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

STOCK DEFINITION AND GEOGRAPHIC RANGE

Geographic Range and Coastal Morphotype Habitat

The coastal morphotype of common bottlenose dolphins is continuously distributed along the Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Based on differences in mitochondrial DNA haplotype frequencies, coastal animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks (Rosel *et al.* 2009; Duffield and Wells 2002). On the Atlantic coast, Scott *et al.* (1988) hypothesized a single coastal migratory stock ranging seasonally from as far north as Long Island, to as far south as central Florida, citing stranding patterns during a high mortality event in 1987-1988 and observed density patterns. More recent studies demonstrate that the single coastal migratory stock hypothesis is incorrect, and there is instead a complex mosaic of stocks residing in coastal waters of the western North Atlantic (Rosel *et al.* 2009; McLellan *et al.* 2003).

The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that occupies habitats further offshore (Hoelzel *et al.* 1998; Mead and Potter 1995; Rosel *et al.* 2009). Aerial surveys conducted between 1978 and 1982 (CETAP 1982) north of Cape Hatteras, North Carolina, identified two concentrations of bottlenose dolphins, one near the coast within the 25-m isobath and the other offshore of the 50-m isobath and concentrated at the continental shelf edge. The lowest density of bottlenose dolphins was observed over the continental shelf. It was suggested, therefore, that north of Cape Hatteras, North Carolina, the coastal morphotype is restricted to waters < 25 m deep (Kenney 1990). Similar patterns were observed during summer months in more recent aerial surveys (Garrison and Yeung 2001; Garrison *et al.* 2003). However, south of Cape Hatteras during both winter and summer months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison *et al.* 2003).

To address the question of the distribution of coastal and offshore morphotypes in waters south of Cape Hatteras, tissue samples were collected in coastal, shelf and slope waters from New England to Florida between 1997 and 2006. Genetic analyses using mitochondrial DNA sequences of these biopsies identified individual animals to the coastal or offshore morphotype. Using the genetic results from all surveys combined, a logistic regression was used to model the probability that a particular bottlenose dolphin group was of the coastal morphotype as a function of environmental variables including depth, sea surface temperature, and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two morphotypes (Garrison *et al.* 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. During summer months, all biopsy samples collected from coastal waters north of Cape Lookout, North Carolina (< 20 m deep), were of the coastal morphotype, and all samples collected in deeper waters (> 40 m deep) were of the offshore morphotype. South of Cape Lookout, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth. In intermediate depth waters, there was spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13 m, and coastal morphotype dolphins were observed at depths of 31 m and 75 km from shore (Garrison *et al*. 2003).

Winter samples were collected primarily from coastal waters in North Carolina and Georgia and the vast majority of them were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout only 7.3 km from shore. Coastal morphotype samples were also collected farther away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions were highly uncertain due to limited sample sizes and spatial overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected 112 km from shore and a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison *et al.* 2003).

In summary, the primary habitat of the coastal morphotype of bottlenose dolphin extends from Florida to New

Jersey during summer months and in waters less than 20 m deep, including estuarine and inshore waters. South of Cape Lookout, the coastal morphotype occurs in lower densities over the continental shelf (waters between 20 m and 100 m depth) and overlaps spatially with the offshore morphotype.

Distinction Between Coastal and Estuarine Bottlenose Dolphins

In addition to inhabiting coastal nearshore waters, tThe coastal morphotype of bottlenose dolphin also inhabits inshore estuarine waters along the U.S. east coast and Gulf of Mexico (Wells *et al.* 1987; Wells *et al.* 1996; Scott *et al.* 1990; Weller 1998; Zolman 2002; Speakman *et al.* 2006; Stolen *et al.* 2007; Balmer *et al.* 2008; Mazzoil *et al.* 2008). There are multiple lines of evidence supporting demographic separation between bottlenose dolphins residing within estuaries along the Atlantic coast. For example, long-term photo-identification (photo-ID) studies in waters around Charleston, South Carolina, have identified communities of resident dolphins that are seen within relatively restricted home ranges year-round (Zolman 2002; Speakman *et al.* 2006). In Biscayne Bay, Florida, there is a similar community of bottlenose dolphins with evidence of year-round residents that are genetically distinct from animals residing in a nearby estuary in Florida Bay (Litz *et al.* 2012). The Indian River Lagoon system in central Florida also has a long-term photo-ID study, and this study identified year-round resident dolphins repeatedly observed across multiple years (Stolen *et al.* 2007; Mazzoil *et al.* 2008). A few published studies demonstrate that these resident animals are genetically distinct from animals in nearby coastal waters; a study conducted near Jacksonville, Florida, demonstrated significant genetic differences between animals in coastal and estuarine waters (Caldwell 2001; Rosel *et al*. 2009), and animals resident in the Charleston Estuarine System show significant genetic differentiation from animals biopsied in coastal waters of southern Georgia (Rosel *et al*. 2009).

Despite evidence for genetic differentiation between estuarine and coastal populations, the degree of spatial overlap between these populations remains unclear. Photo-ID studies within estuaries demonstrate seasonal immigration and emigration and the presence of transient animals (e.g., Speakman *et al.* 2006). In addition, the degree of movement of resident estuarine animals into coastal waters on seasonal or shorter time scales is poorly understood. However, for the purposes of stock definition, bottlenose dolphins inhabiting primarily estuarine habitats are considered distinct from those inhabiting coastal habitats.

Definition of the Southern Migratory Coastal Stock

Initially, a single stock of coastal morphotype bottlenose dolphins was thought to migrate seasonally between New Jersey (summer months) and central Florida based on seasonal patterns in strandings during a large scale mortality event occurring during 1987-1988 (Scott *et al.* 1988). However, re-analysis of stranding data (McLellan *et al.* 2003) and extensive analysis of genetic (Rosel *et al.* 2009), photo-ID (Zolman 2002), and satellite telemetry (Hohn and Hansen, NMFS unpublished data) data demonstrate a complex mosaic of coastal bottlenose dolphin stocks. Integrated analysis of these multiple lines of evidence suggests that there are 5 coastal stocks of bottlenose dolphins: the Northern Migratory and Southern Migratory Stocks, a South Carolina/Georgia Coastal Stock, a Northern Florida Coastal Stock and a Central Florida Coastal Stock.

Among the coastal stocks, the migratory movements and spatial distribution of the Southern Migratory Stock are the most poorly understood. Stable isotope analysis conducted using biopsy samples from free-ranging animals sampled in estuarine, nearshore coastal and offshore habitats suggests migratory movement of animals in coastal waters between Georgia in the winter and southern North Carolina during the summer and fall. In that study, $^{15}N\backslash^{14}N$, and $^{34}S\backslash^{32}S$ ratios of animals sampled off of Georgia during winter months were similar to those of animals sampled in waters off of southern North Carolina, near Cape Fear, during winter months (Knoff 2004). Satellite tag telemetry studies also provide evidence for a stock of dolphins migrating seasonally along the coast between North Carolina and northern Florida. Two dolphins were tagged during November 2004 just south of Cape Fear, North Carolina. One of these animals remained along the South Carolina and southern North Carolina coasts throughout the winter (January-February) while the other migrated south to Northern Florida through February. In the spring (March-June), these animals moved further north of the tagging site to Cape Hatteras, North Carolina. The tags did not last beyond June, and therefore the distribution of these animals during summer months is unknown (Hohn and Hansen, NMFS unpublished data).

Genetic analyses indicate significant differentiation between bottlenose dolphins occupying coastal waters from the North Carolina/Virginia border to New Jersey during summer months and those in southern North Carolina and further south (Rosel *et al.* 2009). In addition, tagging studies of animals occupying New Jersey waters during the summer indicate that animals from the Northern Migratory Stock do not move south of Cape Lookout, North Carolina during winter months. These data demonstrate that the Northern Migratory Stock is distinct from the potential Southern Migratory Stock. However, there is limited capability to demonstrate genetic differentiation of the Southern Migratory Stock from other coastal and estuarine bottlenose dolphin stocks because the Southern

Migratory Stock overlaps spatially with at least one other stock of bottlenose dolphins throughout the year.

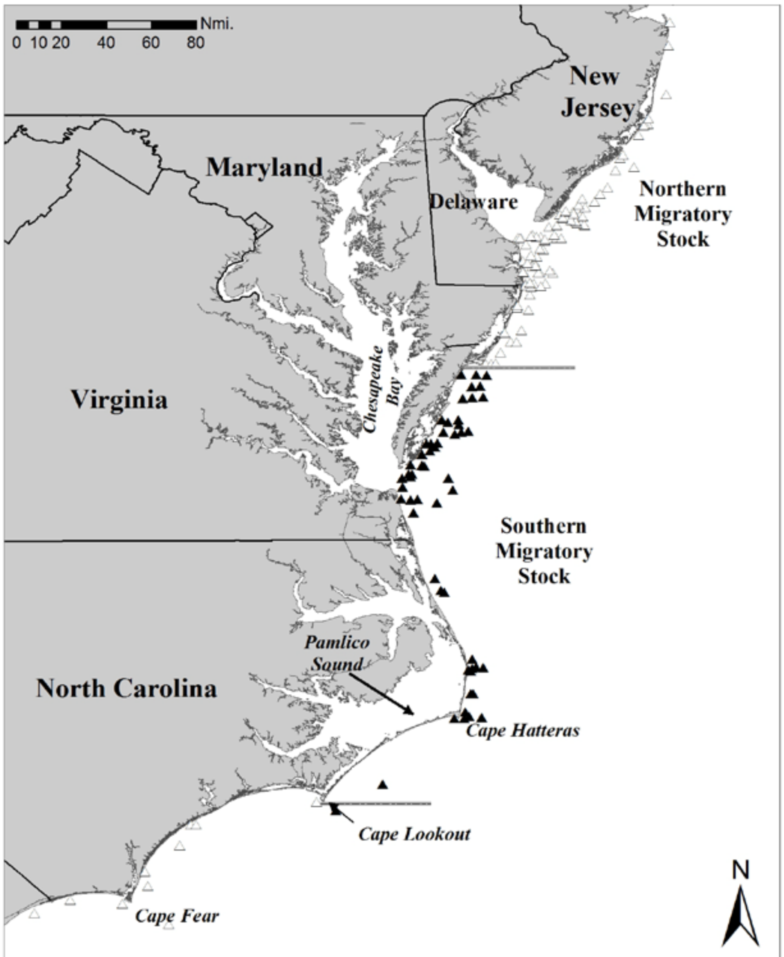

Figure 1. *The summer (July-August) distribution of bottlenose dolphin stocks occupying coastal waters from North Carolina to New Jersey. Locations are shown from aerial surveys (triangles). Sightings assigned to the Southern Migratory Stock are shown with filled symbols.*

In summary, the limited data available supports the definition of a Southern Migatory Stock of coastal morphotype bottlenose dolphins; however, there is a large amount of uncertainty in its spatial movements. The seasonal movements are best described by tag telemetry data. During the fall (October-December), this stock occupies waters of southern North Carolina (South of Cape Lookout) where it overlaps spatially with the Southern North Carolina Estuarine System Stock in coastal waters. In winter months (January-March), the Southern Migratory Stock moves as far south as northern Florida where it overlaps spatially with the South Carolina/Georgia and Northern Florida Coastal Stocks. In spring (April-June), the stock moves north to waters of North Carolina where it overlaps with the Southern North Carolina Estuarine System Stock and the Northern North Carolina Estuarine System Stock. In summer months (July-August), the stock is presumed to occupy coastal waters north of Cape Lookout, North Carolina, to the eastern shore of Virginia (Figure 1). It is possible that these animals also occur inside the Chesapeake Bay and in nearshore coastal waters where there is evidence that Northern North Carolina Estuarine System Stock animals also occur.

POPULATION SIZE

The best available estimate for the Southern Migratory Coastal Stock of bottlenose dolphins in the western North Atlantic is 9,173 (CV=0.46; Table 1). This estimate is from aerial surveys conducted during the summers of 2010 and 2011 covering waters from Florida to New Jersey.

Earlier abundance estimates

Earlier abundance estimates for the Southern Migratory Coastal Stock were derived from aerial surveys conducted during the summer of 2002. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40 m. These surveys employed two observer teams operating independently on the same aircraft to estimate visibility bias. In summer 2004, an additional aerial survey between central Florida and New Jersey was conducted. As with the 2002 surveys, effort was stratified into 0-20 m and 20-40 m strata with the majority of effort in the shallow depth stratum. Observed bottlenose dolphin groups from these were partitioned between the coastal and offshore morphotypes based upon analysis of available biopsy samples (Garrison *et al.* 2003). For the region north of Cape Hatteras, North Carolina, there was complete separation between the coastal and offshore morphotypes, with only coastal animals occupying waters < 20 m deep. Therefore, all animals observed in the 0-20 m depth stratum during surveys of this region were assigned to the coastal morphotype (Garrison *et al.* 2003).

Summer surveys are best for estimating the abundance for both the Northern and Southern Migratory Coastal Stocks since they overlap least with other stocks during summer months. An analysis of summer survey data from 1995, 2002 and 2004 demonstrated strong inter-annual variation in the spatial distribution of presumed Southern Migratory and Northern Migratory Coastal Stock animals. Two groups of dolphins in each survey year were identified using a multivariate cluster analysis of sightings based on water temperature, depth and latitude. One group ranged from Cape Lookout, North Carolina, to just north of the Chesapeake Bay mouth, and one ranged farther north along the eastern shore of Virginia to New Jersey. The southern group (i.e., the Southern Migratory Coastal Stock) was found in water temperatures between 26.5 and 28.0°C, and the northern group (i.e., the Northern Migratory Coastal Stock) occurred in cooler waters between 24.5 and 26.0°C. The spatial distribution of these groups was strongly correlated with water temperatures and varied between years. During the summer of 2004, water temperatures were significantly cooler than those during 2002, and animals from both groups were distributed farther south and overlapped spatially. Very few bottlenose dolphins were observed in waters north of Virginia during the summer 2004 survey. Therefore, it was not possible to develop an estimate of abundance for the Southern Migratory Coastal Stock from the summer 2004 survey and so the The best abundance estimate for the Southern Migratory Stock came from the summer 2002 survey when there was little overlap and an apparent separation from the Northern Migratory Stock at approximately 37.5°N latitude. The resulting abundance estimate for the Southern Migratory Coastal Stock was 12,482 (CV=0.32).

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 summers of 2010 and 2011. The surveys were conducted along tracklines oriented perpendicular to the shoreline that were latitudinally spaced 20 km apart and covered waters from the shoreline to the continental shelf break. The summer 2010 survey was conducted during 24 July–14 August 2010, and 7,944 km of on-effort tracklines completed. A total of 127 bottlenose dolphin groups were observed including 1,541 animals. During the 2011 summer survey, 8,665 km of trackline were completed between Cape May, New Jersey and Ft. Pierce, Florida. The survey was conducted during 6 July - 29 July 2011. The 2011 survey also included more closely spaced “fine-scale” tracklines in waters offshore of New Jersey and Virginia within areas being evaluated for the placement of offshore energy installations. A total of 112 bottlenose dolphin groups were sighted including 1,339 animals.

Both the summer 2010 and 2011 surveys were conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). However, the detection functions from both surveys indicated a decreased probability of detection near the trackline, which limited the effectiveness of the method for correcting for visibility bias due to a relatively small number of sightings made by both teams near the trackline. Abundance estimates were therefore derived by combining the sightings from both teams during a survey and “left-truncating” the data by analyzing only sightings occurring greater than 100 m from the trackline during the 2010 survey and 50 m during the 2011 survey (see Buckland *et al.* 2001 for left-truncation methodology). Detection functions were fit to these left-truncated data accounting for the effects of survey conditions (e.g., sea state, glare, water color) on the detection probabilities. A bootstrap resampling approach was used to estimate the variance of the estimates. The resulting abundance estimates assume that detection probability at the truncation distance is equal to 1. While the estimates could not be explicitly corrected for this assumption, analyses of the summer 2010 data suggest that this bias is likely small.

The abundance estimates for the Southern Migratory Coastal stock were based upon tracklines and sightings occurring between Cape Lookout, North Carolina, and Assateague, Virginia (37.5°N latitude) and in waters from the shoreline to the 20-m isobath. Prior analyses suggested that this latitudinal boundary separates the Northern and Southern Migratory Coastal Stocks. The abundance estimate derived from the summer 2010 survey was 10,093 (CV=0.52), and the estimate from the summer 2011 survey was 7,472 (CV=0.96). The best estimate is a weighted average of these two with higher weighting given to the more precise estimate from 2010. The resulting best estimate is 9,173 (CV=0.46).

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

Month/Year	Area	N_{best}	CV
July-August 2002	North Carolina to Virginia	12,482	0.32
July-August 2010 and 2011	North Carolina to Virginia	9,173	0.46

Minimum Population Estimate

The minimum population size (Nmin) was calculated as the lower bound of the 60% confidence interval for a lognormally distributed mean (Wade and Angliss 1997). The best estimate for the Southern Migratory Coastal Stock of bottlenose dolphins is 9,173 (CV=0.46). The resulting minimum population estimate is 6,326.

Current Population Trend

There are limited data available to assess population trends for this stock. The estimates from the 2002 and 2010/2011 surveys are not significantly different from each other; however, it should be noted that the relatively large CVs limit the power to detect significant differences. The statistical power to detect a trend in abundance for this species is poor due to the relatively imprecise estimates and long survey interval. For example, the power to detect a precipitous decline (i.e., 50% decrease in 15 years) in abundance with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the Southern Migratory 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 Southern Migratory Coastal Stock of bottlenose dolphins is 6,326. 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 depleted. PBR for this stock of bottlenose dolphins is 63.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total estimated average annual fishery mortality of the Southern Migratory Stock ranges between a minimum of 2.6 and a maximum of 16.5 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

This stock has the potential to interact with the following Category I and II fisheries: (1) mid-Atlantic gillnet; (2) Virginia pound net; (3) mid-Atlantic menhaden; (4) Atlantic blue crab trap/pot; (5) mid-Atlantic beach/haul seine; (6) Southeastern U.S. Atlantic shark gillnet; and (7) Southeast Atlantic gillnet. There is also the potential for this stock to interact with the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel fishery. The primary known source of fishery mortality is the mid-Atlantic gillnet fishery, which affects the Northern Migratory, Southern Migratory, Northern North Carolina Estuarine System and Southern North Carolina Estuarine System Stocks of bottlenose dolphins. At certain times of year, it is not possible to definitively assign mortalities observed in that fishery to a specific stock. Additional commercial fisheries that may impact the Southern Migratory Stock are additional pot fisheries and the shrimp trawl fishery. With the exception of the mid-Atlantic gillnet fishery and U.S. Atlantic shark gillnet fishery, the above fisheries have limited or no systematic federal observer coverage, which prevents the estimation of total takes. Therefore, the total average annual mortality estimate is a lower bound of the actual annual human-caused mortality for each stock. Detailed fishery information is presented in Appendix III.

Earlier Interactions

The Atlantic menhaden purse seine fishery historically reported an annual incidental take of 1 to 5 bottlenose dolphins (NMFS 1991, pp. 5-73). This information has not been updated for some time. There has been very limited observer coverage since 2008, but no takes have been observed (see Appendix III).

Mid-Atlantic Gillnet

This fishery has the highest documented level of mortality of coastal morphotype bottlenose dolphins, and 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 (Rossman and Palka 2001). From 2001-2008, 7 additional bottlenose dolphin mortalities were observed in the mid-Atlantic gillnet fishery in North Carolina and Virginia. Because the Northern Migratory, Southern Migratory, Northern North Carolina Estuarine System and Southern North Carolina Estuarine System bottlenose dolphin stocks 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 (BDTRP) 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-BDTRP) and from May 2006 through 2008 (post-BDTRP). Three alternative approaches were used to estimate bycatch rates. First, a generalized linear model (GLM) approach was used similar to that described in Rossman and Palka (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-BDTRP and post-BDTRP 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 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).

Table 1. Summary of the 2002-2008 incidental mortality of bottlenose dolphins (*Tursiops truncatus truncatus*) in the Southern Migratory Stock in commercial mid-Atlantic 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-BDTRP) and after the implementation of the plan (post-BDTRP). 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, VMRC landings 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-BDTRP	2002	0.01	0	29.17 (0.97)	6.71 (0.40)	0	67.83 (0.68)	24.22 (0.45)
	2003	0.01	0	34.77 (0.68)	12.35 (0.36)	63.56 (0.99)	47.08 (0.97)	14.00 (0.40)
	2004	0.02	0	81.52 (0.97)	18.93 (0.39)	0	88.56 (0.68)	31.71 (0.45)
	2005	0.03	114.84 (1)	74.05 (0.68)	19.41 (0.42)	123.18 (1.02)	91.01 (0.97)	26.61 (0.45)
	Jan-Apr 2006	0.03	0	0	0.00	0	0	0.32 (0.42)
Annual Avg. pre-BDTRP			Minimum: 21.81 (CV=0.13)			Maximum: 34.03 (CV=0.12)		
post-BDTRP	May-Dec 2006	0.03	0	0	12.10 (0.48)	174.98 (0.70)	44.29 (0.69)	18.99 (0.51)
	2007	0.03	0	0	10.75 (0.35)	0	36.62 (0.69)	18.33 (0.44)
	2008	0.01	0	0	28.54 (0.51)	0	86.60 (0.69)	36.45 (0.52)
Annual Avg. post-BDTRP			Minimum: 5.71 (CV=0.31)			Maximum: 41.91 (CV=0.14)		

[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 4 observed takes in the mid-Atlantic gillnet fishery that could potentially be assigned to the Southern Migratory Stock. Three of these occurred relatively close to shore and in areas with potential overlap with the Northern North Carolina Estuarine System Stock. A fourth occurred several kilometers from shore in northern North Carolina during summer months, and therefore is most likely to be from the Southern Migratory Stock. These interactions are reflected in positive values for both the pooled and annual ratio estimators (Table 1). 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 of the Southern Migratory Stock are presented for comparison to PBR (Table 1).

Based upon these analyses, the minimum mortality estimate for the Southern Migratory Stock for the pre-BDTRP period was 21.81 (CV=0.13) animals per year, and that for the post-BDTRP period was 5.71 (CV=0.31) animals per year. The maximum estimates were 34.03 (CV=0.12) for the pre-BDTRP period and 41.91 (CV=0.14) for the post-BDTRP period (Table 1).

During the last five years (2007-2011), there were no observed takes by the Northeast Fishery Observer Program (NEFOP) attributed to the mid-Atlantic gillnet fishery, but serious injury and mortality are documented by other sources. 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 2009, there was 1 observed take by the Southeast Fishery Observer Program in small mesh gillnet gear off North Carolina targeting Spanish mackerel. This likely belonged to either the Northern or Southern Migratory Coastal Stock. In 2011 the stranding network recovered a dead dolphin from a fisherman who had incidentally caught it in a small-mesh gillnet targeting spot in North Carolina. This animal could have belonged to the Southern Migratory Coastal or Southern North Carolina Estuarine System Stock. The documented interactions in commercial gear represent minimum known counts 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 Southern Migratory Coastal or NNCES 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.

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. In 2007, 1 dolphin was reported entangled in trap/pot gear for which the fishery type could not be confirmed. In 2009, 1 dolphin was reported 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).

Virginia Pound Nets

Historical and recent stranding network data report interactions between bottlenose dolphins and pound nets in Virginia. During 2007-2011, 11 bottlenose dolphin strandings which could have belonged to the Southern Migratory Coastal 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 26 dolphins that could have belonged to the Southern Migratory Coastal 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 Southern Migratory 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.

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

Gillnet fisheries targeting finfish and sharks operate in southeast waters between North Carolina and southern Florida. Historically, a drift net fishery targeting coastal sharks operated in waters in northern Florida during winter months that could have interacted with the Southern Migratory Stock. Bottlenose dolphin takes (n=2) in the drift net fisheries in this area were documented in 2002 and 2003 (Garrison 2007). Currently, gillnet fisheries include a number of different fishing methods and gear types including drift nets, "strike" fishing and anchored ("sink") gillnets. The majority of this fishing is reported from waters of North Carolina and central Florida, and very little effort is reported during winter months (January-March) within the range of the Southern Migratory Stock. There have been no observed recent bottlenose dolphin takes within the stock boundaries.

Southeastern U.S. Shrimp Trawl Fishery

In August 2002 in Beaufort County, South Carolina, a fisherman self-reported a dolphin entanglement in a commercial shrimp trawl. However, this is outside of the seasonal range of the Southern Migratory Stock in these waters, and there is relatively little effort during winter months when the fishery could possibly interact with this stock. No other bottlenose dolphin mortality or serious injury has been reported to NMFS. There has been very little systematic observer coverage of this fishery during the last decade.

Hook and Line Fisheries

During 2007-2011, 4 dolphins in the stranding database that could have belonged to the Southern Migratory Coastal Stock were documented as interacting with hook and/or line gear. In 2008 in Virginia, a dolphin (mortality) that could have belonged to this stock, the Northern Migratory Coastal Stock or the NNCES Stock, was documented entangled in hook and line gear. During 2010 in South Carolina an animal that may have belonged to this stock or to the South Carolina/Georgia Coastal Stock was documented with ingested recreational hook and line gear (wrapped around its goosebeak). In 2011 an additional animal stranded in South Carolina that may have belonged to this stock or to the South Carolina/Georgia Coastal Stock, and it had also ingested hook and line gear. In 2011 in Virginia, a dolphin that could have belonged to this stock or the NNCES 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.

Beach Haul Seine/Beach-based Gillnet Gear

Beach-based gillnet gear is now considered part of the mid-Atlantic gillnet fishery and has been monitored by the observer program. In 2007, one dolphin was killed in a multifilament beach seine during a state fishery research project that may belong to either the Northern Migratory or Southern Migratory Coastal Stock.

Other Mortality

A mortality occurred in a turtle relocation trawl off of North Carolina during March of 2002 attributable to either the Southern Migratory Coastal or NNCES Stock. One mortality in a research beach seine was reported from June 2007 in northern North Carolina that was consistent with the spatial range of the Northern Migratory Stock or the Southern Migratory Stock. A second mortality was observed in research gear during 2009 in a Spanish mackerel gillnet, and a third mortality was observed in research gear during 2010 in a small mesh gillnet targeting shark. The second and third mortalities could have belonged to the NNCES or Southern Migratory Stocks. All 3 mortalities resulting from research gillnet gear were included in the stranding database and are included in Table 3. All mortalities from known sources including commercial fisheries and research related mortalities for the Southern Migratory Coastal Stock are summarized in Table 2.

The nearshore and estuarine habitats occupied by the coastal morphotype are adjacent to areas of high human population and some are highly industrialized. The blubber of stranded dolphins examined during the 1987-1988 mortality event contained very high concentrations of organic pollutants (Kuehl *et al*. 1991). More recent studies have examined persistent organic pollutant concentrations in bottlenose dolphin tissues from several estuaries along the Atlantic coast and have likewise found evidence of high blubber concentrations particularly in estuaries near Charleston, South Carolina, and Beaufort, North Carolina (Hansen *et al.* 2004), and in portions of Biscayne Bay, Florida (Litz *et al.* 2007). The concentrations found in male dolphins from both of these sites exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). While there are no direct measurements of adverse effects of pollutants on estuarine dolphins and little study of contaminant loads in migrating coastal dolphins, the exposure to environmental pollutants and subsequent effects on population health is an area of concern and active research.

ble 2. Summary of annual reported and estimated mortality of bottlenose dolphins from the Southern Migratory 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**		**SE Gillnet (incidental takes)**	**Beach-based Gillnet Gear (strandings)**	**Virginia Pound Net (strandings and observed)**	**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 = 3.6 Max = 18.3	0	0	Min = 0 Max = 1	Min = 0 Max = 4	0	Min = 0 Max = 1	0	Min = 0 Max = 1	Min = 3.6 Max ≥ 25.3
2008	Min = 9.5 Max = 41.0	0	0	0	Min = 0 Max = 2	0	0	Min = 0 Max = 1	Min = 0 Max = 0	Min = 9.5 Max ≥ 44.0
2009	No estimate	Min = 0 Max = 1	0	0	Min = 0 Max = 4	Min = 0 Max = 1	0	0	Min = 0 Max = 1	Min = 0 Max ≥ 7
2010	No estimate	0	0	0	0	0	0	Min = 0 Max = 1	Min = 0 Max = 1	Min = 0 Max ≥ 2
2011	No estimate	Min = 0 Max = 1	0	0	Min = 0 Max = 1	0	0	Min = 0 Max = 2	0	Min = 0 Max ≥ 4
Annual Average Mortality (2007-2011)					Minimum Estimated = 2.6 Maximum Estimated ≥ 16.5					

Strandings

During 2007-2011, 533 bottlenose dolphins stranded along the Atlantic coast between Florida and Virginia that could potentially be assigned to the Southern Migratory 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 (SER) and 9 November 2012 (NER)). It was not possible to determine whether or not there was evidence of human interaction (HI) for 348 of these strandings, and for 89 it was determined there was no evidence of HI. The remaining 96 showed evidence of HI, of which 79 (82%) were fisheries interactions (Table 3). It should be recognized that evidence of HI 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. During spring and summer months in North Carolina, Virginia and Maryland, the stock overlaps with the Northern Migratory Coastal, Northern North Carolina Estuarine System and the Southern North Carolina Estuarine System Stocks. During fall and winter months, the stock overlaps with the Southern North Carolina Estuarine System Stock, the South Carolina/Georgia Coastal Stock, and the Northern Florida Coastal Stock. Therefore, the counts below include an unknown number of animals from these other stocks, and some of the strandings below were also included in the counts for these other stocks. In addition, 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 Virginia to Florida that can possibly be assigned to the Southern Migratory Stock. Assignments to stock were based upon the understanding of the seasonal movements of this stock. However, in waters of North Carolina and Virginia there is likely overlap with other stocks during particular times of year. 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
Maryland[a]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Virginia[a]	11[e]	5	28	13[f]	2	41	14[g]	6	54	7[h]	6	37	7[i]	5	31
North Carolina[b]	6[j]	8	30	8[k]	5[l]	29[m]	9[n]	5	19	6[o]	18	18	10[p]	13	20
South Carolina[c] (Dec-Mar)	0	4	5	0	0	4	0	4	2	1[q]	3	1	1[r]	2	5
Georgia[d] (Jan-Feb)	1	1	0	0	0	1	0	0	0	0	0	2	2	0	2
Florida[d] (Jan-Feb)	0	0	8	0	0	1	0	1	1	0	0	3	0	1	4
Annual Total	108			104			115			102			104		

[a] Strandings from Virginia and Maryland were assigned to stock based upon location and time of year with most occurring between May and September that could be assigned to the Southern Migratory Stock. Some of these strandings could also be assigned to the Northern Migratory Stock or Northern North Carolina Estuarine System Stock.
[b] Strandings from North Carolina were assigned based on location and time of year. During summer and fall, some of these strandings could also be assigned to the Northern North Carolina Estuarine System or Southern North Carolina Estuarine System Stocks.
[c] Strandings in coastal waters from South Carolina during December-March are potentially from the Southern Migratory Stock or the South Carolina/Georgia Coastal Stock.
[d] Strandings in Georgia and northern Florida during January and February could also be assigned to the South Carolina/Georgia or the Northern Florida Coastal Stocks, respectively.
[e] Includes 10 fisheries interactions (FI), 4 of which were animals (mortalities) entangled in VA pound nets.
[f] Includes 12 FIs, 2 of which were animals (mortalities) entangled in VA pound nets, and another of which was an

animal (mortality) entangled in hook and line gear. Also includes 1 mutilation.
[g] Includes 14 FIs, 4 of which were animals (mortalities) entangled in VA pound nets.
[h] Includes 5 FIs and 1 boat strike.
[i] Includes 6 FIs, 1 of which was also mutilated. One FI was an animal (mortality) entangled in a VA pound net.
[j] Includes 3 FIs and 1 incidental take in a research beach seine.
[k] Includes 8 FIs. One animal had also been mutilated and another had also been boat struck.
[l] Includes a mass stranding of 2 animals.
[m] Includes a mass stranding of 2 animals.
[n] Includes 8 FIs. One FI was an entanglement interaction (mortality) with blue crab pot gear. Also includes 1 incidental take in gillnet research gear. The research gear was a Spanish mackerel commercial fishing gillnet.
[o] Includes 4 FIs and 1 mutilation. One FI was an incidental take in research experimental gillnet gear targeting shark.
[p] Includes 7 FIs, 1 of which was a gillnet entanglement mortality from the mid-Atlantic gillnet fishery.
[q] Includes 1 FI (mortality) in which an animal ingested recreational hook and line gear.
[r] Includes 1 FI (mortality) in which an animal ingested hook and line gear.

STATUS OF STOCK

Bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, but the Southern Migratory Coastal Stock is a strategic stock due to the depleted listing under the Marine Mammal Protection Act. From 1995 to 2001, NMFS recognized only a single migratory stock of coastal morphotype bottlenose dolphins in the western North Atlantic, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units and again in 2008 and 2009 to recognize resident estuarine stocks and migratory and resident coastal stocks. This stock retains the depleted designation as a result of its origins from the original western North Atlantic Coastal Stock. PBR for the Southern Migratory Stock is 63 and so the zero mortality rate goal, 10% of PBR, is 6.3. The documented annual average human-caused mortality for this stock for 2007 – 2011 ranges between a minimum of 2.6 and a maximum of 16.5. However, the total U.S. human-caused mortality and serious injury for the Southern Migratory Stock cannot be directly estimated because of the spatial overlap among the stocks of bottlenose dolphins that occupy waters of North Carolina. In addition, there are several commercial fisheries operating within this stock's boundaries, but these have little to no observer coverage and so 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 therefore unlikely to be less than 10% of the calculated PBR, and thus 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 population trends for this stock.

REFERENCES CITED

Andersen, M.S., K.A. Forney, T.V.N. Cole, T. Eagle, R. Angliss, K. Long, L. Barre, L. Van Atta, D. Borggaard, T. Rowles, B. Norberg, J. Whaley and L. Engleby. 2008. Differentiating serious and non-serious injury of marine mammals: report of the serious injury technical workshop, 10-13 September 2007, Seattle, WA. NOAA Tech. Memo. NMFS-OPR-39. 94 pp.

Angliss, R.P. and D.P. DeMaster. 1998. Differentiating serious and non-serious injury of marine mammals taken incidental to commercial fishing operations: Report of the serious injury workshop, 1-2 April 1997, Silver Spring, MD. NOAA Tech. Memo. NMFS-OPR-13. 48 pp.

Balmer, B.C., R.S. Wells, S.M. Nowacek, D.P. Nowacek, L.H. Schwacke, W.A. McLellan, F.S. Scharf, T.K. Rowles, L.J. Hansen, T.R. Spradlin and D.A. Pabst. 2008. Seasonal abundance and distribution patterns of common bottlenose dolphins (*Tursiops truncatus*) near St. Joseph Bay, Florida, USA. J. Cetacean Res. Manage. 10: 157-167.

Barlow, J., S.L. Swartz, T.C. Eagle and P.R. Wade. 1995. U.S. Marine Mammal Stock Assessments: Guidelines for Preparation, Background and a Summary of the 1995 Assessments. NOAA Tech. Memo. NMFS-OPR-6, 73 pp.

Buckland, S. T., D. R. Andersen, K. P Burnham, J. L. Laake, D. L. Borchers and L. Thomas. 2001. Introduction to distance sampling: Estimating abundance of biological populations. Oxford University Press, New York. 432 pp.

Burdett, L.G. and W.E. McFee. 2004. Bycatch of bottlenose dolphins in South Carolina, USA, and an evaluation of the Atlantic blue crab fishery categorization. J. Cetacean Res. Mange. 6(3): 231-240.

Caldwell, M. 2001. Social and genetic structure of bottlenose dolphin (*Tursiops truncatus*) in Jacksonville, Florida. Ph.D. dissertation from University of Miami. 143 pp.

Cortese, N.A. 2000. Delineation of bottlenose dolphin populations in the western Atlantic Ocean using stable isotopes. Master's thesis from University of Virginia, Charlottesville. 118 pp.

CETAP (Cetacean and Turtle Assessment Program). 1982. A characterization of marine mammals and turtles in the mid- and North Atlantic areas of the U.S. outer continental shelf. Final Report, Contract AA551- CT8- 48, U.S. NTIS PB83-215855, Bureau of Land Management, Washington, D.C. 576 pp.

Duffield, D.A. and R.S. Wells 2002. The molecular profile of a resident community of bottlenose dolphins, *Tursiops truncatus*. pp. 3-11. *In*: C. J. Pfeiffer, (ed.) Cell and Molecular Biology of Marine Mammals. Krieger Publishing, Melbourne, FL. 464 pp.

Garrison, L.P. 2007. Estimated marine mammal and turtle bycatch in shark gillnet fisheries along the Southeast US Atlantic coast: 2000-2006. NMFS Southeast Fisheries Science Center. PRD Contribution #PRBD-07/08-02. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.

Garrison, L.P., P.E. Rosel, A.A. Hohn, R. Baird and W. Hoggard. 2003. Abundance of the coastal morphotype of bottlenose dolphin *Tursiops truncatus*, in U.S. continental shelf waters between New Jersey and Florida during winter and summer 2002. NMFS/SEFSC report prepared and reviewed for the Bottlenose Dolphin Take Reduction Team. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.

Garrison, L.P. and C. Yeung. 2001. Abundance estimates for Atlantic bottlenose dolphin stocks during summer and winter, 1995. NMFS/SEFSC report prepared and reviewed for the Bottlenose Dolphin Take Reduction Team. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.

Hansen, L.J., L.H. Schwacke, G.B. Mitchum, A.A. Hohn, R.S. Wells, E.S. Zolman and P.A. Fair. 2004. Geographic variation in polychlorinated biphenyl and organohaline pesticide concentrations in the blubber of bottlenose dolphins from the US Atlantic coast. Sci. Total Environ. 319: 147-172.

Hoelzel, A.R., C.W. Potter and P.B. Best. 1998. Genetic differentiation between parapatric nearshore and offshore populations of the bottlenose dolphin. Proc. Royal Soc. London 265: 1177-1183.

Kenney, R.D. 1990. Bottlenose dolphins off the northeastern United States. pp. 369-386. *In:* S. Leatherwood and R. R. Reeves (eds.) The bottlenose dolphin. Academic Press, San Diego, CA. 653 pp.

Knoff, A.J. 2004. Bottlenose dolphin (*Tursiops truncatus*) population structure along the Atlantic coast of the United States: A stable isotope approach. Ph.D. Dissertation, University of Virginia, Charlottesville, VA, 156 pp.

Kuehl, D.W., R. Haebler and C. Potter. 1991. Chemical residues in dolphins from the US Atlantic coast including Atlantic bottlenose obtained during the 1987/1988 mass mortality. Chemosphere 22: 1071-1084.

Laake, J.L. and D.L. Borchers. 2004. Methods for incomplete detection at distance zero. pp. 108-189. *In:* S.T. Buckland, D.R. Andersen, K.P. Burnham, J.L. Laake and L. Thomas (eds.) Advanced distance sampling. Oxford University Press, New York.

Litz, J.A., L.P. Garrison, L.A. Fieber, A. Martinez, J.P. Contillo and J.R. Kucklick. 2007. Fine-scale spatial variation of persistent organic pollutants in bottlenose dolphins (*Tursiops truncatus*) in Biscayne Bay, Florida. Environ. Sci. Technol. 41: 7222-7228.

Litz, J.A., C.R. Hughes, L.P. Garrison, L.A. Fieber and P.E. Rosel. 2012. Genetic structure of common bottlenose dolphins (*Tursiops truncatus*) inhabiting adjacent South Florida estuaries - Biscayne Bay and Florida Bay. J. Cetacean Res. Manage. 12(1): 107-117.

Mazzoil, M., J.S. Reif, M. Youngbluth, M.E. Murdoch, S.E. Bechdel, E. Howells, S.D. McCulloch, L.J. Hansen and G.D. Bossart. 2008. Home ranges of bottlenose dolphins (*Tursiops truncatus*) in the Indian River Lagoon, Florida: Environmental correlates and implications for management strategies. EcoHealth 5: 278-288.

Mead, J.G. and C.W. Potter. 1995. Recognizing two populations of the bottlenose dolphin (*Tursiops truncatus*) off the Atlantic coast of North America: Morphological and ecological considerations. IBI Reports 5: 31-44.

McLellan, W.M., A.S. Friedlaender, J.G. Mead, C.W. Potter and D.A. Pabst. 2003. Analysing 25 years of bottlenose dolphin (*Tursiops truncatus*) strandings along the Atlantic coast of the USA: Do historic records support the coastal migratory stock hypothesis? J. Cetacean Res. Manage. 4: 297-304.

NMFS. 1991. Proposed regime to govern the interactions between marine mammals and commercial fishing operations after October 1, 1993. Draft Environmental Impact Statement, June 1991.

NOAA. 2012. Federal Register 77:3233. National policy for distinguishing serious from non-serious injuries of marine mammals. Available from: http://www.nmfs.noaa.gov/op/pds/documents/02/238/02-238-01.pdf

Rosel, P.E., L. Hansen and A.A. Hohn. 2009. Restricted dispersal in a continuously distributed marine species: Common bottlenose dolphins *Tursiops truncatus* in coastal waters of the western North Atlantic. Mol. Ecol. 18: 5030–5045.

Rossman, M.C. and D.L. Palka. 2001. Bycatch estimates of coastal bottlenose dolphin (*Tursiops truncatus*) in the

U.S. mid-Atlantic gillnet fisheries for 1996 to 2000. Northeast Fisheries Science Center Reference Document 01-15. 77 pp.

Schwacke, L.H., E.O. Voit, L.J. Hansen, R.S. Wells, G.B. Mitchum, A.A. Hohn and P.A. Fair. 2002. Probabilistic risk assessment of reproductive effects of polychlorinated biphenyls on bottlenose dolphins (*Tursiops truncatus*) from the southeast United States coast. Env. Toxic. Chem. 21: 2752-2764.

Scott, G.P., D.M. Burn and L.J. Hansen. 1988. The dolphin die off: Long term effects and recovery of the population. Proceedings: Oceans '88, IEEE Cat. No. 88-CH2585-8, Vol. 3: 819-823.

Scott, M.D., R.S. Wells and A.B. Irvine. 1990. A long-term study of bottlenose dolphins on the west coast of Florida. pp. 235-244. *In:* S. Leatherwood and R. R. Reeves (eds.) The bottlenose dolphin. Academic Press, San Diego, CA. 653 pp.

Stolen, M.K., W.N. Durden and D.K. Odell. 2007. Historical synthesis of bottlenose dolphin (*Tursiops truncatus*) stranding data in the Indian River Lagoon system, Florida, from 1977-2005. Fla. Sci. 70: 45-54.

Speakman, T., E.S. Zolman, J. Adams, R.H. Defran, D. Laska, L. Schwacke, J. Craigie and P. Fair. 2006. Temporal and spatial aspects of bottlenose dolphin occurrence in coastal and estuarine waters near Charleston, South Carolina. NOAA Tech. Memo. NOS-NCCOS-37, 243 pp.

Taylor, B.L., M. Martinez, T. Gerrodette, J. Barlow and Y.N. Hrovat. 2007. Lessons from monitoring trends in abundance in marine mammals. Mar. Mamm. Sci. 23(1): 157-175.

Wade, P.R. and R.P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop April 3-5, Seattle, Washington. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.

Weller, D.W. 1998. Global and regional variation in the biology and behavior of bottlenose dolphins. Ph.D. dissertation from Texas A&M University, College Station. 142 pp.

Wells, R.S., M.D. Scott and A.B. Irvine. 1987. The social structure of free ranging bottlenose dolphins. pp. 247-305. *In:* H. Genoways (ed.) Current Mammalogy, Vol. 1. Plenum Press, New York. 519 pp.

Wells, R.S., V. Tornero, A. Borrell, A. Aguilar, T.K. Rowles, H.L. Rhinehart, S. Hofmann, W.M. Jarman, A.A. Hohn and J.C. Sweeney. 2005. Integrating life history and reproductive success data to examine potential relationships with organochlorine compounds for bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. Sci. Total Environ. 349: 106-119.

Wells, R.S., K.W. Urian, A.J. Read, M.K. Bassos, W.J. Carr and M.D. Scott. 1996. Low-level monitoring of bottlenose dolphins, *Tursiops truncatus*, in Tampa Bay, Florida: 1988-1993. NOAA Tech. Memo. NMFS-SEFSC- 385, 25 pp. + 6 Tables, 8 Figures, and 4 Appendices.

Zolman, E.S. 2002. Residence patterns of bottlenose dolphins (*Tursiops truncatus*) in the Stono River Estuary, Charleston County, South Carolina. Mar. Mamm. Sci. 18: 879-892.