COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic Southern Migratory Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are found in estuarine, coastal, continental shelf, and oceanic waters of the western North Atlantic (wNA). Two distinct morphological forms have been identified in offshore and coastal waters of the wNA off the U.S. East Coast: a smaller morphotype present in estuarine, coastal, and shelf waters from Florida to approximately Long Island, New York, and a larger, more robust morphotype present further offshore in deeper waters of the continental shelf and slope (Mead and Potter 1995) from Florida to Canada. The two morphotypes also differ in parasite load and prey preferences (Mead and Potter 1995), and show significant genetic divergence at both mitochondrial and nuclear DNA markers (Hoelzel *et al*. 1998, Kingston and Rosel 2004, Kingston *et al.* 2009, Rosel *et al*. 2009). The level of genetic divergence is greater than that seen between some other dolphin species (Kingston and Rosel 2004, Kingston *et al.* 2009) suggesting the two morphotypes in the wNA may represent different subspecies or species. The larger morphotype makes up the wNA Offshore Stock of common bottlenose dolphins. Spatial distribution data (Kenney 1990, Garrison *et al.* 2017a), tag-telemetry studies (Garrison *et al.* 2017b), photo-identification (photo-ID) studies (e.g., Zolman 2002; Speakman *et al.* 2006; Stolen *et al.* 2007; Mazzoil *et al.* 2008), and genetic studies (Caldwell 2001, Rosel *et al.* 2009, Litz *et al.* 2012) indicate that the coastal morphotype comprises multiple stocks distributed in coastal and estuarine waters of the U.S. East Coast. The Southern Migratory Coastal Stock is one such stock and one of only two (the other being the Northern Migratory Coastal Stock) thought to make broad-scale, seasonal migrations in coastal waters of the wNA.

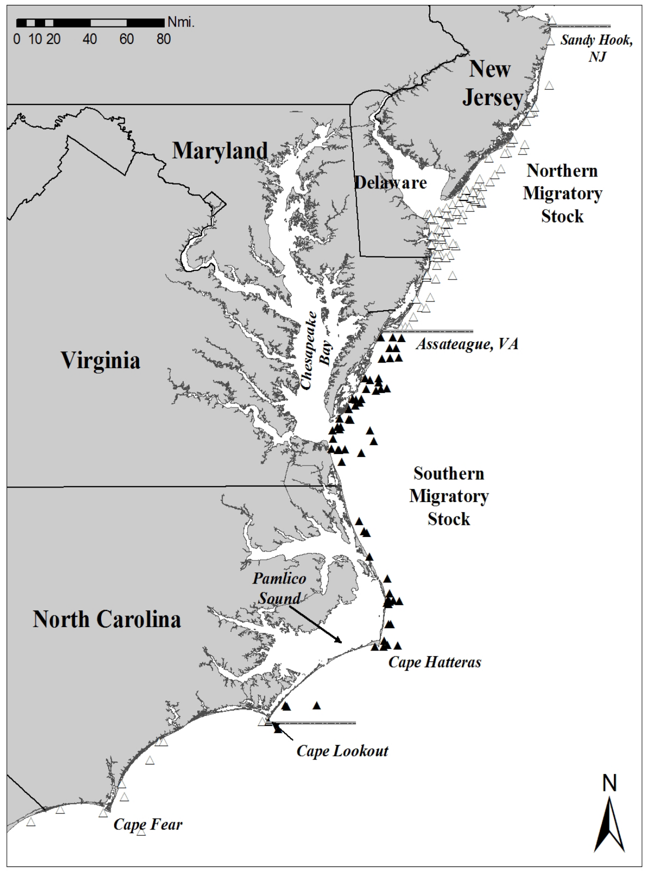

Figure 1. The distribution of common bottlenose dolphin sightings in coastal waters from North Carolina to New Jersey during July-August 2002, 2004, 2010, 2011, and 2016. Sighting locations from aerial surveys are plotted as triangle symbols. Sightings ascribed to the Southern Migratory Coastal Stock are shown as filled symbols; those from the Northern Migratory Coastal Stock as open symbols. Horizontal gray lines intersecting the coast denote the southern boundary for each stock in warm water months.

The spatial distribution and migratory movements of the Southern Migratory Coastal Stock are poorly understood and have been defined based on movement data from satellite-linked telemetry and photo-ID studies, and stable isotope studies. The distribution of this stock is best described by satellite-linked telemetry data which provided evidence for a stock of dolphins migrating seasonally along the coast between North Carolina and northern Florida (Garrison *et al.* 2017b). Telemetry data collected from two dolphins tagged in November 2004 just south of Cape Fear, North Carolina, suggested that, during October–December, this stock occupies waters of southern North Carolina (south of Cape Lookout) where it may overlap spatially with the Southern North Carolina Estuarine System (SNCES) Stock in coastal waters ≤3 km from shore (Garrison *et al.* 2017b). Based on the satellite-linked telemetery data, during January–March, the Southern Migratory Coastal Stock appears to move as far south as northern Florida where it would overlap spatially with the South Carolina/Georgia and Northern Florida Coastal stocks. During April–June, the stock moves back north to North Carolina past the tagging site to Cape Hatteras, North Carolina (Garrison *et al.* 2017b), where it overlaps, in coastal waters, with the SNCES Stock (in waters ≤3 km from shore) and the Northern North Carolina Estuarine System (NNCES) Stock (in waters ≤1 km from shore). During the warm water months of July–August, the stock is presumed to occupy coastal waters north of Cape Lookout, North Carolina, to Assateague, Virginia, including Chesapeake Bay (Figure 1) where it likely overlaps in nearshore-coastal waters of North Carolina (in waters ≤1 km from shore) and southern Chesapeake Bay waters with the NNCES Stock but the exact northern limit is unknown because the satellite-linked tags did not last beyond June (Garrison *et al.* 2017b). The northern boundary in warm water months was therefore inferred from an analysis of spatial distribution of the adjacent Northern Migratory Coastal Stock using aerial survey data and tag-telemetry data, delineating the northern boundary of the Southern Migratory Coastal Stock at the point of the southern boundary identified for the Northern Migratory Coastal Stock (Garrison *et al.* 2017b). An observed shift in spatial distribution during a summer 2004 survey indicates that the northern boundary for the Southern Migratory Coastal Stock may vary from year to year. The location of the boundary between the Northern and Southern Migratory Coastal stocks and the effects of interannual variation in spatial distribution are significant sources of uncertainty in assessing this stock (Garrison *et al.* 2017b). Stable isotope analysis conducted using biopsy samples from free-ranging animals sampled in estuarine, nearshore coastal, and offshore habitats further support migratory movement of dolphins in coastal waters between Georgia in cold water months and southern North Carolina during warm water months (Knoff 2004). Silva (2016) identified a fall increase in sightings during photo-ID surveys in coastal waters of northern South Carolina, lending further support for a migratory stock that moves seasonally through this area.

This stock may also overlap to some degree with the wNA Offshore Stock of common bottlenose dolphins. A combined genetic and logistic regression analysis that incorporated depth, latitude, and distance from shore was used to model the probability that a particular common bottlenose dolphin group seen in coastal waters was of the coastal versus offshore morphotype (Garrison *et al.* 2017a). North of Cape Hatteras during summer months, there is strong separation between the coastal and offshore morphotypes (Kenney 1990, Garrison *et al.* 2017a), and the coastal morphotype is nearly completely absent in waters >20 m depth. South of Cape Hatteras, the regression analysis indicated that the coastal morphotype is most common in waters <20 m deep, but occurs at lower densities over the continental shelf, in waters >20 m deep, where it overlaps to some degree with the offshore morphotype. For the purposes of defining stock boundaries, estimating abundance, and identifying bycaught samples, the offshore boundary of the Southern Migratory Coastal Stock is defined as the 20-m isobath north of Cape Hatteras and the 200-m isobath south of Cape Hatteras.

In summary, this stock is best designated in warm water months, when it overlaps least with other stocks, as common bottlenose dolphins of the coastal morphotype that occupy coastal waters from the shoreline to 200 m depth from Cape Lookout to Cape Hatteras, North Carolina, and coastal waters 0–20 m in depth from Cape Hatteras to Assateague, Virginia, including Chesapeake Bay. Due to the limited understanding of the distribution and movements of this stock, it is unknown whether the stock may contain multiple demographically independent populations that should be separate stocks.

It should be noted that dolphins of the coastal morphotype present in waters between 3 km from shore and the 200-m isobath from the Little River Inlet, South Carolina, to Cape Lookout, North Carolina, in summer are currently not contained within any designated stock. These dolphins could be members of the South Carolina/Georgia Coastal Stock, or the southern limit of the Southern Migratory Coastal Stock may extend further south than currently delimited. In winter, the dolphins in this region are considered members of the Southern Migratory Coastal Stock. Further research is necessary to determine the affinities of the dolphins in this region in summer.

POPULATION SIZE

The best available abundance estimate for the Southern Migratory Coastal Stock of common bottlenose dolphins in the western North Atlantic is 3,751 (CV=0.60; Table 1; Garrison *et al.* 2017a). This estimate was derived from aerial surveys conducted during the summer of 2016 covering coastal and shelf waters from Florida to New Jersey.

Background

Estimating the abundance of the Southern Migratory Coastal Stock is complicated by the spatiotemporal overlap the stock has with other coastal, estuarine, and offshore stocks of common bottlenose dolphins as described above. Summer surveys are best for estimating the abundance for this stock because it overlaps least with other coastal and estuarine common bottlenose dolphin stocks during warm water months. Based on the logistic regression described above, abundance for the Southern Migratory Coastal Stock is estimated using summer sightings made in the 0–200 m depth range between Cape Lookout (34.6°N) and Cape Hatteras, North Carolina (35.2°N), and in the 0–20 m depth range from Cape Hatteras to Assateague, Virginia (37.9°N). As noted above, the definition of the northern boundary and inter-annual variation in stock distribution are significant unquantified sources of uncertainty.

Earlier Abundance Estimates (>8 years old)

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

Recent Surveys and Abundance Estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters along the U.S. East Coast from southeastern Florida to Cape May, New Jersey, during the summer of 2016 (Garrison *et al.* 2017a). The survey was conducted along tracklines oriented perpendicular to the shoreline and spaced latitudinally at 20-km intervals, and covered waters from the shoreline to the continental shelf break (Garrison *et al.* 2017a).

As with previous surveys, the 2016 survey was conducted using a two-team approach to develop estimates of detection probabilities using the independent observer approach with Distance analysis (Laake and Borchers 2004). The detection functions from the 2016 and two previous surveys indicated a decreased probability of detection near the trackline. The sighting data were therefore "left-truncated" by analyzing only sightings occurring greater than 100 m from the trackline during the 2016 survey (see Buckland *et al.* 2001 for left-truncation methodology). The independent observer method assuming point independence was used to estimate detection probability on the trackline. This estimate accounts for the probability of detecting a marine mammal group conditional on it being available to both survey teams. Covariates that may influence detection probabilities (e.g., sea state, glare, cloud cover, visibility) were incorporated into both the mark-recapture and distance function components of the detection models (Laake and Borchers 2004, Garrison *et al.* 2017a). The resulting abundance estimate is negatively biased due to the effects of animals spending some time underwater where they are not available to the survey teams. However, due to the relatively short dive times of bottlenose dolphins (Klatsky *et al.* 2007) and the large group sizes, it is likely that this bias is small (Garrison *et al.* 2017a).

The abundance estimate for the 2016 summer aerial survey was 3,751 (CV=0.60; Garrison *et al.* 2017a). Uncertainties in the abundance estimate arise primarily from annual, and unquantified, variation in stock distribution. Another unquantified source of uncertainty in the abundance estimate is the potential overlap of this stock (during summer) with the NNCES Stock in near-shore ocean waters within 1 km from shore.

Table 1. Abundance estimate for the western North Atlantic Southern Migratory Coastal Stock of common bottlenose dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{est}) and coefficient of variation (CV).

Month/Year	Area	N_{est}	CV
July–August 2016	Cape Lookout, North Carolina (34.6°N) to Assateague, Virginia (37.9°N)	3,751	0.60

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. The best estimate for the Southern Migratory Coastal Stock of common bottlenose dolphins is 3,751 (CV=0.60). The resulting minimum population estimate is 2,353 (Table 2).

Current Population Trend

Available surveys allow an analysis of trend in population size for coastal stocks of common bottlenose dolphins. A standardized analytical approach accounting for variation in survey execution and environmental conditions was used to derive unbiased abundance estimates for each survey (Garrison *et al.* 2017a). A weighted generalized linear model was used to evaluate trends in population size by stock using abundance estimates from surveys conducted in the summers of 2002, 2004, 2010, 2011, and 2016. Abundance estimates were weighted by the inverse of their standard error, which reduces the influence of less certain estimates (Neter *et al.* 1983). Stock was treated as a fixed factor, and surveys were grouped into three periods to test for long-term trends in population size: 2002–2004, 2010–2011, and 2016. Period was also included as a fixed factor in the model along with the interaction between stock and period. Contrasts were specified to test for differences in abundance between periods for each stock (Garrison *et al.* 2017a). For the Southern Migratory Coastal Stock, the resulting mean abundance estimate for 2002–2004 was 23,206

(CV=0.25), and that for 2010–2011 was 6,694 (CV=0.62). There was no significant difference between these estimates and the estimate of 3,751 (CV=0.60) for 2016. There is limited power to detect a significant change given the high CV of the estimates, interannual variability in spatial distribution and stock abundance between 2002 and 2004, and the availability of only one recent survey (Garrison *et al.* 2017a).

An analysis of coast-wide (New Jersey to Florida) trends in abundance for common bottlenose dolphins was conducted. A weighted generalized linear model was used to evaluate trends in coast-wide population size based on aerial surveys conducted between 2002 and 2016 (see Population Size above for survey descriptions). The model included a linear term for survey year and an interaction term to test for a difference in slope between 2002–2011 and 2011–2016. Estimates were weighted by the inverse of their standard error to reduce the influence of less certain estimates. There was no significant trend in population size between 2002 and 2011; however, there was a statistically significant (p=0.0308) change in slope between 2011 and 2016, indicating a decline in population size. The coast-wide inverse-variance weighted average estimate for coastal common bottlenose dolphins during 2011 was 41,456 (CV=0.30) while the estimate during 2016 was 19,470 (CV=0.23; Garrison et al. 2017a). It is possible that this apparent decline in common bottlenose dolphin abundance in coastal waters along the eastern seaboard is a result of the 2013–2015 UME (see Strandings section).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the Southern Migratory Coastal Stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations likely do 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 the 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, Wade 1998). The minimum population size of the Southern Migratory Coastal Stock of common bottlenose dolphins is 2,353. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is depleted. PBR for this stock of common bottlenose dolphins is 24 (Table 2).

Table 2. Best and minimum abundance estimates for the western North Atlantic Southern Migratory Coastal Stock of common bottlenose dolphins with Maximum Productivity Rate (R_{max}), Recovery Factor (F_r) and PBR.

N_{est}	CV	N_{min}	F_r	R_{max}	PBR
3,751	0.60	2,353	0.5	0.04	24

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Southern Migratory Coastal Stock during 2014–2018 is unknown. The minimum mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-related ranged between 0 and 18.3. No additional mortality or serious injury was documented from other human-caused sources (e.g., fishery research) and therefore, the minimum total mean annual human-caused mortality and serious injury for this stock during 2014–2018 ranged between 0 and 18.3 (Tables 3a, 3b and 3c). This range reflects several sources of uncertainty and is a minimum because: 1) not all fisheries that could interact with this stock are observed, 2) stranding data are used as an indicator of fishery-related interactions and not all dead animals are detected and recovered by the stranding network (Peltier *et al*. 2012; Wells *et al*. 2015), 3) cause of death is not (or cannot be) routinely determined for stranded carcasses, 4) the estimate includes an actual count of verified human-caused deaths and serious injuries and should be considered a minimum (NMFS 2016), and 5) the spatiotemporal overlap between this stock and other common bottlenose dolphin stocks throughout its range introduces uncertainty in assignment of mortalities to stock. In the sections below, dolphin mortalities and serious injuries were ascribed to a stock or stocks by comparing the season and geographic location of the take/stranding to the stock boundaries and geographic range delimited for each stock (Lyssikatos and Garrison 2018).

Fishery Information

There are 11 commercial fisheries that interact, or that potentially could interact, with this stock. These include the Category I mid-Atlantic gillnet fishery, nine Category II fisheries (Southeastern U.S. Atlantic shark gillnet, Southeast Atlantic gillnet, Chesapeake Bay inshore gillnet, Virginia pound net, Atlantic blue crab trap/pot, North

Carolina roe mullet stop net, mid-Atlantic menhaden purse seine, mid-Atlantic haul/beach seine, and Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl fisheries), and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery. Detailed fishery information is presented in Appendix III.

Note: Animals reported in the sections to follow were ascribed to a stock or stocks of origin following methods described in Maze-Foley et al. (2019). These include strandings, observed takes (through an observer program), research takes, fisherman self-reported takes (through the Marine Mammal Authorization Program), and opportunistic at-sea observations.

Mid-Atlantic Gillnet

The mid-Atlantic gillnet fishery operates along the coast from North Carolina through New York (2016 List of Fisheries) and overlaps with the Southern Migratory Coastal Stock in the northern part of its range. North Carolina is the largest component of the mid-Atlantic gillnet fishery in terms of fishing effort and observed marine mammal takes (Palka and Rossman 2001, Lyssikatos and Garrison 2018). This fishery is currently observed by the Northeast Fisheries Observer Program, and previously was observed by both the Northeast and Southeast Fisheries Observer Programs (through 2016). The Bottlenose Dolphin Take Reduction Team was convened in October 2001, in part, to reduce bycatch in gillnet gear. The Bottlenose Dolphin Take Reduction Plan (BDTRP) was implemented in May 2006 and resulted in changes to gillnet gear configurations and fishing practices (50 CFR 24776, April 26, 2006, available from: https://www.federalregister.gov/documents/2006/04/26/06-3909/taking-of-marine-mammals-incidental-to-commercial-fishing-operations-bottlenose-dolphin-take). In addition, two subsequent amendments to the BDTRP were implemented in 2008 and 2012 regarding gear restrictions for medium-mesh gillnets in North Carolina waters (https://www.fisheries.noaa.gov/national/marine-mammal-protection/bottlenose-dolphin-take-reduction-plan). Mortality estimates for the period (2002–2006) immediately prior to implementation of the BDTRP and 2007–2011 are available in the 2015 stock assessment report for the Northern Migratory Coastal Stock (Waring *et al.* 2016). The current report covers the most recent available five-year estimate (NMFS 2016) for 2014–2018.

Mortality estimation for this stock is difficult because: 1) observed takes are statistically rare events, 2) the Southern Migratory Coastal, Northern Migratory Coastal, NNCES, and SNCES stocks of common bottlenose dolphin overlap in coastal waters of North Carolina and Virginia at different times of the year, and therefore it is not always possible to definitively assign every observed mortality, or extrapolated bycatch estimate, to a specific stock, and 3) the low levels of federal observer coverage in state waters are insufficient to consistently detect bycatch events (Lyssikatos and Garrison 2018). To help address the first problem, two different analytical approaches were used to estimate common bottlenose dolphin bycatch rates during the period 2014–2018: 1) a simple annual ratio estimator of catch per unit effort (CPUE = observed catch/observed effort) per year based directly upon the observed data and 2) a pooled CPUE approach (where all observer data from the most recent five years were combined into one sample to estimate CPUE; Lyssikatos and Garrison 2018). In each case, the annual reported fishery effort (defined as a fishing trip) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality. Next, the two model estimates (and the associated uncertainty) were averaged, in order to account for the uncertainty in the two approaches, to produce an estimate of the mean mortality of common bottlenose dolphins for this fishery (Lyssikatos and Garrison 2018). To help address the second problem, minimum and maximum mortality estimates were calculated per stock to indicate the range of uncertainty in assigning observed takes to stock (Lyssikatos and Garrison 2018). Uncertainties and potential biases are described in Lyssikatos and Garrison (2018).

During the most recent 5-year time period, 2014–2018, the combined average Northeast (NEFOP) and Southeast (SEFOP) Fisheries Observer Program observer coverage (measured in trips) for this fishery was 5.16% in state waters (0–3 miles from shore) and 9.95% in federal waters (3–200 miles from shore; Lyssikatos 2021). During these trips, observers documented two dolphins (mortalities) entangled in small-mesh gillnet gear off the coast of North Carolina that may have been from the Southern Migratory Coastal Stock. One observed take (NEFOP) occurred in July 2017, and the second observed take (SEFOP) occurred in September 2014. Both takes were ascribed to the NNCES and Southern Migratory Coastal stocks (Lyssikatos 2021). The resultant 5-year mean minimum and maximum mortality estimates (2014–2018) for the Southern Migratory Coastal Stock were therefore 0 and 16.3 (CV=0.23) animals per year, respectively (Table 3a; Lyssikatos 2021).

Historical and recent stranding data have documented multiple cases of dead, stranded dolphins recovered with gillnet gear attached (Byrd *et al.* 2014, Waring *et al.* 2016, Lyssikatos and Garrison 2018). In July 2018, the stranding network recovered a dead dolphin entangled in gillnet gear in Virginia. This animal was ascribed to the Northern and Southern Migratory Coastal stocks. Because there is already an observer program-based bycatch estimate for the

Southern Migratory Coastal Stock for the mid-Atlantic gillnet fishery, and the bycatch estimate was not zero, the additional recovered animal was not added to the bycatch estimate. However, the overall minimum annual mortality for this stock is likely not zero. During the current 5-year period there were also seven common bottlenose dolphin strandings, five in North Carolina and two in Virginia, with markings indicative of interaction with gillnet gear (Read and Murray 2000), but no gear was attached to the carcasses and it is unknown whether the interactions with the gear contributed to the death of these animals. All seven cases were ascribed to multiple stocks including the Southern Migratory Coastal Stock.

Southeastern U.S. Atlantic Shark Gillnet and Southeast Atlantic Gillnet

There have been no documented mortalities or serious injuries of common bottlenose dolphins associated with the Southeastern U.S. Atlantic Shark Gillnet or Southeast Atlantic Gillnet fisheries during 2014–2018 that could be ascribed to the Southern Migratory Coastal Stock (Mathers *et al.* 2015, 2016, 2017, 2018, 2020). These fisheries target sharks and finfish in waters between North Carolina and southern Florida. The majority of fishing effort occurs in federal waters because Florida, Georgia, and South Carolina, with limited exception, prohibit the use of gillnets in state waters. The Southeast Gillnet Observer Program observes these fisheries year-round (e.g., Mathers *et al.* 2016).

Chesapeake Bay Inshore Gillnet

During 2014–2018, stranding data documented one interaction (mortality) between a common bottlenose dolphin and inshore gillnet gear in Chesapeake Bay. In 2015, in Virginia, a dead dolphin was recovered entangled in gillnet gear (this animal was also self-reported by the fisherman per the Marine Mammal Authorization Program). This animal was ascribed to the Northern and Southern Migratory Coastal stocks, and it is included in the annual human-caused mortality and serious injury total for this stock (Table 3b) as well as in the stranding database and stranding totals presented in Table 4 (Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 August 2019). There is no observer coverage of this fishery within Maryland waters of Chesapeake Bay; however, within Virginia waters of Chesapeake Bay, there is a low level of observer coverage (<1%). No estimate of bycatch mortality is available for this fishery, and the documented interactions in this commercial gear represent a minimum known count of interactions in the last five years. Three other dead, stranded common bottlenose dolphins were recovered within Chesapeake Bay with markings indicative of interaction with gillnet gear (Read and Murray 2000), but no gear was attached to the carcasses and it is unknown whether the interactions with the gear contributed to the death of these animals. Two of these animals were ascribed to the Southern Migratory Coastal and NNCES stocks, and one was ascribed to the Northern and Southern Migratory Coastal and NNCES Stocks.

Virginia Pound Net

During 2014–2018, there were no documented mortalities or serious injuries involving pound net gear in Virginia. However, during 2017, one dolphin stranded with twisted twine markings indicative of interactions with pound net gear, but it is unknown whether the interactions with the gear contributed to the death of this animal, and this case is not included in the annual human-caused mortality and serious injury total for this stock. This stranding was ascribed to the Southern Migratory Coastal and NNCES stocks. It occurred inside estuarine waters near the mouth of the Chesapeake Bay in August (Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 August 2019). The overall impact of the Virginia pound net fishery on the Southern Migratory Coastal Stock is unknown due to the limited information on the stock's movements. Because there is no systematic observer program for the Virginia pound net fishery, no estimate of bycatch mortality is available. An amendment to the BDTRP was implemented in 2015 requiring gear restrictions for VA pound nets in estuarine and coastal state waters of Virginia to reduce bycatch (https://www.fisheries.noaa.gov/national/marine-mammal-protection/bottlenose-dolphin-take-reduction-plan).

Atlantic Blue Crab Trap/Pot

During 2014–2018, stranding data documented nine cases of common bottlenose dolphins entangled in trap/pot gear that could be ascribed to the Southern Migratory Coastal Stock. Two cases were mortalities, four were serious injuries, and for the remaining three cases, it could not be determined whether the animals were seriously injured. The mortalities occurred during 2016 in unidentified trap/pot gear and in 2015 in commercial blue crab trap/pot gear. Both mortalities were ascribed to the Southern Migratory Coastal and NNCES stocks. One serious injury occurred in 2014 in commercial blue crab trap/pot gear, and one occurred in 2015 in unidentified trap/pot gear. These two cases were ascribed to the Southern Migratory Coastal and NNCES stocks. The remaining two serious injuries occurred in 2015 and 2017 in commercial blue crab trap/pot gear; one was ascribed to the Southern Migratory Coastal and South

Carolina/Georgia Coastal stocks; the other was ascribed to the Northern and Southern Migratory Coastal and NNCES stocks. The six mortalities and serious injuries are included in the annual human-caused mortality and serious injury total for this stock (Table 3b). In addition, there were three cases where it could not be determined whether the animals were seriously injured. Two occurred in 2017. One case was ascribed to the Northern and Southern Migratory Coastal stocks, and the other was ascribed to the Southern Migratory Coastal and South Carolina/Georgia Coastal stocks. The third case occurred during 2018 and was ascribed to the Northern and Southern Migratory Coastal and NNCES stocks. All nine cases were included in the stranding database and in the stranding totals presented in Table 4 (Northeast Regional Marine Mammal Stranding Network; Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 21 May 2019 for SER and 13 August 2019 for NER). Details regarding the serious injury determinations can be found in Maze-Foley and Garrison (2020). Because there is no observer program, it is not possible to estimate the total number of mortalities associated with crab traps/pots and these documented interactions in this commercial gear represent a minimum known count of interactions with this fishery. Stranding data indicate that interactions with trap/pot gear occur at some unknown level in North Carolina (Byrd *et al*. 2014) and other regions of the southeast U.S. (Noke and Odell 2002, Burdett and McFee 2004).

North Carolina Roe Mullet Stop Net

During 2014–2018, there were no documented mortalities or serious injuries of common bottlenose dolphins in stop net gear. However, a dead stranded dolphin with line markings indicative of interaction with stop net gear was recovered in October 2015 ~300 yards from a stop net, but it is unknown whether the interaction with gear contributed to the death of this animal, and this case is not included in the annual human-caused mortality and serious injury total for this stock. This animal was ascribed to multiple stocks: the Southern Migratory Coastal, NNCES, and SNCES stocks. This mortality is included in the stranding database and in the stranding totals presented in Table 4 (Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 21 May 2019). No estimate of bycatch mortality is available for the stop net fishery. This fishery has not had regular, ongoing federal or state observer coverage. However, the NMFS Beaufort laboratory observed this fishery in 2001–2002 (Byrd and Hohn 2010), and Duke University observed the fishery in 2005–2006 (Thayer *et al.* 2007). Entangled dolphins were not documented during these formal observations, but historical takes of dolphins entangled in stop nets occurred in 1993 and 1999 (Byrd and Hohn 2010).

Mid-Atlantic Menhaden Purse Seine

During 2014–2018, there were no documented mortalities or serious injuries in mid-Atlantic menhaden purse seine gear of common bottlenose dolphins that could be ascribed to the Southern Migratory Coastal Stock. The mid-Atlantic menhaden purse seine fishery historically reported an annual incidental take of one to five common bottlenose dolphins (NMFS 1991, pp. 5–73). There has been very limited federal observer coverage since 2008. No observer coverage was allocated to this fishery during 2014–2018. Because there is no systematic observer program for this fishery, no estimate of bycatch mortality is available.

Mid-Atlantic Haul/Beach Seine

During 2014–2018, one serious injury of a common bottlenose dolphin occurred associated with the mid-Atlantic haul/beach seine fishery that could be ascribed to the Southern Migratory Coastal Stock. During 2014, a common bottlenose dolphin was found within a haul seine net in Virginia and released alive seriously injured (Maze-Foley and Garrison 2020). The animal was ascribed to the Northern and Southern Migratory Coastal and NNCES stocks, and is included in the annual human-caused mortality and serious injury total for this stock (Table 3b) as well as in the stranding database and stranding totals presented in Table 4 (Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 August 2019). The mid-Atlantic haul/beach seine fishery had limited observer coverage by the NEFOP in 2010–2011. No observer coverage was allocated to this fishery during 2014–2018. No estimate of bycatch mortality is available for this fishery, and the documented interaction in this commercial gear represents a minimum known count of interactions in the last five years.

Shrimp Trawl

During 2014–2018, there were no documented mortalities or serious injuries of common bottlenose dolphins associated with the shrimp trawl fishery that could be ascribed to the Southern Migratory Coastal Stock. There has been very little systematic observer coverage of this fishery in the Atlantic during the last decade.

Hook and Line (Rod and Reel)

During 2014–2018, stranding data documented four mortalities and one serious injury that could be ascribed to the Southern Migratory Coastal Stock for which hook and line gear entanglement or ingestion were recorded. The serious injury (2017, Virginia) was ascribed to the Northern and Southern Coastal Migratory stocks (Maze-Foley and Garrison 2020). For one mortality, ascribed to the Southern Migratory Coastal and South Carolina/Georgia Coastal stocks, available evidence suggested the hook and line gear interaction contributed to the cause of death (2017, South Carolina; Maze-Foley *et al.* 2019). This serious injury and mortality are included in the annual human-caused mortality and serious injury total for this stock (Table 3b). For two of the remaining mortalities, evidence suggested the hook and line gear interactions were not a contributing factor to cause of death. Both of these mortalities occurred in 2016 (one in Virginia, one in North Carolina) and were ascribed to the Northern and Southern Migratory Coastal and NNCES stocks. For the final mortality, ascribed to the Southern Migratory Coastal and South Carolina/Georgia Coastal stocks, it could not be determined whether the hook and line gear interaction contributed to cause of death (2017, South Carolina; Maze-Foley *et al.* 2019). All five cases were included in the stranding database and are included in the stranding totals presented in Table 4 (Northeast Regional Marine Mammal Stranding Network; Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 21 May 2019 for SER and 13 August 2019 for NER).

It should be noted that, in general, it cannot be determined if rod and reel hook and line gear originated from a commercial (i.e., commercial fisherman, charter boat, or headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program. The documented interactions in this commercial gear represent a minimum known count of interactions with this fishery.

Other Mortality

Historically, there have been occasional mortalities of common bottlenose dolphins during research activities (Waring *et al.* 2016); however, none were documented during 2014–2018 that could be ascribed to the Southern Migratory Coastal Stock. All mortalities and serious injuries from known human-caused sources for the Southern Migratory Coastal Stock are summarized in Tables 3a, 3b and 3c.

Table 3a. Summary of the incidental mortality and serious injury of common bottlenose dolphins of the Southern Migratory Coastal Stock for the commercial fisheries with ongoing, systematic federal observer programs. The years sampled, the type of data used, the annual percentage observer coverage, the observed serious injuries and mortalities recorded by on-board observers, and the mean annual estimate of mortality and serious injury and its CV are provided. Minimum and maximum values are reported due to uncertainty in the assignment of mortalities to this particular stock because there is spatial overlap with other common bottlenose dolphin stocks in certain areas and seasons.

Fishery	Years	Data Type	Observer Coverage	Observed Serious Injury	Observed Mortality	Mean Annual Estimated Mortality and Serious Injury (CV) Based on Observer Data
Mid-Atlantic Gillnet	2014–2018	Obs. Data Logbook	3.6, 5.6, 9.8, 7.0, 6.4	0, 0, 0, 0, 0	1, 0, 0, 1, 0	Min=0 Max=16.3 (0.23)
Southeastern U.S. Atlantic Shark Gillnet	2014–2018	Obs. Data Logbook	NA due to uncertainty in reported effort	0, 0, 0, 0, 0	0, 0, 0, 0, 0	No estimate
Southeast Atlantic Gillnet	2014–2018	Obs. Data Logbook	NA due to uncertainty in reported effort	0, 0, 0, 0, 0	0, 0, 0, 0, 0	No estimate
Mean Annual Mortality due to the observed commercial mid-Atlantic gillnet fishery (2014–2018)						**Min=0 Max=16.3 (0.23)**

Table 3b. Summary of the incidental mortality and serious injury of common bottlenose dolphins of the Southern Migratory Coastal Stock during 2014–2018 from commercial fisheries that do not have ongoing, systematic federal observer programs. Counts of mortality and serious injury based on stranding data are given. Minimum and maximum values are reported in individual cells when there is uncertainty in the assignment of mortalities to this particular stock due to spatial overlap with other common bottlenose dolphin stocks in certain areas and seasons.

Fishery	**Years**	**Data Type**	**5-year Count Based on Stranding Data**
Chesapeake Bay Inshore Gillnet[a]	2014–2018	Limited Observer and Stranding Data	Min=0 Max=1
Virginia Pound Net[b]	2014–2018	Stranding Data	Max=10
Atlantic Blue Crab Trap/Pot	2014–2018	Stranding Data	Min=0 Max=6
North Carolina Roe Mullet Stop Net[c]	2014–2018	Stranding Data	Max=10
Mid-Atlantic Menhaden Purse Seine	2014–2018	Limited Observer and Stranding Data	0
Mid-Atlantic Haul/Beach Seine	2014–2018	Limited Observer and Stranding Data	Min=0 Max=1
Shrimp Trawl	2014–2018	Limited Observer and Stranding Data	0
Hook and Line[d]	2014–2018	Stranding Data	Min=0 Max=2
Mean Annual Mortality due to unobserved commercial fisheries (2014–2018)			**Min=0 Max=2.0**

[a] Chesapeake Bay inshore gillnet interactions are included if the animal was found entangled in gillnet gear. Strandings with markings indicative of interactions with gillnet gear are not included within the table. See "Chesapeake Bay Inshore Gillnet" text for more details.

[b] Pound net interactions are included if the animal was found entangled in pound net gear. Strandings with twisted twine markings indicative of interactions with pound net gear are not included within the table. See "Virginia Pound Net" text for more details.

[c] Stop Net interactions are included if the animal was found entangled in stop net gear. Stranding with line markings indicative of interaction with stop net gear are not included within the table. See "North Carolina Roe Mullet Stop Net" text for more details.

[d] Hook and line interactions are counted here if the available evidence suggested the hook and line gear contributed to the cause of death. See "Hook and Line" text for more details.

Table 3c. Summary of the incidental mortality and serious injury of common bottlenose dolphins of the Southern Migratory Coastal Stock during 2014–2018 from all sources, including observed commercial fisheries, unobserved commercial fisheries, and research and other takes. See the Annual Human-Caused Mortality and Serious Injury section for biases and limitations of mortality estimates.

Mean Annual Mortality due to the observed commercial mid-Atlantic gillnet fishery (2014–2018) (Table 3a)	**Min=0 Max=16.3 (0.23)**
Mean Annual Mortality due to unobserved commercial fisheries (2014–2018) (Table 3b)	**Min=0 Max=2.0**
Research Takes (5-year Min/Max Count)	0
Other takes (5-year Min/Max Count)	0
Mean Annual Mortality due to research and other takes (2014–2018)	**0**
Minimum Total Mean Annual Human-Caused Mortality and Serious Injury (2014–2018)	**Min=0 Max=18.3**

Strandings

During 2014–2018, 565 common bottlenose dolphins stranded along the Atlantic coast between Florida and Virginia that could be ascribed to the Southern Migratory Coastal Stock (Table 4; Northeast Regional Marine Mammal Stranding Network; Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 21 May 2019 for SER and 13 August 2019 for NER; Maze-Foley *et al.* 2019). There was evidence of human interaction for 59 of these strandings, of which 43 (73%) were fisheries interactions and 1 (2%) showed evidence of a boat strike (Table 4). No evidence of human interaction was detected for 121 strandings, and for the remaining 385 strandings, it could not be determined if there was evidence of human interaction. It should be recognized that evidence of human interaction does not indicate cause of death, but rather only that there was evidence of interaction with a fishery (e.g., line marks, net marks) or evidence of a boat strike, gunshot wound, mutilation, etc., at some point. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012, Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise to recognize signs of human interaction varies among stranding network personnel.

The assignment of animals to a single stock is impossible in some seasons and regions due to spatial and temporal overlap among several common bottlenose dolphin stocks (Maze-Foley *et al.* 2019). Due to its migratory behavior, the Southern Migratory Coastal Stock can overlap with other common bottlenose dolphin stocks in every season. Only two of the 565 strandings ascribed to the Southern Migratory Coastal Stock were ascribed solely to this stock. Therefore, the counts in Table 4 likely include animals from other stocks and therefore overestimate the number of strandings attributable to the Southern Migratory Coastal Stock. Those strandings that could not be definitively ascribed to the Southern Migratory Coastal Stock alone are also included in the counts for these other stocks as appropriate. In addition, stranded carcasses are not routinely identified to either the offshore or coastal morphotype of common bottlenose dolphin, therefore it is possible that some of the reported strandings were of the offshore form though that number is likely to be low (Byrd *et al.* 2014).

This stock has also been impacted by three unusual mortality events (UMEs). Two events, one in 1987–1988 and one in 2013–2015, have been attributed to morbillivirus epidemics (Lipscomb *et al.* 1994, Morris *et al.* 2015). Both UMEs included deaths of dolphins in spatiotemporal locations that apply to the Southern Migratory Coastal Stock. When the impacts of the 1987–1988 UME were being assessed, only a single coastal stock of common bottlenose dolphin was thought to exist along the U.S. eastern seaboard from New York to Florida (Scott *et al.* 1988), so impacts to the Southern Migratory Coastal Stock alone are not known. However, it was estimated that between 10 and 50% of the coast-wide stock died as a result of this UME (Scott *et al.* 1988; Eguchi 2002). The total number of stranded common bottlenose dolphins from New York through North Florida (Brevard County) during the 2013–2015 UME was 1,614 (https://www.fisheries.noaa.gov/national/marine-life-distress/2013-2015-bottlenose-dolphin-unusual-mortality-event-mid-atlantic, accessed 13 November 2019). Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that coastal stocks have been more impacted by this UME than estuarine stocks (Morris *et al.* 2015). The number of dolphins from the Southern Migratory Coastal Stock that died in this event is unknown. Finally, a UME was declared in South Carolina during February–May 2011. Six strandings assigned to the Southern Migratory Coastal Stock were considered to be part of the UME. The cause of this UME was undetermined.

Table 4. Strandings of common bottlenose dolphins during 2014–2018 from Maryland to Florida that were ascribed to the Southern Migratory Coastal Stock, as well as number of strandings for which evidence of human interaction (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of HI. Assignments to stock were based upon the understanding of the seasonal movements of this stock; however, there is likely overlap with other stocks throughout the year. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 21 May 2019 for SER and 13 August 2019 for NER). Please note HI does not necessarily mean the interaction caused the animal's death.

State	2014			2015			2016			2017			2018			Total
	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	(2014–2018)
Maryland	0	0	6	0	0	2	1	0	5	0	0	7	0	0	19	40
Virginia	5	5	49	4	5	55	11	4	35	7	1	29	6	1	52	269
North Carolina	2	25	24	7	20	12	6	13	16	1	8	10	2	9	7	162
South Carolina (Dec–Mar)	0	6	7	0	1	2	0	4	3	3	8	2	1	5	5	47
Georgia (Jan–Feb)	0	1	7	2	2	5	0	0	2	0	0	0	1	1	7	28
Florida (Jan–Feb)	0	1	6	0	0	2	0	0	5	0	0	2	0	1	2	19
Total	**144**			**119**			**105**			**78**			**119**			**565**

[a] Strandings from Virginia and Maryland were ascribed to stock based upon location and time of year with most occurring between May and September that could be ascribed to the Southern Migratory Coastal Stock. Some of these strandings could also be ascribed to the Northern Migratory Coastal Stock or NNCES Stock.

[b] Strandings from North Carolina were ascribed based on location and time of year. During summer and fall, some of these strandings could also be ascribed to the NNCES or SNCES stocks.

[c] Strandings in coastal waters from South Carolina during December–March are potentially ascribed to the Southern Migratory Coastal Stock or the South Carolina/Georgia Coastal Stock.

[d] Strandings in Georgia and northern Florida during January and February could be ascribed to the South Carolina/Georgia or the Northern Florida Coastal Stocks, respectively.

HABITAT ISSUES

The coastal habitat occupied by this stock is adjacent to areas of high human densities, some industrialized areas, and waters that are heavily utilized for commercial and recreational fishing, and boating activities. The blubber of stranded dolphins examined during the 1987–1988 mortality event contained very high concentrations of organic pollutants (Kuehl *et al*. 1991). Persistent organic pollutant levels have not been measured for this stock. Kucklick *et al.* (2011) measured total DDT and total PCB levels in common bottlenose dolphins from 13 sites in the wNA and northern Gulf of Mexico. Total DDT levels measured in common bottlenose dolphins sampled in Holden Beach, North Carolina, the site that may best represent the Southern Migratory Coastal Stock, were lower than 10 other sites sampled and total PCB levels were also lower than most other sampled sites (Kucklick *et al.* 2011), however the sample size for this site was very small (n=3).

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act, but the Southern Migratory Coastal Stock is a strategic stock due to its designation as depleted under the MMPA. From 1995 to 2001, NMFS recognized only the western North Atlantic Coastal Stock of common bottlenose dolphins in the western North Atlantic, and this stock was listed as depleted as a result of a UME in 1988–1989 (64 FR 17789, April 6, 1993). The stock structure was revised in 2008, 2009, and 2010, to recognize resident estuarine stocks and migratory and resident coastal stocks. The Southern Migratory Coastal Stock retains the depleted designation as a result of its origin from the western North Atlantic Coastal Stock. This stock is presumed to be below OSP due to its designation as depleted. PBR for the Southern Migratory Coastal Stock is 24 and so the zero mortality rate goal, 10% of PBR, is 2.4. The documented mean annual human-caused mortality for this stock for 2014–2018 ranged between a minimum of 0 and a maximum of 18.3. However, these estimates are biased low for the following reasons: 1) the total U.S. human-caused mortality and serious injury for the Southern Migratory Coastal Stock cannot be directly estimated because of the spatial overlap of this stock with several other stocks of common bottlenose dolphins resulting in uncertainty in the stock assignment of takes, 2) there are several commercial fisheries operating within this stock's boundaries that have little to no observer coverage, and 3) this mortality estimate incorporates a count of verified human-caused deaths and serious injuries and should be considered a minimum (NMFS 2016). Given these biases and uncertainties, there is insufficient information to determine whether or not the total fishery-related mortality and serious injury is approaching a zero mortality and serious injury rate. The impacts of two large UMEs on the status of this stock are unknown. Although there was no statistically significant difference in abundance for this stock between the 2010–2011 and 2016 surveys, a statistically significant decline in population size of all common bottlenose dolphins in coastal waters from New Jersey to Florida between 2010–2011 and 2016 was detected (Garrison *et al*. 2017a), concurrent with a large UME in the area; however, there is limited power to evaluate trends given uncertainty in stock distribution, lack of precision in abundance estimates, and a limited number of surveys.

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