

BOTTLENOSE DOLPHIN (*Tursiops truncatus*): California Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bottlenose dolphins are distributed worldwide in tropical and warm-temperate waters. In many regions, including California, separate coastal and offshore populations are known (Walker 1981; Ross and Cockcroft 1990; Van Waerebeek et al. 1990). Based on nuclear and mtDNA analyses, Lowther (2006) identified 5 haplotypes from 29 coastal animals and 25 haplotypes from 40 offshore animals from the U.S. west coast. There were no shared haplotypes between coastal and offshore animals and significant genetic differentiation between the two ecotypes was evident. California coastal bottlenose dolphins are found within about one kilometer of shore (Figure 1; Hansen, 1990; Carretta et al. 1998; Defran and Weller 1999) primarily from Point Conception south into Mexican waters, at least as far south as San Quintin, Mexico. In southern California, animals are found within 500 m of the shoreline 99% of the time and within 250 m 90% of the time (Hanson and Defran 1993). Oceanographic events appear to influence the distribution of animals along the coasts of California and Baja California, Mexico, as indicated by a change in residency patterns along Southern California and a northward range extension into central California after the 1982-83 El Niño (Hansen and Defran 1990; Wells et al. 1990). Since the 1982-83 El Niño, which increased water temperatures off California, they have been consistently sighted in central California as far north as San Francisco. Photo-identification studies have documented north-south movements of coastal bottlenose dolphins (Hansen 1990; Defran et al. 1999), and monthly counts based on surveys between the U.S./Mexican border and Point Conception are variable (Carretta et al. 1998), indicating that animals are moving into and out of this area. There is little site fidelity of coastal bottlenose dolphins along the California coast; over 80% of the dolphins identified in Santa Barbara, Monterey, and Ensenada have also been identified off San Diego (Defran et al. 1999, Feinholz 1996, Defran, unpublished data). Although coastal bottlenose 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. Therefore, the management stock includes only animals found within U.S. waters. For the Marine Mammal Protection Act (MMPA) stock assessment reports, bottlenose dolphins within the Pacific U.S. Exclusive Economic Zone are divided into three stocks: 1) California coastal stock (this report), 2) California, Oregon and Washington offshore stock, and 3) Hawaiian stock.

POPULATION SIZE

Based on photographic mark-recapture surveys conducted along the San Diego coast in 2004 and 2005, the most recent estimate of population size is 323 dolphins (CV = 0.13, 95% CI 259-430; Dudzik et al. 2006). This estimate does not reflect that approximately 35% of dolphins encountered lack identifiable dorsal fin marks (Defran and Weller 1999). If 35% of all animals lack distinguishing marks, then the true population size would be closer to 450-500 animals. Comparing the most recent population size estimate



Figure 1. Approximate range (in bold) of California coastal bottlenose dolphins based on aerial surveys along the coast of California from 1990-2000. This population of bottlenose dolphins is found within about 1 km of shore.

with those obtained from 1987-89 (354 dolphins, 95% CI 330 – 390) and 1996-98 (356 dolphins, 95% CI 306 – 437; Dudzik 1999) suggests that the population size has been stable for approximately 20 years. Older estimates of population size for this stock range from 234 (95% CI 205-263) to 285 (95% CI 265-306) animals for the period 1985-89 (Defran and Weller 1999). Because coastal bottlenose dolphins spend an unknown amount of time in Mexican waters, where they may be subject to mortality in Mexican fisheries, an average abundance estimate for California only is the most appropriate for U.S. management of this stock.

Minimum Population Estimate

The minimum number of dolphins photographically identified during 2004-2005 field studies was 164, however, the discovery curve for new animals had not yet reached an asymptote during that study (Dudzik et al. 2006). The minimum population estimate for this stock is therefore taken as the lower 20th percentile of the log-normal distribution of abundance obtained from the photographic mark-recapture estimate (Dudzik et al. 2006), or approximately 290 dolphins.

Current Population Trend

Based on a comparison of mark-recapture abundance estimates for the periods 1987-89 (\hat{N} = 354), 1996-98 (\hat{N} = 356), and 2004-05 (\hat{N} = 323), Dudzik et al. (2006) stated that the population size had remained stable over this period.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No information on current or maximum net productivity rates is available for California coastal bottlenose dolphins.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (290) 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 estimated fishery mortality; Wade and Angliss 1997), resulting in a PBR of 2.9 coastal bottlenose dolphins per year. Not all California coastal bottlenose dolphins are present in U.S. waters at any given moment and approximately 18% of the stock's range occurs in Mexican waters. Thus, the PBR is prorated by a minimum factor of 0.82 to account for time that animals spend outside of U.S. waters. Without additional data on the residence times of dolphins in Mexican waters, this factor cannot be improved upon. Because this stock spends some of its time outside the U.S. EEZ, the PBR allocation for U.S. waters is $2.9 \times 0.82 = 2.4$ dolphins per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Due to its exclusive use of coastal habitats, this bottlenose dolphin population is susceptible to fishery-related mortality in coastal set net fisheries. A summary of information on fishery mortality and injury for this stock of bottlenose dolphin is shown in Table 1. More detailed information on the set gillnet fishery is provided in Appendix 1. From 1991-94, no bottlenose dolphins were observed taken in this fishery with 10-15% observer coverage (Julian and Beeson 1998). The observer program was discontinued at the end of 1994, when coastal set gillnet fishing was banned within 3 nmi of the southern California coast. In 2002, a ban on set gill and trammel nets inshore of 60 fathoms from Point Reyes to Point Arguello became effective. Because of these closures, the potential for mortality of coastal bottlenose dolphins in the California set gillnet fishery has been greatly reduced. Fisher self-report data and 36 stranding records for 1997-2001 do not include any evidence of fishery interactions for this stock. A renewed observer program began in the halibut set gillnet fishery in 2006. Through late 2007, a total of 260 sets were observed without a cetacean interaction. In 2003, an immature female bottlenose dolphin stranded dead in San Diego, California, with 3.5-inch mesh gillnet wrapped around its tailstock (SWFSC stranding KXD0048). Perforation of the animal's skin suggests the net was on the animal for some time. Mitochondrial DNA analysis showed that the haplotype for this animal matches that of known *coastal* animals (Lowther 2006; Lowther et al. in prep). The fishery responsible for this mortality is unknown, but the location and type of gillnet found suggests either a set or drift gillnet targeting yellowtail, white seabass, or barracuda. In 2004, a bottlenose dolphin with missing flukes washed ashore near Newport Beach, California, suggestive of an interaction with an entangling net fishery. The haplotype of this animal

matched those of known *offshore* bottlenose dolphins (Lowther 2006; Lowther et al., in prep). Coastal gillnet fisheries exist in Mexico and may take animals from this population, but no details are available.

Table 1. Summary of available information on the incidental mortality and serious injury of bottlenose dolphins (California Coastal Stock) in commercial fisheries that might take this species. A renewed observer program began in the halibut set gillnet fishery in 2006 (12 sets observed total, <1% observer coverage).

Fishery Name	Data Type	Year(s)	Percent Observer Coverage	Observed Mortality	Estimated Annual Mortality	Mean Annual Takes (CV in parentheses)
CA angel shark/ halibut and other species large mesh (>3.5in) set gillnet fishery	observer	2002	0%	0	0	0
		2003	0%			
		2004	0%			
		2005	0%			
		2006	<1%			
Unknown fishery	stranding	2002-2006	One bottlenose dolphin with a coastal stock haplotype stranded entangled in 3.5-inch mesh gillnet in 2003		≥0.2 (n/a)	
Minimum total annual takes						≥0.2 (n/a)

Other removals

Seven coastal bottlenose dolphins were collected during the late 1950s in the vicinity of San Diego (Norris and Prescott 1961). Twenty-seven additional bottlenose dolphins were captured off California between 1966 and 1982 (Walker 1975; Reeves and Leatherwood 1984), but based on the locations of capture activities, these animals probably were offshore bottlenose dolphins (Walker 1975). No additional captures of coastal bottlenose dolphins have been documented since 1982, and no live-capture permits are currently active for this species.

STATUS OF STOCK

The status of coastal bottlenose dolphins in California relative to OSP is not known, and there is no evidence of a trend in abundance. They are not listed as "threatened" or "endangered" under the Endangered Species Act nor as "depleted" under the MMPA. Coastal bottlenose dolphins are not classified as a "strategic" stock under the MMPA because total annual fishery mortality and serious injury for this stock (≥0.2 per year) is less than the PBR (2.4). The total human-caused 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.

Habitat Issues

Pollutant levels, especially DDT residues, found in Southern California coastal bottlenose dolphins have been found to be among the highest of any cetacean examined (O'Shea et al. 1980; Schafer et al. 1984). Although the effects of pollutants on cetaceans are not well understood, they may affect reproduction or make the animals more prone to other mortality factors (Britt and Howard 1983; O'Shea et al. 1999). This population of bottlenose dolphins may also be vulnerable to the effects of morbillivirus outbreaks, which were implicated in the 1987-88 mass mortality of bottlenose dolphins on the U.S. Atlantic coast (Lipscomb et al. 1994).

REFERENCES

- Britt, J.O. and E. B. Howard. 1983. Tissue residues of selected environmental contaminants in marine mammals. *In*: Howard, E. B. (ed.), Pathobiology of Marine Mammal Diseases. CRC Press, Boca Raton, Florida.
- Carretta, J. V., K. A. Forney and J. L. Laake. 1998. The abundance of southern California coastal bottlenose dolphins estimated from tandem aerial surveys. *Mar. Mamm. Sci.* 14:655-675.
- Defran, R. H. and D. W. Weller. 1999. Occurrence, distribution, site fidelity and school size of bottlenose dolphins (*Tursiops truncatus*) off San Diego, California. *Mar. Mamm. Sci.* 15:366-380.

- Defran, R. H., D. W. Weller, D. L. Kelly, and M. A. Espinosa. 1999. Range characteristics of Pacific coast bottlenose dolphins (*Tursiops truncatus*) in the Southern California Bight. *Mar. Mamm. Sci.* 15:381-393.
- Dudzik, K.J. 1999. Population dynamics of the Pacific coast bottlenose dolphin (*Tursiops truncatus*). M.S. Thesis, San Diego State University, San Diego, California 92182. 63pp.
- Dudzik, K.J., K.M. Baker, and D.W. Weller. 2006. Mark-recapture abundance estimate of California coastal stock bottlenose dolphins: February 2004 to April 2005. SWFSC Administrative Report LJ-06-02C, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 15p.
- Feinholz, D.M. 1996. Pacific coast bottlenose dolphins (*Tursiops truncatus*) in Monterey Bay, California. M.S. Thesis, San Jose State University, San Jose, CA. 78p.
- Forney, K.A., J. Barlow, M.M. Muto, M. Lowry, J. Baker, G. Cameron, J. Mobley, C. Stinchcomb, and J.V. Carretta. 2000. U.S. Pacific Marine Mammal Stock Assessments: 2000. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-300. 276p.
- Hansen, L. J. 1990. California coastal bottlenose dolphins. *In: S. Leatherwood and R.R. Reeves (eds.), The Bottlenose Dolphin*, p. 403-420. Academic Press, Inc., San Diego.
- Hansen, L. J. and R. H. Defran. 1990. A comparison of photo-identification studies of California coastal bottlenose dolphins. *Rep. Int. Whal. Commn. Special Issue* 12:101-104.
- Hanson, M.T. and R.H. Defran. 1993. The behavior and feeding ecology of the Pacific coast bottlenose dolphin, *Tursiops truncatus*. *Aquatic Mammals* 19:127-142.
- 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.
- Lipscomb, T. P., F. Y. Schulman, D. Moffett, and S. Kennedy. 1994. Morbilliviral disease in Atlantic bottlenose dolphins (*Tursiops truncatus*) from the 1987-88 epizootic. *Journal of Wildlife Diseases* 30:567-571.
- Lowther, J. 2006. Genetic variation of coastal and offshore bottlenose dolphins, *Tursiops truncatus*, in the eastern North Pacific Ocean. M.S. Thesis, University of San Diego, San Diego, California, USA. 126 p.
- Lowther, J.L., F.I. Archer, and D.W. Weller. Manuscript in preparation. Genetic variation of coastal and offshore bottlenose dolphins, *Tursiops truncatus*, in the eastern North Pacific Ocean.
- O'Shea, T. J., R. L. Brownell, Jr., D. R. Clark, W. A. Walker, M. L. Gray, and T. G. Lamont. 1980. Organochlorine pollutants in small cetaceans from the Pacific and South Atlantic Oceans, November 1968-June 1976. *Pesticides Monitoring Journal* 14:35-46.
- O'Shea, T. J., R. R. Reeves, and A. Kirk Long (eds.). 1999. *Marine Mammals and Persistent Ocean Contaminants: Proceedings of the Marine Mammal Commission Workshop, Keystone, Colorado, 12-15 October 1998*. Marine Mammal Commission, Bethesda, MD. 150pp.
- NMFS, Southwest Fisheries Science Center. P.O. Box 271, La Jolla, CA 92038-0271
- Norris, K. S. and J. H. Prescott. 1961. Observation on Pacific cetaceans of Californian and Mexican waters. *University of California Publications in Zoology* 63:291-402. University of California Press, Berkeley and Los Angeles.
- Reeves, R. R. and S. Leatherwood. 1984. Live-capture fisheries for cetaceans in USA and Canadian waters, 1973-1982. *Rep. Int. Whal. Commn.* 34:497-507.
- Ross, G. J. B. and V. G. Cockcroft. 1990. Comments on Australian bottlenose dolphins and the taxonomic status of *Tursiops aduncus* (Ehrenberg, 1832). *In: The Bottlenose Dolphin* (eds. S. Leatherwood and R. R. Reeves). pp. 101-128. Academic Press, 653pp.
- Schafer, H. A., R. W. Gossett, C. F. Ward, and A. M. Westcott. 1984. Chlorinated hydrocarbons in marine mammals. Biennial Report, 1983-84, Southern California Coastal Water Research Project, Long Beach, California.
- Van Waerebeek, K., J. C. Reyes, A. J. Read, and J. S. McKinnon. 1990. Preliminary observations of bottlenose dolphins from the Pacific coast of South America. *In: The Bottlenose Dolphin* (eds. S. Leatherwood and R. R. Reeves). pp. 143-154. Academic Press, 653 pp.
- Walker, W. A. 1975. Review of the live-capture fishery for smaller cetaceans taken in Southern California waters for public display, 1966-77. *J. Fish. Res. Board. Can.* 32:1197-1211.
- Walker, W. A. 1981. Geographical variation in morphology and biology of bottlenose dolphins (*Tursiops*) in the eastern North Pacific. *Admin. Rep. LJ-81-03C*. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038, USA. 52p.

- Ward, B.G. 1999. Movement patterns and feeding ecology of the Pacific coast bottlenose dolphin (*Tursiops truncatus*). M.S. Thesis, San Diego State University, San Diego, California, 92182. 98pp.
- Wells, R. S., L. J. Hansen, A. B. Baldrige, T. P. Dohl, D. L. Kelly and R. H Defran. *In*: S. Leatherwood and R. R. Reeves (eds.), The Bottlenose Dolphin, p. 421-431. Academic Press, Inc., San Diego.
- 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. Commerce, NOAA Tech. Memo. NMFS-OPR-12. 93 pp.