BOTTLENOSE DOLPHIN (*Tursiops truncatus*): Western North Atlantic Offshore Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two morphologically and genetically distinct bottlenose dolphin morphotypes (Duffield et al. 1983; Duffield 1986) described as the coastal and offshore forms. Both inhabit waters in the western North Atlantic Ocean (Hersh and Duffield 1990; Mead and Potter 1995; Curry and Smith 1997) along the U.S. Atlantic coast. The offshore and nearshore ecotypes are genetically distinct using both mitochondrial and nuclear markers (Hoelzel et al. 1998). Hersh and Duffield (1990) also described morphological differences between offshore morphotype dolphins and dolphins with hematological profiles matching the coastal morphotype which had stranded in the Indian/Banana River in Florida.

The offshore form is distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic Ocean. North of Cape Hatteras, there is clear separation of the two morphotypes across bathymetry during summer months. Aerial surveys flown during 1979-1981 indicated a concentration of bottlenose dolphins in waters < 25 m deep corresponding to the coastal morphotype, and an area of high abundance along the shelf break corresponding to the offshore type (CETAP 1982; Kenney 1990). Biopsy tissue sampling and genetic analysis demonstrated that bottlenose dolphins concentrated close to shore were of the coastal morphotype, while those in waters > 40 m deep were from the offshore morphotype (Garrison et al. 2003). However, during winter months and south of Cape Hatteras, NC the range of the coastal and offshore morphotypes overlap to some degree. Torres et al. (2003) found a statistically significant break in the distribution of the ecotypes at 34 km from shore based upon the genetic analysis of tissue samples collected in nearshore and offshore waters. The offshore morphotype was found exclusively seaward of 34 km and in waters deeper than 34 m. Within 7.5 km of shore, all animals were of the coastal morphotype. Systematic biopsy collection surveys were conducted coastwide during the summer and winter between 2001-2003 to evaluate the degree of spatial overlap between the two morphotypes. Over the continental shelf south of Cape Hatteras, NC the two morphotypes overlap spatially, and the probability of a sampled group being from the offshore morphotype increased with increasing depth based upon a logistic regression analysis. Offshore morphotype animals have been sampled as close as 7.3 km from shore in water depths of 13 m (Garrison et al. 2003).

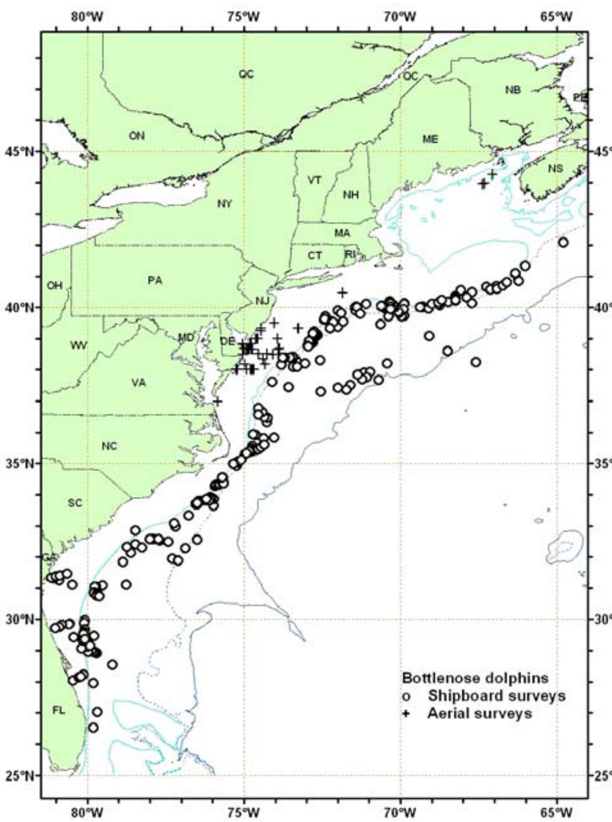

Figure 1. *Distribution of bottlenose dolphin sightings from NEFSC and SEFSC aerial surveys during summer in 1998, 1999, and 2004. Isobaths are at 100 m, 1,000 m, and 4,000 m.*

Seasonally, bottlenose dolphins occur over the outer continental shelf and inner slope waters as far north as Georges Bank (Figure 1; CETAP 1982; Kenney 1990). Sightings occurred along the continental shelf break from Georges Bank to Cape Hatteras during spring and summer (CETAP 1982; Kenney 1990). In Canadian waters, bottlenose dolphins have occasionally been sighted on the Scotian Shelf, particularly in the Gully (Gowans and Whitehead 1995; NMFS unpublished data). Recent information from Wells et al. (1999) indicates that the range of the offshore bottlenose dolphin may include waters beyond the continental slope and that offshore bottlenose dolphins may move between the Gulf of Mexico and the Atlantic. Offshore morphotype bottlenose dolphins have stranded as far south as the Florida Keys.

POPULATION SIZE

An abundance of 16,689 (CV=0.32) bottlenose dolphins was estimated 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) (Figure 1; Palka et al., unpublished manuscript). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and g(0), the probability of detecting a group on the track line. Aerial data were not corrected for g(0).

An abundance of 13,085 (CV=0.40) for bottlenose dolphins was estimated from a shipboard line transect sighting line-transect survey conducted between 8 July and 17 August 1998 that surveyed 4,163 km of track line in waters south of Maryland (38°N) (Fig. 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland et al. 2001; Thomas et al. 1998) accounting for school size bias.

During the summer (June - July) of 2002, aerial surveys were conducted along the U.S. Atlantic coast between Florida and New Jersey. A total of 6,734 km of trackline were completed during the summer survey between Sandy Hook, NJ to Ft. Pierce, FL. The abundance of bottlenose dolphins in survey strata were calculated using line transect methods and distance analysis, and the direct duplicate estimator was used to account for visibility bias (Buckland et al. 2001; Palka 1995). These estimates were further partitioned between the coastal and offshore morphotypes based upon the results of the logistic regression models and spatial analyses described above. A parametric bootstrap approach was used to incorporate the uncertainty in the logistic regression models into the overall uncertainty in the abundance estimate for offshore bottlenose dolphins (Garrison et al. 2003). The resulting coastwide abundance estimate for the offshore morphotype in waters < 40 m depth was 26,849 (CV = 0.193).

An abundance of 9,786 (CV = 0.56) for offshore morphotype bottlenose dolphins was estimated 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 38° N (Figure 1; Palka unpubl.). 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 (Figure 1; Palka unpubl.).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths > 50m) between 27.5 – 38 ºN latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 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 there were a total of 473 cetacean sightings. Sightings were most frequent in waters North of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka, 1995; Buckland et al., 2001). The resulting abundance estimate for offshore morphotype bottlenose dolphins between Florida and Maryland was 44,953 (CV = 0.26).

The best available estimate for offshore morphotype bottlenose dolphins is the sum of the estimates from the summer 2002 aerial survey covering the continental shelf, the summer 2004 vessel survey south of Maryland, and the summer 2004 vessel and aircraft surveys north of Maryland. This joint estimate provides complete coverage of the offshore morphotype habitat from Florida to Georges Bank during summer months. The combined abundance estimate from these surveys is 81,588 (CV = 0.17).

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 minimum population estimate for western North Atlantic offshore bottlenose dolphin is 70,775.

Current Population Trend

The data are insufficient to determine population trends. Previous estimates cannot be applied to this process because previous survey coverage of the species' habitat was incomplete.

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 offshore bottlenose dolphins is 70,775. 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 assumed to be 0.5 because this stock is of unknown status. However, because the CV for the fishery mortality estimate exceeds 0.8, the recovery factor was reduced to 0.4. PBR for the western North Atlantic offshore bottlenose dolphin is therefore 566.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total estimated mean annual fishery-related mortality for this stock during 1999-2003 was 26 (CV=1.16) bottlenose dolphins.

Fisheries Information

Bycatch has been observed in the pelagic drift gillnet, pelagic pair trawl, New England multispecies sink gillnet, North Atlantic bottom trawl and pelagic longline fisheries.

Pelagic Longline

The pelagic longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ. Interactions between the pelagic longline fishery and bottlenose dolphins have been observed. These interactions occurred well offshore in deep waters, corresponding to the offshore morphotype. During 1993-1998, in Atlantic waters not including the Gulf of Mexico, 1 bottlenose dolphin was caught and released alive during 1993, and 1 was caught and released alive during 1998. In addition, one bottlenose dolphin was captured and released alive in 2003 (Garrison, 2003; Garrison and Richards, 2004,). There have been no observed mortalities or serious injuries of bottlenose dolphins in the pelagic longline fishery.

Pelagic Drift Gillnet

Estimated bottlenose dolphin mortalities (CV in parentheses) extrapolated for each year were 72 in 1989 (0.18), 115 in 1990 (0.18), 26 in 1991 (0.15), 28 in 1992 (0.10), 22 in 1993 (0.13), 14 in 1994 (0.04), 5 in 1995 (0), 0 in 1996, and 3 in 1998 (0). Since this fishery no longer exists, it has been excluded from Table 1.

Pelagic Pair Trawl

Thirty-two bottlenose dolphin mortalities were observed between 1991 and 1995. Estimated annual fishery-related mortality (CV in parentheses) was 13 dolphins in 1991 (0.52), 73 in 1992 (0.49), 85 in 1993 (0.41), 4 in 1994 (0.40) and 17 in 1995 (0.26). Since this fishery no longer exists, it has been excluded from Table 1.

North Atlantic Bottom Trawl

One bottlenose dolphin mortality was documented in 1991 and the total estimated mortality in this fishery in 1991 was 91 (CV=0.97). Since 1992 there were no bottlenose dolphin mortalities observed in this fishery.

Squid, Mackerel and Butterfish

Although there were reports of bottlenose dolphin mortalities in the foreign fishery during 1977-1988, there were no fishery-related mortalities of bottlenose dolphins reported in the self-reported fisheries information from the mackerel trawl fishery during 1990-1992.

New England Multispecies Sink Gillnet

The first observed mortality of bottlenose dolphins was recorded in 2000. This was genetically identified as an offshore, deep-water ecotype. The estimated annual fishery-related serious injury and mortality attributable to this fishery (CV in parentheses) was 0 from 1996-1999, and 132 (CV=1.16) in 2000. There have been no observed bottlenose dolphin mortalities since 2000 in this fishery (Table 1).

Mid-Atlantic Coastal Gillnet

Bottlenose dolphins were only reported during the trips in 1998, when 1 mortality was observed as a result of this fishery. Though this dolphin was not genetically identified, it is being treated as an offshore, deep-water ecotype because it was caught in the offshore habitat and statistical analyses of all biopsied bottlenose dolphins caught in this offshore habitat indicate this animal has a high probability of being the offshore ecotype. Observed effort was concentrated off New Jersey and scattered between Delaware and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality attributed to this fishery was 0 in 1995 through 1997, 4 (CV=0.7) in 1998, and 0 from 1999 through 2000. A bottlenose dolphin was captured in the region of overlap over the continental shelf in the Mid-Atlantic gillnet fishery during May, 2001. Mortality estimates have not been developed for the offshore morphotype during 1999- 2003 due to the uncertainties associated with the relative distribution of the two morphotypes.

Table 1. Summary of the incidental mortality of offshore morphotype bottlenose dolphins (*Tursiops truncatus*) 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 mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [a]	Observer Coverage [b]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
New England Multisp.Sink Gillnet	99-03		Obs. Data Dealer Reports, Logbook	.06, .06, .04, .02, .03	0, 1, 0, 0, 0	0, 132, 0, 0, 0	0, 1.16, 0, 0, 0	26 (1.16)
Mid-Atlantic Coastal Gillnet	99-03	Unk[c]	Obs. Data Dealer Reports	.02, .02, .02, .01, .01	0, 0, 1, 0, 0	0, 0, NA, 0, 0	0, 0,NA, 0, 0	NA
Total								26 (1.16)

Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook (logbook) data collected by the Southeast Fisheries Science Center (SEFSC) are used to measure total effort for the pelagic drift gillnet fishery. The NEFSC collects landings data (Dealer Reports), and total landings are used as a measure of total effort for the gillnet fisheries. Mandatory vessel trip reports (Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast multispecies sink gillnet fishery.
Observer coverage of the Northeast multispecies sink gillnet fishery is measured as the percentage of trips observed. Observer coverage of the Mid-Atlantic coastal gillnet fishery is measured as the percentage of tons of fish landed.
Number of vessels is not known.

Other Mortality

Bottlenose dolphins are one of the most frequently stranded small cetaceans along the Atlantic coast. Many of the animals show signs of human interaction (i.e., net marks, mutilation, etc.). The estimated number of animals that represent the offshore morphotype is under evaluation.

STATUS OF STOCK

The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. The western North Atlantic offshore bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. Average 1999-2003 annual fishery-related mortality and serious injury does not exceed the PBR therefore this is not a strategic stock. The total fishery-related 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.

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