

SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): California/Oregon/Washington Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Short-finned pilot whales were once comm off Southern California, with an apparently resident population around Santa Catalina Island, as well as seasonal migrants (Dohl et al. 1980). After a strong El Niño event in 1982-83, short-finned pilot whales virtually disappeared from this region, and despite increased survey effort along the entire U.S. west coast, few sightings were made from 1984-1992 (Jones and Szczepaniak 1992; Barlow 1997; Carretta and Forney 1993; Shane 1994; Green et al. 1992, 1993). In 1993, six groups of short-finned pilot whales were again seen off California (Carretta et al. 1995; Barlow and Gerrodette 1996), and mortality in drift gillnets increased (Julian and Beeson 1998) but sightings remain rare (Barlow 1997). Figure 1 summarizes the sightings of short-finned pilot whales off the U.S. west coast from 1991-2005. Although the full geographic range of the California, Oregon, and Washington population is not known, it may be continuous with animals found off Baja California, and its individuals are morphologically distinct from short-finned pilot whales found farther south in the eastern tropical Pacific (Polisini 1981). Separate southern and northern forms of short-finned pilot whales have also been documented for the western North Pacific (Kasuya et al. 1988; Wada 1988; Miyazaki and Amano 1994). For the Marine Mammal Protection Act (MMPA) stock assessment reports, short-finned pilot whales 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) Hawaiian waters.

POPULATION SIZE

Only one group of pilot whales (numbering approximately 7 animals) was seen during the two most recent ship surveys conducted off California, Oregon, and Washington in 2001 and 2005 (Barlow and Forney 2007 ; Forney 2007). All animals were seen during the 2005 survey. The abundance of short-finned pilot whales in this region appears to be variable and influenced by prevailing oceanographic conditions (Forney 1997, Forney and Barlow 1998). Because animals may spend time outside the U.S.

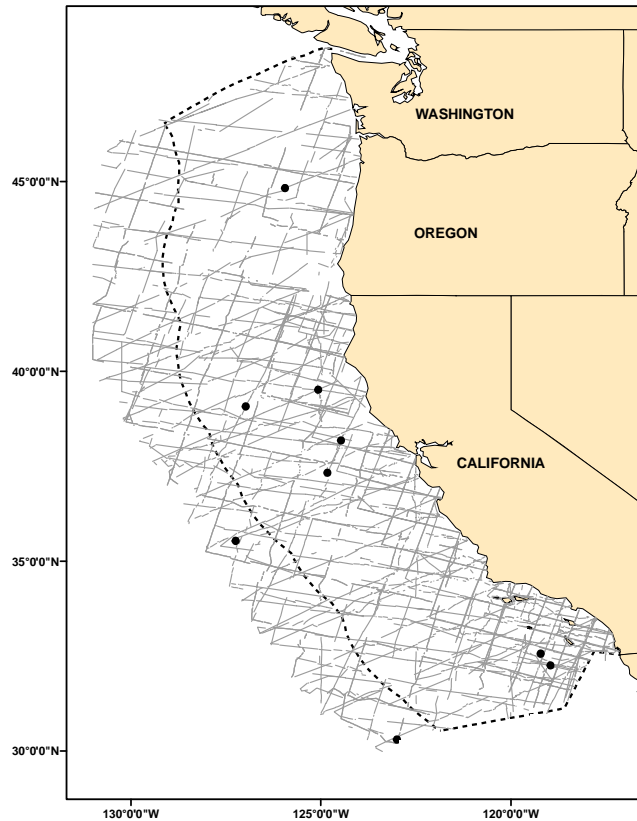


Figure 1. Short-finned pilot whale sightings made during aerial and shipboard surveys conducted off California, Oregon, and Washington, 1991-2005. See Appendix 2 for data sources and information on timing and location of survey effort. Dashed line represents the U.S. EEZ, thin lines indicate completed transect effort of all surveys combined.

Exclusive Economic Zone as oceanographic conditions change, a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 2001-2005 unweighted average abundance estimate for California, Oregon and Washington waters based on the two ship surveys is 245 (CV=0.97) short-finned pilot whales (Barlow and Forney 2007 ; Forney 2007).

Minimum Population Estimate

The log-normal 20th percentile of the 2001-2005 unweighted average abundance estimate is 123 short-finned pilot whales.

Current Population Trend

Approximately nine years after the virtual disappearance of short-finned pilot whales following the 1982-83 El Niño, they appear to have returned to California waters, as indicated by an increase in sighting records as well as incidental fishery mortality (Barlow and Gerrodette 1996; Carretta et al. 1995; Julian and Beeson 1998). However, this cannot be considered a true growth in the population, because it merely reflects large-scale, long-term movements of this species in response to changing oceanographic conditions. It is not known where the animals went after the 82-83 El Niño, or where the recently observed animals came from. Until the range of this population and the movements of animals in relation to environmental conditions are better documented, no inferences can be drawn regarding trends in abundance of short-finned pilot whales off California, Oregon and Washington.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No information on current or maximum net productivity rates is available for short-finned pilot whales off California, Oregon and Washington.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (123) times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.40 (for a species of unknown status with a mortality rate CV>0.80; Wade and Angliss 1997), resulting in a PBR of 0.98 short-finned pilot whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

A summary of known fishery mortality and injury for this stock of short-finned pilot whale 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, 2002-2006 (Carretta and Chivers 2004, Carretta et al. 2005a, 2005b, Carretta and Enriquez 2006, 2007). 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 2003). However, because of interannual variability in entanglement rates and the relative rarity of short-finned pilot whale entanglements, additional years of data will be required to fully evaluate the effectiveness of pingers for reducing mortality of this particular species. There have been 11 pilot whale deaths observed in this fishery since 1990. In 1993, there were 8 deaths observed, and one each in 1990, 1992, 1997 (in an unpingered net) and 2003. Mean annual takes in Table 1 are based on 2002-2006 data. This results in an average estimate of 1.0 (CV=1.00) short-finned pilot whales taken annually.

Drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico and may take animals from this 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. Previous efforts to convert the Mexican swordfish driftnet fishery to a longline fishery have resulted in a mixed-fishery, with

20 vessels alternately using longlines or driftnets, 23 using driftnets only, 22 using longlines only, and seven with unknown gear type (Berdegué 2002).

Historically, short-finned pilot whales were also killed in squid purse seine operations off Southern California (Miller et al. 1983; Heyning et al. 1994), but these deaths occurred when pilot whales were still common in the region. An observer program in the squid purse seine fishery was initiated in 2004 and a total of 193 sets have been observed through 2006 without a pilot whale interaction. Observer coverage in this fishery has been less than 10% of all fishing effort.

Table 1. Summary of available information on the incidental mortality and injury of short-finned pilot whales (California/Oregon/Washington Stock) in commercial fisheries that might take this species. All observed entanglements of pilot whales resulted in the death of the animal. Coefficients of variation for mortality estimates are provided in parentheses; n/a = not available. Mean annual takes are based on 2002-2006 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	2002	22.0%	0	0	1.0 (1.00)
		2003	20.0%	1	5 (1.00)	
		2004	20.6%	0	0	
		2005	20.9%	0	0	
		2006	18.5%	0	0	
Market squid purse seine	observer	2004-2006	<10%	0	0	0
Minimum total annual takes						1.0 (1.00)

STATUS OF STOCK

The status of short-finned pilot whales off California, Oregon and Washington in relation to OSP is unknown. They have declined in abundance in the Southern California Bight, likely a result of a change in their distribution since the 1982-83 El Niño, but the nature of these changes and potential habitat issues are not adequately understood. Short-finned pilot whales are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA. The average annual human-caused mortality from 2002-2006 is one animal, which exceeds the PBR (0.98), and therefore they are classified as a "strategic" stock under the MMPA.

REFERENCES

- 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.
- 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. Administrative Report 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. 2003. Field experiments show that acoustic pingers reduce marine mammal bycatch in the California drift gillnet fishery. *Marine Mammal Science* 19(2):265-283.
- Barlow, J. and K.A. Forney. 2007. Abundance and population density of cetaceans in the California Current ecosystem. *Fishery Bulletin* 105:509-526.
- Berdegué, J. 2002. Depredación de las especies pelágicas reservadas a la pesca deportiva y especies en peligro de extinción con uso indiscriminado de artes de pesca no selectivas (palangres, FAD's, trampas para peces y redes de agallar fijas y a la deriva) por la flota palangrera Mexicana. Fundación para la conservación de los picudos. A.C. Mazatlán, Sinaloa, 21 de septiembre.
- Carretta, J.V. and L. Enriquez. 2007. Marine mammal and sea turtle bycatch in the California/Oregon thresher shark and swordfish drift gillnet fishery in 2006. Administrative Report LJ-07-06, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 9p.

- Carretta, J.V. and L. Enriquez. 2006. Marine mammal bycatch and estimated mortality in California commercial fisheries during 2005. Administrative Report LJ-06-07, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 14p.
- Carretta, J.V. and Chivers, S.J. 2004. Preliminary estimates of marine mammal mortality and biological sampling of cetaceans in California gillnet fisheries for 2003. Paper SC/56/SM1 presented to the IWC Scientific Committee, June 2004 (unpublished). [Available from Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037, USA]. 20p.
- Carretta, J.V., S.J. Chivers, and K. Danil. 2005a. Preliminary estimates of marine mammal bycatch, mortality, and biological sampling of cetaceans in California gillnet fisheries for 2004. Administrative Report LJ-05-10, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, California, 92037. 17 p. Carretta, J.V., T. Price, D. Petersen, and R. Read. 2005b. 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. and K. A. Forney. 1993. Report of the two aerial surveys for marine mammals in California coastal waters using a NOAA DeHavilland Twin Otter aircraft, March 9-April 7, 1991, February 8-April 6, 1992. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-185. 77p.
- Carretta, J. V., K. A. Forney. And J. Barlow. 1995. Report of 1993-94 marine mammal surveys conducted within the U.S. Navy Outer Sea Test Range off Southern California. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-217. 90p.
- Dohl, T. P., K. S. Norris, R. C. Guess, J. D. Bryant, and M. W. Honig. 1980. Summary of marine mammal and seabird surveys of the Southern California Bight area, 1975-1978. Part II. Cetacea of the Southern California Bight. Final Report to the Bureau of Land Management, NTIS Rep. No. PB81248189. 414p.
- 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.
- Forney, K.A. 2007. Preliminary estimates of cetacean abundance along the U.S. west coast and within four National Marine Sanctuaries during 2005. U.S. Department of Commerce NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-406. 27p.
- Green, G., J. J. Brueggeman, R. A. Grotefendt, C. E. Bowlby, M. L. Bonnell, and K. C. Balcomb, III. 1992. Cetacean distribution and abundance off Oregon and Washington. Ch. 1. In: Oregon and Washington Marine Mammal and Seabird Surveys. OCS Study 91-0093. Final Report prepared for Pacific OCS Region, Minerals Management Service, U.S. Department of the Interior, Los Angeles, California.
- Green, G., R. A. Grotefendt, M. A. Smultea, C. E. Bowlby, and R. A. Rowlett. 1993. Delphinid aerial surveys in Oregon and Washington waters. Final Report prepared for NMFS, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, Washington, 98115, Contract #50ABNF200058.
- Heyning, J. E., T. D. Lewis and C. D. Woodhouse. 1994. A note on odontocete mortality from fishing gear entanglements off Southern California. *Rep. Int. Whal. Commn. Special Issue* 15:439-442.
- 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.
- Jones, P. A. and I. D. Szczepaniak. 1992. Report on the seabird and marine mammal censuses conducted for the long-term management strategy (LTMS), August 1990 through November 1991, for the U.S. Environmental Protection Agency, Region IX, San Francisco, July 1992.
- Julian, F. and M. Beeson. 1998. Estimates of marine mammal, turtle, and seabird mortality for two California gillnet fisheries: 1990-95. *Fishery Bulletin* 96:271-284.

- Kasuya, O., T. Miyashita, and F. Kasamatsu. 1988. Segregation of two forms of short-finned pilot whales off the Pacific coast of Japan. *Sci. Rep. Whales Res. Inst.* 39:77-90.
- Miller, D. J., M. J. Herder and J. P. Scholl. 1983. California marine mammal - fishery interaction study, 1979-1981. Administrative Report LJ-83-13C. Available from NMFS, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California, 92038. 233p.
- Miyazaki, N. and M. Amano. 1994. Skull morphology of two forms of short-finned pilot whales off the Pacific coast of Japan. *Rep. Int. Whaling Commn.* 44:499-508.
- Polisini, J. M. 1981. A comparison of *Globicephala macrorhyncha* (Gray, 1846) with the pilot whale of the North Pacific Ocean: An analysis of the skull of the broad-rostrum pilot whales of the genus *Globicephala*. *Dissertation Abstracts International* Vol. 41, No. 08, February 1981, p. 2928-B.
- Shane, S. 1994. Occurrence and habitat use of marine mammals at Santa Catalina Island, California from 1983-91. *Bull. Southern California Acad. Sci.* 93:13-29.
- 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*.
- Vojkovich, M. 1998. The California fishery for market squid (*Loligo opalescens*). *CalCOFI Rep.* 39:55-60.
- Wada, S. 1988. Genetic differentiation between forms of short-finned pilot whales off the Pacific coast of Japan. *Sci. Rep. Whales Res. Inst.* 39:91-101.
- 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.