

NORTHWEST & ALASKA FISHERIES CENTER PROCESSED REPORT

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HAWAIIAN MONK SEAL (MONACHUS SCHAUINSLANDI) SURVEY OF THE NORTHWESTERN (LEEWARD) HAWAIIAN ISLANDS

JULY 1978

by
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AUGUST 1978

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northwest and Alaska Fisheries Center
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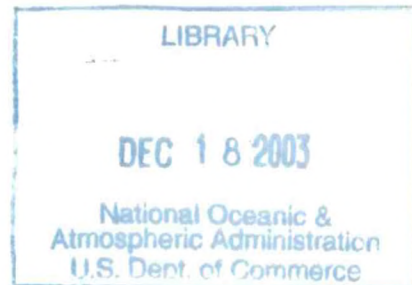
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Hawaiian Monk Seal (Monachus schauinslandi)
Survey of the Northwestern (Leeward) Hawaiian Islands,
July 1978

INTRODUCTION

Cooperative studies of the Hawaiian monk seal by biologists of the Marine Mammal Division of the National Marine Fisheries Services's (NMFS's), Northwest and Alaska Fisheries Center (NWAFC) and the Fish and Wildlife Service's (FWS's), National Fish and Wildlife Laboratories (NFWL) were initiated in 1976. This report describes the 1978 survey of the Northwestern Hawaiian Islands, which was carried out between 12 and 26 July 1978 by the charter vessel Easy Rider. The survey itinerary is presented in Table 1.

The primary objective of the survey was to count all seals on land and determine the numbers of juvenile and subadult animals in each of the major atoll and island populations. Studies by Johnson and Johnson (1978) at Laysan Island in 1977 indicate that July is the time when most juveniles and subadult animals can be expected ashore. Also, the survey would determine if the unexpected mortalities found at Laysan Island and French Frigate Shoals were occurring elsewhere in the Northwestern islands. Other objectives of the voyage were (1) to recover skeletal remains of monk seals which had died at French Frigate Shoals and at Laysan Island and were buried during the May survey and to determine whether additional deaths had occurred at French Frigate Shoals and (2) to resupply the Laysan field party (Brian and Patricia Johnson).

The research program was carried out under authority of the Marine Mammal Protection Act of 1972 and the Endangered Species Act Permit No. 180 issued to NWAFC, NMFS, on 6 April 1977 and the Hawaiian Islands National Wildlife Refuge (HINWR) Special use permit HWN-2-78.

Personnel who participated in the survey cruise follow:

Monk seal survey team

Ancel Johnson	NFWL, FWS
Clifford Fiscus	Marine Mammal Division, NWAFC, NMFS
Karl Kenyon	NFWL, FWS

Other participants

Elizabeth Cummings	Assistant Refuge Manager, HINWR, FWS
Roger Clapp	NFWL, FWS
George Balazs	University of Hawaii, Honolulu

R-V Easy Rider, crew

Capt. Gary Naftel
 Ron Dahleen
 Chipp Fogg
 Marty Naftel

During 1978 in addition to the present survey, Mark Rauzon, (NFWL), FWS, studied monk seals at Kure Atoll, 9 March to 19 April, and Brian and Patricia Johnson are in the second year of their study at Laysan Island (February to September 1978). An emergency voyage to Laysan, Lisianski, and French Frigate Shoals was carried out in May to attempt to determine the cause of above normal monk seal mortality at Laysan Island. An interim report of the results of the voyage has been prepared by DeLong (1978). Final reports of these studies will be available in late 1978.

Cetacean observations were made during the voyage and are listed in Table 2. Green turtle observations will not be listed in the present report. All records and observations of Green turtles were turned over to George Balazs to be incorporated into his research on green turtles.

Roger Clapp and Elizabeth Cummings recorded bird observations; and Clapp obtained the stomach contents of several species of birds for future study.

CENSUSES

We made counts of seals by walking well back from the shoreline to avoid disturbing the animals. Seals were classified as adult, subadult, juvenile, gray pup (weaned), and black pup (not weaned), and were sexed when possible. It is difficult to determine the sex of some monk seals from a distance, and observing these animals from a distance also results in some loss of information that can be obtained from tagged individuals. Nevertheless, we considered that avoiding disturbance was more important than indentifying the sex of every animal and extracting all possible information from tagged individuals. A summary of the 1978 island and atoll censuses appears in Table 3.

Nihoa Island

On 13 July from 1910 to 1940 hours we cruised close to Nihoa Island. Wind and breakers on the beach precluded landing. We examined the island's only sand beach at Derby's Landing in Adams Bay near the western end of the island. Four adult seals (Table 3) were seen with binoculars. Three of these, apparently disturbed by the ships engines, left the beach while we lay offshore.

Necker Island

The field party landed in West Cove Necker Island at 1315 hours, 14 July, and remained ashore until 1635 hours. Weather and sea conditions were excellent. Thirty seals were counted (Table 3). Two seals were sighted in the water near the vessel which was anchored off west cove, 3 on rock ledges in west cove, 15 on the boulder beach in Shark Bay, 3 on the rock ledge adjacent to Shark Bay, and 7 in or near tide pools on the north side below Summit and Bowl Hills. The 2-week-old pup reported by DeLong on 14 May was still present, having molted, and is listed in Table 3 as a gray pup.

French Frigate Shoals

The islands of French Frigate Shoals were surveyed on 15 and 16 July during favorable weather conditions. It was possible to land on all islands except Mullet, which was under water, and Bare and Disappearing Islands which were awash. Counts of seals on Bare and Disappearing were made from the rubber boat (Tables 3 and 4). During the 10-13 May census (DeLong 1978), 199 seals were counted including 40 black and 12 weaned (gray) pups. During the 15-16 July census 196 seals were counted including 40 gray and 10 black pups. At least 40 of the 52 pups counted in May were still present in July and at least an additional 10 pups (those in black pelage) had been born since the May census, indicating that at least 62 pups were born in 1978 at French Frigate Shoals. There were fewer adults of both sexes in July (95 in July and 126 in May) and adult males were found in considerably fewer numbers. The subadult and juvenile segments of the population were

almost entirely missing during the 10-13 May census--1 subadult and 11 juveniles compared to 28 subadults and 23 juveniles counted during the 15-16 July census. Three skeletons buried by the May survey party were recovered in July.

Laysan Island

The Easy Rider arrived and anchored off the West landing, Laysan Island, at approximately 0400 hours on 18 July. At 0925 hours Ancel Johnson, Clifford Fiscus, and Karl Kenyon were put ashore. While Johnson and Kenyon, accompanied by Brian and Patricia Johnson, counted seals, Fiscus recovered skeletons of seals that had died during March and April. Tissue samples and skulls of these animals were taken by the May research team and the skeletons had been numbered and locations marked by the Johnsons. After leaving the shore party, Captain Naftel moved the Easy Rider to the north shore of Laysan where he anchored outside the reef. Using the rubberboat and the aluminum skiff, Naftel and his crew, helped by George Balazs and Brian Johnson, recovered the remainder of the supplies that had been landed there on 28 February by the NOAA ship Townsend Cromwell. All gear, including canned goods and drums of water, were then off loaded at the west landing near the Johnsons' camp and carried to the high beach area by all hands. The Easy Rider departed Laysan at 2300 hours the same day.

Brian and Patricia Johnson told us that our count of seals on 18 July was lower than other of their recent counts. Therefore, their counts will be incorporated into our report when their data become available. We include our count for 18 July in Table 3.

One "sick seal" was reported on Laysan at the time of our visit and subsequently died. Most of the mortalities occurred in March and April and the numbers of animals sick and dying in July had greatly diminished.

Lisianski Island

The field party landed on Lisianski at 1400 hours, 19 July, established a tent camp, and remained on the island to conduct periodic censuses until 1430 hours, 23 July. Ancel Johnson helped set up the camp and participated in the 19 July census with Kenyon and Fiscus before returning to the vessel to continue the survey elsewhere. Kenyon and Fiscus remained ashore to carry out the monk seal study plan; George Balazs, to study green turtles; and Roger Clapp, to study birds. All researchers carried out their studies with minimum impact on the monk seals, turtles, or birds.

Weather conditions were generally favorable during our stay on Lisianski. However, the approach of Hurricane FICO required that we terminate the study 3 days sooner than planned and rejoin the vessel before sea conditions would have made our departure impossible.

Previous studies indicated that maximum numbers of animals were ashore from about midday to late afternoon. We, therefore, scheduled major censuses each day during these hours. The first census on 19 July was made by Ancel Johnson, Kenyon, Fiscus and thereafter by Kenyon and Fiscus, either together or independently. The results of these censuses (Table 3 and 5) indicated a stable population ranging from 75 to 85 animals ashore during the time of observation.

As expected, there was a natural change of animals ashore. Animals with recognizable natural marks would be present for several days then apparently go to sea. For example an adult male which hauled out and spent the night in the Messerschmidtia bush adjacent to camp was present the first night of our stay, absent 2 days, and then returned to the same location. An adult male, apparently in good condition, was recognizable as his penis had eroded, leaving only a baculum protruding from the penile opening. He was present in the same general location for at least 48 hours. New algae covered juveniles appeared almost every day. Gray pups appeared all around the island changing locations daily, although the north and northeastern sides of the island were apparently favored locations.

There was considerable variation in composition of the Lisianski population between the 6 May survey (DeLong 1978) and our 19-23 July surveys. Far fewer adult males were hauled out in July than in May, and numbers of adults in all categories were down from the 61 counted on 6 May to the 35-46 that were counted during 19-23 July. The number of subadults more than doubled, and the number of juveniles tripled in July. The number of pups remained about the same. Only one large black pup was present during the July census.

One complete skeleton of a juvenile female seal was recovered at Lisianski. The seal had apparently died sometime after DeLong's 6 May visit and was almost completely covered by sand. Dermestid beetles and ghost crabs had completely removed all tissues and skin.

Pearl and Hermes Reef

Ancel Johnson, Elizabeth Cummings, and Captain Gary Naftel spent 21 and 22 July surveying monk seals at Pearl and Hermes Reef, (Tables 3 and 6). Although 43 seals were counted in 1977, the number counted in 1978 was the same as in 1976, i.e., 26 seals. We still have no explanation as to why this population has dropped from over 300 seals in the late 1950's to the low counts of recent years.

The threat of approaching hurricane "FICC" caused Captain Naftel to leave Pearl and Hermes Reef on the afternoon of 22 July to pick up the field party (Balazs, Clapp, Fiscus, Kenyon, and Naftel) at Lisianski Island. The evacuation of Lisianski was accomplished during the afternoon of 23 July.

In order to re-survey Southeast Island, the Easy Rider anchored off the small boat entrance at Pearl and Hermes Reef at 0910 hours, 24 July. The field party (Balazs, Clapp, Cummings, Ancel Johnson, Kenyon, and Captain Naftel) remained on shore from 0925 to 1210 hours. Twelve monk seals were counted on shore but for consistency this figure is not included in Table 6 as these animals could conceivably have been counted on other islets of the Atoll on 21 or 22 July.

Midway Islands

During the period February to May, 1978, Gary Means (Midway Game Warden, U.S. Navy (USN)) reported the regular occurrence of at least two adult monk seals on the Spit Islands and on Eastern Island and recorded an adult female with a newborn pup on one of the spit islands on 7 May. Rick Coleman, Refuge Biologist, HINWR, reported that the female and pup were doing well on 9 June. In conferring with USN personnel on 26 July, we learned that

at least one large seal was present on one of the spit islands about mid-July. One informant mentioned an occasional seal hauling out on Sand Island near Frigate Point on the southwestern end of Sand Island.

On 26 July, Kenyon, Fiscus, and Clapp surveyed the three spit islands from the rubber boat. Shoals and heavy surf prevented a landing. No seals were seen although all parts of the islets could not be observed. The party surveyed Eastern Island between 1250 and 1415 hours, also on 26 July; no seals or traces of seals were seen.

Kure Atoll

Mark Rauzon was stationed on Kure from 9 March to 19 April 1978. During this time he reported a maximum of 45 seals at Green Island and adjacent Sand Island. Rauzon's Kure census is incorporated into Table 3.

Kenyon's planned flight to Kure to census monk seals aboard a C130 airplane of the U.S. Coast Guard was cancelled when Hurricane "FICO" passed through the area.

MORTALITY

Beginning in March 1978, Brian and Patricia Johnson observed "sick seals" that eventually died on Laysan Island. In May 1978 a study team was sent to investigate the mortality (DeLong 1978). Twenty-nine seals are known to have died on land between December 1977 - July 1978.

<u>Location</u>	<u>No. seals and source of data</u>
Laysan I.	22 (Brian and Patricia Johnson)
Lisianski I.	1 (Present survey)
French Frigate Shoals	6 (DeLong 1978)
Total	29

The mortality at Laysan Island is reflected in the small number of juveniles and subadults censused when compared to other years (Table 7). Although six dead animals were found at French Frigate Shoals in May, relatively large numbers of subadults and juveniles were counted in July. This probably indicates the French Frigate Shoals population had relatively little recent mortality.

During the July survey no "sick" seals (other than one, which subsequently died on Laysan) were observed. No sick seals were observed at Nihoa, Necker, French Frigate Shoals, or Pearl and Hermes Reef. Between 19 and 23 July, six circuits of Lisianski Island were made. If "sick" seals had been present we believe that they would have been detected. The yet unexplained incidence of "sickness" among Hawaiian monk seals appears to have declined.

TAGGED AND MARKED SEALS

Monel tags were regularly applied to the hind flippers of monk seals by HINWR personnel prior to enactment of the Marine Mammal Protection Act of 1972. Some tagged animals are still present in the population and tag numbers are obtained during census taking, when they can be observed without disturbing the animal. Tag recoveries obtained during the July survey are presented in Table 8.

Brian and Patricia Johnson were authorized to apply temporary marks to limited numbers of seals with bleach at Laysan in 1977 and in 1978 prior to 27 April 1978. DeLong was authorized to mark not more than 10 subadults or juveniles at Laysan and French Frigate Shoals with bleach in May 1978. He subsequently marked 10 seals at Laysan and 7 seals at French Frigate Shoals.

During the course of our surveys we saw no seals marked with temporary bleach marks except on Laysan Island.

SPECIMEN MATERIALS

During the course of the monk seal mortalities at Laysan Island, Brian and Patricia Johnson collected tissue samples and stomach contents; they moved and buried all dead seals high on the beach for later recovery as skeletons. In May, DeLong and other members of his research team obtained additional materials and the skulls from all skeletons.

During the July survey we attempted to recover all skeletal materials buried at Laysan and French Frigate Shoals and material obtained by Brian and Patricia Johnson subsequent to DeLong's May visit. DeLong (1978) reports fully on the material he obtained. Skeletal material obtained in July are listed in Table 9. In addition, tissues and fecal samples were obtained at Laysan Island.

In the future, skeletons should be recovered as soon as possible. It was found during this trip that an unknown number of small bones had been carried away by ghost crabs or been displaced by wind and passage of seals and turtles over the disintegrating skeletons. The skeletons of seals that remained completely buried while decomposing were the most complete and easiest to recover.

NET SCRAPS AND SEALS

Fish net scraps composed of nylon, polyethylene, polypropylene, and cotton are discarded or lost in increasing quantity by fishermen in the North Pacific Ocean and Bering Sea. Floating nets attract seals of several

species. Considerable mortality of northern fur seals (Callorhinus ursinus) occurs when seals become entangled in scraps of net. Helpless, emaciated fur seals have been found both at sea during pelagic seal studies and on the Pribilof Islands (Fiscus and Kozloff 1972, Kajimura 1976). During the 1977 commercial harvest of young male fur seals on St. Paul Island, Pribilof Islands, Alaska, 1.15% of 28,400 seals harvested were entangled in net fragments (Roppel et al. 1978).

Net scraps are common in the environment of the Hawaiian monk seal, and monk seals have been observed entangling themselves in fishing gear (photographs are available). Monk seals bearing scars typical of those caused by nets on fur seals and by lines on northern elephant seals have been observed. Small scraps of netting a foot or so long are probably of no consequence to seals; however, we counted 18 pieces of net scrap on the beaches of Lisianski, which we considered could entangle a seal. Samples of discarded netting picked up on Lisianski by DeLong on 6 May 1978 were identified by Jerry Jurkovich, Resource Assessment and Conservation Division, NWAFC, as polyethylene webbing of Japanese origin which had been used in midwater or bottom trawls, and as small mesh (2 and 3 1/4 inch) nylon gill netting.

The monk seal has an obvious proclivity to investigate and entangle itself in fishing gear of many types. It is thus important that all gear used in the habitat of the seals be designed with great care to exclude the possibility of fatal entanglement of seals and that netting not be discarded from vessels.

SUMMARY

The 1978 survey of the Northwestern Hawaiian Islands was carried out from 12 to 26 July. Generally favorable weather conditions prevailed during the survey with the exception that Hurricane "FICO" caused cancellation of the last 3 days of the study planned for Lisianski Island and the last 2 days planned for Pearl and Hermes Reef.

Census data presented in the tables indicate that more subadults and juveniles were present during the July census than during the April 1977 or May 1978 censuses. It is likely that most pups counted during the May 1978 survey were still present and recognizable as gray pups in July. Fewer adult seals were present in July than in the April 1977 or May 1978 surveys, with large adult males being particularly reduced in numbers.

Adult and subadult animals of both sexes were in various stages of molt on all islands and atolls. Scars were much more difficult to see on newly molted animals; however, it was generally thought that fewer scarred older animals were present in July than has been observed on recent censuses in March - April 1976, April 1977, or May 1978.

Most censuses since 1957 are summarized in Table 10. These counts of animals ashore cannot be considered to represent the total monk seal population; however, they do indicate trends in numbers of animals in the population. The decline at Kure and Midway is due in part to establishment of permanent human populations at these islands. The catastrophic decline in the past 10 to 15 years of the Pearl and Hermes Reef population and the smaller declines in the Lisianski and Laysan Island populations remain unexplained. However the sharp declines are similar to those recorded at Laysan Island during the abnormally high mortality recorded in 1978.

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Table 1. Itinerary of the monk seal survey
7-29 July, 1978.

Date	Vessel or Personnel	Location
7-12 July	Clifford H. Fiscus	Honolulu, Hawaii
7-12 July	Karl W. Kenyon	Honolulu, Hawaii
10-12 July	Ancel M. Johnson	Honolulu, Hawaii
12 July	R/V Easy Rider departs Kewalo Basin	Honolulu, Hawaii
13 July	Censused Island from Vessel	Nihoa
14 July	Anchored 1315 Depart 1720	Necker
15 July	Arrived 0945	French Frigate Shoals
16 July	Depart 1600	French Frigate Shoals
18 July	Anchored 0400 Depart 2200	Laysan Island
19 July	Anchored 1400 Field party ashore 1500 to camp	Lisianski Island
20 July	Depart 1400	Lisianski Island
21 July	Arrived 0530	Pearl and Hermes Reef
22 July	Depart 2030	Pearl and Hermes Reef
23 July	Arrived 1300 Picked up field party Depart 1430	Lisianski Island Lisianski Island
24 July	Arrived 0600 Depart 1230	Pearl and Hermes Reef Pearl and Hermes Reef
24 July	Arrived 2000	Midway
25 July	Ancel M. Johnson depart via MAC log flight	Midway
29 July	Clifford H. Fiscus Karl W. Kenyon depart via MAC log flight	Midway

Table 2. Cetacean observations from Oahu to Midway, Hawaiian Islands, 12-24 July, 1978.

Date/ Time	Location		Species	Number Seen	Remarks
	Latitude	Longitude			
12 July/1800	21°20'N.	158°17'W.	<u>Pseudorca crassidens</u>	50+	did not approach vessel
12 July/1900	21°24'N.	158°25'W.	Unidentified small cetacean	2	
13 July/0734	22°16'N.	160°15'W.	<u>Tursiops truncatus</u>	1	off Lehua
13 July/1830	23°01'N.	161°49'W.	<u>Tursiops truncatus</u>	2	accompanied vessel until 1900
17 July/1735	25°05'N.	170°05'W.	Unidentified small cetaceans	4-2	groups P. crassidens? or beaked whale sp? visibility poor
17 July/1925	25°13'N.	170°23'W.	<u>Tursiops truncatus</u>	6	
19 July/0830	26°00'N.	173°19'W.	<u>Stenella longirostris</u>	50+	on Pioneer Bank
19 July/0950	26°02'N.	173°32'W.	<u>Tursiops truncatus</u>	200+	Several with small calves
22 July/1445	Inside Pearl and Hermes Reef near Southeast Island		<u>Stenella longirostris</u>	20	near anchorage
24 July/1200	Inside Pearl and Hermes Reef near Southeast Island		<u>Stenella longirostris</u>	35	

Table 3. Summary of censuses of Hawaiian monk seals,
in the Northwestern Hawaiian Islands, July 1978.

Island or Atoll	Nihoa Island ^{1/}	Necker Island	French Frigate Shoals	Laysan Island ^{2/6/}	Lisianski Island ^{3/}	Pearl and Hermes Reef	Midway Atoll ^{4/}	Kure Atoll ^{5/6/}
Date of Survey	13 July	14 July	15-16 July	18 July	19-23 July	21-22 July	26 July	
Adults								
Males		8	12	22	11	4	0	18
Females		3	35	9	9	6	1	8
Not sexed	4	10	21	28	15	8	1	13
Total Adults	4	21	68	59	35	18	2	39
Subadults								
Males		2	5	8	4	1	0	0
Females		0	11	5	6	1	0	0
Not sexed		4	12	6	18	0	0	0
Total Subadults		6	28	19	28	2	0	0
Juveniles								
Males		0	7	0	3	1	0	1
Females		0	5	2	1	1	0	0
Not sexed		2	11	12	3	0	0	0
Total Juveniles		2	23	14	7	2	0	1
Gray Pups								
Males		1	8	2	1	2	0	0
Females		0	10	3	6	1	0	1
Not sexed		0	22	12	7	0	0	2
Total Gray Pups		1	40	17	14	3	0	3
Black Pups								
Males		0	1	0	0	0	0	0
Females		0	1	0	0	0	0	2
Not sexed		0	8	1	1	1	1	3
Total Black Pups		0	10	1	1	1	1	3
Unclassified ^{7/}			27					
Total Pups (95)		1	50	18	15	4	1	6
Total Seals (502)		30	196	113	85	26	3	45

Table 3. Continued.

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- 1/ Seals hauled out in Derby's Landing in Adams Bay, observed from vessel, landing impossible.
 - 2/ Repeated counts by Brian and Patricia Johnson are higher than the one given here. Johnsons' counts will be presented in forthcoming reports.
 - 3/ Highest count of six total censuses of Lisianski's beaches.
 - 4/ Walked beaches of East Island, examined Sand Spit Islands from boat but 25 knot wind made landing unsafe. We were told that one seal was seen on the Sand Spit Islets on 22 July.
 - 5/ Data from highest count between 9 March and 19 April; total includes two unclassified animals.
 - 6/ Complete data and discussion of these island populations are contained in separate reports.
 - 7/ Seals not classified by age or sex.

Table 4. Census of Hawaiian Monk seals at French Frigate Shoals, Northwestern Hawaiian Islands, 15-16 July 1978

Island	Shark Island	Tern Island	Trig Island	Whale Skate Island	Round Island	Mullet Island	Bare Island	East Island	Gin Island	Little Gin Island	Disappearing Island	Totals
Date of Survey	16 July	15 July	15 July	15 July	15 July	15 July ^{1/}	15 July ^{2/}	15 July	16 July	16 July	16 July ^{2/}	
Adult												
Males	2	0	3	3	0		0	0	2	2	0	12
Females	0	0	6	15	2		0	10	1	1	0	35
Not sexed	2	1	6	3	2		2	5	0	0	0	21
Total Adults	4	1	15	21	4		2	15	3	3	0	68
Subadult												
Males	2	0	0	3	0		0	0	0	1	0	6
Females	0	0	0	8	0		0	0	2	1	0	11
Not sexed	3	0	2	3	4		0	0	0	0	0	11
Total subadults	5	0	2	14	4		0	0	2	2	0	28
Juvenile												
Males	1	0	1	2	0		0	1	2	0	0	7
Females	1	0	0	0	0		0	1	3	0	0	5
Not sexed	1	0	2	3	0		0	3	2	0	0	11
Total juveniles	3	0	3	5	0		0	5	7	0	0	23
Gray Pups												
Males	0	0	0	4	0		0	3	0	1	0	8
Females	0	0	1	5	0		0	2	1	1	0	10
Not sexed	0	1	1	1	11		0	4	0	0	4	22
Total Gray Pups	0	1	2	10	11		0	9	1	2	4	40
Black Pups												
Males	0	0	0	1	0		0	0	0	0	0	1
Females	0	0	0	0	0		0	0	0	1	0	1
Not sexed	0	0	1	0	0		0	7	0	0	0	8
Total Black Pups	0	0	1	1	0		0	7	0	1	0	10
Unclassified ^{3/}											27	27
Total Seals	12	2	22	51	19		2	36	13	8	31	196

^{1/} Mullet Island under water.^{2/} Complete count from boat; Island small, nearly awash.^{3/} Seals not classified by age or sex

Table 5. Censuses of Hawaiian monk seals at Lisianski Island, Northwestern Hawaiian Islands, 19-23 July 1978.^{1/}

Dates	19 July	20 July	21 July	22 July	22 July	23 July
Time of Count Hours	1545-1830	1145-1550	1125-1525	1210-1545	1210-1630	1215-1320
Adults						
Males	19	18	17	14	11	11
Females	7	10	12	14	9	12
Not sexed	19	18	12	15	15	12
Total Adults	45	46	41	43	35	35
Subadults						
Males	6	5	5	1	4	6
Females	6	6	2	6	6	8
Not sexed	9	11	9	9	18	9
Total Subadults	21	22	16	16	28	23
Juveniles						
Males	0	1	1	2	3	0
Females	0	1	4	4	1	4
Not sexed	1	3	4	4	3	6
Total Juveniles	1	5	9	10	7	10
Gray Pups						
Males	1	1	5	4	1	4
Females	1	2	4	1	6	3
Not sexed	5	6	3	7	7	3
Total Gray Pups	7	9	12	12	14	10
Black Pups						
Males	0	0	0	0	0	0
Females	0	0	0	0	0	0
Not sexed	1	1	1	1	1	1
Total Black Pups	1	1	1	1	1	1
Total Pups	8	10	13	13	15	11
Total Seals	75	83	79	82	85	79

^{1/} On 19, 20, and 21 July the censuses were done cooperatively. On 22 July Fiscus and Kenyon made independent censuses and on 23 July (because of an emergency evacuation) Fiscus and Kenyon independently each did about one half of the census.

Table 6. Census of Hawaiian monk Seals at Pearl and Hermes Reef, Northwestern Hawaiian Islands, 21-22 July 1978.

Island	North Island	Little North Island	Southeast Island	Plaintree Island	Bird, Sand, Grass Islands	Kittery Seal Island	Totals
Date of Survey	21 July	21 July	21 July	22 July	22 July	22 July	
Time of Survey	1330-1400	1230-1255	1530-1630	1000-1130	1200-1210	1230-1300	
Adults							
Males	0	0	1	0	0	3	4
Females	0	0	2	0	0	4	6
Not Sexed	1	1	4	1	0	1	8
Total Adults	1	1	7	1	0	8	18
Subadults							
Males	0	0	0	0	0	0	0
Females	0	0	1	0	0	0	1
Not sexed	1	0	0	0	0	0	1
Total Subadult	1	0	1	0	0	0	2
Juveniles							
Males	0	1	0	0	0	0	1
Females	1	0	0	0	0	0	1
Not sexed	0	0	0	0	0	0	0
Total Juveniles	1	1	0	0	0	0	2
Gray Pups							
Males	0	0	0	0	0	0	0
Females	2	0	0	0	0	0	2
Not sexed	0	0	1	0	0	0	1
Total Gray Pups	2	0	1	0	0	0	3
Black Pups							
Males	0	0	0	0	0	0	0
Females	0	0	0	0	0	0	0
Not sexed	0	0	0	0	0	1	1
Total Black Pups	0	0	0	0	0	1	2
Total Pups	2	0	0	0	0	1	3
Total Seals	5	2	9	1	0	9	26

Table 7. Age structure of Hawaiian monk seals censused at French Frigate Shoals, Laysan, and Lisianski, 1976, 1977, and 1978.

Island	Date	Adult	Subadult	Juvenile	Pups	Total
French Frigate Shoals ^{1/}	20 March, 1976	99	57	24	16	176
	9 April, 1977	132	23	23	28	206
	10 May, 1978	106	10	11	52	179
	15 July, 1978	68	28	23	50	169
Laysan	24 March, 1976	91	53	27	15	186
	13 April, 1977	98	34	24	25	178
	18 July, 1978	59	19	14	18	113
Lisianski	2 April, 1976	79	10	18	20	127
	15 April, 1977	75	7	5	15	106
	6 May, 1978	61	7	3	15	86
	19-23 July, ^{2/} 1978	41	21	7	11	80
		(35-46)	(16-28)	(1-10)	(7-14)	(75-85)

^{1/} Does not include count from Disappearing Island as these animals not classified by age or sex.

^{2/} Six censuses conducted; values are arithmetic mean and range.

Table 8. Monel tags recorded from Hawaiian monk seals during the July 1978 survey of the Northwestern Hawaiian Islands.

Tag Number	Age, Sex, and Remarks	Atoll	Island	Date
A8	adult female	FFS ^{1/}	Whale Skate	15 July
A771	adult male	FFS	Whale Skate	15 July
A794	adult female	FFS	Whale Skate	15 July
A707	adult female		Laysan	18 July
A1074	subadult male		Laysan	18 July
A1071	adult male		Lisianski	22 July

^{1/} FFS designates French Frigate Shoals

Table 9. Skeletal material recovered at French Frigate Shoals, Laysan Island and Lisianski Island during the July 1978 survey of the Northwestern Hawaiian Islands.

Date of recovery	Island	Field number	Remarks
15 July	Whale Skate	1584	skeleton located east side northern half of island
15 July	Whale Skate	1585	southern end of island
15 July	Trig	1583	skeleton located about 25 ft from FFST 2 and another skeleton
18 July	Laysan	1553 skeleton	
		1554 skeleton	many phalanges missing from forelimbs
		1555 skeleton	
		1557 skeleton	forelimbs mostly gone, vertebrae scattered at surface but probably all present
		1565 skeleton	hindlimbs and left forelimb intact
		LA19 skeleton	some bones of forelimbs missing
		1558 skeleton	
		1564 skeleton	
		1559 skeleton	
		1551 skeleton	
		1556 skeleton	
		402 skull	cleaned, covered skeleton for Sept. recovery
		1566 skull	cleaned
		401 skull	mummified
		403 skull	mummified
23 July	Lisianski	1588 Skeleton	length 126+ most of left fore- and skull flipper missing

Table 10. Summary of censuses of Hawaiian monk seals (Monachus schauinslandi) in the Northwestern Hawaiian Islands, 1957-78.

Year and reference	Nihoa I.	Necker I.	French Frigate Shoals	Gardner Pinnacles	Laysan I.	Lisianski I.	Pearl and Hermes Reef	Midway Atoll	Kure Atoll	Total
1957 Spring ^{1/}	-	-	35	-	233	256	290	71	128	1013
1958 Spring ^{2/}	-	-	43	-	326	281	338	76	142	1206
1964 March ^{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 March ^{5/}	0	12	66	-	199	139	80 ^{14/}	-	-	496
1967 Sept. ^{5/}	-	15	95	-	181	108	107	-	-	506
1968 March ^{5/}	-	-	-	-	167	123	96 ^{14/}	1	69	456
1969 ^{6/}	-	20	159	6	211	130	153	4	-	683
1970 ^{7/}	-	-	166	-	147	109	122	7	-	551
1975 ^{8/}	-	-	274	-	139	95	18	5	47	578
1976 ^{9/} Mar-Apr	0	1	195	-	186	127	26	1	29	565
1976 ^{10/}	-	-	269	-	236	126	30	1	32	695
1977 April ^{11/}	-	46	223	-	178	106	43	5	24	625
1978 May ^{12/}	0	22	199	-	-	86	-	-	-	-
1978 July ^{13/}	4	30	196	-	113	85	26	3	45	502

^{1/} Highest count; various aerial and surface counts made (Kenyon and Rice 1959).^{2/} Highest count; various aerial and surface counts made (Rice 1960).

Table 10. Continued.

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- 3/ Surface counts (Kridler letter, 1966).
- 4/ Surface counts.
- 5/ Kenyon, K.W. 1973. Hawaiian monk seal (Monachus schauinslandi). Int. Union Conserv. Nat. Nat. Resour., Morges, Switz., IUCN Pub. New Ser., Suppl. Pap. 39, p. 88-97.
- 6/ Counts except for Midway) are from HINWR unpublished BSFW report by E. Kridler. Counts are selected highest made in February, March, August, and June, 1969.
- 7/ Counts (except for Midway) are from HINWR unpublished report by E. Kridler. Counts are selected highest made in April, July, and August, 1970.
- 8/ Counts in March, May, and August by Sekora and Sincock (FWS), Iverson (NMFS), and Nolten (USN).
- 9/ Counts of 18 March to 9 April by DeLong, Fiscus, and Kenyon.
- 10/ DeLong 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.
- 11/ DeLong and 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. Center, Seattle, Wash., Processed Rep., 43 p.
- 12/ DeLong 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 and Alaska Fish. Center, Seattle, Wash., Interim rep. 22 p.
- 13/ Data from present survey.
- 14/ Incomplete counts.