MARCH 1983

RECOVERY PLAN FOR THE HAWAIIAN MONK SEAL, Monachus schauinslandi

by

William G. Gilmartin

In cooperation with the
Hawaiian Monk Seal Recovery Team

U.S. DEPARTMENT OF COMMERCE
National Oceanic and 'Atmospheric Administration
National Marine Fisheries Service
Southwest Region
300 South Ferry St., Room 2016
Terminal Island, CA 90731

MARCH 1983

RECOVERY PLAN FOR THE HAWAIIAN MONK SEAL, *Monachus schauinslandi*

by

William G. Gilmartin

In cooperation with the
Hawaiian Monk Seal Recovery Team

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Region

RECOVERY PLAN FOR THE HAWAIIAN MONK SEAL, *MONACHUS SCHAUINSLANDI*

by

William G. Gilmartin
In cooperation with the
Hawaiian Monk Seal Recovery Team

TEAM MEMBERS

Robert L. Brownell, U.S. Fish and Wildlife Service
Robert L. DeLong, National Marine Fisheries Service
Douglas P. DeMaster, National Marine Fisheries Service
William G. Gilmartin, National Marine Fisheries Service (Chairman)
Ancel M. Johnson, U.S. Fish and Wildlife Service
Brian W. Johnson, Aquatic Mammals Behavior Research
Alvin Z. Katekaru, Hawaii Department of Land and Natural Resources
Gerald R. Kooyman, Scripps Institution of Oceanography
Eugene T. Nitta, National Marine Fisheries Service
Edward W. Shallenberger, Pacific Basin Maritime, Inc.
Robert L. Shallenberger, U.S. Fish and Wildlife Service
Leighton R. Taylor, Waikiki Aquarium

March 24, 1983

APPROVED:

Alan W. Ford, Regional Director

Date: April 1, 1983

Table of Contents

		Page
I.	Introduction	1
	A. Distribution and historical notes	1
	B. Population size and trends	4
	C. Habitat description	6
	D. Population limiting factors and threats to the species	7
	E. Conservation efforts	9
II.	Hawaiian monk seal recovery plan	12
	A. Recovery plan outline	13
	B. Recovery plan narrative	18
III.	Implementation schedule	25
IV.	Literature cited	26

Table 1 Summary of censuses of Hawaiian monk seals, Monachus schauinslandi in the Northwestrn Hawaiian Islands, 1957-82

Table 2 Implementation schedule for the Hawaiian Monk Seal Recovery Plan

Figure 1 Chart of the Hawaiian Islands

Appendix A Hawaiian Monk Seal Recovery Team statement on proposed critical habitat for the monk seal

RECOVERY PLAN FOR THE HAWAIIAN MONK SEAL, MONACHUS SCHAUINSLANDI

I. Introduction

The genus, Monachus, in the Family Phocidae, is composed of three geographically widely separated species of monk seals: the Mediterranean monk seal, M. monachus; the Caribbean (or West Indian) monk seal, M. tropicalis; and the Hawaiian monk seal, M. schauinslandi. The fossil record indicates that Monachus represents the most primitive of all species of seals. The progenitors of the three species apparently originated in the North Atlantic, and the Hawaiian monk seal became separated from its congeners as early as 15 million years ago (29). Compared with the other phocids, the monk seals appear to be far more sensitive to human intrusion in their environment, perhaps because of their primitiveness. Together with the spread of human activity to the most isolated areas of their habitat, dramatic population declines have been recently seen in all three species. The Caribbean monk seal probably became extinct in the 1950's (23).

The following sections provide background information on the Hawaiian monk seal population, habitat, threats to the species, and conservation efforts which have assisted in protection of the species.

A. Distribution and Historical Notes

The Hawaiian monk seal, is currently found throughout the Northwestern Hawaiian Islands (NWHI), specifically: Kure Atoll, Midway Islands, Pearl and Hermes Reef, Lisianski Island, Laysan Island, French Frigate Shoals, Necker Island, and Nihoa Island (Figure 1). These islands form a chain approximately 1,840 km long. Monk seals are less frequently observed at Gardner Pinnacles and Maro Reef and are also seen infrequently in the waters around the main Hawaiian Islands. At least three seals have been sighted at Johnston Island (30). In 1981 and 1982, pups were born at each of the eight major haul-out atolls listed above. However, pupping at Midway has been intermittent during the past few years and pupping on Necker and Nihoa Islands has been observed only in recent years.

Kure Atoll, at the northwestern end of the archipelago, is a typical coral atoll, the world's northernmost, about 9.5 km in diameter comprising one major island, Green Island, and a few smaller sand spits. Kure is approximately 91 km northwest of Midway and 2,177 km northwest of Honolulu.

Hawaiian monk seals were first recorded at Kure Atoll in 1825. Beginning in 1837, a series of shipwrecks on the atoll's reefs undoubtedly had a major impact on the monk seal population at Kure since the shipwrecked crews often turned to the mammals as a major food source. For instance, the crew of the Parker reportedly killed 60 seals while stranded on Green Island in

1842-43, and the crew of the U.S.S. Saginaw killed at least 60 seals there in 1870 (5). Establishment of a Coast Guard loran (long-range navigation) station at Kure in 1960 resulted in a significant disturbance of the seal population caused by human use of the Green Island beaches and the presence of dogs (19).

Midway Islands, located approximately 2,100 km northwest of Honolulu, consist of two major islands (Sand and Eastern), small sand islets, and a fringing coral reef. Midway was discovered in 1859 and claimed in the name of the United States. Since that time, there has been considerable interest in the use of Midway for various purposes. These activities resulted in a significant alteration of the physical environment. Projects have included an initial unsuccessful effort in 1870 to blast a ship channel through the coral reef, the installation in 1902 of a cable station (which led to the introduction of various species of plants, animals, and birds and the importation of an estimated 9,000 tons of topsoil for use in gardening), and the construction of an airport in 1935 by Pan American Airways. Midway's role during World War II is well known. The large post-World War II military contingent at Midway that peaked at about 2,500 was reduced from 1,600 to less than 250 during 1978. During 1982 the military personne 1, with the exception of a few officers, were replaced by over 250 civilian personnel that now maintain the facilities.

Pearl and Hermes Reef, the first land area southeast of Midway, is a low coral atoll made up of as many as eight islets, four of which are permanent. The reef encloses an elliptical lagoon, approximately 32 by 18 km. The reef was unknown prior to 1822 when two British whaling ships, the Pearl and the Hermes, ran aground there on the same day. Presence of Hawaiian monk seals was first recorded 3 years later. The atoll was visited in 1859 by a sealing expedition and by a vessel collecting turtles, b&he-de-mer, and albatross down in 1882.

Beginning in 1902, Japanese feather poachers came to the NWHI and illegally took thousands of albatross, but the extent of their poaching at Pearl and Hermes Reef is not known. From 1926 to 1930, fishing operations, for pearl oysters led to the construction of several buildings on the reef's Southeast Island. This base was abandoned in October 1931 and the buildings were destroyed by U.S. forces during World War II. Sometime during 1961 a U.S. military operation from Midway, acting without a permit, occupied the reef and left behind a steel observation tower and several 55-gal drums, some filled with fuel. The nature of this project is unknown. The degree to which other military activities during and since World War II may have impacted monk seals at Pearl and Hermes Reef and Midway is also unknown.

Lisianski Island, lying about 1,667 km northwest of Honolulu, is a low, sandy island measuring approximately 1.8 km long and 1.0 km wide. It lies near the north edge of Neva Shoal,

a large shoal area varying in depth to 10 fathoms. The island was discovered in 1805 by Capt. Urey Lisianski, a Russian explorer, and was the site of a number of shipwrecks during the 19th century. Stranded crews from these ships often relied on monk seals, as well as turtles and birds, as a source of food. During the same period, Lisianski was visited by expeditions harvesting fish, turtles, guano, b&he-de-mer, and sharks, as well as monk seals. More concentrated exploitation of the island took place during the period 1904-10 by Japanese feather poachers, but this activity was apparently halted by 1911. Subsequent visits to Lisianski appear to have been limited to those by fishermen, survey parties, and scientific expeditions.

Laysan Is land, the largest land area in the NWHI, is a coral-sand or sandy coralloid island enclosing a saline lagoon. The island is about 2.8 km long and 1.7 km wide and is partially surrounded by a fringing reef. It lies approximately 213 km east of Lisianski Island. Laysan is thought to have been discovered by a U.S. vessel, but details are scarce and the first well-documented visit was by the Russian ship Moller in 1828. An account of an 1857 visit by the Hawaiian vessel Manuokawai inclues notes of the presence of seals on Laysan. The biota of the island remained relatively undisturbed until the late 19th century. By the turn of the century, the activities of sealers and guano miners had seriously impacted the Laysan monk seal population, nearly eliminating it. These activities were followed in 1909-10 by intensive harvesting of bird skins and feathers by the Japanese, who carried out an additional poaching raid in 1915. Since that time, visits to Laysan have primarily been those of survey parties and scientific expeditions.

French Frigate Shoals is a coral atoll, open to the west and partially enclosed by a crescent-shaped reef to the east. It lies about midpoint in the Hawaiian Archipelago. The largest land area in the shoals is Tern Island (about 34 acres), and a number of smaller islets (totaling 44 acres) scattered along the westerly reef of the crescent. The shoals were discovered by the French in 1786 and claimed by the United States in 1859, the same year that monk seals were first recorded on the atoll. The reported discovery of guano deposits that same year aroused some excitement among investors, but the quantity of guano on French Frigate Shoals was never sufficient to make mining worthwhile. In 1882, however, a vessel chartered by a U.S. company visited the atoll and departed with a cargo of shark (flesh, fins, and oil) turtle (shells, and oil), bêche-de-mer, and bird down. During the 1930's, the area was used extensively by the U.S. Navy for training exercises. Following the Battle of Midway during World War II, an airbase was established on Tern Island and construction of a loran station was begun in 1944 on East Island. When the airbase was closed in 1946, Hawaiian fishermen began to use the facilities. The East Island loran station was in operation until it was decommissioned in 1952. At that time a new loran station located at Tern Island was activated and was operated by the Coast Guard until mid-1979. The U.S. Fish and

Wildlife Service has occupied the facility since that date with a staff of two to four personnel.

Necker Island, about 1.1 km long by 0.5 km wide, is a rocky, J-shaped island consisting of two parts connected by a low isthmus. Its European discovery is credited to a French navigator, La Perouse, in 1786, but prehistoric habitation of the island was noted about 1879 by one of the early landing parties. Ships periodically visited the island during the mid- and late-1800's, but landings were of ten thwarted by heavy seas. During the period of feather poaching by the Japanese early in the 20th century, patrol vessels visited Necker, but no evidence of molestation of the birdlife was seen. Observations of seals at the island suggest that the species has occurred there regularly for nearly a century.

Nihoa Island, the easternmost island on which monk seals now regularly haul-out, is a precipitous remnant of a volcanic peak, about 500 m long and ranging in width from roughly 100 to 350 m. Nihoa was discovered by Europeans in 1779, though, like Necker Island, there is evidence of prehistoric occupation. Over the years, difficulties in landing on the steep slopes of Nihoa have restricted visits and may be one reason that feather poachers did not attempt to exploit the island. During the 1960's, Nihoa was occupied briefly by military personnel apparently involved in a project to establish astronomical stations in the NWHI. Occasional landings by scientific and survey parties uncovered little evidence of the use of the island by monk seals until recently .

B. Population Size and Trends

Counts of hauled-out seals at these eight land areas provide the primary data which indicate that the present population has declined over the past two and a half decades. The highest count for all atolls for 1982 is about 50% of the highest counts made for the years 1956-58. Since the late 1950's, counts have been made at the atolls almost every year (Table 1). However, these counts do not provide a total population estimate since the proportion of the total included in the count is unknown. Using various population estimation techniques, Johnson and Johnson (19) reported that the monk seal population frequenting Laysan Island was about three times the mean daily beach count. However, it is not known how the proportion of hauled-out seals may vary among atolls, seasonally or diurnally.

The island counts do, however, show a trend over the past two decades (16). Of the six atolls used consistently by the monk seals during the late 1950's, only one, French Frigate Shoals, has shown an increase. Beach counts there increased sixfold by 1975, but since then there has been no apparent change. The counts have decreased at the other five atolls. The greatest declines have been at Pearl and Hermes Reef and Midway, where the highest recent counts have decreased 93% from those

made in 1957-58. At Lisianski and Kure, high counts made from 1976 to 1979 have declined 50 and 63%, respectively, from the counts made in 1957-58. The counts at Laysan have decreased about 23%.

High totals of 24 and 46 seals have been counted in recent years at Nihoa and Necker Islands, respectively. Although these counts are greater than those made 20 years ago, and while a few pups have been born on these islands in recent years, the small amount of haul-out area makes it unlikely that the counts will increase significantly above present levels.

Since the early 1960's about 1,000 monk seals have been tagged. The re-sighting data, however, are not sufficient to provide reliable estimates of population size or mortality. The re-sighting of tagged animals and other data show that monk seals have a high fidelity to the atolls of their birth. Consistent but low frequency interatoll movement does occur, with seals from some atolls showing more frequent movement than others (15). Based on re-sightings of seals tagged between 1966 and 1972, the greatest amount of movement was exhibited by seals tagged at Laysan. Seals re-sighted at islands other than where they were tagged were most numerous at Pearl and Hermes Reef. This movement information and the known major population reduction at Pearl and Hermes Reef and Midway, and to a lesser extent at Lisianski and Laysan, lead to speculation that some phenomenon at these is lands, possibly centered at or near Pearl and Hermes Reef or Midway, was responsible for the high large seal decline during the 1960's.

Some counts of monk seals also contain information on the age and sex composition of the population ashore which have some relevance in predicting future trends (16). These limited data (beach counts do not necessarily reflect the age/sex structure of the population since the composition of these counts vary seasonally) through 1978 show that the sex ratio at birth is 1:1 and remains so among juvenile and subadult seals for all atoll populations. Among adults, however, the ratio changes significantly from 1 :1 to about 0.8 female per male based on the total of all counts, but this varies significantly among the atolls. Laysan, Lisianski, and Kure have the highest proportions of males, whereas Pearl and Hermes Reef does not deviate from a 1:1 ratio and French Frigate Shoals has a greater number of females than males (1.5:1).

The ratio of juveniles and subadults to adults was found to vary significantly among atolls, with the lowest ratios at Kure and Pearl and Hermes Reef and the highest ratios at Laysan, Lisianski, and French Frigate Shoals (16). The numbers of seals in recent counts at Midway, Necker, and Nihoa are too few to provide composition data. Changes in age composition during the last 25 years are apparent at Pearl and Hermes Reef, one of the three atolls showing the greatest declines. Counts at Pearl and Hermes Reef show no change in the number of adults and averaged

88 from 1964 through 1971; however, the mean counts of juveniles and subadults decreased from 40 (1964 through 1968) to 9 (1969 through 1971). By 1975, the number of adults counted had decreased to an average of 20.5 and the juveniles and subadults to an average of 7.

In the spring of 1978 at least 50 monk seals died at Laysan Island. These mortalities may have been caused by ciguatera poisoning (12, 18). Since the 1978 die-off, total counts of monk seals at Laysan Island have not changed significantly.

Based on the information presented here, the trend of the Hawaiian monk seal population in the near future seems clear. The low number of adult female seals at Kure, Midway, and Pearl and Hermes Reef are not likely to increase greatly, given the low recruitment. At Laysan and Lisianski Islands, the sex ratio among adults shows a disproportionately large number of males, but the intermediate number of juveniles and subadults suggests these two populations have the potential for some recovery. However, the fact remains that the total count for Kure, Midway, Pearl and Hermes Reef, Lisianski, and Laysan continues to decline.

Since 1975 the counts at French Frigate Shoals, Necker, and Nihoa have not demonstrated an apparent change even though the French Frigate Shoals counts include a higher proportion of juveniles and subadults than the populations in the area from Laysan west to Kure. Therefore, it is reasonable to expect that without corrective measures, the total number of monk seals will continue to decline and that this trend will be reversed only if there is an increase in the survival rates of juveniles, subadults, and adult females.

C. Habitat Description

Haul-out areas for pupping, nursing, and resting are primarily sandy beaches, but hard substrate bench areas and exposed reef are utilized at some islands. Monk seals also use the vegetation behind the beaches when it is available as a shelter from wind and rain. Pups are born on the sandy beaches as well as on rocky ledges. However, a sandy beach with shallow protected water nearshore seems to be the preferred habitat for pupping and nursing. At most atolls, there are certain beaches or islets that provide this habitat.

The inner reef waters adjacent to the islands are critical to weaned pups learning to feed, as the pups move laterally along the shoreline but do not appear to travel far from shore during their first few months after weaning (17). Within four months after weaning, the pups' weight appears to stabilize indicating they have begun feeding successfully.

The only observed monk seal matings have been in the waters off Laysan Island. Copulating animals were observed 5 m offshore

and 1 km offshore in May 1978 (6, 18) and about 1 km off shore of Laysan Island in May 1982 (32).

Depth-of-dive recorders were attached to adult male monk seals at Lisianski Island during the breeding season in 1980 to determine depths of the habitat used (7). Only dives deeper than 5.5 fathoms were recorded, and approximately 75% of the diving activity (4,817 dives) of six instrumented seals was between 5.5 and 22 fathoms. The remaining dives were greater than 22 fathoms, and the maximum depths of dives recorded were 13 dives of one individual in a range between 66 and 96 fathoms. The mean diving frequency was 51.2 dives/day/seal. These data indicate daily use of the aquatic habitat around Lisianski Island during the breeding season to at least the 22-fathom isobath and less frequent use of waters deeper than 66 fathoms.

Analysis of regurgitated food and scat samples collected from the beaches indicates that monk seals consume spiny lobsters, octopi, eels, and various reef fishes. These prey species are distributed around coral structures nearshore, over the extensive offshore banks surrounding some of the islands, and down the precipitous bank slopes. Although these food items are available nearshore, the dive data collected at Lisianski Island indicate that the animals regularly range away from the island to feed in the deeper waters of the outer reef and reef slope. The longest absence of an adult male in the Lisianski Island study was 4 days and 5 nights, and adult females were believed to be absent for up to 20 days (7, 17).

The frequency of monk seal sightings at Maro Reef and the known abundance of prey species there indicate that it may be a good feeding area. Recently , a monk seal was observed at Maro Reef about a month after the seal had been sighted on Laysan Island; 4 days later it was seen again at Laysan Island, a distance of about 100 km (20). This seal may have been feeding at Maro Reef.

Even without emergent land for hauling out, the submerged reefs and seamounts of the NWHI may be attractive and important feeding habitat for monk seals. Frequency of use of these potential feeding grounds and transit paths has not been studied.

Feeding has been observed in reef caves, and monk seals also appear to use them for rest and refuge from predators (34). The authors reporting this also observed seals breathing from air bubbles trapped on cave ceilings and suggested this as a possible means of extending a seal's underwater time (31).

D. Population Limiting Factors and Threats to the Species

Although not directly responsible for monk seal mortality, human activity on the beach, even at low levels, if sustained over long periods, can cause monk seals to abandon haul-out areas. The decline in the monk seal populations at Kure and

Midway during the 1960's has been attributed to frequent human disturbance of hauled-out seals (21). More recently a well-documented increase in beach counts (at Tern Island, French Frigate Shoals) occurred following closure of the Coast Guard loran station there. Few seals were observed on the island prior to the station's closing, but since the turnover, the mean number of seals in a daily census has increased to over 40 with a high count of 102 in January 1983 (31).

Monk seals have been found dead with apparent shark-inflicted wounds (9, 13, 22, 36); a shark was observed feeding on a dead seal (4); seals have been seen with all or part of an appendage missing (17, 27); monk seal bones have been found in the stomachs of large tiger sharks (34); and, two large tiger sharks were observed killing and consuming a subadult female monk seal within 7 m of shore at Laysan Island in May 1982 (1). Large scars, apparently caused by sharks, are also commonly seen on adult seals throughout their range. The disappearance of most pups at Kure at some point between about weaning age and the end of the first year of life may be due to shark predation (25, 36). Sharks probably contribute significantly to monk seal mortality throughout the NWHI.

At Kure some fatal wounds on weaned pups are believed to have resulted from attacks by adult male monk seals (36). Such attacks have also been observed at Lisianski and Laysan (7, 17). At Laysan, subsequent infection of a wound caused by an adult male bite was observed to result in the death of one pup (17).

Long scars are seen along the dorsal midline of many adult females at all the major hauling-out atolls. Extensive open-back lesions of unknown etiology on adult females were first reported at Laysan Island (17). In the spring of 1978, approximately 1 km off Laysan, an incident was observed in which a single adult female was encircled by about 12 adult male monk seals and some of the males were attempting to mount her (6, 18). The males' repeated biting of the female's back over a period of 3 hours caused an extensive open lesion at least 30 x 60 cm in the center of her back that exposed blubber and muscle.. Numerous sharks were observed around and beneath the group of seals. An incident very similar to this was observed again in 1982 at Laysan Island (32). The frequency of scars of similar dimensions and locations on adult females indicate that this is probably not an uncommon occurrence. Such behavior may, at least partially, explain the differential mortality in adult male and female seals. It seems reasonable to assume that such incidents may sometimes result in the death of the female since she may be left in a weakened condition leaching body fluids profusely in the presence of numerous large sharks some distance from shore.

During an investigation of a monk seal die-off at Laysan Island in 1978, which resulted in an apparent loss of at least 50 seals to the population, high levels of ciguatoxin and maito-toxin were found in tissues of two seals tested (12). The signs

demonstrated by the dying seals were not inconsistent with ciguatera poisoning in other species. It is theorized that ciguatera may have caused the Laysan die-off since another phocid species has been shown to be highly susceptible to these toxins (8). This has been the only documentation of such a die-off of monk seals. However, the dinoflagellate which produces these toxins is known to be distributed throughout the NWHI, thus dinoflagellate "blooms" may be responsible for some intermittent monk seal mortality. Since most of the monk seal population is not under regular scientific observation, the extent of such mortality is impossible to determine.

The only other known disease that affects the general health of the population is gastric ulceration due to parasites. Moderate to severe ulceration from parasites has been seen in almost all postmortem examinations of monk seals (12, 17, 24).

Monk seals have been found entangled in discarded fishing gear, usually netting, but also line (2, 3, 27, 33). A seal found at French Frigate Shoals was trapped in netting firmly attached to a coral head which could have resulted in the animal's death by starvation, drowning, *or* shark attack (2). A piece of trawl net removed from an immature seal at Lisianski Island in 1980 had cut at least 3 cm. into the seal's neck. The surrounding tissue was necrotic and badly infected (7). In the spring of 1982 four weaned pups were found entangled in netting at Lisianski Island (14). Three of the four probably could not have escaped without assistance. Although no mortality has been observed as a result of such entanglements in monk seals, this may be a source of significant mortality for some species (12), and it is reasonable to assume that some mortality due to entanglement occurs with monk seals as well.

Incidents of pup abandonment and premature birth have been noted but are infrequent.

Presently , the most apparent factors limiting monk seal population growth are mortality in the juvenile and subadult age classes and the differential mortality of adults resulting in a sex ratio skewed toward males. Some probable causes have been identified, but the degree to which they impact the population is unknown.

E. Conservation Efforts

In 1909, President Theodore Roosevelt created the Hawaiian Islands Reservation (since 1940 the Hawaiian Islands National Wildlife Refuge) to halt commercial exploitation of seabirds. By restricting human access to the islands, this action indirectly afforded some protection to monk seals as well. The Reservation included all of the NWHI except Midway. In 1936 Kure Atoll was placed under the jurisdiction of the U.S. Navy, and in 1939 jurisdiction over the Reservation was transferred from the Department of Agriculture to the Department of the Interior.

On December 27, 1951 the U.S. Fish and Wildlife Service (FWS) and the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii entered into an agreement which authorized the concurrent designation of the Federal Refuge as a sanctuary for migrating birds and other wildlife under Territorial laws and regulations. A year later, Kure Atoll was turned over to the Territory of Hawaii, and the Refuge, including Kure, was designated a State Wildlife Refuge by Resolution No. 7 of the Board of Commissioners. In 1978 Green Island and Sand Island at Kure Atoll were also designted a State seabird sanctuary.

Although the exact Refuge boundaries were not specified in the Executive Order, Presidential Proclamation 2416, or the Territorial Board Resolution, the FWS has maintained that, based on the original Executive Order, it has jurisdiction over certain submerged lands and waters as well as the emergent lands. In 1967, a Department of the Interior Secretarial Order designated the Hawaiian Islands National Wildlife Refuge (HINWR) as a Research Natural Area with the concomitant restrictions applicable in such areas. The area included the submerged lands and appurtenant waters . In 1971, the Solicitor of the Department of the Interior pronounced the lower low watermark (Nihoa, Necker, Gardner Pinnacles, and Lisianski) and outer fringing reefs (Pearl and Hermes Reef, French Frigate Shoals, Laysan Island, and Maro Reef) as boundaries of the Refuge.

The State of Hawaii maintains that, despite the unilateral action taken by the Department of the Interior in 1967, only emergent lands are included in the HINWR, thus limiting the jurisdiction of the Federal Government. The State of Hawaii maintains that only emergent lands are included in the HINWR, thus limiting the jurisdiction of the Federal Government. The State Constitution and Statutes maintain that all submerged lands and appurtenant reefs in the archipelagic waters to the territorial limit fall under its jurisdiction.

The HINWR is a part of the National Wildlife Refuge System and is administered and regulated under 50 CFR Sections 25 through 35, inclusive. All activities not specifically authorized by regulation are prohibited by law. Regulations strictly control access, prohibit taking of plant or animal life without a permit, and control land use within Refuges in general.

State of Hawaii revised statutes specify that, except for scientific purposes, the harassment, killing, capture, or possession of any Hawaiian monk seal or its parts in areas under State jurisdiction in the NWHI, including Kure, is prohibited.

Currently , the only inhabitated islands in the NWHI are Green Island (Kure Atoll), Sand Island (Midway Islands), and Tern Island (French Frigate Shoals).

Since 1960, there has been a 20-person U.S. Coast Guard loran station at Green Island. In 1976, on recommendation of the Marine Mammal Commission (MMC), the Commander, Fourteenth Coast Guard District, prohibited dogs at the Kure loran station on Green Island, placed the north end off limits to personnel, prohibited unnecessary vehicle and foot traffic on the beaches, and required a station order regarding "nonharassment" of all wildlife.

Regulations at Midway Naval Air Facility place the spit islands between Sand and Eastern Islands off limits at all times and prohibit the disturbance of monk seals on land and in the water.

The Coast Guard vacated the Tern Island loran station in July 1979. Since that time, the facility has been occupied by a FWS caretaker complement of two to four persons.

Prior to enactment of the Marine Mammal Protection Act (MMPA) in 1972 and the Endangered Species Act (ESA) of 1973, the Hawaii Department of Land and Natural Resources regulated taking of marine mammals and endangered species for scientific or propagation purposes under Chapter 187-4 of the Hawaii Revised Statutes.

Under the MMPA, monk seal management became a Federal responsibility. State jurisdiction over the species was preempted and the National Marine Fisheries Service (NMFS) became the responsible Federal agency. The MMPA prohibits all forms of "take" of monk seals except by permit for scientific research and encourages the growth of the population to the OSP level.

On June 20, 1975, the NMFS requested the MMC's comments and recommendations on a NMFS proposal to declare the Hawaiian monk seal "depleted" under the MMPA. The MMC reviewed the status of the monk seal and, on December 24, 1975, concurred with the NMFS proposal. The MMC further recommended that NMFS designate the Hawaiian monk seal as "endangered" under the ESA.

On July 22, 1976, the Director, NMFS, designated the Hawaiian monk seal as a depleted species under the MMPA (41 FR 30120) and, in a subsequent action (41 FR 33922) on August 11, 1976, proposed listing the monk seal as an endangered species under the ESA. Final rulemaking designating the species as endangered was published and became effective on November 23, 1976 (41 FR 51611).

The ESA, in addition to prohibiting any form of monk seal "take," provides certain mechanisms for the regulation of many indirect impacts on the species. For example, all Federal agencies are required to insure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of the species, or result in the destruction or adverse modification of monk seal critical habitat.

The ESA authorized the appointment of a Monk Seal Recovery Team (Appendix A) to develop this Recovery Plan. It also provides a mechanism by which a "critical habitat" may be designated for the species.

On December 9, 1976, the MMC recommended to the NMFS that, as provided under the ESA, certain portions of the Hawaiian monk seal's range be considered for designation as a critical habitat. On December 5, 1977, the NMFS completed an Environmental Assessment for the "Proposed Designation of Critical Habitat for the Hawaiian Monk Seal (Monachus schauinslandi)" which examined the impacts that would result from the designation of a critical habitat. On March 7, 1980 the Draft Environmental Impact Statement (DEIS) for a critical habitat was officially made available for public review. A public meeting was held in Honolulu on April 28, 1980, to receive comments on the DEIS, and written comments were accepted until May 14, 1980. Since that time, no action has been taken by NMFS, pending completion of this Recovery Plan.

In October 1978, the MMC sponsored a meeting in Seattle, Wash., to identify research needed to define actions to prevent the extinction and encourage recovery of the Hawaiian monk seal. Scientists at that meeting developed a "Five-Year Research Plan for the Hawaiian Monk Seal" (24). This plan provided a good foundation of recommended research needs which were considered in detail in development of this Recovery Plan.

At that 1978 meeting the problem of low pup survival at Kure was discussed, and an experimental shark eradication program was proposed. During the summer of 1981 another solution was tested at Kure. Five female pups were maintained in a beach enclosure to protect them from sharks and adult male seals. This project was an attempt to help define the cause or causes of pup loss and to increase the likelihood of pup survival. The five captive pups remained healthy and were tagged and released in September 1981 (11). Four of the five pups were being sighted regularly at Kure one year after release. Three pups were similarly maintained during the summer of 1982. They will continue to be monitored for survival as well. During the same years, three of six pups in the wild at Kure disappeared. Migration to other atolls is an unlikely cause of this disappearance. Since the captive pups were fed locally caught fish and invertebrates, it is unlikely that food-borne toxicants or diseases were responsible for the loss of the noncaptive seals. Predation by sharks or attacks by adult male seals, therefore, appears to be the probable cause or causes of pup mortality there.

II. Hawaiian Monk Seal Recovery Plan

The objectives of the activities outlined in this Recovery Plan are to: (1) identify and, where possible, mitigate the natural factors causing or contributing to the decreased survival and productivity of monk seals; (2) characterize the marine and terrestrial habitat

requirements of the monk seal, including use patterns and feeding habits; (3) assess the monk seal population and monitor population trends; (4) document and, where possible, mitigate the direct and indirect effects of human activities on monk seals; (5) implement appropriate management actions leading to conservation and recovery of the species ; and (6) develop an educational program to foster greater conservation efforts among the users of the Northwestern Hawaiian Islands and the public.

Specific tasks aimed at meeting these objectives are presented in the Recovery Plan Outline (Section IIA) and are detailed in the Recovery Plan Narrative (Section IIB). An Implementation Schedule (Section III>, setting out priorities for these tasks and identifying the responsible Federal and State agencies, follows the narrative.

A. Recovery Plan Outline

1. Identify and mitigate, where possible, those natural factors causing or contributing to decreased survival and productivity.

1.1 Develop baseline data on diseases

1.11 Perform autopsies

1.111 Determine parasite types and load

1.112 Culture bacterial and viral agents

1.113 Collect tissue samples

1.12 Study sick seals

1.121 Document signs of disease and collect specimens

1.122 Assay serum

1.123 Treat sick animals

1.124 Institute a rescue and rehabilitation program

1.13 Develop standard procedures and forms

1.14 Assess relationship between monk seals and ciguatera

1.141 Assess and monitor ciguatera in prey food items

1.142 Assess ciguatera toxicity to monk seals

1.143 Develop treatment methods

1.2 Determine inter- and intraspecific behavior that may affect survival

1.21 Develop information on monk seal and shark interactions

1.211 Determine rates of scarring due to sharks

1.212 Determine extent of interactions

1.213 Estimate shark abundance

1.214 Identify acceptable measures to reduce monk seal mortality by sharks

1.22 Investigate possible impacts of skewed adult sex ratio

1.221 Develop information on incidence, distribution, and results of adult male monk seal attacks on adult females and young seals

1.222 Determine extent of aggressive behavior and association patterns among males

1.223 Correlate sex ratios, observed incidents, and mortality levels

1.23 Evaluate monk seal and pup intraspecific behavior

1.231 Determine effects of female behavior and condition on pup survival

1.232 Determine incidence and causes of pup desertion

1.3 Examine the relationship between habitat types and population characteristics

1.4 Determine time and causes of pup and juvenile mortality and possible mitigation measures

1.5 Determine time and causes of adult female mortality and possible mitigation measures

2. Identify habitat requirements and determine, characterize, and monitor areas of special biological importance

2.1 Document biological and physical characteristics of habitats

2.11 Describe present haul-out and pupping sites

2.12 Document biological and physical characteristics of all marine habitats

2.13 Identify and characterize marine habitats of special biological significance

2.14 Compare biological and physical characteristics of French Frigate Shoals and Pearl and Hermes Reef

2.15 Identify threats to habitat

2.16 Survey habitats following changes in use patterns

2.2 Study food preferences, requirements, and availability

2.21 Collect scat and spew samples

2.211 Develop reference collection of fish and invertebrate parts

2.212 Analyze collected scat and spew samples

2.22 Quantify monk seal take of commercially important fish and invertebrates

2.3 Determine extent of monk seal habitat in NWHI

2.31 Determine depth of food resources

2.311 Evaluate effects of dive recorders on seals

2.32 Determine haul-out activity patterns

2.321 Evaluate effects of radio packages on seals

2.33 Determine feasibility of sonic or radio tags

2.331 Determine potential interference with monk seal vocalizations

2.332 Evaluate shark attraction potential

2.34 Compare marine habitat use in atolls with extensive shallow-water areas and those without

2.35 Characterize the haul-out and pupping habitats relative to use patterns

2.36 Document seal sightings from pelagic studies and fishing logs

3. Monitor monk seal populations

3.1 Evaluate and select assessment techniques

3.11 Develop and implement standard forms and procedures

3.12 Determine effects of flipper tagging and institute tagging program

3.121 Evaluate tags

3.122 Test predator attraction potential of tags

3.123 Modify and/or select alternative tags

3.13 Determine temporal use of haul-out beaches

3.14 Monitor distribution of hauled-out seals

3.15 Evaluate aerial census techniques

3.151 Assess techniques

3.152 Test validity of techniques

3.16 Examine the use of natural marks for re-sighting program

3.2 Monitor population status

3.21 Design and initiate tagging program

3.22 Monitor population trends at each atoll

3.221 Census haul-out locations

3.222 Estimate pup production

3.223 Estimate reproduction rate

3.224 Estimate age at sexual maturity

3.225 Estimate survival rates

3.23 Estimate monk seal populations at each atoll

3.231 Determine optimal estimation method

3.24 Collect and compare life history data and population characteristics

4. Document effects of human disturbance

4.1 Summarize historical information

4.2 Document information on interactions with fisheries

4.3 Monitor and document monk seal response to human activity

4.4 Assess effects of research activities on monk seals

5. Implement management actions

5.1 Limit access to selected haul-out locations

5.11 Limit access to selected islets at French Frigate Shoals, Pearl and Hermes Reef, Kure Atoll, and Midway Is lands

5.12 Limit research at French Frigate Shoals

5.13 Consider overlay Wildlife Refuge status for Midway

5.14 Move loran station in order to reduce personnel at Kure Atoll

5.15 Enhance enforcement and data collection efforts at Kure and Midway

5.16 Reevaluate off limits zone at Green Island, Kure Atoll

5.17 Enforce existing protective measures

5.171 Require Special Use Permits within Refuge

5.172 Prohibit disturbance of monk seals within Kure **Seabird** Sanctuary

5.173 Enforce Marine Mammal Protection Act and Endangered Species Act and carry out Section 7 consul tat ions

5.18 Coordinate research activities to minimize human disturbance of seals

5.2 Initiate other recommended actions

5.21 Designate Critical Habitat

5.22 Centralize deposition of monk seal survey data

5.23 Complete mass mortality reaction plan

5.24 Evaluate and expand, if appropriate, pup "headstart" project

5.25 Institute shark control measures, if appropriate

5.26 Assess feasibility and advisability of returning rehabilitated monk seals to the wild

5.27 Develop response plan for oil and chemical spill

5.28 Investigate methods to alleviate potential problems resulting from discarded fishing gear

5.29 Interpret research results and initiate appropriate management actions

6. Develop educational and interpretive program

6.1 Distribute informative material to all users of NWHI

6.2 Develop displays and materials for use on Midway and Kure and conduct interpretive programs

6.3 Prepare educational material for public distribution

B. Recovery Plan Narrative

The Hawaiian monk seal has declined and may be continuing to decline throughout a substantial portion of its range. Every effort must be made to identify and, where appropriate, eliminate or modify factors, including human activities, that are causing or contributing to decreased survival and productivity of the species and to the degradation and destruction of habitat critical to its survival. These efforts should stop the decline of the species and allow it to increase to its optimum sustainable population level, as defined by the MMPA and subsequent interpretive definitions.

The MMPA, as amended, defines "optimum sustainable population" as "the number of animals which will result in the maximum productivity of the population or the species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem **of which they form a constituent** element." The NMFS has interpreted this statutory definition to mean "a population size that falls within a range from the population level of a given species or stock which is the largest supportable within the ecosystem to the population level that results in maximum net productivity. "

Available information is insufficient to make reliable estimates of the largest monk seal population that could be supported in the NWHI ecosystem or the population level that would result in maximum net productivity. Obtaining the information needed to make these estimations will require several years of

directed research. Therefore, a quantitative definition of "recovery" is not stated in this plan. The following milestones or intermediate goals can, however, be identified: (1) stopping the downward trend in numbers of monk seals in the central and western portions of the species range; (2) taking action to develop positive growth rates at most or all islands; (3) identifying and preventing human activities that could result in the degradation or destruction of habitats or habitat components critical to the survival and recovery of the species; and (4) determining the population level which will result in maximum net productivity.

Section 1.1 of the Recovery Plan Outline addresses the need to develop baseline disease information on the species. Although dead or apparently sick monk seals are found only occasionally, these animals should be utilized as completely as possible to identify the causes of their condition. For dead seals, a thorough autopsy, including gross and microscopic pathologic examination of all organ systems, identification of potential disease agents, and toxicological testing of tissues should be performed (Section 1.11).

Sick seals should also be utilized to identify disease problems in the population as a whole (Section 1.12). Notation of the clinical disease signs displayed by an individual animal will aid in identification of the disease and recognition of it when it reappears. Tests to be performed on sick animals include collecting blood and culture specimens, and assaying serum for baseline antibody titers to various diseases. Appropriate treatments must be determined and then should be administered as necessary to bring about recovery. A rescue and rehabilitation program should be established to aid in development of disease information and treatment programs, and to help develop and test procedures for maintaining monk seals in captivity. This effort should also address the feasibility and advisability of establishing one or more self-sustaining captive breeding populations and of returning rehabilitated animals to the wild.

Item 1.13 identifies the need to develop uniform procedures for examining animals, collecting specimens, and recording data collected from live or dead seals. This would include the development of standardized forms for autopsies, morphometrics, etc.

Ciguatera is a potential problem for monk seals throughout the NWHI and the toxin has been detected in some samplings of monk seal prey species. The work outlined in Section 1.14 will help in determining the extent of this threat and whether treatment is a reasonable option when a large number of seals are affected. Specifically, it will be necessary to determine the levels and distribution of ciguatoxin in prey food items, to assess the effect of ciguatoxin on monk seals, and, using a model seal of another species, to develop and test a treatment method that could be applicable to monk seals.

The degree of monk seal mortality that results from shark attack and from traumatization of young seals and adult females by male monk seals is unknown (Section 1.2). To develop information relative to the shark problem, it will be necessary to: determine season-, atoll-, sex- and age-specific rates of scarring due to sharks; determine the extent of interaction between monk seals and sharks; and estimate the abundance of sharks at specific islands and atolls. Monk seal and shark interaction, when observed during other monk seal studies or other projects, should be recorded, and observational studies directed at analyzing the frequency and effects of the interaction should be initiated at locations where a significant problem exists. Mitigation of such a problem should be attempted only after the potential impact of such mitigation measures on the entire ecosystem is considered and evaluated (28).

Certain intraspecific behavior among monk seals appears to be counterproductive to the health of the population (Section 1.22). The imbalance in adult sex ratios evident at various islands may also contribute to certain apparently counterproductive behavior, including traumatization of immature seals and adult females by adult males. Research efforts in this area should include collection of information on similar behavior and its causes among other species, and assessment of the relationship between the imbalanced sex ratio and mortality of immature seals and adult female seals. Information obtained should be reviewed to determine the feasibility and advisability of attempting to either modify seal behavior or adjust sex ratios on particular islands. The means of accomplishing this must also be evaluated. Investigations into pup survival should include determining the incidence and causes of pup desertion by their mothers, and the extent to which other behavior patterns and the physical condition of the mother af fect pup survival (Section 1.23).

Pup survival appears to vary greatly among atolls, which warrants an examination of the relationship among pup survival, habitat types, and various population characteristics (Section 1.3).

Survival of monk seals to the age of recruitment and survival of adult females appears to be critical to the recovery of the monk seal population. Determination of the time and causes of this mortality is of high importance (Sections 1.4 and 1.5). Data from which these determinations can be made will come from other research in this Plan, but, because of their significance, the problems are specifically stated here.

Section 2 identifies the need to characterize the marine and terrestrial habitat requirements and the temporal and spatial use patterns and feeding habits of the monk seal. Documentation of the biological and physical characteristics of the monk seal habitats in the NWHI may help to explain some of the differences between populations (Sections 2.11 and 2.12) and will also identify habitat areas of special biological significance such as

those for mating and feeding (Section 2.13). A comparative study of the biological and physical characteristics of French Frigate Shoals and Pearl and Hermes Reef habitats is warranted because Pearl and Hermes Reef now supports only 15% of the number of seals found on French Frigate Shoals although the two habitats appear generally similar (Section 2.14).

Thorough documentation of present patterns and distribution of haul-out will permit future assessment of impacts on the population and enable more knowledgeable management decisions concerning activities affecting the habitat or the seals directly (Sections 2.15 and 2.16).

Studies of monk seal food preferences, requirements, and availability are incomplete and should be continued to document variations among atolls, seasons, and age and sex classes (Section 2.21). A reference collection of fish and invertebrate parts (bones, scales, teeth, otoliths, statoliths, beaks, etc.) should be prepared to aid in this analysis (Section 2.211). At present, not all of the items recovered in scats can be identified as belonging to a particular prey species. Analysis of scat and spew samples collected during 1981 and 1982 must be completed (Section 2.212).

Quantification of monk seal predation on commercially important fish and invertebrates will permit fishery management plans to be developed with this consideration in mind (Section 2.22). One concern is the monk seal's utilization of the spiny lobster resource in the NWHI.

Habitat use studies should include a comparison of the two major types of habitat in the NWHI, i.e.:, those with extensive shallow reef flats and those without. Instrumentation such as depth-of-dive recorders, radio transmitters, and sonic tags appears to be the most efficient means of obtaining this information, but these methods should be evaluated for their potential impact on monk seal behavior (Sections 2.31, 2.32, 2.33, and 2.34). Controlled evaluations of equipment attachment techniques using adult male seals should be completed before the instruments are used on females and other age classes of seals. Evaluation of sonic tags must include testing their efficacy in a coral reef environment and determining whether the frequencies used may affect the behavior of seals or sharks.

Further characterization of habitat requirements should include assessment of haul-out and pupping habitats relative to use patterns (Section 2.35). The summarization of pelagic monk seal sighting notes obtained during Tripartite Agreement studies (involving the NMFS, the FWS, and the State of Hawaii) and from logs of fishing vessels will help define the offshore spatial distribution of the seals (Section 2.36).

Population assessment studies are essential to define problems within the monk seal population and to monitor the

recovery efforts (Section 3). Standard monk seal sighting and census forms and procedures should be developed and implemented as soon as possible. A method of following individual monk seals from time of weaning through adult life is necessary to develop most of the information needed for improved management of the species. Mortality and reproductive data are especially important. A pilot tagging project was initiated in 1982 using weaned pups. If this evaluation demonstrates an acceptable minimal disturbance of the seals and if the tags are satisfactory, the program should be expanded the following year (Section 3.12). If radio transmitters are proven to be satisfactory, they should be used to define temporal use of haul-out beaches for all age and sex classes (Sections 2.321 and 3.13). This information will be used in population assessment work attempting to correlate beach counts to population size at a particular atoll. Biologists are currently collecting 12-month haul-out information on some seals at Kure Atoll and Tern Island and this may give some insight into patterns at these locations (Section 3.14).

Evaluation of aerial census techniques at French Frigate Shoals should be completed (Section 3.15). This includes assessing the techniques as a means of determining total numbers and age classes of hauled-out seals and testing the validity of aerial photographic determination of pup production, accounting for temporal haul-out patterns of mother-pup pairs and weaned pups. This evaluation may lead to a more economical method of monitoring the seal populations in the NWHI.

The use of naturally marked animals to develop information on certain population parameters, haul-out patterns, and interatoll movements should be continued (Section 3.16).

Using techniques which have been described here and evaluated (Section 3.1), the monk seal population should be monitored closely to develop as much information as possible to aid in identification of the problems. This should include design and initiation of a tagging program if the pilot study demonstrates it is acceptable (Sections 3.12, 3.21 and 3.22).

The total abundance of monk seals should be estimated on an atoll-by-atoll basis on a schedule dictated by apparent trends in each population (Section 3.23). The population data should be used for an analysis of relationships among population growth rate, fecundity, age of first reproduction, longevity, and survival to assist in definition of problems (Section 3.24).

Human disturbance of seals has been implicated as a major factor contributing to reduction in numbers of seals at Kure Atoll and Midway. This and other documented and anecdotal information on the impact of human disturbance on monk seals and other pinniped species should be summarized. This report could serve as a reference in evaluating the impact of proposed human activities (Section 4.1). Monk seal and fishery interaction should also be summarized in a report (Section 4.2). This would involve

interviewing fishermen who frequent the NWHI to obtain their accounts of interactions and observations of monk seal behavior. Information gained would be combined with that from documented reports of observers, researchers, and others. Data on discarded fishing nets and line and the implications of this on monk seal mortality rates should be collected and analyzed. Based on experience with other marine mammals and other fisheries, this could pose a significant threat to the monk seal, and it is important to determine the extent of the problem.

A systematic program designed to record monk seal responses to human activities in their environment should be initiated (Section 4.3). To ensure the validity of information developed during research studies on the monk seal and also to help quantify the seals' responses to human activities, all research projects, when possible, should be designed to include collection of data on the disturbance effects of the research itself (Section 4.4).

In developing this Recovery Plan, the Recovery Team addressed many management actions which should be initiated.

Access to certain smaller islands which are heavily used by monk seals should be restricted because of the high probability of disturbance (Section 5.1). These include islands at French Frigate Shoals (Round, Disappearing, Shark, Gin, Little Gin, Mullet, and Bare); Pearl and Hermes Reef (Little North, North, and Seal-Kit tery); and Kure Atoll (Sand and Shark Islands). Al though few seals are currently found at Midway, the sand spit islands and Eastern Island at Midway should also be restricted to encourage recovery of the monk seal population there. These sand spits are already designated "off limits;" however, it has been apparent in recent years that they are regularly visited by persons in the area.

The majority of the Recovery Team members believe strongly that monk seal research on French Frigate Shoals, as well as other activities on these islands should be strictly controlled (Section 5.12). Beach counts at the atoll account for about one-half of the total counts of seals in the NWHI and pup production is also estimated to be much higher at this atoll than at any other location. Therefore, there is a potential for disturbing a large portion of the monk seal population.

Overlay Wildlife Refuge status for Eastern Island and the sand spits at Midway is recommended to provide needed supervision and control over these haul-out and pupping sites (Section 5.13). At Kure Atoll monk seals are disturbed many times a day on the beaches of Green Is land, and less frequently at Sand and Shark Islands. The recommended solution is to move the U.S. Coast Guard loran station from Kure to Midway or, at a minimum, to reduce the number of personnel at Kure. This would make beach access restrictions easier to enforce (Section 5.14). The Recovery Team believes that placement of full-time wildlife protection agents/ biologists at Kure and Midway is the only means by which present and future access limitations can be enforced (Section 5.15).

The current off limits area at Green Island is used predominantly as a haul-out beach for adult male and immature monk seals of both sexes. Four of five pups in 1982, 10 of the 11 pups in 1981, as well as most of the 1980 pups were born at locations outside of the present off limits zone. The off limits zone should be renegotiated with the Coast Guard to protect the most important pupping, nursing, and adult female hauling beaches (Section 5.16).

Section 5.17 lists the existing regulations and protective measures which should be vigorously supported and enforced. These include: requirements of the HINWR for special use permits covering all activities within the Refuge; State of Hawaii regulations prohibiting the disturbance of monk seals within the Kure Seabird Sanctuary; provisions of the MMPA and the EPA, including the requirement for Section 7 consultations on all Federal actions that could impact the monk seal population in the NWHI (such as Coast Guard activities at Kure, Navy activities at Midway, and the fishing activities allowed in fishery management plans under the Magnuson Fishery Conservation and Management Act of 1976).

Efforts should also be made to coordinate monk seal research and other research activities on the islands in an attempt to reduce the disturbance of monk seals and other endangered and threatened species by minimizing the number of field trips and personnel involved (Section 5.18).

The Recovery Team's statement on designation of critical habitat is appended to this plan (Appendix A). In summary, the majority of the team members believe that critical habitat should be designated with the boundary set at the 20-fathom isobath around all monk seal haul-out islands in the NWHI and Maro Reef (Section 5.21).

The NMFS, Southwest Fisheries Center, Honolulu Laboratory, should become a central depository for all information on monk seal surveys, collecting all presently available census data and arranging to receive copies of all future data (Section 5.22).

The monk seal mass mortality reaction plan developed with the support of the MMC should be completed as a response guideline in the event that an incident similar to the 1978 die-off at Laysan Island should occur (Section 5.23).

The "head start" project conducted at Kure Atoll in 1981 and 1982, in which monk seal pups were collected and maintained in captivity for a brief time to increase the probability of their survival, should be fully evaluated (Section 5.24). Based on the results of this evaluation, a determination should be made whether to continue the project to assist recovery of the Kure population.

Shark control efforts may also be appropriate under certain conditions as a means of increasing monk seal survival, but such

actions could have major impacts on shark populations and the ecosystem of which they are a part. Thus, such measures should be carefully evaluated before implementation (Section 5.25).

Occasionally, sick and injured seals and, more rarely, abandoned pups are found which may benefit from a rehabilitation program. Procedures and facilities to enable such care of monk seals should be established and the feasibility and advisability of reintroducing these animals to the wild should also be examined (Section 5.26).

A response plan for dealing with spills of oil or other hazardous substances in the NWHI should be developed (Section 5.27).

Lost and discarded fishing net and line appear to be causing a significant problem for monk seals, and efforts should be made to determine possible solutions (Section 5.28). Both aspects of this situation should be examined; i.e., how to deal with material that has already been discarded and how to reduce the amount of gear which may be disposed of at sea. Appropriate management actions, such as disposal of discarded material that washes up on the beach, should be addressed.

Section 5.29 refers to research work that is proposed elsewhere in this Plan. The Recovery Team believes that the information which will be obtained through this research will help support recovery of the Hawaiian monk seal. Interpretation of research data may indicate that certain management actions are necessary to encourage recovery. In these cases the appropriate agency must take the action indicated.

An educational program addressing the need for monk seal conservation and methods of achieving this should be developed for the public, military, and special interests (Section 6). Informative material detailing the problems and outlining corrective measures should be prepared and distributed to fishermen, researchers, boaters, military personnel, and other visitors to the NWHI. Permanent displays and supplementary materials should be developed for installation and distribution at Kure Atoll and Midway Islands, and interpretative programs should be carried out on a regular schedule for personnel at these locations. More general educational material should be distributed to the public, particularly through the State of Hawaii school system.

III. Implementation Schedule

The implementation schedule for this Hawaiian Monk Seal Recovery Plan is detailed in Table 2. The schedule identifies the tasks (from the Recovery Plan Outline), priorities, responsible agencies, current status of the tasks with starting and completion dates, and funding estimates. The priority listings of 1, 2, or 3 reflect the majority view of the Hawaiian Monk Seal Recovery Team.

A starting and/or completion date has not been indicated for some tasks. This reflects several major problems in planning. One is the high cost of vessel charters which makes access to much of the population impossible with a low funding base in the program. For example, a 23-day charter in 1982 to transport personnel between islands, provide access to Pearl and Hermes Reef for 4 days, and resupply the field camps cost over $41,000.

The NOAA ship Townsend Cromwell, when available, is used to set up or remove personnel and camp supplies at no cost to the NMFS program; however, little of its time is scheduled in the NWHI in the next 2 years. A questionable base funding level together with these uncertain charter requirements and costs make it difficult to realistically project time schedules.

Estimated task fundings in the Implementation Schedule (Table 2) do not include transportation costs which will vary greatly year to year, dependent on NOAA vessel costs to maintain a thorough program of population monitoring, and pup tagging could be as high as $100K for a single field season.

The scope of some of the future tasks is dependent on analysis of data yet to be completed. It is therefore, important that the Recovery Team meet and review the research findings and population status at least biennially to reassess the priorities and update the Plan.

IV. Literature Cited

1. Alcorn, D. J., unpublished observation.

2. Andre, J. B., and R. Ittner.
   1980. Hawaiian monk seal entangled in fishing net. ʻElepaio 41: 51.

3. Balazs, G. H. Unpublished observations.

4. Balazs, G. H., and G. C. Whittow.
   1979. First record of a tiger shark observed feeding on a Hawaiian monk seal. ʻElepaio 39 :107-109.

5. Clapp, R. B., and P. W. Woodward.
   1972. Atoll Research Bulletin 164. The Natural History of Kure Atoll, Northwestern Hawaiian Islands, p. 303-304.

6. DeLong, R. L. Unpublished observations.

7. DeLong, R. L. , G. L. Kooyman, W. G. Gilmartin, and T. Loughlin.
   In press. Hawaiian monk seal diving behavior. Proceedings of Marine Mammals and Man Symposium of the Third International Theriological Congress, Helsinki, 15-20 August 1982. Acta Biol. Fennica, Vol. IV.

8. DeLong, R. L., and W. G. Gilmartin. Unpublished report.

9. DeLong, C. H. Fiscus, and K. W. Kenyon.
1976. Survey of monk seal (Monachus schauinslandi) populations of the Northwestern (Leeward) Hawaiian Islands. Preliminary Report. NMFS Northwest Fisheries Center, Marine Mammals Division, Seattle, Washington, May. Processed Report, 36 p.

10. Fowler, C. W.
1982 (see attached for ref.)

11, Gilmartin, W. G. Unpublished observations.

12. Gilmartin, W. G., R. L. DeLong, A. W. Smith, L. A. Griner, and M. D. Dailey.
1980. An investigation into unusual mortality in the Hawaiian monk seal, Monachus schauinslandi. In R. W. Grigg and R. T. Pfund (editors), Proceedings of the symposium on Status of Resource Investigations in the Northwestern Hawaiian Islands, April 24-25, 1980, University of Hawaii, Honolulu, Hawaii. Sea Grant Misc. Rep. UNIHI-SEAGRANT-MR-80-04, p. 32-41.

13. Harrison, C. Unpublished observations.

14. Henderson, J. R., unpublished observation.

15. Johnson, A. M. Unpublished manuscript.

16. Johnson, A. M., R. L. DeLong, C. H. Fiscus, and K. W. Kenyon.
1982. Population status of the Hawaiian monk seal, (Monachus schauinslandi), 1978. J. Mammal. 63:415-421.

17. Johnson, B. W., and P. A. Johnson.
1978. The Hawaiian monk seal on Laysan Island: 1977. U.S. Department of Commerce, National Technical Information Service, No. PB-285-428, 38 p.

18. Johnson, B. W., and P. A. Johnson.
1981. The Hawaiian monk seal on Laysan Island: 1978. Report to the Marine Mammal Commission.

19. Johnson, B. W., and P. A. Johnson.
1981. Estimating the monk seal population on Laysan Island. Report to the Marine Mammal Commission.

20. Johnson, P. A., B. W. Johnson, and L. T. Taylor.
1981. Interisland movement of a young Hawaiian monk seal between Laysan Island and Maro Reef. 'Elepaio 41:113-114.

21. Kenyon, K. W.
1972. Man versus the monk seal. J. Mammal. 53:687-696.

22. Kenyon, K. W.
1973. Hawaiian monk seal (Monachus schauinslandi). Seals. Proceedings of a Working Meeting of Seal Specialists on Threatened and Depleted Seals of the World, held under the auspices of the Survival Service Commission of IUCN, 18-19 August 1972, University of Geulph, Ontario, Canada, p. 88-97. Int. Union Conserv. Nat. Nat. Resour.

23. Kenyon, K. W.
1977. Caribbean monk seal extinct. J. Mammal. 58:97-98

24. Kenyon, K. W.
1978. A five year research plan for the Hawaiian monk seal. Unpublished report to the Marine Mammal Commission.

25. Kenyon, K. W.
1980. Hawaiian monk seal observations at Kure Atoll 17 June-3 July 980. Unpublished report.

26. Kenyon, K. W.
1980. No man is benign, the endangered monk seal. Oceans, May, p. 48-54.

27. Kenyon, K. W., and D. W. Rice.
1959. Life history of the Hawaiian monk seal. Pac. Sci. 13:215-252.

28. Nolan, R. S.
1981. Shark control and the Hawaiian monk seal. Mar. Mammal Comm. PB82-201808, p.

29. Ray, C. E.
1976. Geography of phocid evolution. Syst. Zool. 25:391-406.

30. Schreiber, R. W., and E. Kridler.
1969. Occurrence of an Hawaiian monk seal (Monachus schauinslandi) on Johnston Atoll, Pacific Ocean. J. Mammal. 50:841-842.

31. Ittner, R. Unpublished observations.

32. Shallenberger, E. Unpublished observations.

33. Shallenberger, R., and R. Ittner. Unpublished observations.

34. Taylor, L. R., and G. Naftel.
1978. Preliminary investigations of shark predation on the Hawaiian monk seal at Pearl and Hermes Reef and French Frigate Shoals. U.S. Marine Mammal Commission Report No. 7AC011, NTIS Publ. No. PB-285-626, 34 p.

35. Whittow, G. C., G. H. Balazs, and G. D. Schmidt.
1979. Parasitic ulceration of the stomach in a Hawaiian monk seal (Monachus schauinslandi). 'Elepaio 38:83-84.

36. Wirtz, W. 0.
1968. Reproduction, growth and development, and juvenile mortality in the Hawaiian monk seal. J. Mammal. 49:229-238.

Table 1.--Summary of censuses of Hawaiian monk seals, Monachus schauinslandi, in the Northwestern Hawaiian Islands, 1957-82.

Year and reference	Nihoa Island	Necker Island	French Frigate Shoals	Gardner Pinnacles	Laysan Island	Lisianski Island	Pearl and Hermes Reef	Midway	Kure Atoll	Total
1957 spring[1]	--	--	35	--	233	256	290	71	128	1,013
1958 spring2	--	--	43	--	326	281	338	76	1 4 2	1,206
1964 Mar.3	1	--	--	--	310	180	121	--	--	612
1964 Sept.3	1	6	43	--	252	121	88			511
1966 Sept.4	--	10	55	5	202	139	109	1		521
1967 Mar.3	0	12	66	--	199	139	5 80	--	--	496
1967 Sept.6	--	15	95	--	181	108	107	--		506
1968 Mar.6	--	--	--	--	167	123	5 96	1	69	456
19697	--	20	159	6	211	130	153	4	--	683
19708	--	--	166	--	147	109	122	7	--	551
19759	--	--	274	--	139	95	18	5	47	578
197610 Mar.-Apr.	0	1	195	--	186	127	26	1	29	565

Table 1. --Continued.

year and reference	Nihoa Island	Necker Island	French Frigate Shoals	Gardner Pinnacles	Laysan Island	Lisiansk: Island	Pearl and Hermes Reef	Midway	Kure Atoll	Total
1976[11]	--	--	269	--	236	126	30	1	32	694
1977 April[12]	--	46	223	--	178	106	43	5	24	625
1978 May[13]	0	22	199	--	--	86	--	--	--	--
1978 July[14]	4	30	196	--	113	85	26	3	45	502
1979 May[15]	12	34	241	--	107	96	28	3	41	562
1980 May-June[16]	8	21	258	--	120	84	27	0	18	536
1981 May[17]	9	17	222	--	86	88	41	5	28	496
198218	8	24	297	6	90	81	29	2	24	561

Legend:

1. Highest count: various aerial and surface counts made (Kenyon and Rice 1959).
2. Highest count; various aerial and surface counts made (Rice 1960).
3. Surface counts (Kridler letter 1966).
4. Surface counts.
5. Incomplete counts.

Legend (continued):

6. Kenyon, K. W. 1973. Hawaiian monk seal, Monachus schauinslandi. Int. Union Conserv. Nat. Nat. Sosour., Morges, Switz., IUCN Pub. New Ser., Suppl. Pap. 39, p. 88-97.
7. Counts (except for Midway) are from HINWR unpublished report by E. Kridler. Counts are selected highest made in February, March, August, and June 1969.
8. Counts (except for Midway) are from HINWR unpublished report by E. Kridler counts are selected highest made in April, July, and August 1970.
9. Counts in March, May, and August by Sekora and Sincock (FWS), Iverson (NMFS), and Nolten (USN).
10. Counts of 18 March to 9 April by DeLong, Fiscus, and Kenyon.
11. DeLong, R. L. 1976. Current information on Hawaiian monk seals (combined 1976 counts). Food and Agric. Organ. U.N., Adv. Comm. Mar. Resour. Res., FAO ACMRR/MM, 4 p.
12. DeLong, R. L. and R. L. Brownell. 1977. Hawaiian monk seal, Monachus schauinslandi, habitat and population survey in the Northwestern (Leeward) Hawaiian Islands, April 1977. Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest and Alaska Fish. Cent,, Seattle, Wash., Processed Rep., 43 p.
13. DeLong, R. L. 1978. Investigation of Hawaiian monk seal mortality at Laysan, Lisianski, French Frigate Shoals, and Necker Island, May 1978. Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest Alaska Fish. Center, Seattle, Wash., Interim rep., 22 p.
14. Fiscus, C. H., A. M. Johnson, and K. W. Kenyon. 1978. Hawaiian monk seal (Monachus schauinslandi) survey of the Northwestern Hawaiian Islands, July 1978. Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest Alaska Fish. Cent., Seattle Wash., Processed rep.
15. Rauzon, M. J., Survey of Hawaiian monk seal, Monachus schauinslandi, Northwestern Hawaiian Islands, 9-25 May 1979. Unpublished rep.
16. Counts in May and June from Townsend Cromwell cruise report for TC-80-03, 1980.
17. Aerial survey of NWHI, May 1981. FWS and NMFS, Honolulu.
18. From counts March-August 1982. Indicated are the means where more than one was performed. W. G. Gilmartin, NMFS, Honolulu.

Table Z.--Implementation schedule for Hawaiian Monk Seal Recovery Plan.

Task	Title	Priority	Agency	Start date	End date	Estimated cost $1,000 ()	Status/comments
1.	CAUSES OF DECREASED SURVIVAL OR PRODUCTIVITY						
1.1	Baseline disease data						
1.11	Autopsies	1	NMFS, FWS,	1978	Con.	2/yr (3.2)	Performed as specimens are available
1.111	Parasites	1	NMFS	1978	Con.	(1.11)	Scats/spews/autopsy materials being examined
1.112	Bacteria/viruses	1	NMFS	1978	Con.	(1.11)	Performed at autopsy, as possible
1.113	Tissue collection	1	NMFS, FWS	1978	Con.	(1.11)	Performed at autopsy
1.12	Study sick seals	2	NMFS	1980	Con.	3/yr (3.2)	Scheduled only as part of mass die-off investigation, or incidentally
1.121	Document diseases	2	NMFS	1980	Con.	(1.12)	do
1.122	Serum assay	2	NMFS	1980	con.	(1.12)	do
1.123	Treat sick seals	2	NMFS	1980	N.D.	(1.12)	do
1.124	Rehabilitation program	2	NMFS	N.D.	1983	38/yr	Not scheduled
1.13	Standard forms/procedures	1	NMFS	1982		0	N.D.
1.14	Effects of ciguatera	2	NMFS	1978			N.D.
1.141	Ciguatoxin exposure	3	NMFS, H	N.D.		6/yr (3.2)	Prey species identification and ciguatoxin testing ongoing
1.142	Ciguatoxin toxicity	2	NMFS	1978	1983	0	Development of circumstantial evidence
1.143	Ciguatoxin treatment	1	NMFS	1982	1984	19	Contract work to develop treatment ongoing
1.2	Behaviors affecting survival						Observations incidental to other tasks
1.21	Monk seals and sharks						do
1.211	Scarring rate	2	NMFS, FWS, H	1977	N.D.	9	do
1.212	Extent of interactions	2	NMFS, FWS, H	N.D.	N.D.	(1.211)	
1.213	Shark abundance	3	NMFS, FWS, H	N.D.	N.D.	?	
1.214	Reduce mortality from sharks	2	NMFS, FWS, H	1981	N.D.	4	Kure Atoll pup captive maintenance
1.22	Impact of sex ratio	1	NMFS, FWS, H	1982	N.D.	16/yr (3.2)	Expanded data collection being scheduled for 1983
1.221	Hale attack data	1	NMFS, FWS, H	1982	N.D.	(1.22)	do
1.222	Male behavior/association	1	NMFS, FWS, H	1982	N.D.	(1.22)	do
1.223	Sex ratios/mortalities	1	NMFS	1982	N.D.	(1.22)	do
1.23	Female/pup behavior	2	NMFS, FWS, H	N.D.	N.D.	31	Incidental assessment
1.231	Female behavior/pup survival	2	NMFS, FWS, H	N.D.	N.D.	(1.23)	do
1.232	Pup desert ion	3	NMFS, FWS, H	N.D.	N.D.	(1.23)	do

Table 2.--Continued.

Task	Title	Priority	Agency	Start date	End date	Estimated cost $1,000 ()	status/comments
1.3	Habitat/population characteristics	2	NMFS, FWS, H	N.D.	N.D.	29	
1.4	Pup/ juvenile mortality	1	NMFS, FWS,H	1977	N.D.	32 (3.2)	
1.5	Adult/female mortality	1	NMFS, FWS, H	1977	N.D.	(1.4)	
2.	HABITAT REQUIREMENTS						
2.1	Habitat characteristics		NMFS, FWS, H	N.D.	N.D.	35	
2.11	Haul-out and pupping sites	1	NMFS	1982	1984	(2.1)	
2.12	All marine habitat	3	NMFS, FWS, H	1977	N.D.	(2.1)	Ongoing tripartite assessment
2.13	Special marine habitat	1	NMFS, FWS, H	1980	N.D.	(2.1)	Ongoing depth-of-dive study in all age classes
2.14	Compare French Frigate Shoals and Pearl and Hermes	2	NMFS, FWS	N.D.	N.D.	(2.1)	
2.15	Threats to habitat	1	NMFS	1976	N.D.	?	
2.16	Use pattern changes	1	NMFS	1980	N.D.	?	As necessary
2.2	Food						Status report in 1983
2.21	Collect scats/spews	1	NHFS, FWS	1976	Con.	22/yr (3.2)	
2.211	Reference collection	1	NMFS	1982	1984	20	
2.212	Identify prey species	1	NMFS	1976	Con.	(2.21)	
2.22	Seal take of commercial species	3	NMFS	1976	N.D.	?	Lobster feeding trials, 1983
2.3	Extent of monk seal habitat						
2.31	Depth of food	1	NNFS	1980	1984	76 (3.2)	Depth-of-dive study in all age classes, 1982-83
2.311	Effects of dive recorders	1	NMFS	1982	1983	0	
2.32	Haul-out patterns	1	NMFS	1980	1984	16 (2.31)	Radio-hauling study in all age classes, 1982-83
2.321	Effects of radios	1	NMFS	1982	1983	0	
2.33	Feasibility of sonic or radio tags	2	NMFS	N.D.	N.D.	?	
2.331	Interference with vocalizations	2	NMFS	N.D.	N.D.	10	
2.332	Shark attraction	2	NMFS	N.D.	N.D.	5	
2.34	Compare marine habitat use	3	NMFS	N.D.	N.D.	12	
2.35	Beach use patterns	2	NMFS	N.D.	N.D.	5	
2.36	Sightings summarization	3	NNFS	1977	N.D.	5	

Table Z.--Continued.

Task	Title	Priority	Agency	Start date	End date	Estimated cost $1,000 ()	Status/comments
3.	MONITOR SEAL POPULATION						
3.1	Evaluate and select technique					0	
3.11	Develop standard forms	1	NMFS	1982	1983		
3.12	Effects of flipper tagging	1	NMFS	1982	1983	7	Field work 1982; analysis and report 1983
3.121	Evaluate tags	1	NMFS	1981	1984	(3.2)	
3.122	Predator attraction	2	NMFS	1983	1984	10	
3.123	Modify and select tags	1	NMFS	1983	1984	?	
3.13	Temporal beach use	1	NMFS, FWS	1980	1984	9 (2.32)	
3.14	Distribution of hauling	2	NMFS, FWS, H	N.D.	N.D.	112	
3.15	Evaluate aerial census	2	NMFS, FWS	1981	1983	0	
3.151	Assess techniques	2	NMFS, FWS	1981	1982	0	
3.152	Test validity	2	NMFS, FWS	1982	1983	0	
3.16	Natural marks	2	NMFS, FWS, H	1977	con.	0	Technique in use to monitor some adult females
3.2	Monitor population status					2501 yr	
3.21	Initiate tagging program	1	NMFS	1983	N.D.	(3.2)	
3.22	Population trends	1	NMFS, FWS, H	1976	N.D.	(3.2)	
3.221	Census	1	NMFS, FWS, H	1976	N.D.	(3.2)	
3.222	Pup production	1	NMFS, FWS, H	1977	N.D.	(3.2)	
3.223	Reproduction rate	1	NMFS, FWS, H	1977	N.D.	(3.2)	
3.224	Age at maturity	1	NMFS, FWS, H	1977	N.D.	(3.2)	
3.225	Survival rates	1	NMFS, F'WS, H	1977	N.D.	(3.2)	
3.23	Estimate populations	1	NMFS, FWS, H	1983	1984	(3.2)	
3.231	Select method	1	NHFS	1983	1983	(3.21	
3.24	Life history/population characteristics	2	NMFS	N.D.	N.D.	(3.2)	
4.	DOCUMENT EFFECTS OF HUMAN DISTURBANCE						
4.1	Historical information	2	NMFS, FWS	N.D.	N.D.	19	
4.2	Fisheries interact ions	1	NMFS, FWS, H	1982	Con.	6/yr	
4.3	Response to human activities	2	NMFS, FWS, H	N.D.	N.D.	?	
4.4	Research effects	1	NMFS, FWS, H	1982	N.D.	?	

Table Z.--Continued.

Task	Title	Priority	Agency	start date	End date	Estimated cost $1,000 ( )	Status/comments
5.	IMPLEMENT MANAGEMENT ACTIONS						
5.1	Limit access						
5.11	French Frigate Shoals, Pearl and Hermes, Kure Atoll, Midway	1	NMFS, FWS	1981	Con.	N.C.	More enforcement required at some locations
5.12	Limit research at French Frigate Shoals	1	NMFS, FWS	1982	Con.	N.C.	
5.13	Refuge at Midway	1	NMFS, FWS, N	N.D.	N.D.	?	
5.14	Move Kure Atoll loran station	1	CG, N	N.D.	N.D.	?	Move under study by U.S. Coast Guard
5.15	Enforcement and data collection Kure Atoll and Hidvay	1	NMFS, FWS, CG, N	1983	N.D.	63/yr	
5.16	Adjust off-limits, Kure Atoll	1	NMFS, H, CG	1983	N.D.	?	
5.17	Enforce regulations	1	NMFS, FWS	Con.		?	
5.171	Require refuge permits	1	FWS	1983	Con.	?	
5.172	Stop disturbance at Kure Atoll	1	H, CG	1983	N.D.	?	
5.173	Enforce MMPA and ESA	1	NMFS, FWS	con.		?	
5.18	Coordinate research	1	NNFS, FWS, H	1979	N.D.	?	
5.2	Initiate other actions						
5.21	Critical habitat	1	NNFS	1980	N.D.		
5.22	Centralize census data	1	NMFS, FWS, H	1980	Con.	0	
5.23	Mortality Reaction Plan	1	NMFS	1980	Con.	0	
5.24	Evaluate "head start" project	1	NMFS, H, CG	1982	N.D.	0	Expansion to other islands not necessary at this time
5.25	Shark control	2	NMFS, FWS, H	N.D.	N.D.	?	
5.26	Return of rehabilitated seals	3	NMFS	N.D.	N.D.	?	
5.27	Oil/chemical response	3	NMFS, FWS, H, N, CG	1982	N.D.	7	
5.28	Mitigate gear impact	2	NMFS	1983	Con.	?	
5.29	Interpret research/initiate action	1	NMFS, FWS, H, N, CG	1980	N.D.	?	

Table 2 .--Continued.

Task	Title	Priority	Agency	Start date	End date	Estimated cost $1,000 ()	Status/comments
6.	DEVELOP EDUCATIONAL PROGRAM						
6.1	Distribute information	1	NMFS, FWS, H, H, N, CG	1983	Con.	0	Complete information/guidelines brochure in 1983
6.2	Kure Atoll and Midway education aids	1	NMFS, FWS, H, N, CG	1983	1984	0	
6.3	Material for public	2	NMFS, FWS, H	1982	N.D.	5	

Legend :

0 = Task providing additional funding for project. If no amount is indicated, task in parentheses provides total funding for project.
0 = No cost above current program funding level
? = Unknown cost
N.C. = No cost

N.D. = Not determined
Con. = Continuing
H = State of Hawaii
N = U.S. Navy
CG = U.S. Coast Guard

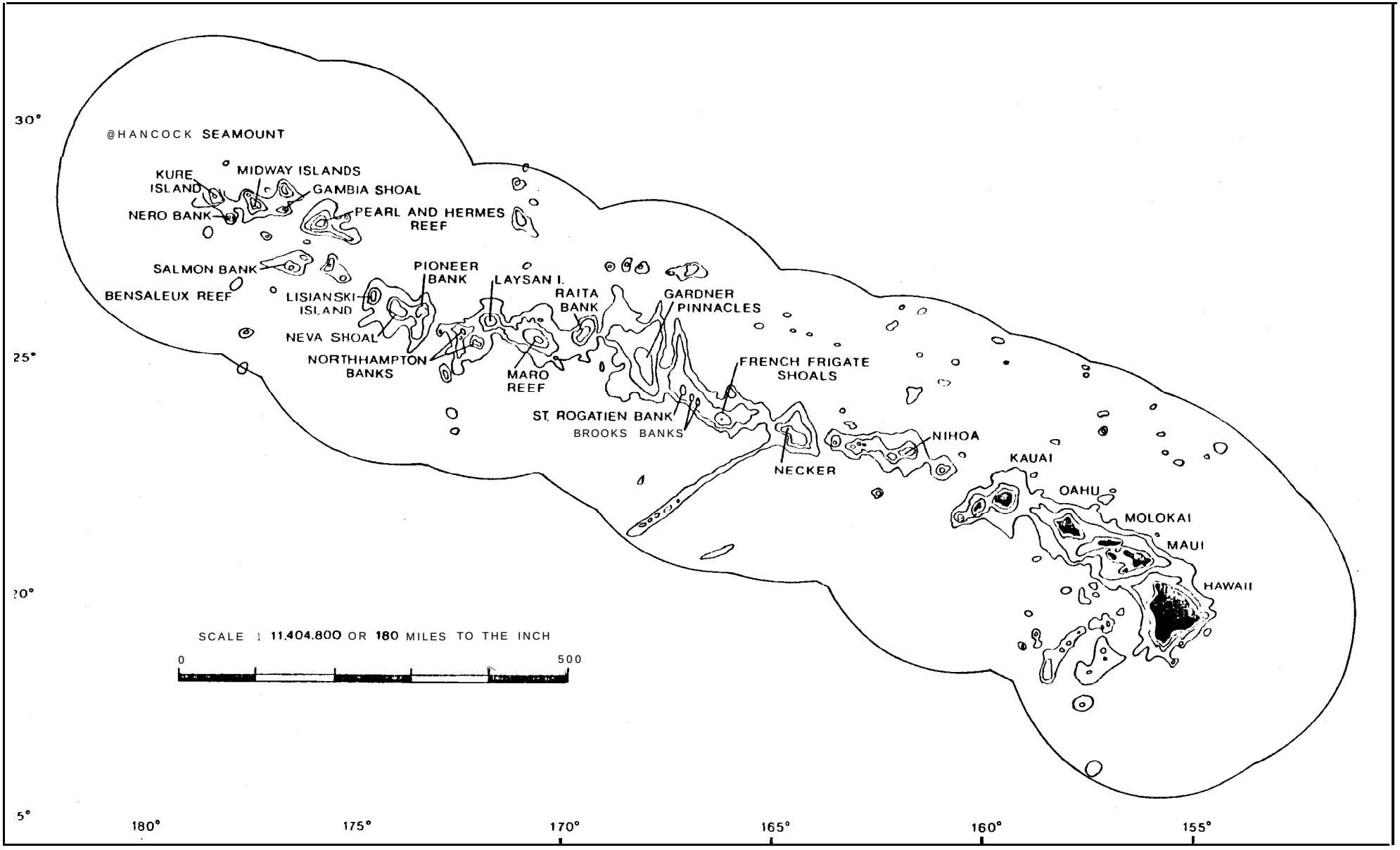

Figure 1. Hawaiian Archipelago

APPENDIX A

HAWAIIAN MONK SEAL RECOVERY TEAM

STATEMENT ON PROPOSED CRITICAL HABITAT FOR THE HAWAIIAN MONK SEAL

27 September 1980

The Hawaiian Monk Seal Recovery Team, at both the 8-10 August and 25-27 September 1980 meetings, considered at length the designation of critical habitat for the monk seal. It was the consensus of the team that critical habitat should be formally proposed and designated to promote the conservation of this species.

After a thorough review of pertinent data, including the results of depth of dive studies conducted on Lisianski Island during 1980, the majority of the team agreed that critical habitat should include all beach areas, lava benches, lagoon waters, submerged lands, and waters to a depth of 20 fathoms in the Northwestern Hawaiian Islands as listed in Enclosure 1. Although the Lisianski study depth of dive data and other observations substantiate the use of waters beyond 20 fathoms by seals, it was agreed that additional research and observations are needed in the determination of the significance of these deeper waters to the recovery of the species. The majority of the team members agreed that if additional data from other sites and from other animals substantiate the 1980 Lisianski field work results or extend the record of diving into deeper waters, then it would be justified to consider expansion of critical habitat boundary beyond the 20-fathom line at a future date.

Several factors were considered in the team's consensus that the 20-fathom line may be a conservative estimate of the amount of habitat critical to the survival of the species: (1) Food habit studies indicate monk seals feed on bottom and reef inhabiting fishes and invertebrates and these identified food species range from shallow water to depths beyond 20 fathoms; (2) Dives were recorded in the 1980 Lisianski study to depths greater than 20 fathoms; (3) Data from Laysan Island and Kure Atoll indicate that adult females leave the beaches for periods lasting 10-30 days or more. Also, observations indicate that these animals do not occupy nearshore waters near the islands during this exodus period; and (4) Interisland movement is well documented by tag returns.

It should be noted that the team's recommendation for critical habitat designation at 20 fathoms was not unanimous (two members dissented and G.R. Kooyman was absent from the meeting). Concern was raised by one member of the team that the available data are not sufficient to justify, on biological grounds, the designation of critical habitat beyond 10 fathoms. A second team member felt that present data did not support designation beyond the beaches, lava benches, and nearshore waters at this time. The second opinion also

pointed out that the Lisianski depth of dive studies did not determine whether or not the animals *were* actually feeding during recorded dives, or determine the significance of the recorded diving activities to recovery of the species.

In response to concerns raised above, team members in the majority felt the Lisianski dive data, food habits data, documented records of interisland movement, and repeated observations of seals from boats in much deeper water all supported their conclusion regarding significance of waters beyond nearshore waters or 10 fathoms. In addition, it was agreed that extrapolation of Lisianski data to other islands was justified, in large part because the bottom topography surrounding Lisianski Island requires animals to travel signficantly farther to reach depths beyond 20 fathoms than is the case at other islands in the Northwestern Hawaiian Islands. This being the case, the relative proximity of deeper waters at sites other than Lisianski lead us to conclude that diving beyond 20 fathoms may be more frequent than recorded at Lisianski. It was noted that the three most active diving adult males in the 1980 Lisianski study were instrumented for 18 to 20 days during which time they accomplished 4,691 dives, a substantial portion of which are assumed to have been feeding dives. In addition, the fact that instrumented animals spent a considerable amount of their dive time in waters beyond 10 fathoms indicates that this deeper water habitat is critical to recovery of the species, regardless of whether or not feeding occurred on some or all of these dives.

Enclosure

Statement of G.R. Kooyman, who was absent from this meeting, is attached.

PROPOSED AREAS TO BE INCLUDED IN CRITICAL HABITAT
FOR THE HAWAIIAN MONK SEAL

The intent of our recommendation is that all land, submerged land, and water areas within the 20-fathom Isobath at the areas listed be designated critical habitat, with exceptions as outlined below.

Critical habitat should include beach areas, lava benches, submerged lands, lagoon waters, and all waters out to 20 fathoms from the low low watermark or barrier reef at Kure Atoll, Midway Islands (except Sand Island), Pearl and Hermes Reef, Lisianski Island, Laysan Island, French Frigate Shoals, and Necker Island. This list also includes similar habitat at three locations not in the DEIS for proposed critical habitat for the Hawaiian monk seal: (1) Nihoa, where pups were born in 1979 and 1980, (2) Gardner Pinnacles, where monk seals are seen in the water and hauled out, and (3) Maro Reef, where monk seals are frequently observed in the water.

The specific land and water areas to be included for each atoll or island are defined as follows:

1. Kure Atoll.--The land area to be designated should include all of Sand Isl and, intermittent sand islets and spits, and on Green Isl and from the low low watermark to 50 feet inland beyond the vegetation line. Critical habitat should also include all lagoon waters and all other water areas and submerged lands encompassed by the 20-fathom isobath.

2. Midway Islands.--The land area to be designated should include Eastern Island from the low low watermark to 100 feet inland beyond the vegetation line, and all of the spit islands. Critical habitat should also include all lagoon waters and all water areas and submerged lands encompassed by the 20-fathom isobath.

3. Pearl and Hermes Reef.--The land area to be designated should include all of the permanent islands and intermittent sand islets. Critical habitat should also include all of the lagoon waters and all water areas and submerged lands encompassed by the 20-fathom isobath.

4. Lisianski Island.--The area to be designated should include the land from the low low watermark to 100 feet inland beyond the vegetation line around the island. Critical habitat should also include the water areas and submerged lands encompassed by the 20-fathom isobath.

5. Laysan Island.--The area to be designated should include the land from the low low watermark to 100 feet inland beyond the vegetation line around the island. Critical habitat should also include all of the water and submerged lands encompassed by the 20-fathom isobath.

6. Gardner Pinnacles.--The land area to be designated should include all of Gardner Pinnacles. Critical habitat should also include all water and submerged lands encompassed by the 20-fathom isobath.

7. French Frigate Shoals.--The land area to be designated should include all the islands including La Perouse. Critical habitat should also include all of the lagoon waters and other waters and submerged lands enclosed by the 20-fathom isobath.

8. Necker Island.--The land area to be designated should include all lava benches and beaches, enclosed by the 20-fathom isobath.

9. Nihoa Island.--The land area to be designated should include the beaches at Derby's Landing and the lava benches. Critical habitat should also include all waters and submerged lands encompassed by the 20-fathom isobath.

10. Maro Reef.--The exposed reefs, water areas, and submerged lands enclosed by the 20-fathom isobath.

Enclosure 1

STATEMENT ON PROPOSED CRITICAL HABITAT FOR THE HAWAIIAN MONK SEAL

20 November 1980

Due to my absence from the 25-27 September 1980 monk seal recovery team meetings in which a statement on the critical habitat was made, I..now wish to comment. I am in full concurrence with the recommendation that critical habitat should include depths to at least 20 fathoms. If later studies justify further expansion, or less likely, contraction of this boundary; this too should be done.

Since two members dissented, I wish to address their concerns as a means of explaining my support for the 20 fathom line. According to the recovery team statement of 27 September 1980, one dissenter felt that critical habitat should not be beyond the beaches, lava benches and nearshore waters. This statement is not clear because nearshore waters are not defined, but presumably this implies a water depth of less than 10 fathoms. Also, that the depth of dive study carried out at Lisianski Is. did not determine whether the seals were feeding at these depths. Both concerns reflect a liberal interpretation that the seals may spend considerable time offshore (>20 fathoms) and diving to and beyond 20 fathoms for a reason other than pursuit of prey. Direct proof that the seals were feeding during the period the dive records were obtained was not obtained and would be extremely difficult data to obtain. However, indirectly, there was no indication over the 3 week period that most of the data from the recorders were collected that there was a weight loss in these animals. If they were fasting during this time, considering the activity of these animals, the weight loss would have been substantial; roughly about 10 kg/da. Therefore, the seals are indeed feeding and some of these 65 dives/da are for feeding. However, could it be that most dives are

for other purposes? Perhaps, but I have spent several years studying Weddell seals, fur seals and penguins. I have found that 65 dives/da is well within the limits of the number of dives these other species make while, again presumably feeding, and maintaining or gaining weight. In short, it is a much more conservative interpretation that the majority of these dives are in pursuit of prey.

Another question raised was the significance of the diving activity to the recovery of the species? That question might be rephrased. If the species of seal was denied from making dives to certain depths could they survive or even increase in numbers. The sea, unlike most terrestrial environments is three dimensional and such a restriction represents a habitat restriction. It is also a question that perhaps has been asked, but to my knowledge never answered for any pelagic marine species, and it would require a considerable amount of research.

Finally, the statement that on biological grounds there are not sufficient data to support the designation of critical habitat beyond 10 fathoms is vague and consequently difficult to respond to. Of the six animals studied one clearly dived beyond 10 fathoms most of the time (over 96%) and the other five animals probably did so over 60% of the time. For the reasons stated above I believe that most of these dives are for feeding, and considering that they had to swim several miles offshore to make these dives I take a conservative interpretation that this is good evidence that dives to these depths are important if not crucial to the animals.