

1970 NARRATIVE REPORT

Hawaiian Islands National Wildlife Refuge

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HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE

This office has responsibilities and duties which go beyond those of strictly a refuge office. Since the project leader serves as the Bureau administrator and representative in Hawaii, a broad variety of tasks were performed by the staff for the various divisions as well as general Bureau business. Work is handled for the Divisions of Management and Enforcement, Wildlife Services, River Basins and Refuges. These activities are briefly discussed within this report.

THE RARE AND ENDANGERED SPECIES PROGRAM

Hawaii has lost more of its native bird species than the entire North American continent or any other-area in the world. And since it also has more birds listed on the endangered species list than all of the other states put together, the Rare and Endangered Species Program here has high priority.

For the past three years, coordinated Bureau-State stilt counts throughout the state have been conducted (Table 1) during which all known habitats are censused on the same day during late July or early August when only permanent water areas are present. The population of both stilts and coots were down this year. A possible reason for this apparent decline was the fact that although the Pearl Harbor count revealed 288 stilt, 600 birds were counted there the week before by reliable observers. Some of these birds may have been missed during the Statewide count period. However, on the other hand, they may have been counted elsewhere that day.

The count of 850 coot made on Menehune Fish Pond on Kauai during 1969 was extremely high. Normally less than 25 coot are seen in that area. Why the large concentration was there at that particular time could not be explained and was considered as an abnormal event.

Table 1\*  
Stilt and Coot Counts

		<u>Oahu</u>	<u>Maui</u>	<u>Niihau</u>	<u>Kauai</u>	<u>Hawaii</u>	<u>Molokai</u>	<u>Total</u>
1968	Stilt	565	611	70	92	19	0	1,287
	Coot	No count made						
1969	Stilt	785	440	155	109	24	0	1,513
	Coot	164	232	145	1,058	20	48	1,667
1970	Stilt	491	469	182	54	27	18	1,241
	Coot	264	171	0	223	39	13	710

As a result of increased interest in the preservation of endangered species habitat on the Main Island, a land acquisition program for endangered waterbirds has been initiated. The initial phases of this program involved the creation of a task force which examined and delineated all of the critical wetland habitat in the state. The task force was comprised of both Bureau and State biologists. Wildlife Administrator Kridler chairmanned

the effort. Bureau research biologists Banko and Sincock cooperated on their respective islands, while Kridler and Dave Woodside from the Hawaii Division of Fish and Game screened areas on Oahu, Molokai and Maui. The booklet, HAWAII'S ENDANGERED WATERBIRDS, summarized and presented this information to the public (copy appended). Preparation of the text, pictures and putting the booklet in final form was done primarily by Bureau personnel and publishing costs were borne entirely by the Bureau. Distribution was made to the Hawaiian congressional delegation, State administration officials, the legislature, land owners, conservationists, schools, libraries and anyone else who might help the program in one way or the other and for educational purposes. The booklet was well received.

After the basic biological delineation was completed, acquisition priorities were established and acquisition procedures initiated. Messrs. Van den Akker and Jacoby from the Regional Office conducted ascertainment investigations, while Messrs. Lindsey and Estheimer from Realty began preliminary appraisal work.

## RIVER BASIN ACTIVITIES

As a result of the National Environmental Policy Act of 1969, permits issued by the Corps of Engineers are necessary before any construction can be initiated in navigable waters. During May, the Corps announced sweeping changes in its established policy and stated that decisions on the issuance of permits will be based upon:

"An evaluation of the impact of the proposed work on the public interest. Public interest is described as including the following factors such as: navigation, fish and wildlife, water quality, economic, conservation, aesthetics, recreation, water supply, flood damage prevention, ecosystems, and in general, the needs and welfare of the people."

Thus, no longer are Corps projects concerned only with the impact a proposed project might have on navigation or flood control nor only economic aspects. Applications for permits to work in navigable waters in Hawaii must be reviewed by this office for possible effects on fish and wildlife resources. Preliminary statements are prepared here and the final project recommendations are prepared by the regional office. The Corps of Engineers prepares environmental statements for all projects which are considered to have a significant impact on the environment. These statements are also reviewed in this office.

The following projects were reviewed during the year:

- Improvements at Maunalua Bay, Oahu, PODCO 937-S
- Avenue Warf - Honolulu, PODCO C 929-S
- Kaimu Beach - Hawaii
- Small Boat Harbor, La Haina, Maui
- Paiko Lagoon - Dredge channel - wildlife improvements  
PODCO 938-D
- Alawai Parkway - improvements in canal
- Honolulu Harbor - Boat launching ramp
- Kawaihae - Deep Draft Harbor - Environmental Statement
- Pier Demolition - Maunalua Bay, Oahu
- Shoreline projects around Oahu, including coral head  
removal, boat slab construction, launching ramp  
construction, and expansion of facilities
- Heeia-Kea Boat Harbor - PODCO 941-S
- Kawaihae Small Boat Harbor
- Extension of culvert, Olowau, Maui
- Pau Hana Development, Kauakakai, Molokai, PODCO 943-S
- Dredging on Maele Bay, Lanai
- Boat Ramp on Maui
- Sand Island Boat Launching Ramp - PODCO 939-S

Investigation of a number of projects took a great deal of time and effort throughout the year. The Kaneohe-Kailua flood control project received final approval and construction on this approximately 7 million dollar project will probably begin during 1971. We recommended the construction of several small ponds for the enhancement of rare and endangered bird habitat.

A considerable amount of time was spent on the Corps of Engineers proposal to dredge Nawiliwili Harbor on Kauai. In their initial plan the spoil was to be placed in an old fill area, however, in a later draft of the plan, an additional fill area was included. This area was a small marsh located some 300 yards from the harbor, and after a survey of the area was completed, it was found that endangered species were using the area. We objected to the Corps depositing spoil in this area, for a project supported by public funds was being used to destroy an area another public agency was trying to preserve. We attended several meetings with Corps and State Harbors personnel relating to this question of the spoil and held firm to our position that this marsh should not be filled. Current plans are now to dump the spoil at sea. Although considerably more expensive than filling the marsh, the wetland has been preserved.

Much time was also devoted to working on the ecological effects of the proposed Honolulu International Airport Reef Runway at Keehi Lagoon. This approximately 35 million dollar project will be constructed on a coral reef adjacent to the existing airport. The lagoon is one of the three remaining estuaries on Oahu. Although there are some general objections to the construction of this project, there are powerful arguments for such project - notably the reduction of noise from jet aircraft. Also, most jets taking off under normal wind conditions must pass over heavily populated congested residential and business areas of Honolulu. Jet noises make life miserable for residents and school children. A power failure while taking off would result in planes plowing into such areas. Our primary interest is the value that this existing reef area has as habitat for migratory shorebirds and the endangered Hawaiian stilt.

The Ralph M. Parsons Company, the engineering consultants who are designing the project, for the State Department of Transportation, are attempting to study the possible ecological objections which might be raised. They contracted for a \$40,000 ecological report of Keehi Lagoon and this approximately 200 page report was completed during November. The micro-biological and water quality phases were the most thoroughly studied. Only very minor attention was given to the existing fish and wildlife values involved by the investigators who were primary physical marine scientists.

Upon our recommendation, funds to evaluate bird use of the area were provided by Parsons Company. Field data are being collected at this time, and it appears now that stilt use in some of the areas in Keeki Lagoon is more significant than first thought.

A medium draft harbor is apparently necessary on Maui. After thorough study, the Corps of Engineers decided that the most ideal (from an economic basis) location to construct this harbor would be in Kealia Pond near Keihi. This is considered to be one of the most important areas for endangered waterbirds in Hawaii even though it goes dry each summer for lack of water. As a result of our recommendation the Corps moved the proposed location of the Harbor toward the far west end of the pond before the proposal was finalized. We recommended that 500 acres be acquired and set aside as a national wildlife refuge to mitigate the losses which would be incurred by the construction of the harbor. The Corps included this recommendation in their proposal, although it would have been far more preferable not to have had it anywhere in the pond area.

Strong opposition to the entire project was voiced by many groups at the public hearing. Some were opposed from simply an aesthetic standpoint, others from a potential pollution standpoint, and others from simply a loss of wildlife values. At this time the Corps is holding the proposal in abeyance until enough public sentiment is expressed one way or the other.

We were able to incorporate our ideas into the interstate Highway H-3 project crossing into Kaneohe Marine Corps Air Station. The areas being crossed by the throughway had but only slight endangered waterbird value. We recommended that the dikes adjacent to the ponds be constructed at a 6:1 slope rather than the usually accepted 2:1 slope. This will provide a great deal more shorebird habitat. We also recommended the construction of sixteen small nesting islands adjacent to the highway in conjunction with this project.

## MANAGEMENT AND ENFORCEMENT

Public Law 91-135 regulating the importation of endangered species of fish and wildlife into the United States became effective on August 3, 1970 as Part 17 of Title 50. With it came a multitude of responsibilities which were assigned to this office.

Although 7 ports of entry were established throughout the United States, Honolulu was not so designated even though it is considered "the hub" of trade in the Pacific. Fish and wildlife imports could legally enter Hawaii if they remained here and were not to be transshipped to Mainland ports. The number of shipments of fish and wildlife entering Hawaii was significant. Preliminary investigation revealed that about 1.2 million tropical fish and 12 thousand birds entered Hawaii each year. In addition, shipments of primates, amphibians and reptiles were common. Coupled with all this was the large number of travellers from various places in the Far East aboard the many airlines servicing those areas (including many military flights) who clear Customs in Honolulu before continuing on to Mainland cities not designated as ports of entry for wildlife. Some had various types of fish and wildlife in their baggage.

A number of shipments without proper documentation were denied entry and subsequently returned to the country of origin. Likewise, a number of illegally imported animals were forfeited to the United States. Included in this long list of items were tiger and leopard skins, skins and parts of crocodiles and numerous mounted birds.

During the last few months of the reporting period the Management and Enforcement responsibilities took much greater percentage of our time. The primary problem was one of learning how to handle the many different types of wildlife shipments which arrived in Hawaii. Working with and acquainting Customs officials here with the laws also took much time and tact because they are the ones who examine baggage since we have no agent-inspector here ourselves. Cooperation was also received from the U. S. Animal Quarantine and State Plant and Animal quarantine agencies which have inspectors assigned here.

The usual number of young shearwaters, testing their wings for the first time, were picked up by interested citizens who either called us to pick up the birds or delivered them to the office, on the windward side of Oahu during December. Most birds were capable of flight if released in a windy area near the sea. A few were taken to the Honolulu Zoo, and those which died or were too badly crippled to salvage were donated to the Bishop Museum.

This station became involved with the desert bighorn sheep incident. A Hawaii resident killed a ram in California during 1969 and Agent Keith Parcher together with Assistant Regional Supervisor Alvin Misseldine and the refuge staff investigated the Hawaiian phase of this incident. The head was seized and now hangs on the wall of the refuge office pending final disposition of the case.

## WILDLIFE SERVICES

There are 60 military installations in Hawaii and eventually wildlife management plans will have to be prepared for each area. Emphasis has been placed on those areas which have value to endangered wildlife.

At various times throughout the year, meetings were held with the Marines at the Kaneohe Marine Corps Air Station relative to wildlife management plans and practices on the base. The cooperative plan was formally approved. All the ponds within the Marine Base were declared as wildlife sanctuaries for Hawaiian stilt, an endangered species. Likewise, the red-footed booby nesting colony was also declared a sanctuary. This colony is one of the only two colonies found on the main islands which are accessible to the public for viewing. An attractive large sign depicting the ponds as sanctuaries was constructed and erected by the Marines at the main entrance gate. We frequently met with the base conservation organizations in an effort to control vegetation and organize a predator control program (primarily mongooses on stilt and their eggs).

The cooperative agreement for a wildlife program at the Pearl Harbor Naval Base was amended to include water as well as land areas. A 32 acre former salt settling pond area with potential for wildlife development was set aside by the Navy as a refuge area.

Since the waters of West Loch are classified as AA, Oahu Sugar Company can no longer dump their waste irrigation waters directly into this bay. Ways are being explored to benefit both wildlife and satisfy pollution requirements by construction of settling basins which will contain water until it is suitable for discharging into the bay. This may include the construction of a dike across part of Walker Bay on the Waipio Peninsula.

The final draft for the Army Waikakalou Storage Depot near Schofield Barracks was prepared.

## I. GENERAL

During the year, seven trips were made to the refuge islands (table 1). Three were made to Pearl and Hermes Reef, and usually two or three days were spent on the atoll. Transportation was provided by Navy helicopter from Midway and this support enabled us to visit each of the small islets within the atoll.

A week was spent on French Frigate Shoals during the peak of the turtle nesting season. Transportation was provided courtesy of the U. S. Coast Guard via the FAA chartered DC-3 based in Honolulu.

The wreck of a Japanese fishing vessel, the KAIYO MARU 25, on Laysan on Feb. 7, necessitated two trips to that island. The first involved the rescue of 18 men marooned on the island, and the second involved collection of evidence for prosecution of a refuge trespass case.

A single "all island" trip was made during August. Transportation was provided by the U. S. Coast Guard Cutter BUTTONWOOD. Nihoa, Laysan, and Lisianski were the islands visited.

A detailed trip report was prepared after the completion of each of the trips to the refuge. Population data including census figures for most forms of wildlife present are included in each of these reports. Study continues on each of the 8 wildlife management studies, and a summary of the work completed during the year is reported under biological investigations.

Table 1  
Summary of Refuge Trips - 1970

Month	Islands Visited	Transportation	Days Involved
FEB	Laysan	BUTTONWOOD	5
APR	Pearl & Hermes	Midway Helicopter	5
JUN	Pearl & Hermes	Midway Helicopter	5
JUL	French Frigate Shoals	FAA DC-3	8
AUG	Nihoa, Laysan, Lisianski	BUTTONWOOD	10
DEC	Pearl & Hermes	Midway Helicopter	5

A. Weather Conditions

A summary of temperature extremes and precipitation data for three stations is presented in Table 2. Lihue, Kauai is located approximately 140 miles southeast of Nihoa, the first refuge island, while Midway is located 90 miles beyond the last refuge island, Pearl and Hermes Reef. Only French Frigate

Table 2  
 Temperature and Precipitation Data  
 Hawaiian Islands National Wildlife Refuge

Month	Lihue, Kauai			French Frigate Shoals			Midway		
	High	Low	Prec.	High	Low	Prec.	High	Low	Prec.
JAN	83	56	7.32	80	60	3.45	69	62	4.6
FEB	83	58	.89	79	63	.64	69	62	3.7
MAR	85	62	.93	79	65	.60	70	63	3.1
APR	82	68	2.83	80	71	1.01	71	64	2.5
MAY	84	68	5.85	87	69	2.58	74	67	1.9
JUN	84	67	.77	90	73	1.35	79	72	3.1
JUL	87	72	1.76	89	75	2.02	81	74	2.9
AUG	87	73	1.33	90	73	3.23	82	75	3.9
SEP	87	66	1.42	93	74	1.59	82	75	3.7
OCT	86	67	2.47	89	72	4.41	79	72	3.7
NOV	84	64	11.05	88	66	2.10	75	69	3.6
DEC	81	66	<u>2.29</u>	85	67	<u>5.77</u>	72	65	<u>4.2</u>
Extreme	87	56		93	60		82	62	
Total Prec:			38.91			28.75			40.9

Shoals is located within the refuge. Complete weather data are collected on each of these stations and they represent general weather conditions throughout the refuge chain.

Annual precipitation data varied approximately 12 inches between French Frigate Shoals and Midway. These differences reflect the type of precipitation, small rain squalls, usually associated with Pacific islands. The lowest temperature reported by any of the weather stations was at Lihue, Kauai where 56° was recorded during January. One would expect that lower temperatures might be observed at Midway for in terms of latitude, it is approximately 200 miles north of the island of Kauai.

Although there were several severe storms which buffeted the entire island chain during the winter, none were severe enough to incur any significant damage to the islands. The areas of vegetation affected by the storm of December 1, 1969 have generally recovered.

#### B. Habitat Conditions

Only 5 of the 7 atolls or islands within the refuge were visited during the year. Necker and Gardner Pinnacles have not been visited since May, 1969. Habitat conditions on the rocky islands such as Nihoa, Necker and Gardner Pinnacles change little from year to year. However, some of the smaller islets within French Frigate Shoals and Pearl and Hermes Reef build up and diminish in size with the storms.

The shorelines of Laysan and Lisianski which were severely damaged by the storm of December 1, 1969 have for the most part recovered. The vegetation line on the west side of Laysan Island has moved to within 10 feet of the high tide line.

## II. WILDLIFE

#### A. Migratory Birds

Many species of seabirds which utilize the refuge islands for nesting are migratory; the islands are used for nesting and during the remainder of the year the birds are "at sea". Migratory patterns differ between species. The Laysan and black-footed albatrosses leave the refuge islands after fledging and most don't return until they attain breeding age, normally 7 years. They roam the entire north Pacific, however, most are observed west of Hawaii.

The migratory patterns of many species of seabirds are not

well understood. A considerable amount of data collected by the Pacific Project of the Smithsonian Institution in recent years has shed some light on this subject. We now know from band return data that in many species of seabirds, there is a strong affinity for nesting on their natal islands. Banding data have also turned up some other interesting information. For example, a number of sooty terns have been found nesting in the leewards one year and Johnston Island, 600 miles to the south, another year. Also, it appears that Southeast Island on Pearl and Hermes Reef may be the only island in the North Pacific where the sooty storm petrel nests in numbers.

Migratory shorebirds are common on Laysan and on some of the smaller islands to a lesser degree. Most of the shorebirds breed in the Arctic or subarctic regions and winter in the Hawaiian archipelago as well as in the southwest Pacific. Unusual this year, was the observation of 2 lesser yellowlegs on Laysan Island by Kridler.

Population data for each of the species of birds observed on the refuge islands during the year is presented in table 3. Data class is included for each population estimate. Class A data constitutes a headcount, Class B either a systematic survey or a figure which we estimate to be plus or minus 20 % in reliability, Class C where the reliability is estimated at plus or minus 50%; Class D an educated guess.

Two emperor geese in eclipse plumage were observed on Laysan Island. A single emperor goose had been seen on Laysan during March 1969 and quite possibly it was the same bird. The birds were closely observed with the aid of a spotting scope and the short primaries, with the blue feather shields were quite noticeable. Rather than the usual "take to the water" behavior when approached, these birds immediately scurried towards the vegetation. It will be interesting to see if these birds will remain and "adapt" to Laysan.

On December 7, Kridler observed and captured a Black Brant on Tern Island at French Frigate Shoals. The bird was in emaciated condition and it was taken to the Honolulu zoo where it only survived for a day. The specimen was added to the refuge collection and a short note in the ELAPAIO was prepared on this first known record from the Northwestern Hawaiian Islands. A short-eared owl was observed there on the same day and also constituted the first definite record from that area.

Table 3  
 Populations of Seabirds Observed on  
 Hawaiian Islands National Wildlife Refuge during 1970

Bird	Nihoa	French	Laysan	Lisianski	Pearl & Hermes	
	August	Frigate June	August	August	June	December
Sooty Tern	2,500D		40,000D	Present	12,000D	
Gray-backed Tern	6,000D				300C	
Blue-gray Noddy	100D					
Common Noddy	5,000D		20,000C	Present	250C	1A
Hawaiian Noddy	1,000D		5,000D		1,500C	700C
Fairy Tern	150D		1,000D	Present	7A	1A
Black-footed Albatross		13A			1,559A	15,000B
Laysan Albatross		53A	200B	10C	7,705A	50,000B
Wedge-tailed Shearwater	22,500D	400C	1,000,000D	Present	1,500D	
Christmas Is. Shearwater	75D	2A	300D		2A	
Bonin Petrel			100,000D			
Bulwer's Petrel	85,000D		500D		2A	
Sooty Storm Petrel						800C
Red-tailed Tropicbird	100D	38B	750D	Present	25A	

<u>Bird</u>	<u>Nihoa</u>	<u>French</u>	<u>Laysan</u>	<u>Lisianski</u>	<u>Pearl &amp;</u>	
	<u>August</u>	<u>Frigate</u>	<u>August</u>	<u>August</u>	<u>Hermes</u>	<u>December</u>
		<u>June</u>			<u>June</u>	
Blue-faced Booby	160C		150C	160B	40A	24A
Brown Booby	135B		10C	10B	100B	35A
Red-footed Booby	1,500B		300C	550C	150B	70A
Frigate Bird	4,600B		850C	1,300B	200B	42A
Sanderling						7A
Wandering Tattler		1A	50B			1A
Bristle-thighed Curlew			100B	25D	2A	11A
den flower		2A	50C	25D	9A	30B
Ruddy Turnstone		8A	4,000B	125D	23A	200B
Glaucous-winged Gull						1A
Lesser Yellowlegs			1A			
Emperor Geese			2A			

G. Fish

No fisheries oriented studies were conducted during the year. Some of the transect markers placed in the French Frigate Shoals area during the summer of 1969 were seen again; however, it appeared that several of the 5/8 inch reinforcement rods had been destroyed by the heavy seas. No attempt was made to resurvey these transects. Likewise, no further attempts were made to access the Crown-of-Thorns (Acanthaster) population on the refuge.

During May, tiger sharks were commonly observed in the shallows within Pearl and Hermes Reef. On several occasions they were observed feeding on fully grown young black-footed albatrosses. They simply picked the birds off the surface as a trout might take a dry fly. Two tiger sharks were taken on shark lines and the stomach contents were analyzed. One contained the partly digested remains of two full grown albatrosses.

Whales, porpoises and other cetaceans are occasionally observed in and around the refuge islands. During the May trip to Pearl and Hermes Reef, a pod of sperm whales was observed between Midway and Pearl and Hermes. One of the helicopters dropped down and good photographs were obtained of one of the larger animals which appeared to be approximately 40 feet.

H. Reptiles

The green sea turtle, a common inhabitant of most of the refuge islands will be discussed under the wildlife management studies.

III. REFUGE DEVELOPMENT AND MAINTENANCE

A. Physical Development

Maintenance was performed on the large recognition sign at Southeast Island. Bureau recognition signs were placed on Pearl and Hermes Reef and Laysan Island during the year.

B. Refuge Collections

The following collections were made on Laysan.

- 2 common noddy terns
- 2 wedge-tailed shearwaters
- 2 red-tailed tropic birds

2 sooty terns  
1 Bulwer's petrel

These birds are being analyzed for pesticide residues, by Mr. Robert Shallenberger who is associated with the Oceanic Institute on Oahu.

The black brant which was collected on Tern Island, French Frigate Shoals was added to the refuge collection.

#### D. Control of Vegetation

The introduced mustard (Brassica sp.) and sow thistle (Sonchus sp.) continue to be a problem at Southeast Island, Pearl and Hermes Reef. In spite of the efforts made to control it during the past several years, it persists at about the same level. With the infrequency of our visits it appears that control of this introduced pest may be an impossibility. Although it is considered a weed, it does provide nesting cover for Hawaiian noddy terns and escape cover for sooty tern chicks from the frigatebirds.

The small patches of Cenchrus sp. appear to be spreading on Nihoa. During the one day that Nihoa was visited this year, time did not permit any attempts for control. Cenchrus in relatively large patches was observed on Lisianski Island. During 1967, the few plants noted were seen only on the east side of the island. During this visit, however, it was noted all around the perimeter of the island. It has become too well established to control. The seed is rapidly spread by birds, especially in the down of young albatross as they begin to wander away from their nests as they grow older. Here again, due to the infrequency of our visits, we are unable to control this introduced pest.

#### IV. RESOURCE MANAGEMENT

Since the refuge islands have been declared natural areas, protection and surveillance are the only forms of management conducted other than attempts to control introduced weeds.

#### V. FIELD INVESTIGATIONS OR APPLIED RESEARCH

Wildlife Management Studies: One of the primary objectives of the refuge trips is to collect biological data relating to the endangered species found on the refuge islands. Of the eight wildlife management studies, six involve work with rare or endangered species of wildlife.

Complete data on each of these studies is collected and reported on in detail in the expedition reports. The following reports briefly summarize the yearly activities in each of the wildlife management studies.

1. Populations and movements of the Hawaiian monk seal on the Hawaiian Islands National Wildlife Refuge.

A total of 95 seal pups were tagged during the year (table 5 ). This number was considerably less than the 169 tagged during 1969. Fewer visits to the refuge this year accounted for the fewer seals tagged.

In considering a total of all peak counts for all the refuge islands we find a total of 546 animals observed on the refuge this year. Again, only one visit was made to each of the islands except Pearl and Hermes reef where 3 censuses were taken. This also is lower than the total peak counts for 1969, and the fewer visits probably account for this decrease. We still are unable to arrive at an estimate as to how many animals are at sea while we are counting on land.

A total of 59 tag returns were accounted for during the year. Of the numerous animals tagged with the large yellow nylon neck tags, only one was recorded this year. It is now apparent that these tags are being lost either because they are being pulled off by fish or because of the excess drag which eventually results in the skin tearing. These large yellow tags will not be used in the future. Although we again observed one of the animals on which we tried the freeze branding technique the symbols were not evident and it appears that this marking technique also will be added to the list of those tried and discarded.

In cooperation with Dr. G. Causey Whittow, School of Medicine, University of Hawaii, we collected temperature information from the seals. This was written up for a short publication on animal thermoregulation for the Journal of Mammology, copy appended.

Again this year the data collected strongly suggest that mortality among seal pups is very high. During 1969 a total of 95 pups were tagged on Laysan and Lisianski. Only 10 of those tagged animals were again observed during 1970. Similarly, 2 trips were made to Pearl and Hermes Reef during the pupping season and a total of 16 pups were tagged. During our December trip none of those previously tagged animals were again observed.

2. Populations and movements of the green sea turtle on the Hawaiian Islands National Wildlife Refuge.

Table 4  
Summary of Seal Census Data - 1970

<u>Date</u>	<u>Nihoa</u>	<u>French Frigate</u>	<u>Laysan</u>	<u>Lisianski</u>	<u>Pearl and Hermes</u>
APR 13					<u>122</u>
JUN					<u>103</u>
JUL 10		<u>166</u>			
AUG 15	<u>2</u>				
AUG 17			<u>147</u>		
AUG 21				<u>109</u>	
DEC 14					80

Underlined figures - total of peak counts for all islands - 546

Table 5  
Summary of Seal Tagging - 1970

<u>Date</u>	<u>French Frigate</u>	<u>Laysan</u>	<u>Lisianski</u>	<u>Pearl and Hermes</u>
APR 13				4
JUN 22				12
JUL	54			
AUG 17		20		
AUG 21	—	—	<u>5</u>	—
Total Tagged	54	20	5	16

Total animals tagged during 1970 - 95

Table 6  
Summary of Seal Returns - 1970

<u>Date</u>	<u>French Frigate</u>	<u>Laysan</u>	<u>Lisianski</u>	<u>Pearl and Hermes</u>
APR 13				9
JUN				9
JUL 10	11			
AUG 17			10	
AUG 21		10		
DEC 14	—	—	—	<u>10</u>
<b>Totals</b>	<b>11</b>	<b>10</b>	<b>10</b>	<b>28</b>

Total seal returns for 1970 - 59

A total of 76 green sea turtles were tagged on the refuge during the year. Only a few small turtles were tagged; the majority weighed between 150 and 220 lbs. A total of 17 previously tagged animals were again observed on the refuge islands (Table 7). Most returns were found on Pearl and Hermes Reef where there seem to be turtles throughout the year.

Of interest was the return of 2 turtle tags taken off the island of Oahu. Both of these were tagged on July 10 on East Island in French Frigate Shoals. This substantiates our contention that a large percentage of the sea turtles using the entire Hawaiian archipelago utilize the French Frigate Shoals area for nesting and then migrate towards the main islands for feeding after the nesting season terminates. A few may move westward to Pearl and Hermes Reef. So far we have had none, however, taken from the Midway atoll.

Although the green sea turtle is considered peripheral in the redbook of endangered species, the state of Hawaii has no restriction on the taking of turtles in the state. Turtle authorities state that the refuge islands are the only remaining islands within the United States where nesting has been observed to any great extent. Unlike the Atlantic subspecies which never comes to land except to nest, the Pacific subspecies does haul up on the beaches at all times of the year to bask in the sun, especially on the refuge. Even though turtles are present in some areas in great numbers in the South Pacific, the Atlantic and Indian Oceans, they have been molested in every ocean to the point where no longer during the daylight hours do turtles venture up on beaches.

The Koral Kings, the diving club at Midway Naval Air Station, has cooperated with us in our study and has also tagged a number of turtles. The Commanding Officer has issued a station regulation prohibiting the taking of turtles under 24 inches in shell length. Most of the turtles seen in the vicinity of Midway atoll are small, and under this size limitation. When these animals are taken they are weighed, measured and tagged by members of the Midway diving club. During 1970 they tagged 14 animals and these data have contributed substantially to our understanding of the life history of the green sea turtles.

Periodically turtles with large growths around the head and neck have been observed. Two such growths were surgically removed from a turtle found on Pearl and Hermes Reef. The growths were frozen and given to the University of Hawaii department of physiology for identification. They were identified as papilloma. One such growth weighed almost a pound. It had grown over one side of the mouth thus preventing the mouth from opening.

Table 7  
Summary of Turtle Return Data - 1970

<u>Date</u>	<u>French Frigate</u>	<u>Laysan</u>	<u>Lisianski</u>	<u>Pearl and Hermes</u>
APR 13				8
JUN 22				1
AUG 21		1		
DEC 14		—		7
<b>Totals:</b>		1		16

Total Returns - 1970 - 17

Table 8  
Summary of Turtle Tagging Data - 1970

<u>Date</u>	<u>French Frigate</u>	<u>Lisianski</u>	<u>Pearl and Hermes</u>
APR 13			3
JUN 23			6
JUL 10	47		
AUG 17		8	
DEC 14	—	—	12
<b>Totals:</b>	47	8	21

Total turtles tagged during 1970 - 76

On a number of occasions turtles have been noted with various parts of their flippers and tails bitten off - presumably by sharks.

3. Populations and life history of the Nihoa finch on Nihoa Island, Hawaiian Islands National Wildlife Refuge.

Nihoa Island was visited only once during the year, and census data were obtained at that time. Fifty two random transects each 250 feet long and a rod wide were conducted. A total of 5.13 acres was sampled. Upon subjecting the data to statistical analysis the population was determined to be 2,341 plus or minus 30.87%, the range of the population is between 2,026 and 3,948. These figures show no significant change from those data collected during May 30, 1969. No additional data on the Nihoa finch were collected. (Table 9)

4. Populations and life history of the Nihoa millerbird on Nihoa Island, Hawaiian Islands National Wildlife Refuge.

Millerbirds were also censused during our visit to Nihoa. A total of 10 birds were observed on transect. Another 12 were observed off transect.

Statistical analysis of data revealed the population to be about 304 plus or minus 57%. The range of the population is thus between 134 and 477.

This population estimate represents a significant decline from the 498 censused on Nihoa during 1969. However, we are dealing with such a small population of relatively secretive birds and a difference between 3 or 4 birds on transect might make a difference of 200 in the island population.

5. Populations and life history of the Laysan finch on Laysan Island, Hawaiian Islands National Wildlife Refuge.

A finch count was conducted on Laysan Island on August 19. Counting on 120 transects and applying standard statistical methods, the population was estimated at 6,764  $\pm$  22.3% (from 8,272 to 5,256).

The Laysan finch transplanted to Southeast Island on Pearl and Hermes Reef are doing well. One hundred random transects were conducted on April 15 and the population was estimated to be 188 birds.

During our June trip to Southeast Island, efforts were made to collect nesting information. Seven active nests were found and most of them were in Eragrostis. In addition a pair of birds was noted on Grass Island and three other pairs were

Table 9  
Finch and Millerbird Populations  
1961-1970

<u>Date</u>	<u>Laysan Finch</u>	<u>(C.L.)</u>	<u>Nihoa Finch</u>	<u>(C.L.)</u>	<u>Millerbird</u>	<u>(C.L.)</u>
DEC 61			800-1,200			
MAR 64			2,500-5,000			
SEP 64			4,500 est.		150 est.	
MAR 65			4,000 est.		100-500 est.	
MAR 66	9,573	+42.5%				
JUL 66			5,000	+10%		
SEP 66	8,879	+61%			150	+25%
MAR 67			5,000			
SEP 67	7,779	+34.6%	4,770		625	
MAR 68			6,596	+27%		
SEP 68	6,981	+22.3%			602	+59%
MAR 69	11,183	+24%	2,993	+36%		
MAY 69			2,987	+32%	493	+42%
AUG 70	6,764	+22.3%	2,341	+29.9%	174	+57.2%

C.L. - Confidence Limits

transported from Southeast Island to Grass Island.

During December, another finch census was made using the standard random transect technique. The total population was estimated at  $425 \pm 43\%$  (from 241 to 609). This increased figure undoubtedly reflects production of the year.

6. Population dynamics and life history of the Laysan teal on Laysan Island, Hawaiian Islands National Wildlife Refuge.

Other than the rescue mission, only a single visit was made to Laysan during the year. One of the primary objectives of this visit was to obtain more accurate population data on the species.

Three types of counts were conducted. Teal were counted on the random selected finch transects and the population estimate was  $136 \pm 99\%$ . This was not considered a reliable method of determining population estimates because of the large degree of error.

A single beat-out was made, and a total of 35 birds was observed. Each of the five observers made their own individual count and the figure of 35 represents an average of all the counts.

Two shoreline counts were also conducted. Since the birds have a tendency to feed along the shorelines at "first light" and dusk, counts at those times of the day are considered one of the reliable ways of determining teal population. An early morning count revealed 50 birds, while the evening count revealed 38 birds.

In summary, it appears that the teal population is below 100 birds, lower than it has been for several years. We believe that efforts should be made as soon as possible to place a team of biologists on the island. Their mission would be to attempt to learn what the factors are that are apparently limiting this population or are causing fluctuations.

7. Studies Involving Vegetative Changes on the Hawaiian Islands National Wildlife Refuge.

Studies involving changes in species composition of the vegetation on the refuge were not conducted during the year. During our September trip, however, it was noted that on Lisianski, Cenchrus had spread almost over the entire perimeter of the island. Likewise, on Nihoa the same species seems to be spreading near the lower slopes of Miller Canyon.

Seeds from this species could have possibly been carried from island to another by birds. They might also have been spread to other islands by personnel engaged in biological investigations during past military operations. Plants of this species were observed around the Air Force HIRAN camp on Nihoa in June, 1962.

## VI. PUBLIC RELATIONS

A. Recreational Uses

Since the refuge has been declared a natural area, recreational uses are not permitted. Although occasionally requests have been received from parties interested in recreational fishing on the refuge islands, such requests are denied.

B. Refuge Participation and Public Relations

- JAN 20 Kridler and Olsen discussed the Kaneohe Marine Corps Cooperative Agreement with base Public Works Officer
- JAN 26 Kridler discussed the R & E program and the Hawaiian Islands National Wildlife Refuge at the monthly meeting of the Animal Health Division of Agricultural Research Service, Honolulu
- FEB Messrs. Van Den Akker and Jacoby, Regional office, visited refuge office regarding asertainment.
- FEB 16-20 Mr. Phil Lehenbauer, Wildlife Services, Portland, Regional Office, visited refuge office to help with cooperative agreements on military bases
- FEB 24-25 Messrs. Banko, Sincock and Woodside met with refuge personnel to discuss R & E task force program.
- MAR 2 Olsen presented slide talk to Enchanted Lakes School, Kailua, 120 attended.
- MAR 11 Kridler met with Oswald Stender, Trustee Trotter - Campbell Estate Representatives regarding development possibilities in Kahuku area.
- MAR 16 Slides were provided for a Hawaii Wildlife Federation TV presentation.
- MAR 16 Kridler and Olsen attended the Hawaii Audubon meeting
- MAR 16 Olsen met with State Conservationist and staff with regard to coordinating activities between agencies.

- MAR 23 Kridler met with Captain Munson, Coast and Geodetic Survey regarding boundaries of the State of Hawaii
- MAR 24 Kridler met with Bob Chuck, Hawaii Division of Water Resources regarding water rights
- MAR 24 Olsen toured Naval Ammunition Depot, Pearl Harbor and discussed possibilities of developing an old salt settling basin area as a stilt sanctuary.
- MAR 25 Olsen met with Honolulu airport officials regarding the proposed reef runway at Honolulu International Airport
- MAR 25 Olsen screened Pacific Project, Smithsonian Institution excess property at Pearl Harbor
- APR 9 Kridler and Olsen photographed important wetland areas on Oahu via courtesy Navy helicopter
- APR 23 Kridler presented illustrated slide talk to the Soil Conservation Service in Hawaii at their annual meeting
- APR 27 Kridler discussed future development plans for Kahuku area with representatives from Donald Wolbrink and Associates
- APR 29 Olsen presented illustrated slide talk to 170 students of Enchanted Lakes School, Kailua
- MAY 10-19 Mr. Travis Roberts, Deputy Regional Director visited Hawaii and was escorted over various islands by Kridler
- MAY 12 Kridler, Roberts and Olsen attended Resource Conservation and Development meeting in Kahalui, Maui
- MAY 14 Kridler presented a paper on Hawaii's Endangered Birds to Hawaii Chapter of the Society of American Foresters, Kahalui, Maui
- MAY 15 Mr. Roberts presented keynote address to annual meeting of the Hawaii Chapter of the Wildlife Society, Kahalui, Maui.
- MAY 18,25 Olsen attended U. S. Court arraignments in Honolulu regarding Laysan Trespass Case.

- MAY 23-25 Kridler and Olsen escorted Assistant Secretary Glasgow and his wife to the island of Hawaii and various officials on Oahu
- JUN 1 Olsen presented slide talk on refuge to Kaneohe School - 120 in attendance
- JUN 6 Kridler presented talk on Hawaii's endangered wildlife to Annual meeting of Hawaii Wildlife Federation, 50 in attendance
- JUN 25 Olsen presented slide talk on refuge on Midway TV Station
- JUL 1 Olsen met with airport officials re permit for fillin Keehi Lagoon for reef runway
- JUL 9 Kridler attended Change of Command ceremonies for Admiral Engle, USCG
- JUL 16 Olsen met with Tom Hida, Bureau of Commercial Fisheries regarding ecological effects of proposed reef runway - Honolulu Airport
- JUL 17 Kridler met with Lt. Cmdr. Wells, Public Works Officer, Kaneohe Marine Corps Air Station to discuss wildlife management plans
- JUL 23-24 Kridler and Olsen met with Lostletter, Banko, Sincock, and Erickson about state R & E Program
- AUG 4 Olsen gave illustrated slide talk on Hawaiian stilt to Kaneohe Marine Corps Air Station Rod and Gun Club
- AUG 7 Annual state-wide Hawaiian waterbird count was conducted by Bureau and State biologists
- SEP Kridler and Olsen met with Dr. Harold Hirth, University of Utah, who is working on the green sea turtle under a Foreign Affairs Office grant
- SEP Kridler and Olsen met with John E. Johnson, Geological Survey regarding EROS Program
- SEP Kridler and Olsen attended a meeting where Mr. Phil Roedell, Director of BCF explained proposed reorganization of BCF, NOAA, etc.

- SEP 17-18 Kridler and Olsen attended Navy "70" Environmental Conference. Kridler presented a paper on Hawaiian Endangered Birds.
- SEP Approximately 800 copies of the refuge master plan were distributed.
- SEP 23 Dave Hickock, Sea Grant Program, Alaska, formerly with the Division of Refuges in Washington Office, paid a courtesy call.
- OCT Kridler attended Refuges System Approach and Analysis Workshop in Anchorage, Alaska
- OCT Olsen met with Corps of Engineers and private contractors regarding a permit to construct drain ditches in Kahuku area
- OCT Olsen presented 3 illustrated slide talks to students of Kainalu, Lanikai and Kailua Elementary Schools, total of 590 children attended
- OCT Photos taken by refuge personnel were featured in an ETV program on Hawaiian birds
- OCT A news release about a Hawaiian stilt was prepared by Olsen and appeared in the local newspaper, The Pali Press
- OCT Former Bureau director John Gottschalk paid a courtesy call.
- OCT 19 Roger Clapp, formerly with the Pacific Program Smithsonian Institute discussed the Pacific Project island reports
- OCT 28 Kridler met with Bishop Estate planners concerning the development of/and adjacent to Ukoa Pond, Oahu
- OCT 22 Kridler escorted former Bureau Director John Gottschalk to some good birding areas on Oahu
- NOV 9 Agents Parcher, Misseldine, Olsen and 3 state wardens inspected stilt habitat off Keehi lagoon.
- NOV 2-13 Messrs. Jacoby and Van den Akker from Regional Office completed biological and engineering ascertainment reports of wetlands recommended for acquisition, Kridler assisted.

- NOV 12-16 Olsen attended Hawaii Audubon Society and the Oahu Chapter of the Conservation Council to present copies of "Hawaii's Endangered Waterbirds"
- NOV 12,13&16 While on Maui Kridler made courtesy contacts with Bureau supporters for a national wildlife refuge at Kealia Pond
- NOV 17 Olsen presented illustrated slide talk to 600 students of Central Intermediate School, Honolulu and to a Kailua Scout troop and parents
- NOV 18 Kridler and Olsen met with Corps, State and other personnel to discuss Nawillwili Harbor, Kauai dredging project
- NOV 23 Kridler and Olsen met with representatives of Kaneohe Marine Rod and Gun Club to formulate plans to trap stilt and booby predators and for habitat improvements on the base
- NOV Kridler participated in an on-site meeting at Kanaha Pond, Maui with State personnel to discuss pond improvements
- NOV Several meetings were attended in regard to the reef runway, Honolulu Airport
- NOV Kridler furnished technical assistance to Honolulu Zoo and Marineland officials to obtain and safely transport live albatross from Midway to Honolulu
- NOV Kridler presented films and talk to members of Boy Scout troop 179 of Kailua
- DEC Kridler and Olsen spoke at a meeting of the Koral Kings on Midway
- DEC 8 Kridler and Olsen presented conservation films to Kaneohe Marine Corps Air Station Rod and Gun Club
- DEC 23 Kridler gave an illustrated talk on KHVH-TV, the Don Robb Show about endangered wildlife

## VII. OTHER ITEMS

Items of Interest

The Karyo Maru 25, which crashed on Laysan Island on February 7, 1970 was just the beginning of problems for us. Apparently, the 110 ft. fishing vessel was off course and slammed into the island going full speed at night. Gaping holes were torn in the bottom of the hull, and the ship was essentially beyond repair. Eighteen men scrambled to the safety of the island and remained there for six days before they were finally rescued.

While there, they raided our food caches and completely destroyed our supply. What they didn't eat they scattered. The Coast Guard dropped emergency rations and together with some food they were able to salvage from the ship, they easily subsisted. They were all apparently in good health when rescued. Olsen accompanied the Coast Guard Cutter BUTTONWOOD on this rescue mission and through an interpreter obtained the whole story. The survivors were brought to Midway and then flown back to Japan. The captain inquired about the possibilities of obtaining employment in Hawaii.

Not long after the wreck, the word spread around Honolulu harbor that a ship had wrecked on Laysan Island. One group obtained permission from us to inspect the wreck for salvage possibilities, and sailed for Laysan. They returned 3 weeks later with some radio gear, a few glass balls and many wild tales. After their return, they spread the word that there were still some 350 large glass balls, radio equipment, and a complete set of long-line gear remaining on the vessel. This was a tempting morsel to pass up. Another vessel left Honolulu to attempt salvage. They neglected to obtain a permit from our office, and as a result we brought them to Federal court for refuge trespass.

Collecting evidence on a refuge trespass case was no simple matter. This involved contacts with the Navy and Air Force, surveillance by ASW Aircraft, and finally authorization to fly to Laysan and photograph the trespassers on the island. The end result was that all four members of the salvage party were cited on charges of refuge trespass.

Of the four cited, two left the state before they were to appear in court. One went to California and has not yet returned while the other is headed around the world and was last heard from in the Seychelles Islands just north of Madagascar.

The part owner and captain of the salvage vessel appeared in Federal court and received a \$300 fine plus two years probation. He has since been hired by the University of Hawaii, Department of Oceanography to captain its brand new million dollar research vessel. Mr. Austin has been convicted on 4 counts of violations of State fishing regulations just a few months previous to the trespass incident. He, however, was bidder for a state funded shark control program and was awarded the contract. Does crime pay? You bet!

The other member of the party received a sentence of 6 months probation. Since neither of the other two defendants returned to Hawaii for a period of 6 months after the charges were placed against them, the Federal court dropped the charges.

A refuge bird list was prepared during the year and submitted to the Regional office. A total of 31 species were listed as commonly found on the refuge. An additional 38 species were classified as accidentals (those which have been reported no more than 5 times).

Distribution was made of the refuge master plan to interested groups and individuals in the state, including the congressional delegation. It has been extremely well received.

This report was drafted by Olsen, reviewed by Kridler and typed by Kube.

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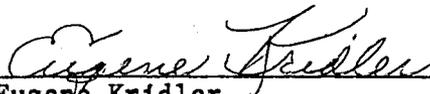
Prepared by:



David L. Olsen  
Assistant Wildlife Administrator

Date: December 17, 1971

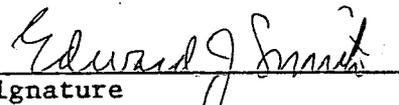
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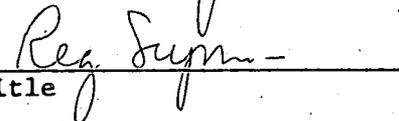
Eugene Kridler  
Wildlife Administrator

Approved, Regional Office:

Date: Dec. 20, 1971



Signature



Title

HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE

Field Trip Report

April 12-16, 1970

Field Trip Personnel

David L. Olsen      Refuge Manager Asst. BSWF, Kailua, Hawaii  
Ronald Amerson      CPO, U. S. Navy, Honolulu, Hawaii

Itinerary

- April 12    10:00 AM Depart Hickam Air Force Base via Northwest log flight for Midway. Arrive Midway Island 1 PM
- April 13    9:00 AM depart Midway via Navy helicopter with another helicopter and a HU 15 as escort. Arrive Southeast Island 10:30 AM. Using helicopter visited all small islets in the atoll. Tagged and measured seals and turtles. Helicopters departed for Midway at 5 PM. Remained on Southeast Island and conducted biological investigations.
- April 14    On Southeast Island conducted biological investigations
- April 15    Continued with biological investigation. Helicopter arrived at 11 AM. Personnel and all gear picked up and returned to Midway at 2 PM.
- April 16    Began summarizing information collected. Depart Midway via MAC Northwest log flight at 1 PM. Arrive Hickam Air Force Base 4:30PM. Checked through customs and returned to Kailua via Gov't vehicle

General

The primary purpose of this trip was to collect information relating to the cooperative agreement the Bureau has with the Army Material Command. In addition valuable population data were collected on the seals, turtles and seabirds on Pearl and Hermes Reef.

The December storm which lashed the Hawaiian Islands was not as devastating to Pearl and Hermes Reef as it was to some of the other refuge islands. Tides and winds were extremely high but the refuge recognition signs remained undamaged.

Changes in the shape of some of the islets were noted. Little north and North islands were mostly affected. The north facing beaches were carved away and additional sand was deposited on the western ends of those islands. Sand was also washed away from the western shore of Southeast Island exposing coral rock.

Laysan and Black footed albatross populations were most drastically affected by the winter storm. The high water levels and accompanying wind destroyed a large number of nests which were located on the north beaches of the islands. High water also took a considerable toll of Laysan nests in the lower areas of Southeast Island.

The most extensive stand of Eragrostis on Southeast Island was also destroyed by the high water levels. This was the most important nesting area for the introduced Laysan Finch. A small group of plants on the east portion of the island numbering probably no more than 15 bunches remained healthy. The patch on the west side of the island was not effected.

One of the objectives of this trip was to try to eliminate the stands of spreading mustard Brassica. However, more than half of the mustard had already gone to seed and it would have been useless to attempt to control it with spray. The sow thistle also showed signs of spreading. It too had gone to seed and the wind blown seed was seen spreading around the east half of the island.

These introduced plant species do not belong on a natural area. However, consideration should be given to the advantages and disadvantages of having these species present. It appears that the thistle has taken over an area of predominately Bermuda grass which was the primary area for nesting sooty storm petrels. Only a few sooty storm petrel burrows were found under the thistle. The thistle has provided a new substrait on which the Hawaiian terns may nest. Approximately 50 such nests were observed in the thistle. Laysan finches were observed eating the thistle seeds on several occasions. The number of Laysan albatross nesting in the area where the thistle and mustard have taken over has decreased however, the young albatross seen to enjoy the shade provided by these large plants.

Introduced species of plants should be controlled or eliminated on a natural area but it appears that due to the infrequent nature of our visits we may never be able to control either of these pests. We may just have to live with them.

An attempt was made to drop emergency water tanks to Southeast Island. The 40 gallon rubber tanks were dropped from the HU 15 at about 75 feet. Due to the speed of the aircraft and the weight of the load, both drums smashed on impact. A third drum was brought in by helicopter on the 15th and buried on the west end of the island.

#### Wildlife Populations

Wildlife populations were censused on Southeast Island (Table 1). Due to a lack of time we were unable to obtain complete bird population estimates on the other islets within the atoll. Brief comments of birds present on other islands are included in Table 2.

Table 1

## Southeast Island Bird Populations

<u>Species</u>	<u>Number Present</u>	<u>Comments</u>
Black footed albatross		Population way down - high water did not affect nesting birds on south side of island.
Laysan albatross		2/3 of last years population
Wedge tailed shearwater	4,000	Not laying yet - C reliability
Bulwers petrel	1	Only noted 1 bird
Sooty storm petrels		Banded 9 birds - fully feathered young - 2 returns
Bonin Island petrels	5	Probably completed nesting - only noted 5
Red tailed tropicbirds	25	No nesting noted
Blue faced booby	40	Eggs to downy chicks
Brown booby	30	No nesting noted
Red footed booby	60	Nesting in <u>Scaevola</u>
Frigatebirds	70	Eggs noted
Golden plovers	10	
Ruddy turnstones	100	
Bristle thighed curlew	11	
Wandering tattler	1	
Sanderling	1	
Sooty terns	7,000	Just beginning to lay eggs
Fairy terns	10-15	No nesting noted
Common noddy	25	No nesting noted
Hawaiian terns	200	Nesting in mustard on east end of island

Table 2

Island Bird Counts

<u>Island</u>	<u>Species</u>	<u>Comments</u>
Grass	Black footed albatross	nesting
	Laysan albatross	nesting
	Red footed boobies (3)	
	Frigates	nesting
Little North	Blue faced boobies (47)	eggs to downy young - no vegetation, shape of island changed considerably
North	Black footed albatross (300)	nesting
	Frigates	nesting
	Blue faced boobies	nesting

Band return data

Grayback tern return #723-63652 - Southeast Island

Laysan albatross return #757-18641, 757-18017 - Southeast Island

Banding data

Banded Sooty storm petrels numbers 682-16152 through 682-16161.  
 Number 682-16161 replaced worn band number 64(?)2-20235.

## Wildlife Management Studies

### Hawaiian Monk Seal

Biopsies were taken on two seals for Dr. Causey Whitlow of the School of Medicine at the University of Hawaii. Samples were taken from a subadult A173 and an adult female 588. It took 5 men to restrain the adult. The samples will be used to learn more about the presence of sweat glands in monk seals.

Respiration rates and pulse information were also obtained for Dr. Whitlow (table 3).

Table 3

<u>Animal</u>	<u>Age</u>	<u>Respiration Rate</u>	<u>Heart beat</u>	<u>Comments</u>
A173	yearling		73 beats/min	biopsy taken
Male	adult	6/minute		sleeping in sun
Male	adult	5/minute		sleeping in sun
Female	adult	1/ 2 minutes		sleeping in sun

Complete seal census data were obtained on all islets within the atoll (table 4). Only 4 pups were noted and all were tagged (table 5). Return data are presented in table 6.

Table 4

### Pearl and Hermes Seal Census 4/13/70

<u>Island</u>	<u>Adults</u>			<u>Sub Adults</u>	<u>Pups</u>	<u>Total</u>
	<u>Male</u>	<u>Female</u>	<u>Unk.</u>			
North Island	2	5	28	3	2	40
Little North	1		11	1	1	14
Seal Island			24			24
Kittery			4	1		5
Grass	1		11		1	13
Grass sandspits			12			12
Southeast	4	6	1	3		14
	Total:					122

91  
5 10

8

4

Table 5

## Seal Tagging Data 4/13/70

<u>Tag No.</u>	<u>Sex</u>	<u>Age</u>	<u>Location</u>	<u>How Tagged</u>
743	Male	Pup	Little North	Double tagged
744	Female	Pup	North	Double tagged
745	Female	Pup	North	Double tagged
746	Male	Pup	Grass	Double tagged

Table 6

## Seal Tag Return Data

<u>Tag #</u>	<u>Age</u>	<u>Location</u>	<u>Originally Tagged</u>	<u>Location</u>	<u># Previous Returns</u>
41	Adult	Southeast	Dead 7/7/67	Southeast	3
A140		Southeast	7/6/67	Southeast	1
A170	Adult	Seal Island	7/8/67	Kittery	1
A173	Yearling	Southeast	7/9/67	Grass Island	1
A184	Adult	Southeast	9/21/67	Laysan	2
A286	Adult	Kittery	9/28/67	Grass Island	1
584	Adult	Southeast	9/24/66	Southeast	3
588	Adult	Southeast	9/24/66	Southeast	4 took biopsy
A667	Yearling	Southeast	Dead 5/26/69	Southeast	1

## Green Sea Turtle

Complete turtle census data were obtained on all islets within the atoll (table 7). Three turtles were newly tagged on Southeast Island (table 8) while 8 other previously tagged turtles were checked (table 9). Due to a lack of time we were unable to take a complete set of measurements on all of these animals.

Table 7

### Turtle Census Data

<u>Location</u>	<u>Number</u>
Little North	1
North Island	12
Seal Island	0
Kittery Island	0
Grass Island	0
Southeast Island	7
Total	<u>20</u>

Table 8

### Turtle Tagging Data

<u>Tag</u>	<u>Sex</u>	<u>Location</u>	<u>Plastron</u>		<u>Carapace</u>			<u>Round</u>	<u>Weight</u>
			<u>Length</u>	<u>Width</u>	<u>Length</u>	<u>Width</u>	<u>Thickness</u>	<u>Measurements</u>	
326	M	Southeast	27.8	27.3	32.1	27.9	12.9	34X33 1/8	210
327	M	Southeast	25.4	25.3	35.4	31.1	11.5	34X33 1/8	169
328	F	Southeast	31.85	30.3	38.4	31.9	14.7	41 1/2 X 39 1/2	325

Table 9

## Turtle Return Data

Tag	Location	Plastron		Carapace		Thickness	Round Measurements	Weight
		Length	Width	Length	Width			
161	Southeast	26.3	25.3	31.6	26.4	11.2	34 $\frac{1}{2}$ X33	176
164	Southeast	28.8	27.2	35.1	29.1	11.7	37X36 $\frac{1}{2}$	202
443	North Island	Unable to remeasure turtle - possible old streamer in tag						
868	Southeast	26.9	23.7	32.2	24.2	11.0	34X31	150
879	North Island	Unable to remeasure turtle						
885	North Island	Unable to remeasure turtle						
666	Little North	Unable to remeasure turtle - white plastic streamer in good shape						
1059	Southeast	29.3	28.4	35.7	28.4	14.1	36X38 $\frac{1}{2}$	250

Laysan Finch

One hundred random Laysan finch transects were made on Southeast Island. Thirty were completed on the west part of the island while 70 were completed on the larger end of the island. Each transect was 100' long by 16' wide. On transect, 19 unbanded and 3 banded birds were counted.

$$\text{Total Birds} = \frac{\text{Number counted} \times \text{Total area}}{\text{Area sampled}}$$

$$\text{Total Birds} = \frac{22 \times 31.37}{\frac{(16 \times 100 \times 100)}{43,560}} = \frac{690}{3.67} = 188$$

Efforts were made to capture previously banded finch. Table 10 lists these recaptured birds and their dates originally banded. From these few band returns and from others in past trips it appears that there is a rapid population turnover in finch on Southeast Island.

Table 10

Finch Banding

<u>Band Number</u>		<u>Originally banded</u>
61-171303	AM white plastic	5/29/69
61-171308	AM	5/29/69
61-171310	AM	5/29/69
61-171328	AM	5/29/69

## Pearl and Hermes Field Trip Report

June 1970

### General

The Pearl and Hermes Reef unit of the Hawaiian Islands Refuge was visited by refuge personnel June 22-24, inclusive. Members of the party were Eugene Kridler, Wildlife Administrator; David Olsen, Assistant Refuge Manager, and Michael Sherwood, Assistant U. S. Attorney for Hawaii.

Transportation between Pearl and Hermes and the Midway Naval Station, 95 miles to the west, was via two HU-34 Navy helicopters. Authorization for such transportation was received from Admiral Donald Davis, Commanding Officer of the Fourteenth Naval District. Excellent cooperation was also received from Captain John R. Anderson, Commanding Officer of the Midway Naval Station, who arranged for the flights and graciously hosted the refuge party while at Midway.

Objectives of the trip were (1) to check on the status of breeding phenology of the Laysan finch, introduced there in March 1967, (2) to census seals, tag pups, and record tags of animals tagged during previous trips, (3) to census, measure, tag and weigh green sea turtles and record numbers of those previously tagged, (4) to census seabird populations when possible, (5) to check on effects of the storms of the past winter, and (6) to acquaint the representative of the U. S. Attorney's office with the programs and objectives of the refuge. While at Midway, discussions were held with Naval authorities regarding methods of handling cases involving violations of Federal wildlife laws. Mr. Sherwood also discussed with them the problem of dealing with civilians stationed there who violate civil laws. In addition, Mr. Olsen appeared on the base television station and gave an excellent half-hour illustrated slide program about the refuge and wildlife in general.

After a one hour flight from Midway to Pearl and Hermes on June 22, all islets of the reef were visited to census and tag seals and turtles and briefly check on seabird populations. Camp was established on Southeast Island after which the helicopters returned to Midway. On June 24th they returned and flew the refuge party back to Midway.

The severe storms which buffeted much of the archipelago the past winter principally affected Kittery and North Islands. Only six black-footed and two Laysan albatross young were recorded on Kittery. Usually 200+ black-footed and 50 or more Laysan young are produced on this islet. Apparently the storms resulted in an almost total loss of production of these birds the past breeding season. Several pairs of blue-faced boobies were the only other bird life present. Usually 15-20 young of this species are raised here. This island supports no vegetation, and apparently is subjected to high surf.

The vegetation line on the north side of North Island has receded about 30 yards from where it was last fall indicating that high surf has pounded this side of the island.

All the Eragrostis grass in the central part of Southeast Island was gone. Two theories might be advanced for the loss: (1) Salt spray resulting from high surf may have had a harmful effect on the grass. Clumps on the far eastern and western sides were not affected for some reason - possibly they were not subjected to the spray. (2) Since the low areas in the interior are influenced by tides, water levels during the winter when surf was very high had risen to such height as to have reached the roots of the plants in the interior, killing them.

Weather conditions during the 3-day stay on the island were excellent - much sun and moderate winds. Maximum temperature recorded since September was 95° and the minimum had been 59°. At 10:30AM on June 22 it was 84°.

#### Wildlife

Complete head counts of young and nests were made on Southeast Island of all species except wedge-tailed shearwaters, gray-backed terns, common noddy terns, Hawaiian noddy terns and Bulwer's petrels. Good estimates were obtained of all these except the wedge-tailed shearwater. Lack of time prevented estimates on the other islets except Kittery. In general, however, everything looked normal. Summaries of individual species are as follows:

#### Laysan Albatross:

Number of young counted (east part)	6690
(west part)	<u>1015</u>
Total:	7705
Data Class A	

On June 22 the albatross young were head counted by three men covering the island by strips marked off with flagged bamboo poles. Although some young may have been missed, slight overlapping compensated so the total figure is considered to be excellent.

Comparative figures of young produced are as follows:

March 1967	5,300
March 1968	10,950
May 1969	5,763
June 1970	7,705

Mortality to date was low and only 50 dead chicks were observed. Although a few had reached flight stage, most still were unable to fly and many had considerable down around the head and neck. The majority were found 10-20 yards from the beaches. Very few adults were observed. Several young, however, were still being fed.

Black-footed Albatross:

Number of young counted (east part)	1255
(west part)	304
Total:	1559

Data Class A

Young were counted concurrently with the preceding species. Comparative figures for the past four years are as follows:

March 1967	1,560
March 1968	4,004
May 1969	2,064
June 1970	1,559

The 1970 figure is a minimum. Although many young had not yet reached flight stage, a number of others had, so undoubtedly some had left prior to our arrival on the island. Very few dead (about 20) were noted. Sometimes as many as 20-30 would congregate in a loose line along the edge of the water. Every now and then one or two would enter the water on the lagoon side and swim about before returning to shore. Occasionally one would swim 50-100 yards out and try to fly by running along the surface of the water. Once in a while one would be successful. At other times one would disappear in a splash as a shark would grab it. On six different occasions sharks were seen taking swimming gooney young - sometimes only 15-20 feet offshore. Sharks were not always successful, and one was seen to miss two gooneys twice - passing between on its first rush then missing again on its second pass. One shark came directly towards shore after a gooney (which it missed) and only turned after its belly rubbed the sandy bottom but 5-6 feet from shore. One 10-foot tiger shark which was caught had its stomach and throat full of albatross remains.

Bonin Petrel:

None were observed.

Bulwer's Petrel:

Two adult birds were found together in a burrow and both were banded. The numbers were 652-42231 and 652-42214. Data has not yet been received on where and when these birds were banded.

Sooty Storm Petrel:

None were observed.

Wedge-tailed Shearwater:

Estimated Population 1,500  
Data Class D

Because many of these birds were nesting in deep burrows, and their numbers swelled considerably as a result of other birds returning at night to rest on the island, population estimates are rough. Birds checked in 10 burrows were all incubating eggs. Stage of incubation was not determined. Distribution was general except that very few burrows were found in the stands of pure Sesuvium in the low places in the middle of the east side. Some calling and moaning took place at night.

Christmas Island Shearwaters:

Only two adults were seen.

Red-tailed Tropicbirds

Population Estimate. 25

Nests

with eggs	7
with large chicks	2
with small chicks	2
Total nests	11

Most nests were found among the remains of the rusted 50-gal. fuel drums. Several were located under clumps of Scaevola and the long Messerschmidia bush near the refuge sign. One adult brooding a small chick was banded with number 595-62351.

Blue-faced Booby:

Estimated Population	40
Young	18
Data Class A	

Young were quite large and were found scattered around the island on the beaches. No clubs of non-breeders were seen at night. Last year in May a total of 19 nests with eggs and young were found.

Red-footed Booby:

Estimated Population 150

Nests

with 1 egg	7
with small chicks	12
with large chicks	8
Total nests	27
Data Class A	

All nests were located in Scaevola. Several of the large young were all gray with a few traces of down. At night about another 100 adults

and gray plumaged immatures returned to the islands to roost on the Scaevola and the steel tower. In May last year 22 nests were found, eight of which contained eggs. The breeding seasons both years are similar in effort and timing.

Brown Booby:

Estimated Population	100
<u>Nests</u>	
with 1 egg	5
with 2 eggs	6
with small chick	21
with large chick	7
with no eggs or chick	1
Total nests	<u>40</u>
Data Class A	

Most nests were on the ground on the south part of the eastern one-half. Several large young almost capable of flight were noted. Following is a tabulation of nests tallied the past three years:

March 1968	41
May 1969	41
June 1970	40

In 1969 only 3 contained eggs, while this June, 11 had eggs thus suggesting that the breeding season this year was slightly earlier than last.

Great Frigatebird:

Estimated Population	200
<u>Nests</u>	
with no eggs	3
with 1 egg	16
with 2 eggs	1
with small chick	25
with large chick	<u>26</u>
Total nests	71
Data Class A	

Nests were usually built in Solanum along the south side of the interior of the eastern part. A few were along the north sides. Males as well as females were incubating eggs and brooding young. Populations were similar to those of last May.

<u>Nests</u>	
May 1969	74
June 1970	71

Gray-backed Tern:

Estimated Population 300  
Data Class C

Most were found on the far east side. As the observer approached, these birds flew off their nests well in advance. Nests were rudimentary and located on the ground, principally in patches of Setaria. They contained eggs to half-grown young.

Sooty Tern:

Estimated Population 12,000  
Data Class D

Although the daytime population was estimated to be about 12,000 birds, this was increased considerably by birds coming in at dusk from the sea. No reliable estimate was obtained at night. Of the daytime population, about 3,000 adults were gathered in a large flock on the Sesuvium covered coral flats in the middle of the island and just appeared to be resting there. About 2,000 half grown chicks were found in the interior of the eastern part. Evenly distributed among these were 4,000 nests containing almost completely incubated eggs to newly hatched chicks.

Common Noddy Tern:

Estimated Population 250  
Data Class C

Several nests with eggs were found. No search was made for others. About 200 of the population appeared to be roosting birds.

Hawaiian Noddy Tern:

Population Estimate 1,500  
Data Class C

Almost all were birds which came to the island to roost in large flocks on the Scaevola bushes. Nests with eggs and newly hatched young were found. Although no count was made of nests, probably less than 25 were present. About 90% contained eggs.

Fairy Tern:

Population Estimate 7  
Data Class A

No nests were found.

Ruddy Turnstone:

23 seen.

Golden Plover:

9 observed. Most were in spring plumage.

Bristle-thighed Curlew:

2 recorded.

Refuge Management Studies

Hawaiian Monk Seal

All of the islets of the refuge were visited by helicopter the first day, so it was possible to census the entire atoll within a few hours. A total of 103 animals were tallied. Last year in May, 100 were observed via the same method. Both figures are a little below average suggesting that early summer populations are lower than those found during the early spring, but almost similar to those of early fall.

A total of 12 pups were tagged this trip. Four were tagged in April, one of which was recorded this trip. Thus at least 15 pups were produced this breeding season. Pups ranged in age from one which still had its umbilical cord to those which had been weaned and were at least 8 weeks old. Considering that monk seals usually begin pupping about early February, it is possible that pups were produced which we missed earlier. The one-day old animal shows that at this atoll, pupping continues to at least June 21.

One female sleeping on Southeast Island was heard snoring as loudly as any human. Several times others were noted sleeping at the edge of the water with their heads under the surface. One was recorded being under at least 2 1/2 minutes before it woke up to see us standing there watching it. How long it had its head under before we started timing it we do not know. Ten animals were recorded which had been tagged on previous trips. Noteworthy was the male which had been tagged as a pup on Lisianski in March 1967 - 145 miles to the east. This animal was last recorded on the latter island March 30, 1969. This plus several other records of tagged animals the past 4 years shows that seals travel between various islands of the refuge although return records indicate that most are seen again on islands where they were tagged.

One large pup on North Island was found with a gaping wound across most of its back. The wound had every appearance of being caused by a shark bite. Since large (9-10 ft.) tiger sharks were commonly seen around the islands, circumstantial evidence points to the shark as a

predator upon small seals. Large sharks are more abundant at this time of the year around the islets as they are attracted to them by large albatross chicks learning to fly and which swim around or alight in the waters off the beaches in the process.

Two pups and 3 adult seals were recorded at Midway upon our return from the refuge. Both pups were tagged and the rectal temperature of one was obtained for Dr. G. Causey Whitlow, of the University of Hawaii, who is studying thermoregulation in seals. The temperature of Tag No. 800, a female, was  $100.1^{\circ}$  ( $37.8^{\circ}\text{C}$ ).

Seal Recoveries  
 Pearl and Hermes Reef  
 June 1970

Tag #	Return Data		Age	Date	Original Tag Data			#of Returns
	Date	Location			Location	Age	Sex	
A77	6/22	Seal	A	3/21/67	Lisianski	P	M	3
A101	6/22	Kittery	A	3/22/67	Kittery	Y	M	2
A137	6/22	Southeast	A	7/6/67	Southeast	Y	F	3
A143	6/22	Southeast	A	7/7/67	Southeast	A	F	1
A152	6/22	North	A	7/7/67	Seal	A	F	1
A170	6/22	Kittery	A	7/8/67	Kittery	A	M	1
A283	6/22	North	SA	3/22/68	Southeast	Y	M(1)	1(2)
A670	6/22	Little North	SA	9/11/69	Seal	P	F	1(3)
A745	6/22	North	P	4/13/70	North	P	F	1(4)

- (1) Animal appeared to be female when examined on 6/22/70
- (2) Originally tagged with white nylon streamer. Streamer gone when recovered.
- (3) Double tagged with yellow nylon, animal found dead, nylon and tag were missing.
- (4) Double metal tagged.

Seal Census  
 Pearl and Hermes Reef  
 June 22, 1970

<u>Island</u>	<u>Adults</u>			<u>Subadults</u>			<u>Pups</u>			<u>Total</u>
	<u>M</u>	<u>F</u>	<u>U</u>	<u>M</u>	<u>F</u>	<u>U</u>	<u>M</u>	<u>F</u>	<u>U</u>	
North		5	10			3	4	1		23
Little North	6	4	6				2	2		20
North Sandbars			4							4
Wreck			4			1				5
Southeast	4	3	9		1	2				19
South Sandbars			5							5
Grass	1	4	9							14
Seal		1					3		1	5
Kittery	<u>1</u>	<u>2</u>	<u>5</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>8</u>
Totals:	12	19	52	0	1	6	9	3	1	103

Note: Found dead but not included in above figures: North Is. 1 SA, Little North 1 SA, North Sandbars 2 SA, - Total: 4.

Seals Tagged  
 Pearl and Hermes Reef  
 June 22, 1970

<u>Number</u>	<u>Age</u>	<u>Sex</u>	<u>Island</u>	<u>Remarks</u>
747	Pup	M	Little North	1 wk old w/mother
748	Pup	F	Little North	3 wks. old w/mother
749	Pup	M	Little North	3 wks. old w/mother
750	Pup	F	Little North	1 day old, w/umbilical cord w/mother
776	Pup	M	North	w/mother
777	Pup	M	North	8+ wks old wo/mother
778	Pup	M	North	8+ wks old wo/mother
779	Pup	F	North	3-4 wks. old w/mother
780	Pup	M	North	3-4 wks. old w/mother
781	Pup	M	Seal	2-3 wks. old w/mother
782	Pup	M	Seal	8+ wks old wo/mother
783	Pup	M	Seal	8+ wks old wo/mother

Midway Islands  
 June 27, 1970

751	Pup	M	Midway	4-5 wks, 50 lbs, w/mother
800	Pup	M	Midway	4-5 wks, 50 lbs, w/mother Rectal temp 100.1°F, 37.8°C

Seal Censuses  
Pearl and Hermes Reef

<u>Island</u>	<u>3/64</u>	<u>9/64</u>	<u>3/65</u>	<u>3/66</u>	<u>9/66</u>	<u>3/67</u>	<u>9/67</u>	<u>3/68</u>	<u>9/68</u>	<u>2/69</u>	<u>3/69</u>	<u>5/69</u>	<u>9/69</u>	<u>4/70</u>	<u>6/70</u>
North	NV	36	52	NV	26	30	29	NV	NV	33	25	17	18	40	23
Little North	NV	19	25	NV	11	4	23	NV	NV	29	NV	19	21	14	20
North Sandbars	NV			NV					NV	11	NV		8		9
Southeast	22	33	45	NV	27	25	11	37	NV	23	37	16	31	14	19
South Sandbars	17	NV	6	NV	4		2		NV	20	NV	7	4	12	5
Grass	27	NV	27	NV	12	9	10	15	NV	18	NV	8	12	13	14
Seal	17	NV	10	NV	9	4	15	14	NV	9	NV	10	12	24	5
Kittery	<u>38</u>	<u>NV</u>	<u>35</u>	<u>NV</u>	<u>21</u>	<u>43</u>	<u>18</u>	<u>28</u>	<u>NV</u>	<u>10</u>	<u>NV</u>	<u>23</u>	<u>13</u>	<u>5</u>	<u>8</u>
Total:	121	88	200		110	115	108	94	94	153	62	100	119	122	103

Pup Seals Observed  
 Pearl and Hermes Reef

<u>Island</u>	<u>March 1968</u>	<u>March 1969</u>	<u>May 1969</u>	<u>March 1970</u>	<u>June 1970</u>
Southeast	0	0	0	Not Visited	0
North	Not visited	2	3		5
Little North	Not visited	5	5		4
Kittery	0	0	1		0
Seal	2	1	2		4
Grass	0	0	1		0
Sandbars	<u>0</u>	<u>0</u>	<u>0</u>		<u>0</u>
Totals:	2	8	12	13	

Green Sea Turtle:

A total of only eight turtles were seen during the three days. One, subsequently tagged, was found on North Island. The others occurred on Southeast Island. Four of the latter (2 females and 2 males) were tagged later. A fifth, a female, had been tagged in 1964. Using the same method of measuring the carapace (a flexible rule) the shell was found to have grown 3 inches in length and 2 in width (39"L X 36"W versus 36"L X 34"W). Although six pits were found on Southeast Island, some of which did not appear to be recent, none contained eggs. No pits were found on any of the other islets. Pearl and Hermes superficially resembles French Frigate Shoals, yet we have not, in recent times, found evidences of successful nesting there. Perhaps others have, but we are not aware of it if they have. Following are tagging and recapture data.

## Turtles Tagged

Tag #	Sex	Weight	Caliper (In.)			Tape (In.)		Island	Date	
			Carapace Length	Carapace Width	Body Plastron Thickness	Body Plastron Length	Carapace Length			Carapace Width
329	F	No measurements taken						North	6/22/70	
330	M	205	35.2	26.9	12.4	27.6	37 1/2	33 3/4	Southeast	6/23/70
331	M	195	35.3	27.7	12.4	28.0	37 1/2	33 1/2	Southeast	6/23/70
343	F	200	36.0	33.1	12.3	26.5	35 1/2	32 1/2	Southeast	6/23/70
344	Not used									
345	F	175	31.6	26.1	13.9	25.5	34 1/4	32 3/4	Southeast	6/23/70
1059*	F		36.0	28.7	13.3	29.4	39	36	Southeast	6/23/70

\*Previously tagged but recaptured for measurements

## Turtles Recaptured

Tag #	Recapture Data			Tagging Data		
	Sex	Location	Date	Location	Date	Time Interval
1059	F	Southeast	6/22/70	Southeast	9/16/64	5 yrs 9 mos.

Laysan Finch:

Seven active nests were found. Three were found for the first time in Setaria which carpeted much of the north central part of the island. This apparently is an adjustment as a result of the loss of the largest stand of Eragrostis there. In addition two old nests were found in Solanum. Nests contained eggs to newly fledged young. Following is a tabulation of the location of nests on the island, the vegetation in which they were built and their contents:

<u>Island Location</u>	<u>Vegetation</u>	<u>Contents</u>
East	Eragrostis	1 old broken egg
East	Eragrostis	3 eggs
East	Eragrostis	4 eggs
Central	Setaria	3 half grown nestlings
Central	Setaria	2 eggs
Central	Setaria	4 eggs
Central	Solanum	Old
Central	Solanum	Old
West	Eragrostis	2 newly fledged young
West	Eragrostis	2 large young unable to fly

Four previously banded birds were recaptured, data follows:

<u>Band No.</u>	<u>Sex</u>	<u>Date Banded</u>	<u>Date Returned</u>	<u>Remarks</u>
61-171193	F	2/11/69	6/22/70	Orange
61-171196	M	2/11/69	6/22/70	Orange
61-171420	M	4/1/69	6/22/70	Blue
61-171440	M	4/1/69	6/22/70	Blue

Several were watched for 15 or more minutes to determine what they were feeding upon. Although sooty tern and gray-backed tern eggs were exposed, finch paid little heed to them. Some actually searched the ground almost under the egg before moving off busily eyeing the ground around them. Others disappeared a half foot or so into shearwater holes only to quickly reappear busily searching all the time. Others were noted feeding on the seeds of Boerhavia and Setaria. In several instances, bill cleaning on a twig (like a sparrow) was observed.

A pair were noted on Grass Island. Whether this was the same or a different pair that was observed there on March 24, 1968 is unknown since we did not have time to search for them nor had we nets then to try to capture them. Three pair were moved over from Southeast Island on June 23 to join them. These had a standard FWS metal band applied on the right leg and a green plastic band placed on the left leg. Data are as follows:

61-171340 thru 342 Immature  
343 Adult Male  
344-345 Immature  
346 Adult Male

No. 343 was moulting its primaries. Primary numbers 1 and 2 on the left were just growing back as was primary number 2 on the left wing. In addition to those bandings, three more were banded on Southeast Island.

61-171338 Female

339 thru 340 Unclassified to sex or age

### Marine Life

When the helicopter first circled Southeast Island the day of arrival, at least 15 large (9-10 plus ft.) tiger sharks were observed just around this island. Five were seen in one group. Several bottles which were thrown into the sea afterwards were quickly siezed by sharks. This activity plus that with the albatross discouraged diving activity.

Four whales, presumably sperm, were observed between Pearl and Hermes and Midway on the return helicopter flight. The pilots dropped to less than 50 ft. above them and photographs were obtained. The pilots reported seeing many on the flight from Midway to pick us up. "Many" was vague, but they hazarded perhaps 25-30.

Expedition Report

French Frigate Shoals

July 1970

Personnel: Eugene Kridler, Wildlife Administrator  
David L. Olsen, Refuge Manager Assistant

Itinerary: July 9 Depart Kailua 6:30AM. Arrive Honolulu 7:30AM.  
Depart Honolulu via FAA DC-3 for French Frigate  
Shoals 8:30AM. Arrive Tern Island 1:00PM. Aerial  
census seals and turtles.

July 10 Biological investigation on East Island

July 11 Biological investigations on Whale Skate and  
Trig Islands

July 12 Biological investigation on Whale Skate Island

July 13 Biological investigations on Big Gin, Little Gin,  
and East Islands

July 14 Biological investigation on Trig Island

July 15 Biological investigation on Trig Island

July 16 Depart Tern Island 2:00PM. Arrive Honolulu 5:10PM.  
Return to Kailua 6:00PM.

GENERAL

Weather conditions throughout the entire stay at Tern Island were excellent. A few thunder squalls passed over the islands occasionally, and winds were a steady 11 to 20 knots out of the east. The higher winds and accordingly choppy lagoon prevented us from visiting Shark Island and La Perouse Pinnacle.

A 16 ft. skiff and 40 horse outboard were provided by the Coast Guard for our transportation from Tern Island to the other islets. Lodging and meals were provided at a nominal cost by the Coast Guard.

The effects of the December storm which caused an evacuation of Tern Island were quite noticeable. Coast Guard repair crews were still present repairing the runway and replacing bulkheads. It is anticipated this repair work will be completed by early September.

Practically all of the vegetation was washed away from the north side of Tern Island. The only vegetation remaining after the storm were the

hardier species such as ironwood, beach morning glory, Cenchrus, and Scaevola.

#### WILDLIFE POPULATIONS

Most of the islets on the north end of the atoll were visited and wildlife population estimates were made on each. On Big Gin, Little Gin, Round, Trig, and Whale Skate, head counts of the larger species of nesting seabirds were made. Where chicks were still present head counts were completed. Reliability figures for each of the population estimates are included in the counts (table 1).

We visited the islands during the peak of the sooty tern nesting season and most chicks were full grown. A few had already attempted first flights. Estimates of sooty tern populations were made by calculating the number of birds per "square yard" (6) and multiplying this times the number of square yards in 5 acres. The population estimate was 145,200  $\pm$  20%. Sooty tern populations on Whale Skate Island were counted by blocks as one would estimate concentrations of waterfowl.

The most difficult species to count were the burrow nesting wedge-tailed shearwaters. A few birds were noted sitting at the entrances to their burrows, but most seemed to be incubating eggs deep in the ground. Not all burrows were in use so population estimates were not reliable and thus considered Class C data ( $\pm$  50%).

Only a few albatross young were noted. The December storm had undoubtedly taken its toll on the albatross population.

Frigatebirds were commonly observed over several of the small islets. Approximately 60 were observed over East Island. Most probably came from La Perouse Pinnacle.

Table (1)

## Bird Populations - French Frigate Shoals

Bird							Gin	
	Tern	Trig	Whale Skate	Round	East	Little	Big	
Black-footed Albatross		1ck(A)	3ad(A) 3ck(A)		6ck(A)			13
Laysan Albatross	2ck(A)		2ad(A), 2ck(A)		47ck(A)			53
Wedge-tailed Shearwater	50(C)	50(C)	200(C)		100(D)			538
Christmas Island Shearwater		2(A)						2
Red-tailed Tropicbird	8 on eggs(A) 8 w/cks (A)	8ad(B)	5ck(A) 1 egg (A)		4 on eggs(B) 4ck(A)			36
Red-footed Booby		2ck(B)	49ck(A) 6 eggs (A)		40ad(A) 6ck(A)			103
Blue-faced Booby		42ck(A)	123ck(A)	20ck(A)	6ck(A)	9ck(A)	25ck(A)	225
Frigatebird			42ck(A)		16ad(B)			57
Wandering Tattler					2(A)			2
Ruddy Turnstone	4(A)				20(A)			24
Grey-Backed Tern			3ck(A)					3
Sooty Tern			24,000ad(B)		145,000(B)			154,500
Noddy Tern		50ad(B) 10 nests(B)	667ad(A)		100ad(C)		40ad(A) 1 egg	857
Hawaiian Tern	10(C)		50ad(B)					60
White Tern	65(C)							65
Nihoa Finch	4ad(A) 3 eggs							4

Key: Reliability classes: (A) - Head count, (B) + 20%, (C) + 50%, (D)  
ck - Chick, ad - Adult

WILDLIFE MANAGEMENT STUDIES

Studies of Hawaiian Monk Seal

An aerial census of the seal population was conducted on July 9th. (Table 2). Several of the islands were circled thus the count of total seal population is considered reliable.

Table (2)

Aerial Census

<u>Island</u>	<u>Seals</u>	<u>Turtles</u>
Disappearing	38	
Big Gin	5	1
Little Gin	12	1
East	13	33
Whale Skate	37	6
Trig	24	
Shark	19	3
Round	<u>18</u>	
Total:	166	44

A total of 54 seal pups were tagged (Table 3). All were double tagged with identically numbered monel tags, with a single tag on each flipper. Numbers 928 and 929 were singly tagged. Sexing was accomplished by rectal examination.

Eleven previously tagged animals were observed during our stay at French Frigate Shoals. Of the 39 pups tagged during 1969 on French Frigate, only 4 were observed during this period. This again indicates that there is either a tremendous mortality rate in pups or that they depart from their natal island after the first year.

In cooperation with Dr. J. Causey Whitlow, Department of Physiology, School of Medicine, University of Hawaii, temperatures were taken rectally on two seal pups. The first, number 918, a young male with an estimated weight of 50 lbs., had a temperature of 97.6. The second, a two week old pup weighing approximately 35 lbs. had a temperature of 98.2. This is somewhat different from the temperatures recorded on the seal pup on Midway during June. Additional samples will have to be taken.

Seal tag return data is incorporated in table 4.

*3 minutes*

Table 3  
SEAL TAGGING DATA  
French Frigate Shoals

<u>Date</u>	<u>Tag #</u>	<u>Location</u>	<u>Sex</u>
7/10	752	East Island	M
7/10	753	East Island	M
7/10	754	East Island	F
7/10	755	East Island	M
7/10	756	East Island	F
7/10	757	Round Island	F
7/10	758	Round Island	M
7/10	759	Round Island	F
7/10	760	Round Island	M
7/10	761	Round Island	F
7/10	762	Round Island	M
7/10	763	Round Island	F
7/10	764	Round Island	M
7/10	765	Round Island	F
7/10	766	Round Island	M
7/10	767	Round Island	M
7/10	768	Round Island	M
7/10	769	Round Island	M
7/11	770	Trig Island	F
7/11	771	Trig Island	M
7/11	772	Whale Skate	F
7/11	773	Whale Skate	F
7/11	774	Whale Skate	F
7/11	775	Whale Skate	F
7/11	901	Whale Skate	F
7/11	902	Whale Skate	F
7/11	903	Whale Skate	M
7/11	904	Whale Skate	F
7/11	905	Whale Skate	F
7/11	906	Whale Skate	M
7/11	907	Whale Skate	F
7/11	908	Whale Skate	M
7/11	909	Whale Skate	F
7/11	910	Whale Skate	M
7/11	911	Whale Skate	F
7/11	912	Whale Skate	M
7/11	913	Whale Skate	M
7/11	914	Whale Skate	M
7/11	915	Whale Skate	M
7/11	916	Whale Skate	M

<u>Date</u>	<u>Tag #</u>	<u>Location</u>	<u>Sex</u>
7/12	917	Whale Skate	M
7/12	918	Whale Skate	M
7/12	919	Whale Skate	F
7/12	920	Whale Skate	F
7/12	921	Whale Skate	M
7/12	922	Whale Skate	M
7/12	923	Whale Skate	M
7/13	924	Big Gin	M
7/13	925	Little Gin	F
7/13	926	Little Gin	M
7/13	927	Little Gin	M
7/13	928	East Island	M
7/13	929	East Island	M
7/12	748	Whale Skate	F **
	748	Pearl & Hermes	

All animals tagged were this years pups. All were double tagged except numbers 928-929

Table (4)

## SEAL TAG RETURN DATA

<u>Return Data</u>				<u>Original Tag Data</u>					
<u>Tag#</u>	<u>Date</u>	<u>Location</u>	<u>Age</u>	<u>Date</u>	<u>Location</u>	<u>Age</u>	<u>Sex</u>	<u>#Of Returns</u>	
A3	7/12	Whale Skate	sm A	3/12/67	East	P	F	5	
A4	7/10	East	sm A	3/12/67	East	Y	F	3	
A8	7/11	Whale Skate	sm A	3/12/67	Trig	P	F	4	
A13	7/11	Whale Skate	A	3/13/67	Trig	Y	M	2	
A20	7/11	Whale Skate	sub A	3/14/67	Whale Skate	P	M	5	
A212	7/14	Trig	sm A	9/17/67	Whale Skate	Y	F	3	
A212	7/11	Whale Skate	sm A	9/17/67	Whale Skate	Y	F	3	
A672	7/11	Whale Skate	yr	8/24/69	Whale Skate	P	M	1 *	
A675	7/13	East	sub A	8/24/69	East	P	F	1	
A687	7/11	Whale Skate	yr	6/14/69	Whale Skate	P	F	1	
A698	7/13	Big Gin	lg sub A	6/16/69	Little Gin	P	F	1	

\* Lost yellow monel tag

## Studies of the Green Sea Turtle

A total of 45 green sea turtles were measured and tagged (table 5). All except one were females. Some nesting pits were still being dug. All measurements except weights were recorded. This speeded up our tagging a great deal.

Turtle pits were noted on all the islands visited and an attempt was made to count all of this year's pits (table 6). These data are not too reliable for determining whether or not a pit has been dug this year or whether it contains eggs. To check on some pits, approximately ten which appeared to be fresh were excavated but no eggs were found. We were also attempting to determine the average number of eggs per pit to see if there is any difference between those of refuge animals and what researchers have found elsewhere. When one follows the trail of a female as she crawls on to the island and begins her search for a place to deposit eggs, it becomes increasingly difficult to understand the female psychology of the turtle. Often they crawl up above the surf line, dig a pit, cover it up, crawl 20 yards, dig a half a pit, crawl 30 yards and dig another pit. Pits may be dug but no eggs are deposited in them. Pits are dug over those of other turtles - sometimes scattering the eggs previously laid. A turtle may crawl all over an island and return to the sea without digging a pit. We have yet found no reliable way of estimating the number of green sea turtles produced on refuge islands in the brief time we have been able to spend there. Until a better method of obtaining this information can be found, the turtle pit count data will have to be used as a very rough index. To adequately determine the nesting population for a particular year would entail stationing someone at French Frigate Shoals throughout the entire nesting season.

During our aerial census of the islets on July 9th, we observed 33 turtles on East Island. After tagging 22 on July 10th, we visited the island on the 13th, and found only 5 animals present. No previously tagged turtles were again observed during the week. We have as yet no way of knowing whether a turtle which we tag has already laid her eggs or is about to lay or for that matter, may just be basking on the beach - a trait of the green sea turtle in the Pacific. Most laying, however, occurs at night.

While diving near the north side of Whale Skate, we observed approximately 20 turtle eggs which had been dropped and then probably eaten by fish. We wondered whether this was a dump or the result of our activities on the island. In 1968 animals which we had tagged and numbered during the day were observed laying eggs that same night.

Table (5)  
TURTLE TAGGING DATA  
French Frigate Shoals

Date	Tag#	Sex	Plastron Length	Carapace Width	Carapace Thickness	Carapace Length	Round Measurement	Location
7/9	351	F	20.7	19.6	10.8	25.7	28X24 1/2	Tern Island
7/10	352	F	27.2	25.2	13.9	34.0	37X32	East Island
7/10	353	F	29.3	28.0	14.3	36.3	38 3/4X35 1/2	" "
7/10	354	F	27.1	27.0	13.8	34.3	37 1/4X33 3/4	" "
7/10	355	F	29.8	27.0	14.6	35.0	37 3/8X36 7/8	" "
7/10	356	F	27.9	27.1	12.1	35.3	37 3/4X33	" "
7/10	357	F	27.8	26.6	13.3	34.2	36 1/4X33	" "
7/10	358	F	29.5	27.3	13.2	36.0	39 3/4X36	" "
7/10	359	F	27.5	27.1	13.2	34.2	36 1/4X33 3/4	" "
7/10	360	F	29	28.2	13.4	35.4	38 1/4X36 1/2	" "
7/10	361	F	30.8	28.4	14.5	37.5	42X39 1/2	" "
7/10	362	F	30.3	27.5	13.4	36.3	39 1/2X35 1/4	" "
7/10	363	F	30.4	29.3	13.6	36.0	35 3/8X36	" "
7/10	364	F	29.6	27.3	13.4	36.3	39 1/4X34 1/4	" "
7/10	365	F	30.8	28.4	12.7	36.3	39 3/8X35 1/4	" "
7/10	366	F	27.2	23.8	13.6	32.2	35X31 3/4	" "
7/10	367	F	32.1	29.4	15.9	36.4	40 1/2X39 1/2	" "
7/10	368	F	29.4	26.9	15.5	36.0	39 1/8X34 3/8	" "
7/10	369	F	30.4	28.4	14.0	36.4	40X35	" "
7/10	370	F	26.8	26.1	11.9	32.8	35 1/8X30 7/8	" "
7/10	371	F	27.8	28.9	13.6	35.3	38 1/8X36	" "
7/10	372	F	28.2	26.8	13.8	35.2	37 3/4X33 5/8	" "
7/10	373	F	29.0	27.6	13.4	35.6	38 3/4X35 3/8	" "
7/10	374	F	24.5	23.9	11.6	29.5	32X29 1/2	Round Island
7/11	375	F	29.5	27.9	12.1	35.9	38 1/2X33 3/4	Trig Island
7/11	376	F	28.9	26.9	13.0	35.2	38 1/8X35	Whale Skate
7/11	377	F	29.4	27.0	14.9	36.2	40 1/2X35 1/8	" "
7/11	378	F	28.9	27.2	14.5	36.0	39X36	" "
7/11	379	F	27.9	25.9	14.9	35.5	38 1/2X36	" "
7/11	380	F	29.3	28.9	13.8	35.3	38X38 1/2	" "
7/11	381	F	30.9	28.1	15.3	36.3	39 1/4X35 1/4	" "
7/11	382	F	28.3	27.6	14.5	35.2	38 1/8X36 5/8	" "
7/11	383	F	28.5	26.9	14.2		He got away	" "
7/12	384	F	28.9	27.3	12.4	36	39 1/8X34	" "
7/12	385	F	28.0	27.3	11.9	34.5	36 1/4X33 5/8	" "
7/13	386	F	28.9	28.9	15.7	35.6	37 3/8X35 1/2	Little Gin
7/13	387		Destroyed					
7/13	388	F	29.0	27.6	15.4	35.6	40X36 5/8	East Island
7/13	389	F	29.0	26.8	13.2	36.8	40 1/8X35 1/2	" "
7/13	390	F	30.3	26.3	13.6	35.8	38 3/8X35 1/8	" "
7/13	391	F	30.4	29.1	13.9	37.3	40 1/2X36	" "
7/14	392	M	27.2	26.8	11.0	34.1	36 7/8X32	" "
7/15	393	F	29.4	27.1	12.8	36.1	39 1/8X34 1/2	Whale Skate
7/15	394	F	28.1	27.0	13.7	34.6	37X34	" "
7/15	395	F	29.2	26.5	14.3	35.4	38 1/2X35 1/8	" "
7/15	396	F	32.1	28.8	14.0	38.1	42 1/8X37 5/8	" "
7/15	397	F	29.6	26.4	14.4	34.8	37 1/8X35 1/8	" "

Table (6)

Turtle Pits  
French Frigate Shoals

Big Gin	22
Little Gin	109
East	
Whale Skate	<u>123</u>
Total:	

## Studies of the Nihoa Finch

The December storm which hit French Frigate Shoals wiped out a large percentage of the vegetation on Tern Island. We suspected that the finch population was gone, however, four adults survived. One previously banded adult male was observed and three, either immature or females were observed.

The brick pile on the west end of Tern Island was examined and a nest containing three eggs was found.

The limiting factors for the Nihoa finch on Tern Island will probably be the available vegetation and seeds for food.

## Marine Observations

Sharks were notably absent during all of our marine observations. A single tiger shark was observed cruising the shallows of East Island. The only other shark observed was a gray reef shark in a deep hole off Whale Skate.

There was an abundance of rays off both East and Whale Skate Islands. Several large individuals with "wing spans" up to 7 feet were observed and photographed. The transects established during August 1969 were examined although species observed were not recorded. The transect marker between Tern and Trig Islands had been bent badly as a result of the storm. We were unable to find the transect marker off Whale Skate Island.

In the 8 1/2 hours of diving accomplished at French Frigate, no crown-of-thorns were observed (table 7). Only a few lobsters and morays were noted.

Beach drift samples were collected in about 8 locations for Dr. Allison Kay, University of Hawaii. In addition, bottom samples under coral heads were collected for analysis.

A search was made for intertidal species of mollusks as requested by Dr. Kay. None were found.

It appears that the shallow reef adjacent to the north side of the reef had been scoured by the December storm. Some species of mollusks which were common during August 1969 were rare during this trip.

Table (7)

## Marine Investigations

<u>Date</u>	<u>Island</u>	<u>Diving Time</u>	<u>Investigation Accomplished</u>
July 9	Tern	1 hour	Tagged turtle
July 10	Round	1 hour	Marine survey
July 11	Whale Skate	1 hour	Photography 20 ft.
July 12	Tern	1 1/2 hours	Marine survey - photography
July 13	East	1 1/2 hours	Marine survey
July 14	Trig	2 1/2 hours	Marine survey - photography

Hawaiian Islands National Wildlife Refuge  
Field Trip Report  
August 1970

Personnel:

Eugene Kridler - Wildlife Administrator, Bureau of Sport Fisheries and  
Wildlife, Kailua  
David L. Olsen - Refuge Manager Assistant, Bureau of Sport Fisheries and  
Wildlife, Kailua  
Joe Mazzoni - Wilderness Coordinator, Bureau of Sport Fisheries and  
Wildlife, Portland, Oregon  
David Woodside - Hawaii Division of Fish and Game, Honolulu  
John Sincock - Research Biologist, Bureau of Sport Fisheries and  
Wildlife, Kauai

Itinerary:

August 14 8:00AM, Depart Sand Island via BUTTWOOD. Picked up Mr.  
Sincock at Port Allen, Kauai at 7:00PM.  
August 15 Landed on Nihoa Island 8:30AM. Departed Nihoa 4:00PM.  
August 16-17 Enroute Laysan Island  
August 18 Arrived on Laysan Island 8:00AM  
August 19 On Laysan Island  
August 20 Departed Laysan Island 4:30PM  
August 21 Arrived Lisianski Island 9:00AM. Depart Lisianski 1:30PM  
August 22 Arrived Midway 11:15AM. Rebark from ship. Overnight Midway  
August 23 Depart Midway 1:50PM via MAC aircraft. Arrived Hickam AFB,  
Honolulu, 5:45PM. Return to Kailua via Government vehicle  
7:00PM.

General

The primary objectives of this trip were to conduct biological investigations on Nihoa, Laysan and Lisianski Islands, inspect the islands for changes since our last trip and check on possible introductions of weeds and rats on Laysan Island by the Japanese fishermen who wrecked their vessel there in February.

Since the Refuge is being considered for wilderness status, Dr. Mazzoni, the Regional Wilderness Coordinator, was afforded the opportunity to gain first hand knowledge of the area.

No marine work was accomplished. Emphasis was placed on gathering data on the rare and endangered wildlife instead.

## NIHOA

### General

Seas were relatively calm, and a landing via rubber boat was affected on Nihoa with little difficulty. We were allowed a single day on Nihoa. Censusing Nihoa finch and millerbird populations was the primary objective. The scientific party arrived on Nihoa at 8:30 AM and left upon completion of its objectives at 4:00 PM. In addition to completing the finch and millerbird transects, some seabird population estimates were made. All signs were still in place and in good order. Maximum and minimum temperatures recorded since the last visit were 88° and 72°.

### Wildlife

The island was divided into five areas, and each member of the party was responsible for obtaining population data within his area. Priority was given to running the finch and millerbird transects. Data on other birds was gathered while moving between transects or after they were completed. Information for the larger and more easily observed birds is more reliable than that for burrowing species or those inhabiting the inaccessible east, north, and west cliffs. Lack of time precluded any type of sampling for any of these species. Estimates are thus gross and of class D quality.

### Albatross:

None of either species was seen.

### Bulwer's Petrel:

Estimated population: 75,000 - 100,000  
Data Class D

Birds of this species were distributed all over the island. The few burrows examined contained paired birds. Others contained small downy dark-brown chicks. Considerable cooing by adults was heard.

### Wedge-tailed Shearwater:

Estimated population: 20,000 - 25,000  
Data Class D

Birds were well distributed over the island.

### Christmas Island Shearwater:

Estimated population: 50 - 100  
Data Class D

One chick at an elevation of about 600 ft. just west of Miller Canyon was found which had down on the sides and nape of the neck. Another chick with down mutton chops was recorded about 150 ft. below Miller Peak.

Red-tailed Tropicbird:

Estimated population: 100

Data Class D

Birds were widely scattered over the island. Seven large feathered young were recorded on the west side. Four almost 3/4 grown young were found, but the cause of death could not be determined.

Blue-faced Booby:

Estimated population: 160

Data Class C

125 adults and 30 young were tallied. Most were on Miller Plateau. All young were flying. Some feeding by adults was observed. Scattered individuals, pairs or single family groups were found on the high exposed ridges, especially the bare areas on the top of the north cliff.

Red-footed Booby:

Estimated population: 1,500+

Data Class B

Approximately 500 young ranging in age from those about 3/4 grown to others which had reached flight stage were recorded. Most, however, were not able to fly. About 450 adults and 150 young in the large colony on Miller Plateau. The tops of Chenopodium, as usual, were utilized as nesting sites. No eggs were found in any of the nests.

Brown Booby:

Estimated population: 135

Data Class B

About 125 were located on the east side. Seven adults were seen on the top of Manager Peak. Two adults with one very large young bird were observed on the west side. Three other adults plus 1 flying young were seen there also. These were near Miller Peak. These birds are the rarest of the three species of boobies.

Great Frigatebird:

Estimated population: 4,600+

Data Class B

Over 1,100 immatures were recorded. Most were very large and well

feathered although still in the nest. The tops of Chenopodium bushes serve as nesting sites. The slopes of East and West Palm Canyons and Miller Canyon were dotted with the nests. About 25 nests were tallied on Miller Plateau.

Sooty Tern:

Estimated population: 2,000 - 3,000

Data Class D

Most of these were found in the upper slope of the saddle between Miller and Tanager Peaks. Several very large young were noted here. Most birds were adult.

Gray-backed Tern:

Estimated population: 6,000

Data Class D

About 95% were almost fledged. About 1,100 young from 1/4 grown to fledgling stage were tallied. About 700 were on the west side and 400 on the east part of the island. All birds were generally well distributed from about 150 feet above sea level to the top of the island.

Fairy Tern:

Estimated population: 100 - 200

Data Class D

This is a very rough estimate. Many of these birds nest in the nooks and crannies of the inaccessible cliffs and could be very easily missed.

Blue-gray Noddy Tern:

Estimated population: 75 - 100

Data Class D

Birds were scattered among the cliffs and rocky outcroppings. Others were noted near the tops of the north cliffs. No eggs or young were found in the usual accessible areas of the south facing slopes.

Common Noddy Tern:

Estimated population: 5,000

Data Class D

About 2,000 of the total were found on the west part of the island. A check of 100 nests at the higher elevations of the west side revealed 34 with eggs, 14 with small downy chicks, and 2 with large almost fledged chicks. Large flying young were noted elsewhere.

Hawaiian Noddy Tern:

Estimated population: 1,000  
Data Class D

The estimation is very rough since most of these birds inhabit the north cliff. About 250 were inhabiting the cliffs of the Devil's Slide near Miller Peak.

Wandering Tattler:

1 seen.

Golden Plover:

Two observed.

Ruddy Turnstone:

Eight noted. One was seen on the top of Miller Peak.

Refuge Management Studies

Nihoa Finch:

Estimated population: 2,341  $\pm$  30.87% at 95% C. L. Range: 1,637 to 3,045

52 randomly selected transects 250 ft. long and 16.5 ft. wide totaling 5.13 acres were run by 5 men. A total of 77 birds were recorded on transect. A similar survey run by two men on May 30, 1969 resulted in a population estimate of 2,987  $\pm$  32.2% with a range of 2,026 to 3,948.

Birds were well distributed over the island. Some were observed feeding on the eggs of common noddy terns which had been flushed from their nests as a result of our activities. In one case approximately 40 were seen feeding on 6 eggs. In another, 6 were noted busily pecking a hole in and eating the contents of another egg. Eggs in all stages of incubation were eaten. Males were more aggressive than females and drove the latter away. Finch were also more aggressive than the terns for several times a tern would return and alight within 6 inches of its eggs and made no effort to drive the finch away, but instead watch them eat it. Finch captured and banded in previous trips frequently had gummy residue on their bills which may have been egg. Obviously they care not about getting caught with egg on their face. Human disturbance undoubtedly causes more than normal predation thus indicating that such disturbance should be held to a minimum. Several old nests were found. These were composed of grass and were in holes in the rimrock. The breeding cycle appeared to have been completed for the year.

### Nihoa Millerbird:

Estimated population: 304  $\pm$  57.06% at 95% C.L. Range: 134 to 477

A survey similar to that for the finch was run for this species. A total of 10 birds were recorded on transects. Another 12 were observed off transect. The location of these plus others seen off transect were marked on aerial photos of the island. Five of these were noted on Miller Plateau.

A similar survey conducted on May 30, 1969 indicated a population of 498  $\pm$  57.5% at 95% C.L. Thus the surveys, if valid, show a drop of both this species and the finch since last year. At that time 15 birds were seen on transect. This latter count was conducted by two men. One variable encountered each trip when five men are used is that usually two men are conducting the transects for the first time and the ability to spot these secretive birds in heavy but low vegetation varies.

Although efforts were made to find nests, none were found.

### Hawaiian Monk Seal:

Two were noted basking on the beach at Derby's Landing.

### Green Sea Turtle:

A small (30-50 lbs. estimated size) turtle was noted swimming adjacent to the sandy beach at Derby's Landing.

### Vegetative Studies:

The island was very dry, and the usual small seeps in the canyons were almost nonexistent. The stands of Sida were very dry and defoliated in some areas. The Cenchrus patch just east of the camp site at the base of Miller Canyon is spreading. Most plants were dry. The infrequency of visits will make control very difficult since the plants should be sprayed with a herbicide at least once a month during the growing season for several years to get plants which have germinated from seed in the interim. One answer may be treatment of the affected area with a pre-ermergent chemical.

## LAYSAN ISLAND

### General:

Parts of three days and two nights were spent on the island. Priority was given to studies involving the Laysan teal, finch, monk seal and turtle. Population estimates of other birds were made in conjunction with the teal and finch transects.

Weather conditions ashore were favorable. Minimum temperatures recorded were 50° and the maximum was 88°. The lagoon gauge read 1.38 feet, and the lagoon itself contained more water than last year about the same time. It was not possible as then to cross between the north end and the middle.

Damage to the west beach of the island was not evident as it had been in the spring; however, in some areas, notably the southwest end, sand had been washed away and coral rock exposed. A netted plastic float was found 300 yards inland on the beach at the northeast part of the island attests to the size of the surf during some winter storms. About 50-75 feet of water now separates the Japanese fishing vessel from the beach where it ran aground in February this year. Action of the surf has removed the sand between it and the island. The bottom is torn out of the vessel, and it is buffeted continually by strong surf action. The group, led by Willard Austin of Honolulu, which trespassed on the island in April for salvage purposes had removed just about everything of value. Left was some of the electronic equipment which had become corroded. A number of glass and plastic fishing floats were salvaged by the Coast Guard for anchor bouys and similar uses. A quantity of rat poison was found in one of the cabinets, and there was evidence of rat chewing on some of the wood items in the cabins. We hope that there were no rats aboard when the vessel hit Laysan. When the crew were rescued last February, the captain was specifically asked if there were any rats aboard at the time of the wreck. He had replied that none had been seen on the trip. A considerable amount of time was spent cleaning up the trash remains of the campsite used by the fishermen the week they spent on the island awaiting rescue. The refuge food cache left near our usual camp site at the northwest had been found and carried down by the Japanese to where they had camped. Most of the contents had been largely unused but scattered about.

### Wildlife

#### Laysan Albatross:

Estimated population: 200  
Data Class C

A minimum of 200 young of the year remained. Most were in poor condition and will undoubtedly die of starvation since they are no longer being fed

by their parents and are too weak to fly. They sit with drooping wings and head and stoically await their fate. Remains of dead chicks of various ages as usual litter the flat west shore of the interior lagoon and furnish a source of food for fly larvae. Nests all along the west beach had been wiped out by the extremely high waves generated by the storms of the past winter.

Black-footed Albatross:

None observed.

Bonin Petrel:

Estimated population: 100,000 +  
Data Class D

These birds were absent during the daylight hours, but at dusk thousands would return to the island. A number were observed digging burrows, but no eggs were found.

Wedge-tailed Shearwater:

Estimated population: 1,000,000 +  
Data Class D

The daylight population was estimated to be at least 400,000 - 500,000 with the nighttime population being at least double, if not triple that. These estimates are at best educated guesses since no time was available to establish sample plots for either day or night populations. Many birds were in their burrows; thousands of others were concealed in the thick belt of Sicyos, Eragrostis, and Ipomea (morning glory) encircling most of the interior lagoon. About 20 nests examined all contained small downy gray chicks. In addition now and then a small chick would be observed near the entrance of a burrow. Considerable caterwauling and moaning by adults took place during the nights.

Christmas Island Shearwater:

Estimated population: 300  
Data Class D

These birds were scattered by ones and twos in the thick vegetation around the interior lagoon. About a half dozen were found among the coral outcroppings on the north beach. No birds that could be positively identified as young were observed.

Fulver's Petrel:

Estimated population: 500  
Data Class D

Most of these were present at night. 1 adult was found under the old

food cache near the northwest campsite. Six others were seen in the Scaevola between the landing and the campsite. 1 half-grown chick was found near the same location.

Sooty Storm Petrel:

None observed. Several burrows near the old guano site at the southwest corner of the interior lagoon were checked with negative results.

Red-tailed Tropicbird:

Estimated population: 750  
Data Class D

These birds occur all over the island under the Scaevola and are hard to find. Most times their presence is only made known by their harsh cries when their nest is too closely approached. Several were incubating eggs. Most other nests contained one-half to almost fully grown young.

Blue-faced Booby:

Estimated population: 150  
Data Class C

About 100 of these birds were immatures. All were capable of flight. No nighttime counts of adults were attempted.

Red-footed Booby:

Estimated population: 300  
Data Class C

About 100 were young of the year, and most were very large but not yet capable of flight. The majority were found in the Scaevola and Pluchea stands in the north and east sides of the island.

Brown Booby:

Estimated population: 5 - 10  
Data Class C

Several were seen by Woodside. One nest with 2 eggs was found.

Great Frigatebird:

Estimated population: 850  
Data Class C

About 350 were very large chicks near flight stage. Very little nesting occurred on the west side this year as a result of the elimination of Scaevola by the winter storms.

Sooty Tern:

Estimated population: 40,000

Data Class D

Of the total population, about 20,000 occurred on the southeast and southwest, 12,000 on the west and northwest, and 6,000 on the east parts of the island. These occurred in scattered colonies of various sizes and generally in the opening spaces among the Eragrostis on higher ground and away from the interior lagoon. Low numbers of chicks almost capable of flight were found. Many others were flying.

Gray-backed Tern:

Estimated population: None noted

Common Noddy Tern:

Estimated population: 20,000

Data Class C

These birds were well distributed over the entire island. Several nests were recorded as being off the ground and on the top of Scaevola brush midway between the beach and the interior lagoon on the west side. All stages of nesting were observed - eggs being incubated to young flying.

Hawaiian Noddy Tern:

Estimated population: 5,000

Data Class D

Large numbers of these birds returned to the island to roost at night. There was no evidence of nesting.

Fairy Tern:

Estimated population: 1,000

Data Class D

Very few were seen during the day. A number were observed at night when they returned to roost on the island. One was captured which carried a band. The number was 652-42628.

Wandering Tattler:

Estimated population: 50

Data Class B

These birds were scattered among plover and turnstones along the shores of the interior lagoon.

Golden Plover:

Estimated population: 50

Data Class C

Although most were found on the shores of the interior lagoon, every now and then one would be observed in the more open grassy areas of the island.

Ruddy Turnstone:

Estimated population: 4,000

Data Class B

Large flocks were observed all the time feeding busily along the shores and the very shallow feathered edges of the interior lagoon.

Lesser Yellowlegs:

One seen by Kridler on the shore of the interior lagoon. In flight it displayed the white tail and uttered its characteristic call. It was observed in good light at a distance of 50 feet with binoculars.

Bristle-thighed Curlew:

Estimated population: 100

Data Class B

These birds were found over the whole island in a variety of areas - on the beaches, the interior lagoon shores, and the more open grassy areas of the uplands.

Emperor Goose:

Two emperor geese were observed on the 18th by Olsen and Sincok. They were first sighted during the evening lagoon teal count as they swam just ahead of the observer. Although lighting conditions were marginal, identification was positive. On the second day they were observed on the south end of the lagoon. A spotting scope was used, and considerable time was spent studying the birds. Unusual was the fact they the birds were moulting. As they extended their wings the shorter than usual primaries were obvious. When an attempt was made to approach the birds, they scuffled off into the vegetation.

These birds must have come to Laysan during the previous winter. They apparently adapted to the conditions there, stayed, and were undergoing their annual moult.

Refuge Management Studies

Hawaiian Monk Seal:

A seal census was conducted on August 17 by circling the entire island on foot and looking for animals hauled up in the vegetation adjacent to the beach as well as on the beaches themselves. In an effort to hold disturbance to a minimum, animals were checked as quietly as possible for tags placed on them previously, and no attempts were made to have them roll over to check sex. Thus most fall within the sex unknown category. A total of 134 were recorded. In early September 147 were tallied. Results of the census this trip are as follows:

Seal Census - Laysan Island, August 17, 1970

	<u>Adults</u>	<u>Subadults</u>	<u>Pups</u>	<u>Yearling</u>
Male	2		8	
Female	2		10	1
Unknown	<u>87</u>	<u>20</u>	<u>4</u>	--
Total	91	20	22	1

There were 19 pups and 1 yearling tagged. All were double tagged with numbered monel metal tags placed in the web of each hind flipper. The exception was No. 934, upon which only one tag was affixed. Tagging data are below:

Seals Tagged - Laysan Island, August 17, 1970

<u>Tag Number</u>	<u>Sex</u>	<u>Age</u>	<u>Remarks</u>
930	M	Pup	
931	F	Pup	
932	M	Pup	
933	F	Pup	
934	Unk.	Pup	Single tagged only
935	F	Y	(Yearling)
936	F	Pup	
937	F	Pup	
938	M	Pup	
939	Tag used on Lisianski		
940	M	Pup	
941	F	Pup	
942	M	Pup	
943	M	Pup	
944	F	Pup	
945	M	Pup	
946	F	Pup	
947	F	Pup	
948	F	Pup	
949	M	Pup	
950	F	Pup	

A total of 10 seals were observed which had been tagged on previous trips. Examination of tagging data revealed several interesting things.

An adult, no. MS 54, had been tagged on Laysan as a pup female on June 26, 1957 by personnel of the Hawaii Division of Fish and Game when they had visited the island then. This animal was observed on this trip August 17, over 13 years later. As far as we can determine, this is the oldest documented age for an individual of this species. Also interesting is the fact that this was the first time it was observed since being tagged.

Another animal, No. 804, was tagged as a pup on Laysan on March 26, 1969. At that time it was double tagged and experimentally marked on its back via the freeze branding technique. No evidence of the brand was apparent.

Six animals which had been double tagged carried only one tag when recorded on this trip. Double tags which had been affixed consisted of a monel metal tag on one flipper and a combination metal-yellow nylon tag on the other flipper. The tag lost was the combination metal-nylon one. This problem had been noted on previous trips and the loss was considered to be of such magnitude that this method of marking was discarded. Now animals are double tagged only with the metal tags.

Recovery Data of Seals Tagged on Previous Trips

<u>Tag #</u>	<u>Age</u>	<u>Date Observed</u>	<u>Island</u>	<u>Date Tagged</u>	<u>Island</u>	<u>Age</u>	<u>Sex</u>	<u>Prev. Returns</u>
51	SA	8/17/70	Laysan	3/19/67	Laysan	Y	F	1
MS 54	A	8/17/70	Laysan	6/26/57	Laysan	P		0
199	SA	8/17/70	Laysan	9/21/67	Laysan	SA	M	2
200	SA	8/17/70	Laysan	9/21/67	Laysan	Y	M	2
**378	SA	8/17/70	Laysan	9/5/68	Laysan	P	M	0
**705	SA	8/17/70	Laysan	6/2/69	Laysan	P	M	0
**716	SA	8/17/70	Laysan	6/2/69	Laysan	P	F	0
! **804	SA	8/17/70	Laysan	3/26/69	Laysan	P	M	0
**818	SA	8/17/70	Laysan	3/26/69	Laysan	Y	F	1
**825	SA	8/17/70	Laysan	3/26/69	Laysan	SA	M	2

! : Freeze branded

\*\* : Double tagged - only 1 tag left at return observation.

Green Sea Turtle:

Two turtles were observed. One carried a Hawaii Fish and Game Tag. No. 1011. Incomplete records of the Division reveal that this animal was probably tagged in February - March, 1963 by Ray Kramer of the Division when he participated in a Pacific Project, Smithsonian Institution field trip to some of the refuge islands.

### Laysan Teal:

Considerable time and effort was devoted to trying to obtain a reliable estimate on the number of these birds, especially in view of the steady decline in numbers. As stated in other reports, lack of opportunity to spend an extended period of time on the island during the breeding season has prevented us from obtaining any information which might give us some insight as to whether lack of reproduction (either high brood mortality from some cause or just very low breeding activity) is a major factor in the decline.

Sampling by the transect method as used for the finch is not suitable since the percent error is much too great. Estimated population via this method was  $136 \pm 97.3\%$ ... The range would be 4 to 268. So morning and evening counts of birds on the lagoon and the beat-out method were used as before for an index.

Four counts were made. Three were lagoon counts, and the fourth was a beat-out. During the evening of August 17, the lagoon shoreline was divided into four parts and an observer assigned one part. Two men started on the north end and worked down the east and west side separately, while another two men started on the south end and worked up their respective shores. A total of 50 birds were observed.

On the morning of August 18, the same observers attempted another lagoon count in a similar fashion at sunrise. This proved to be unsatisfactory because many of the birds had already left the shore and moved into the surrounding vegetation. In the future, observers will have to be in place, ready to observe, just before it is light enough to see.

Another evening count was made on August 18 using the same procedure as the preceding evening. This resulted in only 38 birds being seen.

On August 19, a beat-out by five men of the vegetation completely around the lagoon was made. Each observer kept a record of birds seen. To determine what error might occur from possible duplication of birds or missing birds, each observer kept a separate record. Totals recorded were 32, 32, 35, 35, and 40. Discrepancies could have occurred as a result of one or several men missing a call, not being able to mark where a flushed bird had landed again and counting it again, or not seeing a bird another had seen. Regardless, this is the lowest count ever made since they were initiated in March, 1964.

One bird was captured which proved upon examination to be an immature female thus indicating that there was some reproduction the past summer.

### Laysan Finch

A total of 120 finch transects were conducted on August 19. The transects were selected at random and were 300 ft. long and 16 ft wide. Estimated

population was 6,764 birds + 22.29% at 95% C. L. Range 5,256 to 8,272.

The following table shows results of previous counts conducted in the same manner:

<u>Date</u>	<u>Population Estimate</u>	<u>Percent Dev. at 95% C.L.</u>
September, 1967	7,779	34.6
September, 1968	6,981	22.3
March, 1969	11,183	28.8
September, 1969	No Count Made	
August, 1970	6,764	22.3

Finch were well distributed over the island in just about every conceivable habitat, from the vegetation line on the perimeter beaches to the edges of the interior lagoon. Several times they were observed drinking water from the saline interior lagoon. The breeding season appeared to be over.

#### Collections:

In cooperation with the Oceanic Institute, Hawaii, refuge personnel collected the following seabirds for analysis for DDT and mercury by the institute:

- 2 Common Noddy Terns
- 2 Wedge-tailed Shearwaters
- 2 Red-tailed tropicbirds
- 2 Sooty Terns
- 1 Bulwer's Petrel

#### Vegetation:

The broad belt of Scaevola and morning glory that was wiped out by the high surf early this year is making a recovery. Scaevola is sprouting from roots and morning glory is carpeting much of the area. Nama occupied broad expanses of the north and east beaches.

## LISIANSKI ISLAND

### General

The schedule permitted only part of a day to be spent on this island. Priority was given to the seal census and tagging program. Seabird populations were estimated from the perimeter while encircling the island on the seal work. As a result, data for the smaller birds and those which burrow or nest under the vegetation are very gross and a guss at best.

### Wildlife

#### Laysan Albatross:

Estimated population: 10  
Data Class C

Only six very large chicks were observed. Most appeared to be in a weak condition.

#### Black-footed Albatross:

None observed.

#### Wedge-tailed Shearwater: 100

Present but no estimate made. Several large downy white chicks near the entrance of burrows were noted.

#### Red-tailed Tropicbird:

Present but no estimate made.

#### Blue-faced Booby:

Estimated population: 160  
Data Class E

Since these birds are found almost entirely on the beach, they were easy to census. Of the 88 tallied, 65 were very large young (almost able to fly) while the other 23 were adults. No count was made to determine what percentage of the adults were singles or pairs.

#### Red-footed Booby:

Estimated population: 550+  
Data Class C

A total of 170 adults were tallied. There were a minimum of 165

immatures or very large nestlings almost able to fly. Most could fly. Some immatures were gathered in small clubs of 10-15 birds.

Brown Booby:

Estimated population: 10+  
Data Class D

A total of 6 adults and 4 immatures were noted. No nests were seen.

Great Frigatebird:

Estimated population: 1,300+  
Data Class D

A total of 400 very large chicks still in the nest and 470 adults were noted. There were few flying immature birds observed. Some adults were soaring high above the island, some almost out of sight in the distance.

Fairy Tern:

Present in low numbers but no estimate made.

Common Noddy Tern:

Present in fair numbers but no estimate made.

Sooty Tern:

Present in very low numbers but no estimate made.

Bristle-thighed Curlew:

Estimated population: 25  
Data Class D

There were 11 of these birds recorded. Since the interior of the island was not checked, it is likely that a few were there. These birds prefer the more open areas of an island.

Golden Plover:

Estimated population: 25  
Data Class D

Ruddy Turnstone:

Estimated population: 125  
Data Class D

A total of 105 were actually recorded on the beaches. A few more may have been present in the interior of the island.

Hawaiian Monk Seal

A total of 109 seals were tallied. As at Laysan, no attempt was made to disturb them unduly to record the sex; thus, most are recorded as of unknown sex. The results of the census are as follows:

Seal Census - Lisianski Island, August 21, 1970

	<u>Adults</u>	<u>Subadults</u>	<u>Pups</u>
Male	9	5	0
Female	4	4	5
Unknown	<u>73</u>	<u>4</u>	<u>0</u>
Total	91	13	5

There were only 5 pups tagged this trip. All were double tagged with identically numbered monel metal tags, except No. 939 on which only one tag was placed. Rectal temperatures were taken on two animals in cooperation with Dr. G. Causey Wittow of the University of Hawaii who is studying thermal regulation in mammals.

Seals Tagged - Lisianski Island, August 21, 1970

<u>Tag Number</u>	<u>Sex</u>	<u>Age</u>	<u>Remarks</u>
939	F	P	Rectal temperature 99.6°F. Animal wet.
976	F	P	Rectal temperature 96.6°F. Animal wet.
977	F	P	
978	F	P	
979	F	P	

There were 10 animals recorded which had been tagged previously. All had been tagged on Lisianski. This data plus that for other islands and times shows that these animals have a strong affinity for their natal island. Four animals had been double tagged with the metal and metal-nylon tag combination, but they carried only the single metal control tag. This plus data for other returns on this and other islands confirms significant tag loss of the metal-nylon combination.

The following previously tagged seals were observed:

<u>Tag #</u>	<u>Return Date</u>	<u>Age</u>	<u>Location</u>	<u>Tagging Date</u>	<u>Age</u>	<u>Sex</u>	<u>Loc.</u>	<u># Prev. Rec.</u>
A71	8/21/70	SA	Lisianski	3/21/67	Y	F	Lisianski	1
A72	8/21/70	SA	Lisianski	3/21/67	Y	M	Lisianski	0
A78	8/21/70	SA	Lisianski	3/21/67	P	F	Lisianski	2
A229	8/21/70	SA	Lisianski	9/25/67	Y	M	Lisianski	0
A245	8/21/70	?	Lisianski	9/26/67	Y	M	Lisianski	1
A318	8/21/70	SA	Lisianski	3/20/68	P	F	Lisianski	1
*A827	8/21/70	SA	Lisianski	3/30/69	P	F	Lisianski	1
*A834	8/21/70	SA	Lisianski	3/30/69	P	F	Lisianski	0
*A836	8/21/70	SA	Lisianski	3/30/69	P	M	Lisianski	1
*A841	8/21/70	SA	Lisianski	3/30/69	Y	M	Lisianski	0

\* Animals double tagged but only 1 tag remained at time of return observation.

Green Sea Turtle:

While conducting our seal count, a total of 8 turtles were tagged. In addition four small turtles under 20 pounds and one large turtle approximately 200 pounds were observed swimming just offshore. Turtle tagging data is incorporated in the following table.

<u>Number</u>	<u>Sex</u>	<u>CL</u>	<u>CW</u>	<u>PL</u>	<u>T</u>	<u>Round</u>
398	F	17.6	15.2	14.0	6.9	18 3/4 X 17 3/4
399	F	15.5	12.5	12.6	5.6	16 X 14 1/2
400	F	16.1	13.3	12.7	6.2	17 X 15 1/4
924	F	16.8	13.5	14.1	6.2	17 3/4 X 16
925	F	16.5	13.1	13.1	6.1	17 X 15 3/4
998	F	17.1	14.5	14.2	6.5	18 1/2 X 17 1/2
999	F	17.3	14.3	14.1	6.5	18 X 16 1/2
1000	F	17.1	13.6	13.3	6.1	18 X 15 3/4

Hawaiian Islands National Wildlife Refuge  
Field Trip Report  
December 1970

Personnel

Eugene Kridler - Wildlife Administrator, Bureau of Sport  
Fisheries and Wildlife, Kailua  
David L. Olsen - Refuge Manager Assistant, Bureau of Sport  
Fisheries and Wildlife, Kailua  
Dr. J. Lindsley Cressitt - Bishop Museum Entomologist, Honolulu, Hawaii  
Robert Fakuda - U. S. Attorney

Itinerary

December 13 - Depart Hickam AFB via MAC 10:11 AM. Arrived Midway  
1:17 PM. Overnight Midway.  
December 14 - Departed Midway via Navy Helicopter, arrived Southeast  
Island, Pearl and Hermes Reef 11:16 PM.  
December 15 - Departed Grass Island, Pearl and Hermes Reef 4:08 PM.  
December 16 - On Midway  
December 17 - Departed Midway via MAC 11:43. Arrived Hickam AFB  
3:22 PM, cleared Customs 5:30 PM. Returned to Kailua  
via Government vehicle 6:30 PM.

General

Prior to this trip most of our visits to the refuge islands have been during either the spring or summer months. Due to weather conditions, rarely have any trips been made to the refuge islands during the winter. High winds and heavy seas usually prevail and landings by small boat on the refuge islands are very risky then. The primary objective of this trip was to determine the status of the seal, turtle and Laysan Finch populations on Pearl and Hermes Reef during December.

Although the length of time on the islands was short, the seal population was censused and checked for tags, 19 large green sea turtles were tagged, measured and weighed and a finch count was conducted. Wildlife population estimates were made for all species of birds found on Southeast Island. Time did not permit us to estimate those on the other islands. Necropsy examination did not disclose any unusual problems or significant changes.

Refuge "Blue Goose" and penalty signs were erected on North, Grass and Kittery Islands.

Mr. Fakuda, United States Attorney, was extremely interested in the refuge program, and this trip afforded him the opportunity to get a first hand look at one of the units of the refuge and some of the wildlife. He was instrumental in expediting the Laysan Island trespass case. Dr. Cressitt is a well known entomologist and he has been active

in Hawaii's conservation effort. He is chairman of the Governor's Committee for Natural Areas. This trip also afforded him the opportunity to visit both Midway and Pearl and Hermes Reef and make insect and other arthropod collections on both islands.

Weather conditions during the trip were marginal. Winds gusted up to 40 knots during the first day on the islands and hampered operations slightly. Occasional rain showers buffeted the atoll during the afternoon and night. Only 2 days were spent on the atoll. Had we stayed another day, it was quite possible that the helicopters would have been unable to pick us up because a low pressure frontal system moved over Midway and Pearl and Hermes for 2 days very shortly after our departure from the area.

### Wildlife Populations

#### General

Except for the Laysan Albatross and Sooty Storm Petrel, most population estimates reflected expected winter conditions - fewer birds and little nesting activity. A number of species of migrant shorebirds were observed, including one unusual visitor, the Glaucous-winged Gull.

Many species of plants were in a relatively dormant stage. Sesuvium, Tribulus, and Boerhavia stands were growing quite well. It was too early for much growth of the two introduced species, sow thistle (Sonchus) and mustard (Brassica). A few plants of the latter variety were noted, however, it would have been too early to even attempt to control this weed since plants were just barely beginning to appear above the ground.

#### Laysan Albatross

Estimated Population: 50,000, Data Class B

The island was literally covered with Laysan Albatross and they appeared to be significantly more numerous than they were during February 1969. Eggs were well along into the incubation period, however, there were no signs of any hatching. A concentration of 50,000 albatross on a 32-acre island is certainly an impressive sight.

#### Black-footed Albatross

Estimated Population: 15,000, Data Class B

Most of the nesting by this species was confined to areas along the shoreline, although nests were also scattered throughout the island.

#### Wedge-tailed Shearwater

Estimated Population: 50-100, Data Class C

Two fully feathered young with but a trace of down on the nape of the neck were found. Nesting was thus essentially complete. At dusk a few adults returned to the island.

### Sooty Storm Petrel

Estimated Population: 500, Data Class C

A total of 38 sooty storm petrels were banded. This was apparently the beginning of the nesting season, for birds were extremely active and digging burrows. Pairs were found in many burrows, but no eggs were found. No birds were seen during the day; however, at night the Bermuda grass patch south of the refuge sign was literally covered with birds. (Band numbers 682-16162 through 682-16200, in addition a previously banded bird 682-17741 was recaptured, this bird was originally banded on Feb. 10, 1969 on the same island.)

### Red-tailed Tropicbird

None noted.

### Blue-faced Booby

Estimated Population: 24, Data Class A

Very few were observed during the daylight hours. A head count was completed after dark when most of the birds came back to the island to roost. No nests were noted.

### Red-footed Booby

Estimated Population: 70, Data Class A

These birds also spent their daylight hours feeding at sea and came to the island only to roost at night. Some nesting had begun, however, for three nests with eggs were observed. Head counts totaled 57 adults, 11 immatures, 3 eggs and one medium chick.

### Brown Booby

Estimated Population: 35, Data Class A

Three large immature birds capable of flight were found on the east side of the large part of the island. Another not quite able to fly was observed there also. A total of 30 adults and flying immatures were seen flying off the island proper to the fringing reef on the east side. No nests were recorded.

### Great Frigatebird

Estimated Population: 42, Data Class A

A few birds were noted on freshly built nests, however, no eggs were

found. On one occasion we watched the aerial acrobatics of three frigates, as two attempted to rob a fish from the third bird.

Sooty Tern

None observed.

Gray-backed Tern

None observed.

Fairy Tern

A single bird was observed roosting on the island.

Common Noddy Tern

One bird was observed.

Hawaiian Noddy Tern

Estimated Population: 700, Data Class C

These birds spent the daylight hours feeding at sea and only after dusk did they return to the island to roost in the Scaevola. No nesting activity was noted.

Sanderling

Seven were observed on Southeast Island.

Wandering Tattler

A single individual was observed on Southeast Island.

Bristle-thighed Curlew

11 were seen flying over Southeast Island and a single bird was observed on Seal Island.

Golden Plover

Estimated Population: 30, Data Class B

Most of the birds were seen around the brackish water area on the east end of Southeast Island.

Ruddy Turnstone

Estimated Population: 200, Data Class B

Most of these birds were seen around the shoreline of Southeast Island, a few were observed on the other islands on the Atoll.

Glaucous-winged Gull

A single bird was observed flying over the North Island sand spits. The bird flew within 30 feet of Kridler and Olsen. The general silvery color with darker primaries were quite evident.

## Refuge Management Studies

Hawaiian Monk Seal

All of the islets within Pearl and Hermes Reef were visited by helicopter on December 14 and 15. A total of 80 animals were censused (Table 1).

Table 1  
Seal Census  
Pearl and Hermes Reef  
December 14-15, 1970

<u>Island</u>	<u>Adults</u>			<u>Subadults</u>			
	<u>M</u>	<u>F</u>	<u>U</u>	<u>M</u>	<u>F</u>	<u>U</u>	
North	4	7	5	2	2		
Little North			5				
North Sandbars	1	2	2	2	1	4	
Southeast			8		1	3	
Bird			14				
Grass			10				
Seal			3				
Kittery		2	2				
Totals:	5	11	49	4	4	7	<u>80</u>

Unusual was the fact that no pups produced this past season were observed. On two previous trips to Pearl and Hermes Reef during 1970 a total of 16 seal pups were tagged yet none were observed during this trip.

A total of 10 previously tagged seals were observed (Table 2). All had been originally tagged on Pearl and Hermes Reef. These data support our premise that there is a strong affinity to a specific island or atoll and that only occasionally do seals wander to other atolls.

Table 2  
Seal Recapture Information  
Pearl and Hermes Reef  
December 14, 1970

<u>Tag No.</u>	<u>Location</u>	<u>Age</u>	<u>Tag Date</u>	<u>Age</u>	<u>Sex</u>	<u>Location</u>	<u># Previous Returns</u>
A99	North	SA	3/22/67	P	F	Seal	2
A104	North		5/28/67	P	F	Seal	1
A140	North		7/6/67	Y	F	Southeast	2
A142	Southeast	SA	7/7/67	SA	F	Southeast	2
A170	Kittery		7/8/67	A	M	Kittery	2
A278	North		9/22/67	Y	H	North	1
A283	Southeast	SA	9/27/67	Y	F	Little North	2
A338	Southeast	SA	3/22/68	Y	M	Southeast	2
A546	Grass	A	9/20/66	A	T	Southeast	1
A565	Southeast		9/22/66	P	F	North	1

#### Green Sea Turtle

A total of 19 turtles were measured and weighed on North and Southeast Islands. Twelve were tagged for the first time and their weights ranged from 60 to 210 pounds (Table 3). Seven turtles were originally tagged at Pearl and Hermes Reef and again recaptured there (Table 4). One was originally tagged during 1964 and this animal only reflected approximately 2 inches of shell growth in over 6 years. Some animals showed a weight gain while others stayed the same and one animal lost weight.

Two large growths totaling approximately 4 pounds were surgically removed from one animal. They have been frozen and retained for examination.

Table 3  
Green Sea Turtle Tagging Data  
Pearl and Hermes Reef  
December 14-15, 1970

Tag	Sex	Location	Plastron Length	Carapace Length	Carapace Width	Carapace Thickness	Round Measurements	Weight
927	H	North Is.	27.4	30.1	26.3	10.1	35 X 32	175
928	M	North Is.	27.4	33.3	26.5	11.1	35 1/4X 33	185
929	M	North Is.	27.8	33.0	28.5	12.3	35 1/4X35 1/4	210
930	M	North Is.	26.7	33.3	27.1	11.3	35 1/4X 34	180
931	F	North Is.	26.4	32.0	25.3	12.1	34 1/2X 32	170
932	M	North Is.	28.2	34.7	27.4	12.1	36 X 35 1/4	210
933	M	North Is.	26.1	33.0	26.7	11.3	35 1/4X 33 1/2	175
934*	M	Southeast	26.3	32.3	26.6	11.2	34 X 32 5/8	180
	F	Southeast	25.3	31.4	24.2	12.4	35 3/8X30 1/4	155
936	M	Southeast	27.1	33.0	25.7	10.7	34 X 31	160
937	F	Southeast	24.5	29.7	22.1	10.3	31 1/2X28 1/2	125
938	F	Southeast	29.1	35.3	27.2	14.2	38 3/4X35 1/2	250
939	F	Southeast	19.1	23.6	19.0	8.6	24 3/4X22 1/2	60

\* 934 originally tagged on 9/24/66 with tag # 161 - old tag removed and replaced by tag # 934.

Table 4  
Turtle Recapture Data  
Pearl and Hermes Reef  
December 14-15, 1970

<u>Tag</u>	<u>Sex</u>	<u>Location</u>	<u>Plastron Length</u>	<u>Carapace Length</u>	<u>Width</u>	<u>Thickness</u>	<u>Round Measurements</u>	<u>Weight</u>	<u>Date</u>
130	F	North	25.5	31.1	25.4	12.3	34 1/2X 33 31 1/2X29 1/2	155	12/14/70 9/20/66
* 161	M	Southeast Southeast	26.3	32.3	26.6	11.2	34 X 32 5/8 34 X 33	180	12/15/70 9/24/66
442	M	Southeast	27.7	35.2	26.2	12.2	37 X 33 1/2 38 1/2X 35 1/2	195	12/15/70 3/21/67
881	M	North	26.2	33.3	24.3	10.8	34 3/4X 31	155	12/14/70
	M	North	26.1	33.0	24.2	12.0	34 1/2X30 7/8	174	3/31/69
882	F	North	27.5	34.7	27.3	13.3	37 3/4X34 3/4	225	12/14/70
	F	North	27.0	33.6	26.9	12.2	36 1/2X 34	208	3/31/69
	M	Southeast	27.0	32.2	23.9	12.2	34 1/2X 31	155	12/15/70
	M	Southeast	27.5	32.0	23.6	12.1	34 1/2X 31	165	9/17/69
1042	M	Southeast	27.3	33.0	26.3	12.4	35 1/2 X 33	180	12/15/70
	F	Southeast	26.2	31.8	25.1	13.3	35.0X32.5	180	4/1/69
	F	Southeast					33 1/2X30 1/2		3/3/64

\* Tag # 161 not securely fastened - removed and replaced with Tag # 934.

Laysan Finch

One hundred random Laysan finch transects were made on Southeast Island on December 15. Thirty were completed on the west part of the island while 70 were completed on the larger end of the island. Each transect was 150' long by 16.5' wide. Seventy-one birds were counted on transect. Using the accepted method of calculating the population, the total finch count was 425.

$$\text{Total Birds} = \frac{\text{Number counted} \times \text{Total area}}{\text{Area Sampled}}$$

$$\text{Total Birds} = \frac{77 \times 31.37}{(16.5 \times 100 \times 150)} = \frac{2,416}{43,560} = 425$$

Raw field data are included in table 5. Standard deviation was calculated and at the 95% confidence level the population is 425  $\pm$  43.3% or from 241 to 609.

$$s = \sqrt{\frac{n(\sum x^2) - (\sum x)^2}{n^2}}$$

$$\sum x = 71$$

$$s = \sqrt{\frac{100(291) - (71)^2}{(100)^2}}$$

$$\sum x^2 = 291$$

$$n = 100$$

$$s = \sqrt{\frac{29100 - 5041}{10000}}$$

$$m = 0.71$$

$$s = \sqrt{\frac{24059}{10000}}$$

$$95\% \text{ CL} = m \pm t_{.05} \times s \bar{x}$$

$$95\% \text{ CL} = 0.71 \pm 1.982 \times .1551$$

$$s = \sqrt{2.4059}$$

$$95\% \text{ CL} = 0.71 \pm 0.3074$$

$$s = 1.5510$$

$$95\% \text{ CL} = 0.71 \pm 43.3\%$$

$$s \bar{x} = \frac{1.551}{\sqrt{100}}$$

$$s \bar{x} = \frac{1.551}{10}$$

$$s \bar{x} = .1551$$

Table 5  
 Finch Transects  
 Southeast Island  
 December 15, 1970

<u>Transect No.</u>	<u>X</u>	<u>X<sup>2</sup></u>	<u>Transect No.</u>	<u>X</u>	<u>X<sup>2</sup></u>	<u>Transect No.</u>	<u>X</u>	<u>X<sup>2</sup></u>
1	0		34	0		67	3	9
2	0		35	1	1	68	3	9
3	3	9	36	0		69	0	
4	0		37	1	1	70	0	
5	0		38	0		71	2	4
6	0		39	0		72	0	
7	0		40	0		73	0	
8	0		41	1	1	74	0	
9	0		42	0		75	1	1
10	4	16	43	0		76	0	
11	0		44	1	1	77	1	1
12	0		45	1	1	78	0	
13	0		46	0		79	6	36
14	0		47	0		80	0	
15	0		48	0		81	0	
16	0		49	0		82	1	1
17	0		50	0		83	0	
18	4	16	51	0		84	0	
19	0		52	0		85	0	
20	0		53	0		86	1	1
21	0		54	0		87	0	
22	1	1	55	0		88	0	
23	0		56	1	1	89	0	
24	5	25	57	0		90	0	
25	0		58	0		91	0	
26	0		59	5	25	92	0	
27	1	1	60	0		93	1	1
28	0		61	2	4	94	0	
29	1	1	62	0		95	0	
30	0		63	0		96	0	
31	0		64	0		97	0	
32	0		65	10	100	98	3	9
33	1	1	66	2	4	99	1	1
						100	3	9

Although statistical data indicate a population range of 241 to 609 birds, personal observation would place the actual figure at the lower figure. The 10 birds seen on transect No. 65 is felt to have unduly influenced the data.

Eugene Kridler  
 Wildlife Administrator  
 January 6, 1971

#### BODY TEMPERATURE OF THE HAWAIIAN MONK SEAL

Kenyon and Rice (Pacific Sci., 13:215-252, 1959) recorded a rectal temperature of 31.1° C in an adult male Hawaiian monk seal (*Monachus schauinslandi*), immediately after the animal had been shot. The intrathoracic temperature of the same animal was 35.5° C. These are the only measurements of deep-body temperatures for this species that are reported in the literature; because of the discrepancy between them, it seemed desirable to obtain further information on the body temperature of one of the few tropical species of pinnipeds (Scheffer, Seals, sea lions, and walruses. . ., 179 pp., 1958).

We took additional measurements during three separate visits to the Hawaiian Islands National Wildlife Refuge in the period June to August 1970. Rectal temperatures were determined by a mercury-in-glass clinical thermometer that had been calibrated against a standard thermometer. The thermometer was inserted 10 centimeters into the rectum and left there for at least 3 minutes. All measurements were made while the animals were ashore. The mean rectal temperature of five young seals was 36.9° C, with a range of 35.9° to 37.8°. These values are within the range of rectal temperatures reported for other pinnipeds (Irving, in The biology of marine mammals, pp. 147-174, 1969) and the mean value is identical to the mean of three young California sea lions kept in Hawaii (Whittow, Matsuura, and Lin, Physiologist, 13:339, 1970). These results suggest that the Hawaiian monk seal regulates its body temperature at approximately the same level as do other species of pinnipeds.

This work was supported by a National Science Foundation grant (GB 8393).—E. KRDLER, D. L. OLSEN, AND G. C. WHITTOW, U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Kailua, Hawaii, 96734, and Department of Physiology, School of Medicine, University of Hawaii, Honolulu, 96822 (Whittow).  
Accepted 21 December 1970.



AUDUBON

MARCH 1970



DAVID B. MARSHALL, U.S. FISH AND WILDLIFE SERVICE

*Laysan Island—a speck of coral,  
sand, and lagoon in the North Pacific  
scarcely 40 feet above the sea,  
its incredible birdlife once so  
besieged that three unique  
species were lost to the world,  
a ghost island rescued by intrepid  
scientists so that the Laysan albatross  
still dances in the sun*

**F**ROM THE GENTLY ROCKING DECK of the U.S. Coast Guard cutter *Buttonwood* we could see, lying off to the east, the historic bird island of Laysan. Unlike some of the other rocky islets and atolls we had visited within the boundary of the Hawaiian Islands National Wildlife Refuge, Laysan scarcely rose above the surface of the ocean. From this distance, in the early morning sunlight, it was only a thin yellow line between the sea and the deep-blue sky. But that unimpressive stretch of coral has long been known as one of the world's most productive seabird nurseries. Thus, small groups of people have been coming to this remote part of the mid-Pacific for decades.

Earliest of the ornithologists to visit Laysan were Henry Palmer and George C. Munro, who spent eleven days there in 1891; Walter Rothschild then wrote a three-volume report on their pioneering expedition, although he personally never visited any of the Hawaiian islands. Sailing aboard the U.S. Fish Commission steamer *Albatross*, Walter K. Fisher, C. C. Nutting, and John O. Snyder landed on Laysan on May 16, 1902, and stayed for a week; Fisher wrote a sound and detailed report on the island's birdlife.

Our five-man scientific party was led by Eugene Krider of the Bureau of Sport Fisheries and Wildlife. Gene is manager of the refuge that includes most of the Leeward Islands in the Hawaiian archipelago, and he was accompanied by his assistant, Dave Olsen, and biologists Karl Kenyon and John Sincock. As field editor for *Audubon*, I had signed on as the fifth member.

Of all the intrusions on Laysan Island, none brought greater change than the arrival of Max Schlemmer, 79 years ahead of our landing. In 1890 the Kingdom of

# Haunted Sands of Laysan

by GEORGE LAYCOCK



GEORGE LAYCOCK

...wahi granted mining rights on Laysan to a guano company which dispatched Schlemmer from the main islands to manage the operation. As he sailed from Honolulu with his family and worldly belongings, Schlemmer must have had only the vaguest idea of how life would be on an island less than two miles long.

He saw Laysan as it had been through centuries—low sand dunes rising no more than forty feet above the high-tide mark, and blanketed with the dark greens of thick-growing *Scaevola*, a flowering shrub peculiar to these islands that in some places was shoulder-high. In the heart of the island lay a mile-long lagoon, a shallow basin of water saltier than the surrounding ocean. And on the north side of this pond was a tiny pool, the only source of freshwater on the island except for rain.

A long gentle slope extended down to the lagoon's edge, and here the main cover was *Eragrostis*, a coarse-bladed bunch grass growing in clumps two to three feet high.

Everywhere over this scene were seabirds, some of which are present on Laysan each month of the year. Schlemmer, looking across his new domain, saw clouds of sooty terns mixed with soaring albatrosses and tropicbirds, fairy terns, boobies, and as evening came, thousands of petrels and shearwaters. This extravaganza must have amazed Schlemmer, and as he tried to sleep that first night on Laysan, the calling of the terns mingled with the deep-throated moaning of the shearwaters certainly gave him long wakeful hours to ponder the wisdom of coming to this lonely place to live and work.

Laysan was indeed a frontier where men were cut off from the rest of the world the moment their ship steamed

out of sight. There was no radio, no regular postal service, no medical help, and no way of obtaining emergency supplies. The guano workers on the island would truly learn the meaning of isolation. Yet Schlemmer lived there fifteen years, and his son Eric, born in 1904, was perhaps the only person ever to have claimed Laysan Island as his birthplace.

Schlemmer's ship had brought lumber, with which he built a modest frame house on the ridge above the landing, plus several small outbuildings used in the mining operation. The rest of the wood went into cross-ties for a short stretch of track reaching across the sands. Along these rails, carts carried guano from the deposit to the beach, where it awaited shipment to Honolulu.

But Schlemmer also saw other possibilities in his island. He brought a few coconut seedlings to plant beside his house. He imported a few guinea pigs and turned them loose. He brought a supply of tobacco seed and planted a patch.

Then Schlemmer decided Laysan needed some animals to supply meat. There was all that greenery growing there and not doing anyone a bit of good—and it would take a world of rabbits to eat that much.

Word went back to Honolulu on a visiting ship that Max Schlemmer wanted some Belgian hares, the big domestic rabbits that produce a lot of fine white meat and good-sized skins as well. So one fateful day in 1902, along with a supply of flour, salt, bacon, cloth, and hand tools, there arrived on Laysan's beach the first rabbits ever to reach that Pacific island. The number of rabbits brought ashore in that first shipment has been lost to history, but it was small, for Schlemmer imported rabbits

three times that year and the next, and they totaled only eight or nine. But eight or nine rabbits, as events—and rabbits—were soon to prove, can go a long way.

By 1906, with the guano business rapidly sliding downhill, Schlemmer had packed up his family and belongings and had shipped out for Honolulu. He left behind some weathered buildings standing in the shade of two scrawny coconut trees, a few feral guinea pigs, plus a vigorous and fast-expanding colony of multicolored Belgian hares, hopping through the *Scaevola* bushes and nibbling contentedly at the native vegetation.

The rabbits shared the island with the seabirds whose descendants still come to Laysan to nest. But there were also a few birds that lived on Laysan the year around, some of them known nowhere else in the world. These endemic species included the teal-sized dark-brown Laysan ducks which fattened on brine flies swarming around the edges of the lagoon. There were Laysan finches, yellowish, sparrow-sized birds that nested in the *Eragrostis* clumps. There were red-tinted honeycreepers, and skulking millerbirds, about the size of house wrens. And running through the grass were strange little rails that had evolved only one place on Earth.

The Laysan rails scurried around the abandoned buildings like tiny domestic chickens. Their wings were short and the birds were incapable of flight. They survived because the vegetation provided escape cover from larger birds and because there were no predatory mammals or reptiles to pursue them.

The Schlemmers had been gone from Laysan only a few years when President Theodore Roosevelt, early in 1909, signed an executive order declaring the Leeward Islands to be the Hawaiian Islands Reservation, one of the earliest of America's national wildlife refuges. The same year a band of Japanese plume-hunters ran their boat up on the shore of Laysan Island and took up residency in the old Schlemmer home.

**T**HESE NEW INTRUDERS arranged their tools, stacked their shipping crates in one of the sheds, and set to their grisly task with unequaled efficiency. Their major victims were the thousands of albatrosses that historically returned to Laysan in incredible numbers to nest, but the plumers also took feathers of several other species. They found it exceedingly simple to walk among the unafraid seabirds and knock them on the heads with sticks. To gather the wing feathers, they usually cut off the entire wing, sometimes killing the bird, sometimes not. Soon dead and crippled seabirds littered the coral sand.

Word of the depredations on the new federal refuge leaked out and the revenue cutter *Thetis* was dispatched from Honolulu to apprehend the poachers. Government agents swooped in on the beach and the bird-killers, having no place to run, were soon captives. The whole band, feathers and all, were taken back to Honolulu on the *Thetis*. Behind them was a desolate scene, the weather-beaten buildings once again empty—surrounded with trash now, and the decaying bodies of thousands of birds, around which swarmed multiplying flies. Meanwhile the rabbits, more abundant than ever, spent their days in petrel burrows or in holes they themselves dug,

emerging in the evenings to continue cutting away at the disappearing vegetation, bringing Laysan steadily closer to its day of biological reckoning.

Among those saddened by the turn of affairs on Laysan was ornithologist C. C. Nutting, professor of zoology at the University of Iowa, who had visited the island in 1902. Two years later, on a visit to Iowa City, he showed lantern slides of the amazing courtship dance of the albatrosses. In the audience was a nine-year-old lad named Alfred M. Bailey. "I went home that night and dreamed about albatrosses," he told me recently, "and ever since I've been interested in them."

In 1911 Dr. Nutting influenced the U.S. Biological Survey to send a party to the Leeward Islands to make a museum collection of the native birds there. Professor Nutting handed the assignment to lead this party to an assistant professor, Homer R. Dill, who was shortly enroute to Hawaii in the company of a few assistants.

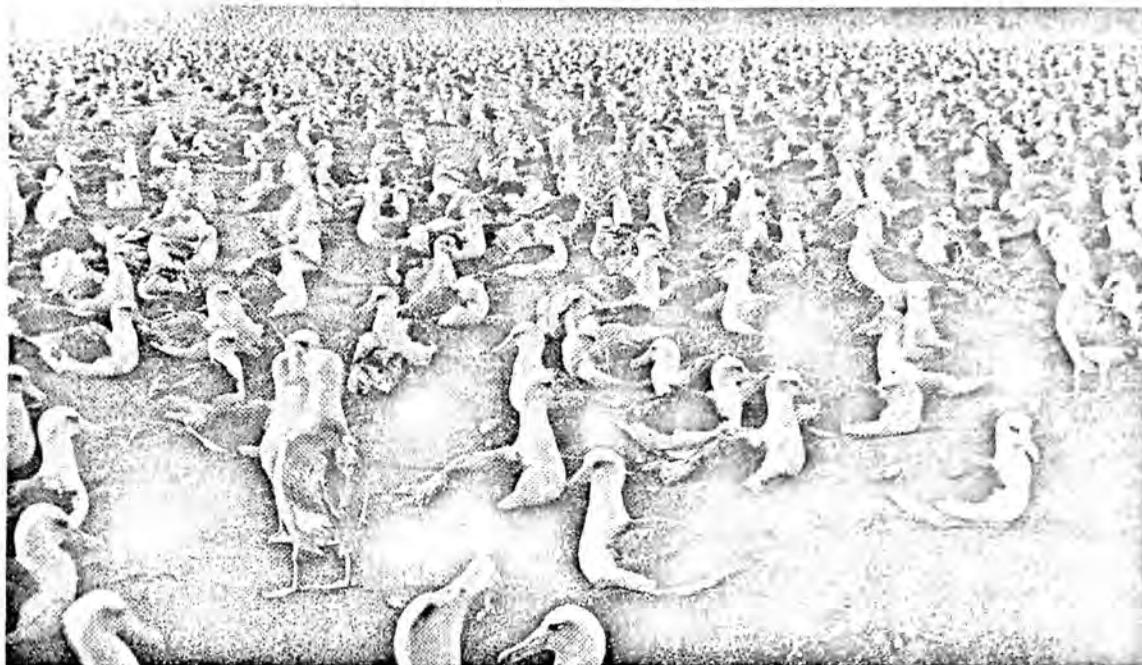
Dill and his group sailed out of Honolulu April 17, 1911, on the *Thetis*. Several days later, when they came within about fifty miles of Laysan, they began seeing increasing numbers of albatrosses, petrels, and terns around their ship. They stayed on Laysan until June 5th, taking their turn at living in the old Schlemmer place. As they came ashore, desolation greeted them. "Our first impression of Laysan," Dill later wrote, "was that the poachers had stripped the place of birdlife. An area of over 300 acres on each side of the buildings was apparently abandoned. Only the shearwaters moaning in their burrows, the little wingless rail skulking from one grass tussock to another, and the saucy finch remained . . . Here on every side are bones bleaching in the sun, showing where the poachers have piled the bodies of the birds as they stripped them of wings and feathers. In the old open guano shed were seen the remains of hundreds and possibly thousands of wings which were placed there but never cured for shipping, as the marauders were interrupted in their work."

The clubs, nets, and other tools of the bird-killers still littered the ground. "Hundreds of boxes to be used in shipping the bird skins were packed in an old building. It was evident that they intended to carry on their slaughter as long as the birds lasted."

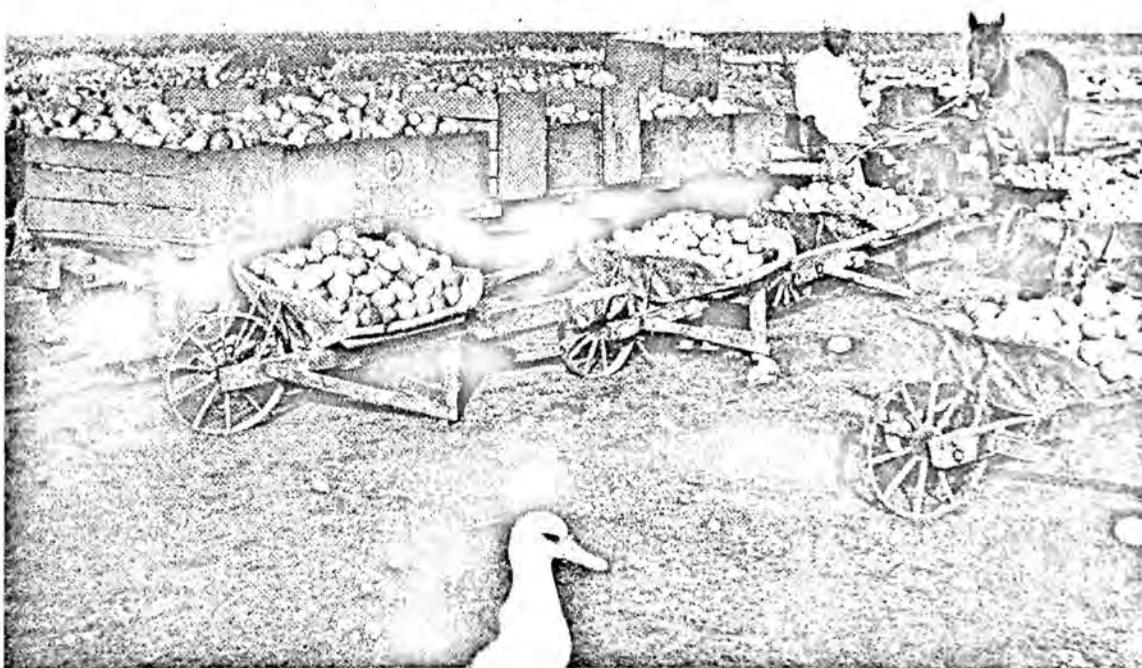
But what astounded the professor from Iowa most were the rabbits. He was surrounded by rabbits. They had taken over Laysan Island. The vegetation was gone from large areas and the sand was free to move before the winds. It may well be that the visit of Professor Dill in 1911 coincided very closely with the maximum population of rabbits, and that the invading mammals were at that moment reaching the point where further breeding would so heavily cut into their food supplies that the rabbits would threaten their own future. "They were very fond" wrote Professor Dill, "of the green juncus that grows near the lagoon, and, while they are eating, their bodies are concealed among the thick growth and only their ears show." In the evenings the island seemed to be a garden of ears.

When Homer Dill returned to Iowa he carried the carefully skinned and packed remains of the rails, finches, and other birds collected to form the planned museum exhibit. But he also carried a warning. Unless

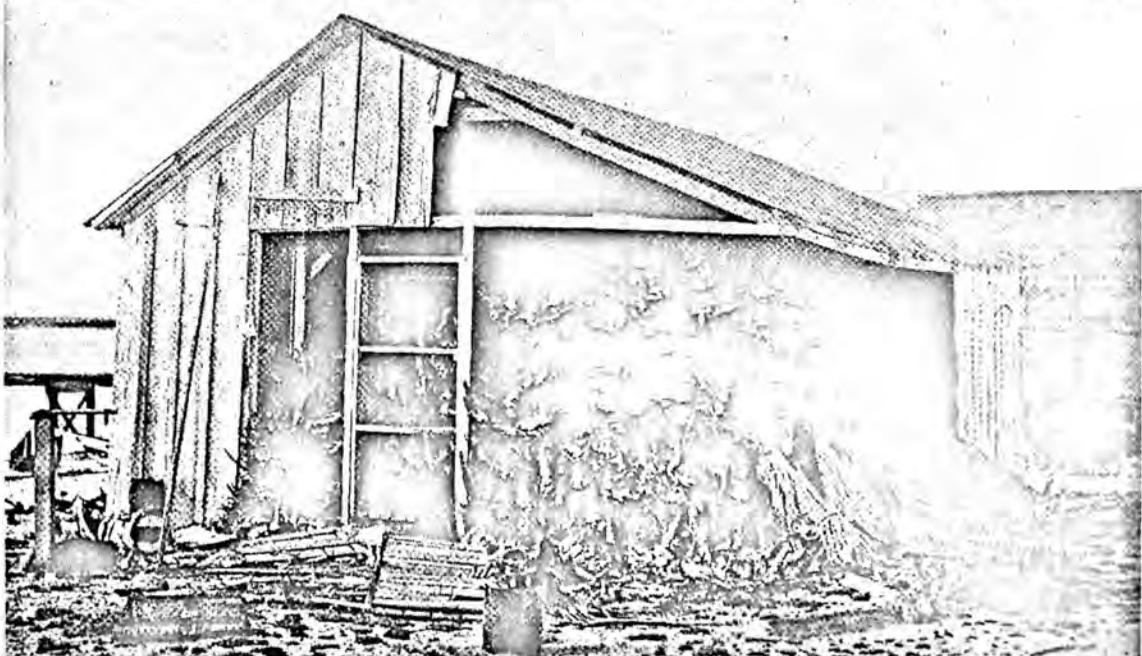
*An incredible, uncountable Laysan albatross colony was photographed sometime before 1900; the scientific world was just then learning about the vast populations of seabirds on this islet.*

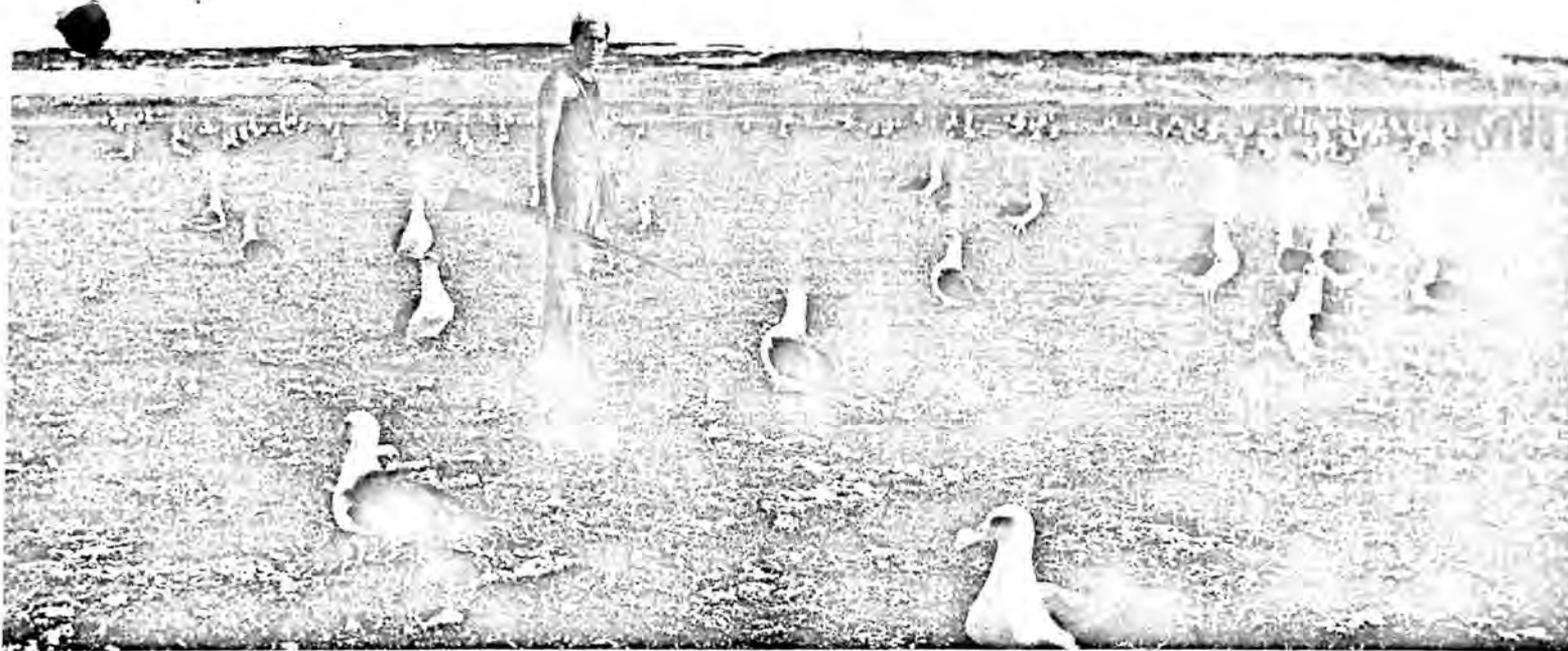


*The same photographer from Honolulu, J.J. Williams, also made this pre-1900 picture—like the others, from the historic files of Alfred M. Bailey. Thousands of eggs from the nests of Laysan albatrosses were being gathered for sale in Hawaii. But while this eggging would wipe out one year's nesting, it was a rare occurrence and hardly as destructive as the rabbits and plume-hunters that came to Laysan Island later.*



*Japanese poachers came to slaughter Laysan's seabirds in 1909—the year these Leeward Islands were declared a bird reservation. Their depredations had annihilated the birdlife before federal agents arrived and found the old dings of the guano mine filled with the wings of thousands of albatrosses.*





an official party could be dispatched to Laysan soon to attack the rabbit hordes, the future was indeed bleak for that amazing bird island.

To this was added the opinion of Professor William A. Bryan of the College of Hawaii, who had joined the party for the first week of its Laysan expedition. "If active steps are not taken by the government to check or exterminate the rabbits on Laysan, it is only a matter of a very short time indeed when they will reduce this green island to a barren heap of white sand."

Because of these warnings, the U.S. Biological Survey organized still another expedition. This one would have a gruesome mission. In charge was a former governor of Guam, Commodore G. R. Saulsbury. The ornithologist aboard was George Willett. The youngest member of the team was Alfred Bailey who, years before, had dreamed of albatrosses. By 1912 the 18-year-old Bailey was a sophomore at the University of Iowa. Recently I visited with Dr. Bailey in his office in Denver, where he is the director of the noted Denver Museum of Natural History. "It would be nice," Dr. Bailey told me, "to be able to say that I was chosen because of my skills as a young naturalist, but I was the expedition cook." But he was also an expert taxidermist, as well as an experienced and self-reliant outdoorsman—an experienced hunter and a crack shot with a rifle. The expedition shipped out aboard the *Thetis* for Laysan, and three days before Christmas they stepped onto the beach. They had become the new tenants of the disintegrating buildings erected by Max Schlemmer.

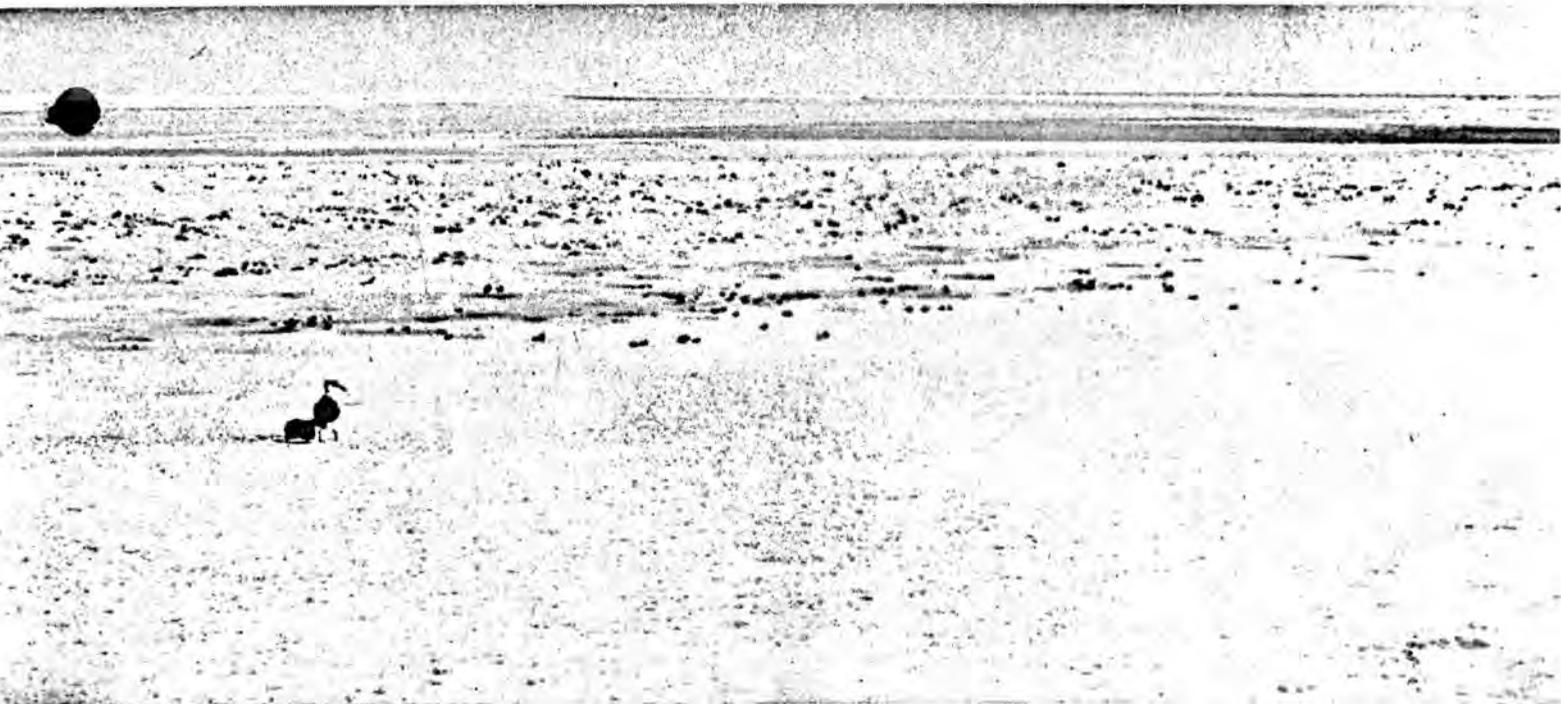
Before them lay a staggering assignment. They had brought only two .22 rifles, one of which was Bailey's personal gun. "We also took along two or three ferrets," Dr. Bailey told me, "thinking these might help chase the rabbits out. We took only males. But when we went ashore and saw how many birds were in burrows, we put the ferrets back on board the *Thetis*." They had brought 6,000 rounds of ammunition, but there were

probably more than that number of rabbits on Laysan at the time.

The rabbits at first were so tame that some could be caught by hand. Bailey kept score of the numbers killed. On their best day the rabbit population was reduced by 254. Toward the end of their tour on the island the rabbits became increasingly wary, and the men knew they were going to fail in their mission. Ammunition was running low, and time was running out. Thumbing his aging journals written more than half a century ago, Dr. Bailey said, "We killed 5,020 rabbits while we were there, and four guinea pigs. It wasn't a pleasant job. But it was one that had to be done. At the last we had a rule that anyone who made a poor shot on a rabbit had to run it down instead of using another shell." Complete elimination of the rabbits during this visit proved impossible. Starvation would eventually confront the ones remaining.

Dr. Bailey's journals also tell the sad tale of Laysan's birds at the time of his visit. The Laysan duck had become the world's rarest waterfowl—only seven remained. The Laysan rails still scurried from one shadow to the next, while beautiful honeycreepers still sang and millerbirds still skulked. All of these endemic species—unlike the traveling seabirds—found their food only on Laysan. The vegetation that supported the insects on which some of them fed, and which provided nesting and escape cover, was vanishing. With the rabbit population still substantial, the future for these resident birds was dim. So in the last days of their tour on Laysan, Willett told Bailey to capture as many of the flightless rails as possible. He penned them in one of the sheds, and on the day of departure 50 Laysan rails went aboard ship for release on Midway, where they flourished for many years.

During those lonely weeks on Laysan, Alfred Bailey made an excellent set of pictures of his favorite birds, the albatrosses. The party also collected birds for museum exhibits, but steadfastly resisted the temptation to take the Laysan ducks. Although only seven of their kind were



left, there was still hope that they would somehow survive the rabbit tragedy that men had visited upon this coral island.

Following my visit with Dr. Bailey, I had one more call to make in my efforts to unravel the patchy history of Laysan Island. In Washington I talked with Dr. Alexander Wetmore of the Smithsonian Institution. Of all those who visited Laysan with the early scientific groups, only Dr. Bailey and Dr. Wetmore are still alive. Ten years passed between the time Dr. Bailey's group left the island and the arrival of Dr. Wetmore.

At the age of 37, Dr. Wetmore, already one of the world's most widely traveled and knowledgeable ornithologists, organized a party to cruise for four months through the Leeward Islands under sponsorship of the Biological Survey and the famed Bishop Museum in Honolulu, and to concentrate especially on the best-known bird island of the chain, Laysan. In Honolulu, Dr. Wetmore sought out a tall, gangly young man who had once lived on Laysan, Eric Schlemmer, and signed him on as a member of the twelve-man party. Schlemmer had not been "home" since his family left the island many years before. The group left the Honolulu harbor on April 4, 1923, on a World War I mine sweeper, the *U.S.S. Tanager*. Aboard were excellent photographers, scientists with varied interests, plus general helpers, including young Schlemmer.

Also in the baggage was equipment for one more attack on the rabbits—if necessary. In addition to rifles and several thousand rounds of ammunition, Dr. Wetmore had purchased a ton of fine leafy alfalfa hay in San Francisco, and had it compressed into compact bales. "I put it aboard with my baggage," Dr. Wetmore recalls with a smile. Included was a supply of poison.

"I don't know whether we should report all the gory details," Dr. Wetmore commented. He was leafing through the yellowing pages of his old journals, verifying facts as he talked. "But getting rid of the rabbits was

*In 1912, a young Alfred M. Bailey, armed with a .22 rifle to attack the island's rabbit hordes, stands amidst a vastly depleted population of Laysan albatrosses—a scene sharply contrasted with the previous photograph taken before the rampage of the Japanese plume-hunters. Worse, the snapshot taken by Alexander Wetmore when he reached Laysan in 1923 shows the island virtually denuded of vegetation by the remaining rabbits. Today, there is little evidence of the guano mining operation which began the tragic chain of events; even the rails carrying carts of guano to the docks have disappeared with time.*



WARREN R. ROLL



The three species that vanished: The Laysan millerbird (top) and Laysan rail (center) were seen at their nests on this besieged island in 1902; the last Laysan honeycreeper (bottom) was portrayed on movie film in 1923.

absolutely essential to the wildlife of the island. We didn't use more than a bale of the alfalfa. We mixed it with poison, and to protect the birds that might have picked it up otherwise, placed it deep in the rabbit burrows."

During his first half-hour on the island, Dr. Wetmore could do little but stand in awe at the swirling clouds of seabirds. Then, when he began inspecting the island, he was struck at once with the desolation. Only remnant stands of vegetation remained. Petrels and shearwaters, once safe in their burrows, were now trapped with each windstorm. The old buildings were still there, more weatherbeaten than ever. Two coconut trees still stood beside the old Schlemmer house. In the limited shelter of a coral outcropping, Dr. Wetmore found three of the little Laysan honeycreepers, all that remained of a once vigorous population. The millerbirds were gone. And as for the Laysan rail, only the mummified remains of the last of the species were found.

The elimination of Laysan's remaining rabbits began immediately. There were perhaps no more than 500 rabbits left—skinny, starving individuals that came out in the evenings, vainly seeking greenery to satisfy their hunger. By the end of the fourth day the expedition had killed more than 250 rabbits. Already, the scientists could see the difference. Scattered plants, relieved of the incessant gnawing, had begun showing signs of renewed life. With his camp established and his party at work, Dr. Wetmore left Laysan aboard the *Tanager*, bound for a brief survey of the islands to the west.

"I returned the afternoon of April 29th. There had been stormy weather throughout most of the western trip." For three days before his return, gale-force winds had swept across the barren sands of Laysan. "But on the date of my return," he added, "everything was calm again, except for the usual trade wind." But the storm brought tragedy.

What about the three honeycreepers? Dr. Wetmore promptly searched for them around the coral rocks—without success. They were never seen again. This was a rare and sad event, for a naturalist had witnessed the extinction of a species. A few days earlier, Donald Dickey had photographed the last living Laysan honeycreeper.

There was still a glimmer of hope for the Laysan rail. If Dr. Bailey's team had not moved a seed stock of the flightless rails to Midway Islands, this species, too, would have been extinct. Now, Dr. Wetmore had brought eight rails back from Midway to their ancestral island. He released them on Laysan and watched as they scurried about, seeking places to hide. Exposed to view as they were on the now barren dunes, the rails were picked up one by one by frigatebirds. After a few days, no rail was ever seen again on Laysan. The species did prosper on Midway, however, until World War II. But increased military activity on the atoll introduced large numbers of rats. The rails on Midway soon vanished. The rabbits

These were two of the last seven Laysan ducks in 1912; there may be 200 on the island today. Perhaps no other species has survived such a low number. A familiar flying goose marks this refuge of the black-footed albatross.

of Laysan had wrought the extinction of three species.

Dr. Wetmore's expedition saw fewer and fewer rabbits as each day passed on Laysan. There were times when they did not find a single rabbit for three or four days. "I went out at dawn," Dr. Wetmore told me, "to check for them. The wind would die down at night, and rise again in the morning. If you got out early before the winds came up to cover the tracks, you could see where the rabbits might still be living." Finally he could find neither rabbits nor tracks. If the *Tanager* party left any rabbits behind, they too soon perished, victims of the biological disaster their ancestors had visited.

As they were preparing to leave Laysan, Dr. Wetmore noticed one of the ship's sailors playing on the beach with some kind of animal, and he walked over quickly to investigate. "What the sailor had brought ashore," Dr. Wetmore recalls with a smile after all these years, "was a pet rabbit that he kept on the *Tanager*. I told him to take that rabbit, get back on the ship, and never come ashore on Laysan Island again."

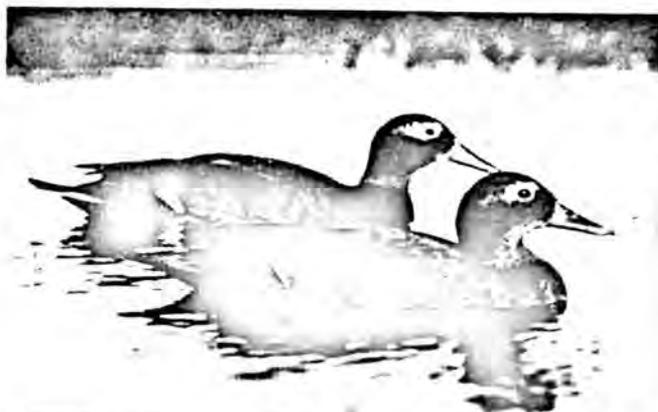
During his visit to the Leeward Islands, Dr. Wetmore also landed on Lisianski, 150 miles farther west. Rabbits had once been released here also, but they had devoured their food sources and starved to death. He then visited Southeast Island in Pearl and Hermes Reef, which he saw in the spring of 1969 with refuge manager Gene ...dler and his team. And there Dr. Wetmore found—and exterminated—still more rabbits, which were wilder than those on Laysan.

As had others before me, I stood one evening on the low ridge where Max Schlemmer had built his frame house, and silently marveled at the multitudes of birds. Hundreds of thousands of wings filled the sky, and the voices of the seabirds created a thunderous din.

Laysan's vegetation has recovered over the years. The old buildings are gone at last. The coconut trees are gone, too. The only evidence of the guano industry are a few remnants of weather-beaten cross-ties lined out across the sand, where carts once carried their guano burden through nesting colonies of albatrosses.

A more recently planted grove of coconut trees grows at the eastern end of the shallow lagoon. In the low vegetation between the coconut trees and the lagoon, hundreds of Laysan albatrosses with their gleaming white breasts and clean black backs raise their young. And nearby, the little Laysan ducks, now numbering perhaps two hundred, slip out of the dense cover of the *Scaevola* in the late evening sun.

Where the trail leads up from the beach, through thick-growing native vegetation, there stands a large sign to warn that Laysan Island is part of the Hawaiian Islands National Wildlife Refuge, and that unauthorized visitors are forbidden to come ashore. One reason is the ever-present fear that some new foreign animal, whether rat, cat, or mongoose, might find its way to this wondrous island which we have reserved for the birds. ■



ALFRED M. BAILEY



GEORGE LAYCOCK



GEORGE LAYCOCK



**Chris Kube, our able bodied secretary, is an attractive and indispensible part of the refuge staff.**



Having no beaches or suitable landing sites, Gardner Pinnacles a 5 acre "rock" has seldom been landed on.

EK



Nihoa Island, home of the endangered Nihoa finch and Nihoa millerbird also affords no easy landing. Miller peak, the highest point on this approximately 156 acre island has an elevation of 890 ft.



Landings on the rocky islands of Necker and Nihoa are often extremely dangerous. The surge sometimes rises and falls up to 20 feet. During this departure from Necker, several bags of equipment were swept into the sea. These photos were taken at approximately 5 second intervals.

Aduck





The Nihoa finch, an endangered species, added 182,500,000 Refuge Benefit Units to our Refuge Output.

DLO



Although primarily a seed eater, the finch frequently feeds on the eggs of sooty and common noddy terns. For a small bird the finch is extremely aggressive.

DLO



Tern Island sustained severe losses as a result of the storm of December 1969. Most of the damaged areas have been repaired.



Although once denuded of its vegetation by the introduction of rabbits, Lisianski, a 382 acre island is now completely vegetated.



The KAIYO MARU 25, a 110 ft. Japanese fishing vessel crashed on Laysan Island during February. This vessel was fully equipped with a full compliment of long line fishing gear and she carried approximately 26 tons of fish when she struck the reef.

EK



The 18 man crew from the KAIYO MARU were marooned for 6 days on Laysan. Efforts by the U. S. Navy to rescue them were unsuccessful and finally a Coast Guard vessel was dispatched to the scene and a successful rescue was accomplished.

DLO



As a result of the wreck of the KAIRO MARU 25, salvage efforts were made by two crews. The second salvage attempt was unauthorized and resulted in Federal prosecution of the violators. This photograph shows two of the defendants carrying glass balls toward their salvage ship.

DLO



Laysan Island is the largest, most exotic and most important island in the refuge chain. The lagoon in the center of the island is approximately 3 times saltier than ocean water.

D. Marshall



Enormous numbers of albatross nest on the refuge islands. This Laysan albatross appears to be proud of her accomplishment. The average incubation period is 61 days.

EK



That's close enough, Buster!!!

EK



Gooney birds are well named as the young begin to loose their down feathers they certainly make their name sound appropriate, not only in looks but in behavior. Talk about the long side-burns fad. So what's new, gooneybirds?

EK



The Hawaiian monk seal is classified as rare. The most recent population estimate shows that probably no more than 1,000 animals exist.

EK



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One of the few tropical pinnipeds, they often bury themselves in the sand, probably as a means of cooling themselves.



Shark bites are common on the Hawaiian monk seal. A bad bite usually means death. Some individuals have amazing recuperative powers. Note the healed over scar on the belly of the seal pictured below.

Top  
Bottom

EK  
DLO





Rectal temperatures were taken of several pup and yearling seals and a short note was published on this work in the Journal of Mammology. John Sincock appears to be strangling this animal while Olsen does the probing.

EK



Sharks are the most common predator around the refuge islands. This tiger shark (Galeocerdo cuvieri) was taken in the shallow water adjacent to Southeast Island at Pearl and Hermes Reef. The black tip shark (Carcharhinus limbatus) was taken off Tern Island at French Frigate Shoals.

DLO





Although never seen within the reef area associated with the refuge islands, the endangered sperm whale is commonly observed between Midway and Pearl and Hermes Reef. This 40 ft. probably adult male was photographed from a hovering helicopter.

EK



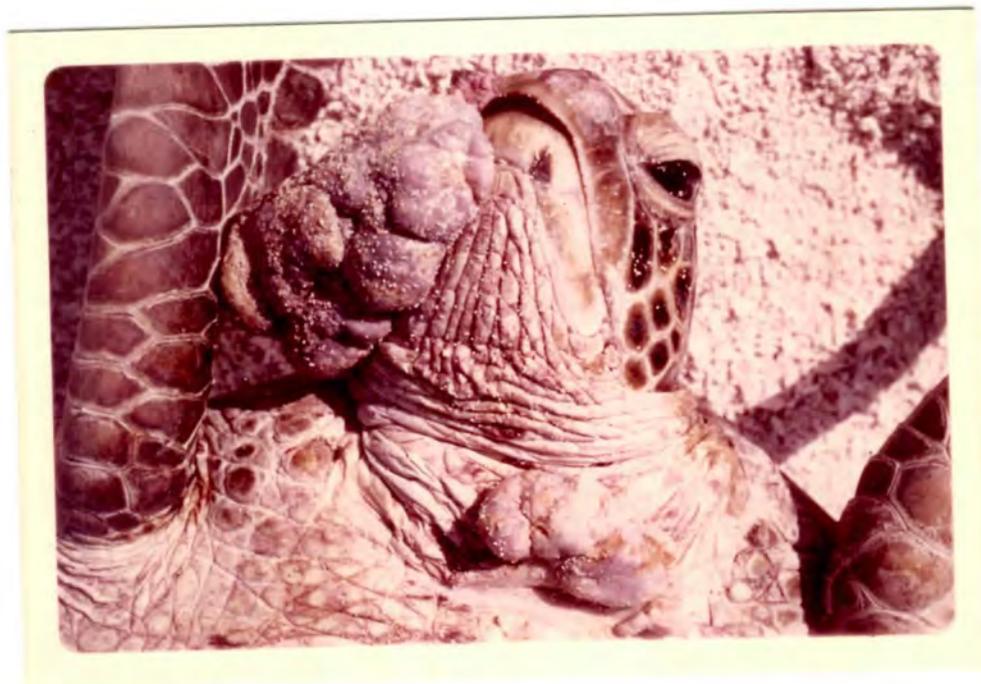
Rays are common in the waters surrounding the refuge islands. They are usually wary and seldom dangerous. Six spines show clearly on the base of this ray's tail.

DLO



Seventy-six turtles were measured, weighed and tagged during the year. Six measurements were taken on each turtle.

Sherwood



Growths were observed on a number of turtles during the year. Several were surgically removed (pocket knife) and sent to the University of Hawaii, School of Medicine for identification. They were identified as Papilomas, a viral growth common in cattle.

EK



Refuge recognition signs have been erected on most of the islands. When first **installed** the birds didn't appreciate our efforts. Since then canopies have been erected on most of the signs.

EK





Opaepa Pond is one of the few waterbird areas available on the island of Hawaii. Studies have been undertaken in this area and hopefully it will be incorporated into the national wildlife refuge system. Stilts and coots are found on the pond throughout the year and both species nest there.

EK



A sanitary land fill was scheduled to fill in this entire area on Pearl City Peninsula; however, Navy officials observed several stilts using the area and with the encouragement from our Bureau the area was set aside as a Navy stilt sanctuary.



The Hawaiian crow is one of the native birds on the threshold to extinction. This species is restricted to the island of Hawaii. The most recent population estimate by Win Banko, research biologist, places the population level at approximately 40 birds.

The annual cooperative state-wide stilt count conducted during July revealed a total of 1187 birds. These counts indicate a gradual decline in population.





Both the black mamo (left) and the  
OO (below) are included in the list  
of extinct Hawaiian birds.





Four species of Hawaiian waterbirds are on the Secretary of Interior's list of endangered species. The primary reason for this is the loss of habitat to the developers. Kaelepulu Pond, now called Enchanted Lakes shown above was historically one of the best areas on the island of Oahu for the endangered Hawaiian duck, stilt and coot. Most of this pond has now been bulkheaded and the only remaining marsh land on the right side of the photo is scheduled to be destroyed during 1971 by a subdivision.

DLO



Several ponds within the Kaneohe Marine Corps Air Station were given refuge status during the year. This large recognition sign portraying the endangered Hawaiian stilt was placed near the main entrance gate.

EK



# Hawaii's Endangered Waterbirds

.....THE RIGHT TO EXIST

Presented by: Bureau of Sport Fisheries and Wildlife  
U.S. Department of Interior  
730 N. E. Pacific Street  
Portland, Oregon 97208  
and  
337 Uluniu Street  
Kailua, Hawaii 96734

Division of Fish and Game  
Department of Land and Natural Resources  
State of Hawaii  
530 South Hotel Street  
Honolulu, Hawaii 96813

This booklet outlines the status of Hawaii's endangered water birds and describes ways to improve their chances for survival. The value of these birds is not measured in the gross national product but in their influence in people's lives. Whether or not they are to remain a part of the human environment depends largely on the point of view. If man is sensitive to the sound of music, the majesty of a sunset, the wonder of a flower or discovery of a bird all but hidden in cool shadows of a marsh, then he is likely to be a whole man receptive to the offerings of his surroundings. He admits forfeiture of a species will not doom civilization, but he is starkly aware that greatness of our society may well be measured by man's acceptance of responsibility for its preservation. When he assumed dominance over earth's creatures, he became responsible for their welfare. In granting them the right to exist, he improves his respectability and preserves for himself a part of his native environment. Now may be his last opportunity to save Hawaii's water birds.



## Hawaii's Endangered Waterbirds



Forest bird habitat

Omas (Hawaiian thrush)



## Foreword

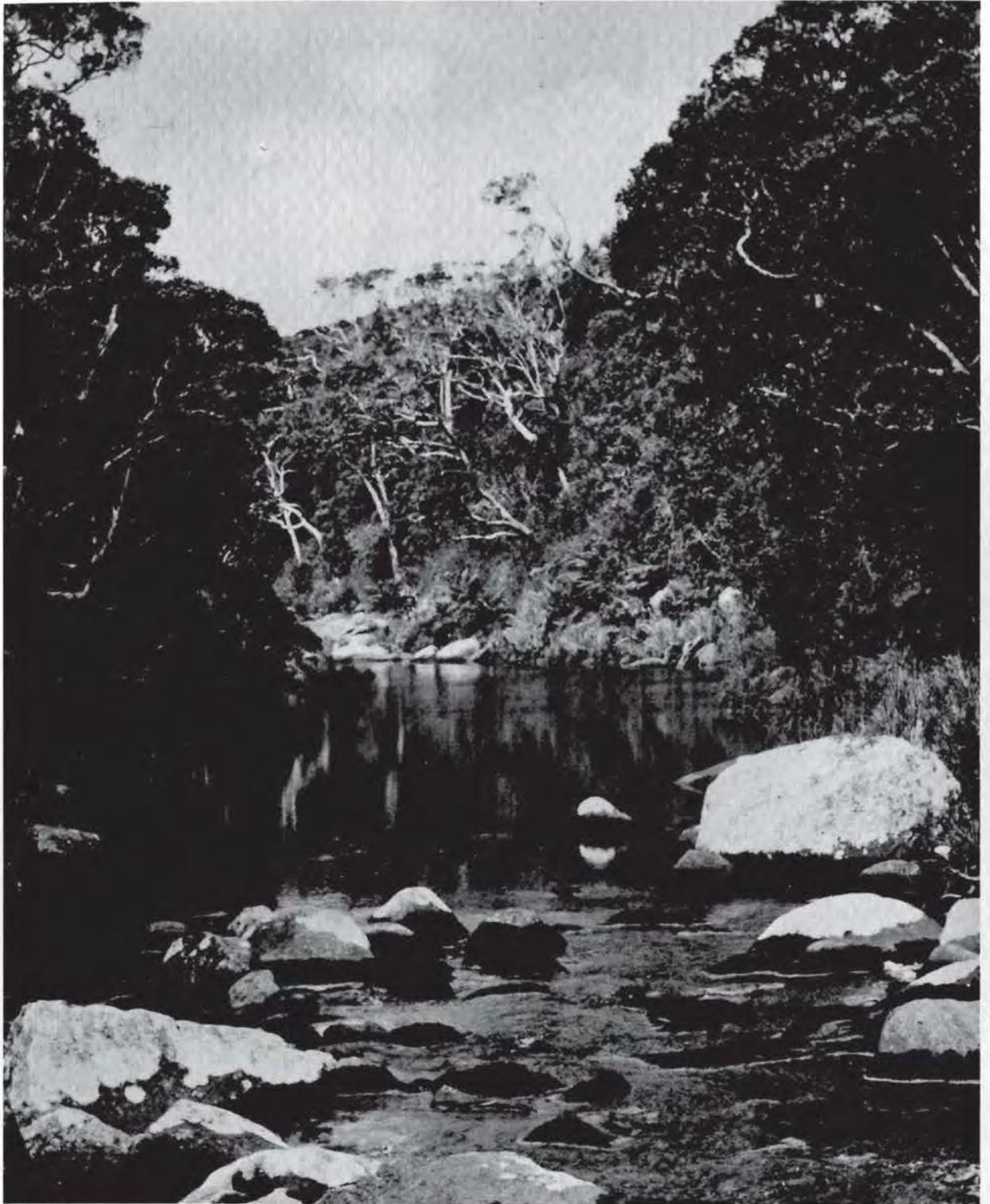


Separated from the continental land masses by vast stretches of ocean, island forms of animal life evolved under conditions favorable for natural selection and specialization. The rails of Hawaii had become so specialized, they lost their powers of flight.

When Captain James Cook came to Hawaii in 1778, there were 69 kinds of birds found nowhere else in the world. Today 25 are extinct and 27 are threatened. The causes vary. Birds introduced from other lands within the past 200 years brought strange diseases to which the native birds had no resistance. Mosquitoes transmitted diseases from bird to bird. Non-native animals like the mongoose, cat and dog were relentless predators on ground nesting birds. Competition for food and space increased. People hunted birds for food, feathers and sport. Vital habitat was destroyed through overgrazing and conversion of lands for agriculture, industry and urbanization.

Many species inhabit mountainous rain forests. Fortunately, this inhospitable environment is less vulnerable to early destruction. Status and distribution research will continue; key areas will be identified and, hopefully, some will be set aside specifically as forest bird sanctuaries.

Most in peril are the wetland dwellers whose habitat has been usurped in man's quest for land. This is the wildlife habitat most in need of immediate protection. It is particularly vulnerable because marshes commonly are low flatlands sought by developers. If remaining wetlands are to be preserved, effort in this direction must be early and substantial. Since man has been the principal offender, it is now his responsibility and opportunity to assure survival of birds that remain.



Of the seven kinds of waterfowl or water birds native only to Hawaii, six are threatened with extinction. They are the *Aeo* (Hawaiian stilt), *Alae keokeo* (Hawaiian coot), *Alae ula* (Hawaiian gallinule), *Koloa* (Hawaiian duck), *Nene* (Hawaiian goose), and the *Laysan duck* (for which the old Hawaiians had no name). Conservationists now are showing concern for the welfare of the *Aukuu* (Hawaiian black-crowned night heron) also.

The Nene is a bird of the vast lava flows, grass and brushlands of the mountains and does not depend on wetlands for its survival. The Laysan duck is restricted to tiny Laysan Island far out in the Northwestern Hawaiian Islands. The most immediate concern is for water birds inhabiting ponds and marshes of lowlands of the main islands. Wetland habitat is being destroyed by draining or filling, and here the need for preservation is most urgent.

## The Birds





Hawaiian stilts

## AEO (HAWAIIAN STILT)

The Aeo derives its name from the word which signifies "one standing high". The name fits this striking black and white bird with needle-shaped black bill and long pink legs. About a foot tall, it requires shallow brackish water ponds, mud flats and feather-edged shore lines where it can wade about probing for aquatic insects and other invertebrates. It prefers to nest on small islands generally free of vegetation and reasonably safe from predation. The gray downy young are able to run about soon after hatching.

Hunted until 1939, the world population today is only about 1,500. An estimated 775 are on Oahu, 250 on Kauai-Niihau, 450 on Maui, and only 25 on Hawaii. There is considerable movement between Niihau and Kauai at certain seasons of the year. Some movement occurs between Oahu and Maui, and occasionally stragglers appear briefly in very small numbers on Molokai.

Key areas on Oahu include the ponds, mud flats, settling basins, and brackish water areas at Pearl Harbor Naval Base, Kaneohe Marine Corps Air Station and Kahuku. Kealia and Kanaha Ponds are extremely important areas on Maui. The Hanalei taro fields on Kauai and the salt ponds on Niihau also are important.



## ALAE KEOKEO (HAWAIIAN COOT)

Hawaiian coot

Once found on all the major islands except Lanai, now the coot is seen most often on Kauai, Oahu, and Maui. The Kauai population moves freely back and forth between that island and nearby Niihau. Some movement probably occurs between other islands. Of the 1,700 estimated in existence in 1969, about 1,200 were on Niihau-Kauai, 175 on Oahu, 250 on Maui, 50 on Molokai, and less than 25 on Hawaii.

It is a stout black bird whose head jerks back and forth as it swims. It needs fresh and brackish water ponds with stable levels and containing extensive growths of tall bulrush (tules) where it can build its nest. Newly hatched young are bits of orange and black fluff. Seeds and green parts of aquatic plants, insects, other invertebrates, and small fish make up important parts of its diet. The coot flies with reluctance when disturbed, but when it does, it scurries rapidly over the surface of the water, kicking up splashes in efforts to become airborne. Its Hawaiian name "keokeo" or "alaekea" means white and refers to its white bill and the white frontal knob just above the bill.

Important areas for the Kauai-Niihau population include the Menhune Fish Pond, Hanalei taro fields and the salt ponds on Niihau, Kawainui Swamp, Pearl Harbor, and the Kahuku ponds harbor fair numbers on Oahu. Kanaha and Kealia Ponds on Maui are important, and small populations are found on Kakahaia Pond on Molokai and Opaepula Pond on Hawaii.



Hawaiian gallinule

## ALAE ULA (HAWAIIAN GALLINULE)

According to tradition, the gallinule gave the gift of fire to the Hawaiian people. In the process, its forehead was burnt a brilliant red with the firebrand; hence, its name "alae", which means red forehead.

It is a brownish-black bird with a bright red forehead and a yellow-tipped bill. Its long legs with spreading long toes enable it to walk on floating plants and turn over their leaves while searching for insects and other aquatic invertebrates. Very secretive in nature, it prefers to remain close to cover where it can hide quickly if danger approaches. Inter-habitat or inter-island movements are almost unknown. They prefer thickly vegetated marshes interspersed with small fresh water ponds with stable levels. Nestlings resemble little downy black chickens and are able to scurry about soon after being hatched.

Gallinules occur on Kauai, Oahu and possibly Molokai. Favored areas on Kauai are the Hanalei taro fields, Opaekaa Valley and the Lihue settling basin. A few are scattered in small wetlands along the coast. Important areas on Oahu are Kawainui Swamp and the ponds and marshes near Kahuku. Very small numbers are found in wetlands of Kahana Valley and the Nuuanu Valley reservoirs. Once it was common on Kaelepulu Pond (Enchanted Lakes).



Koloa (Hawaiian duck)

## KOLOA (HAWAIIAN DUCK)

Once found on all the major islands but Lanai, the Koloa disappeared from all islands except Kauai and Oahu because of predation and excessive hunting. By 1949, it became very rare on Oahu. Drainage and alteration of marshes and other wetlands also contributed materially to its decline.

Its name "Koloa maoli" means native duck, thus distinguishing it from Mainland ducks which migrate to Hawaii in the fall of the year. Brownish in appearance, it resembles a small female mallard duck. The buffy white eggs are laid in nests in vegetation on the ground near water. The little ducklings are light brown in color. The world population is about 3,000 birds, almost all on Kauai.

The Koloa is found in a wide variety of habitats from rushing mountain streams to the banks of slow moving streams and marshes along the coasts.

Within past years, pen-raised birds have been released by the Hawaii Division of Fish and Game in Kawainui Swamp on Oahu and the Kohala Mountains of Hawaii in efforts to re-establish the species in its former range.

For any species to survive, it must have food, shelter, living space, and a place to reproduce its kind and escape its enemies. Action must be taken now to preserve essential wetlands if the endangered water birds are to remain a part of our total environment. Vital areas which need to be preserved through dedication, acquisition, or long-term lease are discussed herein.

Proposed is establishment of a system of wetland wildlife refuges which will accommodate sufficient numbers of birds to insure survival of the species. The system must contain key areas which provide special needs of the species at all seasons of the year. The plan provides for basic requirements of major segments of current populations of stilts and coots and for considerable numbers of gallinules and koloa. Habitat provided for such species will benefit night herons also. Refuges would retain distribution of species among the various islands.

Rare and endangered water birds may be found in scattered and low numbers, either permanently or intermittently, on a number of other wetland areas which, although marginal, would be desirable to supplement key areas. The owners or controlling governmental agencies should be made fully aware of their value to such wildlife and be encouraged to preserve and improve them as wildlife sanctuaries.

Key areas already in governmental ownership, be it Federal, State or County, should be dedicated and developed as endangered wildlife refuges. All levels of Government have a responsibility to the total environment. Certain lands on military bases in Hawaii are also vital habitat areas which should be set aside and developed as integral units of the whole system. Key areas in private ownership should be acquired, preserved, and developed for their full potential for wildlife.

## The Needs

Management and development would vary from area to area. Opaeha Pond, for example, needs little development. At Kealia and Kii, extensive diking, construction of water control structures, canals, and ditches and subimpoundment of water areas would be necessary. Introduction of desirable native aquatic vegetation or control of unwanted vegetation to achieve optimum balance between water and vegetation may be desirable. Construction of islands to lessen predation would be helpful, and buffer zones are needed to minimize disturbance from activities nearby.

Consistent with the needs of endangered wildlife, opportunity for public enjoyment of these unique and picturesque birds would be offered. The refuges would serve as living outdoor museums where the story of these birds and conservation could be told and demonstrated. Observation points, nature walks, educational displays, shelters, and photographic blinds would benefit people who seek pleasure in natural surroundings.

## The Island Habitats



### OAHU

Stilts, gallinules, coots, koloa, and night herons inhabit this island. The koloa, once almost exterminated here by man and other predators, is being brought back by transplants.

Although a few waterbirds are found in several small scattered locations along the coast, there are four areas of major importance. These are the ponds and tidal flats at *Pearl Harbor Naval Base*, the ponds on the *Kaneohe Marine Corps Air Station*, *Kawainui Swamp*, and the remnants of the ponds at *Kahuku*. These areas must be preserved and improved to compensate for losses of important habitat at *Kaelepulu Pond* (Enchanted Lakes), *Kuapa Pond* (Hawaii Kai), *Moanalua*, and *Salt Lake*.

Smaller areas where endangered birds occur in limited numbers too should be preserved. Included are *Paiko Lagoon*, *Ukoa Marsh*, a small part of *Bellows Air Force Base*, a small part of the tidal flats at *Fort Kamehameha*, the small marsh in the lower part of the *Kahana Valley*, *Kuafoa Pond*, and the *Nuuanu Valley* reservoirs.

Located on the windward side of Oahu, near the town of Kailua, is the Kaneohe Marine Corps Air Station. This station contains six brackish water ponds totalling roughly 400 acres. The flat shores of these shallow bodies of water support almost pure stands of *Batis*, a low fleshy-leaved salt tolerant plant. Parts of the ponds are used throughout the year by stilts; as many as 120 have been recorded there in recent years. It is an important stilt nesting area. Night herons feed here, and many migratory shorebirds inhabit the muddy shorelines during winter months.

The U. S. Marines, in cooperation with the U. S. Bureau of Sport Fisheries and Wildlife and the Hawaii Department of Land and Natural Resources, recently designated these ponds as wildlife sanctuaries for endangered waterbirds. Habitat improvement measures needed to increase the ponds' carrying capacity for stilts and other waterbirds include opening dense stands of *Batis*, construction of nesting islets and control of invading mangrove.

The *Pearl Harbor* areas are found mainly within the boundaries of the *Pearl Harbor Naval Base*. These are the mud flats and shallow water areas near the upper end of *West Loch*; temporary irrigation settling basins on *Waipio Peninsula*; and the old dry salt ponds on the west shore of *West Loch*. Two small ponds are located on Navy land on the *Waiawa Peninsula* to the east.



Between 300 to 500 stilts consistently use the shallow waters and tidal mud flats at the upper end of *West Loch* near the Mouth of *Waikele Stream*. About 50 coots and numerous shorebirds also are found here. Some 330 acres were set aside as wildlife refuge areas by the U. S. Navy under terms of a cooperative agreement with the U. S. Bureau of Sport Fisheries and Wildlife and the Hawaii Department of Lands and Natural Resources. To improve its value to waterbirds some growths of mangrove need to be eliminated and nesting islets should be constructed.



Most of the *Waipio Peninsula* is farmed under a lease from the U. S. Navy. Almost all is in sugar cane fields. Several small settling basins for mill waste water furnish excellent waterbird habitat. These are temporary, for when they become silted full, they are dried out, leveled and farmed for sugar cane. More settling basins will be constructed in the future because irrigation water no longer can be drained directly into *West Loch*. Construction and operation of such basins can serve both agriculture and wildlife. These are Federal lands, and since preservation of endangered wildlife is in the public interest, wildlife values should be given full consideration.



A 31-acre former salt pond on the west side of *West Loch* has been set aside by the U. S. Navy as a wildlife sanctuary. It needs a source of fresh water and some diking before it can fulfill its potential for waterbirds.



Ponds, Waiawa Peninsula

The ponds on Waiawa Peninsula need water during summer months. In winter, when they contain water, as many as 40 stilts have been observed there. Cattle egrets and migratory shorebirds also use them then.

Two ancient fish ponds at the northeast corner of West Loch once provided excellent habitat for waterbirds. They have been almost completely destroyed by a county dump. A remnant of *Pouhala Pond* is located between the dump and a housing area. A marsh of 35 acres, it is threatened by expansion of the dump. As many as 330 stilts have been seen here in recent years. It should be preserved and developed as a wildlife refuge.

Kii Pond



Punamano Pond



Punahoolapa Pond

On the north shore of Oahu near the community of Kahuku lie three small ponds and marshes once very valuable to waterbirds. These are *Kii*, *Punamano* and *Punahoolapa* Ponds. Conversion of parts of them and adjacent lands to sugar cane fields has resulted in drastic changes. *Kii* is but a fraction of its former area; *Punahoolapa* is a weed choked wet area; *Punamano* is a smaller pond. Lands now in cane may be developed for resorts, apartment buildings, a golf course, and diversified crops. Owners of the ponds and marshes are interested in having them restored and preserved as wildlife refuges.

Much of *Kii* Pond has been filled through the years. A 35-acre silt settling basin recently constructed by the sugar company is very attractive to stilts, coots and gallinules. Migratory birds frequent it in winter. Developed properly, *Kii* could regain its former importance. This development would require obtaining adequate water, diking, installation of water control structures, and judicious planting of desirable vegetation. Approximately 250 acres are needed.

*Punamano* is located about a mile west of *Kii*. When both areas contain water, birds move back and forth between the two. Marsh vegetation fringes the perimeter. Coots and gallinules, and possibly stilts nest here. During winter, several hundred migratory ducks utilize the area. Given an adequate source of water and properly developed, the value of *Punamano* would be increased. About 90 acres should be preserved by acquisition.

*Punahoolapa* Pond is immediately west of *Punamano*. Deprived of adequate water through the years, it has been invaded by dense stands of wetland grasses and scattered growths of roundstem bulrush. This area needs to have openings created in the vegetation and an adequate and permanent supply of water to enhance it for coots, gallinules and koloa. Small, low nesting islets are needed for stilts. This 122-acre area would complement *Kii* and *Punamano* Ponds.

Kawainui Swamp is owned by the City and County of Honolulu. This 750-acre area is the largest fresh-water marsh left in Hawaii. It is adjacent to the town of Kailua on the windward side of Oahu. Once a lake, it now supports dense stands of Panicum grass and some roundstem bulrush (tules) interspersed with several small open water areas. The marsh has been designated a flood control-conservation area. Flood waters pour into it during heavy rains.

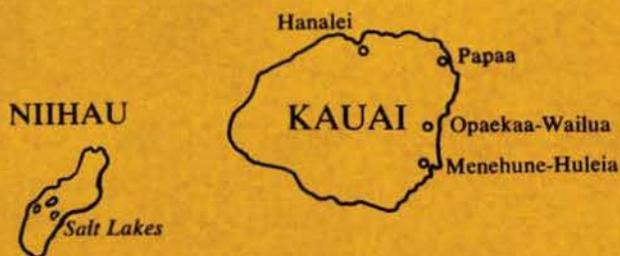




The City Parks and Recreation Department has master-planned this area for a parks-wildlife sanctuary project. A 300-acre lake in the middle would serve as a sanctuary as well as a storage area for flood waters. Islands and smaller ponds would offer nesting sites and escape cover for wildlife such as gallinules, coots, and ducks. Perimeter areas would support playgrounds, picnic areas, tropical water gardens, and possibly a water zoo. Through careful planning, such activities will not adversely affect wildlife in the sanctuary.

The marsh contains resident populations of coots and is the most important gallinule area on Oahu and probably in the entire state. Night herons are found scattered throughout; cattle egrets use it for feeding and roosting; and migratory ducks winter here.

Kaelepulu Pond nearby was once very important as wildlife habitat. Soon the last of it will be lost to subdivision. Kawainui then will assume even greater importance for endangered waterbirds.



P A C I F I C



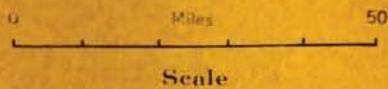
*I iho lakou, e hana kakou i na mea e holo ana maloko o na wai akea o ka moana, ame na manu e lele ana maluna o ka honua i hoohua nui mai la na wai i n me holo e ola ana, i hoohua nui ia mai e na hunahuna liilii o na wai. O na mea nui ame na mea liilii, oia na ia nunui ame na ia liilii, na manu o ka lewa, na mea nui ame na mea liilii. Ua hooko is keia mau mea apu. Nana aela lakou a ua maikai. O ka elima ia o na kau.*

*They said, "Let us make things that swim in the wide waters of the sea and birds to fly over the land that has borne much fruit, let the waters live with swimming things, made fruitful by the tiny drops of water. Let there be big things and little things, that is, the fish big and little, birds of the air big and little." All these things were fulfilled. They looked and it was good.*

*So did the great gods of Hawaii—Kane, Lono, and Ku speak.*

*... Kepelino's Traditions of Hawaii*

O C E A N



MOLOKAI  
Kakahaia

LANAI

Kanaha  
Kealia  
MAUI

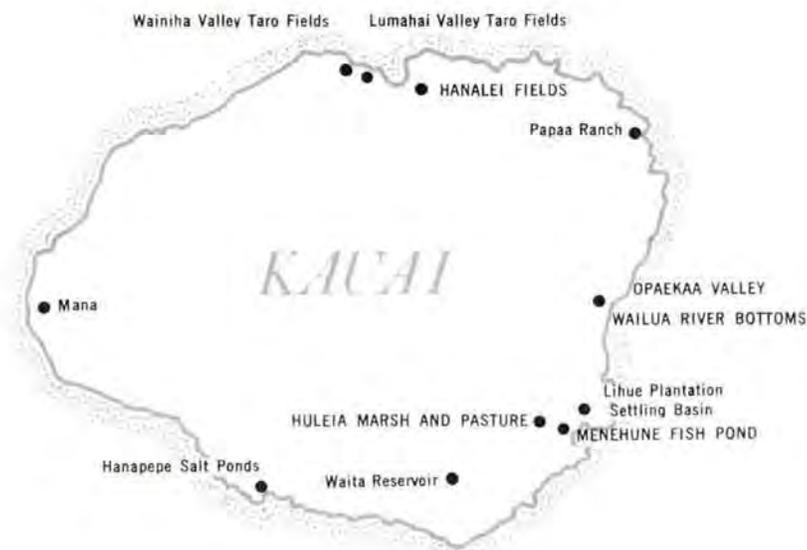
KAHOOLAWE

Opaeula  
Honokahau

HAWAII

.....THE RIGHT TO EXIST



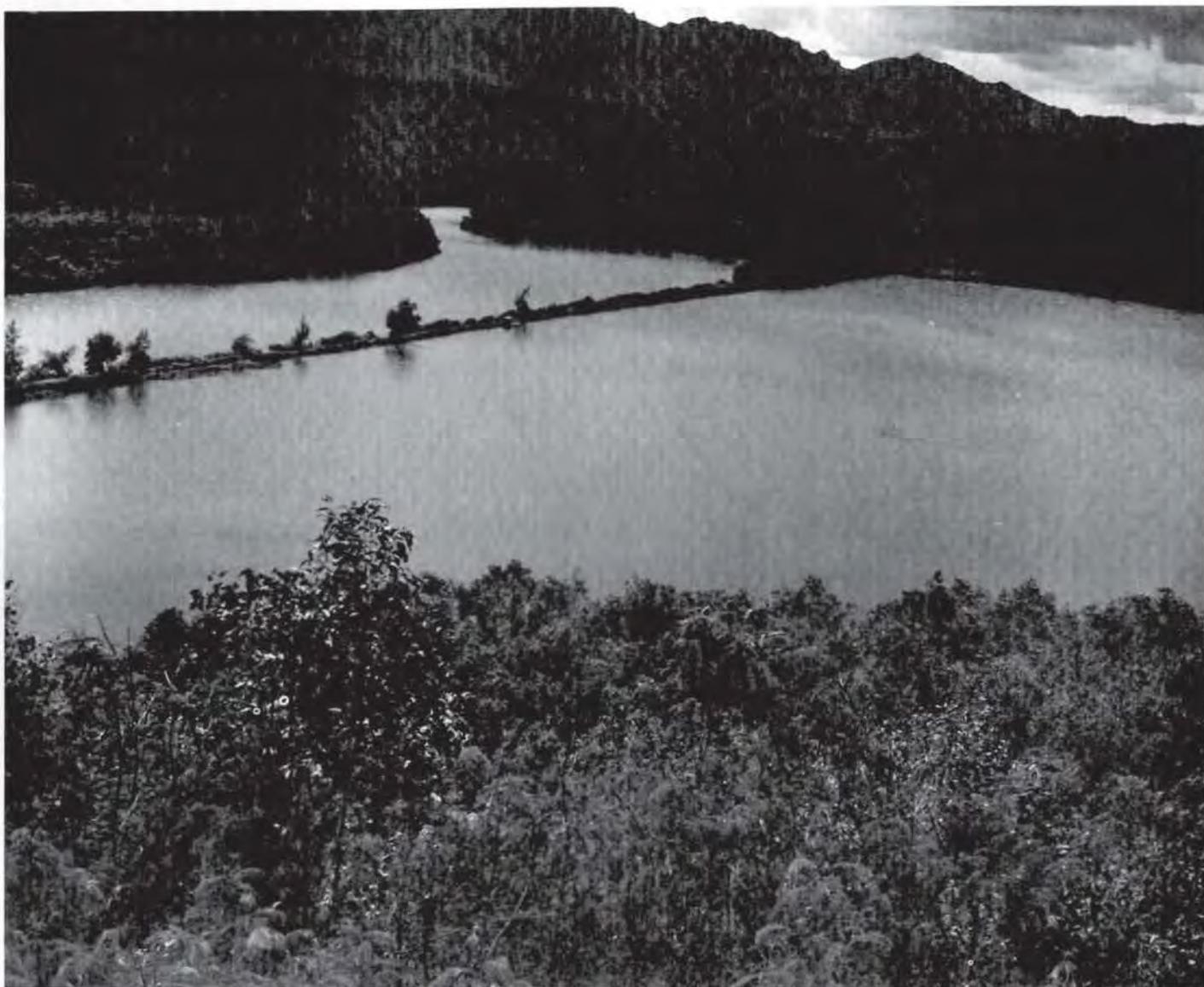


## KAUAI and NIIHAU

Since coot and stilt populations move back and forth between these two islands, both islands must be considered one unit. As the ponds on Niihau become dry, populations of both species move to Kauai. When the ponds contain water again, many of the birds return. Some birds remain throughout the year on Kauai. A few coots and gallinules are scattered along banks of the lower stretches of major streams in the wetter parts. Koloa occur in small numbers in lowland ponds, marshes and wet pastures and are thinly distributed along the many miles of mountain streams. Six areas stand out for their value to waterbirds: *Hanalei taro fields*, *Opaekaa Valley*, wetlands along the *Wailua River* and adjacent to the valley, the *Menehune Fish Pond*, the marshlands along the *Huleia River* above the fishpond, and the *Saline lakes* in southcentral Niihau.

The Hanalei taro fields are located along the Hanalei River behind the community of Hanalei on the north shore of Kauai. Formerly extensive in size, about 150 acres remain. Other fields have reverted to fallow land or low grade pasture.

Koloa, coots, and stilts nest here, and populations sometimes reach 100 stilts and 60 gallinules. Migratory ducks and shorebirds occur during fall, winter and early spring months.



Menehune Fish Pond

Water in the fields teems with invertebrates which are a source of food for waterbirds. Aquatic plants growing in the water or along ditches provide both green food and seed. If substantial acreages of land here remained in taro, some of the needs of waterbirds would be met. A minimum of 300 acres should be acquired.

*Menehune (Alokoko) Fish Pond* is located on the north bank of the Huleia Stream about a half mile from Nawiliwili Bay near the city of Lihue, Kauai. It has scenic and historical value as well as being an excellent endangered waterbird area. According to legend, The Menehune,

the little people of Hawaii, constructed the pond overnight. It is utilized by coots, gallinules and koloa. Coots usually number less than 100, but in 1969, 855 were tallied here—over half of the world population! Considerable use is made of the pond during the fall, winter and spring months by migratory ducks.

Present fish farming operations discourage the growth of valuable waterbird aquatic food plants. A small roundstem bulrush marsh on the west end offers nesting habitat for coots and gallinules.

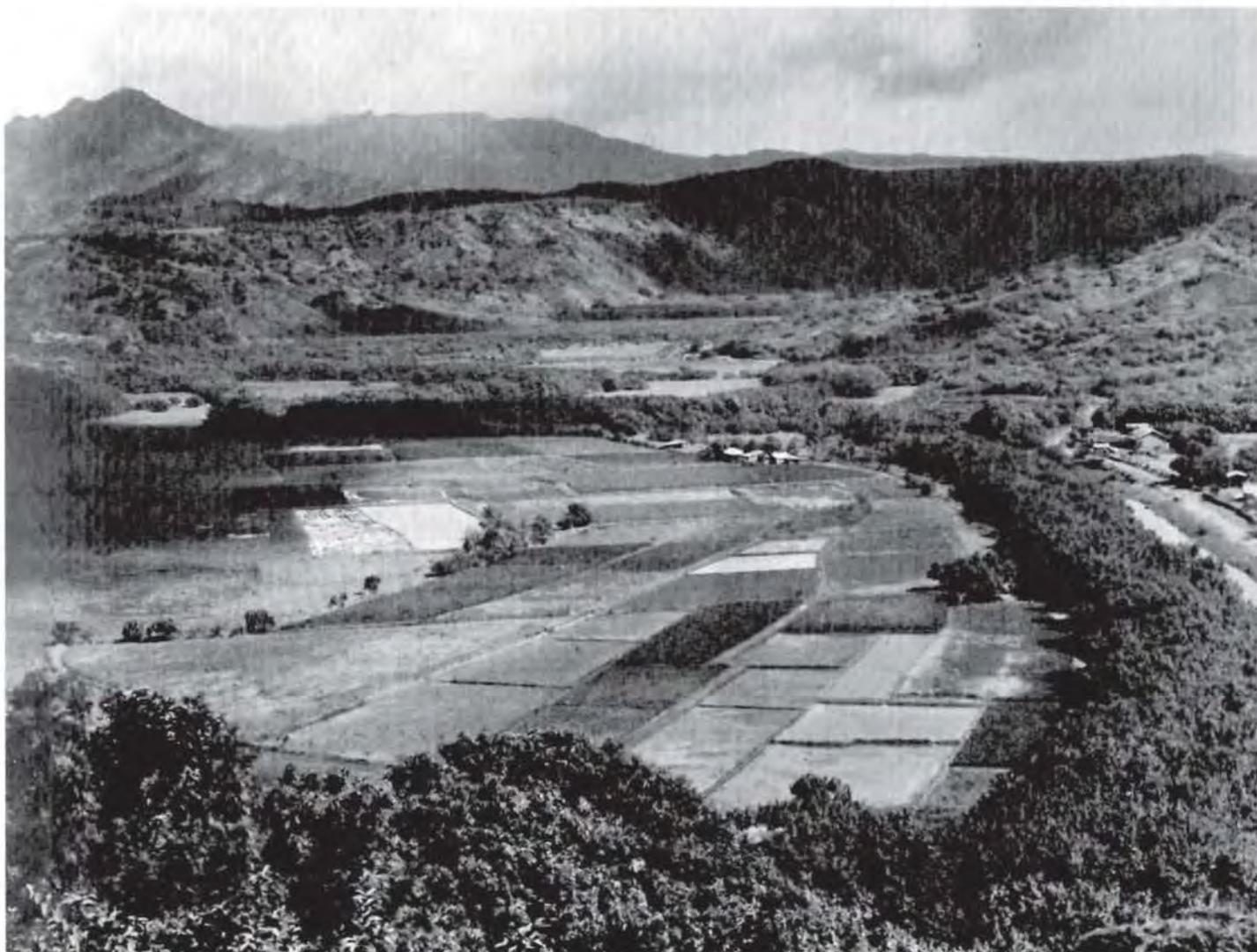
Acquisition of its 40 acres for wildlife would also help insure preservation of other values.



Lihue Plantation Settling Basin

A short distance inland from the Menehune Fish Pond are the marshes and wetlands of the lower Huleia River. About 20 acres along the south shore and about 105 acres along the north bank, formerly in rice and taro, now support low grade pastures choked with wetland grasses. The more soggy areas support round-stem bulrush. Koloa, coots and gallinules are found here. With proper development, including diking and water control, these wetlands could become excellent habitat. About 125 acres should be acquired and managed along with the Menehune Fish Pond as one unit.

Hanalei taro fields





Opaekaa Valley

The *Opaekaa Valley-Wailua River* areas are located near the community of Wailua on the east shore of Kauai. The narrow flat valley has reverted to low grade pasture overgrown with dense stands of *Panicum*. Recently the University of Hawaii cleared small portions for experimental culture of rice and taro. Ample supplies of fresh water are obtained from the Opaekaa Stream which flows through it. Wildlife use presently is limited to gallinules and koloa in the overgrown areas, but newly constructed paddies have become more attractive to these species as well as coots.



WAILUA RIVER BOTTOMS

The private lands should be acquired, combined with State-owned lands, and be developed as a State wildlife refuge. A minimum of 80 acres is needed.

Pasture lands comprising three separate units of approximately 30, 10, and 50 acres, lie along the South Fork of the Wailua River near the valley. Formerly in taro and rice, they have reverted to low grade pasture overgrown with *Panicum*. With development by diking and elimination of unwanted vegetation, they would become excellent areas for all species of endangered waterbirds. Owned by the State, they should be developed as wildlife refuges and managed as part of an Opaekaa Valley refuge.

*Papaa Ranch*, a privately-owned upland area of 146 acres, is potential coot, koloa, and gallinule habitat. Uneven in topography, it offers a variety of possibilities of development for wildlife and public enjoyment. It has an excellent water supply which could be utilized for the development of a small pond and marsh.

Papaa Ranch



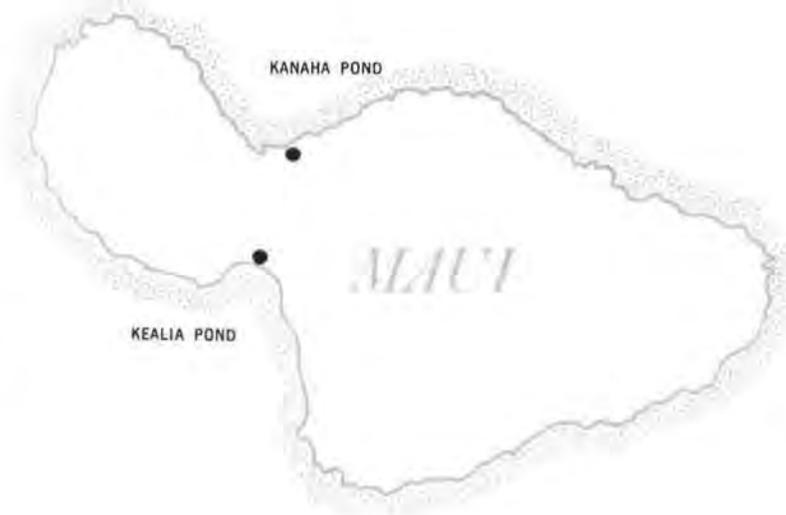
## NIIHAU

Three shallow saline lakes on this island are of high value to stilts and coots in wet seasons of the year. They are the 850-acre *Halalii Lake*, the 620-acre *Halulu Lake*, and the 370-acre *Nonopapa Lake*, clustered in the south central part of the island. Water is received as runoff from adjacent higher ground or as direct rainfall. During parts of the year, they become dry.

Until very recently, bird population data were scant. Counts made in 1969 revealed that as many as 270 stilts and 145 coots were utilizing the lakes. Since stilt and coot populations move back and forth between Kauai and Niihau, depending on whether or not the lakes contain water, the lakes contribute an important part to habitat needs of these birds. Because they may at times support up to one-fifth of the world population of stilts, the lakes should be preserved and improved for wildlife.

Niihau wetlands appear safe now, but there is no guarantee this will continue. If their existence is threatened, they should be placed in public ownership. They provide valuable seasonal habitat for waterbirds. Properly developed, use of the marshes would be year long.





## MAUI

Stilts, coots and night herons are found on the only two suitable habitat areas on the entire island. These areas are *Kanaha Pond*, located near the town of Kahului, and *Kealia Pond*, which is 10 miles distant and lies along the southern shore of the isthmus connecting West and East Maui.

Together they support an average population of about 450 stilts, 250 coots and 100 or more night herons. Movements between the two areas by large numbers of birds indicate each contributes important needs. Although there are some small irrigation reservoirs on the island, they are of little value because of their steep sides, lack of suitable vegetation and food, and fluctuating water levels resulting from irrigation demands.

*Kanaha Pond* probably is the best area in the entire state for waterbirds. During much of the year, it supports several hundred stilts and about 100 coots. When Kealia Pond becomes dry during the summer months, almost all the waterbirds on Maui are found on Kanaha. As many as 475 stilts, almost a third of the entire world population, have been noted. Both stilts and coots nest here. Many night herons frequent the pond all year long.

Kanaha is extremely important also as a wintering area for migratory ducks and shorebirds. In recent years, over half the population of shovelers and pintails wintering in Hawaii have been found here. Species of Asian or Mainland shorebirds also can be found here in late summer or early fall months. Fulfillment of its potential for waterbirds requires habitat improvement measures.

The pond and surrounding land are owned by the State of Hawaii. Permanent and exclusive control of the pond for endangered wildlife refuge purposes might be given to the Hawaii Department of Land and Natural Resources.

Hawaiian stilts





Kealia Pond



Kanaha Pond

*Kealia Pond* is a very important complement to Kanaha Pond in providing habitat for stilts, coots and night herons. Formerly a permanent brackish water pond, it usually contains approximately 200 acres of water during winter, but another 290 acres may become flooded after severe winter storms. Some of its shoreline supports a narrow fringe of three-square bulrush, a very valuable duck food.

Wildlife use is highest when water levels are rising or falling in the fall and spring. Stilt use decreases when the pond is completely full and stable and the water becomes too deep. But it increases during summer months when the pond contains shallow water. Populations of all birds fluctuate from zero when the pond is completely dry to over 1500 ducks, 260 stilts, 80 night herons, and 110 coots when there is water.

Were Kealia to contain water throughout the year and be improved for waterbirds, it would rank as one of the best areas in the state. A permanent supply of water would enable a more varied community of aquatic invertebrates to become established. Subimpoundments for conservation and proper manipulation of water, judicious planting of marsh vegetation, construction of nesting islets and other wildlife enhancement measures would help it fulfill its tremendous wildlife potential.

Opposed to this are proposals for a subdivision, medium draft harbor, fish farm, and power plant. As much of the area as possible should be acquired for endangered wildlife purposes.



## MOLOKAI

The only waterbird species resident here in numbers is the coot. Occasionally a few stilts may occur as stragglers from Maui or when moving between that island and Oahu.

The best area for coot is *Kakahaia Pond* located about 5 miles east of Kaunakakai. This area contains a pond of about 15 acres surrounded by a thick stand of roundstem bulrush. Coots are known to nest here, and as many as 33 have been seen here in recent months. During the winter, small numbers of migrant ducks use the pond. To improve the pond and provide a suitable buffer area, about 80 acres would have to be acquired.

About 3 miles west of Kaunakakai are the *Ooia* and *Kaluaapuhi Fish Ponds*. *Ooia* is badly overgrown with mangrove, and *Kaluaapuhi* supports small numbers of migrant ducks during winter.





## HAWAII

The island of Hawaii has very few wetlands suitable for native waterbirds. Natural ponds are small and occur only at widely spaced areas along the coastline, principally in the lower portions of the larger valleys and along the Kona, Kau, Puna and Hilo shores. Native waterbird use is limited with present populations estimated at 30 stilts and 50 coots. Recently 100 koloa were released in the Kohala Mountains by the Hawaii Division of Fish and Game to reestablish the species there.

Areas of less significance include *Waiakea* and *Lokoaka Ponds* near Hilo. These are managed intensively for public recreational fishing and fish culture respectively. They lack a well balanced flora and fauna necessary for waterbirds. Three valleys on the north side of the island may have been of value to waterbirds. Two, *Pololu* and *Waimanu*, have no known populations of these birds today. Both are inaccessible except by trails down steep valley walls. The large *Waipio Valley*, east of these two, has several wetland taro fields and two small marshy ponds now quite overgrown with vegetation but still occasionally attracting a few migrant ducks and native coots.



Opaepala Pond

*Opaepala Pond* is located on the coast about 11 miles north of Kailua. This small pond has a stable supply of brackish water supporting marsh habitat for resident populations of approximately 20 stilts, 15 coots, and a few night herons. Several koloa have been observed here recently. Small flocks of migratory ducks and shorebirds frequent the area in the winter. It is surrounded on three sides by recent lava flows and on the west side by a sand beach providing a low barrier between the pond and the ocean.

About 30 acres, including the pond and a buffer area around it, should be acquired to insure preservation of stilt and coot populations on Hawaii.

*Aimakapa (Honokahau) Pond*, located about 4 miles north of Kailua, approaches Opaepala Pond in value for waterbirds. It supports small

resident populations of stilts and coots, which at times move between the two ponds. It is comprised of a 15-acre open permanent water area surrounded by a 15-acre marsh. A narrow sand beach separates it from the ocean on the west. Vulnerable to tsunamis (tidal waves), this was once the site of a large old Hawaiian settlement.

It lies in an area of increasing human activity. A small boat harbor has been constructed a short distance south. A retirement residential and resort development is planned for the area around the pond. Present owners are aware of its natural and historic values and have indicated a desire to see them preserved, if they can be accommodated in the planned development.

The pond, marsh, and a buffer area of about 30 acres should be acquired or managed as a wildlife refuge for endangered waterbirds.

Key wetlands need to be preserved and fully developed as refuges for endangered Hawaiian waterbirds to insure their future as part of the fauna of this nation. Areas of lesser importance should not be considered satisfactory substitutes, individually or collectively, for more valuable areas, but they would be regarded as being complementary to the key areas.

Essential wetlands presently in Federal ownership lie within the Pearl Harbor Naval Base and the Kaneohe Marine Corps Air Station. The Navy and Marine Corps have designated endangered wildlife sanctuaries on their respective areas. To play their roles fully, they must be preserved and developed.

Areas in State ownership, including Kanaha Pond, Opaekaa Valley, and Wailua River pasturelands, need to be designated as wildlife refuges under the control and administration of the Hawaii Department of Land and Natural Resources, Division of Fish and Game. Private areas within or adjacent thereto should be acquired to make units complete.

Vital wetlands in county ownership within the City and County of Honolulu need to be set aside as wildlife refuges.

Key areas in private ownership should be acquired by the Federal or State governments. Extensive development is needed on most. Preservation might be possible under long term lease or cooperative agreement, but public ownership would insure protection of wildlife values and opportunities for habitat management.

Hawaii's endangered waterbirds, to remain ingredients of a pleasant human environment, must have places to live. Their survival depends upon actions taken now by people responsible enough to foresee the void created when a species that has taken many thousands of years to evolve, perishes.

## Summary

# Potential Refuges

## KEY AREAS TO BE PRESERVED AND DEVELOPED AS WILDLIFE REFUGES

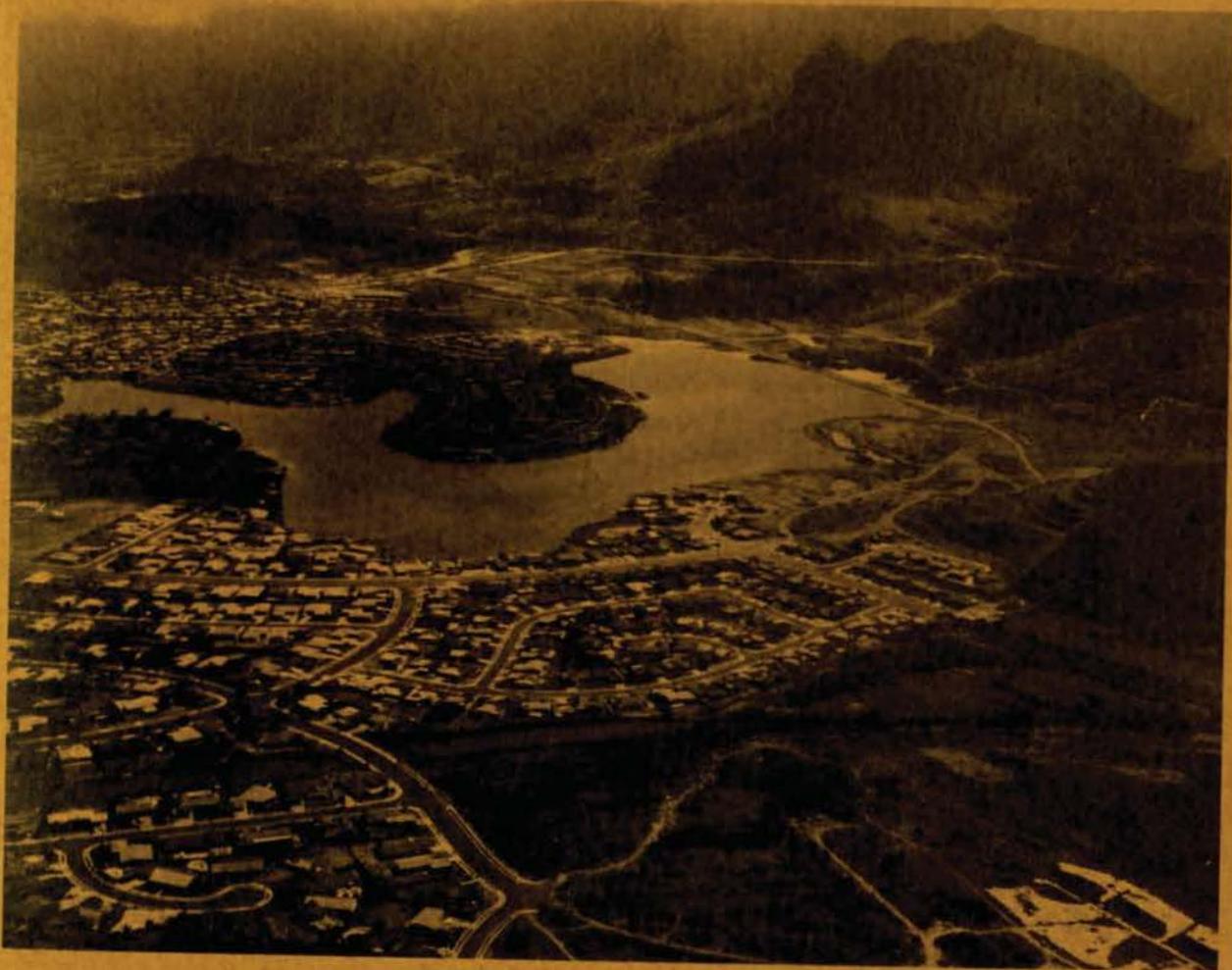
	<i>Acreege</i>	<i>Ownership</i>
<b>KAUAI</b>		
Hanalei Fields	300	Private
Menehune Fish Pond	40	Private
Huleia Marsh and Pasture	125	Private
Opaekaa Valley	80	State-Private
Wailua River Bottoms	90	State
<b>NIIHAU</b>		
Halalii, Halulu, Nonopapa Lakes	2,020	Private
<b>OAHU</b>		
Pearl Harbor Areas	390	Federal
Kaneohe Marine Corps Station Ponds	400	Federal
Kawainui Swamp (Part)	300	County
Pouhala Pond	35	County
Kahuku (Kii, Punamano, Punahoolapa)	460	Private
<b>MAUI</b>		
Kealia Pond	950	Private
Kanaha Pond	140	State
<b>MOLOKAI</b>		
Kakahaia Pond	80	Private
<b>HAWAII</b>		
Opacula Pond	35	Private
Aimakapa (Honokahau) Pond	35	Private

## AREAS OF SECONDARY OR COMPLEMENTARY VALUE BUT WORTHY OF RETENTION

	<i>Ownership</i>
<b>KAUAI</b>	
Hanapepe Salt Ponds	State
Lumahai Valley Taro Fields	Private
Wainiha Valley Taro Fields	Private
Waita Reservoir	Private
Lihue Plantation Settling Basin	Private
<b>OAHU</b>	
Fort Kamehameha Tidal Flats	Federal
Bellows Air Force Base Wetlands	Federal
Paiko Lagoon	State
Kahana Valley Wetlands	State
Nuuanu Reservoirs	State
Kuloa Pond	County
<b>MOLOKAI</b>	
Ooia-Kalaapuhi Fish Ponds	Private
<b>HAWAII</b>	
Pololu Valley	Private
Waimanu Valley	State
Waipio Valley	State-Private
Lokoaka Pond	State

Nuupia Ponds, Kaneohe Marine Corps Air Station





Kaelepu Pond

*Like the human environment, wildlife habitat too is affected by the processes of civilization. Man now must devote some energy to preserving part of his outdoor legacy.*

September 1970



**Hawaiian ISLANDS NATIONAL WILDLIFE REFUGE**

**Hawaii**

Sunrise over Shark Bay—Necker Island.

Warren Roll.



# HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE

## MASTER PLAN

Blue-gray Noddy Tern.



The National Wildlife Refuge System reflects concern of people for the welfare of native species. It is dedicated to preservation and management of a rich wildlife heritage as an ingredient of a quality environment. It comprises the greatest effort in this direction the world has known.

Purposes of this plan are to promote public understanding of refuge goals and to describe developments and operations needed to fulfill the destiny of this important area. Methods of achievement may vary as new ideas are developed, but the basic goal of benefit to present and future generations of Americans will remain unchanged.

Development of a master plan for this wildlife area is less a matter of establishing goals and procedures than of choosing between reasonable alternatives. The prime purpose of the refuge is to sustain abundant wildlife of the islands made more important because of the endangered species they sustain. This makes it impossible to permit types of public use usually offered on refuges. Tours would be damaging to wildlife and habitat; exploitation of known fishery resources also would be harmful. Thus, benefit of the refuge to man must be the satisfaction coming from preserving the islands and their wildlife as part of our living world. It is an easy choice when it is accepted that this is the highest value of these northwest islands.



Sooty Tern colony.

## FOREWORD

This refuge consists of a series of small islands and atolls stretching in a chain over 800 miles long west of the main Hawaiian Islands to Midway. It was established by President Theodore Roosevelt by Executive Order 1019, dated February 3, 1909, as the Hawaiian Islands Reservation. Land area is less than 2,000 acres, but surrounding lagoons included in the established boundary cover more than 200,000 acres. This has been the home of native species for centuries. They are different from the flowering beauty of the main islands glamorized in song and story.

The refuge islands, sometimes called the "Leeward" or "Northwest Islands," vary in size, elevation and composition. All are the tops of giant underwater volcanic peaks. Atolls, some islands, and the reefs are coral formed on suboceanic peaks, but a few islands are composed of basalt. The only human habitation is the U. S. Coast Guard long-range navigation station on Tern Island at French Frigate Shoals.

Access to the refuge is difficult because it is remote, off normal shipping lanes, and landing on reefs and rocky shores in rough surf is hazardous.

The refuge has some of the greatest sea bird nesting colonies of the world, and vast numbers remain through most of the year. Rare and endangered wildlife found nowhere else in the world live here. Forms of marine life in waters surrounding the islands or within atoll lagoons, including those outside the refuge, require protection of their water habitat for survival.

This plan provides guidelines for maintaining native wildlife of the islands as they are. Minor developments required for effective administration of the refuge and its programs will avoid unnecessary disturbances to this wild area. It is fitting that bold effort be applied to the goal of preserving a segment of the Central Pacific as part of our whole environment.



Images from Necker Island.



Ancient Hawaiian stone platforms on Nihoa.

## PAST

Primitive temples, house platforms, and garden terraces are silent witnesses that some of these islands were occupied by ancient Polynesians, perhaps more than 700 years ago. Near the turn of the century, effects of man's intrusion became acute. Three species of native birds disappeared and two others were threatened with extinction. Slaughter of the rare Hawaiian monk seal resulted in the near loss of this unique animal. The green sea turtle, common on the refuge, has been eliminated as a breeding species on the United States mainland.

Native species often are unable to cope with invaders and the changes they cause. Rabbits introduced early in this century by guano diggers at Laysan Island consumed most of the vegetation and upset its ecology. As winds buffeted the island, much wildlife perished in sandstorms. Without food and cover derived from the plants, either directly or in the form of insects, the Laysan honeycreeper, Laysan millerbird, and the Laysan flightless rail—found nowhere else in the world—became extinct. Laysan rails transplanted to Midway were lost there later through accidental introduction of rats which fed on eggs and young birds.

This pre-1900 photograph by J. J. Williams is from the files of Alfred M. Bailey. "Egging" would wipe out one year's hatch, but it was not as destructive as the rabbits and plume hunters.



Most of the plants have made a gradual reappearance on Laysan and Lisianski Islands, but some are lost forever. Plume hunters landing on the islands in the 1900's killed thousands of birds, large and small. Young birds perished when their parents were destroyed. Trespassers introduced pest plants and exotic insects; others left trash.

It was this series of tragic events and growing public awareness of the importance of these islands that led to establishment of the Hawaiian Islands National Wildlife Refuge.

## PRESENT

 Islands of the refuge vary from flat and sandy to rocky pinnacles and volcanic peaks rising nine hundred feet high, and from a few acres to those covering 2 square miles. Some small islands are bare, while larger islands contain extensive stretches of knee-high vegetation interspersed with sandy ridges or rocky outcrops. The palm trees of Nihoa occur nowhere else.

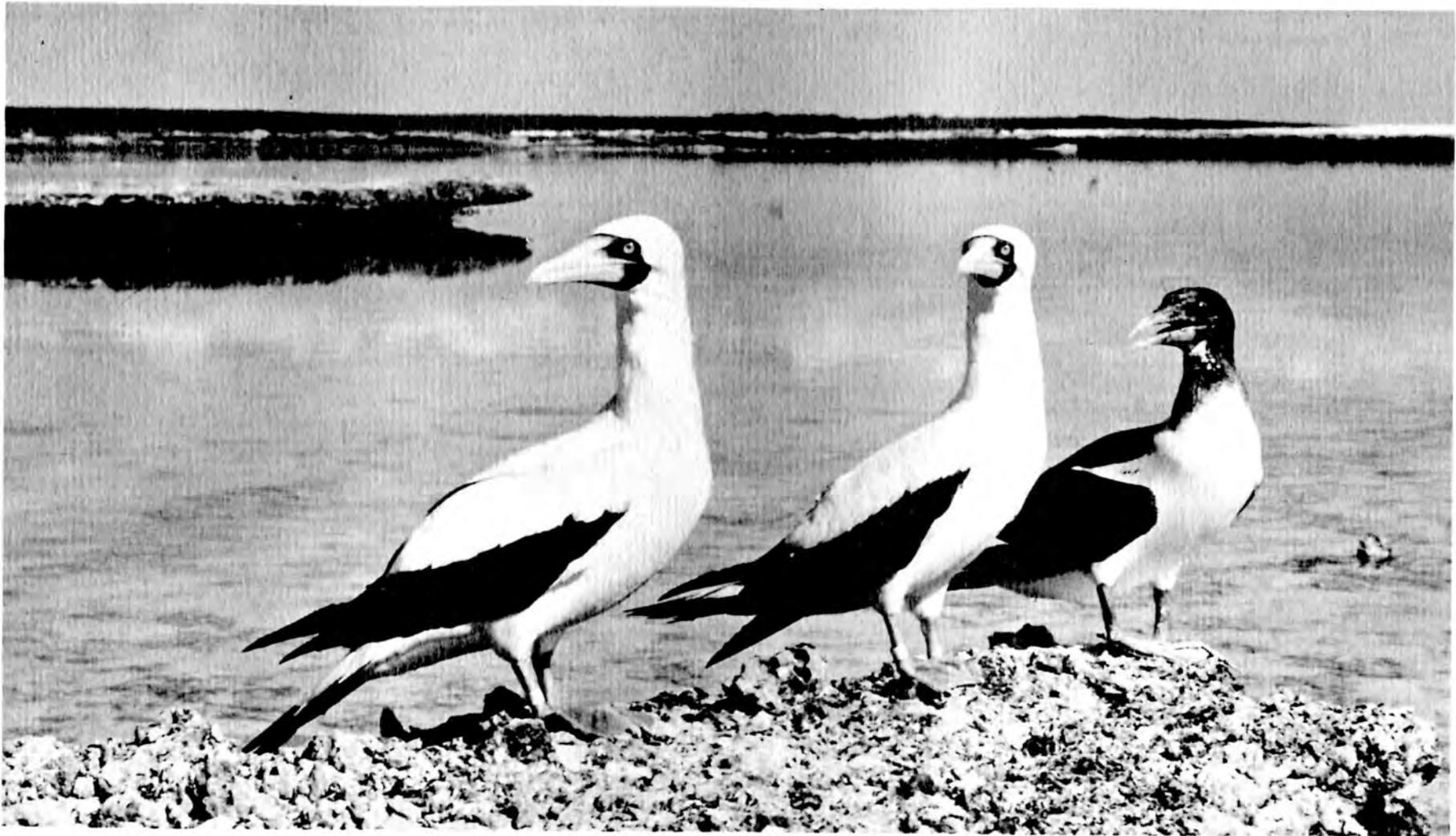
Sea birds like the Laysan albatross and black-footed albatross, known as "gooney birds," are familiar to many people. Over 160,000 nesting pairs on Laysan make it the world's largest colony. Occurring in even larger numbers are the trim black and white sooty terns. Laysan has nesting colonies over a mile in length, and it is difficult to walk there without stepping on eggs or young. Screams of these birds are deafening as they rise up in clouds before the intruder.

The dainty blue-gray noddy tern is a conspicuous bird of the high rocky islands of Necker and Nihoa. The white fairy tern, considered the most beautiful of sea birds, is found on most of the islands.

Little research has been done here compared with studies on and around the main Hawaiian Islands. Much can be accomplished, and the entire area offers outstanding opportunities for investigations, both marine and terrestrial. The refuge has been designated a national research natural area. Since it has qualities meeting basic criteria outlined in the Wilderness Act (Public Law 88-577), studies are underway to determine if the refuge, or parts of it, should be recommended for inclusion in the National Wilderness Preservation System.

Personnel are based on Oahu, not far from Honolulu. In addition to managing the refuge, they perform many diverse functions relating to Bureau of Sport Fisheries and Wildlife responsibilities. Present activities on the refuge are restricted to those relating to protection and research. It is fortunate ships of the world chart courses far from these islands where so much is at stake.

Blue-faced Booby.





Laysan Ducks

The Laysan Finch survives.



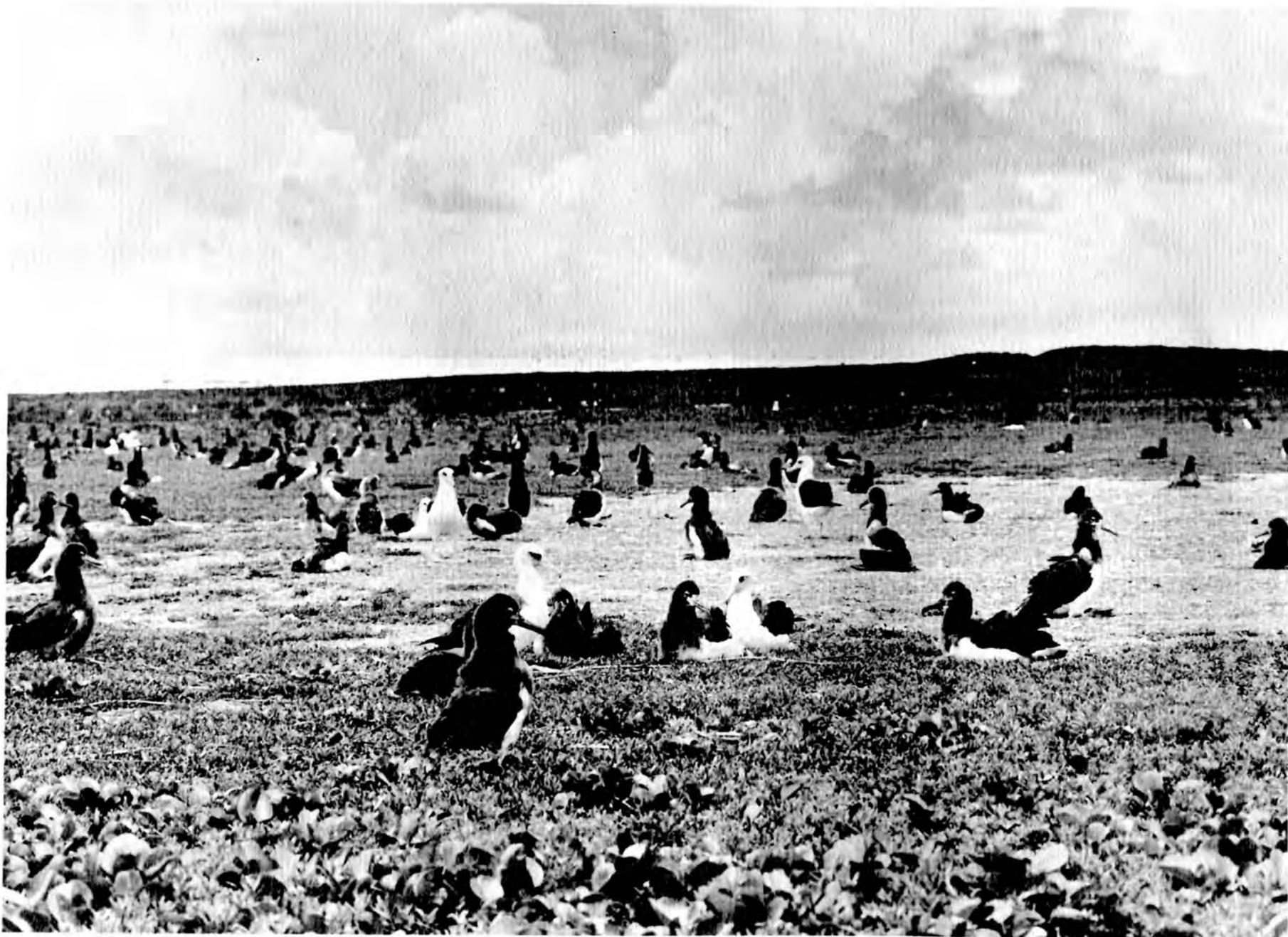
## OBJECTIVES

**H**ow nearly the refuge meets responsibilities for which it was established determines the future of wildlife there. The principal objective is to preserve its flora and fauna, terrestrial and marine, as natural as possible. Danger of upsetting the delicate ecology by accidental introduction of non-native plants, insects, and other undesirable organisms, and disturbance, makes it necessary to restrict public use. Any act adversely affecting wildlife and its habitat must be prevented. Accomplishment of that and related goals hinges on dedicated efforts on the part of all who may influence the integrity of these extraordinary islands. The following aims relate to the overall objective:

*Preserve rare and endangered species.*

Endangered birds present are the Nihoa millerbird, Nihoa finch, Laysan finch, and the Laysan duck. Priority will be given to insuring that human activities will not be detrimental. Desirability of transplanting populations of some species is considered. Such transplants will be undertaken only if there is no possibility of upsetting the ecology elsewhere.

Disturbance of the rare Hawaiian monk seal will be held to the minimum necessary to conduct approved scientific studies. It is described as rare in the U. S. Department of the Interior list of rare and endangered American wildlife. Principal breeding areas are the islets and islands of the refuge. More needs to be known about this animal and there will be studies to learn all its needs. It is apparent this animal cannot tolerate trespassing on its hauling and pupping grounds.



Laysan Albatross colony.



*Preserve sea bird colonies.*

Patrol of sea bird colonies and monitoring population trends will continue. Scientific studies will be permitted when they will not affect other wildlife. Protection from introduction of foreign plants and animals and physical changes caused by man is an important goal. Shearwaters and petrels are birds that construct burrows in the sandy soil. Roofs of these burrows often cave in under the weight of a man, and much human activity would cause loss of eggs and young. Extreme tameness of wildlife of the islands makes protection mandatory. Authorized landing parties are instructed on how to avoid altering the fragile ecology of the islands to assure breeding areas will remain secure and inviolate.

Wedge-tailed Shearwater in burrow.



During courtship, the male Frigatebird inflates his throat patch to many times its normal size.



Survey plans discussed.

George Laycock.

*Preserve marine biota and opportunities for scientific study.*

Waters around the refuge islands and within the atolls contain marine forms rare around the main Hawaiian Islands. The leeward archipelago was the probable immigration route for many of the high-island shallow water life forms. Marine communities will be preserved for their part in our total environment and opportunities they offer for scientific investigations.

A small marine laboratory with facilities for study of marine and land life of the atoll will be established on Tern Island of French Frigate Shoals. Since Tern Island already has been altered by military installations, refuge facilities proposed will add little conflict with wildlife still using the island. The airstrip there facilitates transportation of refuge personnel and supplies. Research around the more remote islands through the use of laboratory ships will be encouraged.

*Interpret wildlife and natural environments to increase knowledge of the island ecology.*

There is a special opportunity to study the relationship of the many features of the islands and their importance to the wildlife resource and, in turn, to people.

*Disseminate information essential to public understanding of wildlife, wildlands, and benefits of the refuge.*

Gathering information and interpreting its meanings become significant when they enrich human experience. Making knowledge of the refuge available to people will help fulfill this goal.

*Preserve selected areas in their natural state for reference observations and study.*

Isolated and remote, the refuge is in an ideal location to serve as a control environment for monitoring changes elsewhere. Many mainland refuges can support heavy public use; but here, because of the remoteness and hazards to be encountered in landings, the restriction on unauthorized visits will cause no public hardship.

*Preserve historic features.*

Two islands, Nihoa and Necker, contain remains of old Polynesian temples, house platforms and garden terraces. Archaeologists estimate some may be over 700 years old. They resemble those found in prehistoric Hawaii and inland areas of the Society Islands, thereby establishing a strong cultural link between Hawaii and Tahiti. These ancient structures on the refuge will be preserved as part of a civilization long past and a tie with the future.

The Hawaiian Islands are believed to have been born when the ocean floor ruptured, pushing up layers of lava until they protruded above the water. Volcanic action continues on the Island of Hawaii, but the Leeward Islands, or Northwest Islands, being older, have eroded. Coral has built up some, but generally the pinnacles and islets are remnants of large lava masses. These are the islands of the refuge where hundreds of thousands of birds converge from thousands of miles of ocean each mating season.



LEGEND

- Proposed Shelter
- Reefs, Coral or Rocky
- Refuge Islands and Atolls

P a c i f i c

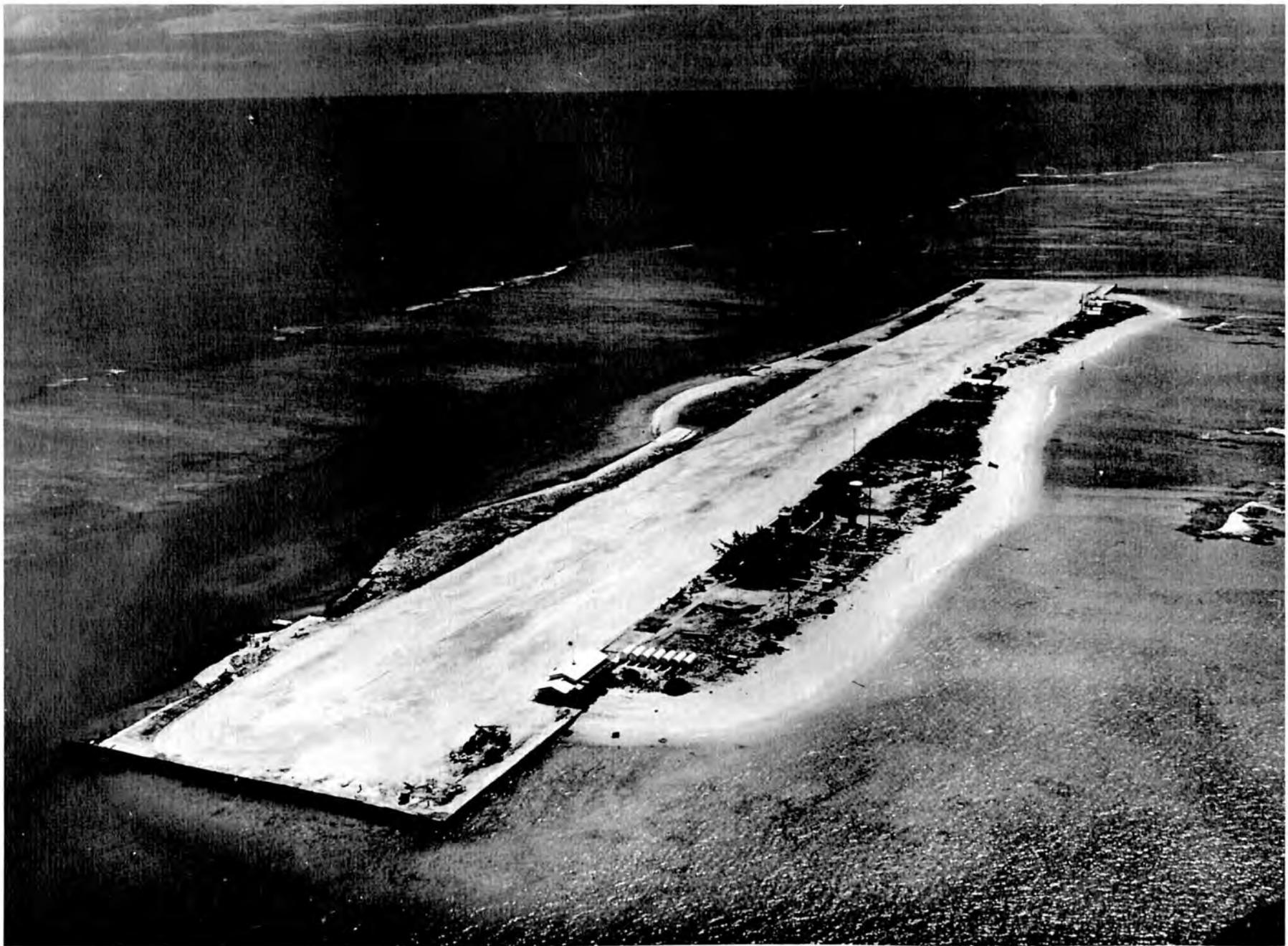
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APPROXIMATE SCALE IN MILES



 HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE



Tern Island, French Frigate Shoals. This Coast Guard station is the only habitation between the main Hawaiian Islands and Midway.

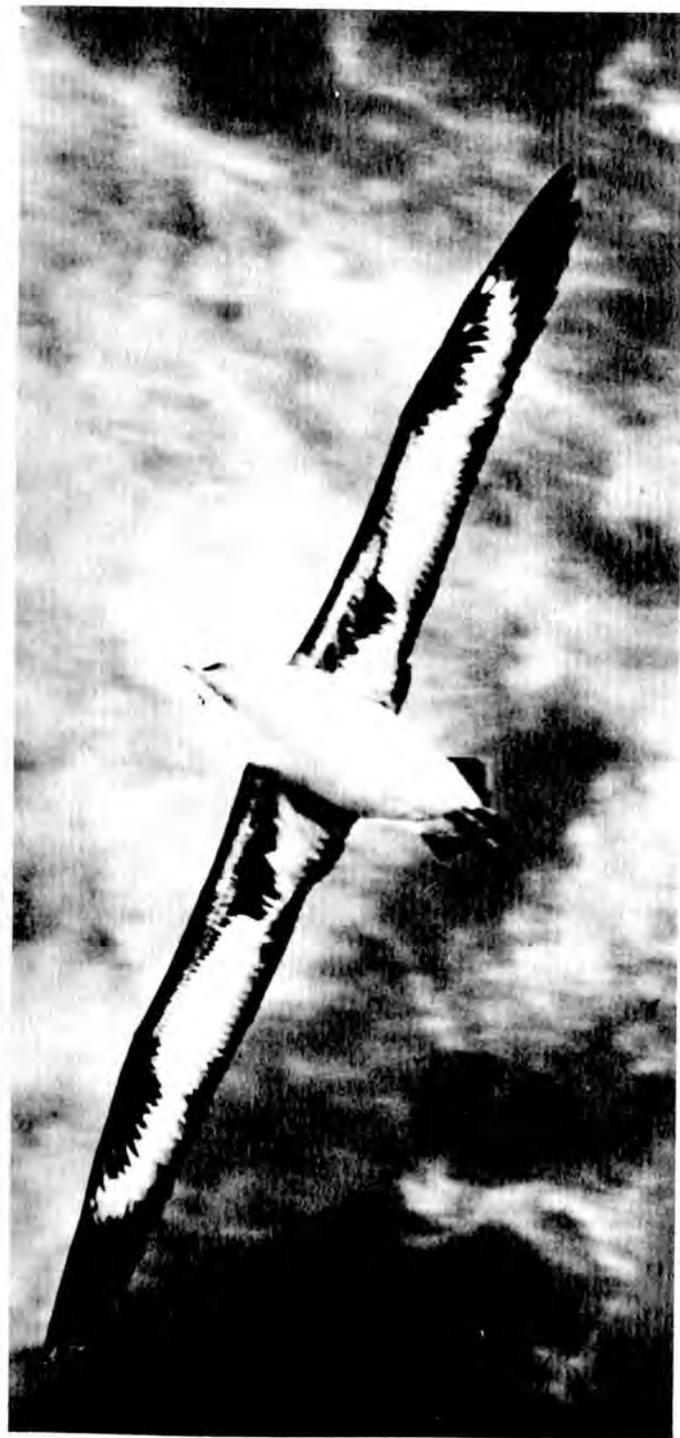
## **DEVELOPMENT & OPERATIONS**

Except for improvement of the boat channel to Tern Island, reefs and lagoons will remain as they are. Land management will consist of preserving refuge islands in near natural state with development held to minor projects beneficial for wildlife and helpful to administration. Personnel will try to eliminate exotic plants or animals there now or which may be introduced accidentally.

A cooperative agreement permits the Coast Guard to improve existing facilities on Tern Island. Enlarging the boat channel for small ships and reconstruction of the airstrip at French Frigate Shoals would benefit official access.

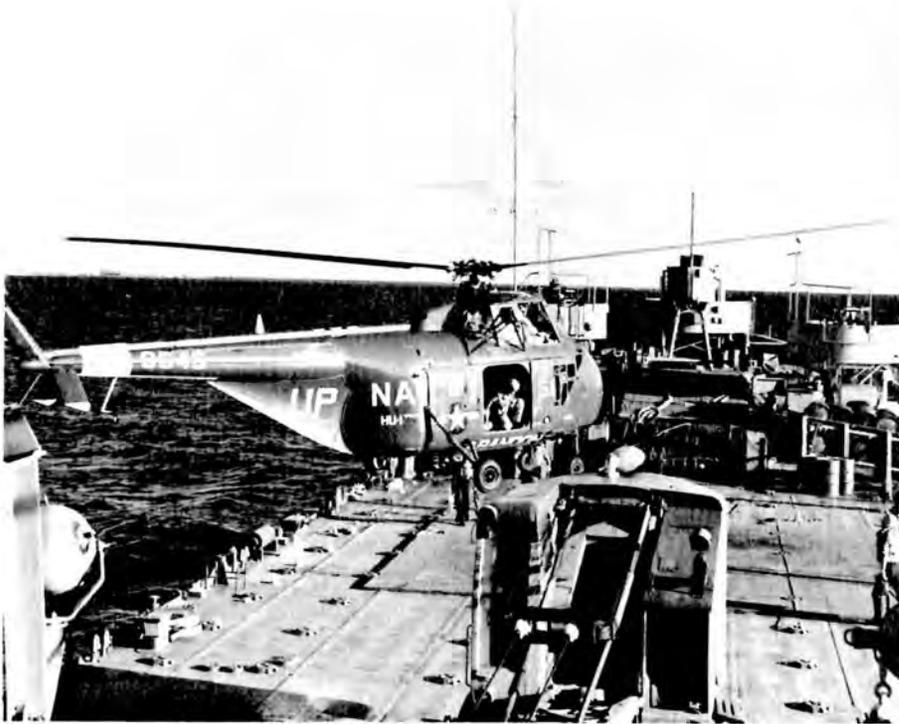
Sudden and violent storms occasionally hamper operations, and small shelters will be erected on major islands to house personnel during patrols and investigations. They will be of design easily transported ashore by small boat or helicopter, stout enough to protect basic equipment and supplies, and be located and designed to attract little notice. Now, provisions and equipment are brought ashore with each landing, sometimes under hazardous conditions. The shelters will make it possible to store food, water, bedding, and instruments needed to conduct activities. This will reduce time and effort of assembling and transporting material, thereby promoting efficiency and safety.

Utilities for the modest living quarters, laboratory, boathouse, and equipment storage building planned for Tern Island may be provided by the Coast Guard station there.



La Perouse Pinnacle, remains of an old volcanic peak.





Combining military maneuver with an official survey of the islands.



Helicopter atop Gardner Pinnacle.

### *Transportation*

Personnel and cooperators will continue to travel via government or private ships and aircraft. Effectiveness of administration depends in large part on ability to reach the islands. Because they are safer and more efficient, helicopters carried aboard ships are preferred to boats for access. But when helicopters are not available, improvements to facilitate boat landings are needed. Simple booms over the water and small boat slips are possibilities considered. Past refuge use of helicopters incidental to military missions has been successful and sometimes fixed-wing airplanes will be used for observation flights.

### *Administration*

The refuge office will remain in Kailua, Oahu, Hawaii, while programs continue at present levels. As the number and scope of activities increase, additional space and staff will be needed. Refuge responsibilities may include administration of some new, small areas on the main islands. Government-owned facilities suitable for expanded programs, including visitor services, will be developed in the Honolulu area. An administrative complex will include wildlife displays, an auditorium for meetings and slide shows, office space, and a place to store equipment and supplies. Design will be determined by types and directions of Bureau of Sport Fisheries and Wildlife activities in Hawaii. This complex will provide greater service to the public.

### *Recreational Facilities*

Remoteness of the islands and hazards of access interfere with casual pleasure visits. Importation of pest animals and plants could easily upset the fragile ecology of the islands, and intolerance to human disturbance by some animals makes public use a threat to natural values. The principal contributions of the refuge to recreation will be its information and interpretation values and enjoyment people receive knowing native species will survive. An interpretive center to be developed in connection with an administrative complex near Honolulu will display island wildlife in typical habitat. Pictures and printed information will complement slides and movies available for showing for groups.

## **BENEFITS**



Young "Gooney Bird" trying wings.

The refuge has flora and fauna which, in combination with unusual topography, are unique in all the world. That these shall be preserved is a goal fitting our most purposeful interest and effort. It has not been possible to repair all past damage or to prevent all trespass, but time has healed some of the abuse.

Scientific studies are producing new information. Tagging of birds, seals, and turtles gives information on migration, distribution, and basic life history data helpful in their management. Transplants of certain species will provide greater safety and wider distribution should some catastrophe occur on a single small island where they now live. Control of nonnative animals and plants will prevent changing the environment and protect resident species.

But the outstanding benefit is perpetuation of this wonderful area and its unique land and marine forms. Its remoteness, hazards, and lack of adornments sought by most travelers are assurances against mass public intrusion.

Wildlife of the islands of the refuge need not be harvested to be valuable; the knowledge it exists is enough for some people. Others see the refuge as a stopover for wildlife in migration, a base for dispersal or nesting. Still others believe the islands may have a significance not now known and recognize their importance to research.

Species lost cannot be restored, and it is unfortunate that some once found on the islands are gone forever. A responsible civilization cannot deny those now endangered this chance for survival. That this vast area shall remain a representative segment of the Central Pacific, no longer exploited, is a value beyond any imaginable monetary return.



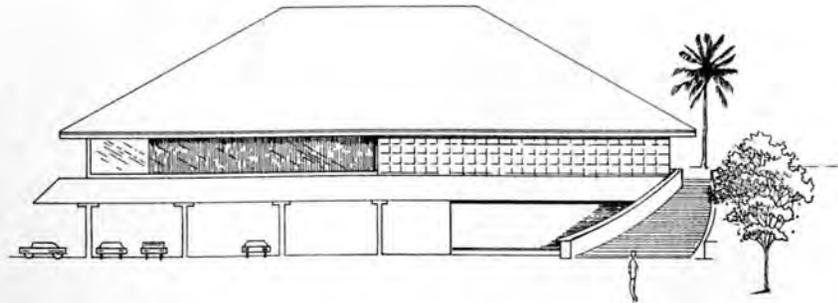
Nihoa Millerbird.



Refuge scientists weighing green sea turtle for life history studies.



Insect study.



Schematic drawing of administration and interpretation center.

## ESTIMATED COSTS

Low estimates shown reflect intent to maintain natural conditions. Structures planned will be simple, inexpensive, and limited to those necessary for safety and effective administration:

Shelters (6)	\$18,000
Laboratory and Quarters	12,000
Boat ramps (2)	6,000
Boathouse	4,000
	<hr/>
	\$40,000

Costs listed do not include development of an administration-interpretation complex in the Honolulu area. This would be a cooperative project costing approximately \$500,000 for the building and displays. Possibility of a site being acquired by exchange of public lands for a tract fitting the purpose will be explored.

Operational costs will be proportional to the tempo of activity. Field studies, travel, visitor services, expanded responsibilities, all affect expense of administration. Normal routine costs relating only to the refuge are expected to remain under \$140,000 a year.

Underwater survey.





Baby green sea turtles leaving the nest.

## SUMMARY

*E*stablishment of the refuge has prevented new damage to this unique island chain, and efforts to preserve native wildlife as a valuable part of our national heritage have been quite successful. Planned development essential to fulfillment of refuge purposes, respecting natural values, will provide substantial returns. Assured survival of species remaining in a setting best described as wilderness is a credible goal worth strong public support. Our posterity deserves no less than this as part of a rich wildlife heritage.



Fairy Terns



As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

This administrative plan proposed and prepared by the Bureau of Sport Fisheries and Wildlife's Western Region, Portland, Oregon, supports and furthers the high objectives of the Department of the Interior for the wise development, management, and use of the lands, waters, and other resources of the National Wildlife Refuge System.

April—1970