April 2014

COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Northern North Carolina Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The coastal morphotype of common bottlenose dolphins is continuously distributed along the Atlantic coast south of Long Island, New York, to the Florida peninsula, including inshore waters of the bays, sounds and estuaries. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present primarily in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several areas (Caldwell 2001; Gubbins 2002; Zolman 2002; Gubbins *et al.* 2003; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005; Balmer *et al.* 2008).

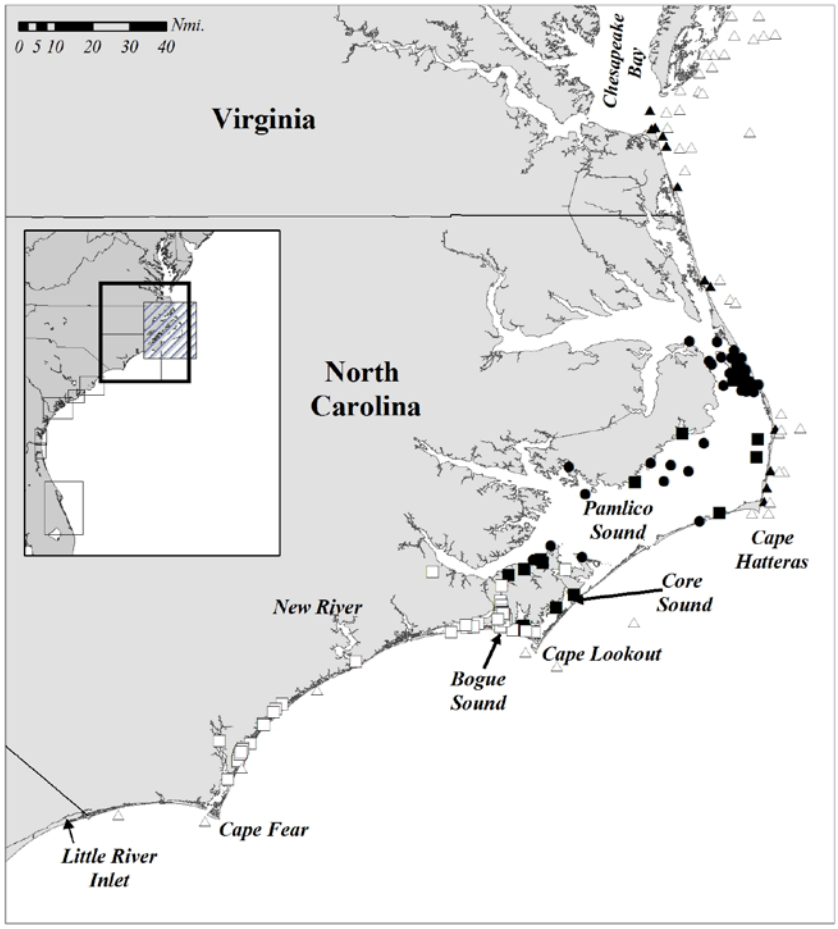

Figure 1. *The distribution of bottlenose dolphins occupying coastal and estuarine waters in North Carolina and Virginia during July-August. Locations are shown from aerial surveys (triangles), satellite-linked telemetry (circles), and photo-identification studies (squares). Sightings assigned to the Northern North Carolina Estuarine System stock are shown with filled symbols (all fall within hatched box in inset map). Photo-identification data are courtesy of Duke University and the University of North Carolina at Wilmington.*

The Northern North Carolina Estuarine System (NNCES) Stock is best defined as animals that occupy primarily estuarine waters of Pamlico Sound during warm water months (July-August). Members of this stock are also thought to make use of coastal waters (<1 km from shore) of North Carolina from Beaufort north to southern Virginia and the lower Chesapeake Bay during this time period. During colder water months, these animals move out of Pamlico Sound and occupy coastal waters (< 3km from shore) between the New River and Cape Hatteras.

The movements and range of this stock have been inferred from a combination of photo-ID, tag telemetry, stable isotope and genetic data. Animals captured and released near Beaufort, North Carolina, were fitted with satellite-linked transmitters and or freeze-branded during July 1995 (30 animals) (Hansen and Wells 1996),

November 1999 (3 animals), April 2000 (8 animals) and April 2006 (5 animals) (Hohn and Hansen, NMFS unpublished data). Long-term photo-ID studies that have been conducted in waters of North Carolina include records of some of these animals and revealed that 18 occupied waters of Pamlico Sound during warm water months. One animal that was tagged near Virginia Beach in September 1998 was observed to move south into waters of Pamlico Sound and had a photo-ID record within the sound during July (NMFS unpublished data) providing evidence that at least some members of this stock may move into nearshore coastal waters along the northern coast of North Carolina and into coastal waters of Virginia and perhaps into Chesapeake Bay. In addition, there are photo-ID matches between inshore waters of Virginia Beach, Virginia, and Pamlico Sound (Urian, pers. comm.) that also demonstrate movements of NNCES animals between these areas during warm water months. There are fewer telemetry data for assigned NNCES animals during cold water months. However, photo-ID studies, available tag data and stable isotope data indicate that the stock moves out of the waters of Pamlico Sound into coastal waters south of Cape Hatteras during cold water months. Telemetry records show that NNCES animals move as far south as the New River during January and February (NMFS unpublished data). In addition, stable isotope analysis of animals sampled along the beaches of North Carolina between Cape Hatteras and Bogue Inlet during February and March showed very low stable isotope ratios of ^{18}O relative to ^{16}O (referred to as "depleted oxygen", Cortese 2000). One explanation for the depleted oxygen signature is a resident group of dolphins in Pamlico Sound that move into nearby coastal waters in the winter (NMFS 2001).

The movements of animals from the NNCES Stock are distinct from those of the Southern North Carolina Estuarine System Stock (SNCES). Some of the animals tagged or freeze-branded near Beaufort moved south to Cape Fear and occupied nearshore coastal and estuarine waters during winter months. During warm water months, these animals moved north and occupied inshore and nearshore coastal waters near Cape Lookout including Bogue Sound and Core Sound. It is probable that there is spatial overlap between these 2 estuarine stocks during this time in the waters near Beaufort. However, SNCES Stock animals were not observed to move north of Cape Lookout in coastal waters nor into the main portion of Pamlico Sound during summer (NMFS unpublished data; Duke University unpublished data; University of North Carolina at Wilmington unpublished data). These movement patterns are consistent with those seen in resightings of individual dolphins during a photo-ID study that sampled much of the estuarine waters of North Carolina (Read *et al.* 2003). Read *et al.* (2003) suggested that movement patterns, differences in group sizes, and habitats are consistent with 2 stocks of animals occupying estuarine waters of North Carolina. Finally, genetic analysis of samples from animals in waters of southern North Carolina (between Cape Lookout and the North Carolina/South Carolina border) demonstrate significant differentiation from animals occupying waters from Virginia and further north and waters of South Carolina (Rosel *et al.* 2009).

In summary, during warm water months, the NNCES Stock occupies primarily estuarine waters of central and northern North Carolina, particularly Pamlico Sound, as well as nearshore coastal waters (< 1 km from shore) up to Assateague, Virginia, including the lower Chesapeake Bay (Figure 1). It likely overlaps with animals from the Southern Migratory Stock in coastal waters during these months, and SNCES Stock animals at the northern end of their range. During cold water months, the NNCES Stock primarily moves out of estuarine waters and occupies nearshore coastal waters (< 3km from shore) between the New River and Oregon Inlet. It overlaps with the Northern Migratory Stock during this period, particularly between Cape Lookout and Cape Hatteras and may overlap with the Southern Migratory Stock in the smaller region between the New River and Beaufort Inlet. The timing of the seasonal movements into and out of Pamlico Sound and north along the coast likely occurs with some inter-annual variability related to seasonal changes in water temperatures and/or prey availability.

In prior stock assessment reports, the animals within the estuarine waters of Pamlico Sound were included in the abundance estimates and stock assessment reports for the Northern Migratory Stock and the winter “mixed” North Carolina management unit of coastal bottlenose dolphins (Waring *et al.* 2007). However, they are now recognized as a distinct stock based upon these differences in seasonal ranging patterns and stable isotope signatures.

POPULATION SIZE

The best available abundance estimate for the NNCES Stock is 950 animals (CV=0.23, 95% Confidence Interval=516-1,384) based upon photo-ID mark-recapture surveys in 2006 (Urian *et al.*, unpublished manuscript). The survey did not include estuarine waters of Albemarle or Currituck Sounds nor more northern estuarine and coastal waters, and it is therefore possible that some portion of the NNCES Stock was outside of the boundaries of the current survey. Thus, the abundance estimate is most likely negatively biased.

Earlier abundance estimates

Read *et al.* (2003) provided the first abundance estimate of bottlenose dolphins that occur within the estuarine portion of the NNCES Stock range. This estimate was based on a photo-ID mark-recapture survey of a portion of

North Carolina waters inshore of the barrier islands, conducted during July 2000. Because the survey did not sample all of the estuarine waters where dolphins are known to occur, the estimates of abundance may be negatively biased. Read *et al.* (2003) estimated the number of animals in the inshore waters of North Carolina equivalent to that of the NNCES Stock to be 919 (95% CI 730 - 1,190, CV=0.13). Gubbins *et al.* (2003) also conducted a photo-ID mark-recapture study during 1997 and provided an abundance estimate (513, CV=0.13) for inshore and nearshore waters near Beaufort, North Carolina, but this area represented only a small portion of the NNCES Stock area and included animals in coastal waters. Goodman *et al.* (2007) conducted seasonal, strip-transect aerial surveys of southwestern Pamlico Sound from July 2004 through April 2006. Their survey area sampled approximately 25% or less of the waters within the NNCES Stock boundaries. Mean seasonal abundance estimates ranged from a low of 54 (CV=0.46) during June - August 2005 (summer), to a high of 426 (CV=0.35) during September - November 2004 (autumn), but seasonal patterns were not consistent among years. For example, the estimate for spring of 2005 was only 71 (CV=0.39) while the estimate for spring of 2006 was 323 (CV=0.35).

Since both telemetry studies and photo-identification records indicate that some portion of the NNCES Stock occurs in coastal waters between Cape Hatteras, North Carolina, and Virginia during summer months, it is appropriate to include animals from summer aerial surveys of these areas in the abundance estimate. Aerial surveys to estimate the abundance of coastal bottlenose dolphins in the Atlantic were conducted during January-February and July-August of 2002. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40m. The surveys employed a stratified design so that most effort was expended in waters shallower than 20m deep where a high proportion of observed bottlenose dolphins were expected to be of the coastal morphotype. The surveys employed 2 observer teams operating independently on the same aircraft to derive a correction for visibility bias. Abundance estimates were calculated using line transect methods and distance analysis (Buckland *et al.* 2001). The independent and joint estimates from the 2 survey teams were used to quantify the probability that animals available to the survey on the trackline were missed by the observer teams, or perception bias, using the direct duplicate estimator (Palka 1995).

An abundance estimate for the NNCES Stock in coastal waters was derived from the summer 2002 aerial survey. Survey data were post-stratified to estimate the abundance of dolphins within a strip extending from the shoreline to 1km from shore between Cape Lookout, North Carolina, and Virginia Beach, Virginia. Telemetry records indicated that NNCES animals rarely ventured further away from shore. However, animals from the Southern Migratory Stock do occur within this strip during summer months. Therefore, the estimate of abundance within this strip includes both NNCES animals and Southern Migratory animals and hence overestimates abundance of the NNCES Stock in coastal waters. The resulting abundance estimate for the NNCES Stock in coastal waters was 468 (CV=0.32).

The abundance estimate for the NNCES Stock during 2000-2002 was the combined abundance from estuarine and coastal waters. This combined estimate is 1,387 (CV=0.17).

Recent surveys and abundance estimates

A photo-ID mark-recapture study was conducted by Urian *et al.* (unpublished manuscript) in 2006, using similar methods to those in Read *et al.* (2003) and included estuarine waters of North Carolina from and including the Little River Inlet Estuary (near the North Carolina/South Carolina border) to and including Pamlico Sound. The survey also included coastal waters extending up to 1 km from shore, which is also consistent with the current understanding of the distribution of this stock. The survey did not include estuarine waters of Albemarle or Currituck Sounds nor more northern estuarine and coastal waters, and it is therefore likely that some portion of the NNCES Stock was outside of the boundaries of the current survey. Thus, the updated abundance estimate is most likely negatively biased. A boundary line between the NNCES Stock and the neighboring SNCES Stock was identified at 34°46' N Latitude in central Core Sound, and this boundary is consistent with the descriptions of the ranges of the 2 stocks during summer months. The resulting abundance estimate included a correction for the proportion of dolphins with non-distinct fins in the population. The abundance estimate for the NNCES Stock based upon photo-ID mark-recapture surveys in 2006 was 950 animals (CV=0.23, 95% Confidence Interval=516-1,384; Urian *et al*., unpublished manuscript). This is the best available abundance estimate for the NNCES Stock.

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 20^{th} percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the NNCES Stock is 950 (CV=0.23). The minimum population estimate for the NNCES Stock is 785.

Current Population Trend

There are insufficient data to determine the population trends for this stock. However, Urian *et al.* (unpublished manuscript) noted that there was no statistically significant difference between abundance estimates within estuarine waters from the surveys conducted during 2000 and those conducted during 2006.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. 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 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). The minimum population size of the NNCES Stock of bottlenose dolphins is 785. 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. The resulting PBR for this stock is 7.9 animals.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total estimated average annual fishery mortality of the NNCES Stock ranges between 1.9 and 9.1 animals per year. This range reflects the uncertainty in assigning observed or reported mortalities to a particular stock.

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.

Fishery Information

The NNCES Stock has the potential to interact with 1 Category I and 5 Category II fisheries: mid-Atlantic gillnet fishery (Category I); the Atlantic blue crab trap/pot fishery, North Carolina long haul seine fishery, North Carolina inshore gillnet fishery, mid-Atlantic haul/beach seine fishery, and Virginia pound net fishery. The NNCES stock could also interact with 2 Category III fisheries: the U.S. mid-Atlantic mixed species stop seine/weir/pound net, which includes the North Carolina pound net fishery, and the Atlantic Ocean commercial passenger fishing vessel (hook and line) fishery.

The magnitude of the interactions with each of these fisheries is unknown because of both uncertainty in the movement patterns of the stock and the spatial overlap between the NNCES Stock and other bottlenose dolphin stocks in coastal waters. Observer coverage is also limited or non-existent for most of these fisheries, thus stranding data are used as an indicator of fishery-related interactions.

Crab Pots and Other Pots

During 2007-2011, there were 2 reported mortalities of bottlenose dolphins in trap/pot gear that could be assigned to either the Southern Migratory Coastal or NNCES Stocks. During 2007 there was 1 reported mortality entangled in trap/pot gear for which the fishery type could not be confirmed. During 2009 there was 1 reported mortality entangled in blue crab pot gear. Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab pots. However, based on stranding data, it is clear that interactions with pot gear are a common occurrence and result in mortalities of coastal morphotype bottlenose dolphins in some regions (Burdett and McFee 2004).

Mid-Atlantic Gillnet

This fishery has the highest documented level of mortality of coastal morphotype bottlenose dolphins, and the sink gillnet gear in North Carolina is its largest component in terms of fishing effort and observed takes. Of 12 observed mortalities between 1995 and 2000, 5 occurred in sets targeting spiny or smooth dogfish, 1 was in a set targeting "shark" species, 2 occurred in striped bass sets, 2 occurred in Spanish mackerel sets, and the remainder

were in sets targeting kingfish, weakfish or finfish generically (Palka and Rossman 2001). From 2001-2008, 7 additional bottlenose dolphin mortalities were observed in the mid-Atlantic gillnet fishery. Three mortalities were observed in 2001 with 1 occurring off of northern North Carolina during April and 2 occurring off of Virginia during November. Four additional mortalities were observed along the North Carolina coast near Cape Hatteras: 1 in May 2003, 1 in September 2005, 1 in September 2006, and 1 in October 2006. Because the Northern Migratory, Southern Migratory, NNCES and SNCES Stocks of bottlenose dolphins all occur in waters off of North Carolina, it is not possible to definitively assign all observed mortalities, or extrapolated bycatch estimates, to a specific stock. In addition, the Bottlenose Dolphin Take Reduction Plan (TRP) was implemented in May 2006 resulting in changes in the gear configurations and other characteristics of the fishery.

To estimate the mortality of bottlenose dolphins in the mid-Atlantic gillnet fishery, the available data were divided into the period from 2002 through April 2006 (pre-TRP) and from May 2006 – 2008 (post-TRP). Three alternative approaches were used to estimate bycatch rates. First, a generalized linear model (GLM) approach was used similar to that described in Palka and Rossman (2001). This approach included all observed mortalities from 1995-2008 where the fishing gear was still in use during the period from 2002-2008. Second, a simple ratio estimator of catch per unit effort (CPUE = observed catch / observed effort) was used based directly upon the observed data. Finally, a ratio estimator pooled across years was used to estimate different CPUE values for the pre-TRT and post-TRT periods. In each case, the annual reported fishery effort (represented as reported landings) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality, again similar to the approach in Rossman and Palka (2001). To account for the uncertainty in the most appropriate of these 3 alternative approaches, the average of the 3 model estimates (and the associated uncertainty) are used to estimate the mortality of bottlenose dolphins for this fishery (Table 1). It should be noted that the extrapolated estimates of total mortality include landings from inshore waters (see North Carolina Inshore fishery section below) where the NNCES Stock is likely to occur.

Table 1. Summary of the 2002-2008 incidental mortality of bottlenose dolphins (*Tursiops truncatus*) in the Northern North Carolina Estuarine System Stock in the commercial mid-Atlantic coastal gillnet fisheries. The estimated annual and average mortality estimates are shown for the period prior to the implementation of the Bottlenose Dolphin Take Reduction Plan (pre-TRP) and after the implementation of the plan (post-TRP). Three alternative modeling approaches were used, and the average of the 3 was used to represent mortality estimates. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to stock. Observer coverage is measured as a proportion of reported landings (tons of fish landed). Data are derived from the Northeast Observer program, NER dealer data, and NCDMF dealer data. Values in parentheses indicated the CV of the estimate.

Period	Year	Observer Coverage[a]	Min Annual Ratio	Min Pooled Ratio	Min GLM	Max Annual Ratio	Max Pooled Ratio	Max GLM
pre-TRP	2002	0.01	0	0	15.64 (0.63)	0	39.45 (0.92)	33.69 (0.38)
	2003	0.01	0	0	11.03 (0.58)	49.46 (0.94)	12.77 (0.92)	19.29 (0.36)
	2004	0.02	0	0	12.10 (0.62)	0	28.46 (0.92)	28.42 (0.34)
	2005	0.03	0	0	11.84 (0.60)	0	22.58 (0.92)	23.01 (0.37)
	Jan-Apr 2006	0.03	0	0	1.40 (0.50)	0	0	1.99 (0.37)
Annual Avg. pre-TRP			Minimum: 3.47 (CV=0.30)			Maximum: 19.79 (CV=0.11)		

post-TRP	May-Dec 2006	0.03	0	0	5.08 (0.42)	73.37 (0.69)	18.84 (0.68)	12.46 (0.36)
	2007	0.03	0	0	8.32 (0.43)	0	24.47 (0.68)	18.77 (0.34)
	2008	0.01	0	0	8.14 (0.42)	0	21.91 (0.68)	16.77 (0.34)
Annual Avg. post-TRP			Minimum: 2.39 (CV=0.25)			Maximum: 18.99 (CV=0.11)		

[a] Observer coverage is reported on an annual basis for the entire fishery as a proportion of the reported tons of fish landed.

During 2001-2008, there were 3 observed takes in the mid-Atlantic gillnet fishery that could potentially be assigned to the NNCES Stock. However, in each of these cases, the take could potentially be assigned to the Southern Migratory Stock since they occurred in near-shore coastal waters of northern North Carolina. Since observed mortalities (and effort) cannot be definitively assigned to a particular stock within certain regions and times of year, the minimum and maximum possible mortality on the NNCES Stock are presented for comparison to PBR (Table 1).

Based upon these analyses, the minimum mortality estimate for the NNCES Stock for the pre-TRP period was 3.47 (CV=0.30) animals per year, and that for the post-TRP period was 2.39 (CV=0.25) animals per year. The maximum estimates were 19.79 (CV=0.11) for the pre-TRP period and 18.99 (CV=0.11) for the post-TRP period (Table 1).

During the last five years (2007-2011), no bottlenose dolphin takes were observed by the Northeast Fishery Observer Program (NEFOP) attributable to the mid-Atlantic gillnet fishery. The average percent federal observer coverage (measured in trips) for this fishery by the NEFOP from 2007-2011 was less than 1% in internal waters (bays, sounds, estuaries), 2.74% in state waters (0-3 miles) and 6.30% in federal waters (3-200 miles). These low levels of coverage are likely insufficient to detect bycatch of coastal bottlenose dolphins in the mid-Atlantic commercial gillnet fishery. Due to a lack of observed takes, no new estimates of mortality in this fishery could be generated, as indicated by the "no estimate" in Table 2 for years 2009-2011. However, serious injury and mortality from this fishery are still occurring based on other documented interactions (see Table 2). Specifically, in 2011, a dead dolphin from the NNCES Stock was recovered in North Carolina by the stranding network entangled around its head and pectoral fin in 2 different pieces of medium mesh commercial gillnet gear likely targeting flounder and spiny dogfish. The documented interaction in commercial gear represents a minimum known count of interactions with this fishery in the last 5 years, absent sufficient observer coverage to generate mortality estimates (see Table 2). In addition, 2 incidental takes (mortalities) in research gillnet gear are documented that could have belonged to the NNCES or Southern Migratory Coastal Stocks: (1) in 2009 during a small mesh gillnet research project targeting Spanish mackerel in North Carolina; and (2) in 2010 during a small mesh gillnet research project targeting sharks in North Carolina. All of these are included in the stranding database and the stranding totals in Table 3.

North Carolina Inshore Gillnet fishery

Information about interactions with bottlenose dolphins and the North Carolina inshore gillnet fishery is based on stranding data. Historically, there was no systematic Federal observer coverage of this fishery. However, from May 2010 through March 2012, the NMFS allocated sea days and observed this fishery for the first time. No bycatch was recorded by observers. Because of sea turtle bycatch in inshore gillnets, the North Carolina Division of Marine Fisheries (NCDMF) has operated systematic coverage of the fall (September-December) flounder gillnet fishery (> 5" mesh) in Pamlico Sound as a part of their Incidental Take Permit under the ESA (Byrd *et al.* 2011). In May 2010, NCDMF expanded the observer coverage to include gillnet effort using nets $\geq$ 4" mesh in most internal state waters and throughout the year, with a goal of 7-10% coverage. No bycatch of bottlenose dolphins has been recorded by observers, although stranding data continue to indicate interactions with this fishery occur. Specifically, stranding data documented 1 mortality in 2010 in commercial gillnet gear that belonged to the NNCES Stock. The dead dolphin was recovered in Roanoke Sound, North Carolina, entangled around its mandible and tongue in commercial gillnet gear (target species unknown). The documented interaction in commercial gear represents a minimum known count of interactions with this fishery in the last five years. In addition, a mortality most likely

from the NNCES Stock was observed in 2007 in the small mesh portion of state fishery in a research gillnet in the Neuse River. Both animals were included in the stranding database and are included in Table 3.

Beach Haul Seine/Beach-based Gillnet Gear

Beach-based gillnet gear is now considered part of the mid-Atlantic gillnet fishery and is monitored by the federal observer program. During 2007-2011, no observed takes or strandings associated with this gear type have been attributed to the NNCES Stock. **Crab Pots**

Virginia and North Carolina Pound Nets

Historical and recent stranding network data report interactions between bottlenose dolphins and pound nets in Virginia. During 2007-2011, 7 bottlenose dolphin strandings which could have belonged to the NNCES Stock were entangled in pound net gear in Virginia (Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 9 November 2012). An additional 18 dolphins that could have belonged to the NNCES Stock stranded with twisted twine markings indicative of interactions with pound net gear. These interactions occurred primarily inside estuarine waters near the mouth of the Chesapeake Bay and in summer months. The overall impact of the Virginia Pound Net fishery on the Northern North Carolina Estuarine System Stock is unknown due to the limited information on the stock's movements, particularly whether or not it occurs within waters inside the mouth of the Chesapeake Bay.

Hook and Line Fisheries

During 2007-2011, 2 dolphins in the stranding database that could have belonged to the NNCES Stock were documented as interacting with hook and/or line gear. In 2008 in Virginia, a dolphin that could have belonged to this stock or to the Northern or Southern Migratory Coastal Stocks was documented entangled in hook and line gear. In 2011 in Virginia, a dolphin that could have belonged to this stock or the Southern Migratory Coastal Stock was documented entangled in hook and line gear. These mortalities were included in the stranding database and are included in the stranding totals presented in Table 3.

Other Mortality

There have been occasional mortalities of bottlenose dolphins during research activities including both directed live capture studies and fisheries surveys. A mortality occurring in a turtle relocation trawl off of North Carolina during March 2002 could have been attributed to either the Southern Migratory Stock or the NNCES Stock. A mortality was observed in 2007 in a research gillnet in the Neuse River that is most likely from the NNCES Stock. A second mortality was observed in research gear during 2009 in a Spanish mackerel gillnet. A third mortality was observed in research gear during 2010 in a small mesh gillnet. The second and third mortalities could have belonged to the NNCES or Southern Migratory Stocks. All 3 research gillnet mortalities were included in the stranding database and are included in Table 3. Three bottlenose dolphins that were captured, tagged with satellite-linked transmitters, and released near Beaufort, North Carolina, during April 2006 by NMFS as part of a long-term stock delineation research project were believed to have died shortly thereafter as a result of the capture or tagging (NMFS unpublished data). Two of the animals were recovered stranded but because of advanced decomposition of the carcasses cause of death could not be determined. One of these 2 animals was known from long-term photo-ID and was likely of the Southern North Carolina Estuarine System Stock. The third animal has not been observed subsequent to release, but patterns in the data received from its satellite tag were similar to that of the other 2 and indicated the fates were similar. These last 2 animals were, based on satellite-derived locations, most likely from the NNCES Stock. All known human-caused mortalities including both commercial fisheries and research related mortalities are summarized in Table 2.

During 2008, a free-swimming animal in Pamlico Sound was observed with constricting gear wrapped around it, and the animal was considered seriously injured (Maze-Foley and Garrison in prep.). During 2011 another free-swimming animal was observed in the Pamlico River entangled in line and a black float around its peduncle. It was also considered seriously injured (Maze-Foley and Garrison in prep.).

This stock inhabits areas with significant drainage from agricultural, industrial and urban sources, and as such is exposed to contaminants in runoff from those sources. The blubber of 47 bottlenose dolphins captured and released in and around Beaufort contained detectable environmental contaminants, and 7 had unusually high levels of the pesticide methoxychlor (Hansen *et al.* 2004). While there are no estimates of indirect human-caused mortality from pollution or habitat degradation, Schwacke *et al.* (2002) found that the levels of polychlorinated biphenyls (PCBs) observed in Beaufort female bottlenose dolphins would likely impair reproductive success, especially of primiparous females.

Table 2. Summary of annual reported and estimated mortality of bottlenose dolphins from the Northern North Carolina Estuarine System Stock during 2007-2011 from observer and stranding data. Where minimum and maximum values are reported, there is uncertainty in the assignment of mortalities to this particular stock due to spatial overlap with other bottlenose dolphin stocks in certain areas and seasons. This is especially the case for strandings where the maximum number reported may truly be a minimum because not all strandings are detected. They are therefore reported as the maximum greater than or equal to what was recovered.

Year	mid-Atlantic Gillnet		Virginia Pound Net (strandings and observed)	NC Inshore Gillnet (strandings)	Beach-based Gillnet (strandings)	Blue Crab Pot (strandings)	Other Pot (strandings)	Hook and Line (strandings)	Research (incidental takes)	Total
	Min/Max estimate extrapolated from observer data (only through 2008)	Additional interactions known from stranding data or observer data								
2007	Min = 2.8 Max = 14.4	0	Min = 0 Max = 2	1	0	0	Min = 0 Max = 1	0	1	Min = 4.8 Max ≥ 19.4
2008	Min = 2.7 Max = 12.9	0	Min = 0 Max = 2	0	0	0	0	Min = 0 Max = 1	0	Min = 2.7 Max ≥ 15.9
2009	No estimate	0	Min = 0 Max = 3	0	0	Min = 0 Max = 1	0	0	Min = 0 Max = 1	Min = 0 Max ≥ 5
2010	No estimate	0	0	1	0	0	0	0	Min = 0 Max = 1	Min = 1 Max ≥ 2
2011	No estimate	Min = 1 Max = 2	0	0	0	0	0	Min = 0 Max = 1	0	Min = 1 Max ≥ 3
Annual Average Mortality (2007-2011)						Minimum Estimated = 1.9 Maximum Estimated ≥ 9.1				

Strandings

Between 2004 and 2008, Between 2007 and 2011, 397 bottlenose dolphins stranded along the Atlantic coast in North Carolina and Virginia that could be assigned to the NNCES Stock (Table 3; Northeast Regional Marine Mammal Stranding Network, Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012 and 9 November 2012). It was not possible to determine whether or not there was evidence of human interaction (HI) for 261 of these strandings, and for 66 it was determined there was no evidence of human interaction. The remaining 70 showed evidence of human interactions (Table 3). Within estuarine waters of North Carolina, where the probability is very high that strandings are from the NNCES Stock, there were a total of 75 strandings in this 5 year period. In most cases, it was not possible to determine if a HI had occurred due to the decomposition state of the stranded animal. Of the 7 (of 75) estuarine strandings positive for HI, 3 (43%) of them exhibited evidence of fisheries entanglement (e.g., entanglement lesions, attached gear). Of the remaining 4 animals, 2 strandings were mutilated, 1 had unidentified line marks, and 1 was an incidental take from research gillnet gear. 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.

The assignment of animals to a particular stock is impossible in some seasons and regions, particularly in coastal waters of North Carolina and Virginia. Therefore, it is likely that the counts below include some animals from either the Southern Migratory Coastal or Northern Migratory Coastal Stocks, and some of the strandings below were also included in the counts for the Southern Migratory Coastal and Northern Migratory Coastal Stocks. Stranded carcasses are not routinely identified to either the offshore or coastal morphotype of bottlenose dolphin,

therefore it is possible that some of the reported strandings were of the offshore form.

Table 3. Strandings of bottlenose dolphins from North Carolina and Virginia that can possibly be assigned to the Northern North Carolina Estuarine System (NNCES) Stock. Strandings observed in North Carolina are separated into those occurring within Pamlico Sound and other estuaries (Estuary) vs. coastal waters. Assignments to stock were based upon the understanding of the seasonal movements of this stock. However, particularly in coastal waters, there is likely overlap between the NNCES Stock and other bottlenose dolphin stocks. HI = Evidence of Human Interaction, CBD = Cannot Be Determined whether an HI occurred or not. NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012 (SER) and 9 November 2012 (NER).

State	**2007**			**2008**			**2009**			**2010**			**2011**		
Type	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
North Carolina-Estuary	2[a]	0	19	0	0	11	2[b]	0	8	2[c]	2	19	1[d]	1	8
North Carolina - Coastal	5[e]	8	26	6[f]	4	26[g]	6[h]	3	19	4[i]	18	18	7[j]	20	25
Virginia[k]	6[l]	3	19	8[m]	1	22	12[n]	2	12	4[o]	2	16	5[p]	2	13
Annual Total	88			78			64			85			82		

[a] Includes 1 mutilation and 1 incidental take in research gillnet gear.
[b] Includes 1 mutilation.
[c] Includes 2 fisheries interactions (FI).
[d] Includes 1 FI which was also mutilated.
[e] Includes 4 FIs
[f] Includes 6 FIs. One animal had also been mutilated, and another animal had also been boat struck.
[g] Includes 1 mass stranding of 2 animals.
[h] Includes 5 FIs, 1 of which was also boat struck. Also includes 1 incidental take in gillnet research gear. The research gear was a Spanish mackerel commercial fishing gillnet.
[i] Includes 3 FIs and 1 incidental take in research experimental gillnet gear targeting shark.
[j] Includes 4 FIs and 1 mutilation.
[k] Strandings from Virginia include primarily waters inside Chesapeake Bay during late summer through fall. It is likely that the NNCES Stock overlaps with the Southern Migratory Stock in this area.
[l] Includes 6 FIs. Two animals (mortalities) were entangled in VA pound nets. One animal (mortality) had trap/pot gear wrapped around its fluke.
[m] Includes 7 FIs and 1 mutilation. Two FIs were animals (mortalities) entangled in VA pound nets and 1FI was an animal (mortality) entangled in hook and line gear.
[n] Includes 12 FIs, 3 of which were animals (mortalities) entangled in VA pound nets.
[o] Includes 2 FIs and 1 boat strike.
[p] Includes 5 FIs, one of which was an animal (mortality) entangled in hook and line gear. One FI was also mutilated.

STATUS OF STOCK

Bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the total human-caused mortality and serious injury is greater than 10% of PBR and may exceed PBR, NMFS considers the NNCES Stock to be a strategic stock under the Marine Mammal Protection Act. PBR for the NNCES Stock is 7.9 and so the zero mortality rate goal, 10% of PBR, is 0.8. The documented annual average human-caused mortality for this stock for 2007 – 2011 ranges between a minimum of 1.9 and a maximum of 9.1. However, the total U.S. human-caused mortality and serious injury for this stock cannot be directly estimated because of the spatial overlap of several stocks of bottlenose dolphins in this area. In addition, there are several commercial fisheries operating within this stock's boundaries and these fisheries have little to no observer coverage. Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and therefore, cannot be considered to be insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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