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

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two morphologically and genetically distinct forms of common bottlenose dolphin (Duffield *et al.* 1983; Mead and Potter 1995; Rosel *et al.* 2009) described as the coastal and offshore forms in the western North Atlantic (Hersh and Duffield 1990; Mead and Potter 1995; Curry and Smith 1997; Rosel *et al.* 2009). 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 to the Florida Keys (Figure 1; CETAP 1982; Kenney 1990), where dolphins with characteristics of the offshore type have stranded. However, common bottlenose dolphins have occasionally been sighted in Canadian waters, on the Scotian Shelf (e.g., Baird *et al.* 1993; Gowans and Whitehead 1995), and these animals are thought to be of the offshore form.

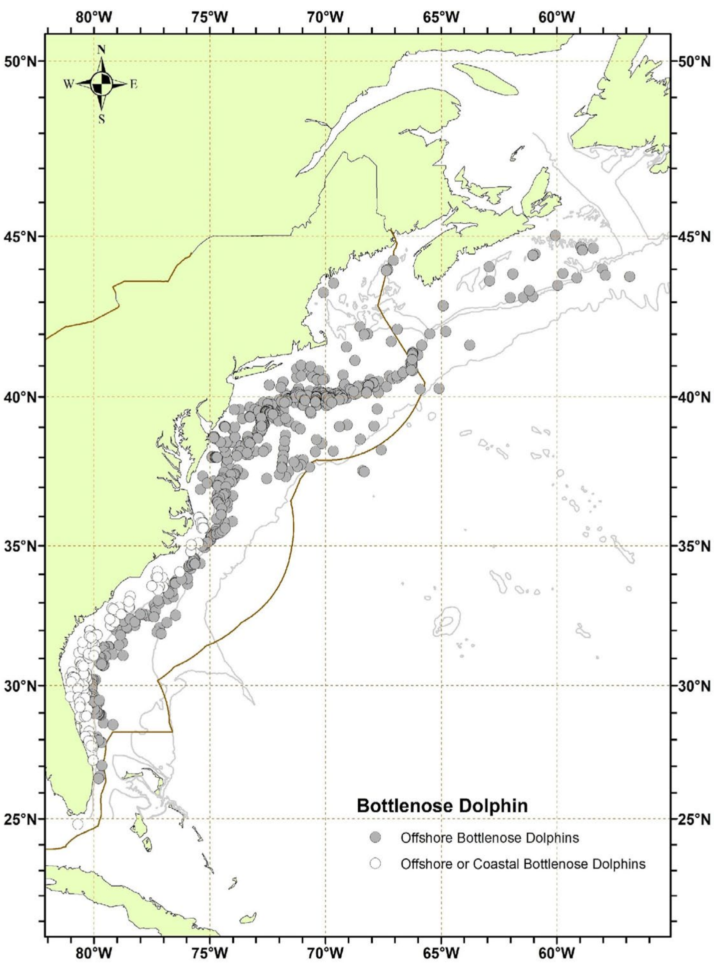

Figure 1. Distribution of bottlenose dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, 2011 and 2016. Isobaths are the 200m, 1,000m, and 4,000m depth contours. The darker line indicates the U.S. EEZ.

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 common 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 common bottlenose dolphins concentrated close to shore were of the coastal morphotype, while those in waters > 25 m depth were from the offshore morphotype (Garrison *et al.* 2003). However, 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 from New York to central Florida. 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 coast-wide 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). Hersh and Duffield (1990) examined common 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 common bottlenose dolphin includes waters beyond the continental slope (Kenney 1990), and also waters beyond the U.S. EEZ, and therefore the offshore stock is a transboundary stock (Figure 1). Offshore common bottlenose dolphins may move between the Gulf of Mexico and the Atlantic (Wells *et al.* 1999).

The western North Atlantic Offshore Stock of common bottlenose dolphins is managed separately from the Gulf of Mexico Oceanic Stock of common bottlenose dolphins. One line of evidence to support this separation comes from Baron *et al.* (2008), who found that Gulf of Mexico common 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. In addition, the western North Atlantic and Gulf of Mexico belong to distinct marine ecoregions (Spalding *et al.* 2007). Restricted genetic exchange has been documented among offshore populations in the Gulf of Mexico (Vollmer and Rosel 2016) but analyses to determine whether multiple demographically independent populations exist within the western North Atlantic have not been performed to date.

POPULATION SIZE

The best available estimate for the offshore stock of common bottlenose dolphins in the western North Atlantic is 62,851 (CV=0.23; Table 1; Garrison 2020; Palka 2020). This estimate is from summer 2016 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.

Recent surveys and abundance estimates

An abundance estimate of 26,766 (CV=0.52) offshore common bottlenose dolphins was generated from aerial and shipboard surveys conducted during June–August 2011 between central Virginia and the lower Bay of Fundy (Palka 2012). The aerial portion covered 6,850 km of trackline 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 trackline 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 common bottlenose dolphins was generated from a shipboard survey conducted concurrently (June–August 2011) in waters between central Virginia and central Florida (Garrison 2016). 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 25x150 “bigeye” binoculars. A total of 4,445 km of trackline was 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).

Abundance estimates of 17,958 (CV=0.33; combined northeast vessel and aerial surveys) and 44,893 (CV=0.29; southeast vessel survey) offshore common bottlenose dolphins were generated from surveys conducted in U.S. waters of the western North Atlantic during the summer of 2016 (Table 1; Garrison 2020; Palka 2020). One vessel survey was conducted from 27 June to 25 August in waters north of 38ºN latitude and included 5,354 km of on-effort trackline along the shelf break and offshore to the U.S. EEZ (NEFSC and SEFSC 2018). A concomitant aerial portion was conducted from 14 August to 28 September and included 11,782 km of trackline that were over waters north of New

Jersey from the coastline to the 100-m depth contour, throughout the U.S. waters (NEFSC and SEFSC 2018). Estimates from these two surveys were combined to provide an abundance estimate for the area north of 38ºN. The second vessel survey covered waters from Central Florida to approximately 38ºN latitude between the 100-m isobaths and the U.S. EEZ during 30 June–19 August. A total of 4,399 km of trackline was covered on effort (NEFSC and SEFSC 2018). All surveys utilized two visual teams and an independent observer approach to estimate detection probability on the trackline (Laake and Borchers 2004). Mark-recapture distance sampling was used to estimate abundance. Estimates from the two surveys were combined and CVs pooled to produce a species abundance estimate for the stock area.

Table 1. Summary of recent abundance estimates for western North Atlantic offshore stock of common bottlenose dolphins* (Tursiops truncatus truncatus) *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 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
Jun–Aug 2016	New Jersey to lower Bay of Fundy	17,958	0.33
Jun–Aug 2016	central Florida to New Jersey	44,893	0.29
Jun–Aug 2016	central Florida to lower Bay of Fundy (COMBINED)	62,851	0.23

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 62,851 (CV=0.23). The minimum population estimate for western North Atlantic offshore common bottlenose dolphin is 51,914.

Current Population Trend

There are three available coastwide abundance estimates for offshore common bottlenose dolphins from the summers of 2004, 2011, and 2016. Each of these is derived from surveys with similar survey designs and all three used the two-team independent observer approach to estimate abundance. The resulting estimates were 54,739 (CV=0.24) in 2004, 77,532 (CV=0.40) in 2011, and 62,851 (CV=0.23) in 2016 (Garrison 2020; Palka 2020). A generalized linear model did not indicate a statistically significant (p=0.646) trend in these estimates. The high level of uncertainty in these estimates limits the ability to detect a statistically significant trend. A key uncertainty in this assessment of trend is that interannual variation in abundance may be caused by either changes in spatial distribution associated with environmental variability or changes in the population size of the stock.

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 common bottlenose dolphins is 51,914. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor is 0.5 because the stock's status relative to optimum sustainable population (OSP) is unknown and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic offshore common bottlenose dolphin is therefore 519.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury of offshore common bottlenose dolphins during 2013–2017 was 28 (CV=0.34; Table 2) due to interactions with the northeast sink gillnet, northeast bottom trawl, and mid-Atlantic bottom trawl fisheries.

Fisheries Information

There are seven commercial fisheries that interact, or that potentially could interact, with this stock in the Atlantic Ocean. These include four Category I fisheries (Atlantic Highly Migratory Species longline; Atlantic Ocean, Caribbean, Gulf of Mexico large pelagics longline; mid-Atlantic gillnet; and northeast sink gillnet), two Category II fisheries (northeast bottom trawl and mid-Atlantic bottom trawl), 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.

No interactions have been documented in recent years for the mid-Atlantic gillnet or the U.S. mid-Atlantic tuna, shark, swordfish hook and line/harpoon fishery. See Appendix V for information on historical takes.

Longline

The Atlantic Highly Migratory Species longline fishery operates outside the U.S. EEZ. No takes of common bottlenose dolphins within high seas waters of the Atlantic Ocean have been observed or reported thus far.

The large pelagics longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ, and pelagic swordfish, tunas and billfish are the target species. During 2013–2017, there were no observed mortalities or serious injuries of common bottlenose dolphins of the offshore stock by this fishery (Garrison and Stokes 2014; 2016; 2017; 2019; 2020). Historically, takes of the offshore stock have been observed occasionally, and the most recent observed take occurred in 2012. During 2013 (2 animals), 2015 (1), and 2017 (1), a total of 4 common bottlenose dolphins were observed entangled and released alive in the Mid-Atlantic Bight and Northeast Coastal regions (Garrison and Stokes 2014; 2016; 2017; 2019; in rpress). These animals were presumed to have no serious injuries.

See Table 2 for observer coverage for the current 5-year period, and Appendix V for historical estimates of annual mortality and serious injury.

Table 2. Summary of the incidental mortality and serious injury of Atlantic Ocean offshore common bottlenose dolphins **(Tursiops truncatus truncatus)** ***by commercial fishery including the years sampled (Years), 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	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Pelagic Longline	2013 2014 2015 2016 2017	Obs. Data Logbook	.09 .10 .12 .15 .12	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	NA NA NA NA NA	0
Northeast Sink Gillnet	2013 2014 2015 2016 2017	Obs. Data Logbook	.11 .18 .14 .10 .12	0 0 0 0 0	1 0 0 0 1	0 0 0 0 0	26 0 0 0 8	26 0 0 0 8	0.95 NA NA NA .92	7 (0.76)
Northeast Bottom Trawl[c]	2013 2014 2015 2016 2017	Obs. Data Logbook	.15 .17 .19 .12 .16	0 0 0 0 0	0 0 3 4 0	0 0 0 0 0	0 0 18.6 33.5 0	0 0 18.6 33.5 0	NA NA 0.65 0.89 NA	10.4 (0.62)
Mid-Atlantic Bottom Trawl[c]	2013 2014 2015 2016 2017	Obs. Data Logbook	.06 .08 .09 .10 .10	0 0 0 0 0	0 3 0 1 3	0 0 0 0 0	0 25 0 7.3 22.1	0 25 0 7.3 22.1	NA 0.66 NA 0.93 0.66	10.9 (0.42)

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
TOTAL	2013–2017	-	-	-	-	-	-	-	-	28 (0.34)

[a] 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).
[b] Proportion of sets observed (for Pelagic Longline).
[c] Fishery related bycatch rates for 2013–2017 were estimated using an annual stratified ratio-estimator following the methodology described in Lyssikatos (2020).

Northeast Sink Gillnet

During 2013–2017, two mortalities were observed (in 2013 and 2017) in the northeast sink gillnet fishery (Hatch and Orphanides 2015, 2016; Orphanides and Hatch 2017; Orphanides 2019, 2020). No takes were observed during 2014–2016. There were no observed injuries of common bottlenose dolphins in the Northeast region during 2013–2017 to assess using new serious injury criteria. See Table 2 for bycatch estimates and observed mortality and serious injury for the current five-year period, and Appendix V for historical bycatch information.

Northeast Bottom Trawl

During 2013–2017, seven mortalities were observed in the northeast bottom trawl fishery (Lyssikatos *et al.* 2020). There were no observed injuries of common bottlenose dolphins in the northeast region during 2013–2017 to assess using new serious injury criteria. See Table 2 for bycatch estimates and observed mortality and serious injury for the current five-year period, and Appendix V for historical bycatch information.

Through the Marine Mammal Authorization Program (MMAP) during 2013–2017, there were four self-reported incidental takes (mortalities) of common bottlenose dolphins off Rhode Island—two in 2014 (single incident involving two animals) and two in 2016. Fishers were trawling for *Illex* and *Loligo* squid.

Mid-Atlantic Bottom Trawl

During 2013–2017, four mortalities were observed in the mid-Atlantic bottom trawl fishery (Lyssikatos *et al.* 2020). There were no observed injuries of common bottlenose dolphins in the mid-Atlantic region during 2013–2017 to assess using new serious injury criteria. See Table 2 for bycatch estimates and observed mortality and serious injury for the current five-year period, and Appendix V for historical bycatch information.

Through the Marine Mammal Authorization Program (MMAP) during 2013–2017, there were three self-reported incidental takes (mortalities) of common bottlenose dolphins off Rhode Island by fishers targeting squid/mackerel/butterfish. All three takes occurred during 2015, and two of those occurred in a single trawling incident.

Other Mortality

Common 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 stock because most strandings are not identified to morphotype, and when they are, animals of the offshore form are uncommon. For example, only 19 of 185 *Tursiops* strandings in North Carolina were genetically assigned to the offshore form (Byrd *et al.* 2014).

An Unusual Mortality Event (UME) of bottlenose dolphins and other cetaceans occurred along the mid-Atlantic coast from New York to Brevard County, Florida, from 1 July 2013 to 1 March 2015. A total of 1,872 stranded common bottlenose dolphins were recovered in the UME area which stretched from New York to Brevard County, Florida. Morbillivirus was determined to be a primary cause of the event (Morris *et al.* 2015). An assessment of the impacts of the 2013–2015 UME on common bottlenose dolphin stocks in the western North Atlantic is ongoing.

HABITAT ISSUES

Anthropogenic sound in the world's oceans has been shown to affect marine mammals, with vessel traffic, seismic surveys, and active naval sonars being the main anthropogenic contributors to low- and mid-frequency noise in oceanic waters (e.g., Nowacek *et al.* 2015; Gomez *et al.* 2016; NMFS 2018). The long-term and population consequences of these impacts are less well-documented and likely vary by species and other factors. Impacts on marine mammal prey from sound are also possible (Carroll *et al.* 2017), but the duration and severity of any such prey effects on marine mammals are unknown.

Offshore wind development in the U.S. Atlantic may also pose a threat to this stock, particularly south of Cape Hatteras where it comes closer to shore. Activities associated with development include geophysical and geotechnical surveys, installation of foundations and cables, and operation, maintenance and decommissioning of facilities (BOEM 2018). The greatest threat from these activities is likely underwater noise, however other potential threats include vessel collision due to increased vessel traffic, benthic habitat loss, entanglement due to increased fishing around structures, marine debris, dredging, and contamination/degradation of habitat (BOEM 2018).

The chronic impacts of contaminants (polychlorinated biphenyls [PCBs] and chlorinated pesticides [DDT, DDE, dieldrin, etc.]) on marine mammal reproduction and health are of concern (e.g., Schwacke *et al.* 2002; Jepson *et al.* 2016; Hall *et al.* 2018), but research on contaminant levels for the offshore stock of bottlenose dolphins is lacking.

Climate-related changes in spatial distribution and abundance, including poleward and depth shifts, have been documented in or predicted for plankton species and commercially important fish stocks (Nye *et al*. 2009; Pinsky *et al*. 2013; Poloczanska *et al.* 2013; Grieve *et al.* 2017; Morley *et al.* 2018) and cetacean species (e.g., MacLeod 2009; Sousa *et al.* 2019). There is uncertainty in how, if at all, the distribution and population size of this species will respond to these changes and how the ecological shifts will affect human impacts to the species.

STATUS OF STOCK

The common bottlenose dolphin in the western North Atlantic is not listed as threatened or endangered under the Endangered Species Act, and the offshore stock is not considered strategic under the MMPA. 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 was no statistically significant trend in population size for this species; however, the high level of uncertainty in the estimates limits the ability to detect a statistically significant trend.

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