

PACIFIC WHITE-SIDED DOLPHIN (*Lagenorhynchus obliquidens*): California/Oregon/Washington, Northern and Southern Stocks

STOCK DEFINITION AND GEOGRAPHIC RANGE

Pacific white-sided dolphins are endemic to temperate waters of the North Pacific Ocean, and are common both on the high seas and along the continental margins. Off the U.S. west coast, Pacific white-sided dolphins have been seen primarily in shelf and slope waters (Figure 1). Sighting patterns from recent aerial and shipboard surveys conducted in California, Oregon and Washington at different times of the year (Green et al. 1992; 1993; Barlow 1995; Forney et al. 1995) suggest seasonal north-south movements, with animals found primarily off California during the colder water months and shifting northward into Oregon and Washington as water temperatures increase in late spring and summer (Green et al. 1992; Forney 1994).

Stock structure throughout the North Pacific is poorly understood, but based on morphological evidence, two forms are known to occur off the California coast (Walker et al. 1986; Chivers et al. 1993). Specimens belonging to the northern form were collected from north of about 33°N, (Southern California to Alaska), and southern specimens were obtained from about 36°N southward along the coasts of California and Baja California. Samples of both forms have been collected in the Southern California Bight, but it is unclear whether this indicates sympatry in this region or whether they may occur there at different times (seasonally or interannually). Recent genetic analyses have confirmed the distinctness of animals found off Baja California from animals occurring in U.S. waters north of Point Conception, California and in the high seas of the North Pacific (Lux et al. 1997). Based on these genetic data, an area of mixing between the two forms appears to be located off Southern California (Lux et al. 1997).

Although there is clear evidence that two forms of Pacific white-sided dolphins occur along the U.S. west coast, there are no known differences in color pattern, and it is not currently possible to distinguish animals without genetic or morphometric analyses. Geographic stock boundaries appear dynamic and are poorly understood, and therefore cannot be used to differentiate the two forms. Until

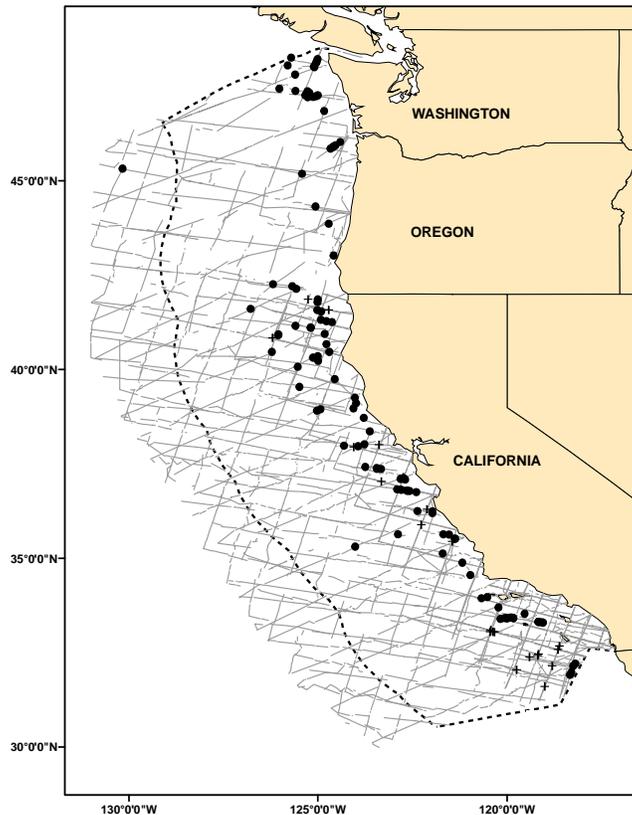


Figure 1. Pacific white-sided dolphin sightings based on aerial and shipboard surveys off California, Oregon, and Washington, 1991- 2005 (see Appendix 2 for data sources and information on timing and location of survey effort). Dashed line represents the U.S. EEZ, thin lines indicate completed transect effort of all surveys combined. Key: ● = summer/autumn ship-based sightings; + = winter/spring aerial-based sightings.

means of differentiating the two forms for abundance and mortality estimation are developed, these two stocks must be managed as a single unit; however, this is an undesirable management situation. Furthermore, Pacific white-sided dolphins are not restricted to U.S. territorial waters, but 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). Additional means of differentiating the two types must be found, and cooperative management with Mexico is particularly important for this species, given the apparently dynamic nature of geographical stock boundaries. Until these goals are accomplished, the management stock includes animals of both forms. For the Marine Mammal Protection Act (MMPA) stock assessment reports, Pacific white-sided 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) Alaskan waters.

POPULATION SIZE

The most recent estimates of abundance for Pacific white-sided dolphins are based on two summer/autumn shipboard surveys conducted within 300 nmi of the coasts of California, Oregon, and Washington in 2001 and 2005 (Barlow 2003; Forney 2007). The distribution of Pacific white-sided dolphins throughout this region is highly variable, apparently in response to oceanographic changes on both seasonal and interannual time scales (Forney and Barlow 1998). As oceanographic conditions vary, Pacific white-sided dolphins may spend time outside the U.S. Exclusive Economic Zone, and therefore a multi-year average abundance estimate including California, Oregon and Washington is the most appropriate for management within U.S. waters. The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the two most recent ship surveys is 25,233 (CV = 0.25) Pacific white-sided dolphins (Forney 2007).

Minimum Population Estimate

The log-normal 20th percentile of the 2001-2005 average abundance estimate is 20,441 Pacific white-sided dolphins.

Current Population Trend

No long-term trends in the abundance of Pacific white-sided dolphins in California, Oregon and Washington are suggested based on historical and recent surveys (Dohl et al. 1980; 1983; Green et al. 1992; 1993; Barlow 1995; Forney et al. 1995, Barlow 2003, Forney 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No information on current or maximum net productivity rates is available for Pacific white-sided dolphins off the U.S. west coast.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (20,441) times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.45 (for a species of unknown status with a mortality rate $CV > 0.60$ and ≤ 0.80 ; Wade and Angliss 1997), resulting in a PBR of 184 Pacific white-sided dolphins per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

A summary of recent fishery mortality and injury for this stock of Pacific white-sided 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, 2000-2004 (Carretta and Chivers 2004, Carretta et al. 2005a, 2005b). 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 Pacific white-sided dolphin entanglements, additional years of data will be required to fully evaluate the effectiveness of pingers for reducing mortality of this particular species. Mean annual takes in Table 1 are based on 2000-2004 data. Including mortality from drift gillnet,

groundfish trawl, and unknown fisheries, the average annual fishery-related mortality of Pacific white-sided dolphins in 2000-2004 is 5.6 (CV = 0.72) animals.

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).

Table 1. Summary of available information on the incidental mortality and injury of Pacific white-sided dolphins (California/ Oregon/Washington Stock) in commercial fisheries that might take this species. All observed entanglements of Pacific white-sided dolphins 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 2000-2004 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 | 2000 | 22.9% | 2 | 9 (0.68) | 4.8 (0.72) |
| | | 2001 | 20.4% | 2 | 10(0.71) | |
| | | 2002 | 22.1% | 1 | 5 (0.86) | |
| | | 2003 | 20.2% | 0 | 0 | |
| | | 2004 | 20.6% | 0 | 0 | |
| WA/OR/CA domestic groundfish trawl fisheries (At-sea processing Pacific whiting fishery only). | observer data | 2000 | 80.6% | 0 | 0 | 0.2 n/a) |
| | | 2001 | 96.2% | 0 | 0 | |
| | | 2002 | 100% | 0 | 0 | |
| | | 2003 | 100% | 1 | 1 (n/a) | |
| | | 2004 | 100% | 0 | 0 | |
| Unknown fishery | stranding | 2000 | | 0 | n/a | ≥0.6 |
| | | 2001 | | 2 | | |
| | | 2002 | | 0 | | |
| | | 2003 | | 0 | | |
| | | 2004 | | 1 | | |
| Minimum total annual takes | | | | | | 5.6 (0.72) |

Low levels of mortality for Pacific white-sided dolphins have also been documented in the California/Oregon/ Washington domestic groundfish trawl fisheries (Perez and Loughlin 1991; Perez, in prep;). Between 2000-2004, with 80-100% of the fishing effort observed, one Pacific white-sided dolphin was reported killed in the at-sea processing portion of the Pacific whiting trawl fishery (NMFS,unpublished data). Fishery-related strandings of Pacific white-sided dolphins in California/Oregon/Washington between 2000-2004 totalled 3 animals (Table 1). In 2001, two white-sided dolphins stranded in southern California within a week, one animal had its flukes cut off, the second animal had yellow nylon line around the caudal peduncle and apparent bullet holes on each side of the head. A third animal stranded in 2004 with net-like markings.

Other removals

Additional removals of Pacific white-sided dolphins from the wild have occurred in live-capture fisheries off California. Brownell et al. (1999) estimate a minimum total live capture of 128 Pacific white-sided dolphins between the late 1950s and 1993. The most recent capture was in November 1993, when

three animals were taken for public display (Forney 1994). No MMPA permits are currently active for live-captures of Pacific white-sided dolphins.

STATUS OF STOCK

The status of Pacific white-sided dolphins in California, Oregon and Washington relative to OSP is not known, and there is no indication of a trend in abundance for this stock. 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. The average annual human-caused mortality in 2000-2004 (5.6 animals) is estimated to be less than the PBR (184), and therefore they are not classified as a "strategic" stock under the MMPA. The total fishery mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate.

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. 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 T. Gerrodette. 1996. Abundance of cetaceans in California waters based on 1991 and 1993 ship surveys. NOAA Tech. Memo. NMFS-SWFSC-233. 15 pp.
- Barlow, J., K. A. Forney, P. S. Hill, R. L. Brownell, Jr., J. V. Carretta, D. P. DeMaster, F. Julian, M. S. Lowry, T. Ragen, and R. R. Reeves. 1997. U.S. Pacific Marine Mammal Stock Assessments: 1996. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-248. 223 pp.
- Barlow, J. 2003. Preliminary estimates of the abundance of cetaceans along the U.S. west coast: 1991_2001. Southwest Fisheries Science Center Administrative Report LJ_03_03. Available from SWFSC, 8604 La Jolla Shores Dr., La Jolla CA 92037. 31p.
- Berdegúe, 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.
- Brownell, R. L., Jr., W. A. Walker and K. A. Forney. 1999. Pacific white-sided dolphin, *Lagenorhynchus obliquidens* Gill, 1865. Pages 57-84 *In*: Ridgway, S. H. and R. Harrison (eds.), *Handbook of Marine Mammals*, Vol. 6. Academic Press, San Diego.
- Carretta, J.V. and S.J. Chivers. 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].
- 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.
- Chivers, S. J., K. M. Peltier, W. T. Norman, P. A. Akin, and J. Heyning. 1993. Population structure of cetaceans in California coastal waters. Paper SOCCS9 presented at the Status of California Cetacean Stocks Workshop, held in La Jolla, California, March 31-April 2, 1993. 49p.
- Dohl, T. P., R. C. Guess, M. L. Duman, and R. C. Helm. 1983. Cetaceans of central and northern California, 1980-1983: Status, abundance and distribution. OCS Study MMS 84-0045. Minerals Management Service Contract # 14-12-0001-29090. 284p.

- 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. 1994. Recent information on the status of odontocetes in Californian waters. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-202. 87 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.
- Forney, K. A., J. Barlow and J. V. Carretta. 1995. The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992. Fish. Bull. 93:15-26.
- 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 NMFS-SWFSC-xxx.
- 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.
- 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 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.
- Lux, C. A., A. S. Costa, and A. E. Dizon. 1997. Mitochondrial DNA population structure of the Pacific white-sided dolphin. Rep. Int. Whaling. Commn. 47:645-652.
- Perez, M. A. and T. R. Loughlin. 1991. Incidental catch of marine mammals by foreign and joint venture trawl vessels in the U.S. EEZ of the North Pacific, 1973-88. NOAA Tech. Rep. NMFS 104. 57 pp.
- Perez, M. A. (in prep). Summary of marine mammal incidental catch data for domestic and joint venture groundfish fisheries in the U.S. EEZ of the North Pacific, 1989-2001. NOAA Tech. Memo.
- 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.
- Walker, W. A., S. Leatherwood, K. R. Goodrich, W. F. Perrin and R. K. Stroud. 1986. Geographical variation and biology of the Pacific white-sided dolphin, *Lagenorhynchus obliquidens*, in the north-eastern Pacific. In: Bryden, M. M. and R. Harrison (eds.), Research on Dolphins, p. 441-465. Clarendon Press, Oxford.