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

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two morphologically and genetically distinct common bottlenose dolphin morphotypes (Duffield *et al.* 1983; Duffield 1986; Mead and Potter 1995; Rosel *et al.* 2009) 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; Rosel *et al.* 2009) along the U.S. Atlantic coast. The two morphotypes are genetically distinct based upon both mitochondrial and nuclear markers (Hoelzel *et al.* 1998; Rosel *et al.* 2009). The offshore form is distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic Ocean from Georges Bank (Figure 1; CETAP 1982; Kenney 1990) to the Florida Keys, where dolphins with characteristics of the offshore type have stranded. However, bottlenose dolphins have occasionally been sighted in Canadian waters, on the Scotian Shelf, particularly in the Gully (Gowans and Whitehead 1995; NMFS unpublished data), and these animals are thought to be of the offshore form.

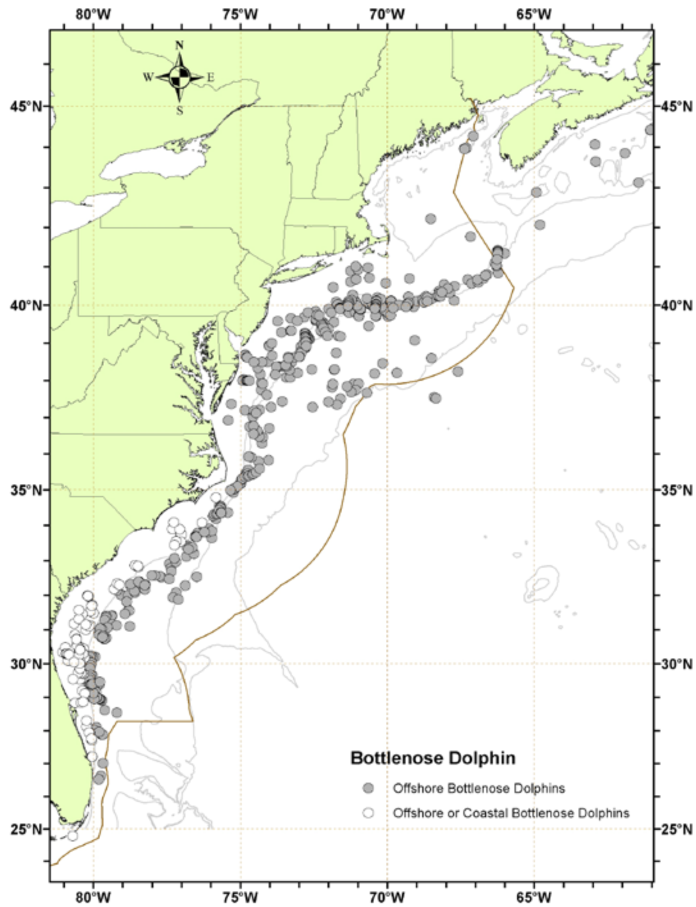

Figure 1. *Distribution of bottlenose dolphin sightings from NEFSC and SEFSC aerial surveys during summer in 1998, 1999, 2002, 2004, 2006 and 2011. Isobaths are the100-m, 1,000-m, and 4,000-m depth contours.*

North of Cape Hatteras, there is 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 stock (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 depth were from the offshore morphotype (Garrison *et al.* 2003). However, during winter months south of Cape Hatteras, North Carolina, the ranges of the coastal and offshore morphotypes overlap to some degree. Torres *et al.* (2003) found a statistically significant break in the distribution of the morphotypes 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. More recently, offshore morphotype animals have been sampled as close as 7.3 km from shore in water depths of 13 m (Garrison *et al.* 2003). Systematic biopsy collection surveys were conducted coastwide during the summer and winter between 2001 and 2005 to evaluate the degree of spatial overlap between the two morphotypes. Over the continental shelf south of Cape Hatteras, North Carolina, 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 (Garrison *et al.* 2003). In southeastern Florida, Hersh and Duffield (1990) examined bottlenose dolphins that stranded along the southeast coast of Florida and found four that had hemoglobin profiles matching that of the offshore morphotype. These strandings suggest the offshore form occurs as far south as southern Florida. The range of the offshore bottlenose dolphin includes waters beyond the continental slope (Kenney 1990), and offshore bottlenose dolphins may move between the Gulf of Mexico and the Atlantic (Wells *et al.* 1999).

The western North Atlantic Offshore Stock of bottlenose dolphins is being considered separate from the Gulf of Mexico Oceanic Stock of bottlenose dolphins for management purposes. One line of evidence to support this decision comes from Baron *et al.* (2008), who found that Gulf of Mexico bottlenose dolphin whistles (collected from oceanic waters) were significantly different from those in the western North Atlantic Ocean (collected from continental shelf and oceanic waters) in duration, number of inflection points and number of steps.

POPULATION SIZE

The best available estimate for the offshore stock of bottlenose dolphins in the western North Atlantic is 77,532 (CV=0.40; Table 1). This estimate is from summer 2011 surveys covering waters from central Florida to the lower Bay of Fundy.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. Distance

Recent surveys and abundance estimates

An abundance estimate of 2,989 (CV=1.11) bottlenose dolphins was generated from an aerial survey conducted in August 2006, which surveyed 10,676 km of trackline in the region from the 2000-m depth contour on the southern edge of Georges Bank to the upper Bay of Fundy and to the entrance of the Gulf of St. Lawrence (Table 1; NMFS 2006). The survey was conducted on the NOAA Twin Otter using the circle-back data collection methods, which allow the estimation of *g(0)* (Palka 2005).

An abundance estimate of 26,766 (CV=0.52) offshore bottlenose dolphins was generated from aerial and shipboard surveys conducted during June-August 2011 between central Virginia and the lower Bay of Fundy. The aerial portion covered 6,850 km of tracklines over waters north of New Jersey between the coastline and the 100-m depth contour through the U.S. and Canadian Gulf of Maine, and up to and including the lower Bay of Fundy. The shipboard portion covered 3,811 km of tracklines between central Virginia and Massachusetts in waters deeper than the 100-m depth contour out to beyond the U.S. EEZ. Both sighting platforms used a double-platform data collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

An abundance estimate of 50,766 (CV=0.55) offshore bottlenose dolphins was generated from a shipboard survey conducted concurrently (June-August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed two independent visual teams searching with 25x bigeye binoculars. A total of 4,445 km of tracklines were surveyed, yielding 290 cetacean sightings. The majority of sightings occurred along the continental shelf break with generally lower sighting rates over the continental slope. Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

Table 1. Summary of abundance estimates for western North Atlantic offshore stock of bottlenose 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
Jun-Aug 2004	Maryland to Bay of Fundy	9,786	0.56
Jun-Aug 2004	Florida to Maryland	44,953	0.26
Aug 2006	S. Gulf of Maine to upper Bay of Fundy to Gulf of St. Lawrence	2,989	1.11

Jun-Aug 2011	central Virginia to lower Bay of Fundy	26,766	0.52
Jun-Aug 2011	central Florida to central Virginia	50,766	0.55
Jun-Aug 2011	central Florida to lower Bay of Fundy (COMBINED)	77,532	0.40

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 77,532 (CV=0.40). The minimum population estimate for western North Atlantic offshore bottlenose dolphin is 56,053.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

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 56,053. 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. PBR for the western North Atlantic offshore bottlenose dolphin is therefore 561.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total annual human-caused mortality and serious injury of offshore bottlenose dolphins was 41.7 (CV=0.26; Table 2) due to interactions with the Northeast bottom trawl, mid-Atlantic bottom trawl, and pelagic longline fisheries.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an “*injury that is more likely than not to result in mortality*”. Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

The commercial fisheries that could potentially interact with this stock in the Atlantic Ocean are the Category I Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline; mid-Atlantic gillnet; and Northeast sink gillnet fisheries; the Category II mid-Atlantic bottom trawl and Northeast bottom trawl fisheries; and the Category III Gulf of Maine, U.S. mid-Atlantic tuna, shark, swordfish hook and line/harpoon fishery. Detailed fishery information is reported in Appendix III.

Earlier Interactions

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet activities off the northeast coast of the U.S. A fishery observer program, which has collected fishery data and information on incidental bycatch of marine mammals, was established in 1977 with the implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA).

Bottlenose dolphin mortalities were observed in the pelagic drift gillnet fishery in 1989-1998. Bycatch mortality estimates extrapolated for each year (CV in parentheses) 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).

Thirty-two bottlenose dolphin mortalities were observed in the pelagic pair trawl fishery 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).

Although there were reports of bottlenose dolphin mortalities in the foreign squid mackerel butterfish 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.

One bottlenose dolphin mortality was documented in the North Atlantic bottom trawl 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.

Pelagic Longline

The pelagic longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ. During 2007-2011, one serious injury of a bottlenose dolphin was observed during quarter 4 of 2009 and estimated serious injuries attributable to the pelagic longline fishery in the Mid-Atlantic Bight (MAB) region during quarter 4 were 8.5 (CV=1.00; Garrison and Stokes 2010; see also Fairfield and Garrison 2008; Garrison *et al.* 2009; Garrison and Stokes 2012a, 2012b). The annual average serious injury and mortality attributable to the Atlantic Ocean pelagic longline fishery for the 5-year period from 2007 to 2011 was 1.7 animals (CV=1.0; Table 2). During 2009 (1 animal), 2010 (1 animal) and 2011 (2 animals), bottlenose dolphins were observed entangled and released alive in the South Atlantic Bight (SAB) and MAB regions (Garrison and Stokes 2010, 2012a, 2012b). The animals were presumed to have no serious injuries. No bottlenose dolphin mortalities or serious injuries were observed between 2002 and 2006 (Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007). However, one bottlenose dolphin was observed entangled and released alive, presumed to have no serious injuries, in 2005 in the SAB region.

Table 2. Summary of the incidental mortality and serious injury of Atlantic Ocean offshore bottlenose dolphins 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	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Northeast Bottom Trawl [c]	07-11	325,297,277,264,226	Obs. Data Logbook	.06, .08, .09, .16, .26	0,0,0,0,0	0,0,4,1,0	0,0,0,0,0	48,19, 18,4,10	48,19, 18,4,10	.95,.88,.92,.53,.84	20 (.52)
Mid-Atlantic Bottom Trawl [c]	07-11	386,374,358,345,325	Obs. Data Logbook	.03, .03, .05, .06, .08	0,0,0,0,0	0,0,1,5,2	0,0,0,0,0	11,16, 21,20,34	11,16, 21,20,34	.42,.36,.45,.34,.31	20 (.17)
Pelagic Longline	07-11	74,78, 75,79, 83	Obs. Data Logbook	.07, .07, .10, .08, .09	0,0,1,0,0	0,0,0,0,0	0,0,8.5,0,0	0,0,0,0,0	0,0,8.5,0,0	NA, NA, 1.00, NA, NA	1.7 (1.0)

TOTAL		41.7 (.26)

[a] Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook and vessel trip reports in the Northeast and Mid-atlantic bottom trawl fisheries.
[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).
[c] Fishery related bycatch rates were estimated using a stratified ratio-estimator, pooling observer data over the five year time period (2007-2011). Pooled stratified bycatch rates were applied to annual fishing effort data resulting in annual mortality estimates across the time period.

Northeast Bottom Trawl

During 2007-2011, 5 mortalities were observed in the Northeast bottom trawl fishery. No takes were observed in 2007, 2008 and 2011; 4 mortalities were observed in 2009, and 1 mortality in 2010. New serious injury criteria were applied to all observed interactions retroactive back to 2007. There were no observed serious injuries of bottlenose dolphins in the Northeast region. Estimated annual fishery-related mortalities (CV in parentheses) were 48 (0.95) in 2007, 19 (0.88) in 2008, 18 (0.92) in 2009, 4 (0.53) in 2010, and 10 (0.84) in 2011. The 2007-2011 average mortality attributed to the Northeast bottom trawl was 20 animals (0.52; Table 2).

Mid-Atlantic Bottom Trawl

During 2007-2011, 8 mortalities were observed in the mid-Atlantic bottom trawl fishery. No takes were observed in 2007 or 2008; 1 mortality was observed in 2009, 5 in 2010, and 2 in 2011. New serious injury criteria were applied to all observed interactions retroactive back to 2007. There were no observed serious injuries of bottlenose dolphins in the Mid-Atlantic region. Estimated annual fishery-related mortalities (CV in parentheses) were 11 (0.42) in 2007, 16 (0.36) in 2008, 21 (0.45) in 2009, 20 (0.34) in 2010, and 34 (0.31) in 2011. The 2007-2011 average mortality attributed to the Northeast bottom trawl was 20 animals (0.17; Table 2).

Through the Marine Mammal Authorization Program (MMAP), there were 2 self-reported incidental takes (mortalities) of bottlenose dolphins during 2011 off Rhode Island and New Jersey by fishers trawling for *Loligo* squid.

U.S. Mid-Atlantic Tuna Hook and Line Fishery

Through the MMAP, there was 1 self-reported incidental take (serious-injury) of a bottlenose dolphin during 2010 off North Carolina by a fisher using hook and line targeting tuna.

Northeast Sink Gillnet

During 2007-2011, there were no observed mortalities or serious injuries to bottlenose dolphins by this fishery. The first observed mortality of bottlenose dolphins was recorded in 2000. This was genetically identified as an offshore morphotype animal. 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 was one additional observed mortality of a bottlenose dolphin presumed to be from the offshore morphotype in this fishery during 2004.

Mid-Atlantic Gillnet

During 2007-2011, there were no observed mortalities or serious injuries to bottlenose dolphins by this fishery. Bottlenose dolphin mortalities were observed in this fishery during 1998, 2001, and 2005. In each case, the dolphin was presumed to be of the offshore morphotype based upon its location in deep water over the outer continental shelf. The only prior estimate of total mortality in the fishery was 4 (CV=0.7) for 1998.

Other Mortality

Bottlenose dolphins are among 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.); however, it is unclear what proportion of these stranded animals is from the offshore morphotype.

STATUS OF STOCK

The western North Atlantic bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act, and the offshore stock is not considered strategic under the Marine Mammal Protection Act. Total U.S. 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 the zero mortality and serious injury rate. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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