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

STOCK DEFINITION AND GEOGRAPHIC RANGE

Stock Structure of the Coastal Morphotype

A. Latitudinal distribution and structure along the coast

The coastal morphotype is continuously distributed along the Atlantic coast south of Long Island, around peninsula Florida and along the Gulf of Mexico coast. On the basis of differences in mtDNA haplotype frequencies, however, Curry (1997) concluded that the nearshore animals in the northern Gulf of Mexico and the western North Atlantic were significantly different and represent separate stocks.

Within the western North Atlantic, the stock structure of coastal bottlenose dolphins is complex. Scott *et al.* (1988) hypothesized a single coastal migratory stock ranging seasonally from as far north as Long Island, NY, to as far south as central Florida, citing stranding patterns during a high mortality event in 1987-88 and observed density patterns along the US Atlantic coast. The continuous distribution of dolphins along the coast seemed to support this hypothesis. It was recognized that bottlenose dolphins were resident in some estuaries; these were considered to be separate from the coastal migratory animals. More recent studies suggest that the single coastal migratory stock hypothesis is incorrect and that there is likely a complex mosaic of stocks. For example, year-round resident populations have been reported at a variety of sites in the southern part of the range, from Charleston, South Carolina (Zolman 1996) to central Florida (Odell and Asper 1990); seasonal residents and migratory or transient animals also occur in these areas (summarized in Hohn 1997). In the northern part of the range the patterns reported include seasonal residency, year-round residency with large home ranges, and migratory or transient movements (Barco and Swingle 1996, Sayigh *et al.* 1997). Communities of dolphins have been recognized in embayments and coastal areas of the Gulf of Mexico (Wells *et al.* 1996; Scott *et al.* 1990; Weller 1998) so it is not surprising to find similar situations along the Atlantic coast.

Recent genetic analyses of samples from Jacksonville, FL, southern South Carolina (primarily the estuaries around Charleston), southern North Carolina, and coastal Virginia, using both mitochondrial DNA and nuclear microsatellite markers, indicate that a significant amount of the overall genetic variation can be explained by differences between the groups (NMFS 2001). The degree of population subdivision, estimated using the parameter F_{ST}, between each of the groups was statistically significant. These results indicate a minimum of four populations of coastal bottlenose dolphins in the Northwest Atlantic and reject the null hypothesis of one homogeneous population of bottlenose dolphins.

Another potential population has been identified from stable isotope ratios of oxygen (NMFS 2001). Animals sampled along the beaches of North Carolina between Cape Hatteras and Bogue Inlet during the months of February and March show very low stable isotope ratios of ^{18}O relative to ^{16}O (referred to as depleted ^{18}O or depleted oxygen) (Cortese 2000). One possible explanation for the depleted oxygen signature is that there is a resident group of dolphins in Pamlico Sound. Alternatively, these animals may represent a component of the migratory animals that spend their summers at the northernmost end of the range of bottlenose dolphins and winter in North Carolina. Either possibility suggests they represent a separate stock. Stable isotope ratios of ^{18}O from samples taken in estuarine waters around Charleston, SC, showed little variation and none were at depleted levels.

Photo-identification studies also support the existence of multiple stocks (NMFS 2001). A coastwide photographic catalogue has been established using contributions from 15 sites from Cape May, NJ, to Cape Canaveral, FL (Urian *et al.* 1999). No matches have been found between the northernmost and southernmost sites. However, there appears to be a high rate of exchange among northern field sites, where dolphins occur only seasonally, and central North Carolina including the Beaufort area. Other areas of frequent exchange include Beaufort and Wilmington, NC. In contrast to the patterns found in the northern end of the range, there appears to be less movement between southern field sites – there are only two confirmed matches between the relatively large catalogs of Jacksonville, FL, and Hilton Head, SC, for example, and no matches between the Charleston, SC site and other sites.

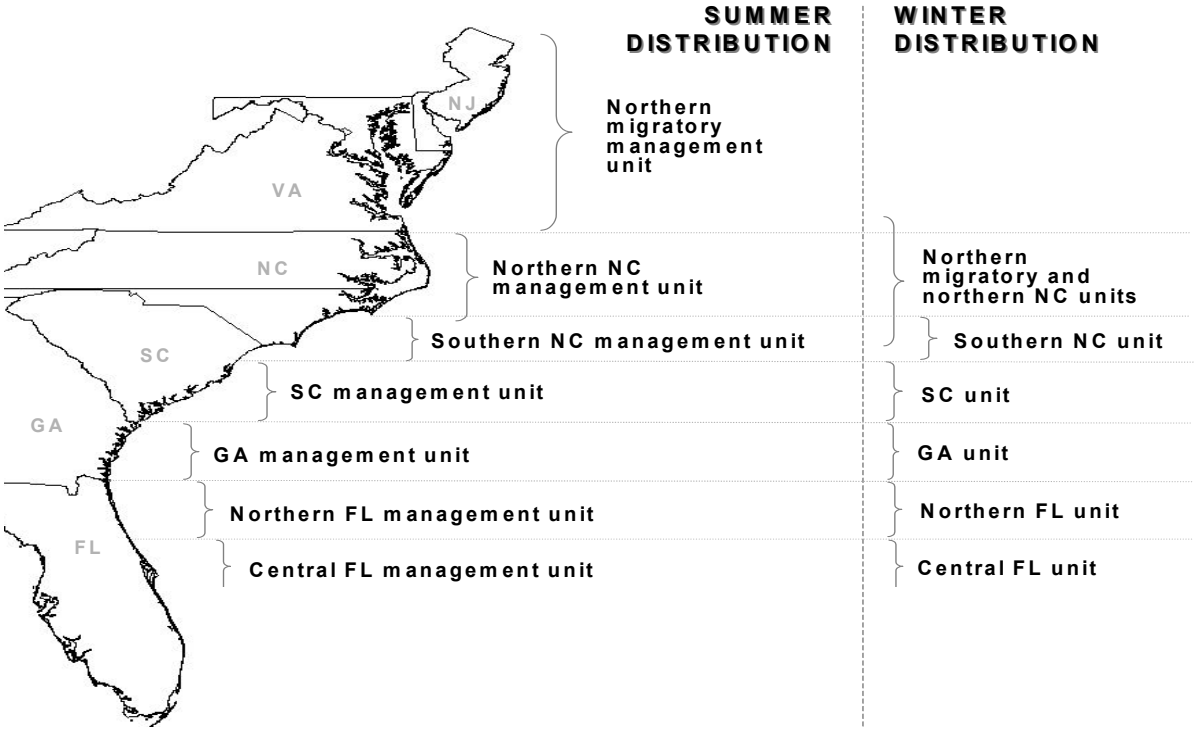
Satellite-linked radio transmitters have been deployed on dolphins in Virginia Beach, VA, Beaufort, NC, and Charleston, SC. The movement patterns of animals with satellite tags provided additional information that was complementary to the photo-identification, genetic, and stable isotope studies. The results, along with photo-identification of freeze-branded animals, indicate that a significant number of dolphins reside in NC in summer and do not migrate. Satellite telemetry results reinforced the photo-identification results from Charleston, SC, indicating a resident population there. Finally, a dolphin tagged in Virginia Beach, VA, spent the winter between Cape Hatteras and Cape Lookout, NC, rather than migrating to Florida as would have been expected in the single coastal-migratory-stock hypothesis (NMFS 2001).

Stable isotope ratios of oxygen suggested the possibility of a resident group of bottlenose dolphins in Pamlico Sound, NC (NMFS 2001). Animals sampled along the beaches of North Carolina between Cape Hatteras and Bogue Inlet during the months of February and March show very low stable isotope ratios of ^{18}O relative to ^{16}O (referred to as depleted ^{18}O or depleted oxygen) (Cortese 2000). One possible explanation for the depleted oxygen

signature is that there is a resident group of dolphins in Pamlico Sound that move into nearby nearshore areas in the winter when Pamlico Sound may have an inadequate resource base. The possibility of a resident group of bottlenose dolphins in Pamlico Sound is supported by the results from satellite telemetry and photo-identification results. Alternatively, however, these animals may represent a component of the migratory animals that spend their summers at the northernmost end of the range of bottlenose dolphins and winter in North Carolina. Either possibility suggests they represent a separate stock. Stable isotope ratios of ^{18}O from samples taken in estuarine waters around Charleston, SC, showed little variation and none were at depleted levels.

In summary, integration of the preliminary results from genetics, photo-identification, satellite telemetry, and stable isotope studies confirms a complex mosaic of stocks of coastal bottlenose dolphins in the western North Atlantic. As an interim measure, pending additional results, seven management units within the range of the "coastal migratory stock" have been defined (Figure 1). The true population structure is likely more than the seven units identified in this report; research efforts continue in an attempt to identify that structure.

Figure 1. Management units of the coastal morphotype of bottlenose dolphins along the Atlantic coast of the U.S. as defined from recent results from genetic, stable isotope ratio, photo-identification, and telemetry studies (per Hohn 1997; NMFS 2001).



B. Longitudinal distribution

Earlier aerial (CETAP 1982) and shipboard (NMFS unpublished data) surveys north of Cape Hatteras identified two concentrations of bottlenose dolphins, one inshore of the 25 m isobath and the other offshore of the 25 m isobath. The lowest density of bottlenose dolphins was observed over the continental shelf, with higher densities along the coast and near the continental shelf edge. It was suggested, therefore, that the coastal morphotype is restricted to waters < 25 m in depth north of Cape Hatteras (Kenney 1990). There was no apparent longitudinal discontinuity in bottlenose dolphin herd sightings during aerial surveys south of Cape Hatteras in the winter (Blaylock and Hoggard 1994). NMFS surveys conducted from 1992-1998 show a clustering of bottlenose dolphins nearshore and then additional bottlenose dolphins in the offshore areas. However, the morphotype of bottlenose dolphins (WNA offshore or WNA coastal) can not be determined from the air so attributing each sighting to a specific morphotype cannot be done. There is also a potential for confusing immature spotted dolphins, with few or no spots dorsally, with bottlenose dolphins where the two species are sympatric.

In 1995, NMFS conducted two aerial surveys along the Atlantic coast (Blaylock 1995; Garrison and Yeung 2001). One survey was conducted during summer 1995 between Cape Hatteras, NC, and Sandy Hook, NJ, and included three replicate surveys. The second survey was conducted during winter 1995 between Cape Hatteras,

NC, and Ft. Pierce, FL. A distributional analysis identified a significant spatial pattern in bottlenose dolphin sightings as a function of distance from shore (Garrison 2001a). During the northern (summer) surveys, the significant spatial boundary occurred at 12 km from shore. During the southern (winter) survey, the significant spatial boundary occurred at 27 km from shore. The gap in sightings best defines, for the time being, the eastern extent of the coastal morphotype for purposes of habitat definition and abundance estimates. NMFS continues to collect biopsy samples from *Tursiops* throughout the possible range of the coastal morphotype so that stock boundaries can be confirmed or modified on the basis of a more comprehensive data set.

POPULATION SIZE

The 1995 aerial surveys were conducted to estimate population size of the hypothesized single coastal migratory stock (Blaylock 1995; Garrison and Yeung 2001). The summer aerial survey was conducted between July 1 and August 14, 1995, covering Cape Hatteras, NC, to Sandy Hook, NJ, (35.23ºN-40.5ºN), and from the mainland shore to the 25 m isobath. This survey provided coverage and abundance estimates for the Northern Migratory (NM) and Northern North Carolina (NNC) management units. However, coverage of the NNC unit was incomplete as the surveys did not cover the region south of Cape Hatteras, NC, to Cape Lookout, NC. Abundance was estimated for each stratum pooling across the three replicate surveys. The winter survey was conducted between January 27 and March 6, covering from Fort Pierce, FL, to Cape Hatteras, NC, (27.30ºN-35.23ºN), from the mainland shore to 9.25 km (5 Nautical Miles) beyond the inshore edge of the Gulf Stream or <200 km offshore. This survey included coverage of the NNC, Southern North Carolina (SNC), South Carolina (SC), Georgia (GA), Northern Florida (NFL) and Central Florida (CFL) management units. However, the coverage of the NNC management unit was incomplete and did not include the region north of Cape Hatteras, NC. These abundance estimates also include NM unit animals that have migrated south of the NC/VA border during winter. Abundance for each management unit was estimated using line transect methods and the program DISTANCE (Buckland *et al.* 1993) for both the winter and summer surveys (Table 1). There was no significant difference between the abundance estimates for the combined NM and NNC management units in summer and the combined NM, NNC, and SNC stocks in winter.

Another set of aerial surveys was conducted parallel to the coastline from the North Carolina/South Carolina border to the Maryland/Delaware border during 1998 and 1999 to document the distribution of dolphins and fishing gear in nearshore waters (Hohn *et al.* unpubl. data). These strip transect surveys were conducted weekly, weather permitting, over 12 months in most of North Carolina and for six months (May to December) in Virginia and Maryland. In retrospect, they provide seasonal coverage of the Southern North Carolina, Northern North Carolina, and Northern Migratory management units (Figure 1; Hohn *et al.* unpubl. data). The strip transect surveys cannot be used directly for abundance estimation because they did not follow the design constraints of line transect survey methods and covered only a small proportion of the habitat of coastal bottlenose dolphin. The density of dolphins near the coastline is high relative to habitats further offshore, and the use of density estimates in this region to calculate overall abundance would likely result in significant positive bias. However, these surveys do provide information on the relative abundance of dolphins between regions that may be used to supplement the abundance estimates from the line transect surveys conducted in 1995 (Garrison and Hohn 2001). Both sets of aerial surveys covered ocean coasts only. An abundance estimate was generated for bottlenose dolphins in estuarine waters of North Carolina using mark-recapture methodology (Read *et al.* In review). It is possible to post-stratify the mark-recapture estimates consistent with management unit definitions (Palka *et al.* 2001) (Table 1).

Table 1. Estimates of abundance and the associated CV, n_{min}, and PBR for each management unit of WNA coastal bottlenose dolphins (from Palka *et al.* 2001). The PBR for the Northern Migratory, Northern NC, and Southern NC management units are applied biannually. For management units south of NC, the PBR is applied annually.

Management Unit		Best Abundance		N_{min}	PBR	
		Estimate	CV		Annual	½ Yr
SUMMER (May - October)						
Northern migratory		5681	24.4	4,640	(46)	23
Northern NC						
	oceanic	3,383	41.8	2,413	(24)	12
	estuary	919	12.5	828	(8.3)	4.2
	BOTH	4,302	33	3,281	(33)	16
Southern NC						
	oceanic	1,157	50	777	(7.8)	3.9

	estuary	141	15.2	124	(1.2)	0.6
	BOTH	1,298	44.6	907	(9.1)	4.5
WINTER (November - April)						
NC mixed*		6,474	39.7	4,691	(47)	23
South Carolina		3,513	47	2,412	24	na
Georgia		767	78.4	428	4.3	na
Northern Florida		354	56	228	2.3	na
Central Florida		10,652	45.8	7,377	74	na

NC mixed* = northern migratory, Northern NC, and Southern NC

Abundance estimates for each management unit are the sum of estimates, where appropriate, from the recent analyses. Estimated overall abundance was 9,206 from summer surveys and 19,459 from winter surveys. However, for consistency with achieving the goals of the MMPA, such as maintaining marine mammals as functioning components of their ecosystems, it is more appropriate to establish abundance estimates for each management unit. Abundance for each management unit was estimated by post-stratifying sightings and effort data consistent with geographic and seasonal management unit boundaries (Table 1) (Garrison and Yeung 2001; Palka *et al.* 2001). Although these estimates are better than previous abundance estimates for coastal bottlenose dolphins, there remain potential biases. The aerial survey estimates are not corrected for g(0), the probability of detecting a group on the track line as a function of perception bias and availability bias. The exclusion of g(0) from the abundance estimate results in a negative bias of unknown magnitude. The relatively large herd sizes in the summer surveys north of Cape Hatteras likely reduce this bias; however, herd sizes were smaller south of Cape Hatteras during winter, likely resulting in greater negative bias (Palka, unpub. data). A positive bias may occur if the longitudinal boundaries have been extended too far offshore resulting in offshore dolphins being included in the abundance estimates for the coastal morphotype or if estuarine dolphins were overrepresented in coastal waters during the time of the survey. Further uncertainties in the abundance estimates result from incomplete coverage of some seasonal management units during the line transect surveys. While the strip transect surveys were used to supplement the survey coverage, uncertainties associated with that analysis also introduce uncertainty in the overall abundance estimate (Garrison and Hohn 2001). The SEFSC intends to conduct both winter and summer coastwide aerial surveys during 2002 to obtain more robust abundance estimates.

Minimum Population Estimate

The minimum population size (NMIN) for each management was calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997): NMIN= N/exp(0.842×[ln(1+[CV(N)]2)]½) (Table 1). It is recognized that these estimates may be negatively biased because they do not include corrections for g(0) and, for some of the managements units, do not include the entire spatial range of the unit during that season. The strip transect surveys compensate for some of the abundance omitted during line-transect survey; nonetheless, for some management units the entire range was not covered.

Current Population Trend

There are insufficient data to determine the population trend for this stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the WNA coastal morphotype. 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 (Wade and Angliss 1997). The "recovery" factor is assumed to be 0.50, the default for depleted stocks and stocks of unknown status. At least part of the range-wide stock complex is depleted; for the remainder, status is unknown. For consistency with achieving the goals of the MMPA, such as maintaining marine mammals as functioning components of their ecosystems, it is more appropriate to establish separate PBRs for each management unit (Table 1).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total estimated average annual fishery-related mortality or serious injury resulting from observed fishing trips during 1996-2000 was 233 bottlenose dolphins (CV=0.16) in the mid-Atlantic coastal gillnet fishery. The

management units affected by this fishery would be the NM, NNC, and SC. An estimated 24 (CV=0.89) were taken in the shark drift gillnet fishery off the coast of Florida during 1999-2000, affecting the Central and Northern Florida management units. No estimates of mortality from observed trips are available for any of the other fisheries that interact with WNA coastal bottlenose dolphins. Therefore, the total average annual mortality estimate is considered to be a lower bound of the actual annual human-caused mortality and serious injury.

Fishery Information

Bottlenose dolphins are known to interact with commercial fisheries and occasionally are taken in various kinds of fishing gear including gillnets, seines, long-lines, shrimp trawls, and crab pots (Read 1994; Wang *et al.* 1994) especially in near-shore areas where dolphin densities and fishery efforts are greatest. There are nine Category II commercial fisheries that interact with WNA coastal bottlenose dolphins in the 2001 MMPA List Of Fisheries (LOF), six of which occur in North Carolina waters. Category II fisheries include the mid-Atlantic coastal gillnet, NC inshore gillnet, mid-Atlantic haul/beach seine, NC long haul seine, NC stop net, Atlantic blue crab trap/pot, Southeast Atlantic gillnet, Southeastern U.S. Atlantic shark gillnet and the Virginia pound net (Table 1.1) (see 2001 List of Fisheries, 66 FR 42780, August 15, 2001). The mid-Atlantic haul/beach seine fishery also includes the haul seine and swipe net fisheries. The term mid-Atlantic refers to the geographic area south of Long Island, landward to the 72˚ 30' W. line, and north of the line extending due east from the North Carolina/South Carolina border (66 FR 6545, January 22, 2001).

There are five Category III fisheries that may interact with WNA coastal bottlenose dolphins. Three of these are inshore gillnet fisheries: the Delaware Bay inshore gillnet, the Long Island Sound inshore gillnet, and the Rhode Island, southern Massachusetts, and New York Bight inshore gillnet. The remaining two are the shrimp trawl and mid-Atlantic menhaden purse seine fisheries. There are have been no takes observed by the NMFS observer programs in any of these fisheries.

Mid-Atlantic Coastal Gillnet

The mid-Atlantic coastal gillnet fishery is actually a combination of small-vessel fisheries that target a variety of fish species, including bluefish, croaker, spiny and smooth dogfish, kingfish, Spanish mackerel, spot, striped bass, and weakfish (Steve *et al.* 2001). It operates in different seasons targeting different species in different states throughout the range of the coastal morphotype. Most nets are set gillnets without anchors and are fished close to shore. Anchored set gillnets or drift gillnets are used in some fisheries (e.g., monkfish or dogfish). A comprehensive description of coastal gillnet gear and fishing effort in North Carolina is available in Steve *et al.* (2001). This fishery has the highest documented level of mortality of WNA coastal bottlenose dolphins; the North Carolina sink gillnet fishery is its largest component in terms of fishing effort and observed takes. Bycatch estimates are available for the past five years, 1996-2000 (Table 2). Of 12 observed mortalities from 1995-2000, 5 occurred in sets targeting spiny or smooth dogfish and another 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).

Table 2. Summary of the 1996-2000 incidental mortality of bottlenose dolphins (*Tursiops truncatus*) by management unit in the commercial mid-Atlantic coastal gillnet fisheries. Data include the years sampled (Years), the number of vessels active within the fishery (Vessels), type of data used (Data Type), observer coverage (Observer Coverage), mortalities recorded by on-board observers (Observed Mortality), estimated annual mortality (Estimated Mortality), estimated CV of the annual mortality (Estimated CVs), and mean annual mortality (CV in parentheses).

Seasonal Management Unit	Years	Vessels	Data Type[1]	Observer Coverage[2]	Observed Serious Injury	Observed Mortality	Estimated Mortality	Estimated CVs[3]	Mean Annual Mortality
Summer Northern Migratory	1996-2000	NA	Obs. Data, NER Dealer Data	.05, .03, .02, .03, .03	0, 0, 0, 0, 0	0, 0, 1, 1, 1	33, 30, 37, 19, 30	0.48	30 (0.22)
Summer Northern NC	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.01, .00, <.01, .01, .03	0, 0, 0, 0, 0	1, 0, 0, 0, 0	27, 33, 17, 13, 26	0.61	23 (0.29)
Summer Southern NC	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.00, .00, .01, .03, .03	0, 0, 0, 0, 0	0, 0, 0, 0, 0	0, 0, 0, 0, 0	NA	0 (NA)
Winter NC mixed	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.01, .01, .02, .02, .02	0, 0, 0, 0, 0	1, 0, 1, 2, 2	173, 211, 175, 196, 146	0.46	180 (0.21)
Total									233 (0.16)

NA=Not Available

[1] Observer data (Obs. data) are used to measure bycatch rates; the USA data are collected within the Northeast Fisheries Science Center (NEFSC) Fisheries Observer Program. The NEFSC collects weighout (Weighout) landings data that are used as a measure of total effort for the USA sink gillnet fisheries.

[2] The observer coverage for the mid-Atlantic coastal sink gillnet fishery is measured in tons of fish landed.

[3] The annual estimates of mortality were generated by applying one bycatch rate per management unit as estimated by a GLM (Palka and Rossman 2001). The CV does not account for variability that may exist in the unit of total landings (mt) from each year that are used to expand the bycatch rate. Therefore, the CV is the same for all five annual estimates.

A sink gillnet fishery for American shad operates seasonally from Connecticut to Georgia, with nets being moved from coastal ocean waters into fresh water with the shad spawning migration. It has been considered likely that a few bottlenose dolphins are taken in this fishery each year (Read 1994) but no takes have been observed (NEFSC observer data). The portion of the fishery which operates along the South Carolina coast was sampled by observers during 1994 and 1995, and no fishery interactions were observed (McFee *et al.* 1996).

South Atlantic Shark Gillnet

The shark gillnet fishery operates in federal waters from southern Florida to southern Georgia. The fishery is defined by vessels using relatively large mesh nets (>10 inches) and net lengths typically greater than 1500 feet. The fishery primarily uses drifting nets that are set overnight, however recently it has been employing a small number of shorter duration "strike" sets that encircle targeted schools of sharks. Since 1999, the Atlantic Large Whale Take Reduction Plan restricted the activities of the fishery to waters south of 27° 51' N latitude during the critical right whale season from 15 November – 31 March and mandated 100% observer coverage during this period. During the remainder of the year, these vessels generally operate north of Cape Canaveral, FL and there is little observer coverage of the fleet.

The fishery potentially interacts with the Georgia, Northern Florida, and Central Florida management units of coastal bottlenose dolphin. During an observer program in 1993 and 1994 and limited observer coverage during summer 1998, no takes of bottlenose dolphin were observed (Trent *et al.* 1997; Carlson and Lee, 2000). However, takes resulting in mortality were observed in the central Florida management unit during 1999 and 2000. Total bycatch mortality for this management unit has been estimated for 1999 and 2000 (Table 3) (Garrison 2001b).

Table 3. Summary of the 1999-2000 incidental mortality of bottlenose dolphins (*Tursiops truncatus*) by management unit in the driftnet fishery in federal waters off the coast of Florida. Data include years sampled (Years), number of vessels active within the fishery (Vessels), type of data used (Data Type), annual observer coverage (Observer Coverage), mortalities recorded by on-board observers (Observed Mortality), estimated annual mortality (Estimated Mortality), estimated CV of the annual mortality (Estimated CVs), and mean annual mortality (CV in parentheses).

Seasonal Management Unit	Years	Vessels	Data Type [1]	Observer Coverage [2]	Observed Serious Injury	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northern Florida	1999-2000	6	Obs. Data, SEFSC FVL	0.31, 0.05	0, 0	0, 0	0, 0	NA	0
Central Florida	1999-2000	6	Obs. Data, SEFSC FVL	0.09, 0.24	0, 0	4, 1	43, 4	0.78, 1	24 (0.89)

NA=Not Available

[1] Observer data are used to estimate bycatch rates. The SEFSC Fishing Vessel Logbook (FVL) is used to estimate effort as total number of vessel trips per bottlenose dolphin management unit.

[2] Observer coverage in the central Florida management unit is largely restricted to the period between January - March south of 27° 51' N.

Beach Haul Seine

A beach seine fishery operates along northern North Carolina beaches targeting striped bass, mullet, spot, weakfish, sea trout, and bluefish. The fishery operates on the Outer Banks of North Carolina primarily in the spring (April through June) and fall (October through December). It uses two primary gear types: a "beach anchored gill net" and a "beach seine". Both systems utilize a small net anchored to the beach. The beach seine system also uses a bunt and a wash net that are attached to the beach and are in the surf (Steve *et al.* 2001). The North Carolina beach seine fishery has been observed since April 7, 1998 by the NMFS fisheries sampling program (observer program) based at the Northeast Fisheries Science Center. Through 2001, there were 101 sets observed during the winter season (Nov-Apr) and 65 sets observed during the summer season (May-Oct). There were no sets observed during the summer of 2001. A total of 2 coastal bottlenose dolphin takes were observed, 1 in May 1998 and 1 in December 2000. The beach seine observer data are currently being reviewed but estimates of mortality are not yet available.

Crab Pots

Between 1994 and 1998, 22 bottlenose dolphin carcasses (4.4 dolphins per year on average) recovered by the Stranding Network between North Carolina and Florida's Atlantic coast displayed evidence of possible interaction with a trap/pot fishery (i.e., rope and/or pots attached, or rope marks). Additionally, at least 5 dolphins were reported to be released alive (condition unknown) from blue crab traps/pots during this time period. In recent years, reports of strandings with evidence of interactions between bottlenose dolphins and both recreational and commercial crab-pot fisheries have been increasing in the Southeast Region (McFee and Brooks 1998). The increased reporting may result from increased effort towards documenting these marks or increases in mortality.

Virginia Pound Nets

Data from the Chesapeake Bay suggest that the likelihood of bottlenose dolphin entanglement in pound net leads may be affected by the mesh size of the lead net (Bellmund *et al.* 1997), but the information is not conclusive. Stranding data for 1993-1997 document interactions between WNA coastal bottlenose dolphins and pound nets in Virginia. Two bottlenose dolphin carcasses were found entangled in the leads of pound nets in Virginia during 1993-1997, for an average of 0.4 bottlenose dolphin strandings per year. A third record of an entangled bottlenose dolphin in Virginia in 1997 may have been applicable to this fishery. This entanglement involved a bottlenose dolphin carcass found near a pound net with twisted line marks consistent with the twine in the nearby pound net lead rather than with monofilament gillnet gear. Given that other sources of annual serious injury and mortality estimates (e.g., observer data) are not available, the stranding data (0.4 bottlenose dolphins per year) were used as a minimum estimate of annual serious injury and mortality and this fishery was classified as a Category II fishery in the 2001 List of Fisheries.

Shrimp Trawl

The shrimp trawl fishery operates from North Carolina through northern Florida virtually year around, moving seasonally up and down the coast. One bottlenose dolphin was recovered dead from a shrimp trawl in Georgia in 1995 (Southeast USA Marine Mammal Stranding Network unpublished data), and another was taken in 1996 near the mouth of Winyah Bay, SC, during a research survey. No other bottlenose dolphin mortality or serious injury has been previously reported to NMFS.

Menhaden Purse Seine

The Atlantic menhaden purse seine fishery targets the Atlantic menhaden in Atlantic coastal waters. Smith (1999) summarized menhaden fishing patterns by the Virginia-North Carolina vessels from 1985-1996. Most of the catch and sets during that time occurred within three miles of the shore. Between 1994 and 1997, menhaden were processed at only three facilities, two in Reedville Beach, VA, and one in Beaufort, NC. Each of the Virginia facilities had a fleet of 9-10 vessels while the Beaufort facility is supported by 2-6 vessels. Since 1998, only one plant has operated in Virginia and the number of vessels has been reduced to ten in Virginia and two in North Carolina (Vaughan *et al.* 2001). The fishery moves seasonally, with most effort occurring off of North Carolina from November-January and moving northward to southern New England during warmer months. Menhaden purse seiners have reported an annual incidental take of 1 to 5 bottlenose dolphins (NMFS 1991, pp. 5-73), although observer data are not available.

Other Mortality

From 1997-1999, 995 bottlenose dolphins were reported stranded along the Atlantic coast from New York to Florida (Table 4) (Hohn and Martone 2001; Hohn *et al.* 2001; Palka *et al.* 2001). Of these, it was possible to determine whether a human interaction had occurred for 449 (45%); for the remainder it was not possible to make that determination. The proportion of carcasses determined to have been involved in a human interaction averaged 34%, but ranged widely from 11-12% in Delaware and Georgia to 49% and 53% in Virginia and North Carolina, respectively.

The nearshore habitat occupied by the coastal morphotype is adjacent to areas of high human population and in the northern portion of its range is highly industrialized. The blubber of stranded dolphins examined during the 1987-88 mortality event contained anthropogenic contaminants in levels among the highest recorded for a cetacean (Geraci 1989). There are no estimates of indirect human-caused mortality resulting from pollution or habitat degradation.

Table 4. Summary of bottlenose dolphins stranded along the Atlantic Coast of the US. Total Stranded is further stratified into carcasses with signs of human interaction, those without any signs, and those where human interaction could not be determined (CBD). Human Interaction is stratified into stranded animals with line or nets marks or gear attached (Fishery Interaction), cleanly removed (cut off) appendages or cuts on the body (Mutilation), and other indications of human interactions such as propellor wounds. Florida strandings include only the Atlantic coast of Florida but extending to Key West.

STATE	1997	1998	1999
New York Total Stranded	**2**	**3**	**3**
Human Interaction			
---- Fishery Interaction	1	0	0
---- Mutilation	0	0	0
---- Other	0	0	0
No Human Interaction	0	2	3
CBD	1	1	0
New Jersey Total Stranded	**10**	**11**	**15**
Human Interaction			
---- Fishery Interaction	0	1	3
---- Mutilation	0	0	0
---- Other	0	0	0
No Human Interaction	2	3	2
CBD	8	7	10
Delaware Total Stranded	**14**	**8**	**18**
Human Interaction			
---- Fishery Interaction	1	1	1
---- Mutilation	0	0	0
---- Other	2	1	0
No Human Interaction	4	0	4
CBD	7	6	13
Maryland Total Stranded	**2**	**2**	**5**
Human Interaction			
---- Fishery Interaction	0	0	1
---- Mutilation	0	0	0
---- Other	0	0	0
No Human Interaction	1	0	1
CBD	1	2	3
Virginia Total Stranded	**44**	**42**	**50**
Human Interaction			
---- Fishery Interaction	11	8	18
---- Mutilation	0	2	3
---- Other	0	1	0
No Human Interaction	15	12	6
CBD	18	19	23

STATE	1997	1998	1999
N. Carolina Total Stranded	**123**	**104**	**94**
Human Interaction			
---- Fishery Interaction	28	23	24
---- Mutilation	5	3	1
---- Other	1	0	0
No Human Interaction	21	16	19
CBD	68	62	50
S. Carolina Total Stranded	**41**	**41**	**34**
Human Interaction			
---- Fishery Interaction	8	4	1
---- Mutilation	2	0	1
---- Other	0	1	2
No Human Interaction	15	10	10
CBD	16	26	20
Georgia Total Stranded	**18**	**26**	**14**
Human Interaction			
---- Fishery Interaction	1	1	1
---- Mutilation	0	0	0
---- Other	0	0	0
No Human Interaction	8	6	8
CBD	9	19	5
Florida Total Stranded	**104**	**80**	**87**
Human Interaction			
---- Fishery Interaction	7	3	4
---- Mutilation	0	0	0
---- Other	0	1	0
No Human Interaction	34	29	28
CBD	63	47	55
Total	**358**	**317**	**320**

STATUS OF STOCKS

The coastal migratory stock is designated as depleted under the MMPA. From 1995-2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the WNA and, therefore, the entire stock was listed as depleted. The management units in this report now replace the single coastal migratory stock. A re-analysis of the depletion designation on a management unit basis needs to be undertaken. In the interim, because one or more of the management units may be depleted, all management units retain the depleted designation. In addition, mortality in multiple units exceed PBR (Table 1). There are no rigorous results that would provide reliable information on current abundance relative to historical abundance. All prior estimates cover only part of the range of management units spatially or temporally, include the offshore morphotype, or are otherwise compromised. Population trends cannot be determined due to insufficient data.

Over the past five years, estimated average annual mortality exceeded PBR in the mid-Atlantic gillnet fisheries for the northern migratory and northern NC management units during summer and for the NC mixed management units in winter (Tables 1 and 2).

The species is not listed as threatened or endangered under the Endangered Species Act, but because, as noted above, the stock is listed as depleted under the MMPA it is a strategic stock. This stock is also considered strategic under the MMPA because fishery-related mortality and serious injury exceed the potential biological removal level.

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