REVIEW AND APPROVALS

JOHNSTON ATOLL NATIONAL WILDLIFE REFUGE

Johnston Atoll, Pacific Ocean

ANNUAL NARRATIVE REPORT

Calendar Year 1991

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U.S. Department of the Interior
Fish and Wildlife Service
National Wildlife Refuge System

Aerial view of Johnston Atoll, one of the most remote atolls in the world. (P. Lobel)

Aerial view of Johnston Island. (D. Forsell)

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 nearest land to over 820,000 square miles of ocean. The Atoll consists of approximately 32,000 acres of coral reef shallows containing four small islands totaling 691 acres. Two of the islands, North and East, were man-made through extensive dredging in the early 1960's. Beginning in the late 1930's, Johnston and Sand Islands were modified and enlarged by dredging and filling, which would continue off and on through the years until the 1960's. Johnston Island is presently inhabited by approximately 1,300 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 (JA) as a strategic military installation is maintained by the Defense Nuclear Agency (DNA), Department of Defense. DNA assumed management responsibilities through a permit issued in 1973 by the Air Force for use and occupancy of JA and its facilities. The Air Force had received responsibility for the Atoll from the Navy in 1949. A Memorandum of Agreement between the U.S. Department of Defense (DOD) and the U.S. Department of the Interior (DOI) was signed in 1976 which provided for co-management of the Atoll. The DOI, represented by the FWS, was given primary responsibility and jurisdiction for the protection and preservation of the Atoll's natural resources. The DOD, represented by the DNA, was given responsibility and jurisdiction over the Atoll's human residents and visitors.

The Department of Energy (DOE) maintains a full time representative on the atoll who acts as the Deputy Base Commander but has oversight authority outside of that position. DOE's interest goes back to the 1950's and 1960's when it ran the nuclear atmospheric testing program. It currently is responsible for maintaining the Atoll's Safe-C status (the ability to return to atmospheric testing) and for maintenance and oversight of Atoll contracts. The DOE is in essence a watchdog over DNA to ensure that DNA does its job of overseeing the island operations contractor, Raytheon Services Nevada (RSN) and other island tenant contractors. All money and contracts go through or come from DOE and are dispersed accordingly. As you might imagine, such an oversight responsibility is not without its local and external conflicts.

The DOE has no authority over or oversight function of FWS activities. On the contrary, the Refuge Manager provides

information to DOE and/or DNA as the case may be if contractors are not responsive to FWS.

That is not all folks. The U.S. Army uses Johnston Atoll as a storage facility for 6.7% of the nation's stockpile of obsolete chemical weapons. In addition, the Army completed construction of the Johnston Atoll Chemical Agent Demilitarization System (JACADS) in July of 1990 for the destruction of these munitions. It is a hi-tech, computerized, prototype plant utilizing robotics to disassemble the munitions and prepare the components for high temperature incineration. This facility has attracted national and international news coverage and has been responsible for a tripling of the Atoll's population. It has been controversial from day one for a variety of reasons, not the least of which is its potential effect on the environment from stack emissions. Many South Pacific nations, the state of Hawaii and certain environmental groups have been strongly opposed to the operation. The movement of the U.S. stockpile of chemical munitions in West Germany to Johnston Atoll in late 1990 added more fuel to the fire, so to speak. Other major contaminant issues include at least four acres of land contaminated with Herbicide Orange which contain soils with over 450 ppb of dioxin as well as related lagoon contamination, 26 acres contaminated with transuranium elements as a result of three failed nuclear tests in the 1960's and tens of thousands of gallons of subsurface petroleum contamination.

The Refuge was established in 1926 by Executive Order number 4467 of President Calvin Coolidge "as a refuge and breeding ground for native birds." It retained that status even through the war years and the era of nuclear atmospheric testing in the 1950's and 1960's. In 1940 the name of the Atoll was changed from Johnston Island Reservation to Johnston Atoll National Wildlife Refuge. At present, the Refuge is managed as nesting and roosting habitat for 14 species of seabirds, wintering habitat for 5 species of shorebirds, and as habitat for a diverse assemblage of marine animals, including the threatened green sea turtle . One Refuge Manager and one Biologist were stationed on Johnston Atoll during the period of this report. Johnston Atoll National Wildlife Refuge has been identified by the Service as a high priority area for corrective action relating to contaminant issues.

INTRODUCTION

TABLE OF CONTENTS

G. WILDLIFE

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

A. HIGHLIGHTS

The role of the Refuge on Johnston Island continued to grow in the past year. The funding for the refuge manager position and O & M on Johnston Island was increased by the Army. (section E. 5.)

Wildlife Biologist Dr. Beth Flint transferred to the Honolulu office. Wildlife Biologist Donna O'Daniel was hired as her replacement. (section E. 1.)

Contaminants issues continued to escalate and become one of the Manager's major duties. Controversy with the Army (PMCD) and DNA remained since the Manager continued to identify contaminants and related activities that should not be the responsibility of the FWS. He continued the process of removing the FWS from such responsibility and placing it on the military. (section D. 4.)

With JACADS attempting to operate at a higher capacity and complete its verification testing, numerous dignitaries visited the refuge and installation. The Manager gave numerous programs and briefings to high ranking military and civilian personnel and foreign dignitaries on the FWS role at JA and environmental issues and conflicts relating to JACADS/military/FWS interests. (section H. 1.)

The Refuge, in cooperation with Woods Hole Oceanographic Institute, published the first Johnston Atoll National Wildlife Refuge Calendar (1991). (section H. 7.)

The Manager and Biologist continued to identify areas where there were controllable conflicts with natural resources and human use. As a result of months of data collecting and observations, coral collecting was suspended on the Refuge. One exclusion zone of no collecting of any sort was also established. (section H. 17.)

The FWS 23-ft. boat was pulled from service by the Manager because of safety problems and costs of repairs. (section I. 4.)

The Coast Guard announced the planned closure of the LORAN station on Sand Island and began the process of working with Refuge staff to plan the removal and disposal of facilities, debris and any contaminants. (section F. 6)

Many dignitaries visited the Atoll but few visits were more important to more parties than the 2 week fact finding trip by the South Pacific Forum. (section D. 5.)

B. CLIMATIC CONDITIONS

Johnston Atoll (JA) has a mild tropical oceanic climate dominated by cooling northeasterly trade winds. Weather observations are taken at the Johnston Island NOAA Weather Station. The yearly mean temperature was 80.8 degrees which was a departure of 1.9 degrees from the average long term mean. The rainfall for the year was 32.25 inches, which was 5.73 inches above normal. The most significant weather event was the 7 inches of rainfall in July.

TABLE 1. Monthly high and low temperatures and rainfall recorded at Johnston Island during 1991.

	Temperature (°F)		
Month	High	Low	Rainfall
January	87	68	1.62
February	88	72	.67
March	86	70	2.34
April	88	70	4.69
May	88	70	1.29
June	90	71	1.05
July	90	72	7.09
August	91	72	1.16
September	91	76	.74
October	90	73	2.79
November	88	72	1.76
December	87	69	7.0

D. PLANNING

1. Master Plan

There is no master plan for Johnston Atoll NWR.

2. Management Plan

There is no actual management plan for the Refuge. However, there are guidelines governing the activities of the military and its contractors as they go about their day-to-day business. The guidelines are those that one might expect on a national wildlife refuge such as Refuge Regulations, FWS and other federal laws and regulations. However, we are under considerable scrutiny because we have to weigh enforcement of these regulations against the special conditions and needs of a 1,300- person island community, national security and international treaties pertaining to the work at Johnston Atoll. Some rules have no latitude for compromise but many others require us to negotiate, compromise and engage in quid pro quo. Other guidelines are internal in nature and are designed to prevent conflicts among the various interests on the atoll and ensure national security and human health.

The Refuge Manager and Biologist are involved regularly with monitoring the day-to-day operations of the base maintenance and construction contractors and advising them on how to limit their impacts on wildlife habitat. They were also asked to participate in the planning of numerous construction and military activities through the year.

No construction or digging except for emergencies can take place without the authorization of FWS personnel. We must review and sign all internal work orders for such activities to prevent destruction of seabird nest sites and ensure that all considerations have been given to the activities where there are conflicts. The military is required to minimize impacts to wildlife and habitat and mitigate where it must disturb or destroy habitat. Some examples where we get involved are given below. They represent only a small portion of the many activities that involved FWS input to prevent greater conflicts in the future.

The Army conducted two major CAIRA (Contaminants Accident/Incident Response Action) exercises and several smaller maneuvers or exercises. Most of the exercises have to do with keeping the Army personnel (military police and chemical weapons and materials specialists) in a high state of readiness for emergencies. The exercises may involve island personnel only or involve midnight transports

bringing large numbers of special operations troops in to simulate a major event. Before each exercise the Manager or Biologist would examine the proposed site for nesting seabirds and flag nest sites or recommend changes to plans or site locations to prevent conflicts. All military personnel were well briefed before each operation to ensure adherence to agreed on procedures. No conflicts resulted from any of the activities which is a credit to the Army's willingness to cooperate and support FWS objectives.

The various contractors were advised and/or monitored on numerous activities including storage of hazardous waste and materials, allocation of storage areas, avoiding destruction of nesting habitat, disposal of construction debris and trash and use of chemicals. The Manager and biologist make regular checks around the island for improperly stored or deposited debris or activities that are producing or might produce contamination. Admittedly, this is not their job and the contractors should be policing themselves, but experience has been a better teacher than expectations. Efforts are being made to change such attitudes and increase the responsibilities of the contractors.

The Refuge Manager is always included in various committees to provide information or a professional opinion regarding island environmental activities such as recycling, composting of sewage sludge and its disposal, reduction of nontoxic waste and its disposal on the island, etc. This is in large part a result of his being considered an island community leader who possesses authority over many activities and, therefore, resides on the City Council to review many island activities. However, the Manager keeps his nose out of safety, recreational activities, clubs, operations and related decisions that have no bearing or impact on the natural resources of the atoll or the FWS mission. He has been placing more pressure on the military and contractors to be doing what they are supposed to be doing environmentally and not to expect the FWS to be responsible.

Management Planning

As a result of the Johnston Atoll Implementation Plan signed in 1984 between the U.S. Corps of Engineers, Pacific Ocean Division (CEPOD), U.S. Army Chemical Activity, Western Command (USACAW), Field Command Defense Nuclear Agency, and the Service, Refuge (Honolulu and Johnston) personnel have worked closely with these agencies on refuge environmental concerns arising from the JACADS project. A draft environmental monitoring plan was submitted in 1987 by then Refuge Biologist Forsell. The plan was the subject of

several meetings and negotiations and was finalized in the fall of 1988. Unfortunately, after several of the concerned agencies signed the document the Director of Field Command DNA refused to sign feeling that the U.S. Army was not funding enough of the studies and the refuge program. Nothing more happened with the document in 1989 or 1990.

The Refuge Manager resurrected the document in 1991 for reevaluation because of the conflicts he was having with the various military commands and divisions. There was no direction or coordination for the environmental programs at Johnston and the military had been going through some of the motions while not really understanding why things should be done. The FWS programs at JA also lacked proper direction and coordination with the necessary objectives. The plan was rewritten but could not be made acceptable to all parties so it again died an ignominious death, but not without rattling a few doors and increasing necessary interest in solving this problem.

The problem is potentially serious because it directly relates to the success or presumed success of JACADS. The Army has been very myopic about its mission here and the role that environmental issues will play in the success of JACADS. Likewise, the FWS (mainly the Regional Office) has had an out of sight, out of mind attitude and maintained a high level of ignorance about the military's, as well as its own, activities at JA. No national or international agency or group or press has yet to ask the right, and potentially embarrassing, questions about how JACADS is affecting the atoll environment and how we are determining that effect, if any. Also, can the effects of JACADS (especially pollution discharge from the stacks) on the environment be separated for evaluation from other anthropogenic effects that are occurring and/or have occurred on the atoll? If the FWS is a watchdog at JA then just what is it watching and to what degree should it bark and/or bite?

The Refuge staff goes to extremes trying to engender an understanding of the environmental programs and the importance of the Refuge to the military mission. If the Army wants to build eight more of these plants in the continental U.S. it needs to give a much greater degree of consideration to the environmental issues with this in mind. Also, if the FWS cannot be positive about the Army's interest and support in this area then conflicts are assured. Neither has the FWS fully considered its role in all of this, especially since we are regarded as the environmental experts and monitors at the site. After all, that is what the Army believes it is paying us for. Our past data are not well organized or recorded and some of it

is suspect due to inattention to detail and lack of proper oversight. This can, and may very well be, embarrassing to the FWS on a local, national and possibly international level. (See South Pacific Forum discussion, section D. 5.)

If JACADS degrades the environment while destroying chemical munitions then it has not been a success and has failed in one of two major areas of concern in the public's view. The major area of controversy is the possibility of a massive gas release from some internal or external problem which results in the destruction of human life around and downwind of a facility. That is certainly a legitimate concern and one the Army has been trying to address. The second issue that comes into play if the Army can politically resolve the first is the subtle effects on the environment, including human health, of the day-to-day operations of the plant. This area of controversy centers around the possibility of stack emissions containing harmful amounts of the organochlorines, dioxins and furans. It must be remembered that regardless of what the facts and data demonstrate, it is the public's perception of the operation that may count the most.

If the general public and the environmental groups are going to want an example of what may or may not happen and how serious the military establishment is about the environmental issues relating to JACADS-type facilities, then there is only one example with which to compare - Johnston Atoll. The current Refuge staff at JA has been trying to demonstrate to the military how positive and potentially beneficial it is to be conducting such operations on a national wildlife refuge. Where better to demonstrate a commitment to environmental concerns and protection regarding a prototype operation like JACADS than on a NWR with FWS personnel and related researchers breathing down your neck. The enlightened would recognize it as a pretty good marketing tool and, indeed, there seems to be some light at the end of the tunnel, and the Army may be moving toward it. This of course is assuming the operation is environmentally safe.

3. Public Participation

Manager Di Rosa and Biologist Flint had been observing and gathering data regarding coral collecting at and exportation from JA since their arrival in May of 1990. In January of 1991 Manager Di Rosa proposed a ban on coral collecting. He and Flint held a public hearing to gather comments from island residents and explain the reasons behind the new regulation. (See section H. 17.)

Aerial View of JACADS. Potentially toxic stack emissions from the incineration process have been a focal point of controversy and environmental challenges from Greenpeace. (R. Di Rosa)

The hazards of handling and processing chemical munitions require numerous safety measures for island residents. These down range (down wind) warning signs are but one of many. (R. Di Rosa)

4. Compliance with Environmental Mandates

Contaminants

Contamination, either present, past, or future, is a part of life at JA. Being issued and fitted with your very own gas mask adds to the significance of anything new residents or visitors may have heard about JA. Even though JA is the most contaminated piece of soil the FWS manages and despite the storage and destruction of chemical munitions, JA is a far cry from a toxic wasteland as it is often depicted in the media.

Contamination at JA falls into three categories: Past - contamination that we have yet to discover but know the probability is high of doing so, such as old underground storage tanks and lines or existing subsurface petroleum, the limits of which haven't been determined; present - known contamination or contaminated sites such as the dioxin contaminated old Agent Orange storage site, Plutonium contamination, subsurface petroleum, heavy metals, etc.; future - potential toxic emissions from the JACADS stacks or a chemical accident involving the munitions or a fuel spill from the large storage tanks or a fuel tanker. To complicate the issue, the military contractors either barely have or don't have the necessary skills or equipment to handle certain types of incidents such as a large oil spill. It is somewhat ironic that in the midst of all this contamination, hazardous and many types of nonhazardous waste cannot be disposed of at JA. It must be deactivated if possible or shipped off island to, you guessed it, an approved disposal site in the continental U.S. Temporary or long term storage of some waste (i.e. dioxin contaminated soil and items) is permitted under existing RCRA permits.

The Manager at JA is heavily involved in contaminants issues by the very nature of his position as somewhat of a watchdog, and the fact that there has been no contaminants specialist at JA or in Honolulu to represent the Service. Therefore, the Manager has become a contaminants specialist by default. His knowledge of and involvement in contaminants issues probably far exceeds that of any refuge manager in the continental U.S. (CONUS). Also, the previous biologist who had the functions of a manager was the only "environmentalist" on the island for a long while and; therefore, had to assume some responsibilities that would not have been acceptable for a manager at a more traditional refuge.

This is a somewhat precarious position since the Service has provided little to no guidance in this area and it has been

left up to the Manager to determine liability and, in some cases, accept responsibility (and liability) for others' work by doing their jobs. The current Manager was greatly surprised at what the previous biologist was involved in, the potential liabilities existing from some activities and the lack of interest and/or ignorance of the Honolulu and Regional Offices about what was and is occurring at JA.

After spending the last half of 1990 getting acquainted with JA operations, researching contaminants issues and JA history and following in his predecessor's footsteps, the current Manager determined that the FWS was involved in areas where it did not belong. Therefore, it and the Manager were inappropriately assuming liability. In late 1990 the Manager began the process of defining liability and responsibility for certain activities and turning those activities over to the responsible parties. In one case he had to actually begin training the responsible party to do the job. It is a long story about the efforts involved and time spent in doing this, and it isn't over yet.

There was strong resistance from the one division, Program Manager Chemical Demilitarization (PMCD), of the Army and some from the DNA command. Needless to say, the Manager was not the most popular person at times and efforts were made "to pull him in line" through the military command. The affected parties were politely reminded that his chain of command was DOI and not DOD. Also, his refusal to continue to do work for the responsible parties unless they became involved and accepted liability and responsibility got the necessary attention. Not doing the work would have placed them in violation of their EPA permits. This was no small threat since the Manager was the only one with the knowledge to do the work. DNA was becoming much more sensitive to violating its NPDES permit.

The following is a "short" overview of a few of the most important areas where changes were made or problems were identified, and it is by no means comprehensive:

NPDES (NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM)

The DNA is the permit holder. However, responsibility for meeting the permit requirements comes from a civilian operations contractor and PMCD (Army). The two main parts involve discharge from the sewage treatment plant (responsibility of the base contractor, Raytheon Services Nevada [RSN]) and the monitoring of the noncontact cooling water discharge from JACADS (responsibility of PMCD).

Sewage Outfall

The new sewage treatment plant has had its problems, apparently (from what we have been told) because the design is inadequate. It was designed to serve a population that is several hundred less than currently occupies the island. It violates its permit by discharging raw sewage when there are large rainstorms. It can't handle the overload of surface runoff water it receives. Yes, as strange as it may sound, the design is such that the plant receives some runoff into its system. It, of course, also discharges raw sewage when malfunctions occur.

These discharges apparently are not the problems they would be within other tropical lagoon systems. The area of sewage discharge is on the south side of JI which is an area without a barrier reef, thus it is open to the ocean. Furthermore, raw sewage has been discharged in the area for perhaps 40 years and has already killed the coral reef community in that area. No human water activities take place on the south side of the island so human health is not at risk. The rich nutrient source has encouraged extensive growths of algae over the dead coral which has resulted in high quality green sea turtle feeding habitat. The sea turtle population is monitored and surveyed (trend data) on a regular basis to detect any problems. There has been no indication that the sewage outfall over the years has affected the turtles, with the possible exception of a few turtles developing tumors. However, there is no way to substantiate this.

Outfall 008

By far the biggest conflict has resulted from the noncontact, cooling saltwater discharge (Outfall 008) from JACADS. The previous biologist helped PMCD establish the protocol for monitoring the outfall for temperature variations and gathering and reducing the data which is a very time consuming process. To complicate matters, the outfall discharge was moved during plant construction but the EPA permit was never modified to correspond with parameters of the new location which is much shallower than the original site. The current Manager waded through the mass of paperwork and historic data and determined the following:

Since the current location of the outfall was not as indicated in the permit, JACADS (or its operator, PMCD and therefore the permit holder, DNA) was possibly in violation of the NPDES permit.

One of the locations, as specified in the permit, for measuring the ambient water temperature turned out to be located in the middle of the aircraft runway. Since no sensor was present at that location (for obvious reasons) this probably constituted another technical violation.

The permit specified a vertical array of three sensors to be in the water close to the outfall (as applies to the original location in 30 feet of water). Only one sensor was present which was a permit violation. The fact that the current location was only in 3 to 5 ft. of water, depending on tide, was beside the point. The permit had never been modified and the permit holder must demonstrate to the EPA the need for change.

The temperature sensors were placed in the water at various sites and recorded temperature data every hour for three months. They were then removed and replaced after that time and the data extracted and reduced by computer, which the Manager was doing. Since it was three months between extractions it could be a long period of time before a violation due to an excessively hot discharge was noted. The permit called for real time monitoring; therefore, this was another violation.

The real time monitor placed in the mouth of the outfall pipe to monitor the actual temperature of the cooling water as it was discharged was in a poor location. The mouth of the pipe receives wave wash during high tides or storms; therefore, measurements were compromised. Also, long gaps in data collection would occur due to equipment failure or human inattention.

The Manager also determined that, in general, the protocol and procedures, regardless of the EPA permit were not adequate to protect refuge resources.

The previous biologist had assumed all the responsibilities (and therefore a large part of the compliance liability) of temperature sensor placements, quarterly extractions of the sensors and reduction of the data and providing the information to PMCD. This was not the responsibility of the FWS, but the responsibility of the permit holder.

Also, it appeared that there had never been an EPA inspection of the NPDES or Clean Water Act activities at JA and apparently NPDES violations were not being reported.

Biologist O'Daniel changing the temperature data logger located at the intake pipes for the JACADS non-contact cooling water. (R. Di Rosa)

Tank 49 area where there is a chronic leak of oil into the lagoon from the large amount of sub-surface petroleum contamination. (R. Di Rosa)

In addition, no baseline data had been gathered on marine organisms in the outfall area as required by the EIS for JACADS. Even though an EIS is not a legally enforceable document, it is a very wise idea to comply with its recommendations.

It also had been identified that the permit allowed for only a one degree level of temperature increase in the outfall area (which applied to the original location). Natural temperature increases from low tides and solar warming exceeded this on a regular basis in the current location when JACADS was not even operating. This gave the illusion that water in excess of allowable temperatures was being discharged.

By the middle of the year the Manager's words were having some impact and grudging attention was being paid by PMCD to the NPDES permit problems. Several items had been or were being resolved by year's end. The exact problems and their nature were being clarified and a permit modification was being written and changes were being requested in anticipation of submitting it to EPA. PMCD had hired and/or delegated responsibility for the temperature data to knowledgeable personnel. The Manager began training these individuals in reducing the data; however, refuge staff were still pulling and replacing all the sensors. Per the Manager's recommendations PMCD had purchased quality oceanographic data loggers to replace the current and less reliable temperature sensors. A stanchion to support a vertical array of three data loggers was built and placed at the appropriate monitoring location. This achieved a degree of permit compliance which also allowed for the gathering of data to demonstrate to EPA that only one data point was needed at that location. Plans were made to move the real time monitor from the mouth of the outfall pipe to the interior so as to properly measure effluent temperatures. However, data were still being gathered at the intake, outflow and ambient temperature sites on a quarterly basis so real time monitoring requirements were not being met. Dr. Phil Lobel had been contracted by PMCD to gather baseline data on the potentially affected marine life (al beit somewhat after the fact). It is to be noted that the EPA has never conducted an inspection on site for compliance with NPDES regulations.

RCRA (RESOURCE CONSERVATION AND RECOVERY ACT)

The extent of contamination or contaminated sites, better known as Solid Waste Management Units (SWMU), that fall under this act are about 18. A process of consolidating information about the sites and identifying assessment needs

and requirements was begun this year. It is expected that all identified sites are subject to investigation and possible corrective action measures as required by the Environmental Protection Agency (EPA). From an environmental contaminants standpoint and potential to affect the refuge resources the two most important sites are the 4-5 acre former Herbicide Orange storage area and the subsurface petroleum contamination. The heavy metal contaminated ash pile from the burn pit is a not too distant third.

Agencies at JA have either or both class A and B permits. DNA is storing dioxin contaminated earth and materials from the partial cleanup of the old Agent Orange storage area. It cannot be shipped off island since there is no EPA approved process for the disposal of waste contaminated with dioxin, except for on site incineration. Regulatory requirements and costs make this prohibitive, which is just as well since there is an additional four acres, perhaps to a depth of 30 inches or more, of contaminated soil that must be remediated. (The Army is storing and destroying hazardous waste (obsolete chemical munitions) at JA.)

The biggest concern from the environmental perspective, especially from Greenpeace, has been the potential impact from possible pollutants being discharged from the stacks of JACADS. The chemicals in question are the organochlorines, dioxins and furans, which could be produced from the burning of mustard gas. The military assures us that virtually nothing but steam escapes from the stacks and JACADS complies with all EPA regulatory requirements, especially TOSCA (Toxic Substances Control Act), and regulators have come and gone at a steady stream since commencement of operations. Nonetheless, Dr. Lobel from WHOI was contracted to study the marine resources for potential effects and gather related baseline data on fishes and, if possible, the microlayer. An important part of his work involves trying to determine what contaminants, mainly furans and dioxins, were present in the marine environment prior to JACADS. This would prevent JACADS from being implicated where it is not at fault. The most obvious problem is the dioxin contamination of sediments and some reef organisms in areas adjacent to the Agent Orange site where contamination continues to seep into the lagoon from the contaminated site. Refuge staff assisted Dr. Lobel with his fish and sediment collections and preparation when necessary. JA also has numerous contaminated sites that fall under RCRA regulations. The Manager reviews and comments on all documents related to this and other contaminants issues for the Service.

Solid Waste Burn Pit

The preferred method of disposing of combustible (and some noncombustible) refuse on the atoll was, and is, to burn it in a waste burn pit. Luckily the ash has been allowed to accumulate instead of being dumped into the lagoon or somewhere else on the island. There was no control over what went into the pit in the past. The approximately 10,000 cu. yds. of accumulated ash recently has been found to harbor high lead levels, thus making it hazardous waste. The site must be remediated in accordance with EPA regulations. Thanks to the previous biologist who had the pit redesigned and a recycling yard and waste reduction program started, past practices are no longer occurring. However, DNA is looking at a hefty remediation bill and options for treatment were being evaluated in 1991. To ship it off island to an approved landfill site in CONUS would cost many millions of dollars so DNA is hoping to find something a bit cheaper.

A solution proposed to the Manager was to turn the ash into a putty- like substance, put it into a giant hypalon bag and bury it, oh yes, and add some monitoring wells. Simplicity at its best. The Manager politely informed the proposers that no one is likely to consider putting hazardous waste into a giant baggy, digging a hole and burying it on a NWR a viable solution, for a variety of reasons. Back to the drawing board. What this demonstrated was the limited knowledge about contaminants laws and liability that many in command have. By the end of the year the Base contractor's environmental personnel in CONUS were developing some workable solutions. However, none will be cheap.

Nine monitoring wells were established around the Solid Waste Burn Pit and the Waste Storage Site for sampling and monitoring data collection. It appeared that the heavy metal contamination was confined to the ash pile and had not spread through the soil.

DERA (Defense Environmental Restoration Act)

This is the Department of Defense's equivalent of CERCLA (Comprehensive Environmental Response, Compensation and Liability Act, also known as the Superfund) which addresses cleanup of contamination on DOD lands. Contaminants issues that are being funded by this are the old Agent Orange (Herbicide Orange) storage site and the subsurface petroleum contamination. The U.S. Air Force is the responsible party for both of these SWMU's. Money was being appropriated by the Air Force to begin remediation of the sites. Money had been appropriated in the 1980's to determine if dioxin

contamination from the Agent Orange site had seeped into the lagoon and bioaccumulated in organisms.

Subsurface Petroleum Contamination

The Base contractor, RSN, began a drilling project to determine the limits and quantity of the subsurface petroleum contamination. It was far from complete by the end of the year but the projections were not good. There is probably a bare minimum of about 50,000 gallons of weathered diesel fuel below the surface and located at various sites around JI. Chances are good that the actual quantity may far exceed that amount.

Herbicide Orange Storage Site

By far the most controversial issue is the dioxin contaminated old Agent Orange storage site comprising about four or so acres. A short history of the site is in order. Approximately 1.37 million gallons of Agent Orange were removed from Vietnam at the end of the war and stored at JA. It was not properly stored or monitored by today's standards, and many of the barrels leaked or were mishandled and product spilled. The Agent was later destroyed at sea in the Dutch incinerator ship, Vulcanus. The Agent contained the dioxin as a by-product of improper manufacturing or control techniques and, therefore, should not have been in the Agent in the first place.

Studies of soil within the site demonstrated contamination as high as 449 parts per billion (ppb) and perhaps as deep as at 30 inches. In 1987 the previous biologist/manager wrote a plan for monitoring the infiltration of dioxin into the lagoon. Subsequently the Air Force accepted and funded it. The biologist began sample collections of organisms in 1989 for lab analysis. A number of organisms contained detectable levels of contamination.

The current Manager and Biologist continued the sampling procedure soon after their arrival in 1990. Even though the Manager continued the sampling and testing he felt very uncomfortable with the project because there was no written methodology or protocol for it; work was being done strictly by verbal instruction that the departing biologist had given the present Manager; past organisms had not been properly labelled and there did not seem to be good written justifications of why various organisms had been selected for sampling; and apparently the project had never been reviewed by appropriate authorities or specialists such as ichthyologists, contaminants specialists and/or toxicologists, or higher level FWS personnel. The Manager

perceived a certain degree of liability for himself since he was not a specialist in this area and perhaps due to the poorly handled past documentation. The Service also probably had a degree of liability for its lack of interest and proper oversight in such a contaminant issue.

Therefore, the Manager enlisted the aid of Dr. Lobel, an ichthyologist with a background in marine contamination. He agreed to help at no cost and he and the Manager developed a rationale for sampling certain marine organisms based on their life histories. However, the Air Force funding to continue the sampling and testing was running out and only allowed for the testing of one more batch of collected samples. WHOI possessed the resources to sample specimens for dioxin and furans and agreed to do additional samples analysis during the year and seek funding from the Army as this had special relevance to JACADS.

Being able to qualify and quantify, if possible, the limits of dioxin and furan contamination in the lagoon is more important to the Army than it might first appear. The biggest controversy over JACADS, outside of a possible chemical release, is potential contamination from the stack emissions that may contain dioxins and furans. Thus, it is to their advantage to develop baseline data (even belated data) to document any existing contamination from these toxins. By the end of the year the Army had agreed to fund further studies designed by Dr. Lobel to do just that. The Manager was removed from the liability equation, however, he would continue to provide support to Dr. Lobel for sample collections and review of documents.

Early in the year the Manager met with representatives from Headquarters, Pacific Air Force, Hickam AFB, Hawaii to discuss a proposed human risk assessment the Air Force wanted to do for the Agent Orange site but related to contamination of lagoon fishes. He pointed out to them in a letter that if they did it, it was not likely to be valid for several reasons, the least of which was the standard problems inherent in developing risk assessments. The data they would be using from the refuge files were compromised due to poor methodology and study controls in the past. Also, there were no comparable data regarding dioxin contamination and analysis in tropical fishes or consumption patterns of fishes by humans at JA. Also, the degree of sensitivity of the analysis could be questionable due to newer methods that had been recently developed. As predicted, the risk analysis was not recognized as valid, even by the authors. They recommended further research

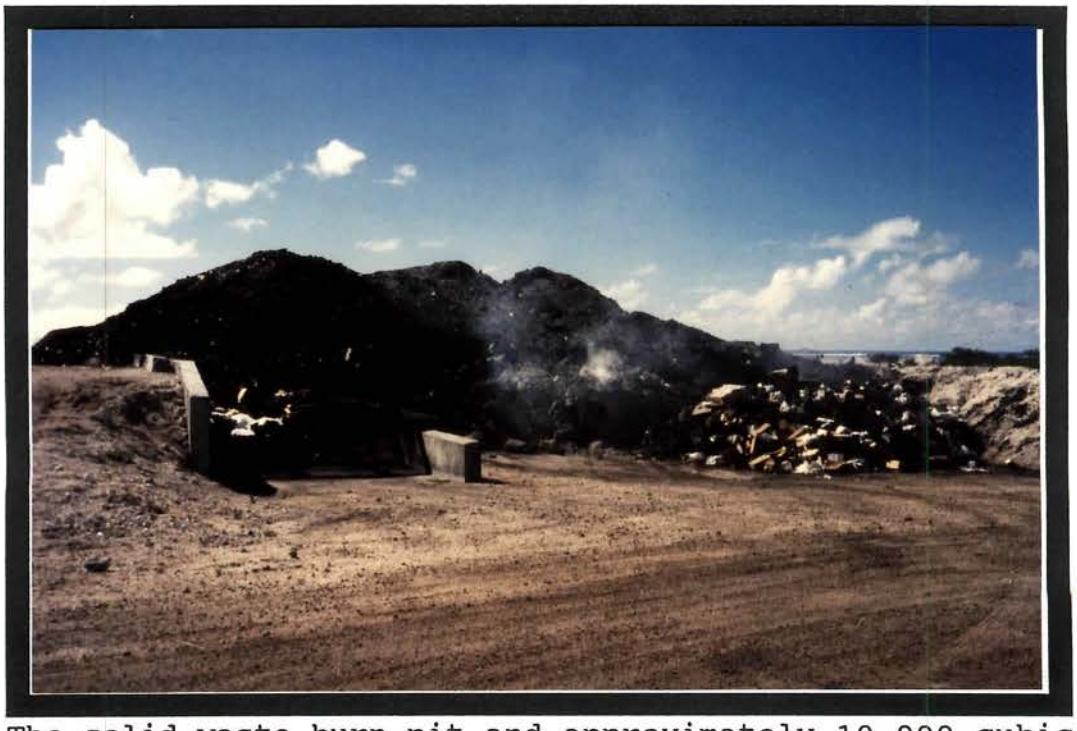
under better designed and controlled conditions. However, the document is an excellent source review of the collective work completed and information gathered to date.

Plutonium Contamination and Cleanup

The contamination is the result of three rocket explosions (one on the launch pad and two in the atmosphere) during the atmospheric nuclear test launches of the 1950's and 1960's at JA. The detonations were not nuclear. Thus, the contamination that resulted was the scattering of radioactive raw plutonium about the islands and launch site. The contamination (other than that which landed in the lagoon) was identified and removed at a later date to be stored in a 26 acre site that contained the launch pad. Contaminated sediment adjacent to the site (much of it had been bulldozed into the lagoon immediately after the launch pad explosion) was retrieved by dredging and also stored on the site. The flesh of lagoon fishes was sampled in the early 1980's to detect any potential radiological contamination. Nothing greater than what could be expected from background radiation was discovered. The risks to humans entering the site are minimal depending on the nature of the work and only monitoring in and out is all that is required. The plutonium is an alpha particle emitter. Generally, no protective clothing is required, again depending on the nature of the work. We coordinate closely with the project operators because of the large number of Red-tailed Tropicbird nests occurring in the bushes within the site each year. There were 80 tropicbird nests within the site in 1991.

Cleanup activity at this site has been funded by DNA as a line item in the budget and does not fall within a special act or fund. It has been deemed to be significantly important a project to warrant such treatment. It is just as well since there is no doubt that significant pressure would have built by now to force the remediation work since it is technically a RCRA site. The project has languished since the initial attempt at cleaning up the soil with prototype equipment in the mid to late 1980's. New life was infused into the project and all the mothballed equipment was being put back on line by a new contractor, TMA/Eberline. The operation is supervised by an Army Health Physicist who is part of the Field Command Johnston (FCJ) Command Staff. By the end of the year the cleanup efforts were ready to fly and full scale operations were expected very soon.

The 26 acre plutonium contaminated site and the prototype plant processing and cleaning the coral "soil" of the contaminant. About 400,000 cubic yards will need to be processed. (R. Di Rosa)



The solid waste burn pit and approximately 10,000 cubic yards of lead contaminated ash that must be disposed of or remediated in a yet to be determined manor. (R. Di Rosa)

It is a very interesting operation. It is quite similar to a hi-tech gold placer operation that might detect gold going down the sluice and riffle tray by detectors that could activate gates to shuttle the gold bearing soil off to the side for closer inspection. In this case it involves radioactive particles and their detection and segregation. It is a prototype operation that has proven successful in previous tests, and this project will determine if the equipment can actually do the job on a large scale. Apparently there are many such contaminated sites in other countries as well. The actual amount of contamination (plutonium) to be retrieved is unknown but extremely small in relation to the amount of material in which it is contained. The project will be moving perhaps as much as 400,000 cu. yds. of "coral soil" through the crushing and detection equipment to find perhaps only a golf ball-sized amount of plutonium. This of course is a very rough guesstimate since the amount of the fissionable material in a warhead is classified, and the explosions scattered the material over a wide area.

CLEAN WATER ACT

There exists a continuous oil leak (technically a spill) from the seawall into the lagoon in the boat basin area. It is the result of migrating diesel fuel from a large amount of subsurface petroleum contamination in that area. It is a chronic violation of the Clean Water Act that DNA has shown no interest in correcting. However, pressure has been put on DNA to respond to this or indicate their intention of doing nothing so that the FWS can pursue it accordingly. A disinterested attitude has been taken toward the chronic spill by DNA and contractor personnel. Refuge staff monitor the spill from time to time to develop a relative idea of degree of contamination. It is hard to estimate the quantity of oil leakage but it does not appear to be great since a little oil goes a long way toward producing a sheen and slick. However, it is chronic and amounts vary with the tides, but there is always a sheen that will cover hundreds of square feet.

In addition, the Manager notified the DNA command that containment structures around several large petroleum tanks are not in compliance with regulations. They do not contain impermeable bottoms and some of the berms have deteriorated. Furthermore, there are drains that lead directly into the lagoon. Any leaks or discharges would quickly seep into the coral-based substrate and then DNA would be responsible for a RCRA site and/or a discharge into the lagoon. In 1991, one small accidental discharge of unknown quantity (maybe 100 gals.) did occur within a containment structure and it

The active small arms firing range containing very high levels of lead is one of the many sites of contamination that will have to be remediated by the military. (SGT V. Gempis)

Numerous containment structures for petroleum storage tanks do not have impermeable bottoms. A major spill would rapidly seep into the ground and/or run into the lagoon. (R. Di Rosa)

The Base contractor's methods of handling hazardous waste have been called into question by the Refuge Manager on several occasions. Old asbestos containing pipe scattered about the storage yard. (R. Di Rosa)

Transformers containing PCB's. (R. Di Rosa)

rapidly percolated into the "soil". By the end of the year DNA had not been very responsive about acknowledging their responsibility and initiating actions to correct the problem. The command has an interesting attitude considering the liability should something happen. These issues will be pursued in 1992.

The EPA has never done a through inspection of the atoll. Personnel have never inspected for violations of the NPDES or Clean Water Acts or RCRA violations outside of JACADS.

Oil Spills into Lagoon Waters

Two small oil spills into the ocean and shoreline occurred during the year. The Punahele fuel barge was leaking from stress cracks in the hull when it arrived at JA during its last mission (the Coast Guard condemned it.) It was immediately surrounded by a containment boom and relieved of as much fuel as possible. Divers were sent by the company to repair the damage but the attempt proved futile. The leaking hold was flooded with water after transfer of fuel to other compartments. The amount of fuel spilled in the lagoon was unknown but did not appear to exceed 100 gallons and no apparent damage to refuge resources occurred. The Refuge Manager was not notified of the spill until the next day and the Coast Guard had not been notified. The Manager ensured that the Coast Guard was notified and the proper documentation was completed. Such oversight is not likely to occur again.

The second spill occurred when maintenance crews were pumping water from a fuel tank and pumped past the water level thereby discharging fuel into the lagoon. The spill was very small and did not cause any detectable damage. However, proper procedures for such an activity had been violated and company supervisors and the Refuge Manager had not been notified of the discharge. The potential for more serious problems was obvious unless corrective measures were taken. The Manager had discovered the spill during one of his regular island checks for just such negligence.

CLEAN AIR ACT

For many years the chosen method of disposal of anything that would burn (and many things that wouldn't) was to toss it into the solid waste burn pit and burn it, or attempt to burn it. It continues today; however, the EPA has found that this is unacceptable and the refuse must be incinerated in accordance with federal regulations. The Air Force is in the process of designing and funding an incinerator to burn the island's nonhazardous waste. Actual starting date is

unknown and DNA will remain in technical violation until the incinerator is built and becomes operational.

Unfortunately, since past burning practices were not very discriminating it has resulted in a RCRA site because of heavy metal contamination. See Waste Burn Pit, RCRA.

OLD MUNITIONS

Coast Guard personnel discovered several old artillery rounds from WWII while diving to check port entry buoys. A subsequent evaluation by Navy EOD divers determined the area to be an old dump site that contained in excess of 50, 50mm white phosphorous rounds. Due to the age of the munitions and hazardous nature of their contents they could not be moved to deeper water for disposal. The area was not a particularly sensitive area in regard to sea turtles or coral reef organisms. A Section 7 consultation for destroying the ordnance in place was conducted with National Marine Fisheries (NMFS). A finding of no significant impact on sea turtles and cetaceans was obtained. Manager Di Rosa and Bob Pitman from NMFS (who happened to be on island for other business) monitored the area before and after the blast and collected fish specimens for Scripps Institute.

Epilogue

The Superfund Amendment and Reauthorization Act of 1986 made federal facilities subject to the same Comprehensive Environmental Response, Compensation, and Liability Act requirements as nonfederal facilities. As a result, Johnston Atoll was required to submit a Preliminary Assessment/Site Investigation (PA/SI) report to the EPA. The major objectives of the PA/SI are: 1) To gain an understanding of the nature and degree of the threat posed by the site; 2) to determine the likelihood of a Hazardous Ranking Score (HRS) of 28.5 or greater; and 3) to identify sites in need of immediate response. Sites with an HRS greater than 28.5 are listed on the National Priorities List (NPL). Federal facilities on the NPL are required by law to begin Remedial Investigations and Feasibility Studies within six months of listing. The PA/SI was prepared and submitted to the EPA in October of 1989. The projected HRS for Johnston Atoll was 52.2 which would make it the highest scoring federal facility in the Pacific. The three major contaminants are dioxin, plutonium, and subsurface diesel fuel, all of which have been released into the marine environment. Only the dioxin has been demonstrated to be entering the food chain.

If the NPL rating is so high why hasn't Johnston been listed? We are not quite sure, and it most probably has something to do with politics. However, there is beginning to be a push by the responsible parties to begin remediation work. The hope or feeling is that if sufficient progress can be demonstrated then the site may remain off the list, thereby, allowing DNA and the Air Force more control over the cleanup activities without direct EPA oversight and involvement.

5. Research and Investigations

This year saw the continuation of several major research projects. All were designed to assess potential impacts of the JACADS project on the wildlife resources of the Refuge. The two major contract research programs supported by funds from the Army and administered by CEPOD were the seabird monitoring studies of Seabird Research Inc. and the monitoring of the lagoon resources by the Hawaii Cooperative Fisheries Research Unit at the University of Hawaii.

JHN-1-91 Seabird Monitoring Studies

The primary goal of the seabird research is to assess and monitor the size and "health" of marine bird populations throughout the operation of 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.

Researchers continued their long term studies under the direction of Betty Ann Schreiber from 3-25 March and from 24 June - July, 1991.

In selected study plots, nests of Red-tailed tropicbirds, Red-footed Boobies, and Brown Boobies were marked with numbered stakes; eggs of several species were measured and weighed; chicks were measured, weighed, and banded. They concluded that chicks were growing well, there was a high fledgling success, and that populations were still increasing. No significant effects of the JACADS plant or human activities on the bird populations were noted. In addition to the above work, feathers were collected from some of the nesting species for heavy metal analysis. Results showed what are considered to be very high levels of lead, selenium, and mercury. It was determined that these metals could not have been picked up from local pollution of the water and the levels detected now provide a baseline for

future comparison. It is assumed these levels occur naturally and are related to the seabirds' diets and long lives.

JHN-2-91

The University of Hawaii Co-op Fisheries Unit terminated their monitoring of the lagoon resources to determine the effects, if any, of increased fishing pressure from the larger human population on the island. The termination was prompted by the transfer of PhD candidates Darby Irons and Randall Kosaki. The study had been conducted for the last 6 years and had one year to go. Refuge staff could have taken over the study if necessary despite the time involved in order to preserve continuity of data. However, it was determined that 6 years of data were sufficient for the researchers to make definitive statements about impacts to the resource from fishing. The researchers found that it appeared there was little impact of fishing on Atoll fish populations, however, they also noted in earlier reports that it was too early to tell if the increase in human population will affect the fishery in the future.

It is worth noting that they did not examine impacts on atoll shark populations and the human population has increased steadily in size since the investigations. It has almost doubled in size to 1,300 from when the research was started. Furthermore, even they admit that the data are not complete since catch reporting was hard to insure, especially when they weren't present, and underwater transects can yield misleading data. Also, there is some controversy over the methodology used and, therefore, accuracy of results. However, it is the best available.

Anecdotal information gathered by the current refuge staff seems to indicate there may be some problems, especially regarding shark populations. Long time atoll residents and Dr. Lobel, an ichthyologist from Woods Hole Oceanographic Institution and long time visitor to JA, indicated they have seen major changes in abundance and size of certain species. Sightings of sharks by divers and boaters have decreased dramatically over the years. This may or may not be related to the uncontrolled fishing and killing of sharks for fun that has been occurring over the years before certain restrictions were enacted. Plans are to prohibit fishing for and killing sharks at the atoll.

Betty Ann Schreiber (Seabird Research, Inc.) conducting her Army funded studies on Red-tailed tropicbirds. (R. Di Rosa)

Dr. Phil Lobel conducting his Army funded research (one of many projects) on domino damselfish reproduction. (R. Di Rosa)

The Red-tailed Tropicbird is of special interest to us because of nesting activities occurring upwind and downwind of JACADS. This has provided a very good population monitoring opportunity for potential effects of any released contaminants. (R. Di Rosa)

Adult Red-tailed Tropicbird and chick in a typical nest. (R. Di Rosa)

Philip Lobel, WHOI, continued his marine research with funding from PMCD (Army). This included studies of marine fish reproduction, collection of certain benthic feeding fishes to be analyzed for dioxins and furans, and monitoring of the lagoon resources. Dr. Lobel and his graduate assistant, David Mann, were present on Johnston Island in June and December. In October, Dr. Lobel received word that his funding from PMCD had been terminated. He subsequently met with Donald Pugh, Acting Chief, Environmental and Monitoring Division of PMCD and others in Washington D.C. where he presented the scope of his studies as they relate to the JACADS project. Manager Di Rosa drafted a letter for Project Leader Leinecke's signature to be sent to the above individuals indicating strong support for Dr. Lobel's research and our displeasure of its termination. His funding was reinstated. Apparently the axe was wielded in an arbitrary and capricious manner and further demonstrates PMCD's myopic view and lack of understanding regarding environmental issues.

Other

For want of a better place to put the next item we elected to place it here. It is not research, but it certainly qualifies as an investigation.

During the first two weeks of December the Army command hosted four members of the South Pacific Forum who were at JA on a fact finding mission regarding JACADS and chemical demilitarization. They were specifically interested in the safety of JACADS and chemical weapons destruction and environmental protection and monitoring. The South Pacific Forum is a forum made up of 30 plus, representatives from all the South Pacific nations with an interest in activities that have the potential to affect the global commons. It is an international body with considerable influence so the Army was extremely cooperative when they arrived. It would not have been wise from a public relations standpoint to have denied their request for the trip.

The four representatives developed their own agenda which included full access to the files. The Refuge Manager was an integral player in their evaluation since he is considered the most knowledgeable about overall environmental issues at JA. The Manager provided them with an overview briefing and spent many hours with them during their two week stay. He answered their questions about environmental compliance, past and present monitoring, interagency relationships and communication candidly and honestly. His answers were not always flattering to the Service, military or the civilian operators. However, he

always made sure there was a PMCD representative present when he commented negatively regarding the Army. That way, a first hand rebuttal could be offered. None was offered. The forum representatives were well briefed prior to their arrival, and they knew how to ask the right questions.

The Service was taken to task for its haphazardly organized monitoring activities, poor data recording in the past and lack of a central archive for storing and integrating scientific information and studies relating to the Atoll and current activities. The Manager agreed on all counts. Furthermore, it did not appear to them that the Service was truly serious about its role at JA because of the lack of past oversight and current interest by higher level superiors. PMCD fared no better on environmental issues, which was being partially demonstrated by its obvious lack of commitment to the spirit and intent of the JACADS Environmental Impact Statement. The concurrent funding problems the Manager and Dr. Lobel were having with PMCD only served to support their feelings.

In general, the Forum representatives were pleased with JACADS and the safety of the entire operation and with the fact that FWS was acting as a watchdog and free to operate uninfluenced by the military. They were pleased with the general overall environmental soundness of the operation, but they were also displeased as noted above. Before they departed they briefed the military commanders and the Refuge Manager and completed their report. The report will be presented to the Forum Chairman in Fiji. It will be up to him to make it public when, or if, he desires.

E. ADMINISTRATION

1. Personnel

The Refuge had a full time staff of two, a permanent refuge manager and a temporary biologist.

Roger Di Rosa, EOD 5/5/90.....Refuge Manager, GS-11, PFT

Dr. Beth Flint, EOD 5/5/90.....Biologist, GS-7, TFT transferred to full time position in the Honolulu complex office in March of 1991.

Donna O'Daniel, EOD 5/10/91.....Biologist, GS-7, TFT

Biologist O'Daniel briefing volunteers prior to beginning seabird census activities. (R. Di Rosa)

Volunteers preparing to help conduct Brown noddy and Grey-backed tern nesting counts on North Island. (R. Di Rosa)

Johnston Atoll NWR is rather unique in that funding is received from the Army and the Service with some on-island support from DNA. The Refuge staff function as members of the Base Commander's Staff, yet have numerous responsibilities to other funding agencies. This leaves them with several groups demanding time and attention to their projects. Even though the Base Commander is listed on the command staff personnel flow charts as the Refuge Manager's direct supervisor, the Manager's chain of command remains DOI. The Manager is regarded as an advisor to the Base and Army Commanders unless push comes to shove on an issue(s), then he becomes an adversary. The Assistant Manager for the remote islands of the Hawaiian Islands NWR complex is the Manager's supervisor. It is well known that FWS personnel retain a high degree of autonomy, responsibility and authority on the Atoll, and the Refuge Manager can and does on occasion supersede the Base and Army Commanders' authorities regarding environmental and public use issues.

Such responsibility and authority come with a high social and personal price at times. The FWS personnel are very well known on the atoll. The Refuge Manager is considered a community leader and usually is obligated to not only attend, but participate in, numerous functions for high ranking military and civilian dignitaries and VIPs. Also, he regularly briefs such personnel on environmental issues, FWS operations and FWS/military relationships. Meals are community affairs taken in a cafeteria, thus offer little respite from those seeking our company or wanting to discuss business or complain about something FWS related. Business related calls are common after normal work hours. The Manager shares a reasonably nice row-type apartment with another command staff member, usually a Major. The biologist, being lower grade, shares a somewhat less comfortable apartment with another female. As you might suspect, the Refuge staff live in a fish bowl with their personal as well as their professional activities under constant scrutiny. The ratio of males to females on the atoll is about 5 to 1 so that creates its own social agenda. It is a very highly socially and politically charged and close environment for the staff and a considerably different environment from other refuges. There is only limited escape from public contact and work issues. It is essential that the Manager and Biologist practice tact and diplomacy with regard to their personal and professional lives because the two are not regarded by people as separate. The ability to communicate well and wisely use diplomacy and tact is an absolute necessity for staff at JA NWR. Gross mistakes are not readily forgotten and do not remain "in house", that is,

they immediately go beyond the Refuge to be viewed by three other government agencies and several major contractors. If ever the term non-traditional fit a refuge and the duties of its staff, Johnston Atoll NWR is certainly it.

The major responsibilities of the staff are: Monitoring wildlife populations and habitat (terrestrial and marine); advising and supporting the JA Base Commander, tenant commands and contractors on environmental and Refuge concerns; providing interpretation/education and volunteer programs for JA residents and visitors; liaison and coordination with visiting researchers and oversight of the projects; acting as a watchdog regarding contaminants issues, reviewing related documents and ensuring the appropriate responses as necessary; and planning, budgeting, and managing the Refuge resources. The duties of the Manager and Biologist overlap, mostly in the biological programs. However, the Manager handles all contaminants issues and related problems. The Biologist has responsibility for the extensive seabird programs as well as other biological duties, administration of the volunteer program and representing the Manager during his absences. The Manager also is involved with the island or interagency "politics", and handles VIP and press briefings and interviews, budgeting, and oversees the marine resources and Refuge SCUBA diving programs. Both individuals engage in environmental education activities and conduct refuge tours for VIPs.

Other

Manager Di Rosa received Achievement and monetary awards for his participation on the "Women in the 485 Series" Task Force in 1990 and 1991.

Manager Di Rosa was detailed to Rose Atoll in American Samoa to assist with a rat eradication project and vegetation surveys. He also was detailed to Guam with Project Leader Leinecke and FWS Deputy Director Smith on an acquisition planning trip for the newly proposed national wildlife refuge in Guam.

4. Volunteer Program

Numerous military and civilian personnel assist the Biologist and Manager 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 Refuge staff and an opportunity to allow the volunteers to

photograph wildlife and receive an interpretive tour. Several proved to be excellent assistants, showing a strong interest and helping on a regular basis. The time that our volunteers donate to the Refuge is especially appreciated since the standard work schedule for island residents is a minimum of 6 days a week, 8-12 hrs a day. Therefore, personal time is limited. The Refuge Biologist maintains and monitors the volunteer program which requires a considerable amount of time.

From May to December, 1991, 67 atoll residents donated 247 hours of their valuable time to the Refuge in resource support activities. The level of much of our biological monitoring could not be maintained without the aid of the volunteers.

5. Funding

As indicated earlier, Johnston Atoll NWR is unique in that funding is obtained from three sources, the Army, the FWS and DNA. To be more specific, the funds come from two divisions of the Army, the Program Manager Chemical Demilitarization (PMCD) and U.S. Army Chemical Activity Pacific (USACAP). PMCD is, you might say, the owner and overseer of JACADS and USACAP deals with the storage, transport and security of the chemical munitions. The FWS funds come from the Division of Contaminants and DNA provides some on island support which is more in the form of direct services than actual funds.

Funding support is negotiated for each FY with the individual entities except DNA. The Honolulu office deals with the FWS Division of Contaminants to secure those funds, and the JA Refuge Manager deals with the two ARMY divisions and DNA, which can be quite a challenge since each operates differently and independently of the other. The funds are spent at the discretion of the JA Refuge Manager.

Total funds from the above sources allocated to JA operations was $105,000. There was still a short fall of about $20,000 for the operations which was made up by the Honolulu Complex office. The staff is on a higher pay scale at Johnston Atoll than their counterparts stateside due to nonforeign differential and a special salary scale authorized by Congress for government civilians stationed at JA. Overtime is also a regular part of the schedule. The Manager negotiated an increase of $5,000 over last year for FY 1991 from PMCD.

The following was the FY-1991 budget summary:

$45,000.....Army-USACAP
30,000.....Army-PMCD
30,000.....FWS-Contaminants
20,000.....FWS-Refuges
$125,000.....Total expended

DNA's actual contribution is unknown since billing to the FWS island account by the civilian contractor goes directly to DNA. The island operations contractor, RSN, performs the service on the refuge vehicles (two golf carts) and the boats and motors. It also provides heavy or other equipment if necessary and supplies as needed for Refuge operations.

Do not let the above, nice neat figures fool you. The Manager spent a lot of time negotiating with and then obtaining the money from the military. The operation ran mostly on loans from the Honolulu office until all the funds were obtained, some as late as Sept. of the Fiscal Year. There is no established document, MOU or otherwise, insuring funding or pathways and, consequently, the money even has been lost at times. Apparently, the funding for the FWS presence on the Atoll because of JACADS was established by verbal arrangement with a past Army commander. The document that is used as the legal supporting document for the transfer of funds by the Army is an archaic 1976 MOU between the DNA and the FWS that establishes the FWS's responsibility for the natural resources and DNA's responsibility for the people and infrastructure. Bear in mind there was no FWS presence at the time of the MOU, JACADS hadn't even been conceived and the island population was but several hundred. It was mostly a mothballed operation to maintain its SAFEGUARD C status (ability to return to nuclear atmospheric testing capabilities) and for storage of some chemical munitions. The funding pathways and how they work or don't work are somewhat convoluted and difficult for someone without close connections to understand. Furthermore, they are not well defined. Needless to say, some work is needed here.

For FY-1992 the Refuge Manager submitted and defended to PMCD a much higher ($101,000) funding package that would cover all FWS expenses (including EE projects) except for the Biologist's salary. PMCD accepted the budget proposal just before the end of the 1991 calendar year. The division of contaminants had indicated they would not provide any funds for JA contaminants work and, therefore, would not fund the biologist position. However, that was under negotiation but no guarantees for funding were stated. If the biologist is terminated then the military has every

right to question the interest and commitment of the FWS regarding JA NWR, and it will do so.

F. HABITAT MANAGEMENT

1. General

Johnston Atoll provides roosting and breeding grounds for tropical Pacific seabirds and wintering grounds for migratory shorebirds. The coral reef ecosystem is unique in that both Hawaiian and central Pacific organisms are represented. Johnston Atoll is the only land mass 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 suggest. Within this area, the waters most intensively foraged by birds from Johnston Atoll are probably those to the west where food availability is increased by upwellings and eddies created by the down-current "wake" of the atoll.

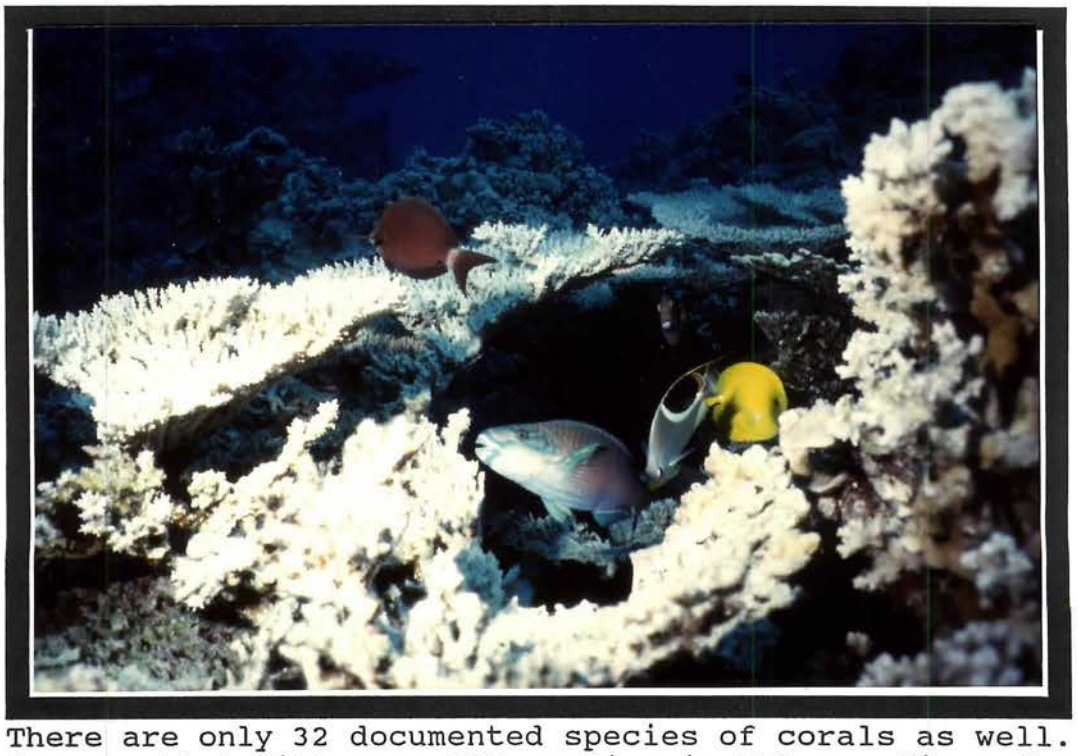
The value of the Atoll has expanded from the initial emphasis on seabirds to also recognize the value and potential uniqueness of its marine resources. Atolls in general are not well studied but JA is one of the most studied in the world, which isn't saying a whole lot. Even though 301 species of fish are documented from the atoll it hasn't undergone a truly thorough survey. Invertebrates is a wide open area for study and given the Atoll's age and isolation, there could be many undescribed species present.

6. Other Habitats

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% coverage in many areas and is probably one of the fastest growing coral species. It also provides an extensive three-dimensional habitat for many fishes. The fish community is dominated by relatively few species of the 301 documented species which is a result of the Atoll's isolation, size and surrounding sea currents. This also limits the diversity of the coral community which further limits the number and species of fish that might occur at the Atoll. The documented number of species of coral at JA is 33 but only a few make up the major portion of the reef habitat.

Terrestrial habitats are a major concern on Johnston Island. The population of Red-tailed tropicbirds increased this year

Typical coral reef habitat within the lagoon. Due to the atoll's isolation, there are only 301 documented species of fish present. Compare that with over 2,000 in Indonesia. (R. Di Rosa)



There are only 32 documented species of corals as well. Compare that with over 700 species in Palau. Since the corals at Johnston Atoll are not very colorful and the species of fishes are limited, divers do not see vivid colors similar to the Caribbean or South Pacific. (R. Di Rosa)

Typical Sooty tern habitat on Sand Island. Bird's-eye view. (R. Di Rosa)

During the breeding season, the Sooty terns become quite dense. Underneath the terns are thousands of Wedge-tailed shearwater burrows, most of which contain chicks. (R. Di Rosa)

Typical shorebird feeding habitat on Johnston Island. Many of the island workers like the wintering shorebirds and will feed them at the workers' respective work areas. Many of the birds become bold enough to walk into apartments or offices. (D. Forsell)

to approximately 1400 pairs. The major concern is that the vegetation along the runway, which is relatively undisturbed, is attracting the tropicbirds. Tropicbirds do a great deal of hovering flight during courtship and pair formation, creating a hazard of bird-aircraft collisions. Regulations adopted in late 1986 require consultation with the Refuge Manager prior to removal or trimming of vegetation. Maintenance personnel removed all bushes from the grassy area between the runway and south taxiway and from the area immediately south of the south taxiway. Refuge personnel worked closely with them to insure that only those areas that were free of nesting birds had bushes removed.

A front-end loader was again used to control the grass Lepturus on East Island in 1991. The heavy growth of grass limits the area in which ground nesting seabirds can lay their eggs. The grass and soil were piled at the end of the clearings to provide roosting habitat for birds. In the weeks following the clearing, several thousand pairs of sooty terns nested in the cleared areas. The grass control project has proven to be a great success in attracting sooty terns away from Sand Island where they are subjected to mortality from colliding with the guy wires supporting the 625 foot LORAN tower operated by the Coast Guard. The Coast Guard funded this project as a measure that could help keep the large numbers of nesting Sooty Terns away from Sand Island when the LORAN tower is destroyed in 1992.

A major vegetation removal project around the runway complex was undertaken in December. Numerous bushes between the runway and south taxiway had grown up and it was feared that they would start attracting prospecting Red-tailed tropicbirds to nest. It was impressed on maintenance services that these bushes must be removed before the birds returned for the nesting season. This was accomplished, as well as clearing of the bushes from south of the taxiway.

Artificial Reef

The Refuge Manager is tasked with assessing the biological recruitment and physical configuration of an artificial reef created from vehicles, heavy equipment, assorted steel debris and tanks and large appliances. The Army Corps of Engineers has issued a permit, renewable every three years, to DNA that specifies the type of debris and parameters to be followed regarding dumping on the reef. All vehicles and equipment placed on the reef are drained of all fluids and burned to remove plastics and residual oils and grease. No tires, plastics, etc. are permitted and only ferrous metals and large concrete debris are dumped. The site was

designated in 1985 after discussions with Service and National Marine Fisheries biologists. The reef lies in 80 ft. of water on a scoured, ancient, hard coral bottom three miles south of Johnston Island and near the edge of the atoll drop-off.

One construction event occurred this year in January. It was observed and documented by the Refuge staff who found the procedure a bit short of compliance with the spirit and intent of the permit. The main objective of the project is to create fish habitat, therefore, achieving vertical buildup of dumped materials is a basic requirement. The dumping occurred in heavy seas and high winds which made it difficult for the tug captain to keep the barge on the site while the materials were being dumped. Also, smaller debris had not been properly secured to larger items or bundled together so that it did not break loose and scatter independently across the bottom. There is at least a consistent one- to two-knot current in the area. Therefore, it was not likely any vertical buildup was achieved. The Manager made recommendations to DNA to alleviate this problem and make compliance with the permit easier. The reports made by the staff can be critical to DNA keeping its permit. The reef already has a slightly jaded past.

No physical or biological evaluations of the reef were conducted in 1991.

Sea Turtle Feeding Habitat

Up until the end of 1990 approximately 220,000 gallons of raw sewage was discharged off the south coast of Johnston Island daily. A sewer treatment plant was constructed and began operation in 1990 and pretty much eliminated the discharge of raw sewage except during malfunctions and rainstorms. The sewage sludge was treated, dried and retained to be disposed of in an as yet undefined and acceptable manner on island. The impacts on the sea turtles and other marine organisms from the years of sewage discharge are unknown. However, it considerably altered the coral reef community in the area. The coral was killed and the high nutrient levels contributed to massive algae growth that covered the coral over much of the south coast area.

The area has become a very attractive feeding area for both adult and juvenile green sea turtles that feed exclusively on the algae. The population is estimated at 200 sea turtles based on trend data derived from monthly head counts in select areas as the feeding turtles surface to breathe. It is unknown how the reduction of nutrients into the ocean

due to the sewage treatment plant will affect the algae, therefore, the turtles. We speculate that it will have little effect. No effects were noted by the end of the year.

G. WILDLIFE

2. Endangered and/or Threatened Species

Hawaiian Monk Seal

Endangered Hawaiian monk seals (Monachus schauinslandi) have historically, at least since 1968, used Johnston Atoll intermittently in very low numbers, somehow finding JA from the Northwest Hawaiian Islands. Federal laws and island regulations concerning the protection of both Hawaiian monk seals and green sea turtles are stressed to all visitors, as well as to permanent personnel. In 1984, nine monk seals were translocated to Johnston Atoll from Laysan Island in the Northwest Hawaiian Islands; since that time, an occasional sighting of single animals (very probably unrelated to the introduced nine) has been reported. There were three sightings of a monk seal during 1991, four people seeing one on July 27, one person seeing one on August 2 and another group of people seeing a large adult hauled-out on the seawall by JACADS on December 27.

Green Sea Turtle

The Refuge supports populations of the threatened green sea turtle (Chelonia mydas) and may provide habitat for endangered whales. The green sea turtle population apparently has remained stable. The turtles do not nest at Johnston Atoll, although mating has been observed off the south shore of Johnston Island. The turtles feed extensively on the algae beds off the south side of Johnston Island. What makes this especially interesting is that this feeding area and high concentration of turtles lies next to JACADS. This threatened species lives, quite literally, in the shadow of chemical demilitarization.

Turtle monitoring was conducted in 1991, seven counts being made from a four-meter high tower off the southeastern end of the JACADS peninsula, and one count being made from a boat off the south side of Johnston Island. All turtles sighted from the tower during three 15 minute observation periods in three different locations were counted. Sightings along with size and time of observation are recorded on a map. At the end of the count, the observer attempts to discern how many individuals are present as each

active turtle usually surfaces for a breath of air about every five minutes. Based on seven counts, we found a mean of 31.3 individuals and a range of 22 to 42 individuals. This is comparable with six counts conducted in 1990 which found a mean of 38.0 and range of 17 to 73 individuals. In 1989, nine counts were made, with a mean of 23.4 and a range of 17 to 36 turtles being sighted. During the one count conducted this year from the FWS boat (before it was surveyed), 52 individually identified turtles were sighted, and this was comparable to the mean of 48.6 turtles (range, 18 to 84) based on five counts during 1990.

5. Shorebirds, Gulls, Terns, and Allied Species

A pair of Great Frigatebirds nested on North Island in the branches of a dead Pluchea bush and successfully fledged a chick. This is the first documented nesting on North Island. There was a dramatic increase in the number of frigatebirds roosting on North Island in the fall. In October an atoll-wide Great Frigatebird count was initiated to monitor the population. Frigatebirds roost on the three uninhabited islands in the atoll, and 553 birds were counted in October on Sand, East, and North islands.

Beginning in May, a biweekly shorebird count was initiated on Johnston Island. Five routes were established, from the east to the west side of the island, and four volunteers are used in each count. Also begun this year were systematic counts of black noddies and white terns on Johnston Island and brown noddies on North Island.

All four islands of Johnston Atoll are used as roosting and/or breeding grounds for at least some of the 14 species of seabirds using the Refuge (Table 1).

Table 1. Populations of nesting seabirds and wintering shorebirds estimated on Johnston Atoll during 1991. Estimates do not include non-breeding and roosting individuals which may be as large as 50 to 100 percent of the breeding populations, and much greater in frigatebirds, red-footed boobies, and white terns.

Species	Pairs of Breeding Seabirds
Bulwer's Petrel	65
Christmas Shearwater	23
Wedge-tailed Shearwater	2311
Red-tailed Tropicbird	1262
Masked Booby	8
Red-footed Booby	260
Brown Booby	259
Great Frigatebird	40
Sooty Tern	140,000
Gray-backed Tern	103
Brown Noddy	3,808
Black Noddy	181
White Tern	125

For Sooty Terns, Black Noddies, and White Terns, the figures listed above reflect censuses done from May through October and therefore do not reflect the total number of pairs which nested on the Atoll during the entire year. The figure for Brown Noddies are for North and Sand islands only.

Shorebirds Wintering on Atoll (Estimated Individuals)

Pacific Golden Plover	324
Ruddy Turnstone	147
Bristle-thighed Curlew	13
Wandering Tattler	6
Sanderling	14

Great Frigatebirds are one of our more colorful species during their breeding season at Johnston Atoll. (R. Di Rosa)

6. Raptors

On December 16, 1991, a mummified juvenile Peregrine Falcon was found in a large inoperative stack in the JACADS plant. The bird had a band on it, which was removed and sent to the Bird Banding Lab to see when and where it had been banded. From the condition of the carcass and use records of that equipment, it was estimated to have been here for no more than six months. Isolated cases of raptors arriving on Johnston Atoll and feasting on seabirds for a while have occurred in the past.

9. Marine Mammals

In January, Refuge staff received a report of a large marine mammal sighted off the west end of Johnston Island. We believed it was a Cuvier's beaked whale (Ziphius cavirostris) since the description was consistent with observed specimens and literature. It could have been in the area because it was calving since bleeding was observed from in front of and under the tail. This judgement is made partly from the 1989 discovery of a female that was giving

birth and may or may not have been in distress on the east shore of the island. Because of this incident, the confirmed sighting of a female giving birth two years ago, the retrieval of the dead adult male in the lagoon last year and other sighting of small whales believed to be Cuvier's beaked whales, it is believed that Johnston Atoll provides habitat for this rare species and perhaps for the endangered humpback whale.

11. Fisheries Resources

See Research and Investigations.

14. Scientific Collection

Betty Anne Schreiber, of Seabird Research, Inc., collected a sample of feathers from five species nesting on the atoll for heavy metal analyses. Heavy metals obtained by birds from the food they eat are deposited in growing feathers. All of these metals are naturally occurring in the environment and it is vital to have a baseline from unpolluted birds for comparison. The results showed what are considered to be very high levels of lead, selenium and mercury. Through a study of the history of Johnston over the years and the known general feeding habits of the birds, it was determined that these metals could not have been picked up from local pollution of the water. Johnston's remote location and lack of dumping of heavy metal wastes in surrounding waters indicate the birds are picking up these levels naturally from the natural presence of the metals in the environment. While the levels are unexpectedly high, they now provide a baseline for future comparison.

15. Animal Control

<u>Bird-Aircraft Strikes</u>

During 1991, five Red-tailed tropicbirds, one Pacific Golden Plover, and an unidentified bird (possibly a Red-tailed Tropicbird) were struck by aircraft. Four of the birds were struck when the aircraft was landing and three when the aircraft was taking off. During 1990, six birds were struck by aircraft. No control measures were deemed necessary except on vegetation adjacent to the runway.

16. Marking and Banding

TABLE 2 . Summary of banding accomplishments for 1991.

Species	Seabird Research Inc.	Fish & Wildlife Service
Red-tailed Tropicbird	808	454
Masked Booby	4	6
Brown Booby	187	72
Red-footed Booby	156	162
Gray-backed Tern	0	102
Black Noddy	0	1*

*This was an orphaned chick raised to fledgling by a resident.

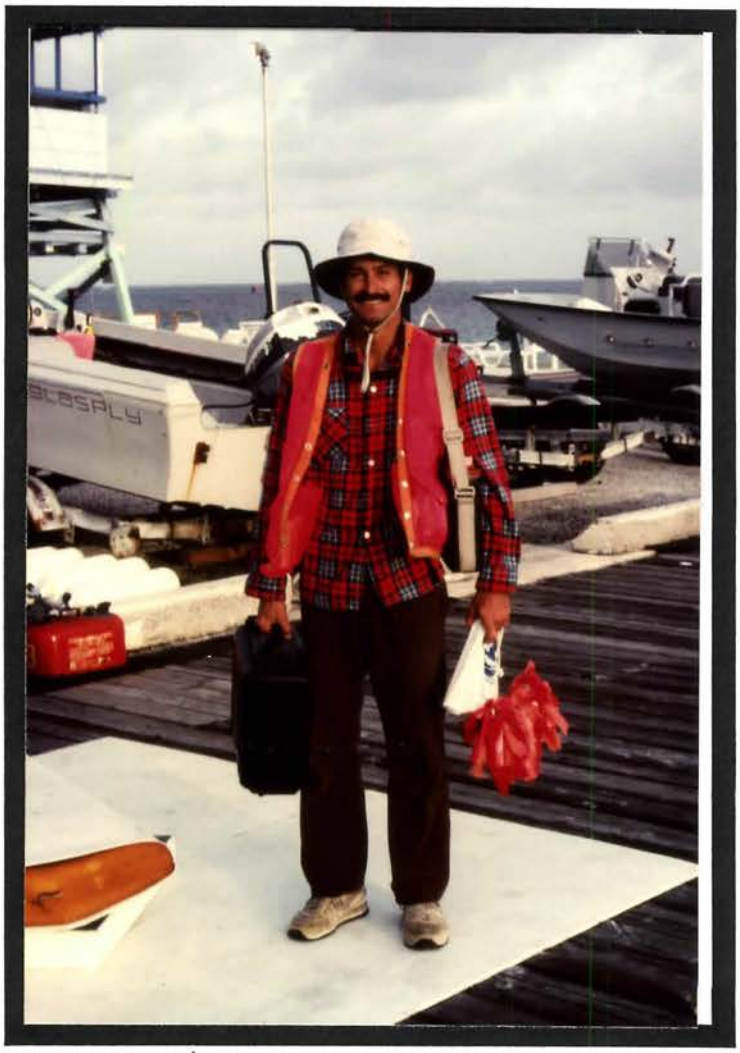
A total of 1,155 birds was banded by Seabird Research Inc. and 797 were banded by Fish & Wildlife Service.

17. Disease Prevention and Control

We neither prevented nor controlled any disease in 1991. However, this seems the best spot to discuss green sea turtle tumors. Sea turtles are rarely observed up close at Johnston, but when they are, no signs of gross tumors are noted. When Dr. George Balazs, NMFS, Honolulu, captured 30+ turtles for tagging in the 1980's he noted only a few small tumors on some of the turtles. When doing the monthly sea turtle surveys refuge staff are able to easily spot turtles with large gross tumors about the head, neck and front flippers. No such tumors have been noted.

So it was with some surprise that the Refuge Manager noticed a 120 lb., tumor-ridden, green sea turtle while he was free-diving. He was able to catch the turtle and remove a two-inch by three-inch tumor from its head. The tumors grow on stalks so excising it caused no great harm to the turtle. The tumor was shipped to Dr. Balazs and then to the Smithsonian for analysis. No results had been received by the end of the year.

The incidence of tumors on and degree of infection of sea turtles have been on the increase in many areas, especially Florida, parts of the Caribbean and Hawaii, for a number of years. The exact causes are unknown and considerable concern about and interest in the problem are being expressed by marine researchers.



Manager Di Rosa prepared for a day of seabird banding activity on the outer islands. (B.A. Schreiber)

An approximately 120 pound green sea turtle. Note the tumors on its head and under the flipper. The larger tumor on its head was removed and sent to the Smithsonian Institution for analysis. (R. Di Rosa)

H. PUBLIC USE

1. General

The population of Johnston Atoll averaged about 1300 military and civilian contractor personnel in 1991. There is no "public" access as such. The Base is a restricted installation and all personnel must be employed at the Atoll or officially visiting and possess an entry authorization from the Base Commander to debark from any ship or plane. Because of the high visibility of JACADS and the chemical operations, the Atoll receives at least monthly visits by general grade officers, Senior Executive Service personnel of the Department of Defense and/or Energy, members of Congress or their staffs. Refuge staff usually have at least some involvement with most of these individuals. Most will receive at least a Refuge tour of the outer islands conducted by the Manager or Biologist. The Manager may provide the individuals with extended briefings on resource and/or contaminants issues and the FWS's role and responsibilities at the Atoll.

The following is a list of some of our more noteworthy visitors that the Manager briefed and he and/or the Biologist attended functions for and took on tours of the Refuge:

U.S. Congressional Staffers:
Madelyn Creedon, Environmental Council, Senate Arms Services Committee (SASC)

Ronald Kelly, Professional Staff Member, SASC

U.S. Senator Daniel Akaka and Senate Aid Debra Wada

Ralph Martin, Chairman of the Board, Raytheon Services, Nevada

Other Ratheon Services dignitaries arrived throughout the year

Colonel Richard Haley, incoming Army Commander for JA

Colonel Brent Smith, incoming DNA Commander for JA

Admiral Mack Gaston, Commander Field Command, DNA, Albuquerque

Dr. Paul Carew, Field Command Albuquerque, DNA

Navy Captain Zorbach, Inspector General for DNA, Washington D.C.

SES-4 Joan Pierre, Director of Radiation and Sciences for DNA

Dr. Bill Mauritz, Physical Scientist for DNA, Washington D.C.

Col. Vial, Program Manager Chemical Demilitarization, Washington D.C.

Bill Jackson, DOE, Marshall Islands Project Officer

Navy Captain Baller, Headquarters DNA, Washington D.C.

Honorable Peter Coleman, Governor of American Samoa

Thomas Baca, Deputy Assistant to Sec. of Defense for Environment, Safety and Occupational Health

Steve Beaudry, Staff Delegate for U.S. Representative Neal Abercrombie

Jason Ohta, Staff Delegate for U.S. Congresswoman Patsy Mink

Major General Watson, Director, DNA, and his 26 member Battle Staff

Generals Fields and Christmas also accompanied Gen. Watson

Colonel Nystrom, Deputy Director, Field Command, DNA, Albuquerque

Fred Delec, Deputy Director of Operations, Field Command, DNA, Albuquerque

Colonel Richard St. John, Deputy Chief of Staff, U.S. Army Pacific Operations

Congressman Eckert of Ohio

Members of the South Pacific Forum (representing the South Pacific Nations)

Dr. Hugh Crone, Australia
Dr. Peter Wailes, Australia
Nicholas Abbott, New Zealand
John Douglas, New Guinea

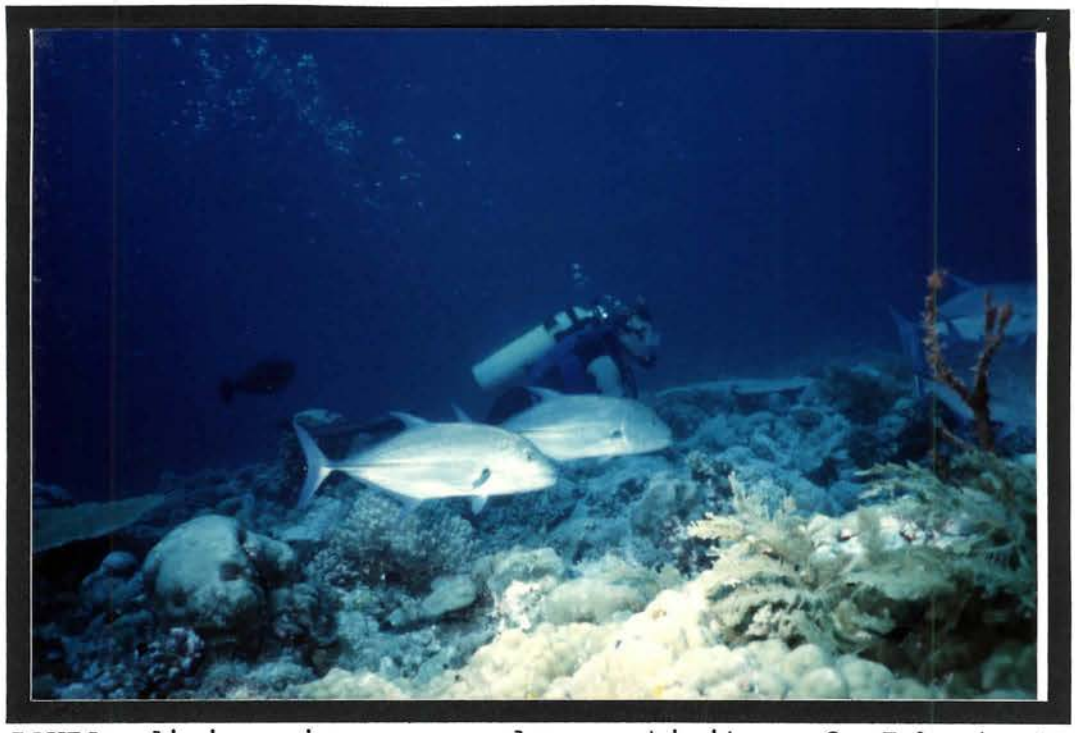
The Refuge Manager also briefed and attended a working luncheon for representatives from the governors of seven states where additional chemical weapons are stored. The DOD wants to build chemical demilitarization plants similar to JACADS in those states, if political and environmental opposition can be overcome.

In addition to the above, there were numerous individuals of lesser importance but still considered VIPs by the military, as well as personnel from EPA, some of which the Manager addressed. Also, the Manager and Biologist attend the yearly but separate change of command ceremonies for the Army and DNA Commanders at JA. The Manager usually presents an award and short speech at the "end of tour" departure dinners and ceremonies.

7. Other Interpretive Programs

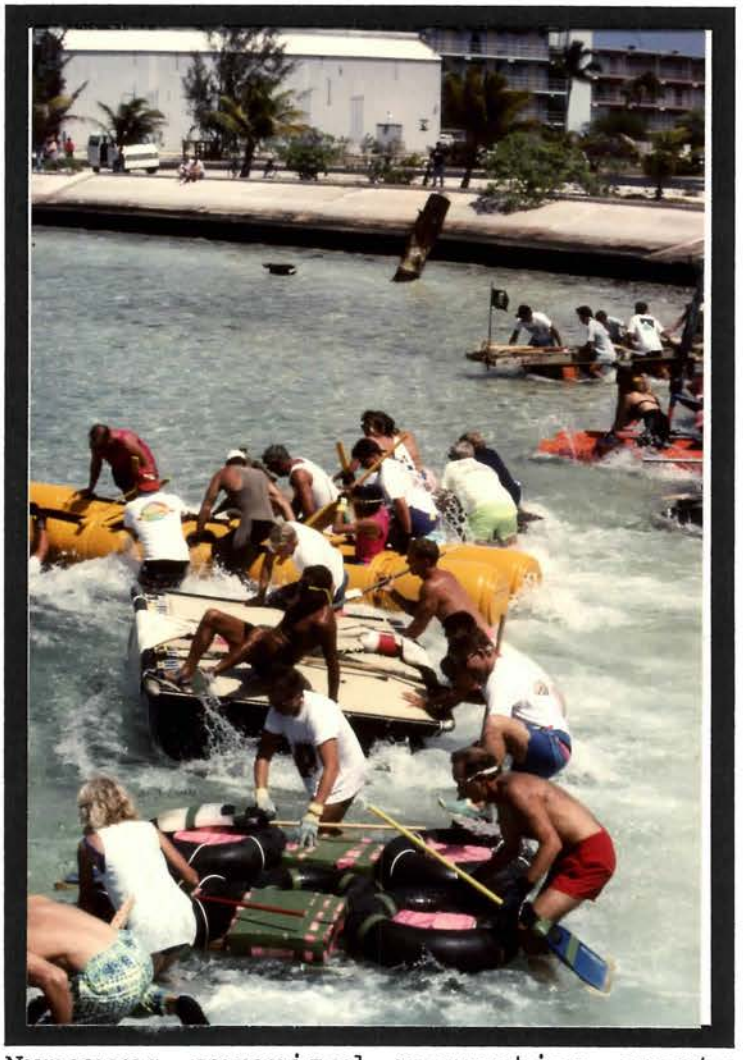
All newly arrived personnel on the Refuge, whether they are visitors or permanently assigned, are presented a 15-minute briefing at the airport terminal by military personnel. Within that dos and don'ts briefing are several minutes of short discussion about Johnston Atoll NWR regulations. They also receive a copy of the Refuge brochure. A second briefing for all "newcomers" stationed for more than one month on the Atoll is part of the three-hour introductory program given each Friday. The Biologist or Manager presents a 30-minute slide program about the Refuge and its history and wildlife, reasons for its existence and relationship with the military, and pertinent regulations and reasons for their existence. In addition, each individual receives a copy of the Base Regulations, which incorporate FWS regulations, regarding the natural resources of the Atoll. The Refuge brochure is basically the only document that visitors have to send to friends and relatives that describes the Atoll. It is franked and visitors may have as many copies as they wish.

The Refuge Manager and Dr. Phil Lobel (WHOI) collaborated on producing the first ever JA calendar in 1991. It was centered on fishes of the Atoll and included text about the Refuge, FWS operations and relationship to the military and its activities, as well as listing historic dates important to JA. The Manager obtained independent funding for it from the Island Unit Fund (IUF) which does not spend appropriated funds, therefore, can engage in commercial activities. The Manager allowed the IUF to keep all profits as a condition for funding the project. He was strictly interested in dissemination of information and generating interest in the Atoll and FWS programs. The IUF was not overly generous and wanted to maximize profits so the Manager operated on a shoe



SCUBA diving is a popular activity of Johnston's residents. Certification courses are conducted for a modest cost. (R. Di Rosa)

Boats are furnished free to Atoll residents for recreational purposes such as diving, snorkeling and fishing. Other activities include sailing, windsurfing and kayaking. (R. Di Rosa)



Numerous organized recreation events for the ever restless 1,300 residents are conducted by Recreation Services staff. The yearly homemade raft race is always a big hit. (L. Ballance)

string to produce and publish it. None-the-less, the calendar was a big success generating the desired attention from certain congressmen and DOD in Washington D.C. General Busbee, U.S. Army, was particularly pleased with it and wanted 150 copies for distribution.

The Biologist spends a good deal of time administering the volunteer program which has become a great success. We cannot accommodate the number of people who wish to help us with our work. The volunteer program provides us an excellent opportunity to do interpretative work on an intimate basis. It also allows the volunteers to photograph birds in restricted areas under a controlled setting.

The Refuge has outdoor and indoor display areas. The outdoor display is composed of one large sign that is permanently displayed and describes the Refuge and diversity of nesting habitats of the seabirds. The second sign has a display we rotate monthly that features a different species or group of animals each month.

The indoor display is composed of two glass-covered bulletin board type displays in the headquarters building. We change the displays as necessary to feature the latest volunteer activities and selected natural resource topic.

In addition to the above, the Manager and Biologist engage in organized presentations to island residents such as slide programs and lagoon and seabird colonies tours as time permits. All researchers visiting the Atoll are encouraged to make presentations to the Atoll residents about their particular area(s) of expertise or research.

Most high ranking military and civilian dignitaries and their entourages are given a lagoon tour of the outer islands and seabird colonies by the Manager or Biologist. This can take up a lot of time due to the number of dignitaries that come through at times. Usually the time is well spent since we also get to discuss the FWS mission and FWS/military relationship on a more intimate basis. Also, since the Army is funding most of the FWS operation we very rarely refuse their requests.

9. Fishing

Recreational fishing is a popular activity on Johnston Atoll. The University of Hawaii research team estimated almost 7,000 hours of effort were expended in fishing activities in 1989. In previous years estimates were double that. After termination of the U of H study no estimates were made in 1990 or 1991. Catches are made from shore and

boat using pole and line, throw net, and spear (Hawaiian sling only) while diving. Also, fishing parties organized by the Base Recreational Services Office use the Base's landing crafts ("MIKE" boats) to troll outside the Refuge boundary in deep water for pelagic species such as wahoo, dolphin and tunas.

16. Other Non-wildlife Oriented Recreation

The lagoon is used for a variety of non-wildlife related recreation including snorkeling, SCUBA diving, sailing, kayaking, water skiing and windsurfing. All equipment is provided free by the Base Recreation Department.

17. Law Enforcement

The Manager and Biologist have no law enforcement authority on the Refuge because all enforcement authority is vested in the Base Commander and administered by the Base security force. The Base Commander is obligated to enforce all FWS and other federal laws and regulations pertaining to natural resources. The Commander can create a regulation instantly if deemed necessary by him and the Refuge Manager. As a result of the severe punishments involved (possible loss of job and deportation from the island) and the interpretive program, violations of wildlife regulations are rare.

At the request of the Refuge Manager the Base Commander established a regulation severely restricting the take of coral from the lagoon. Coral could still be taken but only in select areas (within the ship channels that may have to be dragged to breakdown coral in the future) and only on specially authorized coral collecting trips. The take was further restricted by allowing only two pieces per person per month and no take of especially sought after red coral was allowed. The selling of coral was already restricted but had been continuing anyway.

The reason that coral collecting was not entirely restricted was to give some cushion to additional resource regulations that the Manager had already established with more regulations planned. The restricted collecting activities would not harm the resource and would begin to dry up the available coral for sale. The negative side was that it would continue to foster an attitude toward collecting, even though very restricted. Plans are to stop this as well in due time as old residents are replaced by new ones with little knowledge of the past. We can then educate them. Reactions to the restrictions were mixed and ranged from God bless the Refuge staff to there will be a riot on the island. Neither occurred, but the over all response was

decidedly positive. We attribute that in large part to our educational campaign about coral reef problems worldwide and our public hearing regarding the reasons and authority for enacting protection and providing anyone a chance to respond.

However, three individuals in two separate incidents did not feel that the regulations were meant for them. As a result two had all of their water recreation privileges suspended by the Commander for 6 months and one belligerent individual had his privileges suspended indefinitely. In other words, they can take a bath only and not in the ocean, during their periods of punishment. This is no small punishment when you live on an atoll in the middle of the Pacific Ocean with any number of water activities and equipment at your disposal. As might be expected the penalties had the desired deterrent effect. These were the only discovered resource violations during the year.

Since Johnston Atoll NWR is also a highly secure military installation we approach punishment for violations of FWS regulations in a different manner. On less severe violations, such as the above, the Refuge Manager and Commander discuss the violation and agree on a penalty, and the Commander administers it. On more severe violations such as violations of the Endangered Species Act or Migratory Bird Treaty Act the Manager reserves the authority to have prosecution handled through the FWS. Military personnel are in additional jeopardy from military regulations.

I. EQUIPMENT AND FACILITIES

4. Equipment Utilization and Replacement

The Refuge vehicle is a golf cart owned by the Service. It is the best type of vehicle for our needs and type of work since it is designed for frequent stops and starts, provides easy access and has all the speed necessary to run about the island. A second golf cart was purchased this year as an additional vehicle and as a backup to the current aging cart.

The FWS boat was a 22-year-old, 23-ft. Glassply with twin 110 hp OMC Seadrives. It was converted from an inboard with two old Mercuiser engines to the twin outboards. The current Manager determined that the boat and redesigned fuel system were not marine safe and had the boat pulled from service. The estimated cost to properly rehabilitate the

The following are several photos of human habitat.

The Base Commander's quarters is in the center foreground. The large, yellow, windowless building is the Joint Operations Center (headquarters). It is also the "safe haven" structure which is over pressurized and will withstand 200 mile per hour winds (so we are told) and can accommodate the Atoll's entire population for extended periods. (R. Di Rosa)

So, you thought the island was starting to look pretty good. Make no mistake about it, Johnston Island is an industrial complex with only interspersed vegetation. (R. Di Rosa)

About three-fourths of the 625 acre island is off limits to personnel because of security and safety considerations. (R. Di Rosa)

boat was more than the boat was worth. It was a constant source of irritation to keep running and properly maintained. Given the safety considerations, the fact that the boat was nice (cabin cruiser) but not essential to accomplish our work and the extra workload required to keep it maintained, it was permanently removed from service.

The Refuge also had an old 17-ft. Boston Whaler (also obtained from the Coast Guard) with twin 35-hp engines. Both engines were old and in poor shape and were the property of DNA. The manager returned the engines, whereby one was scrapped and the other cannibalized for parts. The Whaler was gutted of its deteriorated interior and a volunteer was making a new console by the end of the year.

To alleviate the constant problem of boat and engine maintenance and upkeep the Manager approached the Base Commander with the suggestion that it is up to DNA to fully support the Refuge in this manner. An agreement was struck whereby the needs of the Refuge would supersede the needs of Recreation Services. Refuge staff and sponsored researchers would be provided a Whaler from the recreation fleet whenever they needed it, and the contractor would provide all maintenance. When the FWS Whaler is returned to full service with a new engine the contractor will provide all the necessary maintenance and repair services.

5. Communications Systems

Refuge operations are basically supported by the Base infrastructure and radio net. One hand-held unit is assigned to us and others are at our disposal as necessary. We operate on the Base channels.

7. Other

The primary FWS facility is the Refuge office located in the Joint Operations Center (Base headquarters). The office is adjacent to the offices of the Base Engineer and the Base Commander. It is provided and furnished by DNA so that the Refuge staff is able to work closely with the Base command. The Joint Operations Center is a four story air-conditioned, over-pressurized building that is secure against hurricane and, of course, gaseous agents.

The FWS maintenance or project needs are basically supported on island by the contractor and costs are billed to a special O&M on island account that is not part of the regular budget negotiated by the Manager every year. It is time consuming to have things accomplished. A written request must be submitted to DNA Engineering. They review

it then pass it to the contractor where it goes through a couple of channels before arriving at the proper office. They then get back to engineering who gets back to the Refuge Manager if there are problems. Everything must be spelled out in detail to insure the project is accomplished properly. If it needs to be done quickly then the Refuge Manager can pull the necessary strings through the Base Commander. The Refuge staff also can charge to the above account any items available in the supply warehouse that are needed for projects. The drawback is that one to several of many materials or items cannot be obtained. Whole boxes or large rolls must be purchased. However, the carpenters, painters and machinists are good to us and will give us many smaller items or quantities to meet our needs.

J. OTHER ITEMS

3. Credits

Biologist O'Daniel wrote sections B., D.5, E.4, F.6, and G. Manager Di Rosa wrote all others and rewrote and/or copied some relevant portions of the 1989 narrative written by Biologist Forsell.

K. FEEDBACK

Johnston Atoll NWR is a very unique place and there certainly is nothing even close to it in the Refuge System. There are overlays and cooperative agreements but nothing with its professional intensity and personal involvement. The chemical demilitarization activities are throwing us into the national and international spotlight and not just because we are here, but because we are monitors and watchdogs. The professional level and quantity of visiting dignitaries that the staff addresses has no comparison. Make no mistake, we are not entertaining a bunch of bored visitors. A very large portion of these visitors have specific interests in the environmental programs being conducted at JA. The briefings and discussions the manager provides are far more than just a courtesy. He is there to inform and discuss the issues, and his comments may reflect poorly on military and/or past Fish and Wildlife Service operations. There is no one else with the overall knowledge about the contaminants issues and the environment. Consequently, it is he who discusses the issues with Congressmen, their staffs or other high level personnel. What he says is taken to represent the Service's position on the various issues, therefore, comments are chosen with considerable thought. This is very important because of the perception of us as watchdogs.

In addition to what is contained in this narrative the Refuge Manager was twice on a panel in 1990 that contained a member of the State Department and high level military and civilian personnel connected with JACADS. He was on the panels as part of an international press conference composed of 80 international reporters to discuss the Service's mission and relationship with the military at JA. Most importantly, he was the expert on environmental issues at JA. In addition, he was called to Honolulu to be interviewed by the BBC and discussed environmental issues for a one hour, internationally televised, special program on chemical demilitarization. Remember, these issues are national (7 plants to be built in the U.S.) and international (chemical weapons must be transported through the global commons) in scope. What happens or does not happen at Johnston Atoll has major significance for all parties involved. There are major controversies surrounding these issues and what the military is or is not doing in regard to environmental issues. this may very well return to haunt the military as the public continues to question its credibility. It is worth noting that the Refuge Manager is the only individual on the Atoll who has the authority to talk directly to the press or writers without off-Atoll supervisory clearance and censorship. All others, including the DNA and Army Commanders and the DOE Representative must first clear with their supervisory commands in Albuquerque and Washington D.C. Their respective public relations departments may even handle the issue.

Take a close look at the Contaminants section again. You will see very specific actions and decisions that are normally only within the purview of a contaminants specialist. All that information, as well as statements concerning potential liability of the Service, has been contained in the monthly narratives. In the year and a half the staff has been at JA, no one from the Regional Office has even paid an inquiring phone call to the Manager about these issues. The Manager operates with very little supervisory direction. In order to be able to provide adequate direction, a thorough knowledge of the issues and potential ramification of decisions is needed, and that knowledge does not exist in Honolulu or the Regional Office. That's fine, but if the staff is assuming the responsibility, they need to be rewarded accordingly.

The scrutiny that the refuge staff is under by the Army, DNA and prominent contractors like Raytheon adds to the stress of the staff. Exercising dictatorial authority as is common practice with most refuge managers, is of limited value at JA and would only make any problems worse. A high degree of tact and diplomacy must be exercised by the refuge staff at

all times, including during their personal time since there is no escape from being Service representatives. Building consensus for the natural resource and other environmental programs and encouraging a proactive attitude are the primary goals of the staff.

The Refuge Manager did not fall off the refuge management turnip truck yesterday. This is his fourth position as a GS-11 and no where has he experienced or observed this kind of authority, responsibility or autotomy at that grade level. The Manager's low grade level has been brought up by high ranking military officers and civilians in the past when he was challenging them on environmental and contaminants issues. It is worth noting that the Service sought out his special experience and expertise regarding the programs and interagency operations at JA.

The GS-7 Biologist does not become involved in the controversial contaminants issues. However, she must represent the Service and Manager during his many absences and make decisions accordingly that may impact other agencies and a local population. When the Manager is gone she deals with the same high level personnel he does. I defy anyone to find another GS-7 position in the Service with these responsibilities under such conditions.

It appears that from actions and comments that have been made, the Service is stuck in the archaic attitudes of the pass where if you are not building wetlands, engaged in manipulative resource management of some sort or have a lot of heavy equipment on the refuge your job is of less importance. Resource management is a piece of cake compared to dealing with people and their professional egos and territories while trying to build consensus on controversial issues. Colonels and high-grade government civilians do not get to those levels because they have small egos. They take their authority very seriously, especially within the military complex. Many, if not most, regard any challenge as a threat to their authorities.

The Refuge Manager appreciates the confidence his supervisors have in his decisions and in the JA staff, but it seems to result somewhat from an out-of-sight, out-of-mind attitude. Such an attitude and lack of understanding of the staff's work at JA may very well return to haunt the Service if or when the national spotlight brightens. The general public will not sit still and passively let seven more chemical destruction facilities be built in this backyard in the continental United States. The Service better have its act together because JA will be a focal point of both supporters and detractors, and the Service's past and current actions may play a significant role in the debate.

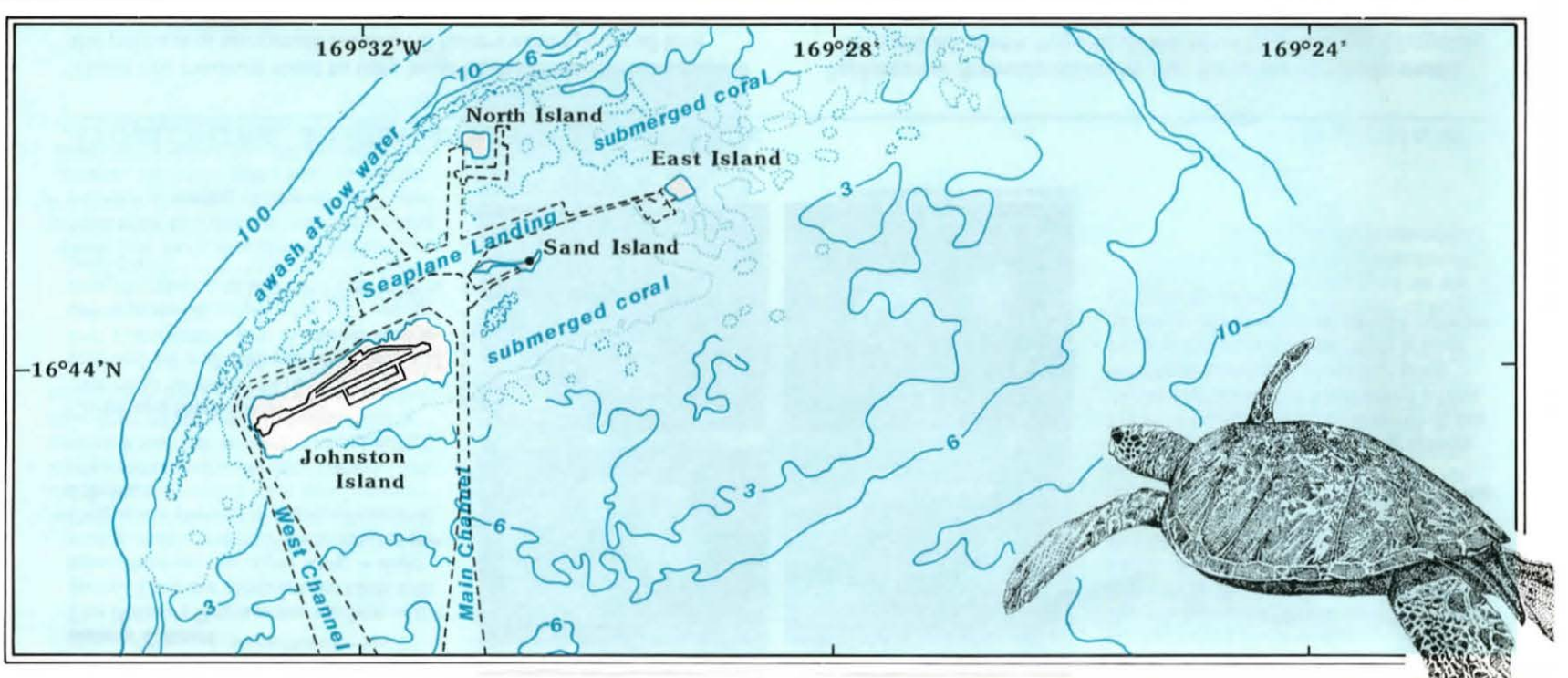
A rare, calm and tranquil sunset over the Atoll. Taken from North Island. (R. Di Rosa)

Johnston Atoll National Wildlife Refuge

Description

Johnston Atoll National Wildlife Refuge is a coral atoll near the center of the North Pacific between the Hawaiian Islands and the Marshall Islands. Located 717 nautical miles southwest of Oahu, and 450 nm south of French Frigate Shoals in the Northwest Hawaiian Islands (at 16°45′ N, 169°31′ W), it is one of the most isolated atolls in the world. It rests on the core of an ancient volcanic island now buried under a limestone cap thousands of feet thick which resulted from 70 million years of reef growth on the slowly sinking island. Today, Johnston Atoll is a broad shallow platform of approximately 50 square miles with a marginal reef emergent only on the northwest. Four small islands (Johnston, Sand, North and East) emerge from the lagoon.

Though the shallow reefs of the atoll are lush and varied, the deep surrounding ocean is a biological desert. In the warm westwardly flowing stream of the North Equatorial Current, few nutrients rise to the surface and the microscopic plant life which supports all other marine creatures is sparse. Flowing around the atoll, the current is diverted and turbulence brings the nutrients of deeper water to the surface. This creates a wake of richer marine life downstream (west) and a feeding ground for the thousands of seabirds which roost and breed on the islands.



History

Johnston Atoll was accidentally discovered on September 2, 1796 by Captain Joseph Pierpont of the American Brig SALLY. He published a notice of his ship's grounding in several American newspapers in 1797, giving an accurate position and noting the two original islands (Johnston and Sand) and the incomplete marginal reef. No traces or records of any earlier visitations or occupations by Polynesians or Europeans during their voyages of discovery exist. Lt. William Smith of HMS CORNWALLIS named the larger island for his ship's captain, Charles J. Johnston, after sighting it briefly on December 14, 1807.

The Guano Act of 1856 granted Americans the privilege of removing guano, the accumulation of sea bird excrement, from nearly 30 central Pacific islands claimed by the United States. For several years guano was removed from Johnston and Sand Islands before the operation was abandoned in the late 1800's. In 1923 the Biological Survey of the U.S. Department of Agriculture and the Bishop Museum visited the islands with a scientific expedition to study the bird and marine life. Their findings resulted in Executive Order 4467 of President Calvin Coolidge designating the islands as a bird refuge. In 1934 by Executive Order 6935, Franklin D. Roosevelt placed the atoll under the Navy while retaining the earlier provisions for refuge designation and protection. Navy development began in earnest in 1936 with reef blasting, dredging, landfilling and grading and construction on the islands. The atoll was briefly shelled by Japanese naval units shortly after the Pearl Harbor attack but combat soon shifted west and the island's role changed from an outpost to an aircraft and submarine stopover and refueling base.

In the late 50's and early 60's a series of high-altitude nuclear tests brought new activity and attention to Johnston atoll. A series of dredge and fill projects completed in 1964 brought the size of Johnston Island up to 625 acres from its original 46, increased Sand Island from 10 to 22 acres, and added two manmade islands, North (Akau) and East (Hikina) of 25 and 18 acres. Today Johnston Atoll remains an unincorporated territory of the United States with operational control held by the Defense Nuclear Agency (DNA). The atoll is maintained as a storage site for chemical munitions and as a standby test site should the United States ever decide to resume atmospheric testing of nuclear weapons.

Migratory Birds

Most of the birds that occur at Johnston Atoll are seabirds. Seabirds obtain their food from the sea and generally possess webbed feet and beaks adapted for feeding on fish. They also have characteristic internal salt glands which make it possible for them to drink sea water. Long narrow wings efficient for soaring are found in many species. Seabirds evolved on islands where natural predators were absent. Compared to other birds, they produce fewer young over their lifetime. Seabirds mate for life and both males and females incubate, brood and feed their young.

Other migratory birds occurring at Johnston Atoll include species which breed in Alaska, Canada, the mainland United States and Asia and migrate to the Central Pacific for wintering. These include shorebirds and waterfowl. The following species descriptions detail information on the birds that regularly occur at Johnston.

Shearwaters and Petrels

Shearwaters and Petrels are small to medium-sized birds distinguished by a hook-end bill with nostril tubes on the upper bill. They are related to the much larger albatross which once nested on Johnston. They feed by plunging or seizing prey at the surface. Their natural longevity is around 20 years.

Bulwer's Petrel
The Bulwer's Petrel is the smallest of the group. They are sooty-brown birds with lighter bars on the upper wing, a short wedge-shaped tail and black legs and feet. Only a few pairs of this species occur at Johnston.


Petrel chick


Wedgetailed Shearwater

Christmas Shearwater
Christmas Shearwaters have a short rounded tail and dark plumage, legs and feet. Competition with the larger wedge-tails is probably responsible for limiting their abundance to less than 100 birds at Johnston.


Bulwer's Petrel


Wedgetailed Shearwaters

Wedge-tailed Shearwaters
The Wedge-tailed Shearwater is the largest of the local shearwaters, has a disinctly wedge-shaped tail, and flesh colored legs and feet. The single egg is laid in a chamber at the end of a burrow that may be six feet long. Burrows are dug with the bill and feet and reexcavated and renovated before each breeding season. Three to four thousand of these birds use the natural portion of Sand Island where the dense roots of the *Lepturus* grass support the burrow walls. Their unique moaning calls at night can give the colonies an eerie character.

Tropicbirds, Frigatebirds and Boobies

These are medium sized to very large birds, distantly related to the pelicans of temperate waters. All have webbing over all four toes and an inflatable gular (throat) pouch. All move poorly on the ground with short, weak legs. Although adults of each species are distinctly different, the chicks are generally similar, born naked (some tropicbirds are downy) and blind. Longevity from tropicbirds and boobies ranges from 16 to 20 years. Frigatebirds may live more than 30 years.

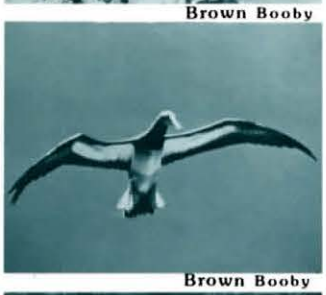
Red-tailed Tropicbird
Red-tailed tropicbirds are white birds distinguished by two long, thin red tailfeathers. The bill is bright red, and the eyes lined with black. Immature birds have black barring over the back and upper wing surfaces. They are tolerant of human activity but susceptible to cat, dog and rat predation. Several thousand utilize Johnston Island, the current population probably having increased with greater vegetation.


Red-tailed Tropicbird


Brown Booby

Great Frigatebird
The Great frigatebird or "iwa" in Hawaiian, is the largest seabird on Johnston. It has a forked tail, hooked bill and the adult males possess a bright red throat pouch. Among the most efficient of soarers, it glides on the wind or thermal updrafts, often harassing other seabirds and stealing their catch. Their aggressive habits extend to the nesting grounds where they will take unattended eggs and chicks of even their own species.


Great Frigatebird


Brown Booby


Great Frigatebird


Red-footed Booby

White-tailed Tropicbird
White-tailed tropicbirds are white birds with two long, thin white tail feathers. The wing edges are lined with black as are the eyes, and the bill is yellow. Viewed from below, the birds appear pure white. This species prefers to nest on cliffs but nests have recently been found on the ground under shrubs on Johnston Island.

Brown Booby
The Brown Booby has a deep chocolate brown back and upper wing surfaces and a sharply delineated white chest and underwing. Prey is taken by diving into the water followed by underwater pursuit. It builds a cup-like nest of dried vegetation and lays two eggs. Usually only one chick is reared successfully. This species is a year-round resident with perhaps several hundred birds feeding in the lagoon and near-shore waters.

Red-footed Booby
The Red-footed Booby has a white body and wings except for dark tips. The legs and feet are an unmistakable bright red. The beak is light blue. Sand and East Island support several dozen breeding pairs. The total population numbers in the thousands in early spring but most are non-breeders.

Terns and Noddies

Terns are small to medium-sized birds with narrow, graceful wings and thin, sharp bills. They feed by plunging or picking and snatching prey from the surface. Most terns nest colonially and usually show strong individual pair bonding and colonial "site tenacity." Tern chicks are born with down and open eyes.

Gray-backed Tern
Gray-backed terns are smaller than sooty terns but similar in general appearance. The upper surfaces are gray, and the white blaze over the face and eyes extends well behind the eyes. Nesting in this species begins early in the year since harrassment by sooty terns can severly reduce breeding success. Several hundred breed on Sand, North and East Islands.


Gray-backed Tern


Sooty Tern

Sooty Tern
The Sooty tern sports long narrow wings and is dusky black on top and white on the neck and belly. The forked tail and harsh screeching call distinguish this bird. This is Johnston's most abundant bird with an estimated 50,000 - 100,000 breeding pairs. The colony was originally located on Johnston and Sand Islands. As human activity increased on Johnston, the entire colony moved to Sand Island and, recently, to East Island.

White Tern
The white tern is unmistakable with its pure white plumage and black bill. Its habit of fluttering curiously over visitors assures that its presence will be noticed. A single egg is laid directly on a tree branch, a ledge, or on any suitable surface. The growth of trees on Johnston and control of the cat population insures that the population of this attractive bird will continue to increase.


White Terns


Brown Noddy

Brown Noddy
Brown noddy terns are gray-brown birds with an indistinct gray-white forehead and crown. The legs, feet and bill are black. Their common name comes from the stereotyped head nodding courtship displays between adults. Several thousand nest on Sand, North and East Islands, making this the second most numerous species using Johnston Atoll.

Black Noddy
The black noddy (also known as the white-capped or Hawaiian noddy) is smaller and darker than the brown noddy. The white on the forehead and crown is more distinct and extends farther back. Black noddies are common on Johnston with many pairs nesting in trees on the main part of Johnston Island.


Black Noddy


Sooty Tern

Shorebirds

Migratory shorebirds are commonly seen on Johnston during the winter months. Shorebirds typically feed near the water's edge, but can also be found in mixed flocks working grassy or gravelly areas. In some cases shorebirds prey upon the eggs of the seabird colonies.

Golden Plover
The golden plover is distinguished by gold spotting on the wings and back and a white stripe over the eye and down the neck. The long legs are a light gray-brown. Winter months are spent in the tropics feeding and preparing for the spring flight to the arctic breeding grounds. The migration flights are made directly from the atoll to the arctic and the birds remain in the air for up to seven days. Several hundred plover may be present on Johnston during the winter.


Golden Plover


Bristle-thighed Curlews

Bristle-thighed Curlew
The bristle-thighed curlew is a large brown shorebird with a long decurved bill. It has an unbarred rusty tail, a brown back and a light stripe over the eye. Its voice is a sharp "curlew" repeated. It breeds on the tundra in Alaska and arrives on the atoll in August and September.

Ruddy Turnstone
Ruddy turnstones are small distinctly marked shorebirds with a bar and blotch pattern of black on white and short reddish legs. Their migratory pattern is believed to consist of a direct flight from the arctic to the atoll in the fall, and a coastal return via the western Pacific, Japan and Siberia in the spring.


Ruddy Turnstone

Waterfowl

Three species of ducks occur fairly regularly on Johnston Atoll. They include the northern pintail, American wigeon and northern shoveler. These ducks breed in North America and are regular winter migrants to Hawaii.

Bird List

Resident Nesting Seabirds	Abundance	Nesting Habit	Adult Wing Span (inches)
Bulwer's Petrel	u	2,6	23
Wedge-tailed Shearwater	c	1	38
Christmas Shearwater	u	2,6	32
White-tailed Tropicbird	u	6	38
Red-tailed Tropicbird	a	2,3	44
Brown Booby	u	3	54
Red-footed Booby	c	4	40
Great Frigatebird	c	4	90
Gray-backed Tern	u	3	29
Sooty Tern	a	3	34
Brown Noddy	a	3,4	33
Black Noddy	c	4	29
White Tern	c	5	28
Non-Nesting/Non-Resident Seabirds			
Black-footed Albatross	r		89
Laysan Albatross	r		82
Townsend's Shearwater	r		13
Phoenix Petrel	x		14
Sooty Storm Petrel	x		22
Red-billed Tropicbird	r		24
Masked (Blue-faced) booby	r		60
Lesser Frigatebird	x		90
Laughing Gull	x		41
Franklin's Gull	x		35
Herring Gull	x		52
Glaucous Winged Gull	x		53
Elegant Tern	x		37
Blue-gray Noddy	r		24

Nesting Habit

1 – Burrow
2 – Rock Crevice
3 – Ground
4 – Shrub or Tree
5 – Branch or Ledge
6 – Under Vegetation

Migratory Shorebirds	Abundance
Black-bellied Plover	x
Golden Plover	c
Semipalmated Plover	x
Lesser Yellowlegs	x
Willet	x
Wandering Tattler	u
Spotted Sandpiper	x
Bristle-thighed Curlew	u
Ruddy Turnstone	c
Sanderling	u
Western Sandpiper	x
Pectoral Sandpiper	x
Sharp-tailed Sandpiper	x
Buff-breasted Sandpiper	x
Ruff	x
Short-billed Dowitcher	x
Wilson's Phalarope	x
Accidentals, Stragglers or Waterfowl	
Peregrine Falcon	x
Short-eared Owl	x
Cattle Egret	r
Northern Pintail	r
American Wigeon	r
Northern Shoveler	x
Skylark	x
Japanese White Eye	x

Abundance

a – Abundant (numerous common species)
c – common (certain to be seen in suitable habitat)
u – Uncommon (present, but not certain to be seen)
r – Rare (seen only a few times a year or not at all)
x – Accidental (not normally expected)

Wildlife Regulations

The Commanding Officer at Johnston Atoll has prescribed regulations concerning wildlife which reflect and support Federal laws and National Wildlife Refuge Regulations. It is prohibited for any person to harass, willfully disturb, hunt, trap, capture, or kill any bird or to take the eggs of any bird. It is also prohibited to harass, willfully disturb, hunt, trap, capture or kill any individual of any species designated as threatened or endangered (sea turtles, Hawaiian monk seals). Entry to North and East islands and the eastern part of Sand island is controlled during the birds' breeding season (Feb. 1-Sept. 1). Fishing and shell and coral collecting are permitted for recreation. Lobster fishing is also permitted within prescribed seasonal, size and gear limitations. Detailed regulations are listed in FCJ Instruction 5000.4.

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Atoll Ecology

As the only shallow water and dry land area in millions of square miles of ocean, Johnston is an oasis for reef and bird life. Corals and coralline algae are responsible for the existence of the atoll. Though corals are true animals, colonies of microscopic symbiotic algae are contained in their tissues. The algae contribute their photosynthetic production to the coral, receiving in return secure space in the sun and the coral's wastes as nutrients. While fewer species of coral are found here than in Hawaii, a few species not found in Hawaii dominate the reefs of the atoll. Most impressive is the table Acropora (*A. cyatherea*) forming massive colonies up to 10 feet in diameter. The diversity of other reef life such as molluscs, crabs, and urchins, is also less than in Hawaii. The reduced fauna, however, does include some species from the western and south Pacific not found in Hawaii.

About 280 species of fish have been recorded from the reefs and inshore waters of Johnston Atoll. This is a much smaller number that the estimate for Hawaii (about 680 species) or the Marshall Islands (about 820 species). The lack of species is probably due to the atoll's isolation, small size and lack of habitat diversity. Most of the fish species also occur in Hawaii and all probably occur elsewhere. The majority of the fishes are edible though some may very rarely retain a poison within their flesh known as **ciguatoxin**. The poison is produced by a microscopic alga that is eaten by fishes browsing along the bottom. The poison can then concentrate in the flesh (particularly the liver) of large carnivorous species primarily eels.

Endangered Species

Two unique forms of marine life found at Johnston Atoll are protected under Federal laws controlling threatened and endangered species. These species are the **green sea turtle,** *Chelonia mydas,* and the **Hawaiian monk seal,** *Monachus schauinslandi.*

Sea turtles are reptiles which spend their entire lives at sea except for brief visits ashore to deposit their eggs in pits dug in sandy areas above the high tide mark. The new hatchlings can fit in a hand but the adults can grow quite large (300 - 400 pounds) and may take 30 - 40 years to reach breeding maturity. Turtles are highly vulnerable to human predation and disturbance. Many turtles at Johnston have been tagged by researchers seeking to understand migration routes and estimate growth, reproduction and mortality. The tag recovery of a nesting female on a beach at French Frigate Shoals indicates the Johnston population probably nests there.

Hawaiian Monk Seal and Pup

The monk seal, found primarily in the Northwest Hawaiian Islands, occasionally occurs at Johnston. The species has declined sharply in historical times as a result of human harvesting and disturbance of breeding colonies. They feed on fish and crustaceans from the reef and lagoon and, although able to spend long periods at sea, often haul out on sandy beaches to bask in the sun. Nine seals were translocated to Johnston from Laysan Island in 1984 and one or two of these tagged individuals have taken up permanent residence.