NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7 CONSULTATION
BIOLOGICAL OPINION

Agency: Army Corps of Engineers, Baltimore District

Activity: Dredging of four borrow areas in the Atlantic Ocean for the Atlantic Coast of Maryland Shoreline Protection Project
F/NER/2006/03915
GARFO-2006-00002

Conducted by: National Marine Fisheries Service
Northeast Regional Office

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Approved by: Pat A Kurkul

This constitutes the Biological Opinion (Opinion) of NOAA's National Marine Fisheries Service (NMFS) on the effects of the Army Corps of Engineers (ACOE) dredging in several offshore shoals for beach nourishment at Ocean City, Maryland (Atlantic Coast of Maryland Shoreline Protection Project) on threatened and endangered species in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC. 1531 et seq.). This Opinion is based on information provided in the 2006 Biological Assessment (BA), a July 1997 BA and an April 6, 1998 Opinion for Maryland beach nourishment activities, other consultations for dredging activities in the ACOE North Atlantic Division (NAD), recent correspondence with the ACOE Baltimore and Norfolk Districts, and other sources of information. A complete administrative record of this consultation will be kept on file at the NMFS Northeast Regional Office. Formal consultation was initiated on July 24, 2006.

BACKGROUND ON THE ACTION AND CONSULTATION HISTORY

The Atlantic Coast of Maryland Storm Protection Project (ACMSPP) is designed to provide coastal flood and erosion protection to Ocean City, Maryland. As part of the project design, periodic nourishment and maintenance of the beach are required to maintain the design level of protection. The initial phase of this project, as authorized by the Water Resources Development Act of 1986, was completed in September 1991. Six dredge cycles have been completed since 1990 with approximately 8.7 million cubic yards removed from two borrow areas located between 2 and 3 miles offshore. All dredging has occurred between May and October. Since 1992 no dredging has occurred in July or August. Consultation on the effects of the ACMSPP on listed species was not completed between NMFS and the ACOE until 1997, with an Opinion issued on April 6, 1998. This Opinion analyzed the effects of the ACMSPP, the Assateague Island Short Term and Long Term Sand Management projects and the Maryland Coastal Bays Habitat Restoration Projects. The Opinion concluded that the Assateague Island Long Term Sand Management Project and the ACMSPP may adversely affect, but were not likely to jeopardize the continued existence of loggerhead, Kemp's ridley or green sea turtles and were not likely to adversely affect leatherback

Figure 2- Action Area

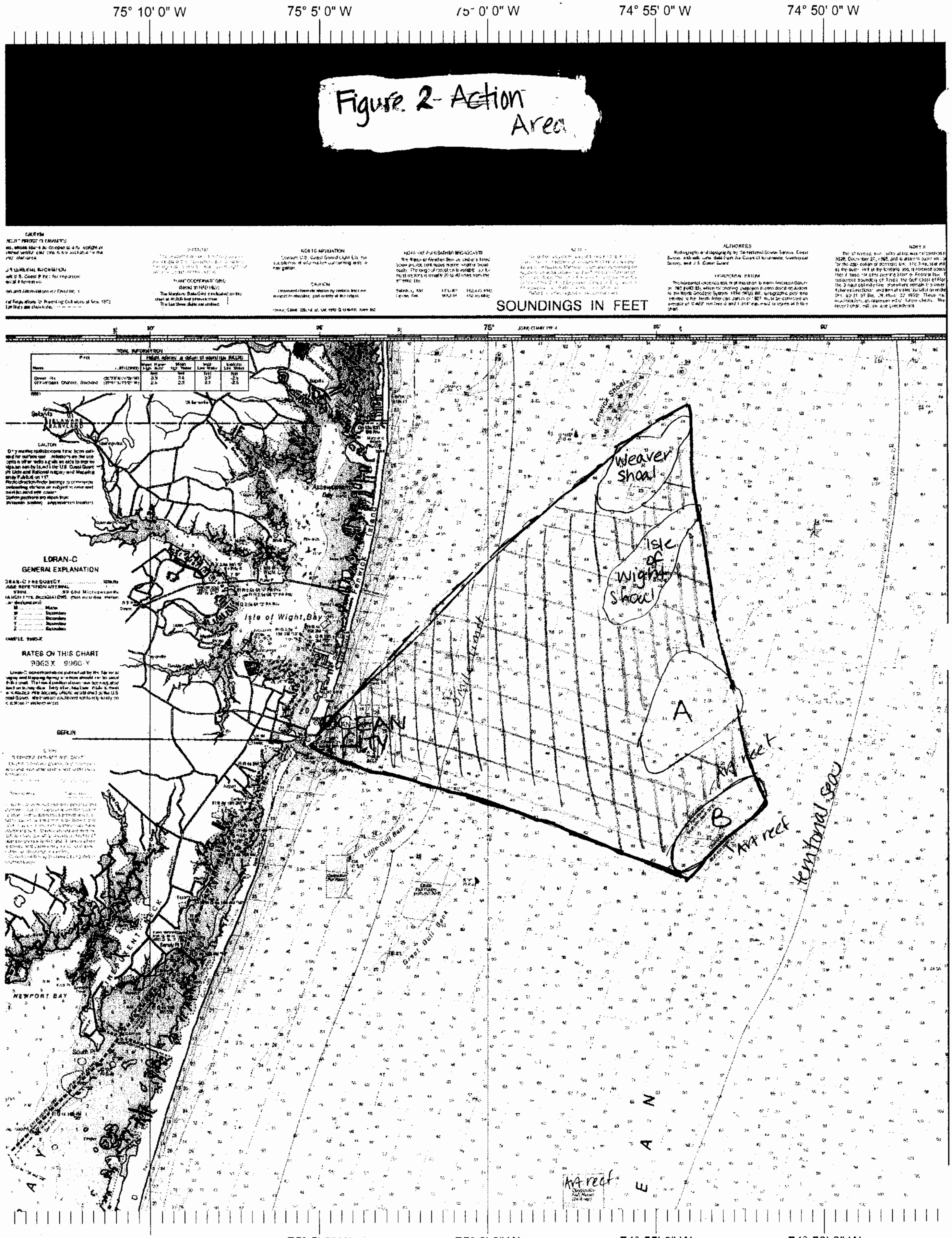

Chart Name: FENWICK ISLAND TO CHINCOTEAGUE INLET
Chart ID: 12211_1
Top Left: 38° 35' 48" N 75° 14' 16" W
Bottom Right: 38° 8' 44" N 74° 46' 20" W

~ 38N 74W

sea turtles or any whale species. The Opinion also concluded that no NMFS listed species were likely to be adversely affected by the Assateague Island Short Term Restoration Project or the Maryland Coastal Bays Habitat Restoration Project. Separate Incidental Take Statements (ITS) were given for the Assateague Island Long Term Sand Management Project and the ACMSPP.

It is difficult to assess the effects that the ACMSPP has had on sea turtles in the past. Dredging events in 1990, 1991 and 1992 were not monitored by endangered species observers so there is no information on entrainment of sea turtles during these dredge events. However, in 1992, three loggerhead sea turtles stranded on the Atlantic coast of Maryland, near Ocean City. Necropsies conducted on these turtles indicated that their deaths were dredge related. It is not known whether these turtles were crushed on the bottom by the dredge or were entrained in the drag head and discharged onto the beach along with the dredged sand. Observers were on board to provide 25% coverage for dredge events occurring in 1994, 1998 and 2002. No takes of sea turtles were reported during any of these dredge cycles. It is important to note that 75% of the dredging operations were not monitored for sea turtle interactions and screening was only placed at the dredge overflow, not the intake. Screening at the overflow is less likely to detect heavy sea turtles or large sea turtle parts that would sink in the hopper and is most likely to detect small pieces that are light enough to float to the top with the water. Since the 1998 Opinion was issued, more effective measures for monitoring hopper dredges for sea turtle interactions have been developed, including the requirement for screening at the intakes.

In correspondence between ACOE staff and NMFS staff in May 2006, the ACOE indicated that borrow sites currently designated for use for the ACMSPP will be consumed within the next one or two dredge cycles. These borrow areas could be depleted sooner if coastal storms create a greater need for sand at the Ocean City beaches than is currently anticipated. Estimates have shown that 10-12 million cubic yards of sand are needed to maintain the 4-year cycles for the remaining project life (i.e., through 2044). The ACOE has identified four new potential borrow areas to provide the needed sand for the Ocean City beaches. During these conversations NMFS indicated that formal section 7 consultation would be necessary as the use of alternate borrow sites had not been contemplated in the 1998 Opinion.

In a letter dated July 20, 2006, the ACOE requested the initiation of consultation on the use of new borrow sites for the proposed beach nourishment project. The proposed borrow areas are located between 7 and 11 miles off Ocean City, Maryland and have been designated as Weaver Shoals, Isle of Wight Shoals, Shoal A and Shoal B. These borrow areas will be used once the current borrow area (Borrow Area 9) is depleted. The ACOE has estimated that this will likely occur following the next dredge event with dredging occurring in the new borrow areas as soon as 2008.

Since the initial phase of the project was completed in 1991, dredging has occurred 4 times (1992, 1994, 1998 and 2002) with an average of 1.22 million cy of sand placed on the beaches (ranging from 0.777 to 1.6 million cy). Sand resources at the four new borrow areas are expected to be sufficient to sustain the needs of the project through the end of its authorized life in 2044. As noted above, the ACOE anticipates that 10-12 million cy of sand will be needed at Ocean City beaches during the remainder of the project life. The ACOE anticipates that on average the removal of 800,000cy of sand every four years will satisfy the needs of the project. However, in the event of extreme storms, erosion can be accelerated and needs may be greater. Based on past nourishment needs and the anticipated needs of the project, up to 1.6 million cy of sand may be removed in a given dredge cycle. However, on average, dredging is expected to occur every 4 years with 800,000 cy removed. The ACOE anticipates that 10 dredge cycles will be completed at the new borrow areas before the expiration of the project life in 2044.

As NMFS had all the information necessary for consultation at that time, the date the July 20, 2006 correspondence was received (July 24, 2006) serves as the initiation of formal consultation.

DESCRIPTION OF THE PROPOSED ACTION

The ACOE proposes to use up to four new borrow sites for beach fill for future maintenance of beaches at Ocean City, Maryland. The new borrow sites consist of four candidate shoals (see Figure 1). The shoals consist predominantly of medium to coarse-grained sands from the crest to their base. These sites have been designated as Weaver Shoals, Isle of Wight Shoals, Shoal A and Shoal B. It is anticipated that an ocean going hopper dredge will be used to remove approximately 800,000 cubic yards (cy) of sand once every four years; however, up to 1.6 million cy of sand could be removed during each dredging event. Work will take place between April and October as it is too dangerous to work offshore during the winter months. Each dredging cycle is expected to take 2 to 3 months to complete. The ACOE is proposing to use a "progressive borrow plan" which will ensure that no more than 5% of any shoal's total volume is removed. Additionally, dredging will occur shallowly over a wide area of each shoal and the dredge will avoid the crest. Dredging will also occur on the up- or down-drift margin of the shoal where practicable. The ACOE has also indicated that they will ensure that NMFS approved endangered species observers are onboard the dredge to inspect for sea turtles or sea turtle parts that may become entrained in the dredge.

As noted above, a self-propelled hydraulically operated hopper dredge will be used for sand removal. The hopper dredge is equipped with two dragheads and a hopper. When the hopper is full, the dredge transports sand to the shore for unloading via an offshore pumpout shoreline connection and subsequent placement on the beach. This type of dredge employs suction produced by high speed centrifugal pumps to excavate the sediment and dispose of it to a storage hopper. Material dislodged from the ocean floor by the suction is suspended in water in the form of a slurry and then passed through the centrifugal pump to the storage hopper. The particular type of dredge that will be employed is also refereed to as a Trailer Suction Hopper Dredge. This type of dredge is a self-propelled ship suitable for operation in an ocean environment and capable of mining sand and loading a self-contained hopper while the ship is underway. Loading takes place as the ship moves at a speed of 1-5 knots. The intake end of the suction pipe is fitted with a draghead, the function of which is to strip off a layer of sediment from the seabed and entrain those sediments into the suction pipe. The time required to load the hopper is highly variable and dependent on the physical characteristics of the material being dredged, the mechanical properties and efficiency of the dredging plant and vessel, and the sea state conditions under which the dredging takes place. A suction hopper dredge is usually on-site for three to four hours during a 24 hour period, with the remaining time spent traveling and unloading sand.

Description of Borrow Areas

The *Weaver Shoals borrow area* is located approximately 7.2 miles offshore of Ocean City, Maryland in the Atlantic Ocean. The shoal is 4.1 miles long by 1.4 miles wide and has a total area of 3.8 square miles. Water depth at the crest is 24 feet and charted depths range from 24 to 18 feet. The shoal contains approximately 93 million cy of sand. This shoal has never been dredged.

The *Isle of Wight Shoal borrow area* is also located approximately 7.2 miles offshore of Ocean City, Maryland. The shoal is 4.9 miles long by 1.6 miles wide and has a total area of 5.5 square miles. Water depth at the crest is 18 feet and charted depths range from 18 to 47 feet. The shoal contains approximately 136 million cy of sand and has not previously been dredged.

The *Shoal "A" borrow area* is located approximately 9.6 miles offshore of Ocean City, Maryland. The shoal is 3.7 miles long and 1.5 miles wide and has a total area of 5.2 square miles. Water depth at the crest is 32 feet and charted depths range from 32 to 60 feet. The shoal contains approximately 103 million cy of sand and has not previously been dredged.

The *Shoal "B" borrow area* is located approximately 11 miles offshore of Ocean City, Maryland. The shoal is 4.7 miles long and 1.2 miles wide and has a total area of 4.4 square miles. Water depth at the crest is 27 feet and charted depths range from 27 to 40 feet. The shoal contains approximately 50 million cy of sand and has not previously been dredged. The State of Maryland maintains an artificial reef within Shoal B and this area is heavily fished by recreational fishermen.

During each dredge cycle, the project will result in approximately 800,000 cy of beach quality sand to be used to maintain the design level of coastal flood and erosion protection to Ocean City, Maryland. The ACOE proposes to remove 800,000 cy of sand (with a maximum of 1.6 million cy per dredge cycle) once every four years through the end of the project life (i.e., 2044). Ten dredge cycles are anticipated to occur during this time period. Each dredge cycle is expected to take 2 to 3 months to complete. All dredging will occur between April and October of the year in which it is scheduled. The actual dredging schedule will be driven in part by changes in need on the beach (i.e., in response to large coastal storms which result in significant beach erosion), funding cycles and the availability of dredge equipment.

Action Area

The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The action area for this consultation includes several areas in the Atlantic Ocean. Specific project actions will take place in the four borrow areas designated as Weaver Shoals, Isle of Wight Shoals, Shoal A and Shoal B. Disposal of the dredged material will occur on beaches in Ocean City, Maryland. The action area for this consultation includes all of the aforementioned sites and the waters between and immediately adjacent to these areas where project vessels will travel and sand will be transported (see Figure 2 for an illustration of the action area).

LISTED SPECIES IN THE ACTION AREA

Several species listed under NMFS' jurisdiction occur off of the Maryland coast. Several species of listed sea turtles occur in these waters during the warmer months (April 1 – November 30). Listed whales may also occur seasonally in these waters. No critical habitat has been designated within the action area; as such, no critical habitat will be affected by this action.

The hawksbill turtle (*Eretmochelys imbricata*) is relatively uncommon in the waters of the continental US. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. However, there are accounts of hawksbills in south Florida and Texas. Most of the Texas records report small turtles, probably in the 1-2 year class range. Many captures or strandings are of individuals in an unhealthy or injured condition (Hildebrand 1982). The lack of sponge-covered reefs and the cold winters in the northern Gulf of Mexico probably prevent hawksbills from establishing a viable population in this area. No takes of hawksbill sea turtles have been recorded in northeast or mid-Atlantic fisheries covered by the NEFSC observer program. In the north Atlantic, small hawksbills have stranded as far north as Cape Cod, Massachusetts (STSSN database). Many of these strandings were observed after hurricanes or offshore storms. There have been no verified observations of hawksbills in the action area. Based on this information, NMFS has determined that hawksbill sea turtles are extremely unlikely to occur in the action area. As such, the proposed action will not affect hawksbills, and this species will not be considered further in this consultation.

STATUS OF AFFECTED SPECIES

NMFS has determined that the action being considered in this Opinion may affect the following endangered or threatened species under NMFS' jurisdiction:

Cetaceans	
Right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Sea Turtles	
Loggerhead sea turtle (*Caretta caretta*)	Threatened
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempi*)	Endangered
Green sea turtle (*Chelonia mydas*)	Endangered/Threatened[1]

This section will focus on the status of the various species within the action area, summarizing information necessary to establish the environmental baseline and to assess the effects of the proposed action. Background information on the range-wide status of these species and a description of critical habitat can be found in a number of published documents including recent sea turtle (NMFS and USFWS 1995, USFWS 1997, TEWG 2000, NMFS SEFSC 2001) status reviews and stock assessments, Recovery Plans for the humpback whale (NMFS 1991a), right whale (NMFS 2005), fin and sei whale (NMFS 1998a), loggerhead sea turtle (NMFS and USFWS 1991) and leatherback sea turtle (NMFS and USFWS 1992), and the 2005 marine mammal stock assessment report (Waring et al. 2006).

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1 Pursuant to NMFS regulations at 50 CFR 223.205, the prohibitions of Section 9 of the Endangered Species Act apply to all green turtles, whether endangered or threatened.

Right Whale

Right whales were probably the first large whale to be hunted on a systematic, commercial basis (Clapham et al. 1999). Records indicate that right whales in the North Atlantic were subject to commercial whaling as early as 1059 (Aguilar 1986). Commercial whaling for right whales along the US Atlantic coast peaked in the 18th century, but right whales continued to be taken opportunistically along the coast and in other areas of the North Atlantic into the early 20th century (Kenney 2002). Right whales have occurred historically in all the world's oceans from temperate to subarctic latitudes (Perry et al. 1999). In both hemispheres, they are observed at low latitudes and in nearshore waters where calving takes place in the winter months, and in higher latitude foraging grounds in the summer (Clapham et al. 1999; Perry et al. 1999).

In 2000, the International Whaling Commission (IWC) reviewed the taxonomic nomenclature for right whales. Based on the results of genetic studies, the IWC formally recognized North Pacific, North Atlantic, and southern hemisphere right whales as three separate species (Best et al. 2001). In April 2003, NMFS published a final rule in the Federal Register (68 FR 17560) that amended the ESA-listing for right whales by recognizing three separate species: North Atlantic right whale (*Eubalaena glacialis*), North Pacific right whale (*Eubalaena japonica*), and southern right whale (*Eubalaena australis*). However, on January 11, 2005, another final rule was published (70 FR 1830) that removed the April 2003 final rule on the grounds that it was procedurally and substantively flawed. As a result, the ESA-listing for right whales has reverted to that in effect prior to the April 2003 rule; all right whales are listed as endangered.

Pacific Ocean. Very little is known of the size and distribution of the North Pacific right whale stocks. Two stocks are generally recognized: a western Pacific stock in the Sea of Okhotsk and an eastern Pacific stock. The number of right whales for each stock are considered to be very low. In the eastern Pacific, sightings have been made along the coasts of Washington, Oregon, California, and Baja California south to about 27° N (Scarff 1986; NMFS 1991b) and also in Hawaii (Herman et al. 1980; Barlow et al. 1998). However, right whales were not sighted consistently in any of these areas. In 1996, a group of 3 to 4 right whales were observed in the middle shelf of the Bering Sea, west of Bristol Bay and east of the Pribilof Islands (Goddard and Rugh 1998). Surveys conducted in July of 1997–2000 in Bristol Bay reported observations of lone animals or small groups of right whales in the same area as the 1996 sighting (Hill and DeMaster 1998, Perryman et al. 1999). In 2004, the National Marine Mammal Laboratory undertook a North Pacific right whale tagging project as part of the Cetacean Assessment and Ecology Program to further investigate the presence of right whales in the eastern North Pacific (AFSC 2004). Researchers used sonobuoys to locate right whales (AFSC 2004). Two whales were located and satellite tagged (AFSC 2004). While tracking one of these whales, the scientists located 25 individual whales, more than doubling the number of known whales in the North Pacific (AFSC 2004). Although no estimate of abundance can be made at this time, all indications are that the number of eastern North Pacific right whales and, in general, all North Pacific right whales is very small.

Southern Hemisphere. A review of southern hemisphere right whales is provided in Perry et al. (1999). Since these right whales do not occur in US waters, there is no recovery plan or stock assessment report for southern hemisphere right whales. Southern hemisphere right whales appear to be the most numerous of the right whales. Perry et al. (1999) provide a best estimate of abundance for southern hemisphere right whales as 7,000 based on estimates from separate breeding areas. In addition, unlike North Pacific or North Atlantic right whales, southern hemisphere right whales have shown some signs of recovery in the last 20 years. However, like other right whales, southern hemisphere right whales were heavily exploited (Perry et al. 1999). In addition, Soviet catch records made available in the 1990s (Zemsky et al. 1995) revealed that southern hemisphere right whales continued to be targeted well into the 20th century. Therefore, any indications of recovery should be viewed with caution.

Atlantic Ocean. As described above, scientific literature on right whales has historically recognized distinct eastern and western populations or subpopulations in the North Atlantic Ocean (IWC 1986). Current information on the eastern stock is lacking and it is unclear whether a viable population in the eastern North Atlantic still exists (Brown 1986, NMFS 1991b). Photo-identification work has shown that some of the whales observed in the eastern Atlantic were previously identified as western Atlantic right whales (Kenney 2002). This Opinion will focus on the western North Atlantic subpopulation of right whales which occurs in the action area.

Right whale life history, habitat and distribution

Western North Atlantic right whales (hereafter referred to as "right whales") generally occur from the southeast US to Canada (e.g., Bay of Fundy and Scotian Shelf) (Kenney 2002; Waring et al. 2002). Like other right whale species, they follow an annual pattern of migration between low latitude winter calving grounds and high latitude summer foraging grounds (Perry et al. 1999; Kenney 2002). Telemetry data have shown lengthy and somewhat distant excursions into deep water off of the continental shelf (Mate et al. 1997) as well as extensive movements over the continental shelf during the summer foraging period (Mate and Nieukirk 1992; Mate et al. 1997; Bowman 2003; Baumgartner and Mate 2005). Photo-identification data have also indicated excursions of animals as far as Newfoundland, the Labrador Basin, southeast of Greenland (Knowlton et al. 1992), and Norway (Best et al. 2001). In the winter, only a portion of the known right whale population is seen on the calving grounds. The winter distribution of the remaining right whales remains uncertain (Waring et al. 2002). Results from winter surveys and passive acoustic studies suggest that animals may be dispersed in several areas including Cape Cod Bay (Brown et al. 2002) and offshore waters of the southeastern US (Waring et al. 2002).

Unknowns about right whale habitat persist. For example, some female right whales have never been observed on the Georgia/Florida calving grounds but have been observed with a calf on the summer foraging grounds (Best et al. 2001). It is unknown whether these females are calving in an unidentified calving area or have just been missed during surveys off of Florida and Georgia (Best et al. 2001). The absence of some known (photo-identified) whales from identified habitats for months or years at a time suggests the presence of an unknown feeding ground (Kenney 2002). Finally, while behavior suggestive of mating is frequently observed on the foraging grounds, conception is not likely to occur at that time given the known length of gestation in other baleen whales. More likely, mating and conception occur in the winter (Kenney 2002). Based on genetics data, it has been suggested that two mating areas may exist with a somewhat different population composition (Best et al. 2001). The location of the mating area(s) is unknown.

Critical habitat for right whales has been designated in accordance with the ESA. Following a petition from the Right Whale Recovery Team, NMFS designated three critical habitat areas for right whales in 1994. These areas are: (1) portions of Cape Cod Bay and Stellwagen Bank, (2) the Great South Channel, and (3) coastal waters off of Georgia and Florida's east coast (NMFS 1994). Right whale critical habitat in Northeast waters were designated for their importance as right whale foraging sites while the southeast critical habitat area was identified for its importance as a calving and nursery area (NMFS 1994). In 2002, NMFS received a petition to revise designated critical habitat for right whales by combining and expanding the existing Cape Cod Bay and Great South Channel critical habitats in the Northeast and by expanding the existing critical habitat in the Southeast (NMFS 2003). In response to the petition, NMFS (2003) recognized that there was new information on right whale distribution in areas outside of the designated critical habitat. However, the ESA requires that critical habitat be designated based on identification of specific habitat features essential to the conservation of the species rather than just known distribution (NMFS 2003). NMFS, therefore, denied the petition to revise critical habitat as requested by the petitioner, but also outlined an approach to investigate factors that may lead to other revisions to critical habitat (NMFS 2003).

There are relatively few right whales remaining in the western North Atlantic, although the exact number is unknown. As is the case with most wild animals, an exact count cannot be obtained. However, abundance can be reasonably estimated as a result of the extensive study of this subpopulation. IWC participants from a 1999 workshop agreed that it was reasonable to state that the number of western North Atlantic right whales as of 1998 was probably around 300 (+/- 10%) (Best et al. 2001). This conclusion was principally based on a photo-identification catalog that, as of July 1999, was comprised of more than 14,000 photographed sightings of 396 individuals, 11 of which were known to be dead and 87 of which had not been seen in more than 6 years. In addition, it was noted that relatively few new non-calf whales (whales that were never sighted and counted in the population as calves) had been sighted in recent years (Best et al. 2001), which suggests that the 396 individuals was a close approximation of the entire population.

A total of 125 right whale calves has been observed since the 1999 workshop, including a record calving season in 2000/2001 with 31 right whale births (B. Pike, New England Aquarium, pers. comm.). Calving numbers have been sporadic, with large differences among years. The three calving years (1997-2000) prior to the record year in 2000/2001 provided low recruitment with only 10 calves born, while the last five calving seasons (2000-2005) have been remarkably better with 31, 21, 19, 16, and 28 births, respectively. The calf count of 28 animals for the latest calving season (2004/2005) is still preliminary and additional calves may be observed on the summer foraging grounds (B. Zoodsma, SERO, pers. comm.). However, the subpopulation has also continued to experience losses of calves, juveniles and adults. As of December 1, 2004, there were 459 individually identified right whales in the photo-identification catalog of which 18 were known to be dead, and 330 had been sighted during the previous six years (B. Pike pers. comm.)[2].

As is the case with other mammalian species, there is an interest in monitoring the number of females in this right whale subpopulation since their numbers will affect the subpopulation trend (whether declining, increasing or stable). Participants at the 1999 IWC workshop reviewed the sex

2 Note that these data do not include four known dead right whales reported during the time period of January 2005 through June 2005.

composition of the right whale subpopulation based on sighting and genetics data (Best et al. 2001). Of the 385 right whales presumed alive at the end of 1998 (excludes the 11 known to have died but includes the 87 that had not been seen in at least 6 years), 157 were males, 153 were females, and 75 were of unknown sex (Best et al. 2001). Sightings data were also used to determine the number of presumably mature females (females known to be at least 9 years old) in the subpopulation and the number of females who had been observed with a calf at least once. For the period 1980-1998, there were at least 90 (presumed live) females age 9 years or greater. Of these, 75 had produced a calf during that same period (Best et al. 2001; Kraus et al. 2001). As described above, the 2000/2001 - 2004/2005 calving seasons have had relatively high calf production and have included additional first time mothers (e.g., eight new mothers in 2000/2001). These potential "gains" have been offset, however, by continued losses to the subpopulation including the death of mature females as a result of anthropogenic mortality (Cole et al. 2005 DRAFT). Five right whale mortalities were recorded from November 2004 through May 2005. Included in this number were two pregnant females and two other females of breeding age. The 2004 - 2005 mortalities have been documented by NMFS; however, this information has not been fully examined and verified by the ASRG process. A determination of the total levels of anthropogenic mortality and serious injury for 2004 and 2005 will be made following the ASRG's review of all of the available data and information.

Data collected in the 1990s suggested that right whales were experiencing a slow but steady recovery (Knowlton et al. 1994). However, Caswell et al. (1999) used photo-identification data and modeling to estimate survival and concluded that right whale survival decreased from 1980 to 1994. Modified versions of the Caswell et al. (1999) model as well as several other models were reviewed at the 1999 IWC workshop (Best et al. 2001). Despite differences in approach, all of the models indicated a decline in right whale survival in the 1990s relative to the 1980s with female survival, in particular, affected (Best et al. 2001; Waring et al. 2002). In 2002, NMFS' NEFSC hosted a workshop to review right whale population models to examine: (1) potential bias in the models and (2) changes in the subpopulation trend based on new information collected in the late 1990s (Clapham et al. 2002). Three different models were used to explore right whale survivability and to address potential sources of bias. Although biases were identified that could negatively affect the results, all three modeling techniques resulted in the same conclusion; survival, particularly of females, has continued to decline (Clapham et al. 2002).

While modeling work suggests a decline in right whale abundance as a result of reduced survival, particularly for females, some researchers have also suggested that the subpopulation is being affected by a decreased reproductive rate (Best et al. 2001; Kraus et al. 2001). Kraus et al. (2001) reviewed reproductive parameters for the period 1980-1998 and found that calving intervals increased from 3.67 years in 1992 to 5.8 years in 1998. In addition, as of 1999, only 70% of presumably mature females (females aged 9 years or older) were known to have given birth (Best et al. 2001).

Factors that have been suggested as affecting the right whale reproductive rate include reduced genetic diversity, pollutants, and nutritional stress. However, there is currently no evidence available to determine their potential effect, if any, on right whales. The size of the western North Atlantic subpopulation of right whales at the termination of whaling is unknown but is generally believed to have been very small. Such an event may have resulted in a loss of genetic diversity which could affect the ability of the current population to successfully reproduce (i.e., decreased conceptions, increased abortions, and increased neonate mortality). Studies by Schaeff et al. (1997) and Malik et al. (2000) indicate that western North Atlantic right whales are less genetically diverse than southern right whales. However, several apparently healthy populations of cetaceans, such as sperm whales and pilot whales, have even lower genetic diversity than observed for western North Atlantic right whales (IWC 2001). Similarly, while contaminant studies have confirmed that right whales are exposed to and accumulate contaminants, researchers could not conclude that these contaminant loads were negatively affecting right whale reproductive success since concentrations were lower than those found in marine mammals proven to be affected by PCBs and DDT (Weisbrod et al. 2000). Finally, although North Atlantic right whales seem to have thinner blubber than right whales from the South Atlantic (Kenney 2000), there is no evidence at present to demonstrate that the decline in birth rate and increase in calving interval is related to a food shortage. Nevertheless, a connection among right whale reproduction and environmental factors may yet be found. Modeling work by Caswell et al. (1999) and Fujiwara and Caswell (2001) suggests that the North Atlantic Oscillation (NAO), a naturally occurring climactic event, does affect the survival of mothers and the reproductive rate of mature females, and it also seems to affect calf survival (Clapham et al. 2002). Further work is needed to assess the magnitude and manner in which the NAO may affect right whale reproductive success.

Threats to right whale recovery

There is general agreement that right whale recovery is negatively affected by anthropogenic mortality. Fifty -five right whale mortalities were reported from Florida to the Canadian Maritimes during the period of 1970-2003 (Moore et al. 2004; Cole et al. IN DRAFT). Eight additional mortalities were reported for the period 2004 through July 1, 2005 (Kraus et al. 2005). This represents an absolute minimum number of the right whale mortalities for this period. Given the range and distribution of right whales in the North Atlantic, it is highly unlikely that all carcasses have been observed.

Considerable effort has been made to examine right whale carcasses for the cause of death (Moore et al. 2004). Examining right whale carcasses is often very difficult. Some carcasses are discovered floating at sea and cannot be retrieved. Others are in such an advanced stage of decomposition when discovered that a complete examination is not possible. Wave action and post-mortem predation by sharks can also damage carcasses, and preclude a thorough examination of all body parts. Moore et al. (2004) provide information on the examination of 30 right whale carcasses during the period of 1970-2002. Cole et al. (IN DRAFT) provides supporting information for some of these as well as for the right whale mortality documented in 2003. Of the 31 animals examined, ship strike was identified as the cause of death or probable cause of death for 15 (11 adults/juveniles; 4 calves) and entanglement in fishing gear was identified as the cause of death for 4 (all adults/juveniles) (Moore et al. 2004; Cole et al. IN DRAFT). A cause of death was undeterminable for 12 animals, 8 of which were calves (Moore et al. 2004). Preliminary information on the eight right whale mortalities for 2004 - July 1, 2005, has been released (Kraus et al. 2005; SEIT 2005). Ship strikes and entanglement in fishing gear are suggested as the primary cause of death for some of these (Kraus et al. 2005; SEIT 2005). However, the ASRG has not yet made a final determination for any of the eight whale mortalities documented for 2004- July 1, 2005.

Ship strikes and entanglements are not always fatal to right whales. Scarification analysis of living animals provides additional information on the frequency of right whale interactions with vessels and rope/line. Based on photographs of catalogued animals from 1935 through 1995, Hamilton et al. (1998) estimated that 61.6 percent of right whales exhibit injuries caused by entanglement and 6.4 percent exhibit signs of injury from vessel strikes. In addition, several whales have apparently been entangled on more than one occasion. Right whales may suffer long term effects of such interactions even when they survive the initial interaction. For example, some right whales that have been entangled were subsequently involved in ship strikes (Hamilton et al. 1998) suggesting that the animal may have become debilitated by the entanglement to such an extent that it was less able to avoid a ship. A necropsy of a right whale found dead in 2005 suggests that the animal died of an infection after the scars from a previous ship strike interaction opened up during her first pregnancy.

Right Whale Status and Trends

Although no estimate of abundance can be made at this time, all indications are that the number of North Pacific right whales is very small. In 2004, researchers located and identified a total of 25 individual right whales in the eastern North Pacific (AFSC 2004). While this represents more than double the previous number of known whales in the eastern North Pacific (AFSC 2004), it demonstrates the very low numbers of North Pacific right whales. In contrast, southern hemisphere right whales number in the thousands and have shown some signs of recovery in the last 20 years. However, like other right whales, southern hemisphere right whales were heavily exploited (Perry et al. 1999). Therefore, any indications of recovery should be viewed with caution.

As noted above, in the Atlantic there are an estimated 300 right whales (+/- 10%) (Best et al. 2001). The 2000/2001 - 2004/2005 calving seasons have had relatively high calf production and have included additional first time mothers. These potential "gains" have been offset, however, by continued losses to the subpopulation including the death of mature females as a result of anthropogenic mortality (Cole et al. 2005 DRAFT).

Sixty-three right whale mortalities were reported from Florida to the Canadian Maritimes during the period from 1970-July 1, 2005 (Moore et al. 2004; Cole et al. IN DRAFT; Kraus et al. 2005). This represents an absolute minimum number of the right whale mortalities for this period. Given the range and distribution of right whales in the North Atlantic, it is highly unlikely that all carcasses will be observed. Ship strikes and fishing gear entanglements were identified as the primary cause of death for many of these. Scarification analysis indicates that some whales do survive encounters with ships and fishing gear. However, the long-term consequences of these interactions are unknown.

A number of different modeling exercises using the extensive data collected on this subpopulation have come to the same conclusion; right whale survival continues to decline (Clapham et al. 2002). Based on recent reviews of the status of the right whales, their reproductive rate (the number of calves that are born in the population each year) appears to be declining, which could increase the whales' extinction risk (Caswell et al. 1999, Fujiwara and Caswell 2001, IWC 2001). Based on the information currently available, for the purposes of this Opinion, NMFS believes that the western North Atlantic right whale subpopulation numbers 300 (+/- 10%) and is declining.

Humpback Whale
Humpback whales inhabit all major ocean basins from the equator to subpolar latitudes. They generally follow a predictable migratory pattern in both hemispheres, feeding during the summer in the higher near-polar latitudes and migrating to lower latitudes where calving and breeding takes place in the winter (Perry et al. 1999).

Humpback whales range widely across the North Pacific during the summer months; from Port Conception, CA, to the Bering Sea (Johnson and Wolman 1984, Perry et al. 1999). Although the IWC recognizes only one stock (Donovan 1991) there is evidence to indicate multiple populations or stocks occur within the North Pacific Basin (Perry et al. 1999, Carretta et al. 2001). NMFS recognizes three management units within the US EEZ for the purposes of managing this species under the MMPA. These are: the eastern North Pacific stock, the central North Pacific stock and the western North Pacific stock (Carretta et al. 2001). There are indications that the eastern North Pacific stock is increasing in abundance (Carretta et al. 2001) and the central North Pacific stock appears to have increased in abundance between the 1980's -1990's (Angliss et al. 2001). There is no reliable population trend data for the western North Pacific stock (Angliss et al. 2001).

Little or no research has been conducted on humpbacks in the Northern Indian Ocean so information on their current abundance does not exist (Perry et al. 1999). Since these humpback whales do not occur in US waters, there is no recovery plan or stock assessment report for the northern Indian Ocean humpback whales. Likewise, there is no recovery plan or stock assessment report for southern hemisphere humpback whales, and there is also no current estimate of abundance for humpback whales in the southern hemisphere although there are estimates for some of the six southern hemisphere humpback whale stocks recognized by the IWC (Perry et al. 1999). Like other whales, southern hemisphere humpback whales were heavily exploited for commercial whaling. Although they were given protection by the IWC in 1963, Soviet whaling data made available in the 1990's revealed that 48,477 southern hemisphere humpback whales were taken from 1947-1980 (Zemsky et al. 1995, IWC 1995, Perry et al. 1999).

Six separate feeding areas are utilized in northern waters during the summer months (Waring et al. 1999). Humpbacks feed on a number of species of small schooling fishes, particularly sand lance and Atlantic herring, by targeting fish schools and filtering large amounts of water for the associated prey. Humpback whales have also been observed feeding on krill (Wynne and Schwartz 1999).

In winter, whales from the six feeding areas mate and calve primarily in the West Indies where spatial and genetic mixing among these groups occur (Waring et al. 2000). Various papers (Clapham and Mayo 1990; Clapham 1992; Barlow and Clapham 1997; Clapham et al. 1999) summarized information gathered from a catalogue of photographs of 643 individuals from the western North Atlantic population of humpback whales. These photographs identified reproductively mature western North Atlantic humpbacks wintering in tropical breeding grounds in the Antilles, primarily on Silver and Navidad Banks, north of the Dominican Republic. The primary winter range also includes the Virgin Islands and Puerto Rico (NMFS 1991a). Calves are born from December through March and are about 4 meters at birth. Females give birth approximately every 2 to 3 years. Sexual maturity is reached between 4 and 6 years of age for females and between 7 and 15 years for males. Size at maturity is about 12 meters.

Humpback whales use the Mid-Atlantic as a migratory pathway to and from the calving/mating grounds, but it may also be an important winter feeding area for juveniles. Since 1989, observations of juvenile humpbacks in the Mid-Atlantic have been increasing during the winter months, peaking from January through March (Swingle et al. 1993). Biologists theorize that non-reproductive animals may be establishing a winter feeding range in the Mid-Atlantic since they are not participating in reproductive behavior in the Caribbean. Swingle et al. (1993) identified a shift in distribution of juvenile humpback whales in the nearshore waters of Virginia, primarily in winter months. Identified whales using the Mid-Atlantic area were found to be residents of the Gulf of Maine and Atlantic Canada (Gulf of St. Lawrence and Newfoundland) feeding groups, suggesting a mixing of different feeding populations in the Mid-Atlantic region. Strandings of humpback whales have increased between New Jersey and Florida since 1985 consistent with the increase in Mid-Atlantic whale sightings. Strandings were most frequent during September through April in North Carolina and Virginia waters, and were composed primarily of juvenile humpback whales of no more than 11 meters in length (Wiley et al. 1995).

Photographic mark-recapture analyses from the Years of the North Atlantic Humpback (YONAH) project gave an ocean-basin-wide estimate of 10,600 (95% c.i. = 9,300 - 12,100) (Waring et al. 2000). For management purposes under the MMPA, the estimate of 10,600 is regarded as the best available estimate for the North Atlantic population (Waring et al. 2000).

Threats to Humpback Whales

As is the case with other large whales, the major known sources of anthropogenic mortality and injury of humpback whales are commercial fishing gear entanglements and ship strikes. Sixty percent of Mid-Atlantic humpback whale mortalities that were closely investigated showed signs of entanglement or vessel collision (Wiley et al. 1995). Between 1992 and 2002 at least 103 humpback whale entanglements and 10 ship strikes were recorded. There were also many carcasses that washed ashore or were spotted floating at sea for which the cause of death could not be determined. Based on photographs of the caudal peduncle of humpback whales, Robbins and Mattila (1999) estimated that at least 48 percent, and possibly as many as 78 percent, of animals in the Gulf of Maine exhibit scarring caused by entanglement. These estimates are based on sightings of free-swimming animals that initially survive the encounter. Because some whales may drown immediately, the actual number of interactions may be higher.

Humpback whales, like other baleen whales, may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries, coastal development and vessel traffic. However, evidence of these is lacking. There are strong indications that a mass mortality of humpback whales in the southern Gulf of Maine in 1987/1988 was the result of the consumption of mackerel whose livers contained high levels of a red-tide toxin. It has been suggested that red tides are somehow related to increased freshwater runoff from coastal development but there is insufficient data to link this with the humpback whale mortality (Clapham et al. 1999). Changes in humpback distribution in the Gulf of Maine have been found to be associated with changes in herring, mackerel, and sand lance abundance associated with local fishing pressures (Waring et al. 2000). However, there is no evidence that humpback whales were adversely affected by these trophic changes.

Humpback Whales Status
The best available population estimate for humpback whales in the North Atlantic Ocean is regarded as 10,600 animals. Anthropogenic mortality associated with ship strikes and fishing gear entanglements is significant. The winter range where mating and calving occurs is located in areas outside of the US where the species is afforded less protection. Modeling using data obtained from photographic mark-recapture studies estimates the growth rate of the Gulf of Maine feeding population at 6.5% (Barlow and Clapham 1997). With respect to the species as a whole, there are also indications of increasing abundance for the eastern and central North Pacific stocks. However, trend and abundance data is lacking for the western North Pacific stock, the Southern Hemisphere humpback whales, and the Southern Indian Ocean humpbacks.

Fin Whale
Fin whales inhabit a wide range of latitudes between 20-75° N and 20-75° S (Perry *et al.* 1999). The fin whale is ubiquitous in the North Atlantic and occurs from the Gulf of Mexico and Mediterranean Sea northward to the edges of the arctic ice pack (NMFS 1998a). The overall pattern of fin whale movement is complex, consisting of a less obvious north-south pattern of migration than that of right and humpback whales. Based on acoustic recordings from hydrophone arrays Clark (1995) reported a general southward flow pattern of fin whales in the fall from the Labrador/Newfoundland region, south past Bermuda, and into the West Indes. The overall distribution may be based on prey availability as this species preys opportunistically on both invertebrates and fish (Watkins et al. 1984). Fin whales feed by filtering large volumes of water for the associated prey. Fin whales are larger and faster than humpback and right whales and are less concentrated in nearshore environments.

Within US waters of the Pacific, fin whales are found seasonally off of the coast of North America and Hawaii, and in the Bering Sea during the summer (Angliss *et al.* 2001). NMFS recognizes three fin whale stocks in the Pacific for the purposes of managing this species under the MMPA. These are: Alaska (Northeast Pacific), California/Washington/Oregon, and Hawaii (Angliss *et al.* 2001). Reliable estimates of current abundance for the entire Northeast Pacific fin whale stock are not available (Angliss *et al.* 2001). Stock structure for fin whales in the southern hemisphere is unknown. Prior to commercial exploitation, the abundance of southern hemisphere fin whales is estimated to have been at 400,000 (IWC 1979, Perry *et al.* 1999). There are no current estimates of abundance for southern hemisphere fin whales. Since these fin whales do not occur in US waters, there is no recovery plan or stock assessment report for the southern hemisphere fin whales.

NMFS has designated one population of fin whale in US waters of the North Atlantic (Waring *et al.* 1998). This species is commonly found from Cape Hatteras northward. A number of researchers have suggested the existence of fin whale subpopulations in the North Atlantic based on local depletions resulting from commercial overharvesting (Mizroch and York 1984) or genetics data (Bérubé *et al.* 1998). Photoidentification studies in western North Atlantic feeding areas, particularly in Massachusetts Bay, have shown a high rate of annual return by fin whales, both within years and between years (Seipt *et al.* 1990) suggesting some level of site fidelity. In 1976, the IWC's Scientific Committee proposed seven stocks (or populations) for North Atlantic fin whales. These are: (1) North Norway, (2) West Norway-Faroe Islands, (3) British Isles-Spain and Portugal, (4) East Greenland-Iceland, (5) West Greenland, (6) Newfoundland-Labrador, and (7) Nova Scotia (Perry *et al.* 1999). However, it is uncertain whether these boundaries define biologically isolated units (Waring *et al.* 1999).

During 1978-1982 aerial surveys, fin whales accounted for 24% of all cetaceans and 46% of all large cetaceans sighted over the continental shelf between Cape Hatteras and Nova Scotia (Waring *et al.*1998). Underwater listening systems have also demonstrated that the fin whale is the most acoustically common whale species heard in the North Atlantic (Clark 1995). The single most important area for this species appeared to be from the Great South Channel, along the 50m isobath past Cape Cod, over Stellwagen Bank, and past Cape Ann to Jeffrey's Ledge (Hain *et al.*1992).

Like right and humpback whales, fin whales are believed to use North Atlantic waters primarily for feeding, and more southern waters for calving. However, evidence regarding where the majority of fin whales winter, calve, and mate is still scarce. Clark (1995) reported a general pattern of fin whale movements in the fall from the Labrador/Newfoundland region, south past Bermuda and into the West Indies, but neonate strandings along the US Mid-Atlantic coast from October through January suggest the possibility of an offshore calving area (Hain *et al.* 1992).

Fin whales achieve sexual maturity at 5-15 years of age (Perry *et al.* 1999), although physical maturity may not be reached until 20-30 years (Aguilar and Lockyer 1987). Conception is believed to occur during the winter with birth of a single calf after a 12 month gestation (Mizroch and York 1984). The calf is weaned 6-11 months after birth (Perry *et al.* 1999). The mean calving interval is 2.7 years (Agler *et al.* 1993).

The predominant prey of fin whales varies greatly in different geographical areas depending on what is locally available (IWC 1992). In the western North Atlantic, fin whales feed on a variety of small schooling fish (*i.e.*, herring, capelin, sand lance) as well as squid and planktonic crustaceans (Wynne and Schwartz 1999). Fin whales feed by filtering large volumes of water for their prey through their baleen plates.

Various estimates have been provided to describe the current status of fin whales in western North Atlantic waters. One method used the catch history and trends in Catch Per Unit Effort to obtain an estimate of 3,590 to 6,300 fin whales for the entire western North Atlantic (Perry *et al.* 1999). Hain *et al.* (1992) estimated that about 5,000 fin whales inhabit the Northeastern US continental shelf waters. The 2001 Stock Assessment Report (SAR) gives a best estimate of abundance for fin whales of 2,814 (CV = 0.21). The minimum population estimate for the western North Atlantic fin whale is 2,362 (Waring *et al.* 2001). However, this is considered an underestimate since the estimate was derived from surveys over a limited portion of the western North Atlantic.

Threats to fin whale recovery

The major known sources of anthropogenic mortality and injury of fin whales include entanglement in commercial fishing gear and ship strikes. Of 18 fin whale mortality records collected between 1991 and 1995, four were associated with vessel interactions, although the proximal cause of mortality was not known. From 1996-July 2001, there were nine observed fin whale entanglements and at least four ship strikes. It is believed to be the most commonly struck cetacean by large vessels (Laist *et al.* 2001). In addition, hunting of fin whales continued well into the 20th century. Fin whales were given total protection in the North Atlantic in 1987 with the exception of a subsistence whaling hunt for Greenland (Gambell 1993, Caulfield 1993). However, Iceland reported a catch of 136 whales in the 1988/89 and 1989/90 seasons, and has since ceased reporting fin whale kills to the IWC (Perry *et al.* 1999). In total, there have been 239 reported kills of fin whales from the North Atlantic from 1988 to 1995. Fin whales may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities.

Summary of Fin Whale Status
As noted above, the minimum population estimate for the western North Atlantic fin whale is 2,362 which is believed to be an underestimate. Fishing gear appears to pose less of a threat to fin whales in the North Atlantic Ocean than North Atlantic right or humpback whales. However, more fin whales are struck by large vessels than right or humpback whales (Laist *et al.* 2001). Some level of whaling for fin whales in the North Atlantic may still occur.

Information on the abundance and population structure of fin whales worldwide is limited. NMFS recognizes three fin whale stocks in the Pacific for the purposes of managing this species under the MMPA. Reliable estimates of current abundance for the entire Northeast Pacific fin whale stock are not available (Angliss *et al.* 2001). Stock structure for fin whales in the southern hemisphere is unknown and there are no current estimates of abundance for southern hemisphere fin whales.

Leatherback sea turtle
Leatherback sea turtles are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic and Pacific Oceans, the Caribbean Sea, and the Gulf of Mexico (Ernst and Barbour 1972). Leatherback sea turtles are the largest living turtles and range farther than any other sea turtles species; their large size and tolerance of relatively low temperatures allows them to occur in northern waters such as off Labrador and in the Barents Sea (NMFS and USFWS 1995). In 1980, the leatherback population was estimated at approximately 115,000 adult females globally (Pritchard 1982). By 1995, this global population of adult females had declined to 34,500 (Spotila *et al.* 1996).

Pacific Ocean. Based on published estimates of nesting female abundance, leatherback populations have collapsed or have been declining at all major Pacific basin nesting beaches for the last two decades (Spotila et al., 1996; NMFS and USFWS 1998b; Sarti et al. 2000; Spotila et al. 2000). Leatherback turtles had disappeared from India before 1930, have been virtually extinct in Sri Lanka since 1994, and appear to be approaching extinction in Malaysia (Spotila et al. 2000). Nesting assemblages of leatherback turtles along the coasts of the Solomon Islands, which supported important nesting assemblages historically, are also reported to be declining (D. Broderick, personal communication, in Dutton *et al.* 1999). In Fiji, Thailand, Australia, and Papua-New Guinea (East Papua), leatherback turtles have only been known to nest in low densities and scattered colonies. Although all causes of the declines in Pacific leatherback turtle colonies have not been documented, the Pacific population has continued to decline leading some researchers to conclude that the leatherback is on the verge of extinction in the Pacific Ocean (*e.g.,* Spotila *et al.* 1996; Spotila *et al.* 2000).

Only an Indonesian nesting assemblage has remained relatively abundant in the Pacific basin. The largest, extant leatherback nesting assemblage in the Indo-Pacific lies on the north Vogelkop coast of Irian Jaya (West Papua), Indonesia, with over 1,000 nesting females during the 1996 season (Suarez *et al.* 2000). During the early-to-mid 1980s, the number of female leatherback turtles nesting on the two primary beaches of Irian Jaya appeared to be stable. More recently, however, this population has come under increasing threats that could cause this population to experience a collapse that is similar to what occurred at Terengganu, Malaysia. In 1999, for example, local Indonesian villagers started reporting dramatic declines in sea turtle populations near their villages (Suarez 1999); unless hatchling and adult turtles on nesting beaches receive more protection, this population will continue to decline. Declines in nesting assemblages of leatherback turtles have been reported throughout the western Pacific region where observers report that nesting assemblages are well below abundance levels that were observed several decades ago (for example, Suarez 1999).

In the western Pacific Ocean and South China Seas, leatherback turtles are captured, injured, or killed in numerous fisheries including Japanese longline fisheries. Leatherback turtles in the western Pacific are also threatened by poaching of eggs, killing of nesting females, human encroachment on nesting beaches, incidental capture in fishing gear, beach erosion, and egg predation by animals.

In the eastern Pacific Ocean, nesting populations of leatherback turtles are declining along the Pacific coast of Mexico and Costa Rica. According to reports from the late 1970s and early 1980s, three beaches located on the Pacific coast of Mexico support as many as half of all leatherback turtle nests. Since the early 1980s, the eastern Pacific Mexican population of adult female leatherback turtles has declined to slightly more than 200 during 1998-99 and 1999-2000 (Sarti et al. 2000). Spotila et al. (2000) reported the decline of the leatherback turtle population at Playa Grande, Costa Rica, which had been the fourth largest nesting colony in the world. Between 1988 and 1999, the nesting colony declined from 1,367 to 117 female leatherback turtles. Based on their models, Spotila et al. (2000) estimated that the colony could fall to less than 50 females by 2003-2004.

In the eastern Pacific Ocean, leatherback turtles are captured, injured, or killed in commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru, purse seine fisheries for tuna in the eastern tropical Pacific Ocean, and California/Oregon drift gillnet fisheries. Because of the limited available data, we cannot accurately estimate the number of leatherback turtles captured, injured, or killed through interactions with these fisheries. However, between 8 and 17 leatherback turtles were estimated to have died annually between 1990 and 2000 in interactions with the California/ Oregon drift gillnet fishery; 500 leatherback turtles are estimated to die annually in Chilean and Peruvian fisheries; 200 leatherback turtles are estimated to die in direct harvests in Indonesia; and before 1992, the North Pacific driftnet fisheries for squid, tuna, and billfish captured an estimated 1,002 leatherback turtles each year, killing about 111 of them each year.

Atlantic Ocean. Evidence from tag returns and strandings in the western Atlantic suggests that adult leatherback sea turtles engage in routine migrations between boreal, temperate and tropical waters (NMFS and USFWS 1992). A 1979 aerial survey of the outer Continental Shelf from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia showed leatherbacks to be present throughout the area with the most numerous sightings made from the Gulf of Maine south to Long Island.

Leatherbacks were sighted in water depths ranging from 1-4151 m but 84.4% of sightings were in waters less than 180 m (Shoop and Kenney 1992). Leatherbacks were sighted in waters within a sea surface temperature range similar to that observed for loggerheads; from 7-27.2°C (Shoop and Kenney 1992). However, leatherbacks appear to have a greater tolerance for colder waters in comparison to loggerhead sea turtles since more leatherbacks were found at the lower temperatures as compared to loggerheads (Shoop and Kenney 1992). This aerial survey estimated the leatherback population for the northeastern US at approximately 300-600 animals (from near Nova Scotia, Canada to Cape Hatteras, North Carolina). However, the estimate was based on turtles visible at the surface and does not include those that were below the surface out of view. Therefore, it likely underestimates the leatherback population for the northeastern US Estimates of leatherback abundance of 1,052 turtles (C.V.= 0.38) and 1,174 turtles (C.V.= 0.52) were obtained from surveys conducted from Virginia to the Gulf of St. Lawrence in 1995 and 1998, respectively (Palka 2000). However, since these estimates were also based on sightings of leatherbacks at the surface, the author considered the estimates to be negatively biased and the true abundance of leatherbacks may be 4.27 times the estimates (Palka 2000).

Leatherbacks are a long lived species (> 30 years). They mature at a younger age than loggerhead turtles, with an estimated age at sexual maturity of about 13-14 years for females with 9 years reported as a likely minimum (Zug and Parham 1996) and 19 years as a likely maximum (NMFS SEFSC 2001). In the US and Caribbean, female leatherbacks nest from March through July. They nest frequently (up to 7 nests per year) during a nesting season and nest about every 2-3 years. During each nesting, they produce 100 eggs or more in each clutch and thus, can produce 700 eggs or more per nesting season (Schultz 1975). However, a significant portion (up to approximately 30%) of the eggs can be infertile. Thus, the actual proportion of eggs that can result in hatchlings is less than this seasonal estimate. As is the case with other sea turtle species, leatherback hatchlings enter the water soon after hatching. Based on a review of all sightings of leatherback sea turtles of <145 cm curved carapace length (CCL), Eckert (1999) found that leatherback juveniles remain in waters warmer than 26°C until they exceed 100 cm CCL.

Leatherbacks are predominantly a pelagic species and feed on jellyfish (*i.e.*, *Stomolophus, Chryaora*, and *Aurelia* (Rebel 1974)), and tunicates (salps, pyrosomas). Leatherbacks may come into shallow waters if there is an abundance of jellyfish nearshore. For example, leatherbacks occur annually in Cape Cod Bay and Vineyard and Nantucket Sounds in Massachusetts during the summer and fall months.

Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1-11.5% increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NMFS SEFSC 2001). The largest leatherback rookery in the western Atlantic remains along the northern coast of South America in French Guiana and Suriname. More than half the present world leatherback population is estimated to be nesting on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana (Hilterman and Goverse 2004). Nest numbers in Suriname have shown an increase and the long-term trend for the Suriname and French Guiana nesting group seems to show an increase (Hilterman and Goverse 2004). In 2001, the number of nests for Suriname and French Guiana combined was 60,000, one of the highest numbers observed for this region in 35 years (Hilterman and Goverse 2004). Studies by

Girondot et al. (in review) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing.

Tag return data emphasize the link between these South American nesters and animals found in US waters. For example, a nesting female tagged May 29, 1990, in French Guiana was later recovered and released alive from the York River, VA. Another nester tagged in French Guiana on June 21, 1990, was later found dead in Palm Beach, Florida (STSSN). Many other examples also exist. For example, leatherbacks tagged at nesting beaches in Costa Rica have been found in Texas, Florida, South Carolina, Delaware, and New York (STSSN database). Leatherback turtles tagged in Puerto Rico, Trinidad, and the Virgin Islands have also been subsequently found on US beaches of southern, Mid-Atlantic and northern states (STSSN database).

Threats to Leatherback recovery

Of the Atlantic turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear. This susceptibility may be the result of their body type (large size, long pectoral flippers, and lack of a hard shell), and their attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, and perhaps to the lightsticks used to attract target species in longline fisheries. They are also susceptible to entanglement in gillnets (used in various fisheries) and capture in trawl gear (*e.g.*, shrimp trawls). Sea turtles entangled in fishing gear generally have a reduced ability to feed, dive, surface to breathe or perform any other behavior essential to survival (Balazs 1985). They may be more susceptible to boat strikes if forced to remain at the surface, and entangling lines can constrict blood flow resulting in tissue necrosis.

Leatherbacks are exposed to pelagic longline fisheries in many areas of their range. According to observer records, an estimated 6,363 leatherback sea turtles were caught by the US Atlantic tuna and swordfish longline fisheries between 1992-1999, of which 88 were released dead (NMFS SEFSC 2001). Since the US fleet accounts for only 5-8% of the hooks fished in the Atlantic Ocean, adding up the under-represented observed takes of the other 23 countries actively fishing in the area would likely result in annual take estimates of thousands of leatherbacks over different life stages (NMFS SEFSC 2001).

Leatherbacks are susceptible to entanglement in the lines associated with trap/pot gear used in several fisheries. From 1990-2000, 92 entangled leatherbacks were reported from New York through Maine (Dwyer *et al.* 2002). Additional leatherbacks stranded wrapped in line of unknown origin or with evidence of a past entanglement (Dwyer *et al.* 2002). A review of leatherback mortality documented by the STSSN in Massachusetts suggests that vessel strikes and entanglement in fixed gear (primarily lobster pots and whelk pots) are the principal sources of this mortality (Dwyer *et al.* 2002). Fixed gear fisheries in the Mid-Atlantic have also contributed to leatherback entanglements. For example, in North Carolina, two leatherback sea turtles were reported entangled in a crab pot buoy inside Hatteras Inlet (D. Fletcher, pers. comm. to Sheryan Epperly, NMFS SEFSC 2001). A third leatherback was reported entangled in a crab pot buoy in Pamlico Sound off of Ocracoke. This turtle was disentangled and released alive; however, lacerations on the front flippers from the lines were evident (D. Fletcher, pers. comm. to Sheryan Epperly, NMFS SEFSC 2001). In the Southeast, leatherbacks are vulnerable to entanglement in Florida's lobster pot and stone crab fisheries as documented on stranding forms. In the US Virgin Islands, where one of five leatherback strandings from 1982 to 1997 were due to entanglement (Boulon 2000), leatherbacks have been observed with their flippers wrapped in the line of West Indian fish traps (R. Boulon, pers. comm. to Joanne Braun-McNeill, NMFS SEFSC 2001). Since many entanglements of this typically pelagic species likely go unnoticed, entanglements in fishing gear may be much more common.

Leatherback interactions with the southeast shrimp fishery, which operates from North Carolina through southeast Florida (NMFS 2002), are also common. The National Research Council Committee on Sea Turtle Conservation identified incidental capture in shrimp trawls as the major anthropogenic cause of sea turtle mortality (NRC 1990). Leatherbacks are likely to encounter shrimp trawls working in the coastal waters off the Atlantic coast (from Cape Canaveral, Florida through North Carolina) as they make their annual spring migration north. For many years, TEDs that were required for use in the southeast shrimp fishery were less effective for leatherbacks as compared to the smaller, hard-shelled turtle species, because the TED openings were too small to allow leatherbacks to escape. To address this problem, on February 21, 2003, NMFS issued a final rule to amend the TED regulations. Modifications to the design of TEDs are now required in order to exclude leatherbacks as well as large benthic immature and sexually mature loggerhead and green turtles.

Other trawl fisheries are also known to interact with leatherback sea turtles although on a much smaller scale. In October 2001, for example, a fisheries observer documented the take of a leatherback in a bottom otter trawl fishing for *Loligo* squid off of Delaware. TEDs are not required in this fishery.

Gillnet fisheries operating in the nearshore waters of the Mid-Atlantic states are also suspected of capturing, injuring and/or killing leatherbacks when these fisheries and leatherbacks co-occur. Data collected by the NEFSC Fisheries Observer Program from 1994 through 1998 (excluding 1997) indicate that a total of 37 leatherbacks were incidentally captured (16 lethally) in drift gillnets set in offshore waters from Maine to Florida during this period. Observer coverage for this period ranged from 54% to 92%. In North Carolina, a leatherback was reported captured in a gillnet set in Pamlico Sound in the spring of 1990 (D. Fletcher, pers.comm. to Sheryan Epperly, NMFS SEFSC 2001). It was released alive by the fishermen after much effort. Five other leatherbacks were released alive from nets set in North Carolina during the spring months: one was from a net (unknown gear) set in the nearshore waters near the North Carolina/Virginia border (1985); two others had been caught in gillnets set off of Beaufort Inlet (1990); a fourth was caught in a gillnet set off of Hatteras Island (1993), and a fifth was caught in a sink net set in New River Inlet (1993). In addition to these, in September 1995 two dead leatherbacks were removed from a large (11-inch) monofilament shark gillnet set in the nearshore waters off of Cape Hatteras, North Carolina (STSSN unpublished data reported in NMFS SEFSC 2001).

Fishing gear interactions and poaching are problems for leatherbacks throughout their range. Entanglements are common in Canadian waters where Goff and Lien (1988) reported that 14 of 20 leatherbacks encountered off the coast of Newfoundland/Labrador were entangled in fishing gear including salmon net, herring net, gillnet, trawl line and crab pot line. Leatherbacks are known to drown in fish nets set in coastal waters of Sao Tome, West Africa (Castroviejo *et al.* 1994; Graff 1995). Gillnets are one of the suspected causes for the decline in the leatherback sea turtle population in French Guiana (Chevalier *et al.* 1999), and gillnets targeting green and hawksbill turtles in the waters of coastal Nicaragua also incidentally catch leatherback turtles (Lagueux *et al.* 1998). Observers on shrimp trawlers operating in the northeastern region of Venezuela documented the capture of six leatherbacks from 13,600 trawls (Marcano and Alio 2000). An estimated 1,000 mature female leatherback sea turtles are caught annually in fishing nets off of Trinidad and Tobago with mortality estimated to be between 50-95% (Eckert and Lien 1999). However, many of the turtles do not die as a result of drowning, but rather because the fishermen butcher them in order to get them out of their nets (NMFS SEFSC 2001).

Poaching is not known to be a problem for nesting populations in the continental US However, the NMFS SEFSC (2001) noted that poaching of juveniles and adults was still occurring in the US Virgin Islands. In all, four of the five strandings in St. Croix were the result of poaching (Boulon 2000). A few cases of fishermen poaching leatherbacks have been reported from Puerto Rico, but most of the poaching is for eggs.

Leatherback sea turtles may be more susceptible to marine debris ingestion than other species due to their pelagic existence and the tendency of floating debris to concentrate in convergence zones that adults and juveniles use for feeding areas and migratory routes (Lutcavage *et al.* 1997; Shoop and Kenney 1992). Investigations of the stomach contents of leatherback sea turtles revealed that a substantial percentage (44% of the 16 cases examined) contained plastic (Mrosovsky 1981). Along the coast of Peru, intestinal contents of 19 of 140 (13%) leatherback carcasses were found to contain plastic bags and film (Fritts 1982). The presence of plastic debris in the digestive tract suggests that leatherbacks might not be able to distinguish between prey items and plastic debris (Mrosovsky 1981). Balazs (1985) speculated that the object may resemble a food item by its shape, color, size or even movement as it drifts about, and induce a feeding response in leatherbacks.

Summary of Status for Leatherback Sea Turtles
The global status and trend of leatherback turtles is difficult to summarize. In the Pacific Ocean, the abundance of leatherback turtles on nesting colonies has declined dramatically over the past 10 to 20 years: nesting colonies throughout the eastern and western Pacific Ocean have been reduced to a fraction of their former abundance by the combined effects of human activities that have reduced the number of nesting females and reduced the reproductive success of females that manage to nest (for example, egg poaching). At current rates of decline, leatherback turtles in the Pacific basin are a critically endangered species with a low probability of surviving and recovering in the wild.

The largest leatherback rookery in the western Atlantic remains along the northern coast of South America in French Guiana and Suriname. More than half the present world leatherback population is estimated to be nesting on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana (Hilterman and Goverse 2004). Nest numbers in Suriname have shown an increase and the long-term trend for the Suriname and French Guiana nesting group seems to show an increase (Hilterman and Goverse 2004). In 2001, the number of nests for Suriname and French Guiana combined was 60,000, one of the highest numbers observed for this region in 35 years (Hilterman and Goverse 2004). Studies by Girondot *et al.* (in review) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing.

In the Atlantic Ocean, the status and trends of leatherback turtles appears much more variable. Some of the same factors that led to precipitous declines of leatherbacks in the Pacific also affect leatherbacks in the Atlantic. Leatherbacks are captured and killed in many kinds of fishing gear and interact with fisheries in US state and federal waters as well as in international waters. Poaching is a problem and affects leatherbacks that occur in US waters. Leatherbacks also appear to be more susceptible to death or injury from ingesting marine debris than other turtle species. The number of female leatherbacks reported at some nesting sites in the Atlantic Ocean has increased, while at others they have decreased. Some of the same factors that led to precipitous declines of leatherbacks in the Pacific also affect leatherbacks in the Atlantic: leatherbacks are captured and killed in many kinds of fishing gear and interact with fisheries in State, Federal and international waters; poaching is a problem and affects leatherbacks that occur in US waters; and leatherbacks also appear to be more susceptible to death or injury from ingesting marine debris than other turtle species. Nevertheless, the trend of the Atlantic population is uncertain. For the purposes of this Opinion, NMFS will assume that the Atlantic population of leatherback sea turtles is declining (the conservative estimate) or stable (the optimistic estimate).

Loggerhead sea turtles

Loggerhead sea turtles are found in temperate and subtropical waters and inhabit pelagic waters, continental shelves, bays, estuaries and lagoons. Loggerhead sea turtles are the most abundant species of sea turtle in U.S. waters, commonly occurring throughout the inner continental shelf from Florida through Cape Cod, Massachusetts, and may occur as far north as Nova Scotia when oceanographic and prey conditions are favorable (NEFSC survey data 1999). The loggerhead was listed rangewide as threatened under the ESA on July 28, 1978.

Loggerhead sea turtles are generally grouped by their nesting locations. Nesting is concentrated in the north and south temperate zones and subtropics. Loggerheads generally avoid nesting in tropical areas of Central America, northern South America, and the Old World (National Research Council 1990). The largest known nesting aggregations of loggerhead sea turtles occur on Masirah and Kuria Muria Islands in Oman (Ross and Barwani 1982). However, the status of the Oman nesting beaches has not been evaluated recently, and their location in a part of the world that is vulnerable to extremely disruptive events (e.g. political upheavals, wars, and catastrophic oil spills) is cause for considerable concern (Meylan et al. 1995).

Pacific Ocean. In the Pacific Ocean, major loggerhead nesting grounds are generally located in temperate and subtropical regions with scattered nesting in the tropics. The abundance of loggerhead turtles on nesting colonies throughout the Pacific basin has declined dramatically over the past 10-20 years. Loggerhead sea turtles in the Pacific are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead turtles (Bolten *et al.* 1996). More recent estimates are unavailable; however, qualitative reports infer that the Japanese nesting aggregation has declined since 1995 and continues to decline (Tillman 2000). Genetic analyses of female loggerheads nesting in Japan indicate the presence of genetically distinct nesting colonies (Hatase *et al.* 2002). As a result, Hatase *et al.* (2002) suggest that the loss of one of these colonies would decrease the genetic diversity of loggerheads that nest in Japan, and recolonization of the site would not be expected on an ecological time scale. In

Australia, long-term census data has been collected at some rookeries since the late 1960's and early 1970's, and nearly all data show marked declines in nesting populations since the mid-1980's (Limpus and Limpus 2003). No recent, quantitative estimates of the size of the nesting aggregation in the southwest Pacific is available, but the nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

Pacific loggerhead turtles are captured, injured, or killed in numerous Pacific fisheries including Japanese longline fisheries in the western Pacific Ocean and South China Seas; direct harvest and commercial fisheries off Baja California, Mexico, commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru; purse seine fisheries for tuna in the eastern tropical Pacific Ocean, and California/Oregon drift gillnet fisheries. Loggerhead turtle colonies in the western Pacific Ocean have been reduced to a fraction of their former abundance by the combined effects of human activities that have reduced the number of nesting females and reduced the reproductive success of females that manage to nest (e.g., egg poaching).

Indian Ocean. Loggerhead sea turtles are distributed throughout the Indian Ocean, along most mainland coasts and island groups (Baldwin *et al.* 2003). In the southwestern Indian Ocean, loggerhead nesting has shown signs of recovery in South Africa where protection measures have been in place for decades. However, in other southwestern areas (*e.g.*, Madagascar and Mozambique) loggerhead nesting aggregations are still affected by subsistence hunting of adults and eggs (Baldwin *et al.* 2003). The largest known nesting aggregation of loggerheads in the world occurs in Oman in the northern Indian Ocean. An estimated 20,000-40,000 females nest at Masirah, the largest nesting site within Oman, each year (Baldwin *et al.* 2003). All known nesting sites within the eastern Indian Ocean are found in Western Australia (Dodd 1988). As has been found in other areas, nesting numbers are disproportionate within the area with the majority of nesting occurring at a single location. This may, however, be the result of fox predation on eggs at other Western Australia nesting sites (Baldwin *et al.* 2003). Throughout the Indian Ocean, loggerhead sea turtles face many of the same threats as in other parts of the world including loss of nesting beach habitat, fishery interactions, and turtle meat and/or egg harvesting.

Mediterranean Sea. Nesting in the Mediterranean is confined almost exclusively to the eastern basin (Margaritoulis *et al.* 2003). The greatest number of nests in the Mediterranean are found in Greece with an average of 3,050 nests per year (Margaritoulis *et al.* 2003). There is a long history of exploitation for loggerheads in the Mediterranean (Margaritoulis *et al.* 2003). Although much of this is now prohibited, some directed take still occurs (Margaritoulis *et al.* 2003). Loggerheads in the Mediterranean also face the threat of habitat degradation, incidental fishery interactions, vessel strikes, and marine pollution (Margaritoulis *et al.* 2003).

Atlantic Ocean. In the Atlantic Ocean, loggerheads commonly occur throughout the inner continental shelf from Florida through Cape Cod, Massachusetts although their presence varies with the seasons due to changes in water temperature (Braun and Epperly 1996; Epperly *et al.* 1995a, Epperly *et al.* 1995b; Shoop and Kenney 1992). Aerial surveys of loggerhead turtles north of Cape Hatteras indicate that they are most common in waters from 22 to 49 meters deep although they range from the beach to waters beyond the continental shelf (Shoop and Kenney 1992). The presence of loggerhead turtles in an area is also influenced by water temperature. Loggerheads have been observed in waters with surface temperatures of 7-30°C but water temperatures of at least

11°C are favorable to sea turtles (Epperly *et al.* 1995b; Shoop and Kenney 1992). As coastal water temperatures warm in the spring, loggerheads begin to migrate to North Carolina inshore waters (*e.g.*, Pamlico and Core Sounds) and also move up the coast (Braun-McNeill and Epperly 2004; Epperly *et al.* 1995a; Epperly *et al.* 1995b; Epperly *et al.* 1995c), occurring in Virginia foraging areas as early as April and on the most northern foraging grounds in the Gulf of Maine in June. The trend is reversed in the fall as water temperatures cool. The large majority leaves the Gulf of Maine by mid-September but some may remain in Mid-Atlantic and Northeast areas until late November. By December, loggerheads have migrated from inshore North Carolina waters and more northern coastal waters to waters offshore of North Carolina, particularly off of Cape Hatteras, and waters further south where the influence of the Gulf Stream provides temperatures favorable to sea turtles (Epperly *et al.* 1995b; Shoop and Kenney 1992).

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. In 1996, the Turtle Expert Working Group (TEWG) met on several occasions and produced a report assessing the status of the loggerhead sea turtle population in the western North Atlantic. The southeastern U.S. nesting aggregation is the second largest and represents about 35 percent of the nests of this species. From a global perspective, this U.S. nesting aggregations is considered to be critical to the survival of this species.

Based on analysis of mitochondrial DNA (mtDNA), which is maternally inherited, the TEWG theorized that nesting assemblages represent distinct genetic entities, and that there are at least four loggerhead subpopulations in the western North Atlantic separated at the nesting beach (TEWG 1998, 2000). A fifth subpopulation was identified in NMFS SEFSC 2001. As such, there are at least five western Atlantic subpopulations, divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29°N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29°N on the east coast to Sarasota on the west coast (approximately 83,400 nests in 1998); (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida (approximately 1,200 nests in 1998); (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (approximately 200 nests per year) (NMFS SEFSC 2001). Genetic analyses conducted at these nesting sites indicate that they are distinct subpopulations (TEWG 2000). Natal homing to the nesting beach is believed to provide the genetic barrier between these nesting aggregations, preventing recolonization from turtles from other nesting beaches. Fine-scale analysis of mtDNA work from Florida rookeries indicate that population separations begin to appear between nesting beaches separated by more than 50-100 km of coastline that does not host nesting (Francisco et al. 1999) and tagging studies are consistent with this result (Richardson 1982, Ehrhart 1979, LeBuff 1990, CMTTP: in NMFS SEFSC 2001). Nest site relocations greater than 100 km occur, but are rare (Ehrhart 1979; LeBuff 1974, 1990; CMTTP; Bjorndal et at. 1983: in NMFS SEFSC 2001). In addition, a recent study by Bowen *et al.* (2004) lends support to the hypothesis that juvenile loggerhead sea turtles exhibit homing behavior with respect to using foraging areas in the vicinity of their nesting beach. Therefore, coastal hazards that affect declining nesting populations may also affect the next generation of turtles when they are feeding in nearby habitats (Bowen *et al.* 2004).

Loggerheads from any of these nesting sites may occur within the action area. However, the majority of the loggerhead turtles in the action area are expected to have come from the northern nesting subpopulation and the south Florida nesting subpopulation with a smaller portion from the Yucatan subpopulation. Rankin-Baransky et. al. examined the genetic composition of loggerheads stranded in the Northeast and determined that 25% were from the northern nesting subpopulation, 59% from the south Florida subpopulation and 16% from the Yucatan subpopulation. Bass et al. (1995) reports that of the sea turtles foraging in Virginia waters, approximately half are from the northern nesting subpopulation and half from the south Florida nesting subpopulation with very few loggerheads from the Mexican subpopulation (less than .07%) occurring in Chesapeake Bay. As the action area for this consultation includes Mid-Atlantic waters, it is likely that loggerheads from these three subpopulations may occur in the action area. Loggerheads from other subpopulations have not been shown to occur in these waters in detectable numbers. As such, in this Opinion NMFS will consider effects of the action on loggerheads from the northern subpopulation, the south Florida subpopulation and the Yucatan subpopulation.

Mating takes place in late March-early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs in the southeastern U.S. Individual females nest multiple times during a nesting season, with a mean of 4.1 nests per individual (Murphy and Hopkins 1984). Nesting migrations for an individual female loggerhead are usually on an interval of 2-3 years, but can vary from 1-7 years (Dodd 1988). In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the gulf coast of Florida.

Like other sea turtles, loggerhead hatchlings enter the pelagic environment upon leaving the nesting beach. Loggerhead sea turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years before settling into benthic environments where they opportunistically forage on crustaceans and mollusks (Wynne and Schwartz 1999). However, some loggerheads may remain in the pelagic environment for longer periods of time or move back and forth between the pelagic and benthic environment (Witzell 2002). Loggerheads that have entered the benthic environment appear to undertake routine migrations along the coast that appear to be limited by seasonal water temperatures. Aerial surveys suggest that loggerheads (benthic immatures and adults) in U.S. waters are distributed in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

Loggerheads appear to concentrate in nearshore and southerly areas influenced by warmer Gulf Stream waters off North Carolina during November and December (Epperly et al. 1995a). Support for these loggerhead movements are provided by the collected work of Morreale and Standora (1998) who showed through satellite tracking that 12 loggerheads traveled along similar spatial and temporal corridors from Long Island Sound, New York, in a time period of October through December, within a narrow band along the continental shelf before taking up residence for one or two months south of Cape Hatteras.

A number of stock assessments (TEWG 1998; 2000; NMFS SEFSC 2001; Heppell *et al.* 2003) have examined the stock status of loggerheads in the waters of the U.S., but have been unable to develop any reliable estimates of absolute population size. Due to the difficulty of conducting comprehensive population surveys away from nesting beaches, nesting beach survey data are used to index the status and trends of loggerheads (USFWS and NMFS 2003).

Nesting beach surveys count the number of nests. As alluded to above, the number of nests laid is a function of the number of reproductively mature females in the population and the number of times that they nest per season. Between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,014 to 92,182, annually with a mean of 73,751 (TEWG 2000). The south Florida nesting group is the largest known loggerhead nesting assemblage in the Atlantic and one of only two loggerhead nesting assemblages worldwide that has greater than 10,000 females nesting per year (USFWS and NMFS 2003; USFWS Fact Sheet). Annual nesting totals have ranged from 48,531 - 83,442 annually over the past decade (USFWS and NMFS 2003). South Florida nests make up the majority (90.7%) of all loggerhead nests counted along the U.S. Atlantic and Gulf coasts during the period 1989-1998. The northern subpopulation is the second largest loggerhead nesting assemblage within the U.S. but much smaller than the south Florida nesting group. Of the total number of nests counted along the U.S. Atlantic and Gulf coasts during the period 1989-1998, 8.5% were attributed to the northern subpopulation. The number of nests for this subpopulation has ranged from 4,370 - 7,887 for the period 1989-1998, for an average of approximately 1,524 nesting females per year (USFWS and NMFS 2003). The remaining three subpopulations (the Dry Tortugas, Florida Panhandle, and Yucatán) are much smaller subpopulations. Annual nesting totals for the Florida Panhandle subpopulation ranged from 113-1,285 nests for the period 1989-2002 (USFWS and NMFS 2003). The Yucatán nesting group was reported to have had 1,052 nests in 1998 (TEWG 2000). Nest counts for the Dry Tortugas subpopulation ranged from 168 to 270 during the 9-year period from 1995-2003.

While nesting beach data is a useful tool for assessing sea turtle populations, the detection of nesting trends requires consistent data collection methods over long periods of time (USFWS and NMFS 2003). In 1989, a statewide sea turtle Index Nesting Beach Survey (INBS) program was developed and implemented in Florida, and similar standardized daily survey programs have been implemented in Georgia, South Carolina, and North Carolina (USFWS and NMFS 2003). Currently available nesting trend data for these subpopulations from the INBS program is still too limited to indicate statistically reliable trends (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Statewide and Index Nesting Beach Survey Programs; USFWS and NMFS 2003). Although not part of the INBS program, nesting survey data are also available for the Yucatán Peninsula, Mexico (USFWS and NMFS 2003). Similarly, nesting surveys for the Dry Tortugas subpopulation have been conducted as part of Florida's statewide survey program since 1995 (although the 2002 year was missed), but no conclusion on the nesting trend for the subpopulation can be made at this time given the relatively short period of survey effort (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Statewide Nesting Beach Survey Data). Similarly, although Zurita *et al.* (2003) did find significant increases in loggerhead nesting on seven beaches at Quintana Roo, Mexico, nesting survey effort overall has been inconsistent among the Yucatán nesting beaches and no trend can be determined for this subpopulation given the currently available data.

More reliable nesting trend information is available from some south Florida and northern subpopulation nesting beaches that have been surveyed for longer periods of time. Using the information gathered from these select south Florida and northern subpopulation nesting beaches, the Turtle Expert Working Group (TEWG) concluded that the south Florida subpopulation was increasing based on nesting data over the last couple of decades, and that the northern subpopulation was stable or declining (TEWG 2000). Trend data for these nesting beaches are expected to be reviewed and the information provided in a revised Loggerhead Sea Turtle Recovery Plan. However, preliminary review of nesting trend data from several sources for the northern and south Florida nesting beaches now suggest: (1) a declining trend in nesting for 11 beaches in North Carolina, South Carolina and Georgia of 2% annually over a 23 year period (1982-2005) (Barbara Schroeder, NMFS, pers. comm.), (2) a declining trend of 3.3% annually for South Carolina beaches since 1980 (Barbara Schroeder, NMFS, pers. comm.), and (3) an overall decline in nesting of 29% for the south Florida subpopulation during the period 1989-2005 (A. Meylan, presentation at the 26th Annual Symposium on Sea Turtle Biology and Conservation, April 2006). Preliminary data from the 2006 nesting season at 27 of the 33 Index beaches indicates that this year may have had the second lowest nesting since monitoring of the Index beaches began in 1989 (McRae 2006).

Nesting trend data must be interpreted cautiously when using it to assess population trends for sea turtles. In general, census of nesting females only reflects the number of reproductively active females (Zurita *et al.* 2003). Females and males that are not reproductively active may not reflect the same tendencies (Ross 1996). Without knowing the proportion of males to females and the age structure of the population, it is impossible to extrapolate the data from nesting beaches to the entire population (Zurita *et al.* 2003; Meylan 1982). In the case of loggerheads, there is currently insufficient information to determine whether the current impacts to mature females are experienced to the same degree amongst all age classes regardless of sex, and/or that the impacts that led to the current abundance of nesting females are affecting the current immature females to the same extent. Adding to the difficulties associated with using loggerhead nesting trend data as an indicator of subpopulation status is the late age to maturity for loggerhead sea turtles. Past literature gave an estimated age at maturity for loggerhead sea turtles of 21-35 years (Frazer and Ehrhart 1985; Frazer *et al.* 1994) with the benthic immature stage lasting at least 10-25 years. New data from tag returns, strandings, and nesting surveys suggested estimated ages of maturity ranging from 20-38 years and the benthic immature stage lasting from 14-32 years (NMFS SEFSC 2001). Given the late age to maturity, there is a greater risk that the factors affecting the number of currently nesting females are not the same as the factors affecting the number of loggerhead sea turtles in the other age classes. Multiple management actions have been implemented in the United States over the last 20 years or less that either directly or indirectly address the known sources of mortality for loggerhead sea turtles (*e.g.*, fishery interactions, power plant entrainment, destruction of nesting beaches, etc.).

In 2001, NMFS (SEFSC) reviewed and updated the stock assessment for loggerhead sea turtles of the western Atlantic (NMFS SEFSC 2001). The assessment reviewed and updated information on nesting abundance and trends, estimation of vital rates (including age to maturity), evaluation of genetic relationships between populations, and evaluation of available data on other anthropogenic effects on these populations since the TEWG reports (1998; 2000). In addition, the assessment also looked at the impact of the U.S. pelagic longline fishery on loggerheads with and without the proposed changes in the Turtle Excluder Device (TED) regulations for the shrimp fishery using a modified population model from Heppell *et al.* (2003)[3]. NMFS SEFSC (2001) modified the model developed by Heppell *et al.* (2003) to include updated vital rate information (*e.g.*, new estimates of the duration of life stages and time to maturity) and, unlike Heppell *et al.* (2003), also considered sex ratios other than 1:1 (NMFS SEFSC 2001). The latter is an important point since studies have suggested that the proportion of females produced by the northern subpopulation is only 35% while the proportion of females produced by the south Florida subpopulation is 80% (NMFS SEFSC 2001).

The assessment looked at the impact of the proposed changes in the Turtle Excluder Device (TED) regulations for the shrimp fishery, as well as the U.S. pelagic longline fishery on loggerheads. NMFS SEFSC (2001) constructed models based on a 30% decrease in small benthic juvenile mortality based on research findings of (existing) TED effectiveness (Crowder *et al.* 1995; NMFS SEFSC 2001; Heppell *et al.* 2003). Model runs were then compared with respect to the change in population status as a result of implementing the requirement for larger TEDs (Epperly *et al.* 2002) alone and also when combined with other changes in survival rate from the pelagic long line fishery. The results of the modeling indicated that the proposed change in the TED regulations which would allow larger benthic immature loggerheads and sexually mature loggerheads to escape from shrimp trawl gear would have a positive or at least stabilizing influence on the subpopulation in nearly all scenarios. Coupling the anticipated effect of the proposed TED changes with changes in the survival rate of pelagic immature loggerheads revealed that subpopulation status would be positive or at least stable. Coupling the anticipated effect of the proposed TED changes with changes in the survival rate of pelagic immature loggerheads revealed that subpopulation status would be positive or at least stable when pelagic immature survival was changed by 0 to +10% in all but the most conservative model scenarios.

Given the late age at maturity for loggerhead sea turtles and the normal fluctuations in nesting, changes in population size as a result of the larger TED requirements and measures to address pelagic immature survival in the U.S. Atlantic longline fishery for swordfish are unlikely to be evident in nesting beach censuses for many years to come. NMFS' SEFSC (2001) assessment was reviewed by three independent experts from the Center for Independent Experts, in 2001. As a result, NMFS SEFSC's stock assessment report, the reviews of it, and the body of scientific literature upon which these documents were derived represent the best available scientific and commercial information for Atlantic loggerheads.

Threats to loggerhead sea turtle recovery

The diversity of a sea turtle's life history leaves them susceptible to many natural and human impacts, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms as well as wave action can appreciably reduce hatchling success. For example, in 1992, all of the eggs over a 90-mile length of coastal Florida were destroyed by storm surges on beaches that were closest to the eye of Hurricane Andrew (Milton *et al.* 1994). Reports

3 Although Heppell *et al.* is a later publication, NMFS SEFSC 2001 is actually a more up-to-date version of the modeling approach. Due to differences in publication times, Heppell *et al.* (2003) was published after NMFS SEFSC 2001.

suggest that extensive loggerhead nest destruction occurred in Florida and other southern states in 2004 due to damage from multiple hurricanes and storm events. Other sources of natural mortality include cold stunning and biotoxin exposure. For example, in the winter of 2004/2005, 2 loggerheads died due to cold stunning on Cape Cod beaches and in the winter of 2005/2006, six loggerheads were cold stunned, with 2 deaths (S. McNulty, NMFS, pers. comm.).

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, beach armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs and an increased presence of native species (*e.g.*, raccoons, armadillos, and opossums) which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the northwest Atlantic coast (in areas like Merritt Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection. Sea turtle nesting and hatching success on unprotected high density east Florida nesting beaches from Indian River to Broward County are affected by all of the above threats.

Sea turtles, including loggerhead sea turtles, are affected by a different set of anthropogenic threats in the marine environment. These include oil and gas exploration, coastal development, and transportation, marine pollution, underwater explosions, hopper dredging, offshore artificial lighting, power plant entrainment and/or impingement, entanglement in debris, ingestion of marine debris, marina and dock construction and operation, boat collisions, poaching, and fishery interactions. In the pelagic environment loggerheads are exposed to a series of long-line fisheries that include the US Atlantic tuna and swordfish longline fisheries, an Azorean long-line fleet, a Spanish long-line fleet, and various fleets in the Mediterranean Sea (Aguilar *et al.* 1995; Bolten *et al.* 1994; Crouse 1999). In the waters off the coastal US, loggerheads are exposed to a suite of fisheries in Federal and State waters including trawl, purse seine, hook and line, gillnet, pound net, longline, dredge, and trap fisheries.

Power plants can also pose a danger of injury and mortality for loggerheads. In Florida, thousands of sea turtles have been entrained in the St. Lucie Nuclear Power Plant's intake canal over the past several decades (Bresette *et al.* 2003). From May 1976 - November 2001, 7,795 sea turtles were captured in the intake canal (Bresette *et al.* 2003). Approximately 57% of these were loggerheads (Bresette *et al.* 2003). Procedures are in place to capture the entrained turtles and release them. This has helped to keep mortality below 1% since 1990 (Bresette *et al.* 2003). The Salem Nuclear Generating Station in New Jersey is also known to capture sea turtles although the numbers are far less than those observed at St. Lucie, FL. As is the case at St. Lucie, procedures are in place for checking for the presence of sea turtles and rescuing sea turtles that are found within the intake canals. Three loggerheads have been recovered from the Salem intakes since 2000, with one turtle released alive. Dredging activities also pose a danger of injury and mortality for loggerheads. Sea turtle deaths in dredging operations have been documented throughout the eastern US. At least 50 loggerheads have been documented to have been killed in northeast dredging projects since 1994.

Summary of Status for Loggerhead Sea Turtles

The loggerhead sea turtle is listed throughout its range as threatened under the ESA. In the Pacific Ocean, loggerhead turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea. The abundance of loggerhead turtles on nesting colonies throughout the Pacific basin have declined dramatically over the past 10 to 20 years by the combined effects of human activities that have reduced the number of nesting females and reduced the reproductive success of females that manage to nest (*e.g.*, due to egg poaching).

Loggerhead sea turtles also occur in the Indian Ocean and Mediterranean Sea. Nesting beaches in the southwestern Indian Ocean at Tongaland, South Africa have been protected for decades and sea turtle nesting shows signs of increasing (Baldwin *et al.* 2003). However, other southwestern Indian Ocean beaches are unprotected and both poaching of eggs and adults continues in some areas. The largest nesting aggregation of loggerhead sea turtles in the world occurs in Oman, principally on the island of Masirah. Oman does not have beach protection measures for loggerheads (Baldwin *et al.* 2003). Sea turtles in the area are affected by fishery interactions, development of coastal areas, and egg harvesting. In the eastern Indian Ocean, nesting is known to occur in western Australia. All known nesting sites within the eastern Indian Ocean are found in Western Australia (Dodd 1988). As has been found in other areas, nesting numbers are disproportionate within the area with the majority of nesting occurring at a single location. This may, however, be the result of fox predation on eggs at other Western Australia nesting sites (Baldwin *et al.* 2003).

There are at least five western Atlantic loggerhead subpopulations (NMFS SEFSC 2001; TEWG 2000; Márquez 1990). As noted above, cohorts from three of these populations, the south Florida, Yucatán, and northern subpopulations, are likely to occur in the action area for this consultation. The south Florida nesting group is the largest known loggerhead nesting assemblage in the Atlantic and one of only two loggerhead nesting assemblages worldwide that have greater than 10,000 females nesting per year (USFWS and NMFS 2003; USFWS Fact Sheet). The northern subpopulation is the second largest loggerhead nesting assemblage within the United States. The remaining three subpopulations (the Dry Tortugas, Florida Panhandle, and Yucatán) are much smaller subpopulations with nest counts ranging from roughly 100 - 1,000 nests per year.

Loggerheads are a long-lived species and reach sexual maturity relatively late; 20-38 years (NMFS SEFSC 2001). The INBS program helps to track loggerhead status through nesting beach surveys. However, given the cyclical nature of loggerhead nesting, and natural events that sometimes cause destruction of many nests in a nesting season, multiple years of nesting data are needed to detect relevant nesting trends in the population. The INBS program has not been in place long enough to provide statistically reliable information on the subpopulation trends for western Atlantic loggerheads. In addition, given the late age to maturity for loggerhead sea turtles, nesting data represents effects to female loggerheads that have occurred through the various life stages over the past couple of decades. Therefore, caution must be used when interpreting nesting trend data since they may not be reflective of the current subpopulation trend if effects to the various life stages have changed.

All loggerhead subpopulations are faced with a multitude of natural and anthropogenic effects. Many anthropogenic effects occur as a result of activities outside of U.S. jurisdiction (*i.e.*, fisheries in international waters). For the purposes of this consultation, NMFS will assume that the northern and the southern Florida subpopulations of loggerhead sea turtles are declining (the conservative estimate) or stable (the optimistic estimate), and the Yucatan subpopulation of loggerhead sea turtles is increasing (the optimistic estimate) or stable (the conservative estimate).

Green Sea Turtle
Green turtles are the largest chelonid (hard-shelled) sea turtle, with an average adult carapace of 91 cm SCL and weight of 150 kg. Based on growth rate studies of wild green turtles, greens have been found to grow slowly with an estimated age of sexual maturity ranging from 18 to 40 years (Balazs 1982; Frazer and Ehrhart 1985; B. Schroeder pers. comm.). Green turtles are distributed circumglobally, and can be found in the Pacific and Atlantic Oceans. In 1978, the Atlantic population of the green sea turtle was listed as threatened under the ESA, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were listed as endangered. As it is difficult to differentiate between breeding populations away from the nesting beaches, all green sea turtles, in water, are considered endangered.

Pacific Ocean. In the Pacific Ocean, green sea turtles can be found along the west coast of the US, the Hawaiian Islands, Oceania, Guam, the Northern Mariana Islands, and American Samoa. Along the Pacific coast, green turtles have been reported as far north as British Columbia, but a large number of the Pacific coast sightings occur in northern Baja California and southern California (NMFS and USFWS 1996). The main nesting sites for the East Pacific green turtle are located in Michoacan, Mexico, and in the Galapagos Islands, Ecuador, with no known nesting of East Pacific green turtles occurring in the US. Between 1982 and 1989, the estimated nesting population in Michoacan ranged from a high of 5,585 females in 1982 to a low of 940 in 1984 (NMFS and USFWS 1996). Current population estimates are unavailable.

Atlantic Ocean. In the western Atlantic, green sea turtles range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999). Green turtle occurrences are infrequent north of Cape Hatteras, but they do occur in mid-Atlantic and northeast waters (e.g., documented in Long Island Sound (Morreale 2003) and cold stunned in Cape Cod Bay, Massachusetts (NMFS unpub. data)). For example, in the winters of 2004/2005 and 2005/2006, a total of three green sea turtles were found coldstunned on Cape Cod beaches.

In the continental US, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan *et al.* 1995). More recently, green turtle nesting occurred on Bald Head Island, North Carolina just east of the mouth of the Cape Fear River, on Onslow Island, and on Cape Hatteras National Seashore. Increased nesting has also been observed along the Atlantic Coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). Certain Florida nesting beaches have been designated index beaches. Index beaches were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of the index beaches in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan et al. 1995). Recent population estimates for the western Atlantic area are not available.

While nesting activity is important in determining population distributions, the remaining portion of the green turtles life is spent on the foraging and breeding grounds. Juvenile green sea turtles occupy pelagic habitats after leaving the nesting beach. Pelagic juveniles are assumed to be omnivorous, but with a strong tendency toward carnivory during early life stages (Bjorndal 1985). At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas, shifting to a chiefly herbivorous diet but may also consume jellyfish, salps, and sponges (Bjorndal 1997). Some of the principal feeding pastures in the western Atlantic Ocean include the upper west coast of Florida and the northwestern coast of the Yucatan Peninsula. Additional important foraging areas in the western Atlantic include the Mosquito and Indian River Lagoon systems and nearshore wormrock reefs between Sebastian and Ft. Pierce Inlets in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito Coast of Nicaragua, the Caribbean Coast of Panama, and scattered areas along Colombia and Brazil (Hirth 1971). In North Carolina, green turtles are known to occur in estuarine and oceanic waters and to nest in low numbers along the entire coast. The summer developmental habitat for green turtles also encompasses estuarine and coastal waters of Chesapeake Bay and as far north as Long Island Sound (Musick and Limpus 1997).

Green turtles face many of the same natural threats as loggerhead and Kemp's ridley sea turtles. In addition, green turtles appear to be susceptible to fibropapillomatosis, an epizootic disease producing lobe-shaped tumors on the soft portion of a turtle's body. Juveniles are most commonly affected. The occurrence of fibropapilloma tumors may result in impaired foraging, breathing, or swimming ability, leading potentially to death.

Threats to sea turtle recovery
Green turtles were traditionally highly prized for their flesh, fat, eggs, and shell, and directed fisheries in the United States and throughout the Caribbean are largely to blame for the decline of the species. In the Gulf of Mexico, green turtles were once abundant enough in the shallow bays and lagoons to support a commercial fishery. In 1890, over one million pounds of green turtles were taken in the Gulf of Mexico green sea turtle fishery (Doughty 1984). However, declines in the turtle fishery throughout the Gulf of Mexico were evident by 1902 (Doughty 1984).

As with the other sea turtle species, fishery mortality accounts for a large proportion of annual human-caused mortality outside the nesting beaches, while other activities like dredging, pollution, and habitat destruction account for an unknown level of other mortality. Stranding reports indicate that between 200-400 green turtles strand annually along the Eastern US coast from a variety of causes most of which are unknown (STSSN database). Sea sampling coverage in the pelagic driftnet, pelagic longline, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles.

Summary of Status of Green Sea Turtles
The global status and trend of green sea turtles is difficult to summarize. In the Pacific Ocean, green turtles are frequent along a north-south band from 15°N to 5°S along 90°W, and between the Galapagos Islands and Central American coast (NMFS and USFWS 1996), but current population

estimates are unavailable. Green turtles range in the western Atlantic from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean. Green turtles face many of the same natural and anthropogenic threats as loggerhead and Kemp's ridley sea turtles. In addition, green turtles are also susceptible to fibropapillomatosis which can result in death. In the continental US, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Recent population estimates for the western Atlantic area are not available. However, the pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in 1989. There is cautious optimism that the green sea turtle population is increasing in the Atlantic. For purposes of this consultation, NMFS will assume that the green sea turtle population is increasing (best case) or at worst is stable.

Kemp's Ridley Sea Turtles

The Kemp's ridley is considered the most endangered sea turtle species. Of the world's seven extant species of sea turtles, the Kemp's ridley has declined to the lowest population level. The Kemp's ridley sea turtle was listed as endangered throughout its range on December 2, 1970 under United States law. The Kemp's ridley is now protected under the ESA.

The only major nesting site for Kemp's ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963), but the population has been drastically reduced from these historical numbers. However, the TEWG (1998, 2000) indicated that the Kemp's ridley population appears to be in the early stage of a recovery trajectory. Conservation efforts by Mexican and US agencies have aided this species by eliminating egg harvest, protecting eggs and hatchlings, and reducing at-sea mortality through fishing regulations. Nesting data, estimated number of adults, and percentage of first time nesters have all increased from lows experienced in the 1970s and 1980s. From 1985 to 1999, the number of nests observed at Rancho Nuevo and nearby beaches has increased at a mean rate of 11.3% per year, allowing cautious optimism that the population is on its way to recovery. For example, data from nests at Rancho Nuevo, North Camp and South Camp, Mexico, have indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and 702 nests in 1985, then increased to produce 1,940 nests in 1995 and about 3,400 nests in 1999. Total nests for the state of Tamaulipas and Veracruz in 2003 was 8,323 (E. Possardt, USFWS, pers. comm.); Rancho Nuevo alone documented 4,457 nests. Estimates of adult abundance followed a similar trend from an estimate of 9,600 in 1966 to 1,050 in 1985 and 3,000 in 1995. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6 to 28 percent from 1981 to 1989 and from 23 to 41 percent from 1990 to 1994. The population model in the TEWG report projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2020, if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular internesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable.

Kemp's ridley nesting occurs from April through July each year. Little is known about mating but it is believed to occur at or before the nesting season in the vicinity of the nesting beach. Hatchlings emerge after 45-58 days. Once they leave the beach, neonates presumably enter the Gulf of Mexico where they feed on available sargassum and associated infauna or other epipelagic species (USFWS and NMFS 1992). The presence of juvenile turtles along both the Atlantic and Gulf of Mexico coasts of the US, where they are recruited to the coastal benthic environment, indicates that post-hatchlings are distributed in both the Gulf of Mexico and Atlantic Ocean (TEWG 2000). The location and size classes of dead turtles recovered by the Sea Turtle Stranding and Salvage Network (STSSN) suggests that benthic immature developmental areas occur in many areas along the US coast and that these areas may change given resource quality and quantity (TEWG 2000).

Juvenile Kemp's ridleys use northeastern and mid-Atlantic coastal waters of the US Atlantic coastline as primary developmental habitat during summer months, with shallow coastal embayments serving as important foraging grounds. Ridleys found in mid-Atlantic waters are primarily post-pelagic juveniles averaging 16 inches in carapace length, and weighing less than 44 pounds (Terwilliger and Musick 1995). Next to loggerheads, Kemp's ridleys are the second most abundant sea turtle in Virginia and Maryland waters, arriving in these areas during May and June (Keinath *et al.* 1987; Musick and Limpus 1997) and on northern foraging grounds in late June. In the Chesapeake Bay, where the juvenile population of Kemp's ridley sea turtles is estimated to be 211 to 1,083 turtles (Musick and Limpus 1997), ridleys frequently forage in submerged aquatic grass beds for crabs (Musick and Limpus 1997). Blue crabs and spider crabs are key components of the Kemp's ridley diet, as noted during examination of stranded sea turtle stomach contents (Seney 2003). Upon leaving the northern foraging grounds, including the Chesapeake Bay in autumn, juvenile ridleys migrate down the coast, passing Cape Hatteras in December and January (Musick and Limpus 1997). Larger juveniles from the Chesapeake Bay are joined there by juveniles of the same size from North Carolina sounds and smaller juveniles from New York and New England to form one of the densest concentrations of Kemp's ridleys outside of the Gulf of Mexico (Musick and Limpus 1997; Epperly *et al.* 1995a; Epperly *et al.* 1995b).

From telemetry studies, Morreale and Standora (1994) determined that Kemp's ridleys are sub-surface animals that frequently swim to the bottom while diving. The generalized dive profile showed that the turtles spend 56% of their time in the upper third of the water column, 12% in mid-water, and 32% on the bottom. In water shallower than 15 m (50 ft), the turtles dive to depth, but spend a considerable portion of their time in the upper portion of the water column. In contrast, turtles in deeper water dive to depth, spending as much as 50% of the dive on the bottom.

Threats to Kemp's ridley recovery

Kemp's ridleys face many of the same natural threats as other sea turtle species, including destruction of nesting habitat from storm events, natural predators at sea, and oceanic events such as cold-stunning. Although cold-stunning can occur throughout the range of the species, it may be a greater risk for sea turtles that utilize the more northern habitats of Cape Cod Bay and Long Island Sound. For example, in the winter of 1999/2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green turtles were found on Cape Cod beaches (R. Prescott, pers. comm.). In the winter of 20043/2004, 79 Kemp's ridleys were found cold stunned on Cape Cod beaches. In the winter of 2004/2005, 32 Kemp's ridleys were found, with 19 deaths. Numbers from the 2005/2006 season are still preliminary but indicate that 29 Kemp's ridleys were coldstunned, with 15 animals dying (S. McNulty, NMFS, pers. comm.). Annual cold stun events do not always occur at this magnitude; the extent of episodic major cold stun events may be associated with numbers of turtles utilizing Northeast waters in a given year, oceanographic conditions and the occurrence of storm events in the late fall. Although many cold-stun turtles can survive if found early enough and transferred to a rehabilitation facility, cold-stunning events can represent a significant cause of natural mortality.

Like other turtle species, the severe decline in the Kemp's ridley population appears to have been heavily influenced by a combination of exploitation of eggs and impacts from fishery interactions. From the 1940s through the early 1960s, nests from Ranch Nuevo were heavily exploited (USFWS and NMFS 1992), but beach protection in 1966 helped to curtail this activity (USFWS and NMFS 1992). Following World War II, there was a substantial increase in the number of trawl vessels, particularly shrimp trawlers, in the Gulf of Mexico where adult Kemp's ridley turtles occur. Information from fishers helped to demonstrate the high number of turtles taken in these shrimp trawls (USFWS and NMFS 1992). Subsequently, NMFS has worked with the industry to reduce turtle takes in shrimp trawls and other trawl fisheries, including the development and use of TEDs. Sea sampling coverage in the Northeast otter trawl fishery, and southeast shrimp and summer flounder bottom trawl fisheries have recorded takes of Kemp's ridley turtles. Although changes in the use of shrimp trawls and other trawl gear have helped to reduce mortality of Kemp's ridleys, this species is also affected by other sources of anthropogenic impacts similar to those discussed above. For example, in the spring of 2000, a total of five Kemp's ridley carcasses were recovered from the same North Carolina beaches where 275 loggerhead carcasses were found. Cause of death for most of the turtles recovered was unknown, but the mass mortality event was suspected to have been from a large-mesh gillnet fishery operating offshore in the preceding weeks. The five ridley carcasses that were found are likely to have been only a minimum count of the number of Kemp's ridleys that were killed or seriously injured as a result of the fishery interaction since it is unlikely that all of the carcasses washed ashore. Four Kemp's ridleys have been documented as killed during dredging operations in the Northeast US since 1994.

Summary of Status of Kemp's Ridley Sea Turtles
The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). From 1985 to 1999, the number of nests observed at Rancho Nuevo and nearby beaches increased at a mean rate of 11.3% per year. Current totals exceed 3000 nests per year (TEWG 2000). Kemp's ridleys mature at an earlier age (7 - 15 years) than other chelonids, thus 'lag effects' as a result of unknown impacts to the non breeding life stages would likely have been seen in the increasing nest trend beginning in 1985 (USFWS and NMFS 1992).

The TEWG (1998) developed a population model to evaluate trends in the Kemp's ridley population through the application of empirical data and life history parameter estimates chosen by the TEWG. Model results identified three trends in benthic immature Kemp's ridleys. Benthic immatures are those turtles that are not yet reproductively mature but have recruited to feed in the nearshore benthic environment where they are available to nearshore mortality sources that often result in strandings. Benthic immature ridleys are estimated to be 2-9 years of age and 20-60 cm in length. Increased production of hatchlings from the nesting beach beginning in 1966 resulted in an increase in benthic ridleys that leveled off in the late 1970s. A second period of increase followed by leveling occurred between 1978 and 1989 as hatchling production was further enhanced by the cooperative program between the USFWS and Mexico's Instituto Nacional de Pesca to increase the nest protection and relocation program in 1978. A third period of steady increase, which has not leveled off to date, has occurred since 1990 and appears to be due to the greatly increased hatchling production and an apparent increase in survival rates of immature turtles beginning in 1990 due, in part, to the introduction of TEDs.

The population model in the TEWG report projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan of 10,000 nesters by the year 2020 if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. The TEWG (1998) identified an average Kemp's ridley population growth rate of 13% per year between 1991 and 1995. Total nest numbers have continued to increase. However, the 1996 and 1997 nest numbers reflected a slower rate of growth, while the increase in the 1998 nesting level has been much higher and decreased in 1999. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular inter-nesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable.

One area for caution in the TEWG findings is that the area surveyed for ridley nests in Mexico was expanded in 1990 due to destruction of the primary nesting beach by Hurricane Gilbert. Because systematic surveys of the adjacent beaches were not conducted prior to 1990, there is no way to determine what proportion of the nesting increase documented since that time is due to the increased survey effort rather than an expanding ridley nesting range. The TEWG (1998) assumed that the observed increase in nesting, particularly since 1990, was a true increase rather than the result of expanded beach coverage. As noted by TEWG, trends in Kemp's ridley nesting even on the Rancho Nuevo beaches alone suggest that recovery of this population has begun but continued caution is necessary to ensure recovery.

ENVIRONMENTAL BASELINE

Environmental baselines for biological opinions include the past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for this biological opinion includes the effects of several activities that occur in the action area that may affect the survival and recovery of threatened and endangered species. The activities that shape the environmental baseline in the action area of this consultation include vessel operations, fisheries, discharges, dredging, ocean dumping, sonic activities, and recovery activities associated with reducing those impacts.

Federal Actions that have Undergone Formal or Early Section 7 Consultation

NMFS has undertaken several ESA section 7 consultations to address the effects of vessel operations and gear associated with federally-permitted fisheries on threatened and endangered species in the action area. Each of those consultations sought to develop ways of reducing the probability of adverse impacts of the action on listed species. Similarly, recovery actions NMFS has undertaken under both the Marine Mammal Protection Act (MMPA) and the ESA are addressing the problem of take of whales in the fishing and shipping industries.

Dredging

As noted above, an Opinion analyzing the effects of dredging two borrow areas for the ACMSPP was completed in 1998. Available sand resources at the two borrow areas have been depleted. The Opinion for this project concluded that the action was not likely to jeopardize the continued existence of loggerhead, green or Kemp's ridley sea turtles. The ITS accompanying the 1998 Opinion exempted the take of 1 Kemp's ridley, 1 green and 6 loggerhead sea turtles during each four year period. This project was expected to have a 50 year life; however, the borrow areas are likely to be depleted after the next dredge cycle. Dredging for this project under the terms of this Opinion took place from May 27, 1998 – July 1, 1998 and September 15 to October 16, 1998 with 1.289 million cy of sand placed on the Ocean City beaches. In 2002 dredging occurred from May 1 to June 26 with 744,827 cy of sand placed on the beach. No takes of sea turtles were observed during these dredge events. Prior to 1998, dredging occurred in 1990, 1991, 1992 and 1994. No observers were present on board the hopper prior to the 1994 dredging event so no information on potential interactions with sea turtles during these events are available. However, three loggerhead sea turtles were found dead on the Ocean City beach in 1992 with necropsies indicating that their deaths were dredge related. This suggests that at least 3 sea turtles have been killed during hopper dredging operations in the action area. Dredging in the action area could have influenced the distribution of sea turtles and/or disrupted potential foraging habitat.

Vessel Operations

Potential adverse effects from federal vessel operations in the action area of this consultation include operations of the US Navy (USN) and the US Coast Guard (USCG), which maintain the largest federal vessel fleets, the EPA, the National Oceanic and Atmospheric Administration (NOAA), and the ACOE. NMFS has conducted formal consultations with the USCG, the USN, and is currently in early phases of consultation with the other federal agencies on their vessel operations (e.g., NOAA research vessels). In addition to operation of ACOE vessels, NMFS has consulted with the ACOE to provide recommended permit restrictions for operations of contract or private vessels around whales. Through the section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid adverse effects to listed species. At the present time, the level of impact of vessel operations on listed species is unknown, however, as stranded sea turtles and whales often demonstrate evidence of being involved in vessel collisions, vessel activities are definitely impacting these species. Refer to the biological opinions for the USCG (September 15, 1995; July 22, 1996; and June 8, 1998) and the USN (May 15, 1997) for detail on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures.

Federal Fishery Operations

Several commercial fisheries operating in the action area use gear which is known to interact with listed species. Efforts to reduce the adverse effects of commercial fisheries are addressed through both the MMPA take reduction planning process and the ESA section 7 process. Federally regulated gillnet, longline, trawl, seine, dredge, and pot fisheries have all been documented as interacting with either whales or sea turtles or both. Other gear types may impact whales and sea turtles as well. For all fisheries for which there is a federal fishery management plan (FMP) or for which any federal action is taken to manage that fishery, impacts have been evaluated through the section 7 process.

Formal ESA section 7 consultation has been conducted on the following fisheries which occur in the action area: Multispecies, Monkfish, Summer Flounder/Scup/Black Sea Bass, Atlantic Bluefish, Highly Migratory Species, Tilefish, Skate, Lobster and Spiny Dogfish fisheries. These consultations are summarized below. These fisheries overlap with the action area in the ocean to varying degrees. None of these fisheries occur in the Delaware River.

The *Multispecies sink gillnet fishery* occurs in the action area and is known to entangle whales and sea turtles. This fishery has historically occurred along the northern portion of the Northeast Shelf Ecosystem from the periphery of the Gulf of Maine to Rhode Island in water depths to 60 fathoms. In recent years, more of the effort in this fishery has occurred in offshore waters and into the Mid-Atlantic. The fishery operates throughout the year with peaks in the spring and from October through February. NMFS reinitiated consultation on the Multispecies FMP on May 4, 2000, in order to reevaluate the ability of the Reasonable and Prudent Alternative (RPA) to avoid the likelihood of jeopardy to right whales. The Opinion, signed on June 14, 2001, concluded that continued implementation of the Multispecies FMP may adversely affect loggerhead, Kemp's ridley and green sea turtles and is likely to jeopardize the existence of the northern right whale. A new RPA was also included to avoid the likelihood that the operation of the gillnet sector of the multispecies fishery would result in jeopardy to northern right whales. The ITS exempted the lethal or non-lethal take of one loggerhead sea turtle, and one green, leatherback, or Kemp's ridley turtle annually.

The federal *Monkfish fishery* occurs in all waters under federal jurisdiction from Maine to the North Carolina/South Carolina border. The monkfish fishery uses several gear types that may entangle protected species. In 1999, observers documented that turtles were taken in excess of the ITS as a result of entanglements in monkfish gillnet gear. NMFS reinitiated consultation on the Monkfish FMP on May 4, 2000, in part, to reevaluate the affect of the monkfish gillnet fishery on sea turtles. The Opinion also considered new information on the status of the northern right whale and new Atlantic Large Whale Take Reduction Plan (ALWTRP) measures, and the ability of the RPA to avoid the likelihood of jeopardy to right whales. The Opinion concluded that continued implementation of the Monkfish FMP was likely to jeopardize the existence of the northern right whale. A new RPA was provided that was expected to remove the threat of jeopardy to northern right whales. In addition, a new ITS was provided for the take of sea turtles in the fishery. However, consultation was once again reinitiated on the Monkfish FMP as of February 12, 2003, to consider the effects of Framework Adjustment 2 measures on ESA-listed species. This consultation was completed on April 14, 2003, and concluded that the proposed action is not likely to result in jeopardy to any ESA-listed species under NMFS jurisdiction. However, takes of sea turtles are still expected to occur, which was reflected in the ITS. The ITS anticipated the take of 3 loggerheads and 1 non-loggerhead species (green, leatherback, or Kemp's ridley) in monkfish gillnet gear, and 1 sea turtle (loggerhead, green, leatherback, or Kemp's ridley) in monkfish trawl gear.

The *Summer Flounder, Scup and Black Sea Bass fisheries* are known to interact with sea turtles. Significant measures have been developed to reduce the take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl by requiring the use of TEDs throughout the year for trawl nets fished from the North Carolina/South Carolina border to Oregon Inlet, NC, and seasonally (March 16-January 14) for trawl vessels fishing between Oregon Inlet, NC and Cape Charles, VA. Takes may still occur with this gear type in other areas however. Based on the occurrence of gillnet entanglements in other fisheries, the gillnet portion of this fishery could entangle endangered whales. The pot gear and staked trap sectors could also entangle whales and sea turtles. The most recent (December 16, 2001) formal consultation on this fishery concluded that the operation of the fishery may adversely affect but is not likely to jeopardize the continued existence of listed species. The ITS anticipated that 19 loggerhead or Kemp's ridley takes (up to 5 lethal) and 2 green turtle takes (lethal or non-lethal) may occur annually. However, as a result of new information not considered in previous consultations, NMFS has reinitiated section 7 consultation on this FMP to consider the effects of the fisheries on ESA-listed whales and sea turtles. Consultation is currently ongoing and to date, a revised Opinion has not yet been issued.

The *Atlantic Bluefish fishery* may pose a risk to protected marine mammals, but is most likely to interact with sea turtles (primarily Kemp's ridleys and loggerheads) given the time and locations where the fishery occurs. Gillnets are the primary gear used to commercially land bluefish. Whales and turtles can become entangled in the buoy lines of the gillnets or in the net panels. Formal consultation this fishery was completed on July 2, 1999, and NMFS concluded that operation of the fishery under the FMP, as amended, is not likely to jeopardize the continued existence of listed species. The ITS exempted the annual take 6 loggerheads (no more than 3 lethal), 6 Kemp's ridleys (lethal or non-lethal) and 1 shortnose sturgeon (lethal or non-lethal).

The primary gear types for the *Spiny dogfish fishery* are sink gillnets, otter trawls, bottom longline, and driftnet gear. Sea turtles can be incidentally captured in all gear sectors of this fishery. Turtle takes in 2000 included one dead and one live Kemp's ridley. Since the ITS issued with the August 13, 1999, Opinion anticipated the take of only one Kemp's ridley (lethally or non-lethally), the incidental take level for the dogfish FMP was exceeded. In addition, a right whale mortality occurred in 1999 as a result of entanglement in gillnet gear that may (but was not determined to be) have originated from the spiny dogfish fishery. NMFS, therefore, reinitiated consultation on the Spiny Dogfish FMP on May 4, 2000, in order to reevaluate the ability of the RPA to avoid the likelihood of jeopardy to right whales, and the effect of the spiny dogfish gillnet fishery on sea turtles. The Opinion also considered new information on the status of the northern right whale and new ALWTRP measures. The Opinion, signed on June 14, 2001, concluded that continued implementation of the Spiny Dogfish FMP is likely to jeopardize the existence of the northern right whale. A new RPA was provided that was expected to remove the threat of jeopardy to northern right whales as a result of the gillnet sector of the spiny dogfish fishery. In addition, the ITS anticipated the annual take of 3 loggerheads (no more than 2 lethal), 1 green (lethal or non-lethal), 1 leatherback (lethal or non-lethal), and 1 Kemp's ridley (lethal or non-lethal).

The management unit for the *Tilefish* FMP is all golden tilefish under US jurisdiction in the Atlantic Ocean north of the Virginia/North Carolina border. Tilefish have some unique habitat characteristics, and are found in a warm water band (47-65° F) at approximately 250 to 1200 feet deep on the outer continental shelf and upper slope of the US Atlantic coast. Because of their restricted habitat and low biomass, the tilefish fishery in recent years has occurred in a relatively small area in the Mid-Atlantic Bight, south of New England and west of New Jersey. An Opinion was issued for this newly regulated fishery on March 13, 2001. An incidental take statement was provided for loggerhead and leatherback sea turtles, anticipating the annual take of 6 loggerheads (up to 3 lethal) and 1 leatherback (lethal or non-lethal).

It was previously believed that the *Scallop dredge fishery* was unlikely to take sea turtles given the slow speed and location at which the gear operates. However, 40 hard shelled turtles were observed or reported captured in the scallop dredge fishery from 1996 to October 2002. Most of these animals were captured in the Hudson Canyon Closed area, and 23 of 40 turtles were alive with no apparent injuries. Section 7 consultation was completed on this fishery, and the Opinion, dated February 24, 2003, concluded that the fishery was not likely to jeopardize listed species. Due to the availability of new information, section 7 consultation was reinitiated and a new Opinion was issued on February 23, 2004. Consultation was reinitiated following the issuance of this Opinion with an Opinion issued on December 15, 2004. Consultation was reinitiated following the issuance of this Opinion with a final Opinion issued on September 19, 2006. The ITS anticipated the annual take in scallop dredge gear of 749 loggerheads (up to 479 lethal), 1 leatherback (lethal or non-lethal), 1 Kemp's ridley (lethal or non-lethal), 1 green (lethal or non-lethal); in trawl gear, the ITS anticipates the annual take of 5 loggerheads, 1 leatherback, 1 Kemp's ridley and 1 green sea turtle, with all takes being lethal or non-lethal.

The *Red crab fishery* is a pot/trap fishery that occurs in deep waters along the continental slope. There have been no recorded takes of ESA-listed species in the red crab fishery. However, given the type of gear used in the fishery, takes may be possible where gear overlaps with the distribution of ESA-listed species. Section 7 consultation was completed on the proposed implementation of the Red Crab FMP, and the Opinion, issued on February 6, 2002, concluded that the action is not likely to result in jeopardy to any ESA-listed species under NMFS jurisdiction. Takes of loggerhead and leatherback sea turtles are considered unlikely but possible. As such, the ITS anticipated the annual take of 1 loggerhead and 1 leatherback sea turtle (lethal or non-lethal).

The *American lobster trap fishery* has been identified as a source of gear causing serious injuries and mortality of endangered whales and leatherback sea turtles. A June 14, 2001 Opinion for this fishery concluded that operation of the lobster trap fishery is likely to jeopardize the continued existence of right whales and may adversely affect leatherback sea turtles. A Reasonable and Prudent Alternative (RPA) to avoid the likelihood that the lobster fishery would jeopardize the continued existence of right whales was implemented. However, these measures are not expected to reduce the number or severity of leatherback sea turtle interactions with the fishery. Information on leatherback entanglements in lobster trap gear is generally lacking. Leatherbacks are known, however, to be caught in lobster trap gear (Dwyer *et al.* 2002). The ITS accompanying the October 31, 2002 Opinion anticipates the take of 2 loggerheads (lethal or non-lethal) and 9 leatherbacks biennially.

The *Squid/Mackerel/Butterfish fishery* is known to take sea turtles and may occasionally interact with whales and shortnose sturgeon. Several types of gillnet gear may be used in this fishery. Other gear types that may be used in this fishery include midwater and bottom trawl gear, pelagic longline/hook-and-line/handline, pot/trap, dredge, poundnet, and bandit gear. Entanglements or entrapments of whales, sea turtles, and sturgeon have been recorded in one or more of these gear types. An Opinion issued on April 28, 1999 anticipates the take of 6 loggerheads (up to 3 lethal), 2 Kemp's ridleys (lethal or non-lethal), 2 green (lethal or non-lethal), 1 leatherback (lethal or non-lethal) and 3 shortnose sturgeon (1 lethal).

Components of the *Highly Migratory Species (HMS)* Atlantic pelagic fishery for swordfish/tuna/shark in the EEZ occur within the action area for this consultation. Use of pelagic longline, pelagic driftnet, bottom longline, hand line (including bait nets), and/or purse seine gear in this fishery has resulted in the take of sea turtles and whales. The Northeast swordfish driftnet portion of the fishery was prohibited during an emergency closure that began in December 1996, and was subsequently extended. A permanent prohibition on the use of driftnet gear in the swordfish fishery was published in 1999. In June 2001, NMFS completed consultation on the HMS pelagic longline fishery and concluded that the pelagic longline fishery and the bottom longline fisheries for shark could capture as many as 1,417 pelagic, immature loggerhead turtles each year and could kill as many as 381 of them and was also expected to capture 875 leatherback turtles each year, killing as many as 183 of them. The Opinion concluded that the Atlantic HMS fisheries, particularly the pelagic longline fisheries, were likely to jeopardize the continued existence of loggerhead and leatherback sea turtles. An RPA was provided to avoid jeopardy to leatherback and loggerhead sea turtles as a result of operation of the HMS fisheries. Consultation was subsequently reinitiated on the HMS fishery following new information on the number of loggerhead and leatherback sea turtles captured in the fishery. NMFS completed the Opinion for that consultation on June 1, 2004. The Opinion concluded that the continued prosecution of the HMS pelagic longline fishery was likely to jeopardize the continued existence of leatherback sea turtles, given that an estimated 805 takes (of which 266 mortalities would result) were expected to occur in 2004, and an estimated 588 takes (with 198 mortalities) were expected in subsequent years, continuing indefinitely. A new RPA was developed. As a result of implementation of the new RPA, leatherback takes are estimated to be 1,981 for the period 2004-2006 with no more than 548 mortalities, and 1764 takes for subsequent 3-year periods with no more than 252 mortalities in each 3-year period (NMFS 2004b). The continued implementation of the HMS fisheries is not expected to jeopardize the continued existence of loggerhead sea turtles. The Opinion anticipates that for the 3-year period from 2004-2006, an estimated 1,869 loggerheads are expected to be taken in the fishery with no more than 438 mortalities. For each subsequent 3-year period, 1,905 loggerheads are expected to be taken with no more than 339 mortalities (NMFS 2004b).

The *Skate fishery* is primarily a bottom trawl fishery with 94.5% of skate landings attributed to this gear type. Gillnet gear is the next most common gear type, accounting for 3.5% of skate landings. The Northeast skate complex is comprised of seven skate species. The seven species of skate are distributed along the coast of the northeast US from the tide line to depths exceeding 700m (383 fathoms). There have been no recorded takes of ESA-listed species in the skate fishery. However, given that sea turtle interactions with trawl and gillnet gear have been observed in other fisheries, sea turtle takes in gear used in the skate fishery may be possible where the gear and sea turtle distribution overlap. Section 7 consultation on the new Skate FMP was completed July 24, 2003, and concluded that implementation of the Skate FMP may adversely affect ESA-listed sea turtles as a result of interactions with (capture in) gillnet and trawl gear. The ITS anticipated the take of one sea turtle annually of any species.

Other than entanglement in fishing gear, effects of *fishing vessels* on listed species may involve disturbance or injury/mortality due to collisions or entanglement in anchor lines. Listed species or critical habitat may also be affected by fuel oil spills resulting from fishing vessel accidents. No collisions between commercial fishing vessels and listed species or adverse effects resulting from disturbance have been documented. However, the commercial fishing fleet represents a significant portion of marine vessel activity. In addition, commercial fishing vessels may be the only vessels active in some areas, particularly in cooler seasons. Therefore, the potential for collisions exists. Due to differences in vessel speed, collisions during fishing activities are less likely than collisions during transit to and from fishing grounds. Because most fishing vessels are smaller than large commercial tankers and container ships, collisions are less likely to result in mortality. Although entanglement in fishing vessel anchor lines has been documented historically, no information is available on the prevalence of such events. Fuel oil spills could affect animals directly or indirectly through the food chain. Fuel spills involving fishing vessels are common events. However, these spills typically involve small amounts of material that are unlikely to adversely affect listed species. Larger spills may result from accidents, although these events would be rare and involve small areas. No direct adverse effects on listed species or critical habitat resulting from fishing vessel fuel spills have been documented. Given the current lack of information on prevalence or impacts of interactions, there is no basis to conclude that the level of interaction represented by any of the various fishing vessel activities discussed in this section would be detrimental to the recovery of listed species.

Non-Federally Regulated Actions

Private and Commercial Vessel Operations

Private and commercial vessels operate in the action area of this consultation and also have the potential to interact with whales and sea turtles. Ship strikes have been identified as a significant source of mortality to the northern right whale population (Kraus 1990) and are also known to impact all other endangered whales. An unknown number of private recreational boaters frequent coastal waters; some of these are engaged in whale watching or sportfishing activities. These activities have the potential to result in lethal (through entanglement or boat strike) or non-lethal (through harassment) takes of listed species that could prevent or slow a species' recovery. Effects of harassment or disturbance which may be caused by whale watch operations are currently unknown. Recent federal efforts regarding mitigating impacts of the whale watch and shipping industries on endangered whales are discussed below.

In addition to commercial traffic and recreational pursuits, private vessels participate in high speed marine events concentrated in the southeastern US that are a particular threat to sea turtles. The magnitude of these marine events in the action area is not currently known. The Sea Turtle Stranding and Salvage Network (STSSN) also reports regular incidents of likely vessel interactions (e.g., propeller-type injuries) with sea turtles. Interactions with these types of vessels and sea turtles could occur in the action area, and it is possible that these collisions would result in mortality.

Other than injuries and mortalities resulting from collisions, the effects of disturbance caused by vessel activity on listed species is largely unknown. Although the difficulty in interpreting animal behavior makes studying the effects of vessel activities problematic, attempts have been made to evaluate the impacts of vessel activities such as whale watch operations on whales in the Gulf of Maine. However, no conclusive detrimental effects have been demonstrated.

Non-Federally Regulated Fishery Operations

Very little is known about the level of interactions with listed species in fisheries that operate strictly in state waters. However, depending on the fishery in question, many state permit holders also hold federal licenses; therefore, section 7 consultations on federal actions in those fisheries address some state-water activity. Impacts on sea turtles from state fisheries may be greater than those from federal activities in certain areas due to the distribution of these species. Nearshore entanglements of turtles have been documented; however, information is not currently available on whether the vessels involved were permitted by the state or by NMFS. Impacts of state fisheries on endangered whales are addressed as appropriate through the MMPA take reduction planning process. NMFS is actively participating in a cooperative effort with the Atlantic States Marine Fisheries Commission (ASMFC) and member states to standardize and/or implement programs to collect information on level of effort and bycatch of protected species in state fisheries. When this information becomes available, it can be used to refine take reduction plan measures in state waters.

With regard to whale entanglements, vessel identification is occasionally recovered from gear removed from entangled animals. With this information, it is possible to determine whether the gear was deployed by a federal or state permit holder and whether the vessel was fishing in federal or state waters. In 1998, 3 entanglements of humpback whales in state-water fisheries were documented. Nearshore entanglements of turtles have been documented; however, information is not available on whether the vessels involved were permitted by the state or by NMFS.

Other Potential Sources of Impacts in the Action Area

A number of anthropogenic activities have likely directly or indirectly affect listed species in the action area of this consultation. These sources of potential impacts include previous dredging projects, pollution, water quality, and sonic activities. However, the impacts from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study impacts from these elusive sources.

Within the action area, sea turtles and optimal sea turtle habitat most likely have been impacted by pollution. Marine debris (e.g., discarded fishing line or lines from boats) can entangle turtles in the water and drown them. Turtles commonly ingest plastic or mistake debris for food, as observed with the leatherback sea turtle. The leatherback's preferred diet includes jellyfish, but similar looking plastic bags are often found in the turtle's stomach contents (Magnuson et al. 1990).

Sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial development. Chemical contaminants may also have an effect on sea turtle reproduction and survival. While the effects of contaminants on turtles is relatively unclear, pollution may be linked to the fibropapilloma virus that kills many turtles each year (NMFS 1997). If pollution is not the causal agent, it may make sea turtles more susceptible to disease by weakening their immune systems.

NMFS and the US Navy have been working cooperatively to establish a policy for monitoring and managing acoustic impacts from anthropogenic sound sources in the marine environment. Acoustic impacts can include temporary or permanent injury, habitat exclusion, habituation, and disruption of other normal behavior patterns. It is expected that the policy on managing anthropogenic sound in the oceans will provide guidance for programs such as the use of acoustic deterrent devices in reducing marine mammal-fishery interactions and review of federal activities and permits for research involving acoustic activities.

Conservation and Recovery Actions Reducing Threats to Listed Species

Education and Outreach Activities
A number of activities are in progress that ameliorate some of the adverse effects on listed species posed by activities summarized in the Environmental Baseline. Education and outreach activities are considered one of the primary tools to reduce the threats to all protected species. NMFS has been active in public outreach to educate fishermen regarding sea turtle handling and resuscitation techniques. For example, NMFS has conducted workshops with longline fishermen to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines. NMFS intends to continue and supplement outreach efforts in an attempt to increase the survival of protected species through education on proper release techniques. Education and outreach activities are also methods to reduce the risk of collision represented by the operation of private and commercial vessels. The USCG educates mariners on whale protection measures and uses its programs -- such as radio broadcasts and notice to mariner publications -- to alert the public to potential whale concentration areas. The USCG also participates in international activities (discussed below) to decrease the potential for commercial ships to strike a whale. Recently, an educational video on the ship strike problem was produced and is being distributed to mariners. In addition, outreach efforts under the ALWTRP for fishermen are also increasing awareness among fishermen that is expected in the long run to help reduce the adverse effects of vessel operations on threatened and endangered species in the action area.

Whales
In addition to the ESA measures for federal activities mentioned in the previous section, numerous recovery activities are being implemented to decrease the adverse effects of private and commercial vessel operations on the species in the action area and during the time period of this consultation. These include the Sighting Advisory System (SAS), other activities recommended by the Northeast Recovery Plan Implementation Team for the Right and Humpback Whale Recovery Plans (NEIT) and Southeast Recovery Plan Implementation Team for the Right Whale Recovery Plan (SEIT), and NMFS regulations.

In 1994, NMFS established the NEIT for the northern right whale and humpback whale recovery plans. Membership of the NEIT consists of representatives from federal and state regulatory agencies and is advised by a panel of scientists with expertise in right and humpback whale biology. The Recovery Plans describe steps to reduce impacts to levels that will allow the two species to recover and rank the various recovery actions in order of importance. The NEIT provides advice to the various federal and state agencies or private entities on achieving these national goals within the Northeast Region. The NEIT agreed to focus on habitat and vessel related issues and rely on the take reduction planning process under the MMPA for reducing takes in commercial fisheries. Through the deliberations of the NEIT, NMFS has implemented a number of activities that reduce the potential for adverse effects to endangered whales from the aforementioned state, federal, and private activities. For example, the NEIT was the driving force behind the outreach activities described above which promote awareness of the right whale ship strike problem among commercial ship operators.

The Northeast Sighting Advisory System (SAS), originally called the "Early Warning System", was designed to document the presence of right whales in and around critical habitat and nearby shipping/traffic separation lanes in order to avert ship strikes. Through a fax-on-demand system, fishermen and other vessel operators can obtain SAS sighting reports and, in some cases, make necessary adjustments in operations to decrease the potential for interactions with right whales. The SAS activity has also served as the only form of active entanglement monitoring in the critical habitat areas, and several entanglements in both the Cape Cod Bay and Great South Channel areas have been reported by SAS flights. Some of these sighting efforts have resulted in successful disentanglement of right whales. SAS flights have also contributed to sightings of dead floating animals that can occasionally be retrieved to increase our knowledge of the biology of the species and effects of human impacts.

In August 1996 NMFS published a proposed rule restricting vessel approach to right whales (61 FR 41116) to a distance of 500 yards. The intent of this rule was to reduce vessel-related impacts, including disturbance,. The Recovery Plan for the Northern Right Whale identified anthropogenic disturbance as one of many factors which had some potential to impede right whale recovery (NMFS 1991b). Following public comment, NMFS published an interim final rule in February 1997 codifying the regulations. With certain exceptions, the rule prohibits both boats and aircraft from approaching any right whale closer than 500 yds. Exceptions for closer approach are provided for the following situations, when: (a) compliance would create an imminent and serious threat to a person, vessel, or aircraft; (b) a vessel is restricted in its ability to maneuver around the 500-yard perimeter of a whale; c) a vessel is investigating or involved in the rescue of an entangled or injured right whale; or (d) the vessel is participating in a permitted activity, such as a research project. If a vessel operator finds that he or she has unknowingly approached closer than 500 yds, the rule requires that a course be steered away from the whale at slow, safe speed. In addition, all aircraft, except those involved in whale watching activities, are excepted from these approach regulations. This rule is expected to reduce the potential for vessel collisions and other adverse vessel-related effects in the environmental baseline.

In April 1998, the USCG submitted, on behalf of the US, a proposal to the International Maritime Organization (IMO) requesting approval of a mandatory ship reporting system (MSR) in two areas off the east coast of the US. The USCG worked closely with NMFS and other agencies on technical aspects of the proposal. The package was submitted to the IMO's Subcommittee on Safety and Navigation for consideration and submission to the Marine Safety Committee at IMO and approved in December 1998. The USCG and NOAA will play important roles in helping to operate the MSR system, which was implemented on July 1, 1999.

Sea Turtles
NMFS has implemented a series of regulations aimed at reducing the potential for incidental mortality of sea turtles in commercial fisheries. On December 3, 2002, NMFS published restrictions on the use of gillnets with larger than 8 inch stretched mesh, in federal waters (3-200 nautical miles) off of North Carolina and Virginia (67 FR 71895). These restrictions were implemented to reduce the impact of the monkfish and other large-mesh gillnet fisheries on endangered and threatened sea turtles in areas where sea turtles are known to concentrate. As a result, gillnets with larger than 8 inch stretched mesh are prohibited in federal waters north of the North Carolina/South Carolina border at the coast to Oregon Inlet at all times; north of Oregon Inlet to Currituck Beach Light, NC from March 16 through January 14; north of Currituck Beach Light, NC to Wachapreague Inlet, VA from April 1 through January 14; and, north of Wachapreague Inlet, VA to Chincoteague, VA from April 16 through January 14. Federal waters north of Chincoteague,

VA are not affected by these new restrictions, although NMFS is looking at additional information to determine whether expansion of the restrictions are necessary to protect sea turtles as they move into northern Mid-Atlantic and New England waters. These measures are in addition to Harbor Porpoise Take Reduction Plan measures that prohibit the use of large-mesh gillnets in southern Mid-Atlantic waters (territorial and federal waters from Delaware through North Carolina out to 72° 30'W longitude) from February 15-March 15, annually.

NMFS regulations require fishermen to handle sea turtles in such a manner as to prevent injury. As stated in 50 CFR 223.206(d)(1), any sea turtle taken incidentally during fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to a series of procedures. In addition, NMFS has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. NMFS has developed a recreational fishing brochure that outlines what to do should a sea turtle be hooked and includes recommended marine mammal and sea turtle conservation measures.

There is an extensive array of Sea Turtle Stranding and Salvage Network (STSSN) participants along the Atlantic and Gulf of Mexico coasts which not only collect data on dead sea turtles, but also rescues and rehabilitates live stranded turtles. The Virginia STSSN has been established since 1979 and includes an extensive volunteer network. Data collected by the STSSN are used to monitor stranding levels and compare them with anthropogenic activities in order to determine whether conservation measures need to be implemented on a particular activity to reduce sea turtle mortality. These data are also used to monitor incidence of disease, study toxicology and contaminants, and conduct genetic studies to determine population structure. All of the states that participate in the STSSN are collecting tissue for and/or conducting genetic studies to better understand the population dynamics of the loggerhead subpopulations. Since the spring of 2002, the Virginia STSSN has improved sea turtle stranding response on Virginia's Eastern shore. This increased level of training, equipment, and effort has enabled timely and effective response to strandings, which has contributed to the better understanding of sea turtle strandings in this area.

Summary and Synthesis of the Status of the Species and Environmental Baseline

The purpose of the Environmental Baseline is to analyze the status of the species in the action area. Generally speaking, the status of sea turtle and whale species overall is the same as the status of these species in the action area given their migratory nature. Impacts from actions occurring in the Environmental Baseline for the action area have the potential to impact sea turtles and whales. Despite regulations on fisheries actions, improvements in dredge technologies and improvements in water quality, sea turtles and whales still face numerous threats in this area, primarily from habitat alteration and interactions with fishing gear and dredging operations.

Without more information on the status of these species, including reliable population estimates, it is difficult to speculate about the long term survival and recovery of these species. However, the best available information has led NMFS to make the determinations about species status as stated below.

Summary of status of whale species

Based on recent estimates, NMFS considers the best approximation for the number of *Northern right whales* to be 300 +/- 10%. Losses of adult whales due to ship strikes and entanglements in fishing gear continue to depress the recovery of this species and the right whale population continues to be declining.

The best available population estimate for *humpback whales* in the North Atlantic Ocean is 10,600 animals. Anthropogenic mortality associated with ship strikes and fishing gear entanglements is significant. Modeling using data obtained from photographic mark-recapture studies estimates the growth rate of the Gulf of Maine feeding population at 6.5% (Barlow and Clapham 1997). With respect to the species as a whole, there are also indications of increasing abundance for the eastern and central North Pacific stocks. However, trend and abundance data is lacking for the western North Pacific stock, the Southern Hemisphere humpback whales, and the Southern Indian Ocean humpbacks.

The minimum population estimate for the western North Atlantic *fin whale* is 2,362 which is believed to be an underestimate. Information on the abundance and population structure of fin whales worldwide is limited. NMFS recognizes three fin whale stocks in the Pacific for the purposes of managing this species under the MMPA. Reliable estimates of current abundance for the entire Northeast Pacific fin whale stock are not available (Angliss *et al.* 2001). Stock structure for fin whales in the southern hemisphere is unknown and there are no current estimates of abundance for southern hemisphere fin whales. As this species continues to be subject to natural and anthropogenic mortality, this population is assumed to be at best stable and at worst declining.

Summary of status of sea turtle species

As noted in the status of the species section, *loggerhead sea turtles* in the action area are likely to be from the northern or South Florida nesting subpopulations or the Yucatan subpopulation. The South Florida nesting subpopulation is the largest known loggerhead nesting assemblage in the Atlantic. Nesting totals from beaches used by the South Florida subpopulation suggests that this subpopulation may be decreasing. The northern nesting subpopulation is the second largest loggerhead nesting assemblage in the Atlantic. Nesting data has led the TEWG to conclude that the northern subpopulation is likely declining and at best is stable. While researchers have documented significant increases in loggerhead nesting on seven beaches at Quintana Roo, Mexico, nesting survey effort overall has been inconsistent among the Yucatán nesting beaches and no trend can be determined for this subpopulation given the currently available data. No reliable estimate of the total number of loggerheads in any of the subpopulations or the species as a whole exists.

Based on the available information it is difficult to determine the current status of the Atlantic *leatherback* population. For example, the number of female leatherbacks reported at some nesting sites in the Atlantic has increased while at other sites the number has decreased. Leatherbacks continue to be captured and killed in many kinds of fisheries and it is likely that the population is declining and at best is stable. No reliable estimate of the total number of leatherbacks in the Atlantic exists.

The *Kemp's ridley* is the most endangered sea turtle species with only one major nesting site remaining. While recent population estimates for this species are not available, patterns of Kemp's ridley nesting data suggests that this population is increasing or is at least stable.

Recent population estimates of the number of *green sea turtles* in the western Atlantic are unavailable. The pattern of nesting abundance for this species has shown a generally positive trend since monitoring began in 1989 suggesting that this population may be increasing or is at least stable.

EFFECTS OF THE ACTION

This section of an Opinion assesses the direct and indirect effects of the proposed action on threatened and endangered species or critical habitat, together with the effects of other activities that are interrelated or interdependent (50 CFR 402.02). Indirect effects are those that are caused later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR 402.02).

Sea turtles are likely to occur in the action area from April 1 – November 30 of any year. Right whales are likely to be present from November 1 – May 31, humpbacks from September 1 – April 30 and fin whales from October – January. The primary concern for loggerhead, Kemp's ridley and green sea turtles is entrainment in the draghead of the hopper dredge, while the main concern for leatherback sea turtles and endangered whales involves the potential for vessel collisions. The proposed action may also affect sea turtle foraging.

The areas under consideration in this Opinion are part of the coastal corridor through which sea turtles migrate. In addition, sea turtles are likely to be foraging in this area during the summer months. Sea turtles are likely to be feeding on or near the bottom of the water column during the warmer months, with loggerhead and Kemp's ridley sea turtles being the most common species in these waters. Although not expected to be as numerous as loggerheads and Kemp's ridleys, green sea turtles are also likely to occur in the action area and this species may be impacted by the proposed project. Leatherback sea turtles may also be present in the action area, but are more subject to vessel collisions than dredge entrainment due to their size and behavioral characteristics.

One of the main factors influencing sea turtle presence in northern waters is seasonal temperature patterns (Ruben and Morreale 1999). Temperature is correlated with the time of year, with the warmer waters in the late spring, summer, and early fall being the most suitable for cold-blooded sea turtles. Sea turtles are most likely to occur in the action area between April and November. As all dredging will be scheduled between April and October, sea turtles are likely to be present in the action area when dredging will occur. Sea turtles have been documented in the action area by the CETAP aerial and boat surveys as well as by surveys conducted by NMFS Northeast Science Center and fisheries observers. The majority of sea turtle observations have been of loggerhead sea turtles, although all four species of sea turtles have been recorded in the area. Right, humpback and fin whales have also been documented in the action area.

To some extent, water depth also dictates the number of sea turtles occurring in a particular area. Waters in and around the borrow areas range from approximately 18 to 60 ft deep. Satellite tracking studies of sea turtles in the Northeast found that turtles mainly occurred in areas where the water depth was between approximately 16 and 49 ft (Ruben and Morreale 1999). This depth was interpreted not to be as much an upper physiological depth limit for turtles, as a natural limiting depth where light and food are most suitable for foraging turtles (Morreale and Standora 1990). The borrow areas and the depths preferred by sea turtles do overlap, suggesting that loggerheads and Kemp's ridleys may be foraging in the borrow areas. As there are no SAV beds in any of the borrow areas, green sea turtles are less likely to use the borrow areas for foraging. In addition, migrating loggerhead, Kemp's ridley, green or leatherback sea turtles may be found swimming through the borrow areas.

Endangered whales, including sperm, humpback, fin, and right whales, could migrate through the action area at various times of the year and migratory movements of these whales species may overlap with times when dredging or transport of dredged materials is occurring in the action area.

The ACOE has indicated that approximately 800,000 cy of material will be removed from these areas each time dredging occurs, with dredging occurring every four years. However, in years where there are significant erosion events, needs on the beach may be greater and dredging of up to 1.6 million cy of sand may be necessary. Dredging is not expected to occur more frequently than once every four years.

Effects of Dredging Operations

NMFS has determined that dredging of the four proposed borrow areas (and associated activities) may affect threatened and endangered species in several different ways: (1) the proposed action can alter foraging habitat; (2) dredges can entrain and kill sea turtles; (3) the proposed action can increase the number of individuals injured or killed in collisions with vessels by increasing vessel traffic in the action area.

Alteration of foraging habitat

Dredging destroys all benthic resources in an area and as such, destroys and degrades the habitat in the area. Since dredging involves removing the bottom material down to a specified depth, the benthic environment will be impacted by dredging operations. No sea grass beds occur in the borrow areas, therefore green sea turtles will not use the borrow areas as foraging areas. Thus, NMFS anticipates that the dredging activities are not likely to disrupt normal feeding behaviors for green sea turtles.

Of the listed species found in the action area, loggerhead and Kemp's ridley sea turtles are the most likely to utilize these areas for feeding, foraging mainly on benthic species, namely crabs and mollusks (Morreale and Standora 1992, Bjorndal 1997). In 1998 and 1999, several studies were completed at the borrow areas to document the benthic assemblage and pelagic resources using the borrow areas (MMS 1999). The most abundant benthic species at the sites were annelid worms, followed by mollusks and crustaceans. As preferred sea turtle foraging items occur at the borrow areas and depths are suitable for use by sea turtles, some sea turtle foraging likely occurs at these sites.

Dredging can cause indirect effects on sea turtles by reducing prey species through the alteration of the existing biotic assemblages. Some of the prey species targeted by turtles, including horseshoe crabs, are mobile; therefore, some individuals are likely to avoid the dredge. While some offshore areas may be more desirable to certain turtles due to prey availability, there is no information to indicate that any of the borrow areas proposed for dredging have more abundant turtle prey or better foraging habitat than other surrounding areas. The assumption can be made that sea turtles are not likely to be more attracted to the borrow areas than to other foraging areas and should be able to find sufficient prey in alternate areas. Recolonization by benthic organisms is expected to occur within approximately 12 months, thus the action area will only be available for foraging habitat for three years at a time before dredging occurs again. It also should be noted that only 5% of the available sand at each borrow area is proposed to be removed. As such, suitable forage should continue to be available at each borrow area at all times. As such, NMFS anticipates that while the dredging activities may temporarily disrupt normal feeding behaviors for sea turtles by causing them to move to alternate areas, the action is not likely to remove critical amounts of prey resources from the action area and any disruption to normal foraging is likely to be insignificant. In addition, the dredging activities are not likely to alter the habitat in any way that prevents sea turtles or whales from using the action area as a migratory pathway.

Entrainment

Leatherback turtles, and sperm, humpback, fin, and right whales are not vulnerable to entrainment in dredge gear due to their large size. Therefore, this section of the Opinion will only consider the effects of entrainment on loggerhead, Kemp's ridley and green sea turtles. Entrainment is the most imminent danger for sea turtles during hopper dredging operations. Sea turtles have been killed in hopper dredges (Magnuson et al. 1990, Slay 1995). The National Research Council's Committee on Sea Turtle Conservation (1990) estimated that dredging mortalities, along with boat strikes, were second only to fishery interactions as a source of probable lethal takes of sea turtles. Experience has shown that injuries sustained by sea turtles entrained in the hopper dredge dragheads are usually fatal. Mortality in hopper dredging operations occurs when the species are sucked into the dredge draghead, pumped through the intake pipe and then killed as they cycle through the centrifugal pump and into the hopper. Because entrainment is believed to occur primarily while the draghead is operating on the bottom, it is likely that only those species feeding or resting on or near the bottom would be vulnerable to entrainment. In relatively rare cases, animals may be entrained if suction is created in the draghead by current flow while the device is being placed or removed, or if the dredge is operating on an uneven or rocky substrate and rises off the bottom. However, it is possible to operate the dredge in a manner that minimizes potential for such incidents as noted in the Monitoring Specifications for Hopper Dredges (Appendix A).

Documented turtle mortalities during dredging operations in the ACOE South Atlantic Division (SAD; i.e., south of Virginia) are more common than in the ACOE NAD probably due to the greater abundance of turtles in these waters; but, the potential for an individual sea turtle to be entrained in hopper dredges would be the same for turtles present in the Northeast and Mid-Atlantic. For example, in King's Bay, Georgia, turtle parts were found at the mouth of the hopper dredge draghead (Slay and Richardson 1988), and at least 38 sea turtle mortalities associated with hopper dredging were recorded during 1991 in three ports located in Brunswick, Georgia, Savannah, Georgia, and Charleston, South Carolina (Slay 1995).

Sea turtle mortality in dredging activities has been documented in the ACOE NAD; a loggerhead turtle was taken by a hopper dredge off the coast of Sea Girt, New Jersey during an ACOE beach renourishment project on August 23, 1997. This turtle was closed up in the hinge between the draghead and the dragarm as the dragarm lifted off the bottom. Additionally, loggerheads were killed during dredging in Delaware Bay on June 22, 1994 and November 3, 1995. Two loggerheads were killed during hopper dredging operations in Delaware Bay in August 2005 and 1 loggerhead was killed during dredging operations off Cape May, New Jersey in August 1993.

Since 1994, 59 sea turtles have been killed by hopper dredges operating in Virginia waters. In Thimble Shoals Channel, maintenance dredging took several turtles during the warmer months of 1996 (1 loggerhead) and 2000 (2 loggerheads, 1 unknown). A total of 15 incidents of turtles and/or turtle parts were taken in association with dredging in Thimble Shoal Channel during 2001 (10 loggerheads, 1 unknown), and one turtle was taken in May 2002 (1 loggerhead). Nine sea turtle takes were reported during dredging conducted in September and October 2003 (7 loggerhead, 1 Kemp's ridley, 1 unknown). Most recently, Thimble Shoals Channel was dredged in the summer of 2006, with 1 loggerhead killed during this operation.

Incidental takes have occurred in the Cape Henry and York Spit Channels as well. In May and June 1994, parts of at least five sea turtles were observed (at least 4 loggerheads and 1 unknown) during dredging at Cape Henry. In September and October 2001, 3 turtle takes were observed (1 Kemp's ridley and 2 loggerheads). Eight turtle takes were observed during dredging at Cape Henry in April, May, June and October 2002 (1 green, 1 Kemp's and 6 loggerhead). Three loggerheads were killed during the dredging of the Cape Henry Channel in the summer of 2006. Four loggerheads were taken in dredging operations occurring during one week in June 1994 at York Spit. Nine turtles were taken in dredging operations at York Spit in 2002 (8 loggerheads, 1 Kemp's ridley). York Spit was last dredged in early April 2004, with no takes of sea turtles reported. No turtles had been observed in dredging operations in Rappahannock Shoal Channels, the York River Entrance Channel or the Sandbridge Shoals borrow area.

It should be noted that the observed takes may not be representative of all the turtles killed during dredge operations. Typically, endangered species observers are required to observe a total of 50% of the dredge activity (i.e., 6 hours on watch, 6 hours off watch). As such, if the observer was off watch and the dredge company either did not report or was unable to identify the turtle incident, there is the possibility that a turtle could be taken by the dredge and go unnoticed. Additionally, in older Opinions, NMFS frequently only required 25% observer coverage and monitoring of the overflows which has since been determined to not be as effective as monitoring of the intakes. These conditions may have led to sea turtle takes going undetected.

NMFS raised this issue to the ACOE during the 2002 season, after several turtles were taken in the Cape Henry and York Spit Channels, and expressed the need for 100% observer coverage. On September 30, 2002, the ACOE informed the dredge contractor that when the observer was not present, the cage should not be opened unless it is clogged. This modification was to ensure that any sea turtles that were taken and on the intake screen (or in the cage area) would remain there until the observer evaluated the load. The ACOE's letter further stated "Crew members will only go into the cage and remove wood, rocks, and man-made debris; any aquatic biological material is left in the cage for the observer to document and clear out when they return on duty. In addition, the observer is the only one allowed to clean off the overflow screen. This practice provides us with 100% observation coverage and shall continue." Theoretically, all sea turtle parts were observed under this scheme, but the frequency of clogging in the cage is unknown at this time. Obviously, the most effective way to ensure that 100% observer coverage is attained is to have a NMFS-approved endangered species observer monitoring all loads at all times. This level of observer coverage would document all turtle interactions and better quantify the impact of dredging on turtle populations.

Sea turtles have been found resting in deeper waters, which could cause additional impacts from dredging activities. In 1981, observers documented the take of 71 loggerheads by a hopper dredge at the Port Canaveral Ship Channel, Florida (Slay and Richardson 1988). This channel is a deep, low productivity environment in the Southeast Atlantic that encourages turtles to rest on the bottom, making them extremely vulnerable to entrainment. The large number of turtle mortalities at the Port Canaveral Ship Channel in the early 1980s resulted in part from turtles being buried in the soft bottom mud, a behavior known as brumation, but this is not a common occurrence everywhere sea turtles inhabit. However, chelonid turtles have been found to make use of deeper, less productive channels as resting areas that afford protection from predators because of the low energy, deep water conditions. Leatherbacks have been shown to dive to great depths, often spending a considerable amount of time on the bottom (NMFS 1995). While sea turtle brumation has not been documented in the mid-Atlantic, it is possible that this phenomenon occurs in these waters.

Several sea turtles stranded on Virginia shores with crushing type injuries from May 25 to October 15, 2002. The Virginia Marine Science Museum (VMSM) found 10 loggerheads, 2 Kemp's ridleys, and 1 leatherback exhibiting injuries and structural damage consistent with what they have seen in animals that were known dredge takes. While it cannot be conclusively determined that these strandings were the result of dredge interactions, the link is possible given the location of the strandings (e.g., in the southern Bay near ongoing dredging activity), the time of the documented strandings in relation to dredge operations, the lack of other ongoing activities which may have caused such damage, and the nature of the injuries (e.g., crushed or shattered carapaces and/or flipper bones, black mud in mouth). Additionally, in 1992, three dead sea turtles were found on an Ocean City beach while dredging operations were ongoing at a borrow area located 3 miles offshore. Necropsy results indicate that the deaths of all three turtles were dredge related. It is unknown if these turtles were crushed by the dredge and subsequently stranded on shore or whether they were entrained in the dredge, entered the hopper and then were discharged onto the beach with the dredge spoils.

A dredge could crush an animal as it was setting the draghead on the bottom, or if the draghead was lifting on and off the bottom due to uneven terrain, but the actual cause of these crushing injuries cannot be determined at this time. Further analyses need to be conducted to better understand the link between crushed strandings and dredging activities, and if those strandings need to be factored into an incidental take level. More research also needs to be conducted to determine if sea turtles are in fact undergoing brumation in mid-Atlantic waters. Regardless, it is possible that dredges are taking animals that are not observed on the dredge (in the inflow or outflow screens), which may result in strandings on nearby Maryland beaches.

Due to the nature of interactions between listed species and dredge operations, it is difficult to predict the number of interactions that are likely to occur from a particular dredging operation. Projects that occur in an identical location with the same equipment year after year may result in interactions in some years and none in other years as noted in the examples of sea turtle takes above. Dredging operations may go on for months, with sea turtle takes occurring intermittently throughout the duration of the action. For example, dredging occurred at Cape Henry over 160 days in 2002 with 8 sea turtle takes occurring over 3 separate weeks while dredging at York Spit in 1994 resulted in 4 sea turtle takes in one week.

The number of interactions between dredge equipment and sea turtles seems to be best associated with the volume of material removed, which is closely correlated to the length of time dredging takes, with a greater number of interactions associated with a greater volume of material removed and a longer duration of dredging. The number of interactions is also heavily influenced by the time of year dredging occurs (with more interactions correlated to times of year when more sea turtles are present in the action area) and the type of dredge plant used (sea turtles are apparently capable of avoiding pipeline and mechanical dredges as no takes of sea turtles have been reported with these types of dredges).

As noted above, the somewhat unpredictable nature of dredging interactions makes it difficult to determine an actual number of interactions that are likely to occur. Each dredge cycle at the borrow areas is expected to remove 800,000 cy of sand although up to 1.6 million cy could be removed. Up to 10-12 million cubic yards of sand may be removed from the borrow areas in 10 dredge cycles before 2044. As noted above, sea turtles are likely using the borrow areas as a travel corridor as they migrate up and down the coast and as a potential foraging and resting area.

Few interactions with listed sea turtles have been recorded during dredging at offshore borrow areas which makes it even more difficult to predict the likely number of interactions between this action and listed sea turtles. As sea turtles have been documented in the action area and suitable habitat and forage items are present, it is likely that sea turtles will be present in the action area when dredging takes place. As sea turtles are likely to be less concentrated in the action area than they are while foraging in Virginia waters such as the entrance channels to the Chesapeake Bay, the level of interactions during this project are likely to be fewer than those recorded during dredging in the Chesapeake Bay area (i.e., the Thimble Shoals and Cape Henry projects noted above).

In previous Opinions NMFS has estimated that for projects in the Chesapeake Bay area, 1 sea turtle is likely to be entrained for each 200,000 cy removed, with approximately 75% of interactions with loggerheads and the remainder with Kemp's ridleys (NMFS 2005). This calculation has been based on a number of assumptions including the following: that sea turtles are evenly distributed throughout all channels and borrow areas for which takes have occurred, that all dredges will take an identical number of sea turtles, and that sea turtles are equally likely to be encountered throughout the April to November time frame.

As noted above, sea turtles are likely to be less concentrated in the action area for this consultation than they are in the Chesapeake Bay area. Based on this information, NMFS believes that hopper dredges operating in the offshore borrow areas are less likely to interact with sea turtles than hopper dredges operating in the Chesapeake Bay area. Based on habitat characteristics and geographic area, the level of interactions during this project may be more comparable to the level of interactions recorded for dredging projects in Delaware Bay or offshore New York and New Jersey (i.e., Cape May, Sea Girt).

As noted above, 3 loggerhead turtles are presumed to have been killed during hopper dredge operations for Ocean City beach nourishment in 1992. During this dredge cycle, 1.59 million cy of sand was removed from a borrow area located approximately 2 miles offshore of Ocean City. Hopper dredges completing beach nourishment or channel dredging projects in other coastal areas (i.e., outside of the Chesapeake Bay area) have typically entrained between zero and two sea turtles per dredge cycle, with up to about 1 million cy of material removed. With the exception of one green turtle in a Virginia dredge, all other sea turtles entrained in dredges operating in the ACOE NAD have been loggerheads and Kemp's ridley. Of these 67 sea turtles, 59 have been loggerhead, 4 have been Kemp's ridleys and 4 have been unknown. Overall, approximately 90% of the sea turtles taken in dredges operating in the ACOE North Atlantic Division have been loggerheads. No Kemp's ridleys have been taken in dredge operations outside of the Chesapeake Bay area. The high percentage of loggerheads is likely due to several factors including their tendency to forage on the bottom where the dredge is operating and the fact that this species is the most numerous of the sea turtle species in Northeast and Mid-Atlantic waters. It is likely that the documentation of only one green sea turtle take in Virginia dredging operations is a reflection of the low numbers of green sea turtles that occur in the area. The low number of green sea turtles in the action area makes an interaction of a green sea turtle with dredge equipment unlikely to occur.

Based on the above information, NMFS believes that it is reasonable to expect that 1 sea turtle is likely to be injured or killed for approximately every 500,000 cy of material removed from any of the four borrow areas. As future maintenance dredging in the four borrow areas could involve removing a range of dredge material, NMFS has assessed the project's impacts on listed species for three different magnitudes of dredge material. Based on the information outlined above, NMFS anticipates that 1 sea turtle is likely to be entrained in dredging operations that remove up to and including 500,000 cy of material. For dredging involving more than 500,000 cy up to and including 1 million cy of material NMFS anticipates that 2 sea turtles could be entrained. NMFS anticipates that 3 sea turtles could be entrained in a dredge cycle involving the removal of more than 1 million up to and including 1.5 million cy of material. During dredge cycles removing greater than 1.5 million cy up to and including 1.6 million cy of material up to 4 sea turtles could be entrained. Due to the nature of the injuries expected by entrainment, all of the turtles are expected to die. NMFS expects that nearly all of the sea turtles will be loggerheads and that the entrainment of a Kemp's ridley during a particular dredge cycle will be rare; however, as Kemp's ridleys have been documented in the action area and have been entrained in hopper dredges, it is likely that this species will interact with the dredge over the course of the project life. As explained above, approximately 90% of the sea turtles taken in dredges operating in the ACOE North Atlantic Division have been loggerheads. Based on that ratio, NMFS anticipates that over the life of the project, for every 10 sea turtle interactions only 1 of them is likely to be with a Kemp's ridley. As noted above, no interactions with green sea turtles are likely. The ACOE has indicated that over the life of the project, approximately 10-12 million cy of material will be removed from the four borrow areas. As such, over the life of the project (i.e., through 2044), NMFS anticipates that up to 24 sea turtles could be killed, with up to two of these being Kemp's ridleys.

Collisions with dredges

There have not been any reports of dredge vessels colliding with listed species but contact injuries resulting from dredge movements could occur at or near the water surface and could therefore involve any of the listed species present in the area. Because the dredge is unlikely to be moving at speeds greater than seven knots during dredging operations, blunt trauma injuries resulting from contact with the hull are unlikely during dredging. It is more likely that contact injuries during actual dredging would involve the propeller of the vessel. Contact injuries with the dredge are more likely to occur when the dredge is moving from the dredging area to port, or between dredge locations. While the distance between these areas is relatively short, the dredge in transit would be moving at faster speeds than during dredging operations, particularly when empty while returning to the borrow areas. Dredges which have been used in the past can operate at speeds of at least 12.1 knots when loaded and 13.4 knots when empty.

The dredge vessel may collide with marine mammals and sea turtles when they are at the surface. These species have been documented with injuries consistent with vessel interactions and it is reasonable to believe that the dredge vessels considered in this Opinion could inflict such injuries on marine mammals and sea turtles, should they collide. As mentioned, sea turtles are found distributed throughout the action area in the warmer months, generally from April through November. Sea turtles will be in the same areas as the dredge and disposal events and as such, it is reasonable to believe that collisions may occur. When these reptiles surface for air (or if they are swimming underwater close to the surface), they will be susceptible to vessel collisions.

North Atlantic right, humpback, and fin whales have all been documented in the action area. In general, right whales can be anticipated to be in the action area from November 1 – March 31. Humpback whales are likely to occur in the action area from September 1 – April 30. Fin whales are likely to occur in these waters from October through January. As such, only fin and humpback whales are likely to occur in the action area when dredging will occur.

While vessel strikes represent a notable threat to marine mammals and sea turtles, there is currently no rule or regulation that implements a requirement for vessel speed. However, NMFS has prepared a draft Ship Strike Reduction Strategy that outlines a number of measures to reduce the threat of ship strikes to right whales. One such measure calls for establishing speed restrictions to minimize collisions. Information included with this strategy indicates that vessels (greater than or equal to 65 feet in length) traveling at speeds of 14 knots and greater are more likely to collide with whales than vessels transiting at slower speeds. The transiting speed of the dredge vessel considered in this opinion will not exceed 13.4 knots. This falls within the range considered by NMFS to reduce the risk of ship strikes of right whales. While right whales are not likely to occur in the action area when dredging is scheduled to occur, these speeds are thought to be protective of other whale species, including fin and humpback whales. Therefore, it is reasonable to believe that collisions with the dredge vessel, operating at speeds of 12 to 13 knots during transit, are unlikely.

CUMULATIVE EFFECTS

Cumulative effects, as defined in the ESA, are those effects of future state or private activities, not involving federal activities that are reasonably certain to occur within the action area of the federal action subject to consultation. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Natural mortality of listed species, including disease (parasites) and predation, occurs in Mid-Atlantic waters. In addition to dredging activities, sources of anthropogenic mortality, injury, and/or harassment of listed species in the action area include incidental takes in state-regulated fishing activities, private vessel interactions, marine debris and/or contaminants.

Future commercial fishing activities in state waters may take several protected species. However, it is not clear to what extent these future activities would affect listed species differently than the current state fishery activities described in the Environmental Baseline section. The Atlantic Coastal Cooperative Statistics Program (ACCSP) and the NMFS sea turtle/fishery strategy, when implemented, are expected to provide information on takes of protected species in state fisheries and systematically collected fishing effort data which will be useful in monitoring impacts of the fisheries. NMFS expects these state water fisheries to continue in the future, and as such, the potential for interactions with listed species will also continue.

As noted in the Environmental Baseline section, private vessel activities in the action area may adversely affect listed species in a number of ways, including entanglement, boat strike, or harassment. It is not possible to predict whether additional impacts from these private activities will occur in the future, but it appears likely that they will continue, especially if actions are not taken to minimize these impacts.

Excessive turbidity due to coastal development and/or construction sites could also influence sea turtle foraging ability. As mentioned previously, turtles are not very easily affected by changes in water quality or increased suspended sediments, but if these alterations make habitat less suitable for turtles and hinder their capability to forage, eventually they would tend to leave or avoid these less desirable areas (Ruben and Morreale 1999).

Marine debris (e.g., discarded fishing line, lines from boats, plastics) can entangle turtles in the water and drown them. Turtles commonly ingest plastic or mistake debris for food, as observed with the leatherback sea turtle. The leatherback's preferred diet includes jellyfish, but similar looking plastic bags are often found in the turtle's stomach contents (Magnuson et al. 1990). It is anticipated that marine debris will continue to impact listed species in the action area.

Sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial development. Chemical contamination may have an effect on listed species reproduction and survival. While the effects of contaminants on sea turtles are relatively unclear, pollution may also make sea turtles more susceptible to disease by weakening their immune systems. While dependent upon environmental stewardship and clean up efforts, impacts from marine pollution, excessive turbidity, and chemical contamination on marine resources and the Chesapeake Bay ecosystem are expected to continue in the future.

INTEGRATION AND SYNTHESIS OF EFFECTS

NMFS has estimated that the proposed action, removing between 800,000 and 1.6 million cy of sand with a hopper dredge from any of the four designated borrow areas once every four years, will result in the mortality of up to 4 sea turtles during each dredge cycle, dependening on the amount of material removed. Over the course of the project life, up to 12 million cubic yards of material are expected to be removed from the borrow areas. NMFS has estimated that 24 sea turtles are likely to be killed during project operations, with no more than 2 of them being Kemp's ridleys and the remainder being loggerheads. While collisions between project vessels and whales and sea turtles are possible, NMFS does not believe that this is likely to occur. As explained in the "Effects of the

Action" section, effects of the proposed dredging on sea turtle foraging areas are likely to be insignificant. Furthermore, the dredging is not likely to alter the borrow areas in a way that would make the action area unsuitable for use as a migratory pathway for any species. As noted above, no critical habitat has been designated in the action area; therefore, this action will not affect any designated critical habitat.

Synthesis of effects of the action

Loggerhead sea turtles. Loggerheads are threatened throughout their entire range. This species exists as five subpopulations in the western Atlantic that show limited evidence of interbreeding. As noted in the "Status of the Species" section (see p. 17), loggerheads in the action area are likely to be from the northern Florida, South Florida or Yucatan nesting subpopulations. Although the northern nesting subpopulation produces about 9 percent of the total loggerhead nests, they comprise more of the loggerhead sea turtles found in foraging areas from the northeastern US to Georgia; between 25 and 59 percent of the loggerhead sea turtles in this area are from the northern subpopulation (Sears 1994, Norrgard 1995, Sears et al. 1995, Rankin-Baransky 1997, Bass et al. 1998). The northern subpopulation may be experiencing a significant decline (2.5 - 3.2% for various beaches) due to a combination of natural and anthropogenic factors, demographic variation, and a loss of genetic viability. As explained above, based on nesting trend data, the south Florida subpopulation may also be experiencing a decline.

As explained in the "Effects of the Action" section, NMFS has estimated that, dependent on the amount of material removed during each dredge cycle, up to 4 loggerhead sea turtles are likely to be entrained during dredging activities at the borrow areas per dredging cycle, with up to 24 loggerheads killed over the course of the project life (i.e., based on the removal of up to 12 million cubic yards of sand through 2044). The death of up to 4 loggerheads per dredge cycle, or up to 24 over the life of the project, will reduce the number of loggerheads from the respective subpopulation as compared to the number of loggerheads that would have been present in the absence of the proposed action. The death of these loggerheads would have the most impact if all of these turtles were juvenile females from the northern subpopulation. However, this is not likely to occur as not all of the loggerheads affected by this action are likely to be juveniles and they are not all likely to be females. Additionally, only 25-59% of the loggerheads in the action area are likely to be from the northern subpopulation, with the remainder from the south Florida and Yucatan subpopulations.

There are at least five western Atlantic loggerhead subpopulations (NMFS SEFSC 2001; TEWG 2000; Márquez 1990). As noted above, cohorts from three of these populations, the south Florida, Yucatán, and northern subpopulations, are likely to occur in the action area for this consultation. The south Florida nesting group is the largest known loggerhead nesting assemblage in the Atlantic and one of only two loggerhead nesting assemblages worldwide that has greater than 10,000 females nesting per year (USFWS and NMFS 2003; USFWS Fact Sheet). Annual nesting totals have ranged from 48,531 - 83,442 annually over the past decade (USFWS and NMFS 2003). The northern subpopulation is the second largest loggerhead nesting assemblage within the U.S. but much smaller than the south Florida nesting group. The number of nests for this subpopulation has ranged from 4,370 - 7,887 for the period 1989-1998, for an average of approximately 1,524 nesting females per year (USFWS and NMFS 2003). The Yucatán nesting group was reported to have had 1,052 nests in 1998 (TEWG 2000).

While reliable estimates of the total size of either subpopulation do not exist, as each subpopulation also includes juveniles and males, the size of each subpopulation is likely to be significantly larger than the number of nesting females. The loss less than 3 loggerheads from any subpopulation each dredge cycle and the loss of up to 3 loggerheads from the species as a whole every four years or the loss of up to 30 loggerheads over the next 38 years, represents a very small percentage of either the subpopulation or the species as a whole and is unlikely to have a detectable effect on the numbers or reproduction of the affected subpopulation. While the loss of a small number of individuals from a subpopulation or species may have an appreciable reduction on the numbers, reproduction and distribution of the species, in general this is likely to occur only when there are very few individuals in a population, the individuals occur in a very limited geographic range or the species has extremely low levels of genetic diversity. This situation is not likely in the case of loggerheads because: the species is widely geographically distributed, it is not known to have low levels of genetic diversity, and in the case of the northern and south Florida subpopulations as well as the species as a whole, there are thousands of nesting females.

Additionally, this action is not likely to reduce distribution of loggerheads because the action will not impede loggerheads from using the action area as a foraging grounds or disrupt other migratory behaviors. In addition, as the action is not likely to have an appreciable effect on the numbers or reproduction of loggerheads, it is not likely to affect the distribution of sea turtles in the five subpopulations or throughout the range of the species. For these reasons, NMFS believes that there is not likely to be any reduction in reproduction and distribution and only a small decrease in the numbers of loggerheads in the western Atlantic subpopulations. As such, there is not likely to be an appreciable reduction in the likelihood of survival and recovery in the wild of the western Atlantic subpopulations or the species as a whole.

Kemp's ridley sea turtles. Kemp's ridleys are endangered throughout their entire range. As explained in the "Effects of the Action" section, NMFS has estimated that 2 Kemp's ridley sea turtle are likely to be entrained during dredging activities at the four borrow areas over the course of the project life (i.e, through 2044). The death of 2 Kemp's ridleys over the next 38 years will reduce the number of Kemp's ridleys as compared to the number of Kemp's ridleys that would have been present in the absence of the proposed action.

The most recent population estimate for Kemp's ridleys indicates that there were approximately 3,000 adults in 1995. While recent population estimates do not exist, the size of the population is thought to be increasing, or at least stable, and as the 1995 estimate includes only adults, the size of the total population is likely significantly higher than 3,000. The loss of 2 Kemp's ridley represents a very small percentage of the species as a whole and is unlikely to have a detectable effect on the numbers or reproduction of Kemp's ridleys. While the loss of a small number of individuals from a subpopulation or species may have an appreciable reduction on the numbers, reproduction and distribution of the species, in general this is likely to occur only when there are very few individuals in a population, the individuals occur in a very limited geographic range or the species has extremely low levels of genetic diversity. This situation is not likely in the case of Kemp's ridleys because: the species is widely geographically distributed, it is not known to have low levels of genetic diversity, there are several thousand individuals in the population and the number of Kemp's ridleys is likely to be increasing and at worst is stable.

Additionally, this action is not likely to reduce distribution of Kemp's ridleys because the action will not impede Kemp's ridleys from accessing suitable foraging grounds or disrupt other migratory behaviors. In addition, as the action is not likely to have a detectable effect on the numbers or reproduction of Kemp's ridleys, it is not likely to affect the distribution of sea turtles in US waters or throughout the range of the species. For these reasons, NMFS believes that there is not likely to be any reduction in reproduction and distribution and only a small decrease in the numbers of Kemp's ridleys in the US Atlantic. As such, there is not likely to be an appreciable reduction in the likelihood of survival and recovery in the wild of this species.

Green sea turtles. Green sea turtles are endangered throughout their entire range. As explained in the "Effects of the Action" section, NMFS has determined that is unlikely that a green turtle will be encountered during dredging operations.

Leatherback sea turtles

As noted in the Effects of the Action section, interactions with leatherback sea turtles are unlikely to occur during dredging. While leatherback sea turtles have been observed swimming near dredge operations in Virginia waters, no entrainments or captures during relocation trawling have ever been recorded. While vessel strikes are possible, the low speeds that the vessels will be operating at make this unlikely to occur.

Right whales. Right whales are endangered throughout their entire range. As explained in the "Effects of the Action" section, right whales are not likely to occur in the action area during the time period when dredging will occur (i.e., May – October). As such, no effects to right whales are likely to occur as a result of this action.

Humpback and fin whales

Humpback and fin whales may be affected by the vessels transiting the action area during project operations, given the potential for collisions with these large whales. While collisions are considered unlikely, a reduction in the speed at which the vessels will be traveling and the practice of maintaining a bridge watch would help reduce the possibility of these interactions.

CONCLUSION

After reviewing the best available information on the status of endangered and threatened species under NMFS jurisdiction, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is NMFS' biological opinion that the proposed action may adversely affect but is not likely to jeopardize the continued existence of the loggerhead and Kemp's ridley sea turtles and is not likely to adversely affect leatherback or green sea turtles or right, humpback or fin whales. NMFS has also concluded that the action will not affect hawksbill turtles as these species are unlikely to occur in the action area. Because no critical habitat is designated in the action area, none will be affected by the proposed action.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include any act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken so that they become binding conditions for the exemption in section 7(o)(2) to apply. Failure to implement the terms and conditions through enforceable measures may result in a lapse of the protective coverage of section 7(o)(2).

When a proposed NMFS action which may incidentally take individuals of a listed species is found to be consistent with section 7(a)(2) of the ESA, section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental taking, if any. It also states that reasonable and prudent measures necessary to minimize such impacts be provided along with implementing terms and conditions. Only those takes resulting from the agency action (including those caused by activities approved by the agency) that are identified in this statement and are in compliance with the specified reasonable and prudent alternatives and terms and conditions are exempt from the takings prohibition of Section 9(a), pursuant to section 7(o) of the ESA.

Amount or Extent of Take

The proposed dredging project has the potential to directly affect loggerhead and Kemp's ridley sea turtles by entraining these species in the dredge. These interactions are likely to cause injury and/or mortality to the affected sea turtles. Based on the distribution of sea turtles in the action area and information available on historic interactions between sea turtles and dredging and relocation trawling operations, NMFS believes that it is reasonable to expect that 1 sea turtle is likely to be injured or killed for approximately every 500,000 cy of material removed from any of the four borrow areas. As future maintenance dredging in the four borrow areas could involve removing a range of dredge material, NMFS has assessed the project's impacts on listed species for four different magnitudes of dredge material.

Based on the information outlined above, NMFS anticipates that 1 sea turtle is likely to be entrained in dredging operations that remove up to and including 500,000 cy of material. For dredging involving more than 500,000 cy up to and including 1 million cy of material NMFS anticipates that 2 sea turtles could be entrained. NMFS anticipates that 3 sea turtles could be entrained in a dredge cycle involving the removal of more than 1 million up to and including 1.5 million cy of material. During dredge cycles removing greater than 1.5 million cy up to and including 1.6 million cy of material up to 4 sea turtles could be entrained. Due to the nature of the injuries expected by entrainment, all of the turtles are expected to die. NMFS expects that nearly all of the sea turtles will be loggerheads and that the entrainment of a Kemp's ridley during a particular dredge cycle will be rare; however, as Kemp's ridleys have been documented in the action area and have been entrained in hopper dredges, it is likely that over the course of the project life that this species will interact with the dredge. As explained above, approximately 90% of the sea turtles taken in dredges operating in the ACOE North Atlantic Division have been loggerheads. Based on that ratio, NMFS anticipates that over the life of the project, for every 10 sea turtle interactions only 1 of them is likely to be with a Kemp's ridley. As noted above, no interactions with green sea turtles are likely. The ACOE has indicated that over the life of the project, approximately 10-12 million cy of material will be removed from the four borrow areas. As such, over the life of the project (i.e., through 2044), NMFS anticipates that up to 24 sea turtles are likely to be entrained and killed, with up to two of these being Kemp's ridleys and the remainder being loggerheads.

NMFS also expects that the maintenance dredging may take an additional unquantifiable number of previously dead sea turtle parts. While decomposed animals taken in federal operations are considered to be takes, as the possession of a listed species is considered a take, NMFS recognizes that decomposed sea turtles may be taken in dredging operations that may not necessarily be related to the dredging activity itself. Theoretically, if dredging operations are conducted properly, no takes of sea turtles should occur as the turtle draghead defector should push the turtles to the side and the suction pumps should be turned off whenever the dredge draghead is away from the substrate. However, due to certain environmental conditions (e.g., rocky bottom, uneven substrate), the dredge draghead may periodically lift off the bottom and entrain previously dead sea turtle parts (as well as live turtles) that may be on the bottom through the high level of suction.
Thus, the aforementioned anticipated level of take refers to those turtles which NMFS confirms as freshly dead. While this definition is subject to some interpretation by the observer, a fresh dead animal may exhibit the following characteristics: little to no odor; fresh blood present; fresh (not necrotic, pink/healthy color) tissue, muscle, or skin; no bloating; color consistent with live animal; and live barnacles. A previously (non-fresh) dead animal may exhibit the following characteristics: foul odor; necrotic, dark or decaying tissues; sloughing of scutes; pooling of old blood; atypical coloration; and opaque eyes. NMFS recognizes that decomposed sea turtles may be taken in dredging operations that may not necessarily be related to the dredging activity itself. NMFS expects that the maintenance dredging may take an additional unquantifiable number of previously dead sea turtle parts.

NMFS believes this level of incidental take is reasonable given the seasonal distribution and abundance of these species in the action area and the level of take historically during other dredging operations in the ACOE NAD. In the accompanying Opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species.

Measures have been undertaken by the ACOE to reduce the takes of sea turtles in dredging activities. Measures that have been successful in minimizing take in other dredging operations have included reevaluating all dredging procedures to assure that the operation of the dragheads and turtle deflectors were in accordance with the project specifications; modifying dredging operations per the recommendation of Mr. Glynn Banks of the ACOE Engineering Research and Development Center; training the dredge crew and all inspectors in proper operation of the dragpipe and turtle deflector systems; and initiating sea turtle relocation trawling. Proper use of draghead deflectors prevent an unquantifiable yet substantial number of sea turtles from being entrained and killed in dredging operations. Tests conducted by the ACOE's Jacksonville District using fake turtles and draghead deflectors showed convincingly that the sea turtle deflecting draghead is useful in reducing entrainments. As the use of draghead deflectors and other modifications to hopper dredge operations have been demonstrated to be effective at minimizing the number of sea turtles taken in dredging operations, NMFS has determined that the use of draghead deflectors and certain operating guidelines (as outlined below) are necessary and appropriate to minimize the take of sea turtles during the dredging of the four borrow areas.

In order to effectively monitor the effects of this action, it is necessary to examine the sea turtles entrained in the dredge. Monitoring provides information on the characteristics of the turtles encountered and may provide data which will help develop more effective measures to avoid future interactions with listed species. For example, measurement data may reveal that draghead deflectors or trawl gear is most effective for a particular size class of turtle. In addition, data from genetic sampling of dead sea turtles can definitively identify the species of turtle as well as the subpopulation from which it came (in the case of loggerheads). Reasonable and prudent measures and implementing terms and conditions requiring this monitoring are outlined below.

Reasonable and Prudent Measures
NMFS has determined that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of sea turtles.

1. The ACOE shall ensure that during times of the year when sea turtles are known to be present in the action area, hopper dredges are outfitted with state-of-the-art sea turtle deflectors on the draghead and operated in a manner that will reduce the risk of interactions with sea turtles which may be present in the action area.
2. A NMFS-approved observer must be present on board the vessel for any dredging occurring in the April 1 – November 30 time frame.
3. The ACOE shall ensure that dredges are equipped and operated in a manner that provides endangered/threatened species observers with a reasonable opportunity for detecting interactions with listed species and that provides for handling, collection, and resuscitation of turtles injured during project activity. Full cooperation with the endangered/threatened species observer program is essential for compliance with the ITS.
4. The ACOE shall ensure that all measures are taken to protect any turtles that survive entrainment in the dredge.
5. NMFS must be contacted before dredging commences and again upon completion of the dredging activity.
6. All interactions with listed species must be properly documented and promptly reported to NMFS.

Terms and Conditions
In order to be exempt from the prohibitions of Section 9 of the ESA, the ACOE must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. To implement RPM #1, hopper dredges must be equipped with the rigid deflector draghead as designed by the ACOE Engineering Research and Development Center, formerly the Waterways Experimental Station (WES), or if that is unavailable, a rigid sea turtle deflector

attached to the draghead. Deflectors must be checked and/or adjusted by a designated expert prior to a dredge operation to insure proper installment and operation during dredging. The deflector must be checked after every load throughout the dredge operation to ensure that proper installation is maintained. Since operator skill is important to the effectiveness of the WES-developed draghead, operators must be properly instructed in its use. Dredge inspectors must ensure that all measures to protect sea turtles are being followed during dredge operations.

2. To implement RPM #2, if dredging occurs during the period of April 1 through November 30, the ACOE must adhere to the attached "Monitoring Specifications for Hopper Dredges" with trained NMFS-approved sea turtle observers, in accordance with the attached "Observer Protocol" and "Observer Criteria" (Appendix A). NMFS-approved observers must be on hopper dredges once surface waters reach or exceed 11° C, or during the period of April 1 through November 30 (whichever occurs first), of any year to monitor the hopper spoil, inflow, screening and dragheads for sea turtles and their remains.

3. To implement RPM #2, observer coverage must be sufficient for 100% monitoring of hopper dredging operations. All biological material found in the intake screens must be documented by the observer.

4. To implement RPM #3, the ACOE must ensure that all contracted personnel involved in operating hopper dredges receive thorough training on measures of dredge operation that will minimize takes of sea turtles. Training shall include measures discussed in Appendix A.

5. To implement RPM #3, if sea turtles are present during dredging or material transport, vessels transiting the area must post a bridge watch, avoid intentional approaches closer than 100 yards when in transit, and reduce speeds to below 4 knots if bridge watch identifies a listed species in the immediate vicinity of the dredge.

6. To implement RPM #4, the procedures for handling live sea turtles must be followed in the unlikely event that a sea turtle survives entrainment in the dredge (Appendix B).

7. To implement RPM #5, the ACOE must inform NMFS of the commencement of operations 3 days prior to the actual start date and of the completion date within 3 days after the actual end of operations.

8. To implement RPM #6, if a dead sea turtle or sea turtle part is taken in dredging or relocation trawling operations, a genetic sample must be taken following the procedure outlined in Appendix C.

9. To implement RPM #6, if a sea turtle or sea turtle parts are taken in dredging operations, the take must be documented on the form included as Appendix D and submitted to NMFS along with the final report (T&C # 12).

10. To implement RPM #6, if a decomposed turtle or turtle part is taken in dredging operations, an incident report must be completed and the specimen must be photographed (Appendix E). Any turtle parts that are considered 'not fresh' (i.e., they were obviously dead prior to the dredge take and ACOE anticipates that they will not be counted towards the ITS) must be frozen and transported to a nearby stranding or rehabilitation facility for review. The ACOE must submit the incident report for the decomposed turtle part, as well as photographs, to NMFS within 24 hours of the take (see Appendix B) and request concurrence that this take should not be attributed to the Incidental Take Statement. NMFS shall have the final say in determining if the take should count towards the Incidental Take Statement.

11. To implement RPM #6, a final report summarizing the results of the dredging and any takes of listed species must be submitted to NMFS (at the addresses specified in Appendix C) within 30 working days of completion of each cycle of the project.

12. To implement RPM #6, if the take of loggerhead sea turtles approaches ½ of the anticipated incidental take level during any project cycle, the ACOE must immediately contact NMFS at (978) 281-9300, ext. 6530, to review the situation. At that time, the ACOE must provide NMFS with information on the amount of material dredged thus far and the amount remaining to be dredged that year. Also at that time, the ACOE should contact NMFS to discuss whether any new management measures could be implemented to prevent the total incidental take level from being reached. For dredge cycles when the take of only 1 sea turtle is anticipated (i.e., when up to 500,000 cy of material is being removed), the situation should be reviewed with NMFS once the anticipated take level is met.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize and monitor the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, reinitiation of consultation and review of the reasonable and prudent measures are required. ACOE must immediately provide an explanation of the causes of the taking and review with NMFS the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

In addition to Section 7(a)(2), which requires agencies to ensure that proposed projects will not jeopardize the continued existence of listed species, Section 7(a)(1) of the ESA places a responsibility on all federal agencies to "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species". Conservation Recommendations are discretionary activities designed to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. When endangered species observers are required on hopper dredges (April 1 to November 30), 100% overflow screening is recommended. While monitoring 100% of the inflow screening is required as a term and condition of this project's Incidental Take Statement, observing 100% of the overflow screening would ensure that any takes of sea turtles are detected and reported.

2. If any Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are observed during dredging operations, this should be reported to NMFS. Observers should also attempt to take length and weight data and photograph specimens if possible.

3. To facilitate future management decisions on listed species occurring in the action area, ACOE should maintain a database mapping system to: a) create a history of use of the geographic areas affected; and, b) document endangered/threatened species presence/interactions with project operations.

4. The ACOE should support ongoing and/or future research to determine the abundance and distribution of sea turtles in North Atlantic waters.

5. The ACOE should investigate, support, and/or develop additional technological solutions to further reduce the potential for sea turtle takes in hopper dredges. For instance, NMFS recommends that the ACOE coordinate with other Southeast Districts, the Association of Dredge Contractors of America, and dredge operators regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle takes. The diamond-shaped pre-deflector, or other potentially promising pre-deflector designs such as tickler chains, water jets, sound generators, etc., should be developed and tested and used where conditions permit as a means of alerting sea turtles and sturgeon of approaching equipment. New technology or operational measures that would minimize the amount of time the dredge is spent off the bottom in conditions of uneven terrain should be explored. Pre-deflector use should be noted on observer daily log sheets, and annual reports to NMFS should note what progress has been made on deflector or pre-deflector technology and the benefits of or problems associated with their usage. NMFS believes that development and use of effective pre-deflectors could reduce the need for sea turtle relocation trawling.

6. New approaches to sampling for turtle parts should be investigated. The ACOE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle takes by hopper dredges. Observation of overflow and inflow screening appears to be only partially effective and may provide only minimum estimates of total sea turtle mortality. NMFS believes that some listed species taken by hopper dredges may go undetected because body parts are forced through the sampling screens by the water pressure (as seen in 2002 Cape Henry dredging) and are buried in the dredged material, or animals are crushed or killed but not entrained by the suction and so the takes may go unnoticed (or may subsequently strand on nearby beaches). The only mortalities that are documented are those where body parts float, are large enough to be caught in the screens, or can be identified to species.

7. NMFS recommends that all sea turtles entrained in hopper dredge dragheads, and sea turtles captured during relocation trawling, be sampled for genetic analysis by a NMFS laboratory. Any genetic samples from live sea turtles must be taken by trained and permitted personnel. Copies of NMFS genetic sampling protocols for live and dead turtles are attached as Appendix I.

8. The ACOE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their

satisfactory completion of dredging operations, or a certain number of cubic yards of material removed, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop "turtle friendly" dredging methods, more effective deflector dragheads, pre-deflectors, top-located water ports on dragarms, etc.

9. When whales are present in the action area, vessels transiting the area should post a bridge watch, avoid intentional approaches closer than 100 yards (or 500 yards in the case of right whales) when in transit, and reduce speeds to below 4 knots.

REINITIATION OF CONSULTATION

This concludes formal consultation on ACOE's proposed use of four new borrow areas for beach nourishment at Ocean City, Maryland. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) a new species is listed or critical habitat designated that may be affected by the action; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered.

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APPENDIX A.

MONITORING SPECIFICATIONS FOR HOPPER DREDGES

I. EQUIPMENT SPECIFICATIONS

A. Baskets or screening

Baskets or screening must be installed over the hopper inflows with openings no smaller than 4 inches by 4 inches to provide 100% coverage of all dredged material and shall remain in place during all dredging operations between April 1 and November 30 of any calendar year. Baskets/screening will allow for better monitoring by observers of the dredged material intake for sea turtles and their remains. The baskets or screening must be safely accessible to the observer and designed for efficient cleaning.

B. Draghead

The draghead of the dredge shall remain on the bottom **at all times** during a pumping operation, except when:

1) the dredge is not in a pumping operation, and the suction pumps are turned completely off;
2) the dredge is being re-oriented to the next dredge line during borrow activities; and
3) the vessel's safety is at risk (i.e., the dragarm is trailing too far under the ship's hull).

At initiation of dredging, the draghead shall be placed on the bottom during priming of the suction pump. If the draghead and/or dragarm become clogged during dredging activity, the pump shall be shut down, the dragarms raised, whereby the draghead and/or dragarm can be flushed out by trailing the dragarm along side the ship. If plugging conditions persist, the draghead shall be placed on deck, whereby sufficient numbers of water ports can be opened on the draghead to prevent future plugging.

Upon completion of a dredge track line, the drag tender shall:

1) throttle back on the RPMs of the suction pump engine to an idling speed (e.g., generally less than 100 RPMs) **prior to** raising the draghead off the bottom, so that no flow of material is coming through the pipe into the dredge hopper. Before the draghead is raised, the vacuum gauge on the pipe should read zero, so that no suction exists both in the dragarm and draghead, and no suction force exists that can impinge a turtle on the draghead grate;
2) hold the draghead firmly on the bottom with no flow conditions for approximately 10 to 15 seconds before raising the draghead; then, raise the draghead quickly off the bottom and up to a mid-water column level, to further reduce the potential for any adverse interaction with nearby turtles;
3) re-orient the dredge quickly to the next dredge line; and
4) re-position the draghead firmly on the bottom prior to bringing the dredge pump to normal pumping speed, and re-starting dredging activity.

C. Floodlights

Floodlights must be installed to allow the NMFS-approved observer to safely observe and monitor the baskets or screens.

D. Intervals between dredging

Sufficient time must be allotted between each dredging cycle for the NMFS-approved observer to inspect and thoroughly clean the baskets and screens for sea turtles and/or turtle parts and document the findings. Between each dredging cycle, the NMFS-approved observer should also examine and clean the dragheads and document the findings.

II. OBSERVER PROTOCOL

A. Basic Requirement

A NMFS-approved observer with demonstrated ability to identify sea turtle species must be placed aboard the dredge(s) being used, starting immediately upon project commencement to monitor for the presence of listed species and/or parts being entrained or present in the vicinity of dredge operations.

B. Duty Cycle

Beginning April 1, NMFS-approved observers are to be onboard for every week of the dredging project until project completion or November 30, whichever comes first. While onboard, observers shall provide the required inspection coverage on a rotating basis so that combined monitoring periods represent 100% of total dredging through the project period.

C. Inspection of Dredge Spoils

During the required inspection coverage, the trained NMFS-approved observer shall inspect the galvanized screens and baskets at the completion of each loading cycle for evidence of sea turtles or shortnose sturgeon. The Endangered Species Observation Form shall be completed for each loading cycle, whether listed species are present or not (Appendix G). If any whole (alive or dead) or turtle parts are taken incidental to the project(s), Julie Crocker (978) 281-9328 ext. 6530 or Pat Scida (978) 281-9208 must be contacted within 24 hours of the take. An incident report for sea turtle/shortnose sturgeon take (Appendix H) shall also be completed by the observer and sent to Julie Crocker via FAX (978) 281-9394 within 24 hours of the take. Incident reports shall be completed for every take regardless of the state of decomposition. NMFS will determine if the take should be attributed to the incidental take level, after the incident report is received. Every incidental take (alive or dead, decomposed or fresh) should be photographed, and photographs shall be sent to NMFS either electronically (julie.crocker@noaa.gov) or through the mail. Weekly reports, including all completed load sheets, photographs, and relevant incident reports, as well as a final report, shall be submitted to NMFS NER, Protected Resources Division, One Blackburn Drive, Gloucester, MA 01930-2298.

D. Information to be Collected

For each sighting of any endangered or threatened marine species (including whales as well as sea turtles), record the following information on the Endangered Species Observation Form (Appendix F):

1) Date, time, coordinates of vessel
2) Visibility, weather, sea state
3) Vector of sighting (distance, bearing)
4) Duration of sighting
5) Species and number of animals
6) Observed behaviors (feeding, diving, breaching, etc.)
7) Description of interaction with the operation

E. Disposition of Parts

If any whole turtles or shortnose sturgeon (alive or dead, decomposed or fresh) or turtle or shortnose sturgeon parts are taken incidental to the project(s), Julie Crocker (978) 281-9328 ext. 6530 or Pat Scida (978) 281-9208 must be contacted within 24 hours of the take. All whole dead sea turtles or shortnose sturgeon, or turtle or shortnose sturgeon parts, must be photographed and described in detail on the Incident Report of Sea Turtle/Shortnose Sturgeon Mortality (Appendix G). The photographs and reports should be submitted to Julie Crocker, NMFS, Protected Resources Division, One Blackburn Drive, Gloucester, MA 01930-2298. After NMFS is notified of the take, it may instruct the observer to save the animal for future analysis if there is freezer space. Regardless, any dead **Kemp's ridley** sea turtles shall be photographed, placed in plastic bags, labeled with location, load number, date, and time taken, and placed in cold storage. Dead turtles or turtle parts will be further labeled as recent or old kills based on evidence such as fresh blood, odor, and length of time in water since death. Disposition of dead sea turtles/shortnose sturgeon will be determined by NMFS at the time of the take notification. If the species is unidentifiable or if there are entrails that may have come from a turtle, the subject should be photographed, placed in plastic bags, labeled with location, load number, date and time taken, and placed in cold storage. Dead Kemp's ridley or unidentifiable species or parts will be collected by NMFS or NMFS-approved personnel (contact Julie Crocker at (978) 281-9328 ext. 6530).

Live turtles (both injured and uninjured) should be held onboard the dredge until transported as soon as possible to the appropriate stranding network personnel for rehabilitation (Appendix C). No live turtles should be released back into the water without first being checked by a qualified veterinarian or a rehabilitation facility. Virginia and Maryland stranding network members (for rehabilitating turtles) include Mark Swingle and/or Susan Barco at the Virginia Marine Science Museum [(757)437-4949], Jack Musick at the Virginia Institute of Marine Science [(804)684-7313], and Dr. Brent Whitaker and/or David Schofield of the National Aquarium in Baltimore [(410)576-3853]. Mark Swingle/Susan Barco, Brent Whitaker/David Schofield, and the NMFS Stranding Network Coordinator ((978) 281-9300) should also be contacted immediately for any marine mammal injuries or mortalities.

III. OBSERVER REQUIREMENTS

Submission of resumes of endangered species observer candidates to NMFS for final approval ensures that the observers placed onboard the dredges are qualified to document takes of endangered and threatened species, to confirm that incidental take levels are not exceeded, and to provide expert advice on ways to avoid impacting endangered and threatened species. NMFS does not offer certificates of approval for observers, but approves observers on a case-by-case basis.

A. Qualifications

Observers must be able to:

1) differentiate between leatherback (*Dermochelys coriacea*), loggerhead *Caretta caretta*), Kemp's ridley *(Lepidochelys kempii*), green (*Chelonia mydas*), and hawksbill *(Eretmochelys imbricata*) turtles and their parts, and shortnose (*Acipenser brevirostrum*) and Atlantic (*Acipenser oxyrinchus oxyrinchus*) sturgeon and their parts;
2) handle live sea turtles and sturgeon and resuscitate and release them according accepted procedures;
3) correctly measure the total length and width of live and whole dead sea turtle and sturgeon species;
4) observe and advise on the appropriate screening of the dredge's overflow, skimmer funnels, and dragheads; and
5) identify marine mammal species and behaviors.

B. Training

Ideally, the applicant will have educational background in marine biology, general experience aboard dredges, and hands-on field experience with the species of concern. For observer candidates who do not have sufficient experience or educational background to gain immediate approval as endangered species observers, the below observer training is necessary to be considered admissible by NMFS. We can assist the ACOE by identifying groups or individuals capable of providing acceptable observer training. Therefore, at a minimum, observer training must include:

1) instruction on how to identify sea turtles and sturgeon and their parts;
2) instruction on appropriate screening on hopper dredges for the monitoring of sea turtles and sturgeon (whole or parts);
3) demonstration of the proper handling of live sea turtles and sturgeon incidentally captured during project operations. Observers may be required to resuscitate sea turtles according to accepted procedures prior to release;

4) instruction on standardized measurement methods for sea turtle and sturgeon lengths and widths; and
5) instruction on how to identify marine mammals; and
6) instruction on dredging operations and procedures, including safety precautions onboard a vessel.

APPENDIX B

Sea Turtle Handling and Resuscitation

It is unlikely that sea turtles will survive entrainment in a hopper dredge, as the turtles found in the dragheads are usually dead, dying, or dismantled. However, the procedures for handling live sea turtles follow in case the unlikely event should occur. These guidelines are adapted from 50 CFR § 223.206(d)(1).

Please photograph all turtles (alive or dead) and turtle parts found during dredging activities and complete the Incident Report of Sea Turtle Take (Appendix G).

Dead sea turtles

The procedures for handling dead sea turtles and parts are described in Appendix C-II-E.

Live sea turtles

When a sea turtle is found in the dredge gear, observe it for activity and potential injuries.

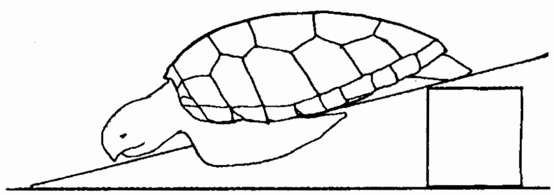
- **If the turtle is actively moving**, it should be retained onboard until evaluated for injuries by a permitted rehabilitation facility. Due to the potential for internal injuries associated with hopper entrainment, it is necessary to transport the live turtle to the nearest rehabilitation facility as soon as possible, following these steps:
  1) Contact the nearest rehabilitation facility to inform them of the incident. If the rehabilitation personnel cannot be reached immediately, please contact Julie Crocker at (978) 281-9328 ext. 6530 or Pat Scida at (978) 281-9128.
  2) Keep the turtle shaded and moist (e.g., with a water-soaked towel over the eyes, carapace, and flippers), and in a confined location free from potential injury.
  3) Contact the crew boat to pick up the turtle as soon as possible from the dredge (within 12 to 24 hours maximum). The crew boat should be aware of the potential for such an incident to occur and should develop an appropriate protocol for transporting live sea turtles.
  4) Transport the live turtle to the closest permitted rehabilitation facility able to handle such a case.

  Do not assume that an inactive turtle is dead. The onset of rigor mortis and/or rotting flesh are often the only definite indications that a turtle is dead. Releasing a comatose turtle into any amount of water will drown it, and a turtle may recover once its lungs have had a chance to drain.

- **If a turtle appears to be comatose** (unconscious), contact the designated stranding/rehabilitation personnel immediately. Once the rehabilitation personnel has been informed of the incident, attempts should be made to revive the turtle at once. Sea turtles have been known to revive up to 24 hours after resuscitation procedures have been followed.
  - Place the animal on its bottom shell (plastron) so that the turtle is right side up and elevate the hindquarters at least 6 inches for a period of 4 up to 24 hours. The

degree of elevation depends on the size of the turtle; greater elevations are required for larger turtles.

- Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches then alternate to the other side.
- Periodically, gently touch the eye and pinch the tail (reflex test) to see if there is a response.
- Keep the turtle in a safe, contained place, shaded, and moist (e.g., with a water-soaked towel over the eyes, carapace, and flippers) and observe it for up to 24 hours.
- If the turtle begins actively moving, retain the turtle until the appropriate rehabilitation personnel can evaluate the animal. The rehabilitation facility should eventually release the animal in a manner that minimizes the chances of re-impingement and potential harm to the animal (i.e., from cold stunning).
- Turtles that fail to move within several hours (up to 24) must be handled in the manner described in Appendix C-II-E, or transported to a suitable facility for necropsy (if the condition of the sea turtle allows and the rehabilitation facility wants to necropsy the animal).



Stranding/rehabilitation contacts

Sea Turtles in Virginia

- Mark Swingle and/or Susan Barco, Virginia Marine Science Museum
  Phone: (757) 437-4949
- Jack Musick, Virginia Institute of Marine Science
  Phone: (804) 684-7313

Sea Turtles in Maryland

- Dr. Brent Whitaker and/or David Schofield of the National Aquarium in Baltimore
  Phone: (410) 576-3853

Marine Mammals

- Mark Swingle/Susan Barco (VA)
- Dr. Whitaker/Mr. Schofield (MD)
- NMFS Stranding Network Coordinator: (978) 281-9300

APPENDIX C
Protocol for Collecting Tissue from Sea Turtles for Genetic Analysis

Materials for Collecting Genetic Tissue Samples

- surgical gloves
- alcohol swabs
- betadine swabs
- sterile disposable biopsy punches
- sterile disposable scalpels
- permanent marker to externally label the vials
- scotch tape to protect external labels on the vials
- pencil to write on internal waterproof label
- waterproof label, 1/4" x 4"
- screw-cap vial of saturated NaCl with 20% DMSO*, wrapped in parafilm
- piece of parafilm to wrap the cap of the vial after sample is taken
- vial storage box

* The 20% DMSO buffer within the vials is nontoxic and nonflammable. Handling the buffer without gloves may result in exposure to DMSO. This substance soaks into skin very rapidly and is commonly used to alleviate muscle aches. DMSO will produce a garlic/oyster taste in the mouth along with breath odor. The protocol requires that you wear gloves each time you collect a sample and handle the buffer vials. DO **NOT** store the buffer where it will experience extreme heat. The buffer must be stored at room temperature or cooler, such as in a refrigerator.

Please collect two small pieces of muscle tissue from all live, comatose, and dead stranded loggerhead, green, leatherback, and hybrid sea turtles (and any hawksbills, although this would be a rare incident). A muscle sample can be obtained no matter what stage of decomposition a carcass is in. Please utilize the equipment in these kits for genetic sampling of **turtles only** and contact the NMFS sea turtle stranding coordinator when you need additional biopsy supplies.

Sampling Protocol for Dead Turtles

1. Put on a pair of surgical gloves. The best place to obtain the muscle sample is on the ventral side where the front flippers insert near the plastron. It is not necessary to cut very deeply to get muscle tissue.

2. Using a new (sterile and disposable) scalpel cut out two pieces of muscle of a size that will fit in the vial.

3. Transfer both samples directly from the scalpel to a single vial of 20% DMSO saturated with salt.

4. Use the pencil to write the stranding ID, date, species ID and SCL on the waterproof label and place it in the vial with the samples.

5. Label the outside of the vial using the permanent marker with stranding ID, date, species ID and SCL .

6. Apply a piece of clear scotch tape over the what you have written on the outside of the vial to protect the label from being erased or smeared.

7. Wrap parafilm around the cap of the vial by stretching as you wrap.

8. Place the vial in the vial storage box.

9. Complete the Sea Turtle Biopsy Sample Collection Log.

10. Attach a copy of the STSSN form to the Collection Log - be sure to indicate on the STSSN form that a genetic sample was taken.

11. Dispose of the used scalpel and gloves. It is very important to use a new scalpel for each animal to avoid cross contamination.

At the end of the calendar year submit all genetic samples to:

Sea Turtle Stranding Coordinator
NMFS Protected Resources Division
One Blackburn Drive
Gloucester, MA 01930
(978)281-9300

APPENDIX D

ENDANGERED SPECIES OBSERVER FORM
Borrow Area Dredging
Atlantic Coast of Maryland Shoreline Protection Project

Daily Report

Date: ________________________________
Geographic Site: ____
Location: Lat/Long ____________________ Vessel Name ___________________________

Weather conditions: ____
____
Water temperature: Surface ____________ Below midwater (if known) ____________

Condition of screening apparatus: ____
____
____

Incidents involving endangered or threatened species? (Circle) Yes No
(*If yes, fill out Incident Report of Sea Turtle/Shortnose Sturgeon Mortality*)

Comments (type of material, biological specimens, unusual circumstances, etc:)
____
____
____

Observer's Name: ____
Observer's Signature: ____

Species	# of Sightings	# of Animals	Comments

APPENDIX D

Incident Report of Sea Turtle Take

Species ____________ Date ______________ Time (specimen found) _______________

Geographic Site ____
Location: Lat/Long ____
Vessel Name _____________________ Load # ____________________________
Begin load time ____________________ End load time __________________________
Begin dump time ___________________ End dump time _____________________

Sampling method ____
Condition of screening ____
Location where specimen recovered ____
____

Draghead deflector used? YES NO Rigid deflector draghead? YES NO
Condition of deflector ____
____

Weather conditions____
____

Water temp: Surface _______________ Below midwater (if known) ___________________

Species Information: *(please designate cm/m or inches.)*
Head width ________________________ Plastron length ___________________________
Straight carapace length _______________ Straight carapace width_____________________
Curved carapace length ________________ Curved carapace width ____________________

Condition of specimen/description of animal (please complete attached diagram)
____
____
____

Turtle Decomposed: NO SLIGHTLY MODERATELY SEVERELY

Turtle tagged: YES NO *Please record all tag numbers.* Tag # _____________________
Genetic sample taken: YES NO
Photograph attached: YES NO
(please label *species, date, geographic site* and *vessel name* on back of photograph)

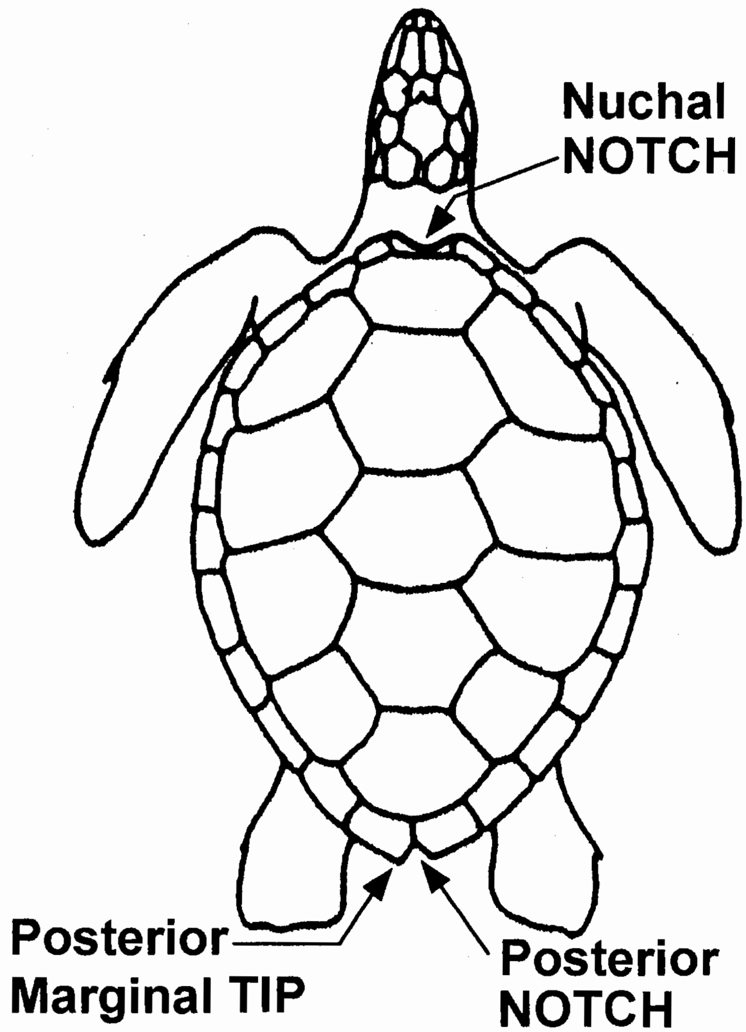
Comments/other (include justification on how species was identified) __________________
____
____
____

Observer's Name ______________________________________

Observer's Signature _________________________________

Incident Report of Sea Turtle Take

Draw wounds, abnormalities, tag locations on diagram and briefly describe below.



Description of animal:

APPENDIX F

Incident Report of Sea Turtle Take

Species ____________ Date ______________ Time (specimen found) _______________

Geographic Site ____
Location: Lat/Long ____
Vessel Name ________________________ Load # ___________________________
Begin load time _____________________ End load time________________________
Begin dump time ____________________ End dump time ______________________

Sampling method ____
Condition of screening ____
Location where specimen recovered____
____

Draghead deflector used? YES NO Rigid deflector draghead? YES NO
Condition of deflector ____
____

Weather conditions____
____

Water temp: Surface _______________ Below midwater (if known) __________________

Species Information: *(please designate cm/m or inches.)*
Head width _________________________ Plastron length ________________________
Straight carapace length _______________ Straight carapace width___________________
Curved carapace length ________________ Curved carapace width ___________________

Condition of specimen/description of animal (please complete attached diagram)
____
____
____

Turtle Decomposed: NO SLIGHTLY MODERATELY SEVERELY

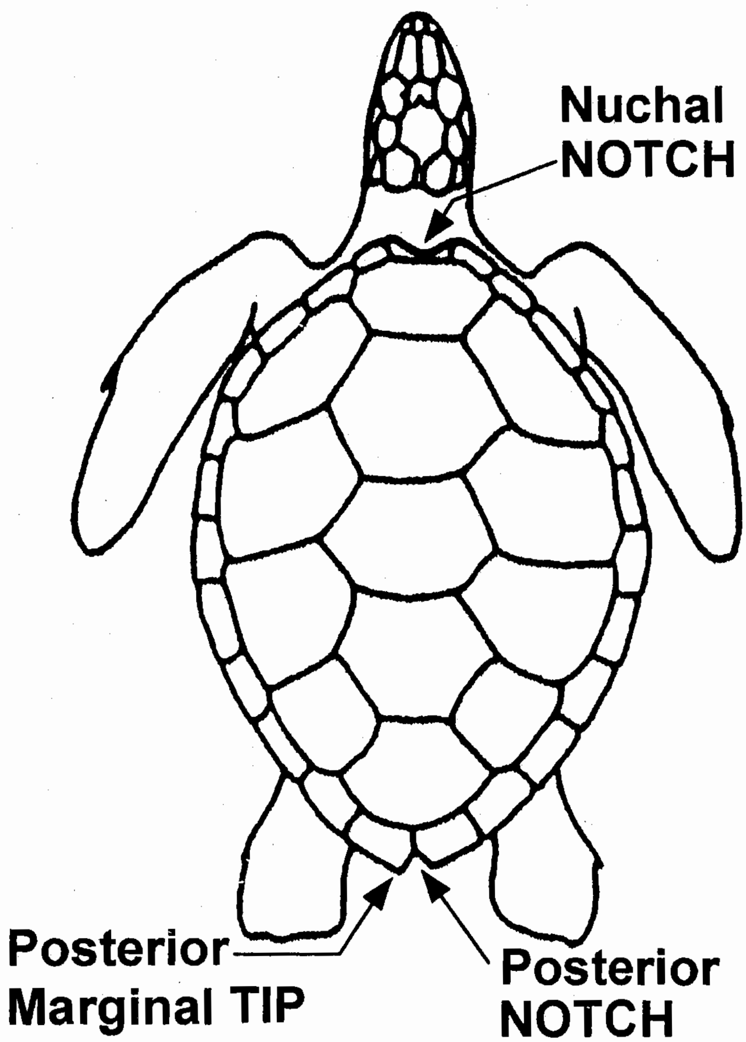
Turtle tagged: YES NO *Please record all tag numbers.* Tag # ____________________
Genetic sample taken: YES NO
Photograph attached: YES NO
(please label *species, date, geographic site* and *vessel name* on back of photograph)

Comments/other (include justification on how species was identified) ________________
____
____
____

Observer's Name ____________________________________
Observer's Signature ________________________________

Incident Report of Sea Turtle Take

Draw wounds, abnormalities, tag locations on diagram and briefly describe below.



Description of animal: