

NOAA Technical Memorandum NMFS



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**HAWAIIAN MONK SEAL OBSERVATIONS
AND CAPTIVE MAINTENANCE PROJECT
AT KURE ATOLL, 1981**

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

NOAA Technical Memorandum NMFS

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ABSTRACT

The mean beach count of Hawaiian monk seals at Kure Atoll 1 April-13 September 1981 was 20.8, excluding pups of the year. Six female and four male pups were born between mid-February and late August. Six of the pups were born on Green Island, four on Sand Island. A single female pup disappeared before weaning and a male pup disappeared about 1 month after weaning. The other eight pups were double flipper tagged after weaning.

Five female pups were captured after weaning and maintained for a limited time in a large beach enclosure. These seals were fed live locally caught reef fishes and invertebrates. The pups were released on 2 September and one disappeared within a few days. The four other female seals have been resighted at Kure Atoll each field season through 1985.

INTRODUCTION

Kure Atoll, located at the western end of the Hawaiian Archipelago, supports a population of the Hawaiian monk seal, Monachus schauinslandi, which has been declining during the past 25 years (Johnson et al. 1982). The natural history of Kure Atoll, including early human impacts on monk seals and some beach count information, is reviewed in Woodward (1972).

Mortality and disappearance of monk seal pups at Kure Atoll were first reported by Wirtz (1968). He found that of 62 pups born in 1964 and 1965, 12 died, and 49 of the remaining 50 disappeared between 16 and 74 days of age. Some of those found dead were believed killed by sharks which are nearshore in the late spring and summer, probably attracted by fledging seabirds in the water. Other pups had open back wounds surrounded by lacerations and badly bruised tissue which Wirtz believed may have been inflicted by adult male monk seals. Subsequent observations by others have confirmed the source of this type of injury to be adult males (Johnson and Johnson 1981; Alcorn 1984; Johanos and Kam 1986).

Births at Kure substantially declined from 30-32 pups per year in 1965 and 1964, respectively, to 9-13 pups per year from 1977 through 1980 (Johnson et al. 1982; Kenyon¹; ²Ruehle and Johnson³). Pup survival has also remained low based on summer census data from 1976 through 1980 which gave the following high beach counts of juveniles and subadults: 1976: 0, 1977: 3, 1978: 3, 1979: 4, and 1980: 5 (Johnson et al. 1982; see footnotes 1, 2,). The decreasing number of births and the low survival caused concern that recruitment of breeding seals was so low that survival of the Kure population was in jeopardy (Gilmartin et al.⁴).

In addition to the two probable traumatic causes of pup death mentioned above, other potential causes included disease, natural toxins in the reef fishes, and congenital problems.

In an attempt to enhance survival of monk seal pups at Kure Atoll, an experimental temporary captive maintenance project was conducted in 1981. Results of this project are presented here together with other population and reproductive data collected in 1981.

¹Kenyon, K. W. 1979. Hawaiian monk seal observations at Kure Atoll, 10-22 May 1979, 55 p.

²Kenyon, K. W. 1980. Hawaiian monk seal observations at Kure Atoll 17 June-3 July 1980. Unpubl. manusc. Natl. Fish Wildl. Lab., U.S. Fish Wildl. Serv., 35 p. + figs.

³Ruehle, J., and A. M. Johnson. 1977. Observations of monk seals and other wildlife of Kure Atoll, 10 February-13 May 1977. Manusc. in prep., 40 p.

⁴Gilmartin, W. G. 1984. Recovery plan for the Hawaiian monk seal, Monachus schauinslandi, 44 p.

METHODS

Observations and censuses of monk seals on Green Island and the adjacent sand islets (Sand Island and Shark Island) at Kure Atoll (Fig. 1) were conducted almost daily from 1 April to 13 September, and then irregularly at 1-2 week intervals through the remainder of 1981. Stone (1984) describes which seals were included in a beach count and the size class criteria into which most were assigned.

All but one pup of the year were tagged on both hind flippers with gray Temple Tags⁵ while being physically restrained by one person. A 5-mm diameter hole was punched through the webbing between the fourth and fifth digits using a leather punch tool. The single piece plastic tag was then inserted through this hole to the position where the connecting post of the two plates was in the punched hole. The pups, while sleeping, were also marked with large symbols on their pelage using a commercial hair lightener. Standard length and girth measurements were taken at the time of tagging and weights were obtained by suspending the pup in a hoop net from a spring scale. All of the above activities were performed on the pups following weaning.

Construction of a 36 x 61 m enclosure consisting of welded wire mesh supported by galvanized pipe posts was completed on 5 June. The enclosure was located on the southwest beach of Green Island (Fig. 1) and enclosed equal areas of sand and water; the fence height was about 0.8 m on the beach and 0.5 m above high tide in the water. The maximum water depth at low tide was approximately 1.5 m. Three female pups which had been weaned earlier in the season were captured and placed into the enclosure as soon as it was completed. Two other female pups were collected subsequently and also placed in the pen. The pups were captured with a hoop net and carried by hand to the pen or transported by small boat. Time from capture to placement in the enclosure did not exceed 20 min.

The pups in the enclosure were fed fish and invertebrates which were trapped or netted in the lagoon near Green Island. Four fish traps (1 x 1 x 0.5 m) were placed near coral heads within 500 m of the enclosure and fish caught in the traps were collected daily. This, together with some gill netting adjacent to the enclosure at least every other day, provided ample fish to feed the five pups. The trapping and netting yielded from 2 to 20 kg of fish per day. Nenu, Kyphosus cinerascens, were the most abundant fish in the traps. Squirrelfish, Adioryx spp.; weke, Mulloidichthys spp.; manini, Acanthurus triostegus; various wrasses, Labridae; and butterfly fishes, Chaetodon spp., were also common. Occasionally, lobsters, Panulirus spp., and conger and moray eels were also recovered in the traps and they too were offered to the pups. The total catch each day was released into the enclosure alive, except during some of the initial feeding sessions when dead or stunned fish were presented.

⁵Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

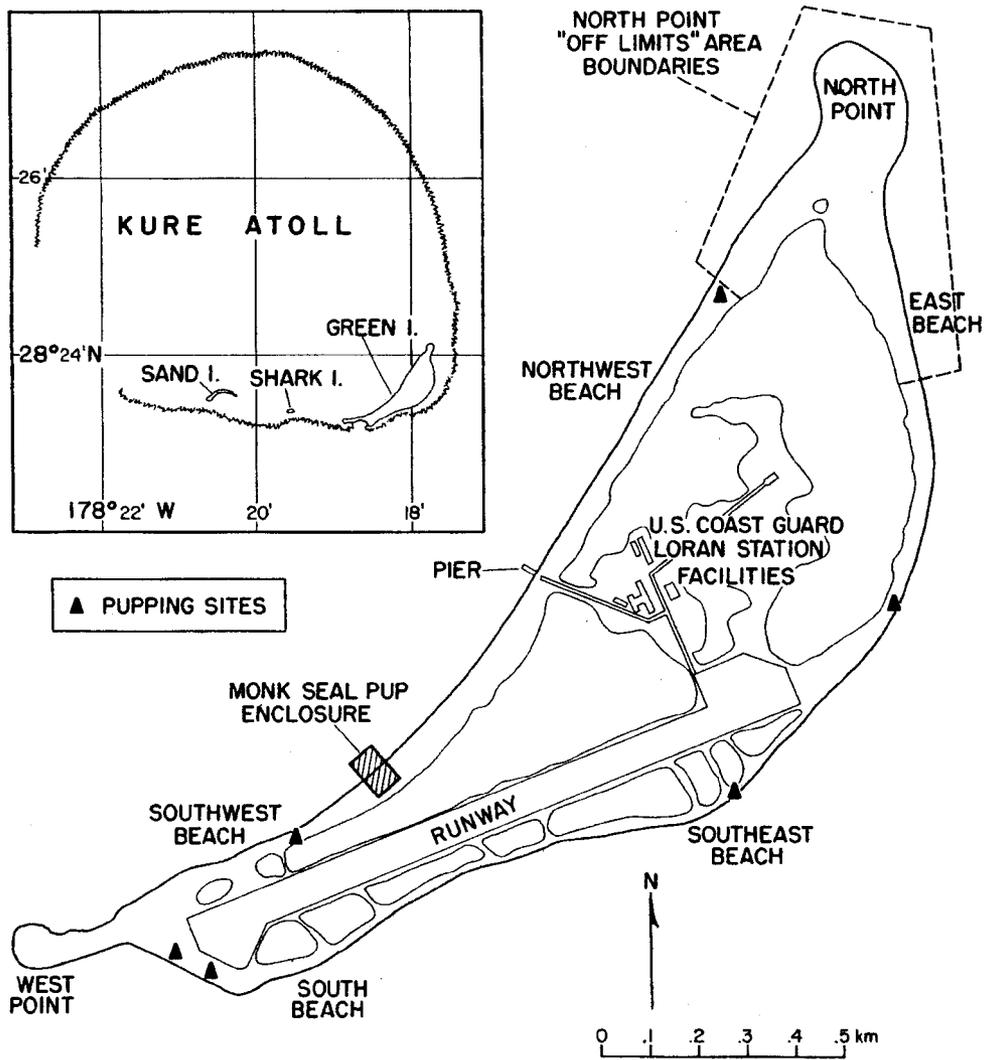


Figure 1.--Kure Atoll and Green Island, showing the monk seal enclosure site, off limits area, and 1981 pupping sites.

The five pups in the enclosure were released on 2 September. The fencing was simply removed from the enclosure; no attempt was made to actively release the pups by chasing them from the pen. Following release, resightings of the pups through the winter were recorded by U.S. Coast Guard personnel and in subsequent years by National Marine Fisheries Service (NMFS) staff.

RESULTS AND DISCUSSION

All of the atoll-wide monk seal census data are presented in Table 1. The mean count for all seals except pups of the year was 20.8. Kenyon (see footnotes 1, 2) reported mean counts of all seals on Green Island and the Sand Islets as 24.5 in 1979 and 17.9 in 1980. The mean count of 26 for all seals in 1981 is not comparable to the earlier counts of Kenyon because it includes all pups in the enclosure and includes counts later in the summer when adult males are molting. The highest atoll-wide beach counts for each size and sex class in a single census and the dates in parentheses were: adult males: 18 (9/5); adult females: 6 (6/17, 8/2); subadult males: 3 (9/5); subadult females: 1 (4/3, 4/16, 6/17, 6/25, 8/6, 9/5, 9/13); juvenile males: 4 (6/25); and juvenile females 2 (6/21, 8/20). In spite of known differences in hauling patterns by sex and season (Stone 1984), these census data indicate that males outnumbered females at Kure Atoll, an observation confirmed in more recent work (Gerrodette⁶). Figure 2 shows the hauling locations of all non-nursing adult females sighted on Green Island during 1981 censuses. There is a clear preference for Northwest Beach and, to a lesser extent, North Point, an area designated as "off limits" to Coast Guard personnel stationed on the island.

A summary of information on the 1981 pups is presented in Table 2. Six of the 10 pups were born on Green Island which was historically the major pupping island at the atoll. In the recent past, however, it had lost its appeal as a birth site, probably because of constant human associated disturbance with beach vehicles and dogs (Kenyon 1972). The return of pupping to Green Island is probably a result of decreasing beach disturbance which should contribute to better pup survival. In 1981 births occurred in all months from February through August, with the exception of July. The mean nursing time was approximately 40 days. Sites of the six births on Green Island are shown in Figure 1.

The capture and release weights of the female pups are shown in Table 3. The mean weight loss for the five was 23% of their capture weight. Monk seal pups will normally lose up to 50% of their weaning weight during the 6-12 months following weaning. The decrease in the size of captive pups appeared less than that of seal pups in the wild during the same time period based on subjective visual size comparison.

⁶Gerrodette, T. 1985. Estimating the 1983 population of Hawaiian monk seals from beach counts. Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Admin. Rep. H-85-5, 13 p.

Table 1.--Summary of Hawaiian monk seal beach counts for Kure Atoll, 1981.

Date 1981	Non-pups									Pups						Totals		
	Adult			Subadult			Juvenile			Weaned			Nursing			Non- pup	Pup ¹	Grand
	M	F	?	M	F	?	M	F	?	M	F	?	M	F	?			
4/1	9	3	0	1	0	0	2	1	0	1	0	0	0	0	3	² 17	4	21
4/3	13	3	4	1	1	1	1	0	0	1	0	0	0	0	3	² 25	4	29
4/16	6	4	4	1	1	1	0	0	1	1	0	0	1	2	1	18	5	23
5/21	5	2	4	0	0	0	1	0	1	1	0	0	0	0	1	² 19	2	21
6/17	8	6	5	1	1	1	0	0	0	0	3	0	0	2	0	22	5	27
6/21	5	3	3	1	0	1	1	2	0	0	3	0	0	2	0	² 18	5	23
6/25	10	3	1	0	1	0	4	0	0	0	3	0	0	1	0	19	4	23
7/11	4	2	2	0	0	0	0	0	1	0	3	0	0	2	0	9	5	14
7/17	5	2	1	1	0	0	3	1	0	0	5	0	0	0	0	² 14	5	19
7/21	9	3	1	2	0	0	2	1	2	0	5	0	0	0	0	20	5	25
7/25	7	4	2	2	0	0	3	1	0	0	5	0	0	0	0	² 21	5	26
7/29	5	3	0	0	0	0	3	0	1	0	5	0	0	0	0	² 17	5	22
8/2	7	6	6	1	0	0	2	1	0	0	5	0	0	0	0	23	5	28
8/6	9	2	3	0	1	3	1	0	0	1	5	0	0	0	0	19	6	25
8/16	7	0	3	2	0	3	1	0	1	0	5	0	0	0	0	17	5	22
8/20	8	3	8	2	0	1	2	2	0	0	5	0	1	0	0	² 27	6	33
8/24	13	5	2	0	0	1	1	1	2	1	5	0	1	0	0	² 26	7	33
8/28	7	2	6	2	0	2	0	0	0	1	5	0	1	0	0	19	7	26
9/1	15	1	8	1	0	1	2	0	1	0	5	0	0	0	0	² 30	5	35
9/5	18	1	4	3	1	1	3	1	0	0	2	0	1	0	0	32	3	35
9/13	15	2	8	1	1	2	2	1	0	1	2	0	1	0	0	32	4	36

¹Weaned female pups in the protective enclosure were included in the census.

²Total includes some seals which were not placed in any size/sex class. These censuses were not used to calculate the mean non-pup beach count reported in the text.

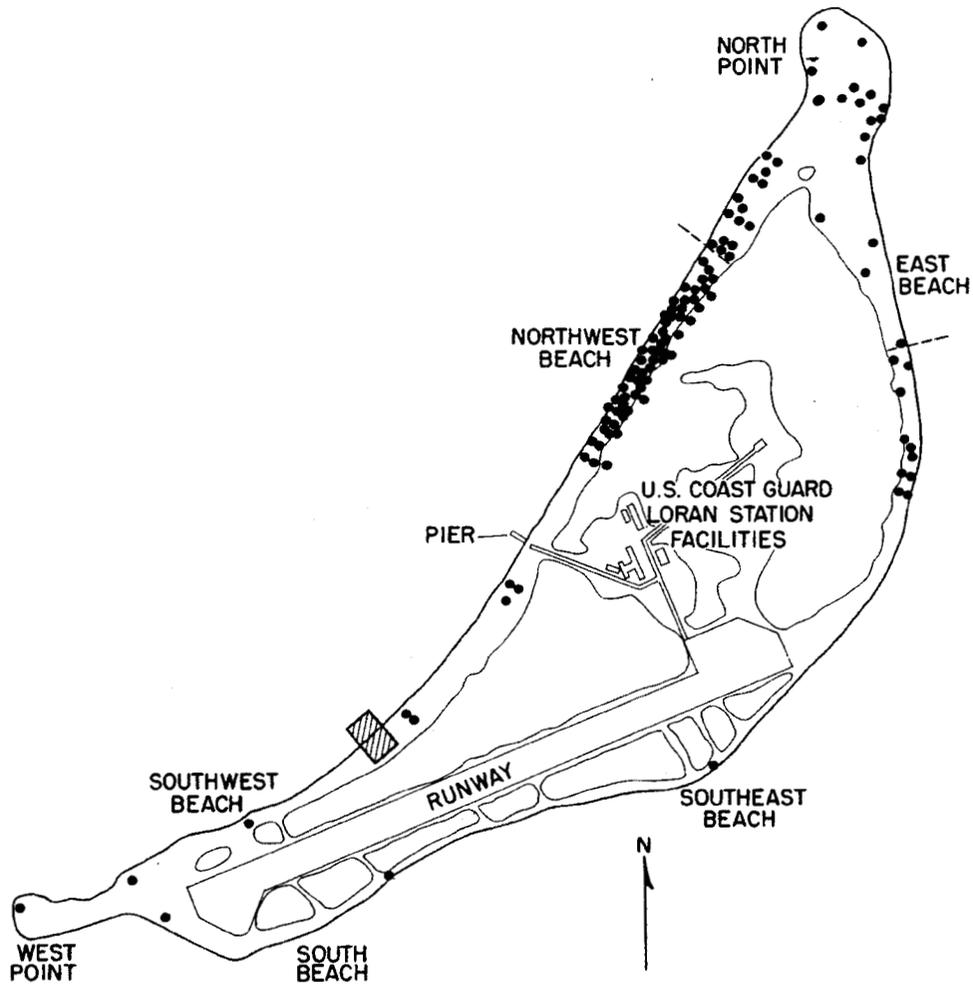


Figure 2.--Map showing the locations (●) of all non-nursing adult female monk seal sightings during the 1981 field season on Green Island.

Table 2.--Pups born on Kure Atoll, 1981.

Pup No.	Sex	Birth		Weaning date	Time nursing (days)	Tagging date	Tag (gray)		Capture date ²
		Place ¹	Date				Left	Right	
5	M	G	2/18	3/23	33	6/17	615	616	--
26	M	G	3/10	4/22	43	6/08	609	610	--
53	M	S	~ 3 wk old, 4/11	4/25-26	~ 35	(not seen after 5/21/81)			
56	F	S	~ 10 d old, 4/11	Not determined	--	6/11	606	612	6/09
50	F	G	4/10	6/01	52	6/11	605	604	6/06
64	F	G	4/19	5/20	31	6/11	607	608	6/06
00	F	G	Between 5/5 and 5/19	Disappeared with mother 2-3 June					
82	F	S	~ 6/03	7/17	~ 44	7/18	617	618	7/18
83	F	S	~ 6/06	7/17	~ 41	7/18	890	900	7/18
131	M	G	8/17	9/25	39	10/7	621	620	--

¹G = Green Island and S = Sand Island.

²All pups were released on 2 September 1985.

Table 3.--Kure Atoll captive pup weights, 1981.

Pup No.	Capture weight (kg)	Time in enclosure (days)	Release weight (kg)	Percent loss
56	56.8	85	44.5	22
50	87.7	88	65.9	24
64	75.0	88	55.0	26
82	80.9	46	64.1	21
83	84.1	46	69.1	18

The pups were observed to consume at least some of all species of fish offered to them as well as lobsters, one eel, and one hermit crab. There was a clear preference for the butterfly fishes and weke. Based on 24 h observations the seals appeared to chase fish more at night than during daylight hours. Initially, the pups would take only dead or stunned fish and were occasionally seen mouthing sea cucumbers. Once they began mouthing fish, they all progressed quickly to catching live fish. It was observed that the last two pups placed in the pen began eating much sooner than the original three animals; presumably seeing the older pups catching and consuming fish enabled them to learn the techniques faster. No health problems were encountered by pups during the 3 months of maintenance and, once a pup began eating, it was observed eating regularly.

Following release of the seals on 2 September 1981, only one animal (pup No. 64) has never been resighted and is presumably dead. She was last seen the day of release. The other four females have been resighted regularly in subsequent years through the summer of 1985.

The female pups appeared healthy throughout their captive maintenance period and neither the quantity nor quality of fish which was made available to the pups appeared to negatively impact their development. At least in 1981, toxins in reef fishes were not a problem. Similarly, speculation that congenital problems may have been a cause of high mortality of Kure pups does not seem valid. This work demonstrated that protecting female monk seal pups at Kure Atoll from being traumatized by adult male seals or attacked by sharks during their first summer can greatly enhance their probability of survival.

ACKNOWLEDGMENTS

The original concept for this project came from Ancel Johnson, USEWS, Anchorage, Alaska. He also suggested the use of the Temple Tag on monk seals, which now appear to have a very high retention rate. Important assistance with the field observations and pup care was provided by Karl Kellar, Bonnie Storm, Amy Uyemura, and Deanna Vick. Personnel of the U.S. Coast Guard, Kure Island Loran Station, provided various types of support assistance on a day-to-day basis and the Coast Guard Air Station, Barbers Point, Oahu, provided transportation to Kure Atoll.

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