# GUADALUPE FUR SEAL (*Arctocephalus townsendi*)

## STOCK DEFINITION AND GEOGRAPHIC RANGE

Commercial sealing during the 19th century reduced the once abundant Guadalupe fur seal to near extinction in 1894 (Townsend 1931). Prior to the harvest it ranged from Monterey Bay, California, to the Revillagigedo Islands, Mexico (Hanni *et al*. 1997, Repenning *et al.* 1971; Figure 1). The prehistoric distribution of Guadalupe fur seals during the Holocene was apparently quite different from today, as the archeological record indicates Guadalupe fur seal remains accounted for 40%-80% of all pinniped bones at the California Channel Islands (Rick *et al*. 2009). The live capture of two adult males (and killing of ~ 60 more animals) at Guadalupe Island in 1928 established the continued existence of the species (Townsend 1931). Guadalupe fur seals pup and breed mainly at Isla Guadalupe, Mexico. In 1997, a second rookery was discovered at Isla Benito del Este, Baja California (Maravilla-Chavez and Lowry 1999) and a pup was born at San Miguel Island, California (Melin and DeLong 1999). Since 2008, individual adult females, subadult males, and between one and three pups have been observed annually on San Miguel Island (NMFS, unpublished data). The population at Isla Benito del Este is now well-established, though very few pups are observed there. Population increases at Isla San Benito are attributed to immigration of animals from Isla Guadalupe (Aurioles-Gamboa *et al.* 2010, García-Capitanachi 2011). Along the U.S. west coast, strandings occur almost annually in California waters and animals are increasingly observed in Oregon and Washington waters. In 2015-2016, Guadalupe fur seal strandings totaled approximately 175 animals along the coast of California (compared with approximately 10 animals annually in prior years), and NMFS declared an unusual mortality event[1]. Most strandings involved animals less than 2 years old with evidence of malnutrition. Individuals have stranded or been sightedinside the Gulf of California and as far south as Zihuatanejo, Mexico (Hanni et al. 1997 and Aurioles-Gamboa and Hernadez-Camacho 1999) and another in 2012, at Cerro Hermoso, Oaxaca, Mexico (Esperon-Rodriguez and Gallo-Reynoso 2012). Recent video records of pinnipeds hooked in the mouth from international waters west of the California Current involving the shallow set Hawaii longline fishery were independently reviewed by pinniped experts and at least one animal in early 2016 was identified as a Guadalupe fur seal. Guadalupe fur seals that stranded in central California and treated at rehabilitation centers were fitted with satellite tags and documented to travel as far north as Graham Island and Vancouver Island, British Columbia, Canada (Norris *et al.* 2015). Some satellite-tagged animals traveled far offshore outside the U.S. EEZ to areas 700 nmi west of the California / Oregon border. The population is considered to be a single stock because all are recent descendants from one breeding colony at Isla Guadalupe, Mexico.

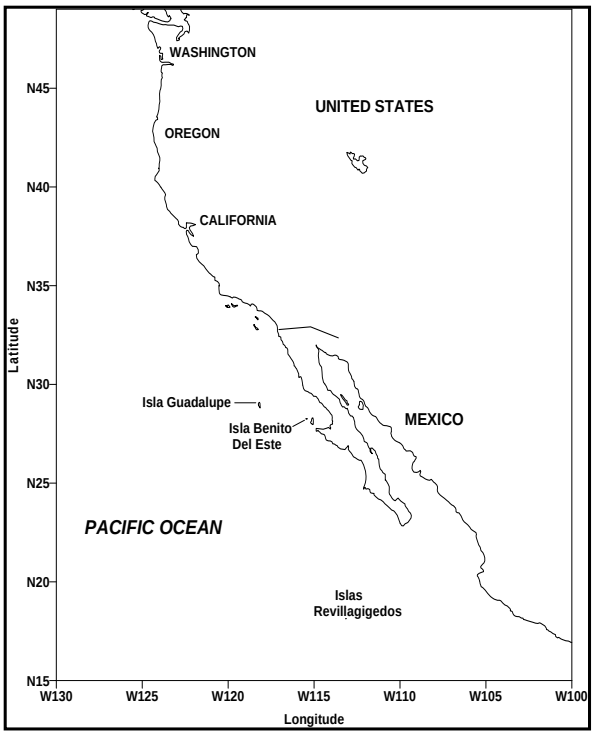


**Figure 1.** Geographic range of the Guadalupe fur seal, showing location of two rookeries at Isla Guadalupe and Isla Benito Del Este.

## POPULATION SIZE

[1] http://www.nmfs.noaa.gov/pr/health/mmume/guadalupefurseals2015.html

The size of the population prior to the commercial harvests of the 19th century is not known, but estimates range from 20,000 to 100,000 animals (Fleischer 1987). Surveys conducted between 2008 and 2010 resulted in a total estimated population size of approximately 20,000 animals, with ~17,500 at Isla Guadalupe and ~2,500 at Isla San Benito (García-Capitanachi 2011, Aurioles-Gamboa 2015). These estimates are corrected for animals not seen during the surveys.

**Minimum Population Estimate**

All the individuals of the population cannot be counted because all age and sex classes are never ashore at the same time and some individuals that are on land are not visible during the census. Direct counts of animals at Isla Guadalupe and Isla San Benito during 2010 resulted in a minimum of 13,327 animals and 2,503 animals respectively, for a minimum population size of 15,830 animals (García-Capitanachi 2011).

**Current Population Trend**

Counts of Guadalupe fur seals have been made sporadically since 1954. Records of Guadalupe fur seal counts through 1984 were compiled by Seagars (1984), Fleischer (1987), and Gallo (1994). The count for 1988 was taken from Torres et al. (1990). More recent counts from 1977-2010 are summarized in García-Capitanachi (2011). Also, the counts that are documented in the literature generally provide only the total of all Guadalupe fur seals counted (i.e., the counts are not separated by age/sex class). The counts that were made during the breeding season, when the maximum number of animals are present at the rookery, were used to examine population growth (Gallo 1994, García-Capitanachi 2011). The natural logarithm of the counts was regressed against year to calculate the growth rate of the population. These data indicate that Guadalupe fur seals are increasing at an average annual growth rate of 10.3% (Figure 2).

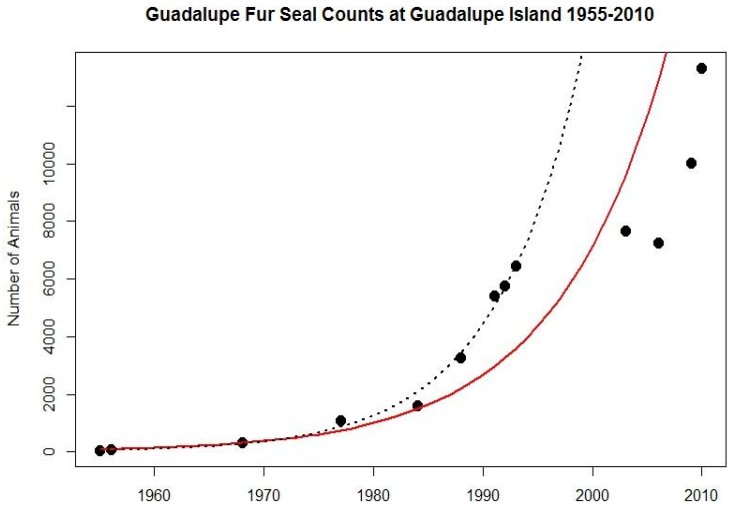


**Figure 2.** Counts of Guadalupe fur seals at Guadalupe Island, Mexico, and the estimated population growth curves derived from counts made during the breeding season. Direct counts of animals are shown as black dots. An estimated annual growth rate of 13% is based on counts made between 1955 and 1993 (black dashed line). The estimated growth rate over the period 1955-2010 is approximately 10% annually (solid red line).

**CURRENT AND MAXIMUM NET PRODUCTIVITY RATES**

Reported annual growth rates of 21% at Isla San Benito over an 11-year period are too high and likely result from immigration from Isla Guadalupe (Esperón-Rodríguez and Gallo-Reynoso 2012). The maximum net productivity rate can be assumed to be equal to the maximum annual growth rate observed between 1955 and 1993 (13.7%) because the population was at a very low level and should have been growing at nearly its maximum rate (Gallo 1994). Based on direct counts of animals at Guadalupe Island between 1955 and 2010, the estimated annual population growth rate is 10.3%.

**POTENTIAL BIOLOGICAL REMOVAL**

The potential biological removal (PBR) for this stock is calculated as the minimum population size (15,830) times one half the maximum net growth rate observed for this species (½ of 13.7%) times a recovery factor of 0.5 (for a threatened species, Wade and Angliss 1997), resulting in a PBR of 542 Guadalupe fur seals per year. The vast majority of this PBR would apply towards incidental mortality in Mexico as most of the population occurs outside of U.S. waters.

## HUMAN-CAUSED MORTALITY AND SERIOUS INJURY
### Fisheries Information

**Table 1.** Summary of available information on the incidental mortality and injury of Guadalupe fur seals in commercial fisheries and other unidentified fisheries that might take this species.

| Fishery Name | Year(s) | Data Type | Percent Observer Coverage | Observed Mortality and Serious Injury | Estimated Mortality and Serious Injury (CV) | Mean Annual Takes (CV) |
|---|---|---|---|---|---|---|
| **CA driftnet fishery for sharks and swordfish** | 2010-2014 | observer | 12%-37% | 0 | 0 | 0 |
| **CA set gillnet fishery for halibut/white seabass and other species** | 2010-2014 | observer | 9% | 0 | 0 | 0 |
| Unidentified fishery interactions | 2010-2014 | strandings | n/a | 16 | ≥ 16 | ≥ 3.2 |
| **Minimum total annual takes** | | | | | | ≥3.2 |

No Guadalupe fur seals have been observed entangled in California gillnet fisheries between 1990 and 2014 (Julian and Beeson 1998, Carretta *et al*. 2004, Carretta *et al*. 2016b), although stranded animals have been found entangled in gillnet of unknown origin (see 'Other mortality' below). Gillnets have been documented to entangle marine mammals off Baja California (Sosa-Nishizaki *et al*. 1993), but no recent bycatch data from Mexico are available.

One confirmed interaction of a mouth-hooked Guadalupe fur seal in the Hawaii shallow set longline fishery has been reviewed by U.S. west coast pinniped experts from video taken at sea in early 2016. Two additional videos of unidentified pinnipeds that were hooked in the mouth in 2015 in the same fishery were also reviewed. These interactions occurred outside of the U.S. EEZ, west of the California Current.

### Other mortality and serious injury

There were 16 records of human-related deaths and/or serious injuries to Guadalupe fur seals from stranding data for the most recent 5-year period of 2010-2014 (Carretta *et al.* 2016a). These strandings included entanglement in marine debris and gillnet of unknown origin, and shootings. The average annual observed human-caused mortality and serious injury of Guadalupe fur seals for 2010-2014 is 3.2 animals annually (16 animals / 5 years). Observed human-caused mortality and serious injury for this stock very likely represents a fraction of the true impacts because not all cases are documented. No correction factors to account for undetected mortality and injury are currently available for pinnipeds along the U.S. west coast.

## STATUS OF STOCK

The Endangered Species Act lists the Guadalupe fur seal as a threatened species, which automatically qualifies this stock as "depleted" and "strategic" stock under the Marine Mammal Protection Act. There is insufficient information to determine whether fishery mortality in Mexico exceeds the PBR for this stock, but given the observed growth of the population over time, this is unlikely. The total U.S. fishery mortality and serious injury for this stock (≥ 3.2 animals per year) is less than 10% of the calculated PBR for the entire stock, but it is not currently possible to calculate a prorated PBR for U.S. waters with which to compare serious injury and mortality from U.S. fisheries. Therefore, it is unknown whether total U.S. fishery mortality is insignificant and approaching zero mortality and serious injury rate. The population is growing at approximately 10% per year.

## REFERENCES

Aurioles-Gamboa, D. and C. J. Hernadez-Camacho. 1999. Notes on the southernmost records of Guadalupe fur seal, Arctocephalus townsendi, in Mexico. Mar. Mamm. Sci. 15:581-583.

Aurioles-Gamboa, D., Elorriaga- Verplancken, F. and Hernández-Camacho, C.J. 2010. Guadalupe fur seal population status on the San Benito Islands, Mexico. Marine Mammal Science 26(2): 402-408.

Aurioles-Gamboa, D. 2015. Arctocephalus townsendi. The IUCN Red List of Threatened Species 2015: e.T2061A45224420. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T2061A45224420.en

Carretta, J.V., T. Price, D. Petersen, and R. Read. 2004. Estimates of marine mammal, sea turtle, and seabird mortality in the California drift gillnet fishery for swordfish and thresher shark, 1996-2002. Marine Fisheries Review 66(2):21-30.

Carretta, J.V., M.M. Muto, J. Greenman, K. Wilkinson, J. Viezbicke, and J. Jannot. 2016a. Sources of human-related injury and mortality for U.S. Pacific west coast marine mammal stock assessments, 2010-2014. U.S. Department of Commerce, NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-554. 102 p.

Carretta, J.V., J.E. Moore, and K.A. Forney. 2016b. Regression tree and ratio estimates of marine mammal, sea turtle, and seabird bycatch in the California drift gillnet fishery, 1990-2014. Draft document PSRG-2016-08 reviewed by the Pacific Scientific Review Group, Feb 2016, Seattle WA.

Esperón-Rodríguez, M. and Gallo-Reynoso, J.P., 2012. Analysis of the re-colonization of San Benito Archipelago by Guadalupe fur seals (Arctocephalus townsendi). Latin American Journal of Aquatic Research, 40(1), pp.213-223.

Fleischer, L. A. 1987. Guadalupe fur seal, *Arctocephalus townsendi*. In J. P. Croxall and R. L. Gentry (eds.). Status, biology, and ecology of fur seals. Proceedings of an international symposium and workshop. Cambridge, England, 23-27 April 1984. p. 43-48. U.S. Dept. of Commerce, NOAA, NMFS, NOAA Tech. Rept. NMFS 51.

Gallo, J. P. 1994. Factors affecting the population status of Guadalupe fur seal, *Arctocephalus townsendi* (Merriam, 1897), at Isla de Guadalupe, Baja California, Mexico. Ph.D. Thesis, University of California, Santa Cruz, 199 p.

García-Capitanachi, B. 2011. Estado de la población de lobo fino de Guadalupe (Arctocephalus townsendi) en Isla Guadalupe e Islas San Benito. MC Thesis dissertation. Facultad de Ciencias Universidad de Baja California, México.

Hanni, K. D., D. J. Long, R. E. Jones, P. Pyle, and L. E. Morgan. 1997. Sightings and strandings of Guadalupe fur seals in central and northern California, 1988-1995. J. of Mamm. 78:684-690.

Julian, F. and M. Beeson. 1998. Estimates for marine mammal, turtle, and seabird mortality for two California gillnet fisheries: 1990-95. Fish. Bull. 96:271-284.

Maravilla-Chavez, M. O. and M. S Lowry. 1999 Incipient breeding colony of Guadalupe fur seals at Isla Benito del Este, Baja California, Mexico. Mar. Mamm. Sci. 15:239-241.

Melin, S. R. and R. L. DeLong. 1999. Observations of a Guadalupe fur seal (*Arctocephalus townsendi*) female and pup at San Miguel Island, California. Mar. Mamm. Sci. 15:885-888.

Norris, T., G. DeRango, R. DiGiovanni, and C. Field. 2015. Distribution of and threats to Guadalupe fur seals off the California coast. Poster presented at the Society of Marine Mammalogy Biennial meeting. San Francisco, CA.

Repenning, C. A., Peterson, R. S. and Hubbs, C. L. (1971) Contributions to the Systematics of the Southern Fur Seals, with Particular Reference to the Juan Fernández and Guadalupe Species, in Antarctic Pinnipedia (ed W. H. Burt), American Geophysical Union, Washington, D. C.. doi: 10.1029/AR018p0001.

Rick, T.C., DeLong, R.L., Erlandson, J.M., Braje, T.J., Jones, T.L., Kennett, D.J., Wake, T.A. and Walker, P.L., 2009. A trans-Holocene archaeological record of Guadalupe fur seals (Arctocephalus townsendi) on the California coast. Marine Mammal Science, 25(2), pp.487-502.

Seagars, D. J. 1984. The Guadalupe fur seal: a status review. National Marine Fisheries Service, Southwest Region, Admin. Rep. SWR-84-6. 29pp.

Sosa-Nishizaki, O., R. De la Rosa Pacheco, R. Castro Longoria, M. Grijalva Chon, and J. De la Rosa Velez. 1993. Estudio biologico pesquero del pez (*Xiphias gladius*) y otras especies de picudos (marlins y pez vela). Rep. Int. CICESE, CTECT9306.

Torres-G., A., A. Aguayo-L., and N. Valdez-T. 1990. Tamaño y distribucion de la poblacion del lobo fino de Guadalupe, *Arctocephalus townsendi* (Merriam, 1897), durante el verano de 1988. [Abstracts] XV Reunion internacional para el estudio de los mamiferos marinos, 18-20 April 1990. La Paz, B. C. S., Mexico.

Townsend, C. H. 1931. The fur seal of the California islands with new descriptive and historical matter. Zoologica 9:443-457.