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NORTHERN FUR SEAL (*Callorhinus ursinus*): San Miguel Island Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Northern fur seals occur from southern California north to the Bering Sea and west to the Okhotsk Sea and Honshu Island, Japan (Fig. 1). During the breeding season, approximately 74% of the worldwide population is found on the Pribilof Islands in the southern Bering Sea, with the remaining animals spread throughout the North Pacific Ocean (Lander and Kajimura 1982). Of the seals in U. S. waters outside of the Pribilofs, approximately 1% of the population is found on Bogoslof Island in the southern Bering Sea and San Miguel Island off southern California (NMFS 1993). Northern fur seals may temporarily haul out on land at other sites in Alaska, British Columbia, and on islets along the coast of the continental United States, but generally outside of the breeding season (Fiscus 1983).

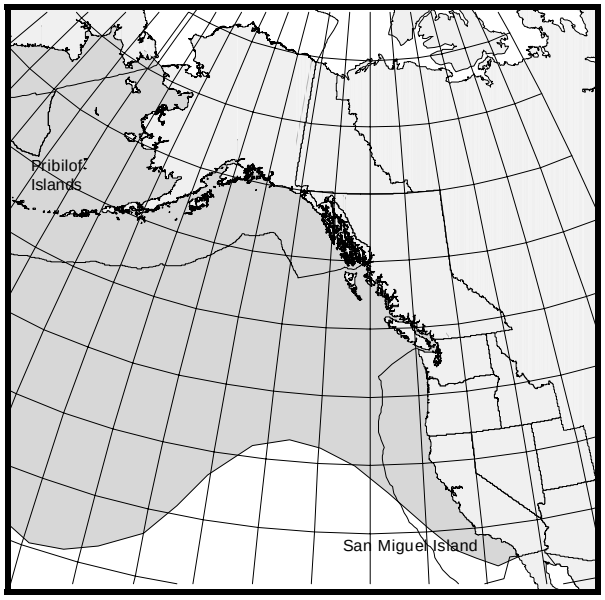

Figure 1. Approximate distribution of northern fur seals in the eastern North Pacific (shaded area).

Due to differing requirements during the annual reproductive season adult males and females typically occur ashore at different, though overlapping times. Adult males usually occur on shore during the 4-month period from May-August, though some may be present until November (well after giving up their territories). Adult females are found ashore for as long as six months (June-November). After their respective times ashore, seals of both genders spend the next 7-8 months at sea (Roppel 1984). Adult females and pups from the Pribilof Islands migrate through the Aleutian Islands into the North Pacific Ocean, often to the Oregon and California offshore waters. Many pups may remain at sea for 22 months before returning to their rookery of birth. Adult males from the Pribilof Islands generally migrate only as far south as the Gulf of Alaska (Kajimura 1984). There is considerable interchange of individuals between rookeries.

The following information was considered in classifying stock structure based on the Dizon et al. (1992) phylogeographic approach: (1) Distributional data: geographic distribution is continuous during feeding, geographic separation during the breeding season, high natal site fidelity (DeLong 1982); (2) Population response data: substantial differences in population dynamics between Pribilofs and San Miguel Island (DeLong 1982, DeLong and Antonelis 1991, NMFS 1993); (3) Phenotypic data: unknown; and (4) Genotypic data: unknown. Based on this information, two separate stocks of northern fur seals are recognized within U. S. waters: an Eastern Pacific stock and a San Miguel Island stock. The Eastern Pacific stock is reported separately in the Stock Assessment Reports for the Alaska Region.

POPULATION SIZE

The population estimate for the San Miguel Island stock of northern fur seals is calculated as the estimated number of pups at rookeries multiplied by an expansion factor. Based on research conducted on the Eastern Pacific stock of northern fur seals, a life table analysis was performed to estimate the number of yearlings, 2 year olds, 3 year olds, and animals at least 4 years old (Lander 1981). The resulting population estimate was equal to the pup count multiplied by 4.475. The expansion factors are based on a sex and age distribution estimated after the harvest of juvenile males was terminated. A more appropriate expansion factor for the San Miguel Island stock is 4.0, based on the known increased immigration of recruitment-age females (DeLong 1982) and mortality and possible emigration of adults associated with the El Niño Southern Oscillation event in 1982-1983 (DeLong, pers. comm.). The most recent pup count occurred in 1997, resulting in a total count of 3,176 (NMFS, unpubl. data). Based on the 1997 count and the expansion factor, the most recent population estimate of the San Miguel Island stock is 12,704 (3,176x4.0) northern fur seals. Currently, a CV for the expansion factor is unavailable.

Minimum Population Estimate

The survey technique utilized for estimating the abundance of northern fur seals within the San Miguel Island stock is a direct count, with no associated CV(N) as sites are surveyed only once. Additional estimates of the overall population size (i.e., N_{BEST}) and associated CV are also unavailable. Therefore N_{MIN} for this stock can not be estimated using Equation 1 from the PBR Guidelines (Wade and Angliss 1997). Rather, N_{MIN} is estimated as twice the maximum number of pups born in 1997 (to account for the pups and their mothers) plus the maximum number of adult and sub-adult males counted for the 1997 season which results in an N_{MIN} of 6,720 ((3,176x2)+368). This method provides a very conservative estimate of the northern fur seal population at San Miguel Island.

Current Population Trend

The population of northern fur seals on San Miguel Island has increased steadily since the early 1970s, except during the El Niño Southern Oscillation event in 1982-1983. Specifically, live pup counts increased about 24% annually from 1972 through 1982, an increase due, in part, to immigration of females from the Bering Sea and the western North Pacific Ocean (DeLong 1982). In 1983 the counts decreased dramatically, by 63% (DeLong and Antonelis 1991), and have since steadily increased; yet, counts remained below the 1982 level (pre-El Niño) until 1990 and have increased thereafter (Fig. 2).

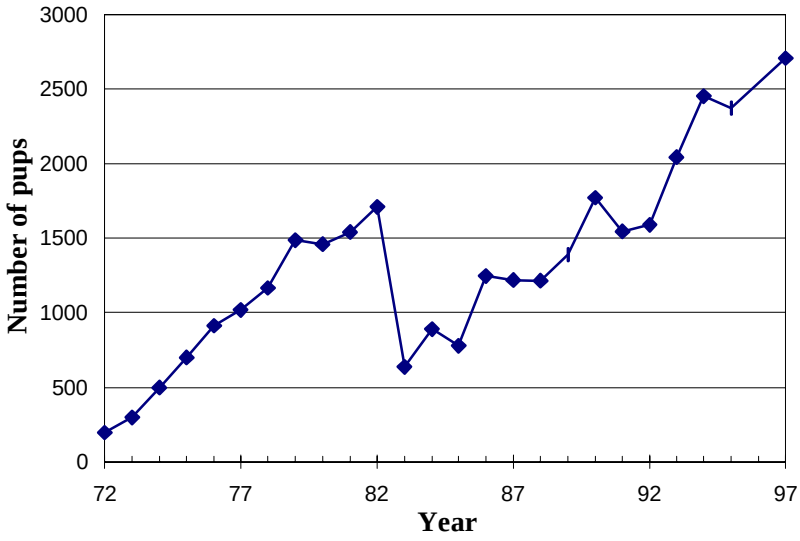

Figure 2. Northern fur seal live pup counts on San Miguel Island, 1972-97. Counts from 1996 were incomplete and have not been included the figure.

The 1997 live pup count of 2,706 was the highest reported at the San Miguel colony since it was discovered in 1968 (S. Melin, unpubl. data). Up to 75% of pups born in 1997 died within 5 months of birth, and pups surviving to weaning were very emaciated. It is expected there will be no survival of pups from the 1997 cohort (DeLong et al. 1998 at http://nmml.afsc.noaa.gov/el_nino). However, because the San Miguel Island stock is small and located at the southern extent of the species' range, it appears to be more sensitive to environmental fluctuations than the Pribilof Island population and thus experiences greater fluctuations in population trends. The San Miguel Island stock will likely experience increased emigration and pup and adult mortality in 1998 if the predicted El Niño Southern Oscillation event is as strong as the 1982-83 event, which may result in slowed population growth or decline in the next few years.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

The northern fur seal population in the Pribilof Islands increased steadily during 1912-24 after the commercial harvest no longer included pregnant females. During this period, the rate of population growth was approximately 8.6% (SE=1.47) per year (A. York unpubl. data), the maximum recorded for this species. This growth rate is similar and slightly higher than the 8.12% rate of increase (approximate SE=1.29) estimated by Gerrodette et al. (1985). Given the extremely low density of the population in the early 1900s, the 8.6% rate of increase is considered a reliable estimate of R_{MAX}.

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 re-authorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 1.0, the

value for stocks of unknown status that are increasing with no evidence of change in the level of incidental mortality (Wade and Angliss 1997). Thus, for the San Miguel Island stock of northern fur seals, PBR = 270 animals (6,720 x 0.043 x 1.0).

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Northern fur seals taken during the winter/spring along the west coast of the continental U. S. could be from the Pribilofs and thus belong to the Eastern Pacific stock. However, it is the intention of NMFS to consider any takes of northern fur seals by commercial fisheries in waters off California, Oregon and Washington as being from the San Miguel Island stock. Information concerning the three observed fisheries that may have interacted with northern fur seals are listed in Table 1. There were no reported mortalities of northern fur seals in any observed fishery along the west coast of the continental U. S. during the period from 1990-96. Fishing effort in the California angel shark/halibut set gillnet fishery was substantially reduced as a result of a California voter proposition banning gillnet fishing in certain areas (Julian 1997, Julian and Beeson 1998). For this fishery, there were no observed sets after 1994. The estimated mean mortality rate in observed fisheries is zero northern fur seals per year from this stock.

An additional source of information on the number of northern fur seals killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1990 and 1996, fisher self-reports from 2 fisheries (Table 1) reported mortalities of northern fur seals. The reported mortalities have been included in Table 1 for completeness. However, these mortalities were not used in the mortality rate calculation because there is a reasonable likelihood that the animals had been misidentified and both fisheries were observed during those years without any observed mortalities of northern fur seals. Mortality of northern fur seals incidental to these fisheries, if it occurred, indeed appears minimal. Self-reported fisheries data are not available for 1994 and 1995, and considered unreliable for 1996 (see Appendix 4 of Hill and DeMaster 1998).

Table 1. Summary of incidental mortality of northern fur seals (San Miguel Island stock) due to commercial fisheries from 1990 through 1996 and calculation of the mean annual mortality rate. n/a indicates that data are not available.

Fishery name	Years	Data type	Range of observer coverage	Reported mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
CA/OR thresher shark and swordfish drift gillnet	90-96	obs data	4-18%	0, 0, 0, 0, 0, 0, 0	0, 0, 0, 0, 0, 0, 0	0
CA angel shark/halibut set gillnet	90-94	obs data	5-15%	0, 0, 0, 0, 0	0, 0, 0, 0, 0	0
WA/OR/CA groundfish trawl (Pacific whiting component)	90-96	obs data	44-72%	0, 0, 0, 0, 0, 0, 0	0, 0, 0, 0, 0, 0, 0	0
Observer program total						0
CA/OR thresher shark and swordfish drift gillnet	90-96	self reports	n/a	1, 0, 0, 0, n/a, n/a, n/a	n/a	-
CA angel shark/halibut set gillnet	90-96	self reports	n/a	1, 0, 1, 0, n/a, n/a, n/a	n/a	-
unknown west coast fishery	90-96	strand data	n/a	2, 0, 0, 0, 0, 0, 0	n/a	0
Minimum total annual mortality					Total	0

Strandings of northern fur seals entangled in fishing gear or with injuries caused by interactions with gear are a final source of fishery-related mortality information. During 1990-96 the only reported northern fur seal strandings occurred in 1990 (Table 1). The strandings could not be attributed to a particular fishery and as a result have been included as unknown west coast fishery. Fishery-related strandings during 1992-96 result in an estimated annual mortality of zero animals from this stock. This estimate is considered a minimum because not all stranded

animals are found, reported, or examined for cause of death (via necropsy by trained personnel).

STATUS OF STOCK

The San Miguel Island northern fur seal stock is not considered to be "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Based on currently available data, the estimated annual level of total human-caused mortality and serious injury (0) does not exceed the PBR (270). Therefore, the San Miguel Island stock of northern fur seal is not classified as a strategic stock. The minimum total fishery mortality and serious injury for this stock (0) is not known to exceed 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. The stock size has increased in recent years although the population status of this stock relative to OSP is unknown, unlike the Eastern Pacific northern fur seal stock which is formally listed as depleted under the MMPA.

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