddy) <sup>3</sup>	<i>Anous tenuirostris melanogenys</i>		
White Tern	<i>Gygis alba rothschildi</i>		
ARDEIDAE			
Black-crowned Night Heron	<i>Nycticorax nycticorax hoactli</i>		

TABLE 1--Continued

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REGULAR MIGRANTS: A total of 11 species<sup>7</sup>

Pale-footed Shearwater, Pintail, American Widgeon, Shoveler, Lesser Scaup, Sanderling, Golden Plover, Black-bellied Plover, Ruddy Turnstone, Bristle-thighed Curlew, and Wandering Tattler.

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<sup>1</sup>Former range included Hawaii Volcanoes National Park, but present contracted range does not extend into the Park.

<sup>2</sup>Not yet recorded within the boundaries of Haleakala National Park, but it may occur there. Access to the known range of the species is under National Park Service control.

<sup>3</sup>Most of these indigenous birds nest either on Leeward Islands or islands offshore from main islands; they feed at sea. Several of them are often seen flying and feeding offshore of national parks in Hawai'i, but except for the 'Ua'u, 'A'o, and Koa'e-kea they rarely occur far inland. Some noddy terns may nest on sea cliffs in Hawaii Volcanoes National Park, and the White-capped Noddy nests on sea cliffs near the mouth of 'Ohe'o in Haleakala National Park.

<sup>4</sup>Nests exclusively in Hawaiian Islands.

<sup>5</sup>While the 'A'o has been reported as nesting in recent years only on Kaua'i, its former range may have included parts of both Haleakala and Hawaii Volcanoes National Parks.

<sup>6</sup>This subspecies was once listed as endangered, but was removed on the basis of its not being considered a valid subspecies. It could be listed as an endangered population.

<sup>7</sup>Several of these migrants are regularly observed in national parks in Hawai'i.

TABLE 2. Status of Hawaiian Birds, by Major Category.

Major Category	Extinct	Endangered	Neither	Total
Endemic Species (occur only in Hawaiian Islands)	15	20	9	44
(Endemic Species and Subspecies)	(23)	(29)	(15)	(67)
Indigenous Species (occur in Hawaiian Islands and open ocean)	--	1	22	23
Regular Migrants	--	--	11	11
Introduced and Established Species (approximate number)	--	--	50	50
Total	15	21	92	151

Source: Marshall, D.B. Special Report. Birds of Hawaii.  
Supplement to: Endangered Species Technical Bulletin, Vol. 1,  
No. 5, Nov. 1976. U.S. Fish and Wildlife Service.

TABLE 3. Endangered Birds in National Parks in Hawaii.

National Park	Number of Taxa of Endangered Birds Known from Park*
Hawaii Volcanoes	8
Haleakala	7

\*Two of these, the Nēnē and the 'Ua'u, occur in both parks; the others are restricted to a single park. Thus, a total of 13 taxa are involved in all.



there is little scientific information on birds on which rational and effective resource management policies for their protection can be based. This situation prevails even though Hawai'i has a much greater proportion of endangered species than any other part of the United States.

In recent years a large number of government agencies, and some private organizations, have undertaken research on endangered birds in Hawai'i, and some reliable and useful information is beginning to become available. This report enumerates current research activities on endangered Hawaiian birds, to identify what remains to be done in order to provide a reasonably complete data base for resource managers, and to propose appropriate roles for the NPS in undertaking and facilitating research on this subject.

There are three aspects of endangered birds which need attention in a comprehensive plan. These are:

- A. Status in the past, including information on both magnitude and causes of population decline.
- B. Present status and current inventory.
- C. Study of the factors now limiting population size in order to provide for their mitigation and insure future survival.

This report is organized around these themes.

## II. REVIEW OF PREVIOUS WORK

Since Berger (1972) has recently summarized the scientific literature on Hawaiian ornithology, this report does not present a full literature review of the subject. Rather we will briefly mention the major, comprehensive works, and then those papers which deal specifically with native birds, especially endangered birds, in national parks in Hawai'i. No attempt has been made here to include all reports of field observations and sightings made in the national parks. Such notes often are published in *'Elepaio*, the journal of the Hawaii Audubon Society, and they form part of W. E. Banko's *Hawaiian Bird Bibliography* (1978).

Although scientific specimens of birds had been collected as early as Cook's voyage to Hawai'i, and scattered descriptions of new species had been published, it was not until the late 19th and early 20th centuries that comprehensive summaries of the Hawaiian avifauna were prepared. Then, within a 14-year period four major works appeared (Wilson and Evans 1890-1899; Rothschild 1893-1900; Henshaw 1902-1904; Perkins 1903). The expeditions that made the collections on which these works were based marked the last sightings in the wild of a number of the taxa. This indicates the severe state of decline of many Hawaiian birds toward the end of the 19th century.

The next comprehensive work was that of Munro (1944). Recently Berger's (1972) *Hawaiian Birdlife* has provided a critical summary of previous scientific work and offered

current data on life histories, ecology, and status of all known birds in Hawai'i. In more popular form, the Hawaii Audubon Society's booklet *Hawaii's Birds* (1975, based on earlier editions of 1967 and 1971) offers an extensive checklist with illustrations and descriptions of most endemic species. A checklist of all birds recorded from the Hawaiian Islands is given by Pyle (1977).

The Drepanididae, the endemic Hawaiian family which contains the majority of endemic Hawaiian birds (23 of 44 species, 40 of 67 taxa), has been the subject of many special studies. In addition to an early review by Perkins (1901), major works include an extensive monograph by Amadon (1950), a classic ecological study by Baldwin (1953), and a study of functional morphology and evolution of the genus *Loxops* by Richards and Bock (1973).

A number of publications deal with birds in areas which are now included in national parks. Among those dealing with Hawaii Volcanoes National Park are Bryan (1903), Baldwin (1940, 1941, 1953), Dunmire (1961a, 1961b, 1962), Smathers (1963a, 1963b), Doty and Mueller-Dombois (1966), and Conant (1975, 1976). Those dealing with Haleakala National Park include Richardson and Woodside (1954), Dunmire (1961a), several of the papers in Warner (1967), and Banko (1968, 1970).

### III. WORK ON ENDANGERED BIRDS NOW UNDERWAY IN HAWAI'I

#### 1. Agencies involved

A number of federal and state government agencies are sponsoring or participating in research on endangered birds in Hawai'i. They include:

#### U.S. DEPARTMENT OF THE INTERIOR

##### Fish and Wildlife Service (FWS)

- (A)\* Office of Endangered Species
- (B) Patuxent Wildlife Research Center

##### National Park Service (NPS)

- (C) Hawaii Volcanoes National Park
- (D) Haleakala National Park
- (E) Cooperative National Park Resources Studies Unit, University of Hawaii (CPSU/UH)
- (F) Cooperative National Park Resources Studies Unit, University of Washington (CPSU/UW)

#### U.S. DEPARTMENT OF AGRICULTURE (USDA)

##### Forest Service

- (G) Institute of Pacific Islands Forestry

#### HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES (DLNR)

- (H) Division of Fish and Game
- (I) Division of Forestry

#### UNIVERSITY OF HAWAII

- (E) Cooperative National Park Resources Studies Unit, University of Hawaii (CPSU/UH)
- (J) Various faculty members at U.H. working outside CPSU/UH

#### OTHERS

- (K) Various scientists at other universities or scientific institutions

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\*Letters (A) through (K) identify sponsoring agencies and are used to show affiliations of people whose work is described below.

## 2. Recovery teams

Recovery teams have been appointed by the Fish and Wildlife Service for several endangered birds. The ultimate objective of a recovery team is to prepare a recovery plan to assure perpetuation of viable populations of the species involved. The team is charged with determining the factors responsible for depletion of populations and developing plans to alleviate these factors.

To date recovery teams have been named for the following:

Forest birds of Hawai'i

Forest birds of Maui and Moloka'i

Forest birds of Kaua'i

Palila

'Alalā

Nēnē

Waterbirds

Laysan Duck

Representatives from the NPS are members of some of the recovery teams. A number of recovery plans are in draft stage, but none of those dealing with birds found in national parks in Hawai'i has yet been accepted by FWS.

## 3. Research on status in the past and probable causes of decline

This part of the problem is basically attacked by a comprehensive literature survey followed by a critical analysis of the references obtained. In addition to the formal scientific literature, it is necessary to screen

various in-house government reports, notes collected by reliable observers, journals of early explorers and collectors, and even magazines and newspaper files for information. While the major ornithological works have reviewed the formal literature, and Berger's (1972) review is thorough and current in this respect, there has been no published review of all the available literature, including that from more ephemeral sources. Winston E. Banko, while employed by the Fish and Wildlife Service (B)\*, worked on such a survey. The bibliography compiled has recently been published by Banko through the CPSU/UH (E) (1978), and one paper (Banko and Banko 1976) analyzing some of the factors responsible for decline has appeared. Banko proposes to complete a full analysis of the information obtained by 1981, and the contract to accomplish this has been funded through CPSU/UH.

While there have been a number of papers (Warner 1961, 1968, 1973; Atkinson 1977) suggesting factors responsible for the decline of endemic bird populations, Berger (1970, 1972, 1975) has pointed out the paucity of scientifically sound information on the causes of such decline. Thus, the need for a thorough and critical literature analysis made by one who is familiar with the current status of Hawaiian birds and their habitats is evident, and Banko's study should fill this need.

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\*Letters in parentheses refer to the agencies listed on page 17.

#### 4. Research on present status and current inventory

The U.S. Fish and Wildlife Service (B), in cooperation with the State Division of Fish and Game (H) is currently involved in the third year of a major study to inventory Hawaiian forest birds. This study, which is an exceptionally thorough and comprehensive one, is producing large amounts of quantitative data on distribution and numbers of birds and on the vegetation types with which they are associated. Most of the forested areas of Hawaii Volcanoes National Park were inventoried in 1977; forested areas of Haleakala National Park are proposed to be surveyed in 1979. Publication of the results of this work will provide park resource managers with excellent baseline information on bird populations within the forested areas of both parks.

However, this project does not encompass such non-forested areas as the lowlands and the upper part of the Mauna Loa Strip at Hawaii Volcanoes, and the Crater District of Haleakala. These areas are being surveyed by Sheila Conant with support from CPSU/UH (E). In addition, John Kjargaard and Jitsume Kunioki (D) have censused the 'Ua'u (Hawaiian Petrel) population and mapped 'Ua'u burrows in Haleakala National Park.

#### 5. Research on the factors now limiting population sizes

The most comprehensive study concerned with the habitat and food requirements of forest birds on Hawaii is being conducted by the U.S. Forest Service (G) under the leadership of C. J. Ralph (see study plan by C. J. Ralph, H. F. Sakai, and C. P. Ralph, Appendix 1). Detailed observations of

feeding and other activities, and of population structure and composition, of a number of bird species in selected areas over long (>1 year) periods of time are being made, primarily on the Keauhou Ranch on the slopes of Mauna Loa, a few kilometers from Hawaii Volcanoes National Park.

An extensive investigation of avian diseases and their effects on Hawaiian birds is being conducted by C. van Riper III, sponsored by CPSU/UH (E), assisted by M. L. Goff of the University of Hawaii (J) and M. Laird of the Memorial University of Newfoundland (K).

J. K. Baker of the NPS (C) is studying roles and ecological impacts of the introduced rodents and carnivores on native species (including birds) and ecosystems in Hawaii Volcanoes National Park.

For many years the Hawaii Division of Fish and Game (H) has operated a captive propagation and release program for Nēnē, but there have been no thorough follow-up studies of the birds released into the wild. This aspect is being remedied by P. C. Banko who, under the direction of D. A. Manuwal, is studying the life history, ecology, and management of Nēnē in Hawaii Volcanoes and Haleakala National Parks. This study is funded by NPS through the CPSU, University of Washington (F).

The 'Alalā is the subject of behavioral studies in a captive population being maintained at Pōhaku-loa, Hawai'i, by Hawaii Division of Fish and Game personnel (H). Long-range objectives of this project involve development of a captive-breeding population leading to a propagation and release program.



#### IV. RESEARCH RECOMMENDED FOR NATIONAL PARK SERVICE SUPPORT

From the review presented above, it is evident that a number of agencies are involved in sponsoring research on endangered birds in Hawai'i. We must now address the need for and desirability of NPS sponsorship of such research.

It is within the policy of the NPS, as well as scientifically desirable, that the NPS sponsor mission-oriented basic research needed to enable its resource managers to manage native bird populations within national parks in line with the objectives of NPS. It becomes necessary that the NPS sponsor such research when the work is not being done by other agencies. Those studies now being supported by NPS in Hawai'i do not seem to duplicate work being sponsored by other agencies and should be continued; in addition, some areas in which research is needed but not yet underway are identified as candidates for NPS support.

##### A. Ongoing

##### 1. Research on status in the past and probable causes of decline

The project "A Historical Synthesis of Endemic Hawaiian Birds with Special Emphasis on Birds Found Within Areas Administered by the National Park Service," being carried out by W. E. Banko under contract from NPS through the CPSU/UH (Appendix 1), is the only significant work being done in this area. The project is worthy of continued NPS support.

## 2. Research on present status and current inventory

Although the U.S. Fish and Wildlife Service is doing an excellent job in this area of research, its work concentrates on forest birds and forested areas. The NPS also needs to obtain similar data on non-forest areas within the parks. Thus the bird survey now being conducted by S. Conant with NPS support (Appendix 1) should continue. This project should, however, be somewhat modified, to emphasize only those parts of the parks not surveyed by FWS. Also, within limitations imposed by differences in ecosystem structure (e.g., forest vs. barren lava flows), bird population sizes, and availability of manpower, efforts should be made to assure some comparability of data obtained in this survey with those obtained by FWS.

## 3. Research on the factors now limiting population sizes

The investigation of avian diseases being conducted by C. van Riper III with NPS support (Appendix 1) is yielding vital knowledge in an area where very little factual information was previously available. Any management program must have such information, and this project should be given highest priority for continued support.

The effects of feral mammals on birds also have not been critically studied in Hawai'i. Thus J. K. Baker's study of rodents and carnivores (Appendix 1) is of importance as it relates to effects on birds. It is possible that greater emphasis could be placed on this aspect of the study than the original proposal implied, especially if the early phases

of the project suggest that these mammals are having a measurable effect on native birds.

P. Banko's work with Nēnē (Appendix 1) is providing reliable information of two sorts that have not been previously available. First, there have been no detailed, long-term, follow-up studies of what happens to Nēnē that have been propagated in captivity and released into the wild. Yet the results of such studies have enormous implications for the resource manager attempting to evaluate the worth of a captive propagation project. Second, Banko's study deals with some Nēnē populations at lower elevations in Hawaii Volcanoes National Park, and very little is known about the ecology of the Nēnē at lower elevations, even though the Nēnē was formerly fairly widespread in the lowlands. For these reasons this project is particularly valuable.

#### B. Proposed

Proposed research for which a need has been identified emphasizes research on the factors now limiting population sizes, i.e., what the habitat limitations are and how birds are utilizing their habitats.

1. In Haleakala National Park top priority goes to a study of the 'Ua'u (Hawaiian Petrel). J. Kjargaard and J. Kunioki have conducted a thorough census and marked known nesting burrows. At this point a general ecological study dealing with such diverse subjects as breeding behavior, effects of predators, habitat preferences, and habitat limiting factors

is needed. A proposal to accomplish this, by D. A. Manuwal (Appendix 1), has recently been funded by the NPS.

2. While the results of much of the work being conducted by C. J. Ralph's group will be applicable to park problems, this work to date has emphasized study of an area which has been greatly disturbed during the past 25 years by removal of much of the forest in logging and pasture development operations. Ease of access and ease of visibility in this region has made possible the collection of large amounts of data in fairly short periods of time. But it is not yet known how much of the information obtained is directly transferrable to closed forests and other habitats in the national parks. For example, the NPS may need to know how to manage the 'Ō'ū in the 'Ōla'a Tract, or the Maui Nuku-pu'u in Kīpahulu Valley. Therefore, there is need for a number of detailed biological studies of endangered birds within the parks. An example of such a study is that proposed by M. Stemmermann for the crested honeycreeper or 'Akohekohe in Haleakala National Park (Appendix 1). Some of these studies could comprise appropriate graduate student research projects. In other cases the studies might be too complex, or the birds too rare and the chances of success too small, for the projects to be appropriate for graduate students. As the need for such projects arises, and NPS resource managers identify them as priority items, each should be handled on an individual basis and appropriate individuals sought, generally through the CPSU/UH, or through other agencies if such assistance were available there.

## V. SPECIAL PROBLEMS

### 1. The Hawaiian Crow ('Alalā)

Hawaii Volcanoes National Park was formerly part of the habitat occupied by the 'Alalā. Recently Hawaii Volcanoes National Park (1977) applied for a permit to salvage birds in an effort to study and breed them and eventually reestablish them in the park. The application for permit was denied by the U.S. Fish and Wildlife Service. The State Division of Fish and Game is currently salvaging and studying birds in an effort to develop an 'Alalā propagation and release program.

Since Hawaii Volcanoes National Park has areas of former 'Alalā habitat, is interested in reestablishing the bird in these areas, and has resources to devote to the purpose, NPS personnel should be involved in the activities of the recovery team and the implementation of the recovery plan. At the moment there is no NPS representation on the recovery team. It is my recommendation that such representation be effected, and that one or more NPS representatives in Hawai'i be appointed to this team.

### 2. Development of facilities for captive propagation of endangered birds

The study leading to this report was initiated, in part, by a proposal for an expanded Mauna Loa Field Station of the Fish and Wildlife Service in Hawaii Volcanoes National Park. Many of the activities proposed for such a station are now underway as reported above. However, one part of the proposal

called for construction of extensive propagation facilities in order that studies of endangered species of the sort carried out at the Patuxent Wildlife Research Center, eventually leading to large-scale propagation of endangered birds for subsequent release, could be conducted in Hawai'i. After consulting with Ray C. Erickson of Patuxent, it now seems inappropriate to consider development of such a facility in Hawai'i. The costs of such a facility are enormous:

- a) large areas of land are needed, in part to enable effective quarantine procedures to be carried out when necessary, in part to provide the privacy required by many wild species, especially during breeding seasons;
- b) a large professional staff is needed, including ornithologists, behavioral scientists, veterinarians, animal nutrition specialists, pathologists, and administrators.

The putative benefits of such a facility in Hawai'i are questionable. While much valuable research has been conducted at the Patuxent facility, it has not functioned effectively as a site where captive populations have been propagated for subsequent release into the wild. While captive breeding populations have been successful in increasing populations of Nēnē and some other types of birds, it is improbable that similar successes could be obtained with such ecologically specialized birds as the Hawaiian honeycreepers.

Therefore, it is recommended that extensive propagation facilities not be constructed as part of the NPS research program on endangered Hawaiian birds. This recommendation

should not preclude, however, the construction of small facilities needed to house birds being used in research projects such as the avian disease project, or minimal facilities that might be needed as part of a management program for Nēnē or, in future, for 'Alalā.

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## APPENDIX 1

Copies of the following proposals may be seen at the Cooperative National Park Resources Studies Unit and Hamilton Library, University of Hawaii, Honolulu; the National Park Service Hawaii State Director's Office, Honolulu, and Western Regional Office, San Francisco; Hawaii Volcanoes National Park and Pu'uuhonua o Hōnaunau National Historical Park, Hawaii; and Haleakala National Park, Maui.

- Baker, James K., Hawaii Field Research Center, Hawaii Volcanoes National Park, Hawaii 96718.  
Rats and mongooses in Hawaii Volcanoes National Park.
- Banko, Paul, Hawaii Field Research Center, Hawaii Volcanoes National Park, Hawaii 96718.  
Life history, ecology, and management of the Nēnē (*Branta sandvicensis*) in Hawaii Volcanoes National Park.
- Banko, Winston E., Hawaii Field Research Center, Hawaii Volcanoes National Park, Hawaii 96718.  
A historical synthesis of endemic Hawaiian birds with special emphasis on those species found in Hawaii's National Parks.
- Conant, Sheila, General Science Dept., University of Hawaii, Honolulu, HI 96822.  
Survey of birds in Hawaii Volcanoes and Haleakala National Parks.
- Manuwal, David A., College of Forest Resources, University of Washington, Seattle, Wash. 98195.  
Breeding ecology of the Dark-rumped Petrel (*Pterodroma phaeopygia*) in the Hawaiian Islands.
- Ralph, C. John, Howard F. Sakai, and Carol Pearson Ralph, US Forest Service, 1151 Punchbowl St., Honolulu, HI.  
Study plan to study the structure and composition of forest bird populations.
- Stemmermann, Maile, Zoology Dept., University of Hawaii, Honolulu, HI 96822.  
A preliminary proposal for the study of the biology of the Crested Honeycreeper (*Palmeria dolei*) on Haleakala, Maui, Hawaii.\*
- van Riper, Charles, III, Avian Diseases Laboratory, Hawaii Field Research Center, Hawaii Volcanoes National Park, Hawaii 96718.  
Investigation of avian malaria in Hawaii's National Parks.

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\*Proposal in preliminary draft stage.