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# 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). Spatial segregation in foraging areas between males and females is evident from satellite tag data (Le Beouf *et al*. 2000). Males migrate to the Gulf of Alaska and western Aleutian Islands along the continental shelf to feed on benthic prey, while females migrate to pelagic areas in the Gulf of Alaska and the central North Pacific to feed on pelagic prey (Le Beouf *et al*. 2000). 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.

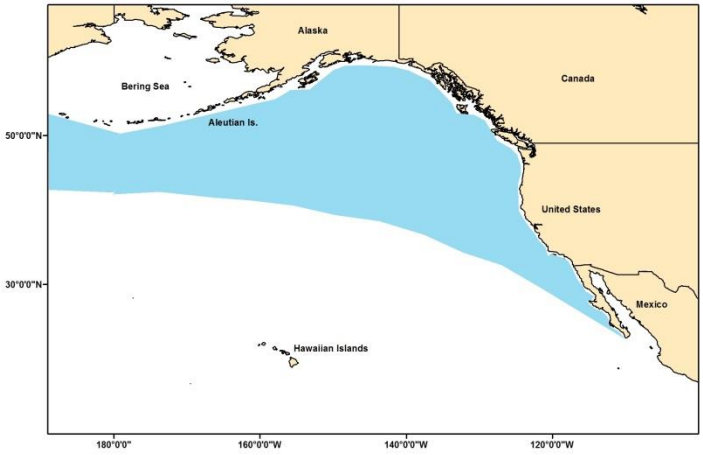


**Figure 1.** Pelagic range of northern elephant seals in the eastern North Pacific. Major breeding rookeries occur along the west coast of Baja California and the California coast, as described in Lowry *et al*. (2014).

Populations of northern elephant seals in the U.S. and Mexico have recovered after being nearly hunted to extinction (Stewart *et al*. 1994). Northern elephant seals underwent a severe population bottleneck and loss of genetic diversity when the population was reduced to an estimated 10-30 individuals (Hoelzel *et al*. 2002). Although movement and genetic exchange continues between rookeries, most elephant seals return to 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.

## POPULATION SIZE

A complete population count of elephant seals is not possible because all age classes are not ashore simultaneously. Elephant seal population size is estimated by counting the number of pups produced and multiplying by the inverse of the expected ratio of pups to total animals (McCann 1985). Based on counts of elephant seals at U.S. Channel Islands rookeries in 2013, Lowry *et al*. (2020) reported 34,788 pups were born. This value represents the sum of live pups (33,454) and estimated pre-census pup mortality (1,334), but it excludes un-surveyed areas in central and northern California (Lowry *et al*. 2020). Lowry *et al*. (2014) reported that 81.5% of the U.S. population resided at the Channel Islands and uses the inverse of this percentage to estimate statewide births, which is 42,685 pups. Lowry *et al.* (2020) extrapolated from total births to a statewide population estimate of 187,386 (95% CI 161,876 – 214,418). This correction factor is based on life table data on elephant seal fecundity and survival rates, where approximately 23% of the population represents pups (Cooper and Stewart, 1983; Le Boeuf and Reiter, 1988; Hindell, 1991; Huber *et al*., 1991; Reiter and Le Boeuf, 1991; Clinton and Le Boeuf, 1993; Le Boeuf *et al*., 1994; Pistorius and Bester, 2002; McMahon *et al*., 2003; Pistorius *et al*., 2004; Condit *et al*., 2014).

### Minimum Population Estimate

The minimum population size for northern elephant seals in 2013 can be estimated conservatively as 85,369 seals, which is equal to twice the estimated statewide pup count (to account for the pups and their mothers).

**Current Population Trend**

The population is reported to have grown at 3.1% annually since 1988 (Lowry *et al*. 2020).

**CURRENT AND MAXIMUM NET PRODUCTIVITY RATE**

An annual growth rate of 17% for elephant seals in the U.S. from 1958 to 1987 is reported by Lowry *et al.* (2014), but some of this growth is likely due to immigration of animals from Mexico and the consequences of a small population recovering from past exploitation. From 1988 to 2013, the population is estimated to have grown 3.1% annually (Lowry *et al*. 2020). For this stock assessment report, we use the default maximum theoretical net productivity rate for pinnipeds, or 12% (Wade and Angliss 1997).

**POTENTIAL BIOLOGICAL REMOVAL**

The potential biological removal (PBR) level for this stock is calculated as the minimum population size ( 85,369) times one half the observed maximum net growth rate for this stock (½ of 12%) 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 5,122 animals per year.

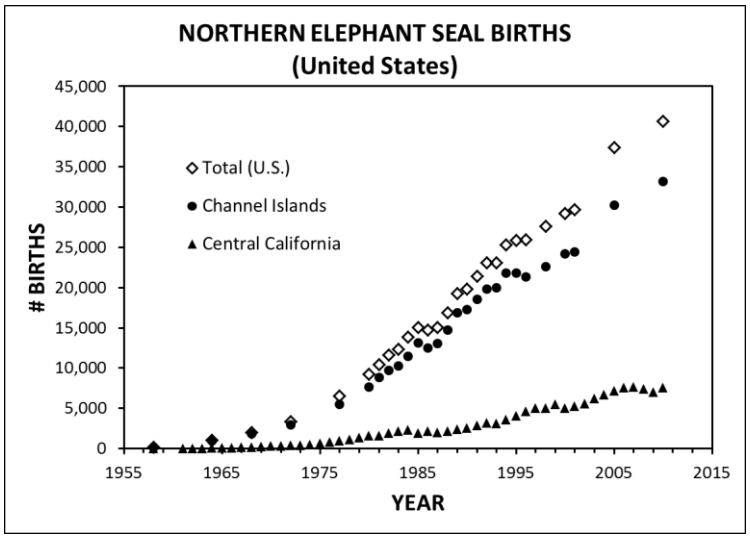


**Figure 2.** Estimated number of northern elephant seal births in California 1958-2010. Multiple independent estimates are presented for the Channel Islands 1988-91. Estimates are from Stewart *et al*. (1994), Lowry *et al*. (1996), Lowry (2002), Lowry *et al*. (2014), and unpublished data from Sarah Allen, Dan Crocker, Brian Hatfield, Ron Jameson, Bernie Le Boeuf, Mark Lowry, Pat Morris, Guy Oliver, Derek Lee, and William Sydeman.

**HUMAN-CAUSED MORTALITY AND SERIOUS INJURY**

**Fisheries Information**

A summary of known commercial fishery mortality and serious injury for this stock of northern elephant seals is given in Table 1. Total estimated commercial fishery mortality is ≥ 5.3 elephant seals annually (Table 1). Although all of the mortality 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.

**Other Mortality**

For the period 2015-2019, deaths and serious injuries from the following non-commercial fishery sources were documented: shootings (2); marine debris entanglement (4); hook and line fisheries (2); dog attack (1); unidentified human interaction (2); harassment (7); vehicle collision (1); tar/oil (22); and vessel strike (1) (Carretta *et al*. 2021). These non-commerical fishery sources of mortality and serious injury total 42 animals, or an average of 8.4 elephant seals annually (Carretta *et al*. 2014b).

**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 (Carretta et al. 2020a, 2020b, Jannot *et al.* 2018). n/a indicates information is not available. Mean annual takes are based on 2015-2019 data unless noted otherwise. The California halibut and white seabass set gillnet fishery has been observed only sporadically in recent years and no elephant seal entanglements have been recorded in this fishery since 2000 when the fishery operated north of Point Conception.

| Fishery Name | Year(s) | Data Type | Percent Observer Coverage | Observed Mortality | Estimated Mortality (CV in parentheses) | Mean Annual Takes (CV in parentheses) |
|---|---|---|---|---|---|---|
| **CA thresher shark/swordfish drift gillnet fishery** | 2015-2019 | observer | 21% | 3 | 10.8 (0.41) | 2.2 (0.41) |
| **CA halibut and white seabass set gillnet fishery** | 2017 | observer | ~10% | 0 | 0 | 0 (n/a) |
| **California halibut trawl fishery open access** | 2012<br>2013<br>2014<br>2015<br>2016 | observer | 0.06<br>0.06<br>0.22<br>0.33<br>0.30 | 0<br>0<br>0<br>0<br>1 | 0.63 (n/a)<br>0.76 (n/a)<br>0.63 (n/a)<br>0.60 (n/a)<br>1.61 (n/a) | 0.85 (n/a) |
| **Limited Entry Sablefish Hook and Line** | 2012<br>2013<br>2014<br>2015<br>2016 | observer | 0.22<br>0.22<br>0.27<br>0.42<br>0.33 | 1<br>0<br>0<br>3<br>0 | 2.33 (n/a)<br>0.95 (n/a)<br>0.87 (n/a)<br>3.86 (n/a)<br>1.08 (n/a) | 1.82 (n/a) |
| **WA, OR, CA domestic groundfish trawl fishery (includes at-sea hake and other limited-entry groundfish sectors)** | 2012-2016 | observer data | 98% to 100% of tows in at-sea hake fishery | 2 | 2 | 0.4 (n/a) |
| **Total annual takes** | | | | | | ≥ 5.3 (n/a) |

## STATUS OF STOCK

Northern elephant seals are not listed as "endangered" or "threatened" under the Endangered Species Act nor designated as "depleted" under the MMPA. Total annual human-caused mortality ( commercial fishery (5.3) + other sources (8.4) = 13.7) is less than the calculated PBR for this stock ( 5,122), thus northern elephant seals are not considered a "strategic" stock under the MMPA. The average rate of incidental fishery mortality for this stock over the last five years ≥ 5.3) is less than 10% of the calculated PBR (5,122); therefore, the total fishery serious injury and mortality appears to be insignificant and approaching a zero mortality and serious injury rate. The population growth rate between 1958 and 1987 was 17% annually (Lowry *et al*. 2014). From 1988 to 2013, the population grew at an annual rate of 3.1% (Lowry *et al*. 2020). The population continues to grow, with ~80% of births occurring at southern California rookeries (Lowry *et al*. 2014, 2020). No estimate of carrying capacity is available for this population and the population status relative to OSP is unknown. There are no known habitat issues that are of concern for this stock. However, expanding pinniped populations in general have resulted in increased human-caused serious injury and mortality, due to shootings, entrainment in power plants, interactions with recreational hook and line fisheries, separation of mothers and pups due to human disturbance, dog bites, and vessel and vehicle strikes (Carretta *et al*. 2021).

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