

ATLANTIC SPOTTED DOLPHIN (*Stenella frontalis*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Atlantic spotted dolphins are distributed in tropical and warm temperate waters of the western North Atlantic (Leatherwood *et al.* 1976). Their distribution ranges from southern New England, south through the Gulf of Mexico and the Caribbean to Venezuela (Leatherwood *et al.* 1976; Perrin *et al.* 1994). Atlantic spotted dolphins regularly occur in the inshore waters south of Chesapeake Bay and near the continental shelf edge and continental slope waters north of this region (Payne *et al.* 1984; Mullin and Fulling 2003). Sightings have also been made along the north wall of the Gulf Stream and warm-core ring features (Waring *et al.* 1992).

There are two species of spotted dolphin in the Atlantic Ocean, the Atlantic spotted dolphin, *Stenella frontalis*, formerly *S. plagiodon*, and the pantropical spotted dolphin, *S. attenuata* (Perrin *et al.* 1987). The Atlantic spotted dolphin occurs in two forms which may be distinct sub-species (Perrin *et al.* 1987, 1994; Rice 1998): the large, heavily spotted form which inhabits the continental shelf and is usually found inside or near the 200 m isobath; and the smaller, less spotted island and offshore form which occurs in the Atlantic Ocean but is not known to occur in the Gulf of Mexico (Fulling *et al.* 2003; Mullin and Fulling 2003; Mullin and Fulling 2004). Where they co-occur, the offshore form of the Atlantic spotted dolphin and the pantropical spotted dolphin can be difficult to differentiate at sea.

A genetic analysis of mtDNA and microsatellite DNA data from samples collected in the Gulf of Mexico and the western North Atlantic reveal significant genetic differentiation between these areas (Adams and Rosel 2006). The western North Atlantic population is provisionally being considered a separate stock from the Gulf of Mexico stock(s) for management purposes. Adams and Rosel (2006) also provide evidence for genetic separation of dolphins within the western North Atlantic into two stocks with a provisional point of differentiation near Cape Hatteras, NC. These two Atlantic stocks, however, are not currently recognized as distinct management units, and thus will be treated as one western North Atlantic stock for the remainder of this assessment.

POPULATION SIZE

Total numbers of Atlantic spotted dolphins off the U.S. or Canadian Atlantic coast are unknown, although estimates are available from selected regions for select time periods. Sightings have been concentrated in the slope waters north of Cape Hatteras, but in the shelf waters south of Cape Hatteras sightings extend into the deeper slope and offshore waters of the mid-Atlantic (Fig. 1). The best recent abundance estimate for Atlantic spotted dolphins is the sum of the estimates from the two 2004 western U.S. Atlantic surveys. This joint estimate ($3,578+47,400=50,978$) is considered best because these two surveys together have the most complete coverage of the species' habitat.

Because *S. frontalis* and *S. attenuata* are difficult to differentiate at sea, the reported abundance estimates, prior to 1998, are for both species of spotted dolphins combined. At their November 1999 meeting, the Atlantic SRG recommended that without a genetic determination of stock structure, the abundance estimates for the coastal and offshore forms should be combined. There remains debate over how distinguishable both species are at sea, though in the waters south of Cape Hatteras identification to species is made with very high certainty. This does not, however, account for the potential for a mixed species herd, as has been recorded for several dolphin assemblages. Pending further genetic studies for clarification of this problem, a single species abundance estimate will be used as

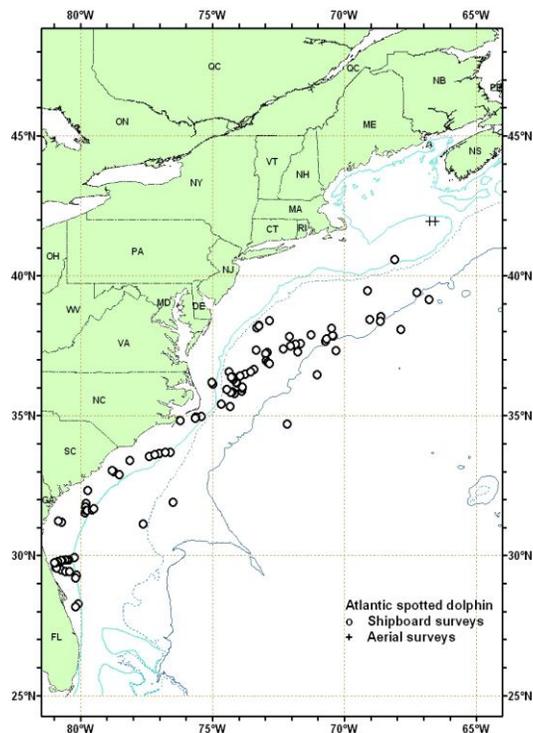


Figure 1. Distribution of Atlantic spotted dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1998 and 2004. Isobaths are at 100 m, 1,000 m, and 4,000 m.

the best estimate of abundance, combining species specific data from the northern as well as southern portions of the species' ranges.

Earlier abundance estimates

An abundance estimate of 6,107 undifferentiated spotted dolphins (CV=0.27) was obtained from an aerial survey program conducted from 1978 to 1982 on the continental, shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance estimate of 4,772 (CV=1.27) undifferentiated spotted dolphins was obtained from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (NMFS unpublished data). An abundance estimate of 32,043 (CV=1.39) Atlantic spotted dolphins was derived from a line-transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N). An abundance estimate of 14,438 (CV=0.63) Atlantic spotted dolphins was generated from a shipboard line-transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 4,163 km of track line in waters south of Maryland (38°N) (Mullin and Fulling 2003). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable and should not be used for PBR determinations.

Recent surveys and abundance estimates

An abundance estimate of 3,578 (CV= 0.48) Atlantic spotted dolphins was obtained from a line-transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (38°N) to the Bay of Fundy (45°N) (Table 1; Palka 2006). Shipboard data were collected using the two independent team line-transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and $g(0)$, the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for $g(0)$ and biases due to school size and other potential covariates (Palka 2005).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths ≥ 50 m) between 27.5 – 38 °N latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 25x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the Mid-Atlantic. The survey included 5,659 km of trackline, and accomplished a total of 473 cetacean sightings. Sightings were most frequent in waters North of Cape Hatteras, North Carolina along the shelf break. Data were corrected for visibility bias $g(0)$ and group-size bias and analyzed using line-transect distance analysis (Palka 1995; Buckland *et al.* 2001). The resulting abundance estimate for Atlantic spotted dolphins between Florida and Maryland was 47,400 animals (CV=0.45)(Table 1).

Table 1. Summary of abundance estimates for the western North Atlantic spotted dolphins, <i>Stenella frontalis</i> , by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV)			
Month/Year	Area	N_{best}	CV
Jun-Aug 2004	Maryland to the Bay of Fundy	3,578	0.48
Jun-Aug 2004	Florida to Maryland	47,400	0.45
Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	50,978	0.42

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best abundance estimate is 50,978 (CV=0.42). The minimum population estimates based on the combined abundance estimates is 36,235.

Current Population Trend

There are insufficient data to determine the population trends for this species, because prior to 1998, species of spotted dolphins were not differentiated during surveys.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the Atlantic spotted dolphin is 36,235. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is set to 0.5 because this stock is of unknown status. PBR for the combined offshore and coastal forms of Atlantic spotted dolphins is 362.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total fishery-related mortality and serious injury cannot be estimated separately for the two species of spotted dolphins in the U.S. Atlantic EEZ because of the uncertainty in species identification by fishery observers. The Atlantic Scientific Review Group advised adopting the risk-averse strategy of assuming that either species might have been subject to the observed fishery-related mortality and serious injury. Total annual estimated average fishery-related mortality or serious injury to this stock during 2001-2005 was 6 (CV=1) undifferentiated spotted dolphins.

Earlier Interactions

No spotted dolphin mortalities were observed in 1977-1991 foreign fishing activities. Bycatch had been observed in the pelagic drift gillnet and pelagic longline fisheries, but no mortalities or serious injuries have been documented in the pelagic pair trawl, Northeast sink gillnet, Mid-Atlantic coastal gillnet, and North Atlantic bottom trawl fisheries. No takes have been documented in a review of Canadian gillnet and trap fisheries (Read 1994).

Forty-nine undifferentiated spotted dolphin mortalities were observed in the drift gillnet fishery between 1989 and 1998 and occurred northeast of Cape Hatteras within the 183m isobath in February-April and near Lydonia Canyon in October. Six whole animal carcasses sent to the Smithsonian were identified as pantropical spotted dolphins (*S. attenuata*). The remaining animals were not identified to species. Estimated annual mortality and serious injury attributable to this fishery (CV in parentheses) was 25 in 1989 (.65), 51 in 1990 (.49), 11 in 1991 (.41), 20 in 1992 (0.18), 8.4 in 1993 (0.40), 29 in 1994 (0.01), 0 in 1995, 2 in 1996 (0.06), no fishery in 1997 and 0 in 1998.

Pelagic Longline

Between 1992 and 2005, 2 spotted dolphins (recorded as Atlantic spotted dolphins) were hooked and released alive in the Atlantic, including one dolphin hooked and released alive with serious injuries in 2003 (in the Mid-Atlantic Bight fishing area), and one dolphin was released alive without serious injuries in 2005 (in the Sargasso fishing area) (Garrison and Richards 2004; Fairfield-Walsh and Garrison 2006.). The estimated fishery-related mortality to Atlantic spotted dolphins in the U.S. Atlantic (excluding the Gulf of Mexico) attributable to this fishery between 2001-2005 was 6 (CV=1) (Table 2) (Garrison 2003, 2005; Garrison and Richards 2004; Fairfield-Walsh and Garrison 2006).

Table 2. Summary of the incidental mortality and serious injury of undifferentiated spotted dolphins (*Stenella frontalis* and *Stenella attenuata*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels ^a	Data Type ^b	Observer Coverage ^c	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality ^d	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
Pelagic Longline (excluding NED-E) ^h	01-05	98, 87, 63, 60, 60	Obs. Data Logbook	.04, .05, .09, .09, .06	0, 0, 1, 0, 0	0, 0, 0, 0, 0	0, 0, 30, 0, 0	0, 0, 0, 0, 0	0, 0, 30, 0, 0	0, 0, 1, 0, 0	6 (1)
TOTAL											6 (1)

a. Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.
 b. Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

Other Mortality

From 2001-2005, 16 Atlantic spotted dolphins were stranded between Massachusetts and Puerto Rico (NMFS unpublished data). Two animals stranded in North Carolina and 3 in Florida in 2001; 2 animals stranded in North Carolina and 2 in Florida in 2002; 1 animal stranded in 2003 in Massachusetts, North Carolina, and Florida; one dolphin stranded in Florida and one in Puerto Rico in 2004; and one dolphin stranded in North Carolina and one in Georgia in 2005. None of these strandings had documented signs of fishery or human interactions.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

Table 2. Atlantic spotted dolphin (*Stenella frontalis*) reported strandings along the U.S. Atlantic coast, 2001-2005.

STATE	2001	2002	2003	2004	2005	TOTALS
Massachusetts	0	0	1	0	0	1
North Carolina	2	2	1	0	1	6
Georgia	0	0	0	0	1	1
Florida	3	2	1	1	0	7
Puerto Rico	0	0	0	1	0	1
TOTALS	5	4	3	2	2	16

STATUS OF STOCK

The status of Atlantic spotted dolphins relative to OSP in the U.S. Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. Total U.S. fishery-related mortality and serious injury for the western North Atlantic stock of Atlantic spotted dolphins is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. Average annual human-related mortality and serious injury does not exceed the PBR; therefore, this is not a strategic stock.

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