

NORTHERN ELEPHANT SEAL (*Mirounga angustirostris*): California Breeding Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Northern elephant seals breed and give birth in California (U.S.) and Baja California (Mexico), primarily on offshore islands (Stewart et al. 1994), from December to March (Stewart and Huber 1993). Males feed near the eastern Aleutian Islands and in the Gulf of Alaska, and females feed further south, south of 45°N (Stewart and Huber 1993; Le Boeuf et al. 1993). Adults return to land between March and August to molt, with males returning later than females. Adults return to their feeding areas again between their spring/summer molting and their winter breeding seasons.

Populations of northern elephant seals in the U.S. and Mexico were all originally derived from a few tens or a few hundreds of individuals surviving in Mexico after being nearly hunted to extinction (Stewart et al. 1994). Given the very recent derivation of most rookeries, no genetic differentiation would be expected. Although movement and genetic exchange continues between rookeries, most elephant seals return to their natal rookeries when they start breeding (Huber et al. 1991). The California breeding population is now demographically isolated from the Baja California population. No international agreements exist for the joint management of this species by the U.S. and Mexico. The California breeding population is considered here to be a separate stock.

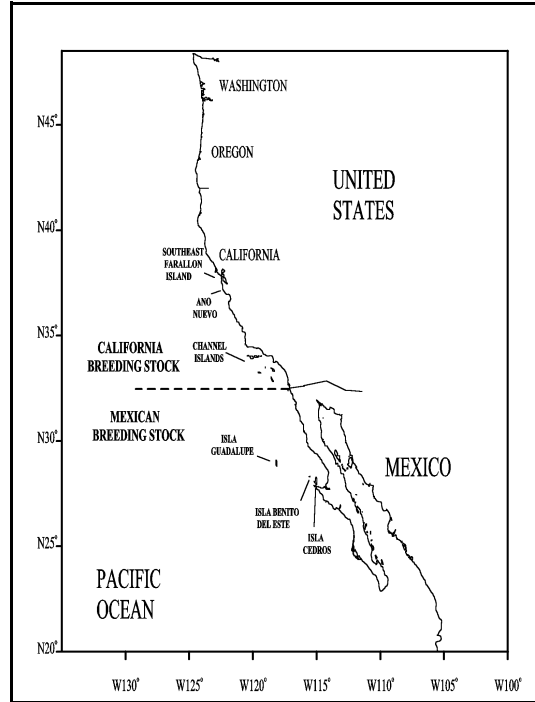


Figure 3. Stock boundary and major rookery areas for northern elephant seals in the U.S. and Mexico.

POPULATION SIZE

A complete population count of elephant seals is not possible because all age classes are not ashore at the same time. Elephant seal population size is typically estimated by counting the number of pups produced and multiplying by the inverse of the expected ratio of pups to total animals (McCann 1985). Stewart et al. (1994) used McCann's multiplier of 4.5 to extrapolate from 28,164 pups to a population estimate of 127,000 elephant seals in the U.S. and Mexico in 1991. The multiplier of 4.5 was based on a non-growing population. Boveng (1988) and Barlow et al. (1993) argue that a multiplier of 3.5 is more appropriate for a rapidly growing population such as the California stock of elephant seals. Based on the estimated 28,845 pups born in California in 2001 (Fig. 2) and this 3.5 multiplier, the California stock was approximately 101,000 in 2001.

Minimum Population Estimate

The minimum population size for northern elephant seals can be estimated very conservatively as 60,547, which is equal to twice the observed pup count (to account for the pups and their mothers) plus 2,317 males and 17 juveniles counted at the Channel Island sites in 2001 (Mark Lowry, NMFS unpubl. data) and 523 males counted at Año Nuevo sites in 1996 (Le Boeuf 1996). More sophisticated methods of estimating minimum population size could be applied if the variance of the multiplier used to estimate population size were known.

Current Population Trend

Based on trends in pup counts, northern elephant seal colonies were continuing to grow in California through

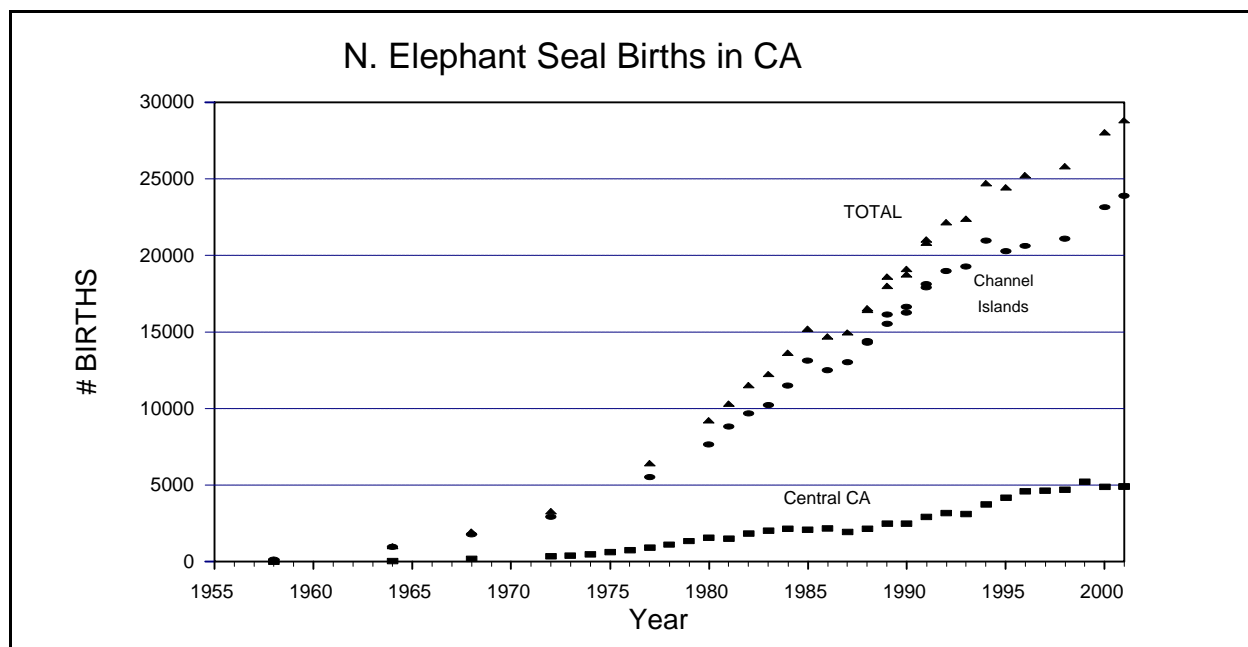


Figure 2. Estimated number of northern elephant seal births in California 1958-2001. Multiple independent estimates are presented for the Channel Islands 1988-91. Estimates are from Stewart et al. (1994), Lowry et al. (1996), and unpublished data from Sarah Allen, Dan Crocker, Brian Hatfield, Ron Jameson, Bernie Le Boeuf, Mark Lowry, Pat Morris, Guy Oliver, and William Sydeman.

2001 (Fig. 2) but appear to be stable or slowly decreasing in Mexico (Stewart et al. 1994).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Although growth rates as high as 16% per year have been documented for elephant seal rookeries in the U.S. from 1959 to 1981 (Cooper and Stewart 1983), much of this growth was supported by immigration from Mexico. The highest growth rate measured for the whole U.S./Mexico population was 8.3% between 1965 and 1977 (Cooper and Stewart 1983). A continuous growth rate of 8.3% is consistent with an increase from approximately 100 animals in 1900 to the current population size. The "maximum estimated net productivity rate" as defined in the Marine

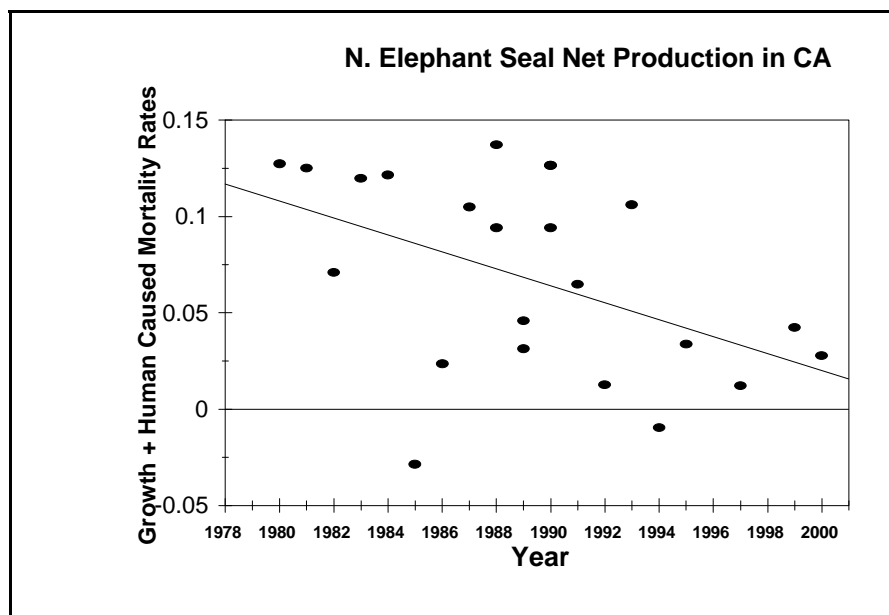


Figure 3. Net production rates for northern elephant seals in California based on pup births and fishery mortality. Annual mortality for 1980-1987 is assumed to be 300, the average of 1988-90 values (Perkins et al. 1994).

Mammal Protection Act (MMPA) would therefore be 8.3%. In California, the net productivity rate appears to have declined in recent years [Figure 3; net production rate was calculated as the realized rate of population growth (increase in pup abundance from year i to year $i+1$, divided by pup abundance in year i) plus the harvest rate (fishery mortality in year i divided by population size in year i)].

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (60,547) times one half the observed maximum net growth rate for this stock ($\frac{1}{2}$ of 8.3%) times a recovery factor of 1.0 (for a stock of unknown status that is increasing, Wade and Angliss 1997) resulting in a PBR of 2,513.

Table 1. Summary of available information on the mortality and serious injury of northern elephant seals (California breeding stock) in commercial fisheries that might take this species (Julian 1997; Cameron and Forney 1999, 2000; Carretta 2001; Perez, in prep.; NMFS unpubl. data). n/a indicates information is not available. Mean annual takes are based on 1996-2000 data unless noted otherwise.

Fishery Name	Year(s)	Data Type	Percent Observer Coverage	Observed Mortality	Estimated Mortality (CV in parentheses)	Mean Annual Takes (CV in parentheses)
CA/OR thresher shark/swordfish drift gillnet fishery	1996	observer data	12.4%	4	37 (0.55)	25 (0.21) ¹
	1997		22.8%	8	45 (0.33)	
	1998		20.2%	4	20 (0.44)	
	1999		20.0%	1	10 (0.61)	
	2000		25.1%	6	26 (0.41)	
CA angel shark/halibut and other species large mesh (>3.5") set gillnet fishery	1996	observer data	0.0%	-	46 (0.23) ²	60 (0.10)
	1997	data	0.0%	-	60 (0.24) ²	
	1998		0.0%	-	70 (0.26) ²	
	1999	extrapolated	23.1% ³	10 [†]	76 (0.19) ²	
	2000	estimate	26.9% ³	4 [†]	48 (0.23) ²	
WA, OR, CA groundfish trawl	1998	observer data	77%	1	1 (n/a)	1 (n/a)
WA Willapa Bay drift gillnet fishery (salmon)	1991	personal communication	n/a	2	2	n/a
Chehalis River salmon setnet fishery	1993	personal communication	n/a	4	4	n/a
Total annual takes						> 86 (0.14)

¹ Only 1997-2000 mortality estimates are included in the average because of gear modifications implemented within the fishery as part of a 1997 Take Reduction Plan. Gear modifications included the use of net extenders and acoustic warning devices (pingers). Following these changes in the fishery, entanglement rates of northern elephant seals declined.

² The CA set gillnets were not observed in 1995-98, and observations in 1999-2000 only included Monterey Bay; mortality for unobserved areas and times was extrapolated from effort estimates and 1991-94 entanglement rates.

[†] Observer coverage and observed mortality in 1999-2000 only includes the portion of the fishery in Monterey Bay.

HUMAN-CAUSED MORTALITY

Fisheries Information

A summary of known fishery mortality and injury for this stock of northern elephant seals is given in Table 1. More detailed information on these fisheries is provided in Appendix 1. The set gillnet fishery in Monterey was observed again in 1999-2000 after a lapse of four years. Entanglement rates of northern elephant seals were similar to extrapolated rates in the previous three years; therefore, mortality estimates for the five most recent years were averaged to give the mean annual take for that fishery. Current mortality could not be estimated for a few fisheries that have taken

small numbers of elephant seals in the past; therefore, the overall mortality is likely to be slightly greater than 86 per year. Stranding data reported to the California Marine Mammal Stranding Network in 1996-2000 include elephant seal injuries caused by hook-and-line fisheries (2 injuries) and gillnet fisheries (1 injury).

Although all of the mortalities in Table 1 occurred in U.S. waters, some may be of seals from Mexico's breeding population that are migrating through U.S. waters. Similar drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico and probably take northern elephant seal. Quantitative data are available only for the Mexican swordfish drift gillnet fishery, which has increased from two vessels in 1986 to 29 vessels in 1992 (Sosa-Nishizaki et al. 1993). The total number of sets in this fishery in 1992 can be estimated from data provided by these authors to be approximately 2,700, with an observed rate of marine mammal bycatch of 0.13 animals per set (10 marine mammals in 77 observed sets; Sosa-Nishizaki et al. 1993). This overall mortality rate is similar to that observed in California driftnet fisheries during 1990-95 (0.14 marine mammals per set), but species-specific information is not available for the Mexican fisheries. There are currently efforts underway to convert the Mexican swordfish driftnet fishery to a longline fishery (David Holts, NMFS, SWFSC, pers. comm.). The number of set-gillnet vessels in this part of Mexico is unknown. The take of northern elephant seals in other North Pacific fisheries that have been monitored appears to be trivial (Barlow et al. 1993, 1994).

Other Mortality

The California Marine Mammal Stranding database maintained by the National Marine Fisheries Service, Southwest Region, contains the following records of human-related elephant seal mortalities and injuries in 1996-2000: (1) boat collision (2 mortalities, 1 injury), (2) automobile collision (5 mortalities), (3) shootings (3 mortalities) and (4) entanglement in marine debris (1 injury). Protective measures were taken to prevent future automobile collisions in the vicinity of Piedras Blancas/San Simeon (Hatfield and Rathbun 1999).

STATUS OF STOCK

A review of elephant seal dynamics through 1991 concluded that their status could not be determined with certainty, but that they might be within their Optimal Sustainable Population (OSP) range (Barlow et al. 1993). They are not listed as "endangered" or "threatened" under the Endangered Species Act nor as "depleted" under the MMPA. Because their annual human-caused mortality is much less than the calculated PBR for this stock (2,513), they would not be considered a "strategic" stock under the MMPA. The average rate of incidental fishery mortality for this stock over the last 5 years (86) also appears to be less than 10% of the calculated PBR; therefore, the total fishery mortality appears to be insignificant and approaching a zero mortality and serious injury rate. The population is continuing to grow and fishery mortality is relatively constant. There are no known habitat issues that are of particular concern for this stock.

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