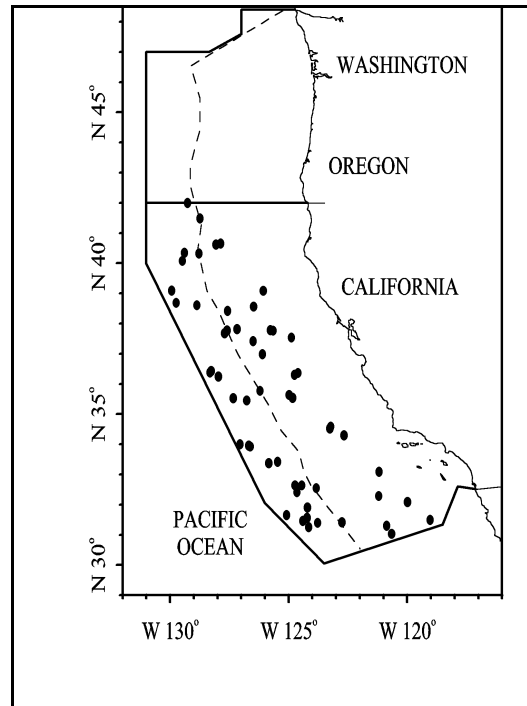


## STRIPED DOLPHIN (*Stenella coeruleoalba*): California/Oregon/Washington Stock

### STOCK DEFINITION AND GEOGRAPHIC RANGE

Striped dolphins are distributed world-wide in tropical and warm-temperate pelagic waters. On recent shipboard surveys extending about 300 nmi offshore of California, they were sighted within about 100-300 nmi from the coast (Figure 1). No sightings have been reported for Oregon and Washington waters, but striped dolphins have stranded in both states (Oregon Department of Fish and Wildlife, unpublished data; Washington Department of Fish and Wildlife, unpublished data). Striped dolphins are also commonly found in the central North Pacific, but sampling between this region and California has been insufficient to determine whether the distribution is continuous. Based on sighting records off California and Mexico, striped dolphins appear to have a continuous distribution in offshore waters of these two regions (Perrin et al. 1985; Mangels and Gerrodette 1994). No information on possible seasonality in distribution is available, because the California surveys which extended 300 nmi offshore were conducted only during the summer/fall period. Although striped dolphins are not restricted to U.S. waters, cooperative management agreements with Mexico exist only for the tuna purse seine fishery and not for other fisheries which may take this species (e.g. gillnet fisheries). Therefore, the management stock includes only animals found within U.S. waters. For the Marine Mammal Protection Act (MMPA) stock assessment reports, striped dolphins within the Pacific U.S. Exclusive Economic Zone are divided into two discrete, non-contiguous areas: 1) waters off California, Oregon and Washington (this report), and 2) waters around Hawaii.



**Figure 1.** Striped dolphin sightings based on aerial and shipboard surveys off California, Oregon and Washington, 1991-96 (see Appendix 2, Figures 1-5, for data sources and information on timing and location of survey effort). Dashed line represents the U.S. EEZ, thick line indicates the outer boundary of all surveys combined.

### POPULATION SIZE

Three summer/fall shipboard surveys were conducted within 300 nmi of the coasts of California in 1991 and 1993 (Barlow and Gerrodette 1996) and California, Oregon and Washington in 1996 (Barlow 1997). The abundance of striped dolphins in this region appears to be variable between years and may be affected by oceanographic conditions, as with other odontocete species (Forney 1997, Forney and Barlow 1998). Because animals may spend time outside the U.S. Exclusive Economic Zone as oceanographic conditions change, a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 1991-96 weighted average abundance estimate for California, Oregon and Washington waters based on the above three ship surveys is 20,235 (CV = 0.14) striped dolphins (Barlow 1997).

### Minimum Population Estimate

The log-normal 20th percentile of the 1991-96 weighted average abundance estimate is 17,995 striped dolphins.

### Current Population Trend

Prior to the 1991 shipboard survey (Barlow 1995), striped dolphins were not thought to be common off California (Leatherwood et al. 1982), and two surveys extending approximately 200 nmi offshore of California and Baja California in 1979 and 1980 resulted in only one sighting of three striped dolphins (Smith et al. 1986). Thus it is possible that striped dolphin abundance off California has increased over the last decade (consistent with the observed warming trend for these waters; Roemmich 1992); however, no definitive statement can be made, because statistical

estimates of abundance were not obtained for the earlier surveys.

### CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No information on current or maximum net productivity rates is available for striped dolphins off California.

### POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (17,995) times one half the default maximum net growth rate for cetaceans ( $\frac{1}{2}$  of 4%) times a recovery factor of 0.50 (for a species of unknown status with no known fishery mortality; Wade and Angliss 1997), resulting in a PBR of 180 striped dolphins per year.

### HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

#### Fishery Information

A summary of recent fishery mortality and injury for this stock of striped dolphin is shown in Table 1. More detailed information on these fisheries is provided in Appendix 1. Mortality estimates for the California drift gillnet fishery are included for the five most recent years of monitoring, 1994-98 (Julian and Beeson 1998; Julian 1997; Cameron and Forney 1999). After the 1997 implementation of a Take Reduction Plan, which included skipper education workshops and required the use of pingers and minimum 6-fathom extenders, overall cetacean entanglement rates in the drift gillnet fishery dropped considerably (Barlow and Cameron 1999). However, because of interannual variability in entanglement rates and the rarity of striped dolphin entanglements, additional years of data will be required to fully evaluate the effectiveness of pingers for reducing mortality of this particular species. Because of the changes in this fishery after implementation of the Take Reduction Plan, mean annual takes in Table 1 are based only on 1997-98 data. This results in an average estimate of zero striped dolphins taken annually.

**Table 1.** Summary of available information on the incidental mortality and injury of striped dolphins (California/Oregon/Washington Stock) in commercial fisheries that might take this species. The single observed entanglement of a striped dolphin resulted in the death of the animal. Coefficients of variation for mortality estimates are provided in parentheses. Mean annual takes are based on 1994-98 data unless noted otherwise.

Fishery Name	Data Type	Year(s)	Percent Observer Coverage	Observed Mortality	Estimated Annual Mortality	Mean Annual Takes (CV in parentheses)
CA/OR thresher shark/swordfish drift gillnet fishery	observer data	1994	17.9%	1	6 (0.90)	0 <sup>1</sup>
		1995	15.6%	0	0	
		1996	12.4%	0	0	
		1997	23.0%	0	0	
		1998	20.0%	0	0	
<b>Minimum total annual takes</b>						0

<sup>1</sup> Only 1997-98 mortality estimates are included in the average because overall cetacean entanglement rates dropped considerably after a Take Reduction Plan was implemented in 1997.

Drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico and may take animals from the same population. Quantitative data are available only for the Mexican swordfish drift gillnet fishery, which uses vessels, gear, and operational procedures similar to those in the U.S. drift gillnet fishery, although nets may be up to 4.5 km long (Holts and Sosa-Nishizaki 1998). The fleet increased from two vessels in 1986 to 31 vessels in 1993; Holts and Sosa-Nishizaki 1998). The total number of sets in this fishery in 1992 can be estimated from data provided by these authors to be approximately 2700, 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; Julian and Beeson, 1998), 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 (D. Holts, pers. comm.).

### STATUS OF STOCK

The status of striped dolphins in California relative to OSP is not known, and there are insufficient data to

evaluate potential trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA. Including driftnet information only for years after implementation of the Take Reduction Plan (1997-98), the average annual human-caused mortality in 1994-98 is zero. Because recent mortality is zero, striped dolphins are not classified as a "strategic" stock under the MMPA, and the total fishery mortality and serious injury for this stock can be considered to be insignificant and approaching zero.

## REFERENCES

- Barlow, J. 1995. The abundance of cetaceans in California waters. Part I: Ship surveys in summer and fall of 1991. *Fish. Bull.* 93:1-14.
- Barlow, J. 1997. Preliminary estimates of cetacean abundance off California, Oregon and Washington based on a 1996 ship survey and comparisons of passing and closing modes. Admin. Rep. LJ-97-11. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 25p.
- Barlow, J. and G. A. Cameron. 1999. Field experiments show that acoustic pingers reduce marine mammal bycatch in the California drift gillnet fishery. Paper SC/51/SM2 presented to the International Whaling Commission, May 1998 (unpublished). 20 pp.
- Barlow, J. and T. Gerrodette. 1996. Abundance of cetaceans in California waters based on 1991 and 1993 ship surveys. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-233. 15 pp.
- Cameron, G., and K. A. Forney. 1999. Estimates of cetacean mortality in the California gillnet fisheries for 1997 and 1998. Paper SC/51/O4 presented to the International Whaling Commission, May 1998 (unpublished). 14 pp.
- Forney, K. A. 1997. Patterns of variability and environmental models of relative abundance for California cetaceans. Ph.D. dissertation, Scripps Institution of Oceanography, University of California, San Diego.
- Forney, K. A. and J. Barlow. 1998. Seasonal patterns in the abundance and distribution of California cetaceans, 1991-92. *Mar. Mamm. Sci.* 14:460-489.
- Holts, D. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038.
- Holts, D. and O. Sosa-Nishizaki. 1998. Swordfish, *Xiphias gladius*, fisheries of the eastern North Pacific Ocean. In: I. Barrett, O. Sosa-Nishizaki and N. Bartoo (eds.). *Biology and fisheries of swordfish, Xiphias gladius*. Papers from the International Symposium on Pacific Swordfish, Ensenada Mexico, 11-14 December 1994. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 142, 276 p.
- Julian, F. 1997. Cetacean mortality in California gill net fisheries: Preliminary estimates for 1996. Paper SC/49/SM02 presented to the International Whaling Commission, September 1997 (unpublished). 13 pp.
- Julian, F. and M. Beeson. 1998. Estimates of mammal, turtle and bird mortality for two California gillnet fisheries: 1990-1995. *Fish. Bull.* 96:271-284.
- Leatherwood, S., R. R. Reeves, W. F. Perrin, and W. E. Evans. 1982. Whales, dolphins and porpoises of the eastern North Pacific and adjacent Arctic waters. A guide to their identification. NOAA Tech. Rep. NMFS Circular 444, U.S. Dep. Commer., NOAA, NMFS. 245 pp.
- Mangels, K. F. and Gerrodette, T. 1994. Report of cetacean sightings during a marine mammal survey in the eastern Pacific Ocean and Gulf of California aboard the NOAA ships *McARTHUR* and *DAVID STARR JORDAN* July 28 - November 6, 1993. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-211. 88 pp.
- Perrin, W. F., M. D. Scott, G. J. Walker and V. L. Cass. 1985. Review of geographical stocks of tropical dolphins (*Stenella* spp. and *Delphinus delphis*) in the eastern Pacific. NOAA Tech. Rep. NMFS 28. Available from NMFS, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California, 92038. 28p.
- Roemmich, D. 1992. Ocean warming and sea level rise along the southwest U.S. coast. *Science* 257:373-375.
- Smith, R. C., P. Dustan, D. Au, K. S. Baker, and E. A. Dunlap. 1986. Distribution of cetaceans and sea-surface chlorophyll concentrations in the California Current. *Marine Biology* 91:385-402.
- 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.
- Wade, P. R. and R. P. Angliss. 1997. Guidelines for Assessing Marine Mammal Stocks: Report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12. 93 pp.