

**PACIFIC REMOTE ISLANDS
NATIONAL WILDLIFE REFUGES
HONOLULU, HAWAII**

**ANNUAL
NARRATIVE REPORT
CY 1986**

**U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM**

REVIEW AND APPROVALS

Stewart C. Sepe
Submitted by Refuge Complex Manager

8/18/88
Date

Jerry F. Lencucha
Supervisor, Refuges & Wildlife Review

8/25/88
Date

Allan Marmolstein
Pacific Islands Administrator Review

29 Aug 88
Date

Regional Office Review

Date

JOHNSTON ATOLL
NATIONAL WILDLIFE REFUGE

Honolulu, Hawaii

ANNUAL NARRATIVE REPORT

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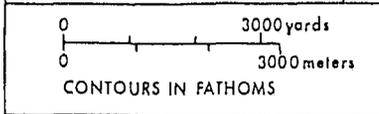
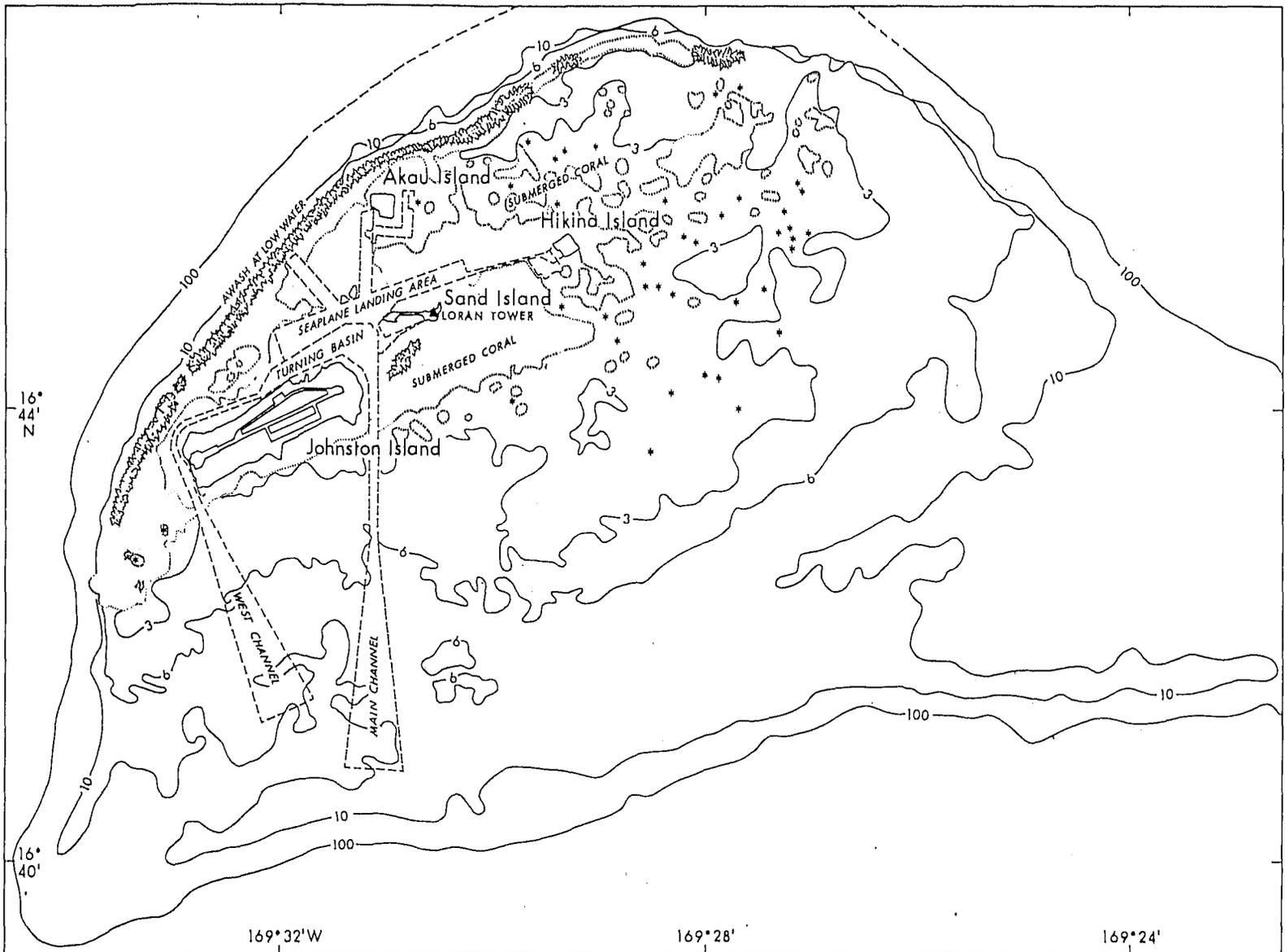
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INTRODUCTION

Johnston Atoll National Wildlife Refuge is located in the Central Pacific Ocean, 717 nautical miles west southwest of Honolulu Hawaii and 460 nautical miles south of French Frigate Shoals. Because of the great distances to other islands, Johnston Atoll is one of the most remote atolls in the world. It is the the nearest land to over 820,000 square miles of ocean. The atoll consists of approximately 32,000 acres of shallows with four small islands totaling 691 acres. Two of the islands, North and East, were man-made through extensive dredging in the early 1960s. Beginning in the 1940's, Johnston and Sand Islands were also greatly enlarged by landfill. Johnston Island is presently inhabited by approximately 850 military and civilian contractor personnel while Sand Island is the duty station for 10 Coast Guard personnel who maintain a LORAN C station there.

Operational control of Johnston Atoll as a strategic military installation is maintained by the Defense Nuclear Agency (DNA), Department of Defense. Johnston Island is also utilized by the U.S. Army as a storage facility for chemical munitions. The Army is currently constructing a facility on Johnston Island to destroy the obsolete weapons. This facility called the Johnston Atoll Chemical Activity Disposal System (JACADS) has attracted national news coverage and has been responsible for a doubling of the Atoll's population. Other contaminant issues include seven acres of land contaminated with Herbicide Orange and containing over 400 ppb of dioxin and about 40 acres contaminated with plutonium oxide as a result of three failed nuclear tests in the 1960's.

The refuge was established in 1926 by Executive Order (No. 4467) of President Calvin Coolidge "as a refuge and breeding ground for native birds". At present, the refuge is managed as nesting and roosting habitat for 14 species of seabirds, 6 species of shorebirds, and as habitat for a diverse assemblage of marine animals, including the threatened green sea turtle and the endangered Hawaiian monk seal. One Refuge Biologist was stationed on Johnston Atoll during the period of this report, the first full year of permanent FWS presence on the island since it's designation as a Refuge. In April 1986, Johnston Atoll NWR was identified as a high priority area for corrective action relating to contaminant issues in a Fish and Wildlife Service report, Preliminary Survey of Contaminant Issues of Concern on National Wildlife Refuges.



JOHNSTON ATOLL NATIONAL WILDLIFE REFUGE
North Pacific Ocean

UNITED STATES
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service

JOHNSTON ATOLL NATIONAL WILDLIFE REFUGES

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Johnston Island viewed from top of 640 ft.
Loran C Tower operated by the U.S. Coast
Guard on Sand Island. (G. Ludwig)

A. HIGHLIGHTS

The role of the refuge on Johnston Island has undergone considerable growth in the past year. The funding for the biologist position on Johnston Island was increased by the Office of the Program Manager for Chemical Munitions (OPMCM) and the funding is passed through the Defense Nuclear Agency (DNA) rather than the Army Corps of Engineers. This increased funding allowed the refuge to up grade the biologist position at the refuge from a GS-9 to a GS-11. In addition, the transfer of funds through the Defense Nuclear Agency, enables the biologist to function as a part of the Base Commander's Staff and therefor carry out refuge goals and the protection of the wildlife and natural resources of the refuge under the Base Commander's authority and resources.

A close working relationship between the Island's population and the Service has been fostered by several interpretive programs. The presence of a biologist on the Island throughout the year has increased the Service's visibility, and given both the Island's residents and management confidence in the services' interest in the Refuge, thus fostering greater cooperation.

The Johnston Atoll Chemical Disposal System (JACADS) was under construction throughout the year. This plant is the first of its kind and is designed to destroy the obsolete chemical weapons stored at Johnston Island. The plant has received a great deal of interest from the national media, the Defense Department, and those concerned with the environment.

Johnston Atoll NWR was identified as a Category A area for contaminants in a Fish and Wildlife Service report of April 1986 entitled Contaminant Issues of Concern on National Wildlife Refuges. A category A area is an area where evidence of toxic substance presence indicates the need for corrective action.

A Johnston Atoll NWR brochure was printed which describes the Refuge and its wildlife. The brochure is distributed on-island and has been a great success in informing people about the Refuge.

B. CLIMATIC CONDITIONS

Johnston Atoll (JA) has a mild tropical oceanic climate dominated by cooling northeast trade winds. Weather observations are taken at the Johnston Island Weather Station. Temperatures were moderate throughout the year with the yearly mean only 0.10 F below the 30 year mean. The rainfall in 1986 of 29.8 in. was 2.5 in. above the 30 year mean. Table 1 presents the mean monthly temperatures and rainfall.

TABLE 1. Mean temperature and rainfall recorded at Johnston Island during 1986 and 30 year mean from January 1955 - October 1984.

Month	Mean Temperature (oF)		Rainfall (in)	
	1986	30 Year Mean	1986	30 Year Mean
January	77.1	76.9	0.32	1.79
February	77.7	76.8	0.34	1.62
March	78.6	77.0	4.59	2.65
April	79.0	77.8	2.14	2.46
May	81.5	79.0	1.21	1.90
June	81.2	80.2	1.20	0.96
July	81.6	80.8	4.82	1.06
August	81.9	81.3	4.81	2.52
September	82.3	81.3	3.66	2.12
October	82.2	80.8	1.23	3.19
November	78.6	79.3	4.48	3.61
December	78.4	77.6	0.77	3.14
All Months	79.2	79.1	29.57	27.03

C. LAND ACQUISITION

The land surfaces of Johnston Island are owned by the Dept. of Defense.

D. PLANNING

The refuge biologist is involved regularly with monitoring the day to day operations of the base maintenance and construction contractors, advising them on how to limit their impacts on wildlife habitat. He also is asked to participate in planning of numerous activities and construction on the base. Refuge staff from the Honolulu office and the biologist from Johnston Island participated in several major planning efforts in 1986.

2. Management Plan

As a result of the Johnston Atoll Implementation Plan signed in 1984 between Corps of Engineers - Pacific Ocean Division (COE-POD), U. S. Army Chemical Activity - Western Command (USACAW), DNA Field Command Johnston (FCJ), and the Service, Refuge Complex personnel have worked closely with these agencies on refuge environmental concerns arising from the JACADS project. On several occasions, Refuge Manager, Leinecke, met with Mr. Richard Rife of OPMCM and officials of DNA to arrange funding and logistics support for the Refuge Biologist position and to define the interpretation and education program to be developed for the JA population.

In November and December of 1985, a Recreational Fishing Plan and the required documentation were drafted and reviewed. This plan was required since the refuge was open for fishing, but lacked a Fishing Plan. Public access and use regulations governing fishing on the refuge had been published in 1976 (Federal Register 41091), so an existing framework of regulations was in place. The extensive data collected by the Hawaii Cooperative Fisheries Research Unit (HCFRU) Johnston Atoll Aquatic Resources Study provided a firm scientific basis for concluding that populations of fish and invertebrates could easily withstand current and anticipated harvesting pressure. The Fishing Plan was submitted for Regional Office approval in January 1986 and approved by the Regional Director in February 1986.

From 22 through 25 September Jerry Leinecke, Jim Krakowski, and Doug Forsell traveled to Johnston Atoll at the request of Col. Thomas L. Reese, the Base Commander. They represented the Service in briefings by representatives of Hughes Aircraft and the USAF Space Division on possible plans to launch space vehicles from the atoll. Specifically, they were proposing to use East Island as the launch site. We accompanied them to East and North Islands, explained the delicate nature of the nesting habitat and how colonization of an island is a process which takes decades. We also told them that a refuge compatibility study would have to be completed, but, the outcome would probably be that their activity would not be compatible because it would likely destroy the nesting area of over 200,000 seabirds and very likely cause the deaths of many thousands of birds.

On 26 September, Refuge Staff met in Honolulu with the representatives of Hughes and reiterated our position. They stated that they were not going to pursue their plan for Johnston Atoll for their immediate project, but we could expect to hear from them in the future concerning other projects.

4. Compliance with Environmental and Cultural Resource Mandates

In November the Refuge Biologist and Refuge Manager (Remote Islands) drafted comments on the supplement to the draft environmental impact statement titled "Deep Ocean Disposal Site Near Johnston Atoll for Brine and Solid Waste". Biologist Forsell met with Mr. William Lennan of the Corps of Engineers to discuss the project and pass along some informal comments on the DEIS. The deep ocean disposal site for JACADS scrubber brines and solid wastes is one of the major decisions remaining concerning the operation of the new plant. A previous refuge concern centered on barge transport of the brine from the JACADS plant, through the lagoon and out the main channel to the open ocean. The barge's design, low power, and operating scenario raised the possibility of an accidental grounding in the narrow channel with subsequent release of brine into the lagoon environment. The composition of stack scrubber brines (ionic salts and heavy metals) suggested the possibility of long-term contamination of the

reef environment as well as immediate mortality of reef organisms if a spill were to occur. This problem was eliminated by proposing the salts be dumped using a twin screw vessel with more maneuverability and having it use the West Channel. Most of these concerns were addressed in the draft commented on in November. Unfortunately, this draft did not present all alternatives in an equal perspective and was rewritten for comments in 1987.

5. Research and Investigations

This year saw continuation of several major research projects initiated in earlier years. All were designed to assess potential impacts of the JACADS project on wildlife resources of the refuge. The two major contract research programs supported by funds from OPMCM and administered by the COE- POD were the seabird monitoring studies of Drs. R.W. Schreiber and E. A. Schreiber of Seabird Research Inc. and the Aquatic Resources Study of the FWS Hawaii Cooperative Fisheries Research Unit (HCFRU).

JHN-1-86 Seabird Monitoring Studies The primary goal of the seabird research was to assess and monitor the size and "health" of populations of marine birds throughout the JACADS project. Ten major questions were posed to achieve these goals: total and breeding population size of each species, numbers of nests receiving eggs, number of young raised to fledgling, egg size and weight, growth rates of young, types of nest sites, diet, rates and causes of mortality, and susceptibility to human disturbance.

The research team visited the refuge from 9-22 February, 3-12 July, and 31 July to 7 August. In selected study plots nests of Red-tailed Tropicbirds, Red-footed Boobies, Brown Boobies, and Great Frigatebirds were marked with numbered stakes; eggs of many species were measured and weighed; chicks were measured and weighed; and regurgitation samples were taken and frozen. Their estimates of populations, nest, and fledgling numbers are shown in the "Wildlife" section under "Shorebirds, Gulls, Terns, and Allied Species" (G.5), Table 2. Most populations appeared to be stable with slight increase over 1985. Fledgling success appears high in most species, and regulations and protection generally seem to contribute to high productivity. Except for the Great Frigatebirds, the unnatural mortality from birds striking the LORAN tower guy-wires does not appear to be having a significant impact on populations.



Dr. Ralph Schreiber measures a female Brown Booby while Elizabeth Schreiber records the data. (J. Krakowski)

Recommendations from this study included continued monitoring and banding, education of island personnel to avoid disturbing nests, and establishing a policy on how brushes are trimmed in order to preserve them for nesting tropicbirds. These have already been implemented by the Refuge and the Base Commander. Other long-term recommendations such as establishing a baseline of heavy metal contamination of selected species and monitoring of seabird feeding at open ocean dump sites are being considered if ocean dumping is initiated.

Two other researchers accompanied the Schreibers on their visits to investigate other aspects of seabird breeding biology. Fran Horvath, a USC doctoral student, studied attendance patterns of Red-tailed Tropicbirds at their nests from 3 July to 7 August. She also collected food samples from tropicbirds and collected data on chick growth. Dr. Joe Williams of Pepperdine University was investigating temperature regulation and basic metabolic rates of Brown Noddies. He was interested in determining the effects of heat and disturbance on chicks when humans enter a colony. The results from these studies have not been received by the refuge.

JHN-2-86. The University of Hawaii Co-op Fisheries Unit continued their monitoring of the lagoon resources to determine the effects if any of increased fishing pressure from the larger population on the island.

Darby Irons and several different partners including Steven Poet, Vanessa Gauger, Stanley Jazwinski, and Randall Kosaki made four month long trips to the island to conduct their quarterly census of fishes and invertebrates. A report was received in July stating "it appears there was very little impact of fishing on atoll fish populations" but, "it is too early to tell if the increase in population will affect the fishery in the future."



Darby Irons of the Hawaii Cooperative Fisheries Research Unit weighs a "menpachi" or brick sholderfish the most commonly caught fish on the atoll. (W. Cook)

JHN-3-86 Department of Energy, Project " Thumper". Thumper was a seismic refraction study funded by the Department of Energy (DOE), and conducted by the Los Alamos National Laboratory to determine the subsurface geologic structure of Johnston Atoll. The operation occurred on Johnston Atoll from 9 October through 21 October 1986. The original proposal was to set off three explosive charges of 10 to 50 lbs at six underwater stations in the shallow waters of the atoll. The refuge determined that the project did not include adequate safeguards to avoid possible injury or death to threatened green sea turtles or other wildlife in the reef. Since there were very few seabirds inhabiting the three outer islands of the atoll, a special use permit was issued to allow a

limited number of blasts on the islands as long as serious disturbance to the birds was avoided. They detonated three 20 lb charges on western Sand Is., one 25 lb charge and two 45 lb charges on North Island, and three 60 lb charges on East Island. All charges were buried and caused little disturbance to the few birds roosting on the islands. A small amount of mounding was created at the blast sites, but these were leveled with a front-end loader.



Twenty pound charge explosion on Sand Island as a part of seismic testing to determine the thickness of the coral cap of Johnston Atoll. Charges were buried five feet below the surface to limit air shock which would disturb roosting birds.

(JHN-4-86)

Approximately seven acres of the northwestern corner of Johnston Island is contaminated with dioxin in concentrations greater than 400 parts per billion in some areas. The Air Force has the responsibility to clean up the areas and to monitor the area until its clean-up. A research development and demonstration permit under the Resource Conservation and Recovery Act was issued to operate a hazardous waste destruction unit at Johnston Island. The object of the test plant was to demonstrate the rate and amount of removal of dioxin and other contaminants from 4,000 pounds of coral by thermal desorption/ultraviolet light photolysis. The plant was constructed and operated in July and August of 1986. The results of the project have not been released at this time.

E. ADMINISTRATION

1. Personnel

1986 was the first full year of a full-time FWS employee stationed on the refuge since it was established. The position was a temporary Fish and Wildlife Biologist (GS-401-9) funded by OPMCM. The biologist William J. Cooke, resigned effective 16 May 1986. James Krakowski, Assistant Refuge Manager was detailed to the refuge from 26 June through 26 July and from 7 August through 6 September. The position was upgraded to a permanent GS-11 in September and Doug Forsell transferred from the Alaska Fish and Wildlife Research Center effective 14 September.

The position has five major responsibilities: monitoring wildlife populations; advise and support the JA base and tenant commands on environmental and refuge concerns; providing interpretation and education programs for JA residents and visitors; liaison and coordination with visiting researchers; and planning, budgeting, and managing refuge resources to achieve these goals.

4. Volunteer Program

Numerous military and civilian personnel assist the Refuge Biologist with biological surveys and seabird banding duties. All of these individuals expressed a strong interest in natural history and the biology of the species found on the refuge. Many of the volunteers are used for one or two surveys and the trips provide both aid to the biologist and an opportunity to allow them the chance to photograph wildlife and receive an interpretive tour. Several proved to be excellent assistants, and showed a strong interest in helping on a regular basis so volunteer agreements were signed.

5. Funding

The FWS program at JA—including the Biologist position, operational support money, and the cost of the seabird, and aquatic resources monitoring programs—are funded entirely by the Army's Office of the Program Manager - Chemical Demilitarization (OPMCM). In FY86 approximately \$40,000 was provided for salary, travel, and on Island support expenses for the Service biologist through the Corps of Engineers. In addition, all JACADS environmental studies (HCFERU, Seabird Research, etc.) also used the same COE on island support accounts and OPMCM provided similar amounts for their overall contracts. Complex Manager Leinecke negotiated increased funding for the position for FY-87 and a change in the way the funds are transferred. Rather than funds being transferred through the Corps of Engineers, funding for the service biologist was received by the Refuge from OPMCM through DNA. Funds for on island support will be transferred from DNA to the Island contractor directly. This funding was established as 45k to the Service per year for salary and travel and 5k for on island support.

F. HABITAT MANAGEMENT

1. General

Johnston Atoll serves primarily as a roosting and breeding grounds for Central Pacific seabirds, a wintering grounds for migratory shorebirds, and a unique coral reef ecosystem combining elements of Hawaiian and Central Pacific organisms. Johnston Atoll is the closest point of land, thus, the only island available as a roosting and breeding habitat for seabirds in 820,000 square miles of ocean. The importance of Johnston Atoll in the ecology of the Central Pacific is far greater than its relatively small land mass would at first suggest. Within this area, the areas most intensively foraged by birds from Johnston Atoll are probably the waters to the west of Johnston Atoll where food availability is increased by upwellings created by the down-current "wake" of the atoll.

5. Grasslands

A front-end loader was provided by the Thumper Project for control of the grass *Lepturus* on East Island. The heavy growth of grass caused by unusually large amounts of rain in 1975, limits the area in which ground nesting seabirds can lay their eggs. The loader cleared roughly a circle of 60 m diameter and four strips about 7 m by 120 m in about 3.5 hours. Within an hour, over 77 Golden Plovers and 58 Ruddy Turnstones were counted feeding on the abundance of insects uncovered. By 1800 hours, 300 Sooty Terns were hovering over the area and numerous Brown Noddies were roosting on the exposed areas. The grass and soil was piled along the edges of the clearings in hopes that, as the vegetation decomposed, the hills would provide roosting habitat for birds. In the weeks following the clearing, over 30,000 pairs of Sooty Terns nested in the cleared areas.



Sooty terns nesting in cleared areas of East Island. (E.A. & R.W. Schreiber)

6. Other Habitats

The lagoon and surrounding shallow waters of the refuge were thoroughly characterized by the HCFRU Aquatic Resources Survey conducted in 1984. Their program of monitoring five permanent stations within the lagoon four times per year found no significant change in the populations during 1986. *Acropora* and *Montipora* species dominate the coral community, with *Acropora cytherea* being especially dominant in coverage. This species, commonly called "table coral", can attain 100% cover in many areas, is probably one of the fastest growing coral species, and provides extensive three-dimensional habitat for many different fish. The fish community is also dominated by relatively few species.

While the marine habitat appeared healthy and at minimal risk, the terrestrial habitat, particularly nesting habitat for seabirds on Johnston Island, faced considerable risk during 1986. Two major construction projects, the small arms firing range and the JACADS facility, eliminated large areas of shrubs utilized by Red-tailed Tropicbirds as nest sites. The Refuge Biologist worked closely with the JA Base Engineer and the construction contractors during clearance of this brush (primarily *Pluchea odorata* and *P. indica*). Clearance was scheduled to occur during the non-breeding season, although the presence of some unsynchronized breeders complicated operations. In these areas (used for aggregate stockpiles and materials storage yards) active nests were identified and marked by the contractors under the guidance of the Refuge Biologist. Heavy equipment operators were also briefed on avoiding the location of the nests. Although brush areas containing over one-hundred nesting sites were cleared, no active nests were lost. Monitoring of birds which had used these sites will determine if they shift to other brush areas on Johnston Island or other islands.

Biologist Cook worked with Hawaiian Dredging and Construction Co. to delineate the nesting habitat where the JACADS contractor will be staging their equipment.

Krakowski worked with the contractor constructing the small arms firing range to save as much nesting habitat as possible and to ensure that all young tropicbirds had departed the nest sites prior to disturbance of the shrubs. One young tropicbird was not ready to leave the nest when the bush had to be moved. The equipment operator moved the nesting bush about 10 feet per day until the shrub was out of the way. The chick continued to be fed by its parents and fledged a few weeks later.

The refuge biologists on several occasions have advised and sometimes initiated cutting of vegetation in the runway clear zone to discourage Red-tailed Tropicbirds from nesting there and creating a bird-aircraft strike hazard.

In November, Doug Forsell met with Mr. Walter Higuchi, the field supervisor for grounds maintenance, to discuss removal of trees and shrubs. He briefed Mr. Higuchi on the importance of trees and shrubs to

Red-tailed Tropicbirds and White Terns, the most abundant species of seabirds nesting on Johnston Island. Mr. Higuchi agreed to contact the biologist prior to cutting of any trees and shrubs. This policy was adopted with the new base regulations on wildlife.



White tern chick at Johnston Island. These birds have benefited due to man's planting of trees. (R. Shallenberger)

In 1975 Ralph Schreiber of Seabird Research identified a lack of nest and roost sites for Red-footed Boobies and Great Frigatebirds. In response, one hundred and fifty concrete cinder blocks were moved to the north side of East Island. Here they provided off-ground bases for Red-footed Booby nests and roosting perches for Great Frigatebirds away from the hazard of the LORAN tower guy wires over Sand Island. Monitoring in 1986 showed most of these blocks were being used by boobies and one pair of frigatebirds nested on them.

G. WILDLIFE

2. Endangered Species

The refuge supports populations of the threatened green sea turtle and the endangered Hawaiian monk seal. The populations of the green sea turtle have apparently remained stable. The turtles do not nest on Johnston Atoll, but feed extensively on the algae off the south side of Johnston Island. One notable finding in 1986 was the recovery at French Frigate Shoals in the Hawaiian Islands NWR (HINWR) of an adult male tagged at Johnston Atoll in 1983. This tag recovery combined with one from 1985 indicates that at least some of the population foraging on Johnston Atoll migrate to the Northwestern Hawaiian Islands for breeding. However, turtles tagged at French Frigate Shoals were never recovered at Johnston Atoll during the period when take was legal and many were taken. This suggests that some of the refuge population may migrate to other island groups besides the Northwestern Hawaiian Islands for breeding. In July of 1986 an administrative report was released by the The National Marine Fisheries Service, Southwest Fisheries Center titled Status and Ecology of Marine Turtles at Johnston Atoll: 1985 Assessment by George H. Balazs and Robert G. Forsyth.

Hawaiian monk seals have historically used Johnston Atoll intermittently in very low numbers (migrating from HINWR). Of the nine Hawaiian monk seals translocate from HINWR to the refuge in 1984, only one was present in 1986 and this animal was last reported in March. They have either migrated back to the Northwestern Hawaiian Islands (NWHI), or perished. Natural migrations are certainly within the species' capabilities, but the missing seals have not been resighted in the NWHI despite an extensive observation program. Federal laws and island regulations concerning the protection of both the monk seals and the turtles are stressed to all visitors as well as permanent personnel.

3. Waterfowl

Although the refuge supports no wetland habitat, ducks are often found during fall migration. Two pintails (*Anas acuta*) were found in October 1986, but both died from starvation.

5. Shorebirds, Gulls, Terns, and Allied Species

All four islands of Johnston Atoll are used as roosting and/or breeding grounds for at least some of the 15 species of seabirds using the refuge. One Masked Booby nest was found nesting on the East Camera Stand in October and a survey of the area revealed that several pairs may have bred on the platform in 1986. This was evidently the first time this site had been investigated for nesting birds and the first time Masked Boobies have been found nesting on the Atoll in recent years. Several Brown Noddy chicks were found on the West Camera Stand in October, thus these birds nest there in unknown numbers. The camera stands will be censused more thoroughly in 1987.



Female great frigatebird and chick on
Sand Island, Johnston Atoll. (G. Ludwig)

Several vagrant birds were observed on Johnston Is. during October. A male Osprey was on the island for at least two weeks. Two immature or female Northern Pintails were also on the island one of which died and was found to be emaciated from migration. And at least five Cattle Egrets were on the Johnston Island for several days many staying for several months.

TABLE 2. Seabird and Shorebird populations utilizing Johnston Atoll in 1986.

Populations of nesting pairs are estimates made by R. W. Schreiber and E. A. Schreiber based on three trips to the Atoll. Total populations include roosting (except Red-footed Boobies and Great Frigatebirds on the tower at sand Island) and nesting birds were derived from the Schreiber's estimate (SS) or from estimates by D. J. Forsell (DF).

Species	Atoll nesting population (From Schreiber and Schreiber, 1987)	Estimated Total Population	
Bulwer's Petrel	8-10 pairs	20	SS
Wedge-tailed Shearwaters	800 - 1000 pairs	2,000+	SS
Christmas Shearwater	30 pairs	20	SS
Red-tailed Tropicbird	500 pairs	1,100	SS
Masked Booby	2+ pairs	25	DF
Red-footed Booby	170 pairs	220	SS
Brown Booby	110 nests	300	SS
Great Frigatebird	58 nests	150	SS
Sooty Tern	30,000 nests	80,000	SS
Grey-backed Tern	450 nests	900	SS
Blue-grey Noddy	1 nest	3	SS
Brown Noddy	1,500 nests	3,000	SS
Black Noddy	10 nests	150	SS
White Tern	40 nests	2,000	SS
Pacific Golden Plover	314 birds	450	DF
Ruddy Turnstone	175 birds	225	DF
Bristle-thighed Curlew	6 birds	10+	DF
Wandering Tattler	3 birds	10+	DF
Sanderling	6 birds	6	DF

6. Raptors

Two short-eared owls were consistently sighted in the vicinity of the "Scientific Row" buildings along the runways on Johnston Island. Short-eared owls had been regularly reported from Johnston Island before. It is presumed they feed on the abundant mouse population, since pellets contained only mouse bones. No bird carcasses or attacks on seabirds have been observed. The presence of another raptor species at some time cannot be completely excluded since at least one, the Peregrine Falcon, has been collected in the past.

9. Marine Mammals

See G.2, Endangered and/or Threatened Species (above).

11. Fisheries Resources

The fisheries resources of the refuge consist of approximately 271 species of fish and many species of coral and other invertebrates. Of the fish species, the actual take is concentrated on just a few species as shown in Table 3. Although fishing is popular with both military and long-time resident personnel, the latter are responsible for the bulk of the take. These long-time residents have the experience and familiarity with fishing tropical reefs, while newcomers, although enthusiastic and curious, are often not very successful until they learn the local techniques. The impact of this recreational fishery is minimal on the atoll-wide populations, as shown in Table 3. The most-taken fish in relation to atoll-wide population size still suffers only an estimated 3% annual mortality from recreational fishing. The population estimates were derived from the lagoon surveys of the HCFRU team, while the annual take was estimated from the Catch Report Forms and the Creel Censuses performed by the same research team.



Acropora and Pocyllepora coral at Johnston Island. Table coral probably grows faster and achieves greater coverage at Johnston Atoll than anywhere else in the world. (E. Kridler)

TABLE 3. The eleven most abundant fish species on JA.

The HCFRU report also noted that the six dominant surgeonfishes (Acanthuridae) are especially widespread and consistently found in most zones, while others (Butterflyfish - Chaetodontidae) were more variably distributed between zones.

Name	Atoll Population	Annual Catch	Percent of Population Caught
Yellow-eyed surgeonfish	1,650,300	2,188	0.1
Convict surgeonfish	599,600	1,695	0.3
Brick sholderfish	385,400	2,365	0.6
Yellowstripe goatfish	188,900	326	0.2
Manybar goatfish	61,850	220	0.4
Doublebar goatfish	48,000	362	0.8
Spectacled parrotfish	29,450	328	1.1
Blue goatfish	27,600	307	1.1
Blue jack	26,500	607	2.3
Low fin chub	22,350	239	1.1

14. Scientific Collection

No scientific collecting was conducted during 1986.

15. Animal Control

A base regulation was written by biologist Cook and adopted by the Base Commander restricting the introduction of dogs, cats, or other pets to Johnston Atoll. This regulation also limited the activity of the few pets now present on the Refuge.

16. Marking and Banding

Both service personnel and Seabird Research Inc. are actively banding birds at Johnston Atoll. Table 4. summarizes the accomplishments for 1986.

TABLE 4. Banding accomplished at Johnston Atoll in 1986.

Species	Number Banded by FWS Personnel	Number Banded by Seabird Research Inc.
Great Frigatebird	0	38
Red-tailed Tropicbird	160	718
Masked Booby	6	2
Brown Booby	8	187
Red-tailed Booby	6	137
Sooty Tern	2	121
Grey-backed Tern	1	0
Brown Noddy	647	780
Black Noddy	0	3
White Tern	36	177
Wedge-tailed Shearwater	370	6

H. PUBLIC USE

1. General

The population of Johnston Atoll grew from approximately 700 personnel in 1985 to an average of 850 military and civilian contractor personnel by the end of 1986. This growth was due to the on going construction of Igloos for storage of the chemical munitions and the Johnston Island Chemical Agent Disposal System (JACADS) construction projects. There is no "public" access as such; the base is a restricted installation and all personnel must be employed at the facility and possess an entry authorization from the Base Commander to debark from any plane or ship.

Because of the high visibility of JACADS and chemical operations, the island receives at least monthly visits by general grade officers, Senior Executive Service personnel of the Department of Defense, or congressional aids. The refuge biologist usually delivers a one to five minute briefing at the airport and sometimes a slide show to explain the refuge's role on the Atoll.

7. Interpretive Programs

All new personnel arriving on the refuge, whether they are temporary visitors or permanently assigned, are presented a three to four minute briefing of the refuge status of Johnston Atoll and the regulations pertaining to them. They are also given a copy of the refuge brochure to aid in their orientation. A second briefing, for all newcomers permanently stationed (more than 1 month) on the Atoll is part of the two hour introductory program given by the Base Commander and his representatives. The refuge biologist presents a twenty minute slide show including: The regulations of the refuge, a brief history of the the refuge and the reasons for its existence, the major species which use the

refuge, and the research projects currently underway. The longer briefing is tailored to providing background information as to why the protection and regulations exist and what each individual's responsibilities are while on the Atoll.

A brochure was printed in early 1986 which describes the refuge and the wildlife. The brochure has been a great success and all personnel arriving on the island receive a copy. Many people request additional copies to mail to friends and relatives.

On each trip to the outer islands to band birds or conduct censuses one to three volunteers are used to record data or to help with the census. This provides an excellent opportunity to do interpretive work and allow people to photograph birds in a controlled setting, rather than having them going to the islands at times when the nesting seabirds may be disturbed.

The Draft text for the interpretive display for Johnston Island was reviewed by The Johnston Is. Office and in Honolulu. The contract was let for a cost of just under \$10,000 for one large panel and six smaller panels to be changed monthly. Funds were provided by PEOPM.

9. Fishing

Recreational fishing is a popular activity on Johnston Atoll. The Recreational Fishing Plan for the refuge has been covered above (D.2) as have the Fisheries Resources (G.11). In terms of actual public use, the HCFRU survey team estimated approximately 19,000 hours of fishing effort per year on the refuge. Catches are made by hand, by pole and line, by throw net, and by spearfishing while diving. Additionally, fishing parties organized by the Base Recreational Services Office use landing craft ("Mike" boats) and other small craft to troll just outside the refuge boundary for pelagic species such as wahoo (ono) or tunas (ahi and aku).

Base regulations controlling fishing prohibited the use of throw nets within 100 yards of the shoreline of Johnston Island while allowing their use from other islands. Because catch data from the HCFRU research team showed that recreational fishing has minimal impact, this regulation was examined in a public meeting held in late 1985. The general sentiment was that the regulation worked a hardship on fishermen who could not travel to the other islands (recreational boats were often in high demand). As a result of the HCFRU findings and the sentiment of the resident population, the Refuge Biologist obtained a six-month trial suspension of the regulation from the Base Commander. In late 1986 the results of the opening of the Johnston Island shoreline to fishing were evaluated and the decision was made to continue to allow the fishing.



Coral harvested by divers for gifts and as a memory of Johnston Atoll. (G. Ludwig)

17. Law Enforcement

The Refuge Biologist has no law enforcement authority on the *refuge* as all enforcement authority is vested in the Base Commander and carried out by the base Security Force. As a result of the severe punishments involved (possible loss of job and deportation from the Island) and the interpretive program violations of the wildlife regulations are quite rare.

Suggestions for extensive revisions to the base regulations pertaining to wildlife were submitted to Col. Reese in November and were finalized at the end of December. The three most significant changes included more stringent control of pets, limitation of access to the outer islands based on actual nesting activity rather than specific dates, and establishing controls on cutting of shrubs and trees.

I. EQUIPMENT AND FACILITIES

The primary FWS facility on the refuge is the Refuge Biologist's office located in the Joint Operations Center. The office is adjacent to the Base Engineer's and the Base Commander's offices. This office was provided and furnished by DNA so that the Refuge Biologist could work closely with the Base Command. The office includes desk and chairs, filing cabinets, lab table with microscope, bookshelves, and a couch. The JOC building is completely air-conditioned and highly secure.

ROSE ATOLL NWR

ANNUAL NARRATIVE REPORT

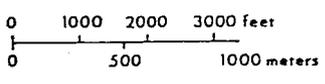
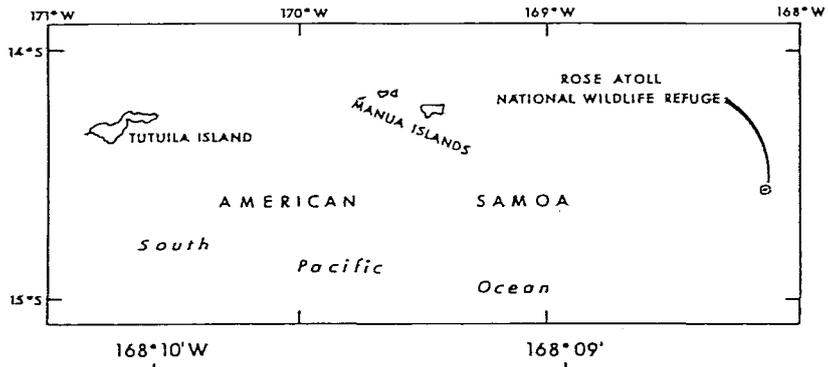
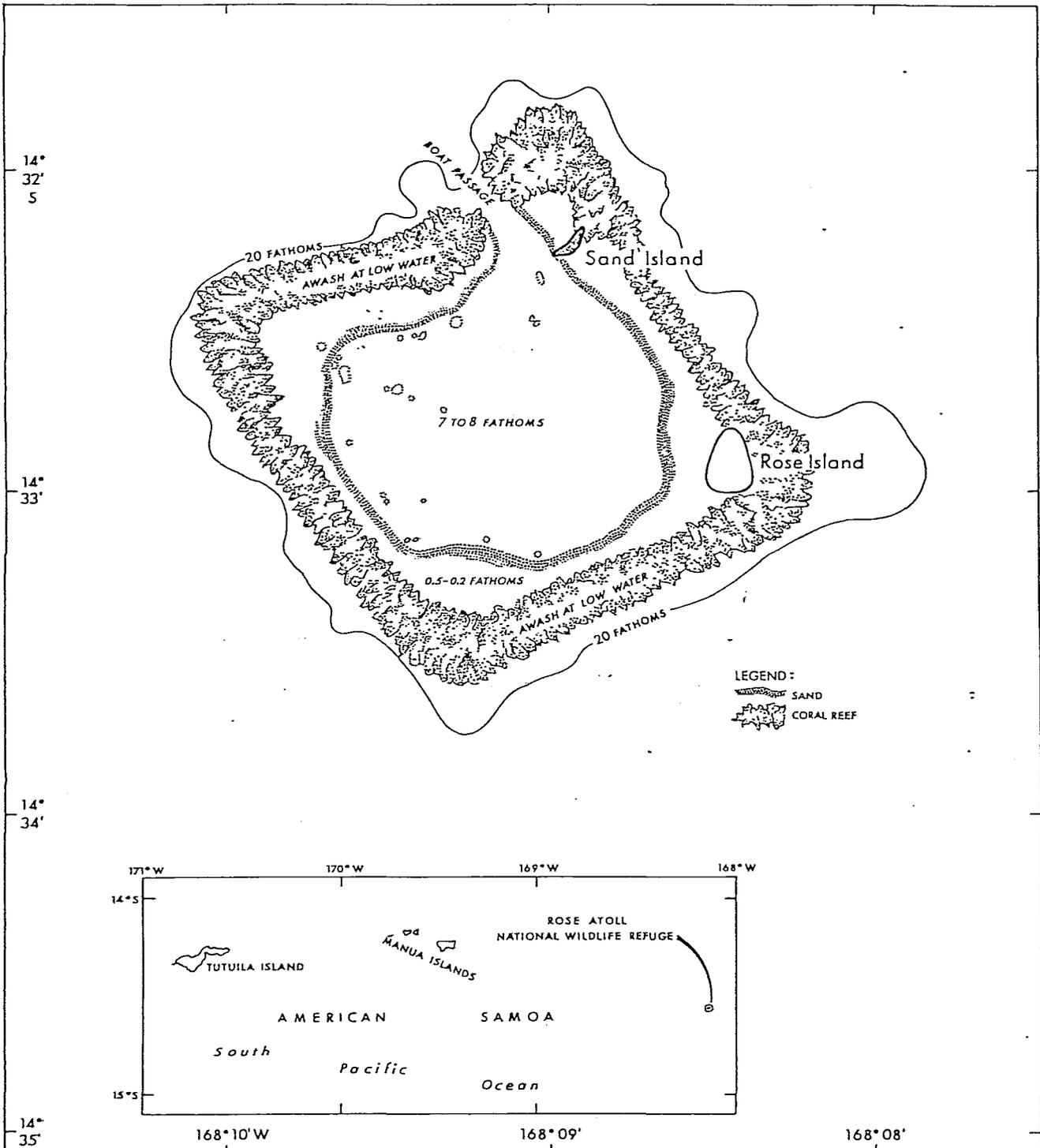
Calendar Year 1986

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

INTRODUCTION

Rose Atoll National Wildlife Refuge is the southernmost unit of the National Wildlife Refuge System located 14 degrees south of the equator in the tropical Pacific approximately 2,500 miles south of Hawaii and 180 miles east of Tutuila Island, American Samoa. It is a coral atoll with 1,593 acres of submerged reef and lagoon and two emergent islands. Rose Island comprises 18 acres and is heavily vegetated with Pisonia trees and Tournefortia shrubs. Sand Island comprises 2 acres and has been unvegetated until recently. Rose Atoll has never been inhabited, though Samoans traditionally fished the nearshore waters.

The refuge was established in 1973 by Cooperative Agreement between the American Samoa Government and the Fish and Wildlife Service and is jointly managed by both agencies. Management objectives are to preserve the marine and terrestrial habitats and associated flora and fauna for scientific study and environmental education and to protect the aesthetic values as part of our national heritage. The atoll is an important nesting area for the threatened green sea turtle and provides nesting and roosting habitat and forage areas for about 15 species of seabirds and shorebirds. Hundreds of species of fishes, corals, and other invertebrates inhabit the shallow reefs and lagoon, including the giant clam (Tridacna maxima) which is highly prized as food by the Samoans.



ROSE ATOLL
NATIONAL WILDLIFE REFUGE
American Samoa
South Pacific Ocean

UNITED STATES
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service

ROSE ATOLL NATIONAL WILDLIFE REFUGE

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HIGHLIGHTS

Three field trips were conducted to Rose Atoll NWR during the year aboard the American Samoa Government vessel SAUSAUIMOANA. Fish and Wildlife Service (FWS) personnel accompanied one of the trips. Other agencies and groups participating in the trips included the Office of Marine and Wildlife Resources and Department of Education (both with the American Samoa Government), the National Marine Fisheries Service and the University of Hawaii.

Dr. Richard Radtke completed his contract report titled "Population Dynamics of the Giant Clam, Tridacna maxima, at Rose Atoll. The report is a compilation and analysis of ecological and stock assessment data collected over a seven year period by the Fish and Wildlife Service, the American Samoa Government and the University of Hawaii.

An unusually low level of green sea turtle nesting activity was observed compared to previous years.

The first off-island recapture of a green turtle tagged while nesting at Rose Island was recorded. The animal was speared by a Fijian fisherman 870 miles WSW of Rose Atoll.

In an effort to capitalize on the educational and cultural values of the refuge, two teacher training sessions involving 15 Samoan teachers and science specialists were conducted at Rose Atoll under the auspices of the Department of Education and the Office of Marine and Wildlife Resources, American Samoa Government. The purpose of the trips was to give the teachers an awareness and appreciation for the atoll's ecosystem and to cause them to convey this to their students and the general public.

B. CLIMATIC CONDITIONS

The nearest weather station to Rose Atoll is located 180 miles to the west at Pago Pago on Tutuila Island, American Samoa. There is a distinct difference between the topography of Rose and Tutuila Islands, so there is little value in summarizing weather data for Tutuila. The climatic conditions at Rose can be summarized as warm and humid. Prevailing tradewinds are from the ENE.



Rose Atoll NWR. Rose Island is at the upper right and Sand Island is to the right of the channel leading into the lagoon. (G. Witham, National Marine Fisheries Svc.)

D. PLANNING

2. Management Plan

Rose Atoll NWR is administered by the FWS under a Cooperative Agreement with the American Samoa Government developed at the time the refuge was established in 1974. The agreement provides for management of the refuge through periodic aerial surveys and the deputization of Samoan officials to enforce refuge regulations. Budget constraints, increased interest on the part of the American Samoa Government in resource studies and management, and changing priorities within the Service have resulted in a need for revision of the agreement. The revision process was initiated in 1981 but has yet to be completed.

Early in 1980, the Office of Marine and Wildlife Resources (OMWR), American Samoa Government, requested the FWS to study the feasibility of allowing Samoan fishermen to harvest giant clams (Tridacna maxima) from the lagoon and reefs of Rose Atoll on a strictly regulated basis. In December of that year, the OMWR submitted a draft management plan for the clam fishery which included minimum size limits, a closed area, and observer coverage for all fishing trips. The proposal repeatedly emphasized the need for additional data. The FWS has conducted seven field trips to Rose since 1980. During each of these trips, stock assessment and ecological data were collected for the Tridacna population and considerable data now exist relative to growth rate, size at maturity, age, mortality, size frequency, population density and distribution.

In 1985, funds were budgeted to compile and analyze the data and to recommend a strategy for managing the clam resource. This report was to provide the basis for a decision on whether to open the refuge to clam fishing. Dr. Richard Radtke, University of Hawaii, was contracted to conduct the analysis and write the report. He conducted clam research during two of the FWS field trips to Rose Atoll and is very familiar with the resource and existing data. His report was completed in 1986 and is summarized below under D.5. Research and Investigations.



A diver surveying giant clams Tridacna maxima, known by the Samoans as "faisua". GML

Late in 1985, a letter was received from the Director, OMR, American Samoa Government, which stated he had re-evaluated the 1980 request and determined that a giant clam harvest was no longer deemed the wisest use of the resource. He requested that no harvest regulations be proposed and that no fishery be allowed. He further stated that Rose Atoll is the last area in the territory to remain unaffected by fishery impacts and development and,

as such, has great cultural, educational, and scientific value which favor preserving the area in its natural state. The FWS shares these sentiments and is gratified by this re-alignment of the Samoan government's priorities for the atoll.

In keeping with their desire to emphasize cultural, educational and scientific uses for the atoll, the American Samoa Government has initiated an effort to increase research and survey efforts within the marine and terrestrial habitats. The Office of Marine and Wildlife Resources has established five permanent reef transects on the seaward edges of the reef for the collection of quantitative data on fishes, corals and other invertebrates. The data will be used 1) as a baseline from which to measure future changes in the resources and habitats; 2) as a basis for developing management recommendations and regulations relative to the fishery conducted just outside the refuge boundary; and 3) for comparison with similar data collected along the heavily fished shoreline of Tutuila which is the main island in American Samoa. The transects will be surveyed on most or all OMWR trips to Rose Atoll though trips will not be scheduled solely for that purpose.

The receipt of Pittman-Robertson funding by the American Samoa Government made possible the hire of a wildlife biologist and resulted in the name change from "Office of Marine Resources" to "Office of Marine and Wildlife Resources" during 1986. The presence of a wildlife biologist on the American Samoa Government staff has resulted in increased effort to survey and manage seabirds, turtles and rats at Rose Atoll on a regular basis. The FWS provided onsite training for the biologist during the November field trip as well as written recommendations relative to population and habitat survey methodologies. The OMWR wildlife biologist will continue to monitor wildlife population at Rose Atoll using methods developed by service biologists resulting in a larger data base on this Atoll.

5. Research and Investigations

Research at Rose Atoll has consisted principally of surveys of terrestrial and marine organisms and habitat during brief visits to the atoll. Three such visits were made during 1986. Marine biologists from the Office of Marine and Wildlife Resources and six school teachers and two science specialists from the Department of Education visited Rose on May 24 and 25 to conduct reef surveys and to provide the teachers with an awareness of Rose Atoll's ecological importance and the desire and ability to pass it on to their students. Marine biologists from the Office of Marine and Wildlife Resources and a sea turtle biologist from the National Marine Fisheries Service visited the atoll on October 7-10 to conduct reef surveys and investigate the status of nesting sea turtles. Wildlife and marine biologists from the Fish and Wildlife Service, Office of Marine and Wildlife Resources, and the University of Hawaii and another group of teachers and a science specialist from the Department of Education visited the atoll on November 7-10. They monitored seabird, turtle and rat populations, surveyed vegetation and giant clams, and participated in teacher training and orientation activities. The results of this trip are detailed in Hu, Darcy. January 1987. Rose Atoll Trip Report, 4-12 November 1986, Administrative Report, Refuges and Wildlife, Honolulu Hawaii.

The seven year effort by the Fish and Wildlife Service, the Office of Marine and Wildlife Resources and the University of Hawaii to study the population ecology of the giant clam and the contract with Dr. Richard Radtke to analyze the data and report the results was described above under D.2. Dr. Radtke's report titled "Population Dynamics of the Giant Clam, Tridacna maxima, at Rose Atoll" was completed August 28, 1986. It analyzes data from field surveys, marking experiments and age determination studies to provide considerable information on growth, mortality and potential yield and a model of population dynamics for the giant clam community. Dr. Radtke concludes with the statement "...production of Tridacna maxima at Rose Atoll does not appear to be within the scope of rational exploitation and exploitation could endanger the perpetuity of the unique environment." Fortunately, the agencies responsible for management of the atoll have already agreed not to allow the harvest of clams and have given top priority to preservation of the atoll in its pristine condition.

E. ADMINISTRATION

1. Personnel

There are no personnel assigned specifically to Rose Atoll NWR. The Refuge is administered from the Pacific Island Office of Refuges and Wildlife in Honolulu, Hawaii.

5. Funding

There was no funding for specific projects at Rose Atoll. Funds to administer this Refuge are part of the overall refuge complex budget.

7. Technical Assistance

Technical assistance was provided to biologists of the Department of Marine and Wildlife Resources of the Government of American Samoa by Wildlife Biologist Darcy Hu of the Refuge Staff. Darcy provided guidance and assistance to Bill Knowles involving methods to monitor seabirds and sample rodent populations on Rose Atoll. Bill Knowles is a wildlife biologist on the Government of American Samoa's wildlife populations in future months. This will allow for the collection of data that will be comparable to data collected during past surveys.

F. HABITAT MANAGEMENT

Rose Atoll, one of the smallest atolls in the world, is composed of a coralline algae reef that encloses a 50-foot deep lagoon. A single channel leads into the lagoon which can be navigated by medium-sized vessels at high tide. The atoll is almost square in shape and is notable for the high density of coralline algae that comprises most of the reef substrate. The atoll is about two miles across diagonally. Two islands are located on the northeast side. Rose Island is the largest and is heavily vegetated. Sand Island is much smaller and has been unvegetated until recently.

3. Forests

Rose Island is dominated by a Pisonia forest on the south side of the island and groves of Tournefortia bushes on the east and north sides of the island. In addition, there is a small grove of coconut palms in the center. The palms were introduced during visits by Samoan officials during the first half of this century. The Tournefortia forest has increased in size from a few plants in the early 1970's to the point where most of the northern and eastern part of the island is covered by this bush. It provides nesting habitat for red-footed boobies and frigatebirds. Vegetation on Rose Island was termed "generally healthy" during the November 1986 field trip. Trunk diameters at breast height were measured for Pisonia trees located on permanent transects used for seabird breeding population estimates.

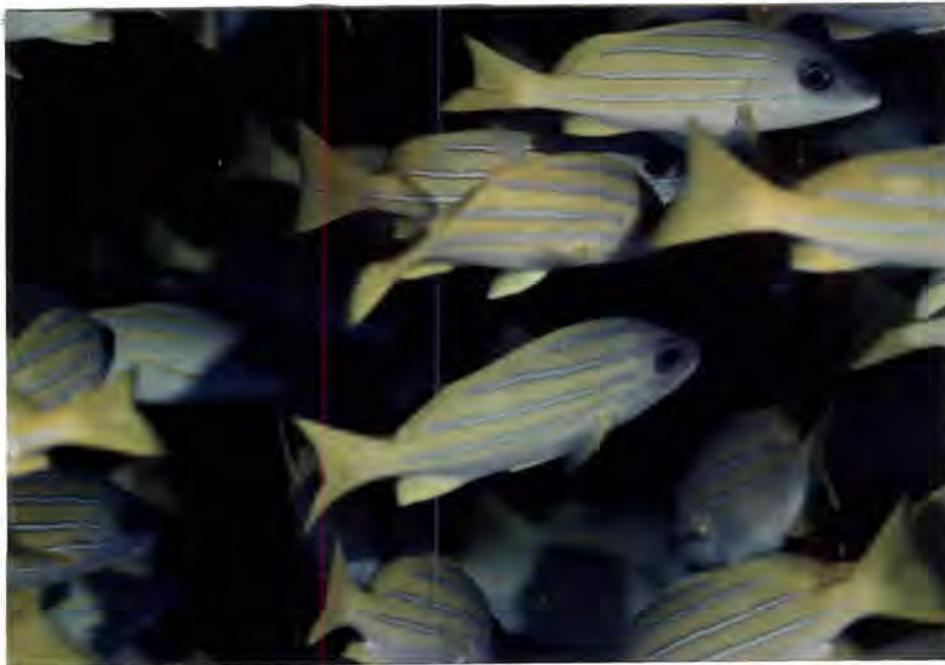


Beach along the south side of Rose Island with Pisonia forest in background. RJS.

In April 1983, six Tournefortia bushes up to five feet tall and two seedlings were observed on Sand Island. There are no historical records of vegetation on this island and none was documented during FWS field trips conducted prior to this date. In May 1985, a group of science teachers visited Sand Island and reported the presence of 47 Tournefortia bushes of various sizes. During November 1986, 35 Tournefortia plants were counted by FWS personnel and flowering Boerhavia was noted. A series of photographs from a single point on the island was also taken to be used as a baseline for measurement of future vegetational changes.

6. Other Habitats

The most extensive habitat at Rose Atoll is the marine habitat. The reef, which is dominated by coralline algae, forms an approximate square with a single opening to the sea. The outside of the reef descends to great depths and is composed of an extremely diverse coral complex. The inner edge of the reef crest slopes gradually to a rubble-dominated shelf that contains numerous patch reefs composed of coralline algae, coral, and a diversity of other sessile invertebrates including the giant clam, Tridacna maxima. The rubble shelf slopes abruptly to about 50 feet and forms the bottom of a one-mile wide lagoon. The bottom of the lagoon is principally composed of rubble, sand, and small coral patches. Occasional patch reefs project nearly to the surface. A high diversity of fishes and invertebrates is present within the lagoon. The diversity is even greater outside the atoll.



The blue-stripe snapper, Lutjanus kasmira, is one of the most common fishes at Rose Atoll and known by the Samoans as "savane".
GML

10. Pest Control

All visitors to the atoll report the presence of Polynesian rats on Rose Island. No attempts to control the animal have been instituted, although it is possible that the presence of the rats may be correlated with the absence of burrow-nesting seabirds. Rats at Rose have been observed to prey on the eggs of seabirds and hatchling turtles.

During each of the three evenings of the November trip, 73 snap traps were set within the Pisonia forest and 13 traps in the Tournefortia area on Rose Island. A total of 131 rats were captured during the three nights; 54% of the traps set in the Pisonia forest captured rats and 31% of the traps in the Tournefortia area captured rats indicating that rats are more active in the interior where the substrate has a higher organic content. The sex ratio of the captured rats did not differ significantly from 1:1. Of the two brands of traps used, the Victor had a higher rate of capture than the McGill.

No sign of rats has ever been documented for Sand Island.



Sooty tern eggs predated by rats. GML

G. WILDLIFE

1. Wildlife Diversity

Wildlife resources at the atoll include nesting and resident seabirds, nesting endangered and threatened sea turtles, rats, and a low diversity of terrestrial invertebrates (coconut crabs, hermit crabs, and insects). Diversity varies during the year because of the seasonal nature of the use of the atoll by nesting seabirds.

Coconut crabs, Birgus latro, were unknown at Rose Island until their presence was documented during the October 1982 field trip. During the 1984 trips, juveniles were commonly observed around the campsite at night, and one individual weighing an estimated one-quarter pound was found. This species now appears to be well established as individuals are seen on every trip to the island.

2. Endangered and/or Threatened Species

Rose Atoll supports populations of resident, and possibly nesting, endangered hawksbill turtles and resident and nesting populations of threatened green sea turtles. Previous studies have shown that turtle nesting activity occurs in the fall. Consequently, turtle surveys were conducted during both the October and November trips to the atoll.

George Balazs, National Marine Fisheries Service, was issued a Special Use Permit (ROS-5-86) to monitor nesting activity and tag turtles during his October 7-10 visit. He concluded "there has been a near collapse of the 1986 breeding season at Rose" based on his observations of only one nesting turtle during three nights of beach monitoring and finding evidence of only three nestings during the 1986 season prior to his arrival. The turtle he saw had been tagged four years earlier at Rose Island during a previous survey.

Rose Island surveys conducted by Darcy Hu (FWS) and others during the early mornings of November 8-10 revealed a higher level of nesting activity. They found six sets of nest pits indicating that as many as six turtles may have emerged during those three nights. One turtle was observed proceeding seaward across the exposed reef flat off Rose Island on November 9. It was tagged and measured. A survey of Sand Island on November 9 yielded eight "relatively recent" sets of pits and tracks.

Considerably higher levels of activity were observed in 1984. During a four day visit in October of that year, it was estimated that 33 green turtles emerged to nest on Rose Island. During a November 1985 visit, 126 nests/pits and 48 plainly visible sets of tracks were noted around the perimeter of Rose Island and 118 nests/pits and seven tracks were counted at Sand Island.

A Special Use Permit (ROS-3-86) was also issued to Dr. Harold F. Hirth for a three month study (September 1 - December 1, 1986) of the nesting ecology of sea turtles at Rose Atoll. Unfortunately, Refuge safety policies against working in remote sites alone and without radio communications necessitated the cancellation of the permit. This study will be proposed for the fall of 1988.

5. Shorebirds, Gulls, Terns and Allied Species

Eleven species of sea birds comprise the most prominent group of wildlife within the refuge. The species nesting at Rose Island in approximate order of abundance are: sooty tern, black noddy, white tern, brown noddy, red-footed booby, masked booby, brown booby, great frigatebird, red-tailed tropicbird, lesser frigatebird, and white-tailed tropicbird. Six species of shorebirds (golden plover, ruddy turnstone, wandering tattler, bristle-thighed curlew, reef heron and sanderling) commonly migrate to or reside at Rose Atoll.

During the November 1986 field trip, FWS personnel censused white terns on the two permanent Pisonia transects, made rough estimates of population sizes for some of the other species of seabirds and shorebirds, collected breeding chronology data for seabirds and made general observations on all species of seabirds and shorebirds. Thirteen species were encountered. Bird activity was low. Sooty terns, white terns and masked boobies were the most active nesters. A few red-tailed tropicbird and brown noddy nests were also found. Gray-backed terns, reported nesting on Sand Island prior to 1980, were not seen. -- Vegetation on this island may make it unsuitable for this species, which does not nest in Western Samoa and may not breed elsewhere in American Samoa. Of concern was the lack of either breeding or roosting black noddies, and the egg shell fragments littering the ground underneath old nests. In November 1981, this species was actively nesting; in October 1982, adults were roosting; in October 1984, only a few nests were active, these with eggs. On Tern Island, French Frigate Shoals, this inshore feeder roosts on the island year-round.



A group of young brown boobies roosting atop a Pisonia tree. RJS

11. Fisheries Resources

Fishery resources within the refuge include a wide variety of reef fishes, resident and migratory pelagic fishes, lobsters, and tridacnid clams. Some commercial fishing is conducted for bottomfishes (snappers, groupers, and jacks) along the outer reef slope at depths of 20-200 fathoms just outside the refuge boundary. The long distance to the inhabited islands (180 miles to Tutuila and 80 miles to Ofu and Ta'u), however, generally limits the effort to less than a half dozen boat trips per year.

16. Marking and Banding

Fourteen seabirds were banded during the November field trip. The total included 8 fledgling and 3 adult masked boobies (plus 14 recaptures of previously banded adults), one fledgling and one adult brown booby and one adult red-footed booby.

As mentioned above, one green sea turtle tagged four years earlier was recaptured in October and another individual was tagged in November.

One of the most significant events of the year for the refuge was the August recapture of a green turtle in Tavuki, Kandavu, Fiji that had originally been tagged while nesting at Rose Island on November 10, 1980. The turtle was speared by a Fijian fisherman about 870 miles WSW of Rose Atoll and represents the first recapture of a Rose Island turtle away from the island. This single recapture represents the sum total of our knowledge regarding the distribution and migration of turtles nesting within the refuge.



Measuring the carapace length of a green turtle that has just been tagged subsequent to nesting. Refuge files photo.

H. PUBLIC USE

1. General

Because of the small size of the refuge, the presence of threatened green sea turtles and endangered hawksbill turtles, and the susceptibility of the island environment to noxious species introductions, public access is restricted to all but those conducting activities that will benefit the resources or provide outstanding educational opportunities.

3. Outdoor Classrooms - Teachers

Both the American Samoa Government and the FWS feel that the natural resources of Rose Atoll have great educational value to the territory. Efforts to take advantage of this value are encouraged. To this end, a Special Use Permit (ROS-2-86) was issued to the Department of Education, American Samoa Government for the second year in a row. The permit authorized two three-day trips to the refuge--one in May and the other in November--for 15 local school teachers and science specialists. The primary objective of the trips was to provide the teachers with an awareness of the environmental importance of Rose Atoll to the Territory of American Samoa and to give them the experience of being on and studying the atoll so they could convey the experience and importance to their students and to the Samoan public. The teachers took photographs and videotapes, tagged and measured clams, conducted reef transects for comparison with transects on

Tutuila Island, collected sand and plankton for comparison with Tutuila samples, inventoried plants and beach debris, made seabird and turtle observations, collected oceanographic data and kept journals. Upon their return to Honolulu, each teacher was required to present lectures, videotapes and slideshows to school classes and to the public and write a narrative of their impressions and observations. As was the case for the 1985 trip, the 1986 trips were deemed a great success. The effort will continue in 1987.

The data collected by the teacher training groups are mostly used for their own purposes though some of the observations will be of value to refuge managers and biologists for determining habitat and population changes over time. One survey of particular value was conducted during the May trip by one of the science specialists, Larry Madrigal. His report titled "A Survey of Holothurians on Rose Atoll" identifies the four most common species of sea cucumbers and notes their relative abundance.

J. OTHER ITEMS

3. Items of Interest

A Special Use Permit (ROS-1-86) was issued early in the year for an unusual purpose, given the refuge policy of limiting entry to only those people whose activities will benefit the resources or be of significant educational value. The permit was issued to allow a salvage crew to conduct visual, bathymetric and magnetronic surveys for a sunken vessel rumored to have carried cargo of considerable value (i.e. treasure!!). The permit only authorized search and survey operations. A second permit would be required for salvage and removal of any cargo or portion of the vessel.

The search was to occur along the seaward slope of the outer reef and, therefore, outside the refuge boundary. The Department of Interior and the Department of Commerce, however, have joint jurisdiction over the submerged lands adjacent to Rose Atoll. It was the legal opinion of the Acting Assistant Regional Solicitor for the Pacific Northwest Region that the Fish and Wildlife Service has jurisdiction over these submerged lands under joint Interior-Commerce authority. The Hawaiian and Pacific Islands National Wildlife Refuge Complex was delegated administrative jurisdiction because Rose Atoll NWR adjoined the area in question. A Special Use Permit was the only means the Complex had to authorize the search activity.

The outcome of all the discussions, study, correspondence and consultation associated with this permit was anticlimactic. The survey vessel never even went to Rose Atoll.

HOWLAND ISLAND and BAKER ISLAND
NATIONAL WILDLIFE REFUGE

Honolulu, Hawaii

ANNUAL NARRATIVE REPORT

Calendar Year 1986

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

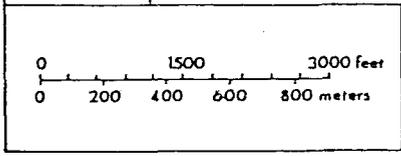
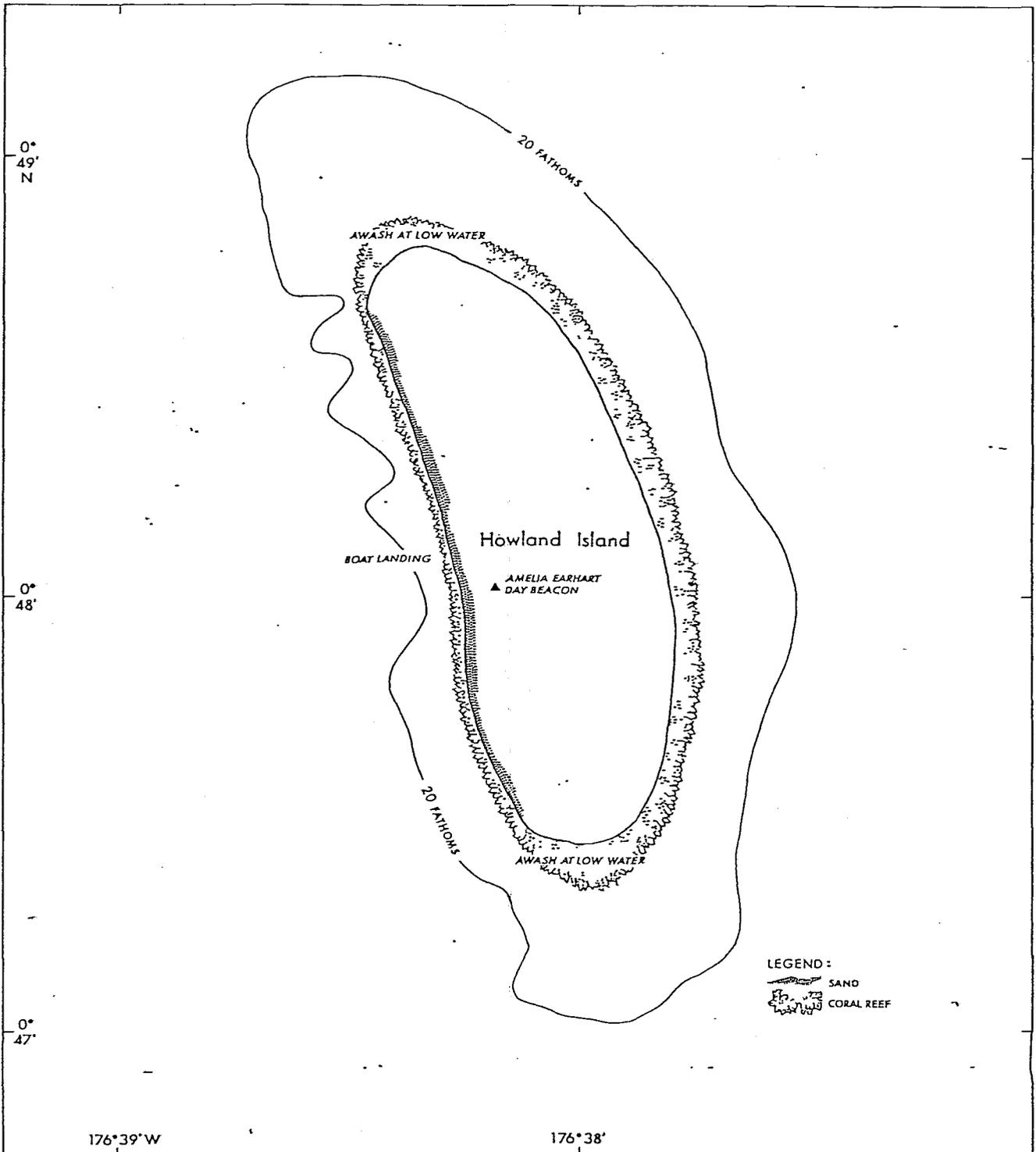
INTRODUCTION

Baker Island and Howland Island National Wildlife Refuges are isolated coral islands 20 and 50 miles north of the equator in the Central Pacific Ocean about 1,600 nautical miles southwest of Honolulu, Hawaii. Baker Island Refuge contains about 340 acres of land and 31,397 acres of submerged land and water. Howland Island Refuge contains about 400 acres of land and 32,150 acres of submerged land and water. Both islands are uninhabited and vegetated only by grasses, prostrate vines, and low-growing shrubs due to the scant rainfall and burning sun. Because marine birds apparently move between the two islands and all trips to one island includes a trip to the other, both refuges are combined for the purposes of the narrative.

The refuges were established by the Secretary of the Interior in 1974 when management responsibility was transferred from the Office of Territorial Affairs to the Fish and Wildlife Service. They are managed primarily as nesting and roosting habitat for about 20 species of seabirds and shorebirds.

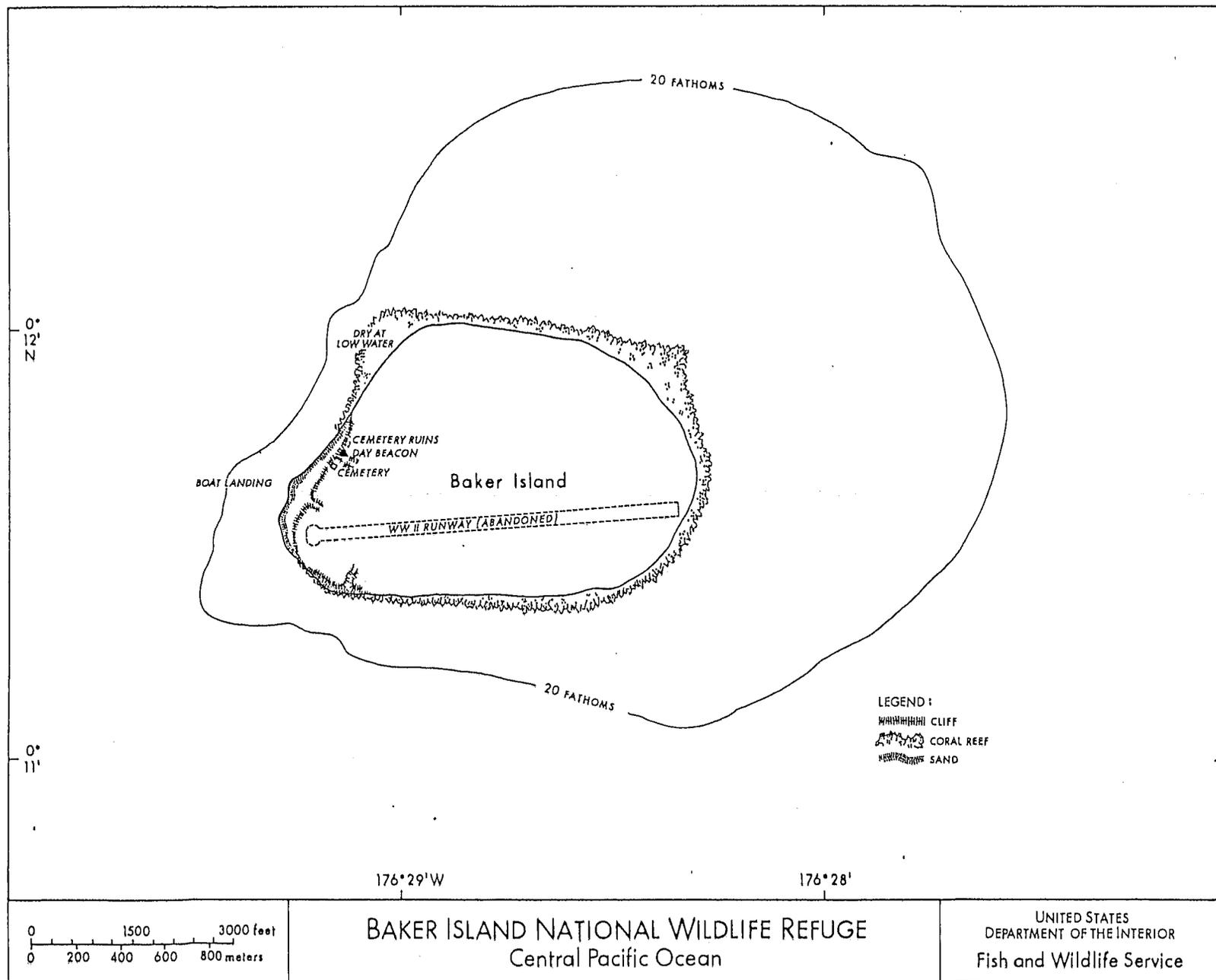


Aerial view of Howland Island. Note bomb craters from WWII bombing by Japanese and old walls of Itascaville built by colonists in late 1930's. (Gene Witham)



HOWLAND ISLAND
 NATIONAL WILDLIFE REFUGE
 Central Pacific Ocean

UNITED STATES
 DEPARTMENT OF THE INTERIOR
 Fish and Wildlife Service



HOWLAND ISLAND & BAKER ISLAND
NATIONAL WILDLIFE REFUGES

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Western Beach of Baker Island. Wall of Guano diggers home from late 1800's in foreground and day beacon and anchor of WWII vintage. (Stewart Fefer)



Richard "Dick" Wass Refuge Manager of Hawaiian and Pacific Islands NWR. Dick is next to old cannon brought by guano diggers in the late 1800s. (Ken McDermond)

A. HIGHLIGHTS

FWS personnel visited Baker and Howland Islands twice during 1986. This is the most work conducted in one year on the refuge since the 1960's when the Pacific Ocean Biological Survey Project (POBSP) mounted numerous expeditions.

During the spring expedition a contaminant survey of drums and debris left by the military and other agencies on the islands was conducted by a representative of the U.S. Coast Guard. Also during this trip, feral cats were eradicated from Howland Island, seabird populations and vegetation were surveyed, and a satellite-transmitting meteorological observation station was installed on Baker Island by the National Oceanic and Atmospheric Administration.

During the fall visit, over 1000 barrels of petroleum products left on Baker Island during World War II were burned. After the contents of the barrels were burned, the barrels were laid on their sides to prevent birds from becoming entrapped in them and dieing. Grace McGuire, an aviatrix who is planning to attempt a round-the-world flight in an aircraft similar to that in which Amelia Earhart disappeared while flying from New Guinea to Howland Island, accompanied the fall trip to Howland Island. in order to determine if an aircraft landing is still possible. Wildlife surveys were also conducted on this trip.

It appears that the populations of marine birds are higher than ever recorded and that most birds now nest on Baker Island while 25 years ago most nested on Howland Island. The most recent refuge staff visits to Baker and Howland Islands were in 1980 to monitor seabird populations and habitat.

B. CLIMATIC CONDITIONS

Climatic conditions at Baker and Howland were unknown to us except for the time spent on the islands. The Islands appeared to have normal growth of vegetation indicating it was not experiencing either a drought nor extensive rainfall.

D. PLANNING

4. Compliance with Environmental Mandates

An environmental assessment was prepared by the Army Corps of Engineers for the burning of the barrels of petroleum products at Baker Island. The finding of the assessment was that no significant impact would occur and, in fact, that the project would benefit the seabird resources.

The Corps also funded an archaeological survey conducted by Kanalei Shun during the fall trip to ensure no historically significant areas were disturbed. His report titled "Archaeological Reconnaissance Site Survey and Limited Subsurface Testing of Baker and Howland Islands" was received in April 1986. He concluded that prehistoric peoples might have used the islands as a stopping place on their voyages, but it is doubtful that they would have willingly settled on the islands. He also concluded that the historic remains on the islands represents a unique set of event in American history and might warrant the nomination of the two islands to the National Register of Historic Places.

MSTCS William Anthony of the U. S. Coast Guard (USCG) accompanied the spring expedition to assess the contents of the barrels and ensure that there were no hazardous substances present. His report titled "Howland and Baker Island Survey" dated April 10, 1986 reported on the numbers of drums and their location. Later lab analysis revealed that most drums were filled with petroleum products or drinking water.

Joseph Keola, a fuel burning specialist was contracted by the Corps to conduct the burning operation on Baker Island.

5. Research and Investigations

Two trips to Howland and Baker Islands occurred in 1986. The first trip was on board the RV Feresia chartered by the Service. Steven Berendzen and Doug Forsell flew to Johnston Atoll with William Anthony (USCG) and Tim Williams (NOAA) and departed for the refuge on 15 March. Baker Island was surveyed on 21 to 25 March and on 12 April. Berendzen and Forsell were left on Howland Island to eradicate cats while the vessel made a 10 day trip to Tarawa to drop off Anthony and Williams. Refuge Biologist Stewart Refer returned with the boat on 11 April. The results of the surveys are presented elsewhere in this narrative and in the following trip reports:

Berendzen, S. L. and D. J. Forsell. 1986. Expedition Report -- Howland Island. March 25 to April 12, 1986. Administrative report, U.S. Fish and Wildlife Service, Hawaiian and Pacific Islands National Wildlife Refuge Complex.

Forsell, D. J. and S. L. Berendzen. 1986. Expedition Report -- Baker Island; March 21-25 and April 12, 1986. Administrative report, U.S. Fish and Wildlife Service, Hawaiian and Pacific Islands National Wildlife Refuge Complex.



Doug Forsell and Steve Berendzen near refuge sign at Baker Island. They censused marine birds and eradicated feral cats from Howland Island during the spring trip. (Stewart Fefer)



Camp site on Howland Island. (Stewart Fefer)

The second expedition to the Islands was led by Refuge Manager Richard Wass who was accompanied by Ken McDermond, a Biological Technician with The Hawaiian Is. Unit; Helene Takemoto of the Army Corps of Engineers; Kanalei Shun, Archaeologist; Joseph Keola, Fuel Burning Specialist; and Grace McGuire, Aviatrix. They traveled on the NEI MATABURO, a 140 ft ship chartered from the government of Kiribiti. The ship comes with a 36 man crew who helped greatly with the removal of the fuel barrels. This cruise departed Tarawa on 5 September, worked from 8-18 September at Baker Island and from 18 to 20 September at Howland Island, returning to Tarawa on 23 September. The details of the surveys are presented elsewhere in this narrative and in the following trip report:

McDermond, D.K. and R. Wass. 1986. Expedition Report -- Baker Island September 8-17, 1986; Howland Island, September 18-20, 1986. Administrative report, U.S. Fish and Wildlife Service, Hawaiian and Pacific Islands National Wildlife Refuge Complex. 18 pp.

The Pacific Marine Environmental Lab, National Oceanic and Atmospheric Administration was issued a special use permit (BHJ-1-86) to install a remote satellite-transmitting meteorological observation station on Baker Island. The station was erected in March on the northwest corner of Baker Island. The data is being collected as part of a chain of stations along the equator to study oceanographic and weather conditions associated with El Nino.



Remote satellite transmitting weather station erected on Baker Island during the spring trip. This station will transmit data to satellites and then to NOAA in Seattle. The project is to monitor and study El Nino. (Richard Wass)

The skulls of 17 cats along with other pertinent biological information was sent to Dr. Ralph Kirpatrick of Ball State University who is studying speciation in domestic cats.

E. ADMINISTRATION

1. Personnel

Howland and Baker Islands are managed by the Refuge Manager-Remote Islands stationed in the Honolulu office. The Manager, Richard Wass, was field leader on the fall expedition accompanied by Ken McDermond, a Biological Technician for the Hawaiian Islands Unit. Steven Berendzen, Assistant Manager for Hawaiian Islands Wetlands Refuge Complex led the spring expedition.

4. Volunteer Program

Doug Forsell, a biologist with the Alaska Fish and Wildlife Research Center and a former temporary employee of the refuge volunteered for the spring expedition. The refuge covered his travel expenses to gain his guidance as one of the few Service employees to have previously visited these remote islands. He was employed by the refuge in 1977 and 1978 to conduct surveys of these islands.

5. Funding

The refuge received 25.0 k from threat and conflict funding to eradicate the cats on Howland Island and an additional 20.0 k for contaminant and debris removal from Baker Island.

The spring expedition was funded through threat and conflict funding to eradicate the feral cats on Howland Island and confirm the eradication of cats on Jarvis Island. Also this cruise was partially funded by the service for the debris and contaminant assessment conducted by the U.S. Coast Guard. The spring charter vessel was also partially funded by NOAA to erect the remote weather station. The charter vessel for the fall expedition was funded by the Defense Environmental Restoration Account (DERA) through the U.S. Army Corps of Engineers. This included a 19 day vessel charter (about \$35,000) for the trip from Tarawa to Baker and Howland Islands, a contract with Unitek Environmental Services (\$9,900) to provide a specialist with experience in waste fuel burning methodology, and a contract (\$993) for the archaeological survey. FWS expenses included travel and camping supplies for two employees.

F. HABITAT MANAGEMENT

1. General

Habitat management on each of these islands has been based on the philosophy that the resident populations of seabirds and other wildlife will return to a natural state if environmentally destructive conditions resulting from former habitation of the islands are removed or controlled. Past management efforts have been limited due to the expense of getting to the islands and the short time allotted for work on the islands. These have taken two forms: control of introduced cats and altering debris such as barrels to prevent birds from becoming entrapped. The natural state of these island is maintained by a restrictive policy of limited entry and of allowing only those activities that would be beneficial to the wildlife. The fact that the nearest inhabited island is 660 miles away from Howland and Baker Islands facilitates this type of management.

In 1986 several projects were accomplished on the refuges to enhance the habitat for marine birds and rid the islands of contaminants. Feral Cats were eradicated on Howland Island and is discussed under G. Wildlife.

Thousands of 55 gal drums of diesel fuel, water, motor oil, and hundreds of smaller containers of grease, oil and paint were abandoned on Baker Island by the U.S. military when they left the island in 1944. Most had subsequently rusted through and lost their contents. However, a survey conducted by U.S. Coast Guard MSTCS William Anthony concluded that about 640 drums were still intact and contained their original contents. Several hundred of the empty drums were standing upright with their tops rusted out. Seabirds roosting on the edges often fall into the drums. Because they are unable to fly out or clamber up the vertical sides, they eventually die of starvation. This was evident by piles of seabird bones and feathers at the bottom of the empty drums.

Most of the fuel on Baker Island was stored in upright 55 gal drums in long, shallow trenches. The number of 55 gal drums totaled 2,751. Most (2,101) were badly deteriorated with the contents long gone; 294 were whole but empty; 241 had their original contents largely replaced by rain water which had seeped through the bung holes or pinhole leaks in the top; 105 contained mostly diesel fuel (with some water); and 10 contained mostly motor oil.

The objectives of burning the fuel and overturning the drums were accomplished as follows: The work crew of 10-14 people (8-10 men from the chartered vessel the NEI MATABURO and 2-4 members of the field party) went through the site prying the badly deteriorated and empty drums out of the ground (many were partially buried) and rolling them up the sides of the trench and over the surrounding berm. Fuel was sprinkled on drums containing petroleum products and ignited. Once the fire really got going, drums would explode as the result of boiling diesel and water. When the burned-out drums had cooled, they too were turned on their side

so that no upright drums remained on the island. No attempt was made to crush the empty and deteriorated drums or to arrange them in an orderly fashion. Future surveys will reveal the degree to which the empty drums are used as nesting habitat by seabirds. Three 25-gallon and nine 5-gallon containers of oil, grease, and paint and about 100 smaller cans of paint were also burned.

Approximately 100 of the drums were constructed of stainless steel. About 100 additional stainless steel drums were abandoned in two other locations. The latter contained drinking water. The stainless steel drums were highly prized by the crew of the NEI MATABURO. They loaded 137 intact drums aboard the vessel and brought them back to Tarawa for use as storage for fresh water caught off the roofs of their dwellings.

The seabird populations of Baker Island should benefit greatly from the actions described above. No more deaths or debilitations are expected to result from plumage fouled by petroleum products abandoned at Baker Island or from entrapment in empty upright drums. Further actions to flatten, bury or remove the drums are not recommended at this time. However, seabird populations and the use of the drums for nesting and roosting will be monitored during future trips to the island to ensure that the presence of the drums poses no further threat. If adverse impacts are detected, further actions will be recommended to mitigate the problems.



Abandoned fuel and oil drums left by the military during WWII. (Richard Wass)



Crew members of NEI MONTEBURO remove drums from ditches. Note the footwear. These guys are tough! (Richard Wass)



Burning fuel and oil. Note the explosions as the drums heated up. (Richard Wass)

5. Grasslands

In the course of cat eradication it became necessary to burn several acres of the rank non-native grass Digitaria pacifica. This was a last resort to remove approximately 100 acres rank grass the few remaining cats were hiding in. This effort may have additional benefits to the nesting seabirds by making a large area available to nesting which would otherwise be covered by grass two to three feet high. The grass was also eliminating native plants by out competing them. The fall survey revealed that the introduced grass had not returned, but the native plants were thriving in the burned areas. Future surveys will reveal if this technique is valuable for future restoration of these islands.

G. WILDLIFE

2. Endangered and/or Threatened Wildlife

Baker and Howland Islands occur within the range of three species of sea turtles: the endangered Hawksbill and Leatherback Turtles and the threatened Green Turtle. No evidence of nesting was seen on either trip though long stretches of beach on both islands appeared well suited. Green turtles were seen at both islands during snorkeling surveys conducted on the reef flat and along the fore reef slope to depths of 40 ft. Twelve individuals were seen during one two-hour dive on the SW corner of Baker Island on the fall survey. No turtles were seen during six other dives in different areas. One green turtle was sighted along the west shore of Howland Island on both surveys.



Hermit crab on Baker Island. These crabs grow to about 3 inches and are real pests in the camp sites. On the spring trip we counted over 1,200 within our camp area. We also found they move up to 400 meters in 48 hours. (Richard Wass)

5. Shorebirds, Gulls, Terns, and Allied Species

Seabirds and shorebirds were censused on both surveys. Some seabirds nest on the islands throughout the year so one must keep in mind that censuses only represent "snapshot" views of the refuges and many more birds than are counted at any one time may utilize the islands. For this reason 1986 surveys are presented with past surveys conducted at similar times in tables 2 and 3. Another unique feature of these islands is that their relative close proximity (40 nm) has allowed birds to nest on either island and some species such as frigatebirds have apparently moved back and forth between the islands over several decades. Populations appear to be healthy and well protected with larger populations now than in historical times.



A pair of masked boobies on a nest. (Stewart Fefer)

Table 1. Populations of birds estimated on Howland (H) and Baker (B) Islands during spring surveys. Pacific Ocean Biological Survey Program (POBSP) data is the Maximum of either a March 1962 or a May 1965 survey.

Species		POBSP 62-65 Maximum	Kridler May 1973	Gizentanner March 1976	Forsell- Berendzen Apr. 1986
Red-tailed Tropicbird	H	100	50	0	122
	B	15	8	0	34
Masked Booby	H	3,000	1,000	2,500	2,387
	B	400	360	125	2,830
Brown Booby	H	100	50	275	15
	B	21	20	375	170
Red-footed Booby	H	250	0	0	41
	B	1	20	0	648
Great Frigatebird	H	500	0	550	few
	B	+	50	700	900+im
Lesser Frigatebird	H	18,000	6,000	0?	0
	B	+	200	1,550	5,920++im
Lesser Golden-Plover	H	19	?	2	18
	B	28	40	2	50
Wandering Tattler	H	12	?	1	0
	B	35	70	9	3
Bristle-thighed Curlew	H	8	?	0	0
	B	10	13	14	26
Ruddy Turnstone	H	59	?	0	0
	B	9	70	16	150
Gray-backed Tern	H	200	0	0	0
	B	25	42	0	500
Sooty Tern	H	250,000	150,000	2,800	50
	B	1,000	6,000	2,795	81,720++
Brown Noddy	H	25	0	0	0
	B	980	650	375	1,214
Blue-gray Noddy	H	0	0	0	0
	B	0	26	25	1
White Tern	H	0	50	0	2
	B	10	0	5	7

Table 2. Populations of birds estimated on Howland (H) and Baker (B) Islands during fall surveys from 1923 to 1986.

Species		Munro Sept. 1923	POBSP 1963-66 Maximum	Forsell Nov. 1977	Forsell Nov. 1978	Wass- McDermond Sept 1986
Red-tailed Tropicbird	H	50	100	0	0	92
	B	3	15	0	0	36
Masked Booby	H	2,000	3,000	923	2,125	300
	B	800	400	1,000	595	1,180
Brown Booby	H	200	100	44	117+	50
	B	15	21	20	88	150
Red-footed Booby	H	1,500	250	20	3	150
	B	1,500	1	146	266	192
Great Frigatebird	H	2,000	500	2	2	+
	B	1,500	+	90	50	154
Lesser Frigatebird	H	+	18,000	0	0	+
	B	-	+	4,500	8,656	3,432
Lesser Golden-Plover	H	50	108	20	0	126
	B	several	150	50	19+	120
Wandering Tattler	H	20	18	4	0	17
	B	0	59	3	3	22
Bristle- thighed Curlew	H	20	13	0	0	31
	B	several	10	25	5+	12
Ruddy Turnstone	H	30	126	0	0	53
	B	several	258	5+	144+	300
Gray-backed Tern	H	20	200	0	0	0
	B	0	25	0	32+	1,000
Sooty Tern	H	few	250,000	1,500++	8,000++	10,000++
	B	100,000	1,000	150+	9,570	81,720++
Brown Noddy	H	1,000	25	0	0	0
	B	1	980	58+	1,046	1,214
Blue-gray Noddy	H	20	0	0	0	0
	B	0	0	1	1	1
White Tern	H	6	0	0	0	2
	B	0	10	0	38	7

10. Giant Clams

Giant clams (*Tridacna maxima*) are fairly abundant on the reefs of both islands to depths of at least 40 ft. The lack of small individuals is noteworthy as no specimens smaller than three inches were sighted. At Rose Atoll NWR giant clams of less than three inches valve width are far more abundant than larger individuals. Baker and Howland specimens also seem to grow to a larger size than those at Rose Atoll. Specimens as large as 14 inches were found. Nine specimens 3-13 inches in width were collected at Baker Island and given to Dr. Richard Radtke, University of Hawaii who is studying the population dynamics of this species.

11. Fishery Resources



Looking over edge of reef where depths drop from 20 ft. to over 1,000 ft. deep in about 300 ft. lateral distance. (Stewart Fefer).

Quantitative surveys of the marine waters were not conducted, but biologists from both parties went skin diving in the reef areas of the islands. A species list of reef fishes was compiled by Richard Wass during seven snorkeling surveys made at Baker Island and the two surveys conducted at Howland Island. A total of 138 species were sighted at Baker Island. A complete list was not compiled for Howland as there was less time for diving, but six additional species were seen at this location. Because the islands are so close together, it is likely that all 144 species occur at both places. Only highly visible and relatively large species are identified by visual surveys. Hundreds of additional species would likely be added to the list by a thorough survey at deeper depths and through the

use of standard collecting techniques. Compared to Samoan reefs with which Wass is very familiar, the fish fauna of Baker and Howland Islands is depauperate. This is probably due to the lack of habitat diversity. However, the fish biomass at Baker and Howland Islands is much greater than in the Samoa Islands--even when compared to Rose Atoll which has no fishing pressure. Wass was particularly impressed with the large numbers of predators including snappers, jacks, and sharks.

15. Animal Control

During the spring expedition the Forsell and Berendzen spent 16 days on Howland Island with most of their effort directed at eradicating the feral cats. The last three cats were quite wary and required extensive hunting. A total of 17 cats were killed using a variety of methods including shotguns, carbon monoxide cartridges, and traps. Shotguns and night hunting were most effective, but the use of the smoke cartridges in dens was also effective. The cats have apparently been eliminated as no sign was observed on the fall survey.

16. Marking and Banding

On the spring survey 57 Masked Boobies were captured and their bands replaced. This is significant in that from 1962 to 1965 the total population was banded thus at least 2% of the population is greater than 22 years of age. More complete analysis will be reported when the banding lab returns the data on where and when the birds were banded. Additionally, during the spring one Red-footed Booby was rebanded on Baker Island. During the fall survey 32 chicks of Red-tailed Tropicbirds were banded on Howland Island.

H. PUBLIC USE

These islands are not open to the public and are posted at the major landing beaches. It is suspected that the islands are visited either by passing fishing vessels or pleasure craft or even by foreign fishing vessels. During both cruises foreign tuna fishing vessels approached the island and then departed presumably after finding someone present on the island. During the spring expedition a small helicopter circled Baker Island and departed. There is only a small amount of evidence that the islands are visited, that being a few beer cans and a fire pit on a beach. a large pile of Coke bottles from the WWII occupation were broken and had been intact in 1978.

For the past several years Ms. Grace McGuire has been planning to pilot an around-the-world flight at the equator in an attempt to complete the ill-fated effort of Amelia Earhart who disappeared in 1937 enroute from Lae, New Guinea to Howland Island. Grace accompanied our fall trip to determine if a landing was still possible on the 50-year old strip constructed for Amelia Earhart or whether another area of the island might offer better conditions.

Upon landing at Howland, Grace walked the perimeter with the rest of our party. She also inspected some of the interior portions at the same time. She concluded that the old runway was adequate and a safe landing could be made. A small amount of labor would be required to fill a couple of potholes and to mark the touchdown area, but no large-scale leveling or brush clearing would be necessary. The FWS members of the field party, however, were not as favorably impressed with the old runway. In fact, they could not even identify its location with certainty. Neither of them are pilots so they felt unable to comment authoritatively on the feasibility and safety of landing an aircraft on Howland. The FWS is currently awaiting a written proposal from Ms. McGuire detailing her requirements in terms of brushing and marking the landing strip, filling potholes, preventing birdstrikes, etc. The proposal will also include a map of the old runways overlain with a map of the strip proposed for this landing.

Archaeological Surveys

Kanalei Shun, the contract archaeologist, conducted archaeological and historical surveys on both Baker and Howland Islands. He conducted visual surveys for house sites, heiau's, large artifacts, etc., search for middens and small artifacts with a boring device and measured and photographed structures remaining from historical periods of occupation. His observations and findings were documented in a report, which are on file in the Refuge Office in Honolulu.

JARVIS ISLAND
NATIONAL WILDLIFE REFUGE

Honolulu, Hawaii

ANNUAL NARRATIVE REPORT

Calendar Year 1986

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

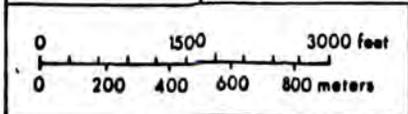
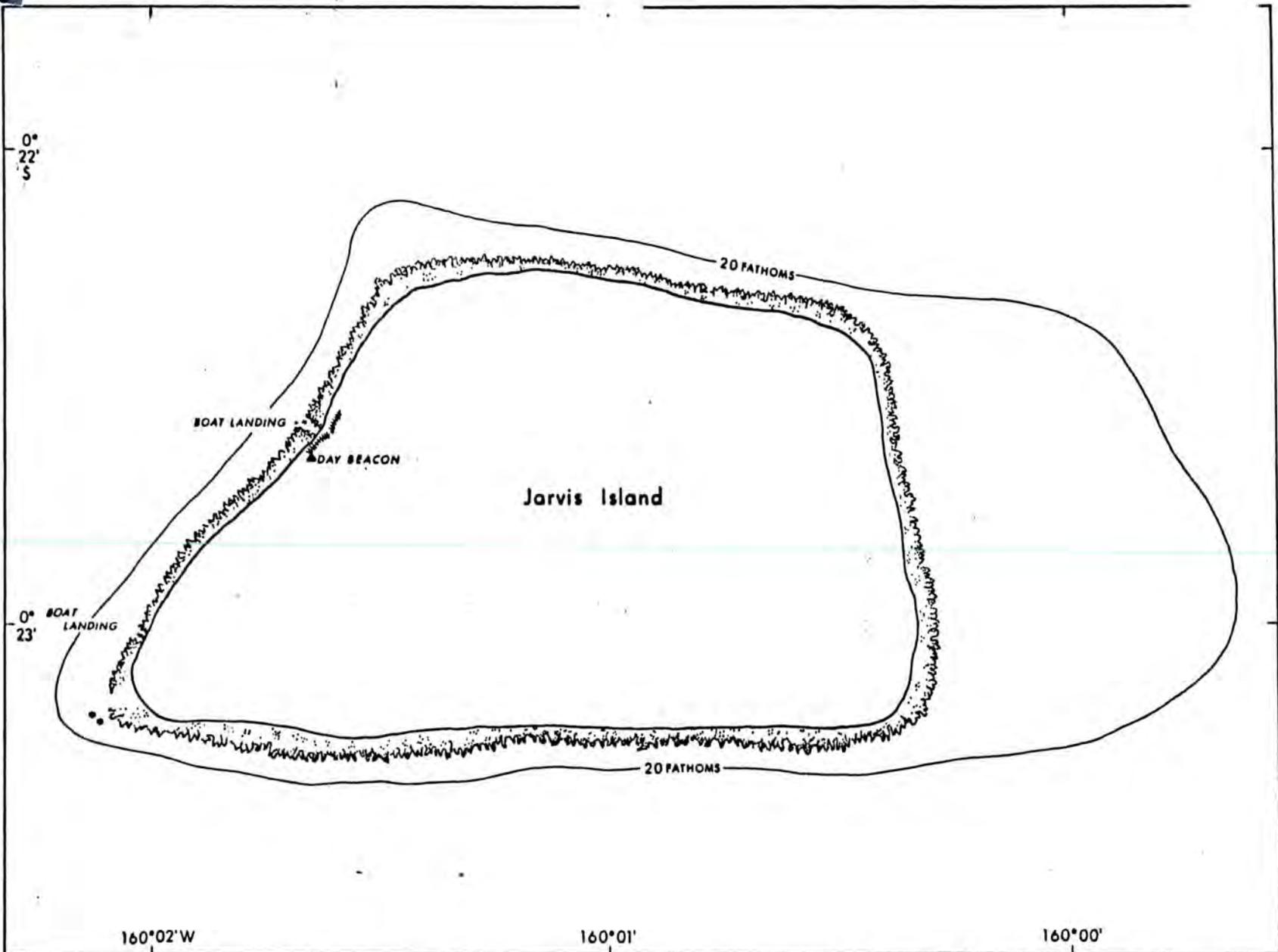
INTRODUCTION

Jarvis Island National Wildlife Refuge is located 20 miles south of the equator about 1,300 miles south of Honolulu and 1,000 miles east of Baker and Howland Islands. Jarvis Island Refuge contains 1,100 acres of land and 36,419 acres of submerged land and water. The island is uninhabited and vegetated only by grasses, prostrate vines, and low-growing shrubs the scant rainfall, constant wind, and burning sun.

The refuge was established by the Secretary of the Interior in 1974 when management responsibility was transferred from the Office of Territorial Affairs to the Fish and Wildlife Service. It is managed primarily as nesting and roosting habitat for about 20 species of seabirds and shorebirds.



Jarvis Island with colony of Lesser Frigatebirds
in the foreground. (Stewart I. Fefer)



JARVIS ISLAND NATIONAL WILDLIFE REFUGE
 Central Pacific Ocean

UNITED STATES
 DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service

JARVIS ISLAND NATIONAL WILDLIFE REFUGE

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A. HIGHLIGHTS

Jarvis Island was visited from approximately 1100 hours on 19 April to 0100 hours on 20 April 1986. This was the first visit by Service personnel to the refuge since two refuge staff visits were made to Jarvis Island in 1983 to eradicate feral cats, monitor seabird populations, and supervise four amateur radio operators. The purpose of this visit was to census seabird populations, sample vegetation, check for feral cat sign, and survey the island for contaminants.

B. CLIMATIC CONDITIONS

Climatic conditions at Jarvis Island are unknown for the reporting period. No remote-sensing instrumentation was operating to furnish meteorological data. Data collected from other Central Pacific locations during the year indicated near-normal conditions with no evidence of the "El Nino" conditions that adversely impacted the Jarvis Island seabird populations in 1982 and 1983. The vegetation on the island was sparse and the majority appeared dead. This indicates it has been a drier year than on Baker and Howland Islands.

D. PLANNING

On 8 May 1986 a meeting was held between several Service personnel and Mr. Paul Visher, Vice President of Hughes Aircraft. The purpose of the meeting was to explain to Mr. Visher the regulations covering use of the National Wildlife Refuge System and management objectives of the remote islands refuges (specifically Jarvis Is. NWR). Mr. Visher presented a proposal to launch satellites from Jarvis Island as a back up to launching from their first choice of Canton Island, a former U. S. possession now part of the country of Kiribati. They were proposing to dredge a lagoon with a 1,000 ft diameter and 20 ft depth on the southwest corner of the island.

A preliminary determination was made that the proposed use of the island was not compatible with the purpose for which the refuge was established. The noise and heat generated from a launch would likely cause significant disturbance and mortality to nesting migratory birds. The Refuge had no further contact with Hughes Aircraft on this proposal.

5. Research and Investigations

Jarvis Island was visited on 19 April 1986 by Refuge Biologist Stewart Fefer, Steven Berendzen, Assistant Manager Hawaiian Wetlands Refuges and Doug Forsell of the Alaska Fish and Wildlife Research Center. Jarvis was visited using the RV Feresa on the return trip from Howland and Baker Islands. The details of this visit are reported in the following report: Berendzen, S. L., D. J. Forsell, and S. I. Fefer. 1986. Expedition Report -- Jarvis Island, April 19, 1986. Administrative Report U.S. Fish and Wildlife Service, Hawaiian and Pacific Islands NWR Complex. 14 pp.

F. HABITAT MANAGEMENT

1. General

Habitat management on this island is based on the philosophy that the resident populations of seabirds and other wildlife will return to a natural state if environmentally destructive conditions resulting from former habitation of the islands are removed or controlled. Past management efforts have taken two forms: control of introduced cats and the destruction of debris. The natural state of these islands is maintained by a restrictive policy of limited entry and of allowing only those activities that would be beneficial to the wildlife populations. The fact that the nearest inhabited island is 240 miles away facilitates this type of management.

G. WILDLIFE



Black tip reef sharks patrol the landing beach at Jarvis Island. (Stephen Berendzen)

5. Shorebirds, Gulls, Terns, and Allied Species

The results of the seabird surveys are listed in Table 1. The populations seem to be relatively stable but a lack of surveys in April precludes comparison with past years.



Red-tailed tropicbird chick in shaded nest covered by an old rusted out 55 gallon drum. (Richard Wass)

Table 1. Results of migratory bird surveys conducted at Jarvis Island on 19 April 1986.

Species	Nests or Territories	Estimated Population
Red-tailed Tropicbird		85
Masked Booby	1,963 t	4,564
Brown Booby	13 t	72
Red-footed Booby	69 t	258
Great Frigatebird	167 n	334
Lesser Frigatebird	609 n	1,218
Wandering Tattler		4
Gray-backed Tern	4 n	18
Brown Noddy		322
Blue-gray Noddy		1

15. Animal Control

The island was searched carefully for cats and their sign both during the day and at night with lights. No cats were observed and the only sign found were several scats which were quite old and may have persisted for years. The survey crew agreed that it is very unlikely that there are cats remaining on the island.

17. Disease Prevention and Control

The Island was searched for contaminants possibly left by past military operations or various research efforts since world War II. The island is relatively free of contaminants except for about 15 Lead-Acid batteries left at the remote weather station on the east end of the Island. The installation was deactivated about 1981 but the building and debris remains. The acid has evaporated and the lead should be properly disposed of in the near future. Dr. Martin Vitousek the project leader of the station stated he paid the crew dismantling the station to remove the batteries. Other debris left on the island in past years continues to deteriorate and has been manipulated by refuge personnel over the years so as not to present hazards to the birds. Some of the debris actually provides nesting and roosting habitat for the birds.



Remains of remote weather station deactivated in 1981. Some of the lead-acid batteries left on the island are on the ground in the lower right of the photo. (Stewart I. Fefer)

J. OTHER ITEMS

4. Credits

This narrative report was written by Douglas J. Forsell and the section on Rose Atoll was co-authored by Richard C. Wass. The entire report was reviewed by Jerry F. Leinecke and Stewart I. Fefer.