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**NORTHERN ELEPHANT SEALS
ON THE POINT REYES PENINSULA, CALIFORNIA,
1988**

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INTRODUCTION

Northern elephant seals (*Mirounga angustirostris*) were harvested for oil in the late 19th century and Bartholomew and Hubbs (1960) speculated that there were fewer than 100 animals by the early 20th century. Since that time, elephant seals have made a remarkable recovery and the total population estimate for the U. S. in 1986 was 50,800 animals including 14,400 pups (Boveng 1988). The apparent growth rate between 1980 and 1986 was estimated to be about 8.75 percent annually (Boveng 1988). Associated with this rapid increase has been the colonization of many areas along the California coast.

Whether northern elephant seals historically bred on the mainland rather than islands is not known. Le Boeuf and Panken (1977) speculated that mainland breeding was uncommon because of predation by grizzly bears and man. The first pup born on the mainland in this century was at Ano Nuevo Point in 1975. Since then other mainland pupping areas have been established at Cape San Martin (Monterey County), Point Saint George (Del Norte County), and Point Reyes (Marin County) (Bonnell et al. 1983, Stewart and Yochem 1986). With the establishment of mainland colonies, researchers have speculated that the present abundance of elephant seals may actually be greater than prehistoric times (Boveng 1988).

Colonization in Point Reyes exemplifies the continued range expansion of northern elephant seals. The first pup was found on the Point Reyes Peninsula in 1976 and a colony was first noted

in 1981 at Point Reyes Headland. Since then, the average annual rate of growth in pup counts has been about 100% (Allen and Peaslee 1987).

This report provides a summary of the 1987-88 breeding season at Point Reyes Headland (PRH). The objectives of this study were 1) to provide baseline information on reproductive success and colony growth rate, 2) to document the expansion of the colony into other areas and 3) to identify potential conflicts with park visitors. The results of this project may be applied to the development of a management plan for northern elephant seals in the Point Reyes National Seashore.

STUDY AREA AND METHODS

The Point Reyes Peninsula extends from Bolinas Bay ($37^{\circ}55'N$) north to Tomales Point ($38^{\circ}15'N$) and the coastline consists of sheer rocky cliffs, small pocket beaches, and long, dune-backed sandy beaches. Elephant seals have been sighted in several areas here, including Point Reyes, Limantour, and Drakes Beaches. The greatest number, though, occurs within a series of inaccessible pocket beaches at Point Reyes Headland (PRH) (Figure 1).

Seals were counted at PRH between December 17, 1987, and July 22, 1988. Seals were classified by sex and age class. Categories included bull, subadult male, female, pup, weaned pup and immature. Seals were censused at low to medium tides from cliffs 100 m above a series of pocket beaches. The numbers recorded for each census are the exact number seen, although in

some cases the number present was greater than the number recorded because I was unable to see seals lying immediately next to the base of the cliffs. The maximum number of breeding animals present each year is derived from the maximum number of animals of each age and sex class recorded throughout the season. For example, not all females that gave birth during a season were present at the same time; however, a direct count of pups provided an estimate of the number of females.

I estimated the reproductive success of the PRH colony in 1988 as the proportion of pups surviving to the age of weaning divided by the number of pups born. A regression of the natural logarithm of the pup count with year of the count yielded the average rate of growth in total pup count from 1981 to 1988.

To document the expansion of the colony into other areas, I periodically surveyed Point Reyes and Drakes Beaches for elephant seals.

RESULTS AND DISCUSSION

Point Reyes Headland (PRH) continued to be the only location on the Point Reyes Peninsula in 1988 where seals congregated in large numbers and where females gave birth. In addition, a maximum of three subadult male seals were observed during the breeding season at the south end of Point Reyes Beach and one subadult male was noted at the north end of Limantour Beach.

The colony at PRH increased by 36% during the breeding season of 1987-88 from the previous year (Tables 1 and 2). The increase was primarily composed of female/pup pairs since the

number of males remained the same as that noted in 1987. Females and pups accounted for 86% of the total estimated number for the breeding season (Table 2).

The first pup was observed in early January at PRH and by February 12, 1988, all pups had been born. A maximum of 34 pups was counted and this represented a 55% increase from the previous year pup estimate. This increase is larger than the average annual rate of growth of 13.7% for total California pup counts between 1965 and 1986 and larger still than the average annual rate of growth of 8.8% for the years 1980 through 1986 (Boveng 1988). The average annual rate of growth for the Point Reyes colony between 1981 and 1988 was 104% (slope = 0.556, s.e. = 0.54, $p < 0.001$, $r^2 = 0.88$); however, the average growth rate declined to 31.8% per year between 1985 and 1988 (slope = 0.23, s.e. = 0.13, $p < 0.01$, $r^2 = 0.91$).

Only one dead pup was recorded during the 1988 breeding season, and on March 10, 32 weaned pups were counted. The survival rate to weaning is estimated to be 97% for the 1988 breeding season. This figure may be inflated because of census interval. Daily censuses were not conducted, and therefore, some dead pups may have washed away with high tides. The 3% mortality rate, however, is similar to that noted at other colonies (Boveng 1988). Pup mortality at San Miguel Island, California, in 1985 and 1986 was estimated to be 5%. The high survival rate at Point Reyes may be attributed to a mild winter and an absence of crowding on the haul-out area. Both factors have been shown to

cause higher pup mortality at established colonies (Le Boeuf 1971, Huber et al. 1985).

During the molt season in 1988, I counted a maximum of 60 seals on April 9 at PRH, an increase of 23% from the previous year. The herd was composed of immatures and females during April and May and subadults and bulls in June and July. No seals were documented at any other location during the molting season.

During the breeding and molt seasons, there were a total of 20 sightings of seals with flipper tags and four with dye marks. One immature seal had an orange tag indicating it was tagged by the California Marine Mammal Center and the rest had tags from Ano Nuevo (80%) and the Farallones (15%). The dye-marked animals were all subadult males and all but one had been marked at the Farallones during the previous breeding season. One had been dye-marked at Ano Nuevo.

The annual increase in the number of seals at PRH between 1984 and 1987 was modest in comparison to that noted at South Farallon Islands and Ano Nuevo when those colonies were initially growing (Cooper and Stewart 1983, Huber et al. 1985, Le Boeuf and Panken 1977). The slow rate of growth at PRH for those years may be attributed to the after-effects of the 1982-83 El Nino/Southern Oscillation (ENSO), which had a documented effect on other pinniped populations in California (Bayer 1985, Boveng 1988, Heath and Francis 1984, Huber et al. 1986). The large increase in the number of pups produced in 1988 at PRH compared to 1987 suggests that the after-effects of ENSO have diminished and similar increases have been documented at other colonies in

California (D. DeMaster, National Marine Fisheries Service, pers. commun.). Consequently, one can expect a renewed and continued rapid increase in this colony with eventual expansion onto nearby beaches. If the colony continues to grow at 41% per year (as was the estimated rate of pup production at Ano Nuevo between 1962 and 1968) then by 1995 almost 380 pups may be expected at Point Reyes (Cooper and Stewart 1983). No interactions with park visitors were documented in 1988 and none will likely occur until seals become established at more accessible beaches.

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Table 2. Estimates of age and sex classes of northern elephant seals present during the breeding season at Point Reyes, 1981-1988.

YEAR	BULLS		SA MALES		FEMALES		PUPS		TOTAL	
	#	%*	#	%	#	%	#	%	#	%**
1981			3	50	2	33	1	17	6	
1982			3	50	2	33	1	17	6	0
1983	1	9			8	72	2	18	11	46
1984	1	3	5	17	12	40	12	40	30	173
1985	1	3	5	13	17	42	17	42	40	33
1986	1	2	6	13	19	42	19	42	45	13
1987	2	3	12	21	22	38	22	38	58	29
1988	3	4	8	14	34	43	34	43	79	36

* Percent representation to the total estimate for each year.

** Percent increase from previous year.

Table 1. Northern elephant seals at Point Reyes, California, during the 1987-88 breeding and molt seasons.

DATE	TOTAL	MALE	FEMALE	PUP	WEANED	OTHER
1987						
OCT 27	33		1			32
DEC 17	9	8				1
JAN 5	9	1	6	1		1
18	34	5	16	12		1
29	61	4	30	26		1
FEB 5	62	5	28	29		
12	62	10	18	34		
18	53	9	14	30		
26	41	8	8	25		
MAR 10	36	4		32		
APR 7	5					5
9	60					60
MAY 24	22					22
JUN 23	15	8				7
JUL 6	15	13				2
22	14	13				1

Figure 1. Location of haul-out sites of northern elephant seals at Point Reyes Headland, 1987-88.

