

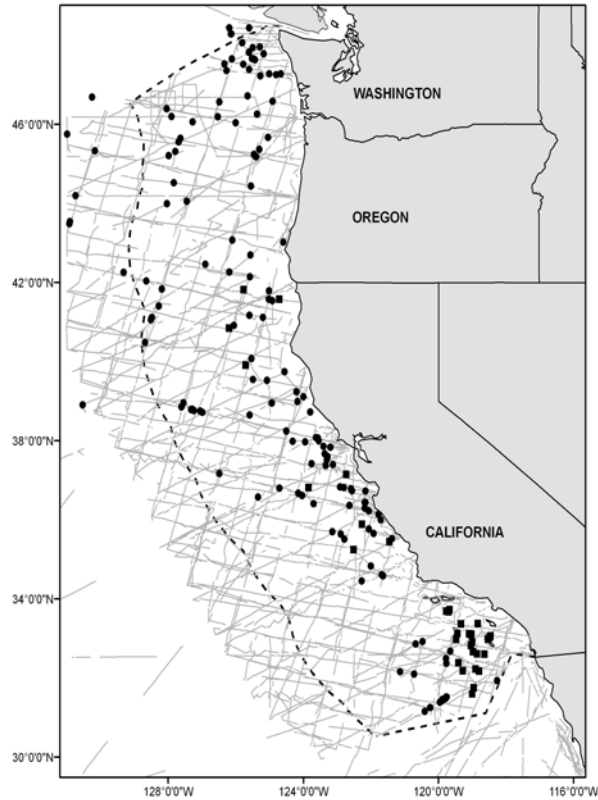
## NORTHERN RIGHT-WHALE DOLPHIN (*Lissodelphis borealis*): California/Oregon/Washington Stock

### STOCK DEFINITION AND GEOGRAPHIC RANGE

Northern right-whale dolphins are endemic to temperate waters of the North Pacific Ocean. Off the U.S. west coast, they have been seen primarily in shelf and slope waters (Figure 1), with seasonal movements into the Southern California Bight (Leatherwood and Walker 1979; Dohl et al. 1980; 1983; NMFS, unpublished data). Sighting patterns from recent aerial and shipboard surveys conducted in California, Oregon and Washington during different seasons (Green et al. 1992; 1993; Forney et al. 1995; Barlow 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; Forney and Barlow 1998). The southern end of this population's range is not well-documented, but during cold-water periods, they probably range into Mexican waters off northern Baja California. Genetic analyses have not found statistically significant differences between northern right-whale dolphins from the U.S. West coast and other areas of the North Pacific (Dizon et al. 1994); however, power analyses indicate that the ability to detect stock differences for this species is poor, given traditional statistical error levels (Dizon et al. 1995). Although northern right-whale dolphins are not restricted to U.S. territorial waters, there are currently no international agreements for cooperative management. For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single management stock including only animals found within the U.S. Exclusive Economic Zone of California, Oregon and Washington.

### POPULATION SIZE

The previous best estimates of abundance for northern right-whale dolphins (Barlow et al. 1997) were based on winter/spring 1991-92 aerial surveys (Forney et al. 1995) off California, which were presumed to include northern right-whale dolphins that are found off Oregon and Washington during summer and fall. Two summer/fall shipboard surveys were conducted within 300 nmi of the coasts of California, Oregon and Washington in 2005 (Forney 2007) and 2008 (Barlow 2010). The distribution of northern right-whale dolphins throughout this region is highly variable, apparently in response to



**Figure 1.** Northern right whale dolphin sightings based on aerial and shipboard surveys off California, Oregon, and Washington, 1991-2008 (see Appendix 2 for data sources and information on timing and location of survey effort). Dashed line represents the U.S. EEZ, thin lines indicates completed transect effort of all surveys combined. Key: ● = summer/autumn ship-based sightings; ■ = winter/spring aerial-based sightings.

oceanographic changes on both seasonal and interannual time scales (Forney and Barlow 1998). As oceanographic conditions vary, northern right-whale dolphins may spend time outside the U.S. Exclusive Economic Zone, and therefore a multi-year average abundance estimate is the most appropriate for management within U.S. waters. The 2005-2008 geometric mean abundance estimate for California, Oregon and Washington waters based on the two ship surveys is 8,334 (CV=0.40) northern right-whale dolphins (Forney 2007, Barlow 2010).

#### **Minimum Population Estimate**

The log-normal 20th percentile of the 2005-2008 average abundance estimate is 6,019 northern right-whale dolphins.

#### **Current Population Trend**

Abundance estimates for all California, Oregon, and Washington waters from 1996, 2001, 2005, and 2008 surveys were 11,347 (CV = 0.27), 14,937 (0.21), 11,100 (0.60), and 6,258 (CV=0.58), respectively (Barlow and Forney 2007, Forney 2007, Barlow 2010). Currently, there is no evidence of a trend in abundance for this stock.

#### **CURRENT AND MAXIMUM NET PRODUCTIVITY RATES**

No information on current or maximum net productivity rates is available for northern right-whale 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 (6,019) 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 48 northern right-whale dolphins per year.

#### **HUMAN-CAUSED MORTALITY AND SERIOUS INJURY**

##### **Fishery Information**

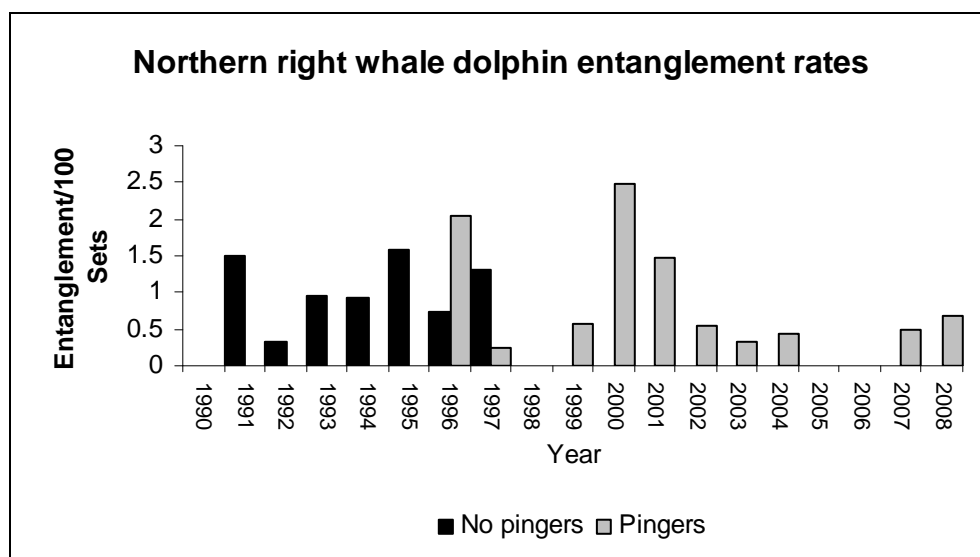
A summary of recent fishery mortality and injury for this stock of northern right-whale dolphin is shown in Table 1. More detailed information on these fisheries is provided in Appendix 1. Mortality estimates for the California drift gillnet fishery are included for the five most recent years of monitoring, 2004-2008 (Carretta et al. 2005 Carretta and Enriquez 2006, 2007, 2009a, 2009b). 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 northern right-whale dolphin entanglements, additional years of data will be required to fully evaluate the effectiveness of pingers for reducing mortality of this particular species. Entanglement rates for this species may be related to oceanographic conditions, as lower entanglement rates have been observed during warm-water periods, such as El Niño (Figure 2). Mean annual takes in Table 1 are based on 2004-2008 data. This results in an average estimate of 3.6 (CV= 0.96) northern right-whale dolphins 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).

**Table 1.** Summary of available information on the incidental mortality and injury of northern right-whale dolphins (California/Oregon/Washington Stock) in commercial fisheries that might take this species. All observed entanglements of northern right-whale dolphins resulted in the death of the animal. Coefficients of variation for mortality estimates are provided in parentheses. Mean annual takes are based on 2004-2008 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	2004	20.6%	1	5 (0.99)	3.6 (0.96)
		2005	20.9%	0	0	
		2006	18.5%	0	0	
		2007	16.4%	1	6 (1.00)	
		2008	13.5%	1	7 (0.99)	
Minimum total annual takes						3.6 (0.96)

**Figure 2.** Entanglement rates of northern right whale dolphin per set fished in the California drift gillnet fishery for swordfish and thresher shark, 1990-2008. Kill rates include observations from pingered and unpingered sets. Pingers were not used from 1990-95 and were used experimentally in 1996 and 1997. For the period 1998-2008, over 99% of all observed sets utilized pingers.



**Other removals**

In 2008, six northern right whale dolphins were incidentally killed in California waters during scientific sardine trawling operations conducted by NMFS (Southwest Regional Office Stranding Program, unpublished data). All six animals were killed in a single trawl where 11 Pacific white-sided dolphin were also killed (see Pacific white-sided dolphin stock assessment). The average annual research-related mortality of northern right whale dolphin from 2004 to 2008 is 1.2 animals.

**STATUS OF STOCK**

The status of northern right-whale dolphins in California, Oregon and Washington relative to OSP is not known, and there are insufficient data to evaluate 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. The average annual human-caused mortality in 2004-

2008 (4.8 animals) is estimated to be less than the PBR ( 48), and therefore they are not classified as a "strategic" stock under the MMPA. The total fishery mortality and serious injury for northern right-whale dolphins does not exceed 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate.

## REFERENCES

- Barlow, J. 2010. Cetacean abundance in the California Current from a 2008 ship-based line-transect survey. NOAA Technical Memorandum, NMFS, NOAA-TM-NMFS-SWFSC-456. 19p.
- 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. 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., 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. 223p.
- 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.
- 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.
- Carretta, J.V. and L. Enriquez. 2009a. Marine mammal and seabird bycatch observed in California commercial fisheries in 2007. Administrative Report LJ-09-01, available from Southwest Fisheries Science Center, 3333 North Torrey Pines Rd., La Jolla, CA 92037. 12 p.
- Carretta, J.V. and L. Enriquez. 2009b. Marine mammal bycatch observed in the California/Oregon swordfish and thresher shark drift gillnet fishery in 2008. Administrative Report LJ-09-03, available from Southwest Fisheries Science Center, 3333 North Torrey Pines Rd., La Jolla, CA 92037. 10 p.
- 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., S.J. Chivers, and K. Danil. 2005. 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.
- Dizon, A., C. LeDuc, and R. LeDuc. 1994. Intraspecific structure of the northern right-whale dolphin (*Lissodelphis borealis*): The power of an analysis of molecular variation for differentiating genetic stocks. CalCOFI Rep. 35:61-67.
- Dizon, A. E., G. M. O'Corry-Crowe, and B. L. Taylor. (1995). Why statistical power is necessary to link analyses of molecular variation to decisions about population structure. pp. 288-294 *In*: J. L. Neilsen (ed.), Evolution and the Aquatic Ecosystem: Defining Unique Units in Population Conservation. American Fisheries Society Symposium 17.
- 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. NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWFSC-202. Available from NMFS, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California, USA.
- 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-406. 27 p.
- 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 p.
- 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. and W. A. Walker. 1979. The northern right-whale dolphin *Lissodelphis borealis* Peale in the eastern North Pacific. In: Winn, H. E. and B. L. Olla (eds.), Behavior of Marine Mammals, p. 85-141. Plenum Press, New York - London.
- National Marine Fisheries Service, Southwest Fisheries Science Center. Unpublished data.
- 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.
- Stick, K. C. and Hreha, L. 1989. Summary of the 1988 Washington/Oregon experimental thresher shark gill net fishery. State of Washington, Department of Fisheries, Progress Report 275. 40p.
- 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.