STRIPED DOLPHIN (*Stenella coeruleoalba*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The striped dolphin, *Stenella coeruleoalba*, is distributed worldwide in temperate and tropical seas of the world. Striped dolphins are found in the western North Atlantic from Nova Scotia south to at least Jamaica and in the Gulf of Mexico. In general, striped dolphins appear to prefer continental slope waters offshore to the Gulf Stream (Leatherwood *et al*. 1976; Perrin *et al*. 1994; Schmidly 1981). There is no information concerning striped dolphin stock structure in the western North Atlantic.

In waters off the northeastern U.S. coast, striped dolphins are distributed along the continental shelf edge from Cape Hatteras to the southern margin of Georges Bank, and also occur offshore over the continental slope and rise in the mid-Atlantic region (CeTAP 1982). Continental shelf edge sightings in this program were generally centered along the 1,000 m depth contour in all seasons (CeTAP 1982). During 1990 and 1991 cetacean habitat-use surveys, striped dolphins were associated with the Gulf Stream north wall and warm-core ring features (Waring *et al*. 1992).

POPULATION SIZE

The total number of striped dolphins in the U.S. Exclusive Economic Zone (EEZ) is unknown; however, three abundance estimates are available for for portions of the northeastern U.S. Atlantic during spring and summer 1978-82, August to September 1991, and July to September 1995 (Table 1; Figure 1).

A population size of 36,780 striped dolphins (CV=0.27) was estimated 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 (Table 1; CeTAP 1982). R. Kenney (pers. comm.) provided abundance estimates that accounted for survey effort in two continental slope survey blocks and uncertainties resulting from sighting of unidentified small dolphins. The estimate is based on an inverse variance weighted pooling of spring and summer data. An average of these seasons were chosen because the greatest proportion of the population off the northeast U.S. coast appeared in the study area during these seasons. This estimate does not include a correction for dive-time or g(0), the probability of detecting an animal group on the track line. This estimate may not reflect the current true population size because of its high degree of uncertainty (e.g., large CV), its old age, and it was estimated just after cessation of extensive foreign fishing operations in the region.

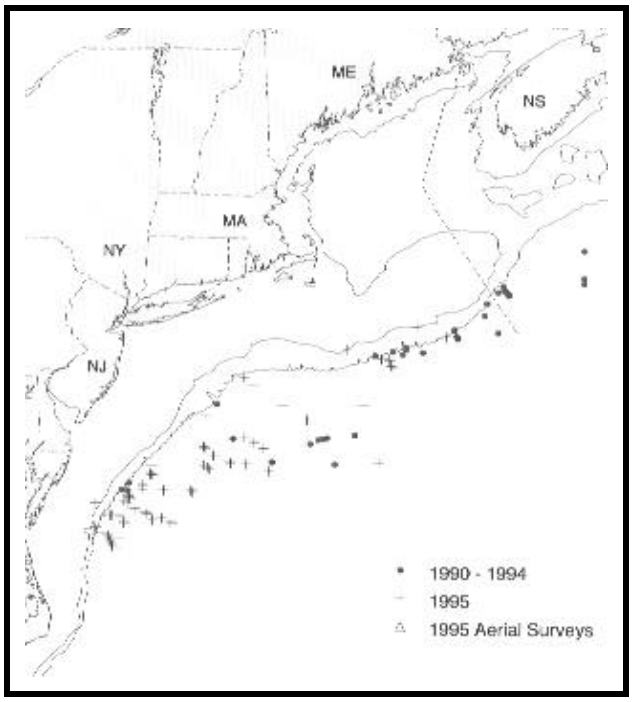

Figure 1. *Distribution of striped dolphin sightings from NEFSC shipboard and aerial surveys during the summer in 1990-1995. Isobaths are at 100 m and 1,000 m.*

A population size of 25,939 (CV=0.36) and 13,157 (CV=0.45) spotted dolphins was estimated from line transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11, respectively (Table 1; Anon. 1991). The study area included that covered in the CeTAP study plus several additional continental slope survey blocks. Due to weather and logistical constraints, several survey blocks south and east of Georges Bank were not surveyed. The data were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993), where the CV was estimated using the

bootstrap option. The abundance estimates do not include g(0) and were not pooled over platforms because the inter-platform calibration analysis has not been conducted.

Due to insufficient numbers of striped dolphin sightings collected during the August 1990, June-July 1991, and June-July 1993 sighting surveys, spotted dolphin abundances for these surveys were not estimated.

A population size of 31,669 (CV=0.73) striped dolphins was estimated 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 (Table 1; Palka and Waring, in prep.). Total track line length was 32,600 km (17,600 nmi). The ships covered waters between the 50 and 1000 fathom contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the Mid-Atlantic from the coastline to the 50 fathom contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom contour line. Shipboard data were collected using a two independent sighting team procedure and were analyzed using the product integral method (Palka 1995) and DISTANCE (Buckland *et al.* 1993). Shipboard estimates were corrected for g(0) and, if applicable, also for school size-bias. Standard aerial sighting procedures with two bubble windows and one belly window observer were used during the aerial survey. An estimate of g(0) was not made for the aerial portion of the survey. Estimates do not include corrections for dive-time. Variability was estimated using bootstrap resampling techniques.

The best available current abundance estimate for striped dolphins is 31,669 (CV=0.73) as estimated from the July to September 1995 line transect survey (Palka and Waring, in prep.) because this survey is recent and provided the most complete coverage of the known habitat.

Table 1. Summary of abundance estimates for western North Atlantic striped dolphins. 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
spring & summer 1978-82	Cape Hatteras, NC to Nova Scotia	37,780	0.27
Aug-Sep 1991	Cape Hatteras, NC to Nova Scotia	25,939 and 13,157*	0.36 and 0.45*
Jul-Sep 1995	Virginia to Gulf of St. Lawrence	31,669	0.73

* From data collected on the Twin Otter and AT-11, respectively.

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 estimate of abundance for striped dolphins is 31,669 (CV=0.73). The minimum population estimate for the western North Atlantic striped dolphin is 18,220 (CV=0.73).

Current Population Trend

There are insufficient data to determine the population trends for this species.

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 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 (Wade and Angliss 1997). The minimum population size is 18,220 (CV=0.73).

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 0.45 because this stock is of unknown status and the variance associated with the estimated total annual fishery-related mortality and serious injury for striped dolphins is high (CV = 0.75). PBR for the western North Atlantic striped dolphin is 164.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

No mortalities were observed in 1977-1991 foreign fishing activities off the northeast U.S. coast. Nineteen mortalities were documented between 1989 and 1993 (see below) in the pelagic drift gillnet fishery, and two mortalities were documented in 1991 in the North Atlantic bottom trawl fishery. No mortalities were documented in review of Canadian gillnet and trap fisheries (Read 1994).

Total estimated average annual fishery-related mortality and serious injury to this stock in the Atlantic during 1991-1995 was 47.1 striped dolphins annually (CV = 0.75) (Table 2).

Fisheries Information

Data on current incidental takes in U.S. fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989 and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras.

By-catch has been observed by NMFS Sea Samplers in the pelagic drift gillnet and North Atlantic bottom trawl fisheries but no mortalities or serious injuries have been documented in the pelagic longline fisheries, pelagic pair trawl, New England multispecies sink gillnet, and mid-Atlantic coastal sink gillnet fisheries.

The estimated total number of hauls in the pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991, 1992, 1993, 1994 and 1995 were 233, 243, 232, 197 and 164 respectively. Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. In 1995 there were 11 vessels in the fishery (Table 2). Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994 and 99% in 1995. Effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the pelagic drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total by-catch, from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by strata (Northridge 1996). Estimates of total annual by-catch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques (Bisack, in prep.). Thirty-three striped dolphin mortalities were observed in this fishery between 1989 and 1995 and occurred east of Cape Hatteras in January and February, and along the southern margin of Georges Bank in summer and autumn. Estimated annual mortality and serious injury (CV in parentheses) attributable to this fishery was 39 striped dolphins in 1989 (0.31), 57 in 1990 (0.33), 11 in 1991 (0.28), 7.7 in 1992 (0.31), 21 in 1993 (0.11), 13 in 1994 (0.06) and 2 in 1995 (0). The 1991-1995 average annual mortality and serious injury to striped dolphins in the pelagic drift gillnet fishery was 10.9 dolphins (0.08) (Table 2). The 1991-1995 period provides a better characterization of this fishery (i.e., fewer vessels and increased observer coverage).

Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under the MMPA, were observed in order to meet fishery management needs, rather than marine mammal management needs. An average of 970 vessels (full and part time) participated annually in the fishery during 1989-1995. The fishery is active in New England waters in all seasons. The only reported fishery-related mortalities (two) occurred in 1991. Total estimated mortality and serious injury attributable to this fishery in 1991 was 181 (CV = 0.97); average annual mortality and serious injury during 1991-1995 was 36 striped dolphins (CV = 0.97) (Table 2).

Table 2. Summary of incidental mortality of striped dolphins due to commercial fisheries from 1990 through 1995 and calculation of the mean annual mortality rate (CV in parentheses).

Fishery	Years	Number Vessel	Data Type[1]	Range of Observer Coverage[2]	Observed Mortality	Estimated Mortality	CVs	Mean Annual Mortality
Pelagic Drift Gillnet	91-95	1994=12[3] 1995=11	Obs Data Logbook	Sets .20, .40, .42, .87, .99	1, 0, 13, 12, 2	11, 7.7[4], 21, 13, 2.0[5]	.28, .31, .11, .06, 0	10.9 (.08)
North Atlantic Bottom Trawl	91-95	970	Obs Data Weighout	Days Fished .007,.006.004,.004 .011[6]	2, 0, 0, 0, 0	181, 0, 0, 0, 0	.97, 0, 0, 0, 0	36.2 (.97)
TOTAL								47.1 (.75)

[1] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. Mandatory logbook (Logbook) data are used to measure total effort for the pelagic drift gillnet and longline fishery, and these data are collected at the Southeast Fisheries Science Center (SEFSC).

[2] Observer coverage for the pelagic drift gillnet and bottom trawl fishery are in terms of sets.

[3] 1994 and 1995 shown, other years not available on an annual basis.

[4] For 1991-1993, pooled bycatch rates were used to estimate bycatch in months that had fishing effort but did not have observer coverage. This method is described in Northridge (1996). In 1994 and 1995, observer coverage increased substantially, and bycatch rates were not pooled for this period (Bisack, in prep).

[5] One vessel was not observed and recorded 1 set in a 10 day trip (in the logbook). If you assume 1 set, the point estimate would increase by 0.01 animals.

[6] Only January - May data available for 1995 effort (Weighout). All 1995 marine mammal bycatch occurred during January to May.

STATUS OF STOCK

The status of striped 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. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and cannot be considered to be insignificant and approaching zero mortality and serious injury rate. Average annual fishery-related mortality and serious injury does not exceed the PBR; therefore, this is not a strategic stock.

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