**ENDANGERED SPECIES ACT SECTION 7 CONSULTATION**
**BIOLOGICAL OPINION**

**Action Agency:** National Marine Fisheries Service, Northeast Fisheries Science Center

**Activity:** Endangered Species Act Section 7 Consultation on the Proposed Award of Research Set-Aside for the 2010 to 2012 Surveys of the NEAMAP Near Shore Trawl Program [Consultation No. F/NER/2009/07486] GARFO-2009-00002

**Consulting Agency:** National Marine Fisheries Service, Northeast Region, through its Protected Resources Division

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Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*), requires that each Federal agency shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect species listed as endangered or threatened under the ESA, that agency is required to consult with either the NOAA Fisheries Service (NMFS) or U.S. Fish and Wildlife Service (FWS), depending upon the species that may be affected. In instances where NMFS or FWS are themselves authorizing, funding, or carrying out an action that may affect listed species, the agency must conduct intra-service consultation. Since the action described in this document is proposed to be funded by the NMFS Northeast Fisheries Science Center (NEFSC), this office has requested formal intra-service section 7 consultation.

NMFS NEFSC proposes to provide funding in the form of pounds of summer flounder, scup, black sea bass, bluefish, and *Loligo* squid to the Virginia Institute of Marine Science (VIMS) under the 2010-2012 Mid-Atlantic Research Set-Aside (RSA) Program for the Spring and Fall of each aforementioned year. The surveys will be conducted as part of the Northeast Area Monitoring and Assessment Program (NEAMAP) Near Shore Trawl Program. These surveys require the use of bottom trawl gear in areas and at times when sea turtles are likely to be present. The NMFS Northeast Regional Office (NERO) has, therefore, initiated formal intra-service consultation with NMFS NEFSC in accordance with section 7(a)(2) of the ESA given that the use of bottom trawl gear for the Spring and Fall 2010-2012 surveys may adversely affect loggerhead, Kemp's ridley, green, and leatherback sea turtles as a result of capture in the gear. This document represents NMFS's biological opinion (Opinion) on the proposed project, and its effects on ESA-listed species under NMFS jurisdiction in accordance with section 7 of the ESA.

Formal intra-service section 7 consultation on the Spring and Fall 2010-2012 NEAMAP surveys was initiated by NMFS NERO on January 6, 2010 [Consultation No. F/NER/2009/07486]. This Opinion is based on information provided in VIMS's Environmental Assessment (EA) for the NEAMAP Near Shore Trawl Program 2010-2012 (VIMS 2010), NMFS's recent biological opinion on the Spring and Fall 2009 NEAMAP surveys (NMFS 2009a), correspondence with NMFS NEFSC, and other sources of information. A complete administrative record of this consultation will be kept on file at NMFS NERO.

## 1.0 CONSULTATION HISTORY

On October 5, 2009, the NEFSC Operations, Management, and Information (OMI) Division requested the initiation of section 7 consultation, pending the receipt of additional information, on the proposed funding in the form of pounds of summer flounder, scup, black sea bass, bluefish, and *Loligo* squid to VIMS under the 2010-2012 Mid-Atlantic RSA Program in support of the NEAMAP Near Shore Trawl Program. Based on conversations with OMI Division staff and information provided in the EA for the action, the request for consultation includes the Spring and Fall surveys for 2010, 2011, and 2012. Additional information was received on January 6, 2010, in the form of a revised EA, and consultation was initiated on that date.

The study design for the 2010-2012 NEAMAP surveys includes using bottom trawl gear for approximately 30 days in April/May and again in September/October of each year. Each 30-day cruise will involve 150 sampling sites. The spring surveys start at the southernmost sampling stations around Cape Hatteras, NC and head north to Montauk, NY as Mid-Atlantic waters warm from April to May. The fall surveys start at the northernmost sampling stations around Montauk, NY and head south to Cape Hatteras, NC as Mid-Atlantic waters cool from September to October. Some sampling will also occur in Block Island Sound and Rhode Island Sound. The use of bottom trawl gear for the surveys may adversely affect loggerhead, Kemp's ridley, green, and leatherback sea turtles as a result of physical contact with and capture in the gear given that: (a) the use of the trawl gear will overlap in time and area with the distribution of sea turtles in the survey area in the spring and fall, (b) sea turtle interactions with comparable trawl gear in the survey area have occurred during NEFSC spring and fall bottom trawl surveys, and (c) sea turtle interactions with commercial trawl gear have occurred in this same area during the same seasons. Formal consultation was, therefore, initiated by NMFS NERO on January 6, 2010, the date on which all necessary information to conduct the consultation was received.

NMFS previously consulted on its funding of the 2009 Spring and Fall NEAMAP trawl surveys under the 2009 Mid-Atlantic RSA Program. That consultation was initiated on December 23, 2008, and considered the effects to ESA-listed species under NMFS jurisdiction as a result of funding the trawl survey that was conducted in nearshore waters from Montauk, NY to Cape Hatteras, NC in the Spring and Fall of 2009. The consultation was completed on April 16, 2009, and concluded that the proposed action may adversely affect but was not likely to jeopardize the continued existence of loggerhead sea turtles. An Incidental Take Statement (ITS) along with non-discretionary Reasonable and Prudent Measures (RPMs) to minimize the impacts of incidental take of loggerheads were also provided. The proposed action was not expected to adversely affect leatherback, Kemp's ridley, green, and hawksbill sea turtles, shortnose sturgeon, the Gulf of Maine Distinct Population Segment (DPS) of Atlantic salmon, or ESA-listed cetaceans.

NMFS also previously consulted on its funding of the Fall 2008 NEAMAP trawl survey under the 2008 Mid-Atlantic RSA Program. That consultation was initiated on August 8, 2008, and considered the effects to ESA-listed species under NMFS jurisdiction as a result of funding the trawl survey that was conducted in nearshore waters from Montauk, NY to Cape Hatteras, NC in the Fall of 2008. The consultation was completed on September 19, 2008, and concluded that the proposed action may adversely affect but was not likely to jeopardize the continued existence of loggerhead sea turtles. An ITS along with non-discretionary RPMs to minimize the impacts of incidental take of loggerheads were also provided. The proposed action was not expected to adversely affect leatherback, Kemp's ridley, green, and hawksbill sea turtles, shortnose sturgeon, the Gulf of Maine DPS of Atlantic salmon, or ESA-listed cetaceans.

Finally, NMFS also previously consulted on its funding of the NEAMAP pilot trawl survey of Fall 2006. That consultation, which was initiated on November 28, 2005 and completed on May 5, 2006, concluded that the proposed action may adversely affect but was not likely to jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley, or green sea turtles. An ITS and non-discretionary RPMs to minimize the impacts of incidental take of these sea turtle species were provided. The proposed action was not expected to adversely affect shortnose sturgeon, the Gulf of Maine DPS of Atlantic salmon, hawksbill sea turtles, or ESA-listed cetaceans.

While past consultations on NEAMAP trawl survey projects concluded that the action may affect only loggerhead sea turtles, this current consultation considers that the proposed action may also affect Kemp's ridley, green, and leatherback sea turtles. This is due to the fact that a Kemp's ridley and a green sea turtle were taken during the Fall 2009 NEAMAP trawl surveys, and a leatherback sea turtle was taken during the NEFSC's Fall 2009 bottom otter trawl survey.

## 2.0 DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the Spring and Fall 2010-2012 NEAMAP trawl surveys to be conducted by VIMS in nearshore waters along the U.S. east coast from Montauk, NY to Cape Hatteras, NC and inclusive of Block Island and Rhode Island Sounds. The purpose of these surveys is to collect data on the living marine resources in the designated area for the NEAMAP Near Shore Trawl Program (VIMS 2010). A summary of the proposed action relevant to the analysis of its potential effects on threatened and endangered species is presented below.

The NEAMAP surveys are intended to be a complement to the NEFSC bottom trawl surveys that are conducted from the Gulf of Maine to Cape Hatteras in the spring and fall of each year. The NEFSC surveys are conducted in waters less than approximately 1,800 feet (300 fathoms; 549 meters), but few stations have been sampled in waters less than 90 feet (15 fathoms; 27.4 meters) due to the size and draft of the survey vessel. With the larger, deeper-draft *FSV Henry B. Bigelow* having come online in 2009, survey coverage of near shore areas is now even less, and waters less than 60 feet (10 fathoms; 18.3 meters) will no longer be surveyed by the NEFSC.

The objective of the NEAMAP Near Shore Trawl Program, in general, is to survey areas undersampled or not sampled by the NEFSC trawl surveys and to collect data on the diversity, biomass, relative abundance, and distribution of living marine resources that occur in waters of the Mid-Atlantic and Southern New England regions, from approximately Martha's Vineyard, MA to Cape Hatteras, NC. The protocol for the Spring and Fall 2010-2012 NEAMAP surveys, which is discussed in detail in VIMS (2010), is as follows:

- a single vessel, to be determined through an annual contract, will be used for the surveys;
- the vessel will tow a bottom otter trawl net with varying mesh-sizes in different panels;
- tows will only be conducted during daylight hours;
- each tow will be 20 minutes in duration;
- the target tow speed will be 3.1 knots;
- trawling will occur in waters of Rhode Island Sound and Block Island Sound at depths of 60-120 feet (10-20 fathoms; 18.3-37 meters);
- trawling will occur in waters from Montauk, NY to Cape Hatteras, NC at depths of 20-60 feet (3.3-10 fathoms; 6-18 meters);
- the spring survey will be conducted for an approximately 30-day period starting in mid- to late April, and will start sampling at the southernmost stations and work northward;

- the fall survey will be conducted for an approximately 30-day period starting in mid- to late September, and will start sampling at the northernmost stations and work southward; and,
- a total of 150 randomly selected stations will be sampled during each cruise, with approximately 18 of these stations located in the Dr. Carl N. Shuster, Jr. Horseshoe Crab Reserve, which is a 1,500-square mile reserve in Federal waters adjacent to Delaware Bay.

### 2.1 Action Area

The action area for an Opinion is defined as all of the areas directly or indirectly affected by the Federal action, and not merely the immediate area involved in the action. NMFS anticipates that the only effects on ESA-listed species and their habitat as a result of the survey are the direct effects of interaction between sea turtles and bottom trawl gear that will be used for the survey, and the effects on other marine organisms (*i.e.*, sea turtle prey) on or very near the seafloor from towing the trawl net. Therefore, for the purpose of this consultation, the action area for the proposed action is defined by the area in which bottom trawl gear for the project will be operated, roughly all U.S. Atlantic coastal ocean waters from Montauk, NY to Cape Hatteras, NC from 20-60 feet in depth and also all waters in Rhode Island and Block Island Sounds from 60-120 feet in depth.

## 3.0 STATUS OF THE SPECIES

NMFS has determined that the actions being considered in the Opinion may adversely affect the following sea turtle species provided protection under the ESA:

| Common name | Scientific name | ESA Status |
|---|---|---|
| Loggerhead sea turtle | *Caretta caretta* | Threatened |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | Endangered |
| Green sea turtle | *Chelonia mydas* | Threatened/Endangered[1] |
| Leatherback sea turtle | *Dermochelys coriacea* | Endangered |

NMFS has determined that the actions being considered in the Opinion are not likely to adversely affect shortnose sturgeon (*Acipenser brevirostrum*), the Gulf of Maine DPS of Atlantic salmon (*Salmo salar*), hawksbill sea turtles (*Eretmochelys imbricata*), North Atlantic right whales (right whales) (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), fin whales (*Balaenoptera physalus*), sei whales (*Balaenoptera borealis*), blue whales (*Balaenoptera musculus*), and sperm whales (*Physeter macrocephalus*), all of which are listed as endangered species under the ESA. Thus, these species will not be considered further in this Opinion. The following discussion is NMFS's rationale for these determinations.

Shortnose sturgeon are benthic fish that occur in large coastal rivers of eastern North America. They range from as far south as the St. Johns River, Florida (possibly extirpated from this

[1] Green sea turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green sea turtles are considered endangered wherever they occur in U.S. waters

system) to as far north as the Saint John River in New Brunswick, Canada. The species is anadromous in the southern portion of its range (*i.e.*, south of Chesapeake Bay), while some northern populations are amphidromous (NMFS 1998a). Given the range of the species, shortnose sturgeon are not expected to be present in the area where trawl effort for the survey will occur.

The naturally spawned and conservation hatchery populations of anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, including those that were already listed in November 2000, are listed as endangered under the ESA (NMFS 2009b, 2009c). These populations include those in the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, Sheepscot, Penobscot, Androscoggin, and Kennebec Rivers as well as Cove Brook. Juvenile salmon in New England rivers typically migrate to sea in May after a two- to three-year period of development in freshwater streams, and remain at sea for two winters before returning to their U.S. natal rivers to spawn. Results from a 2001 post-smolt trawl survey in Penobscot Bay and the nearshore waters of the Gulf of Maine indicate that Atlantic salmon post-smolts are prevalent in the upper water column throughout this area in mid to late May. Therefore, commercial fisheries deploying small mesh active gear (pelagic trawls and purse seines within 10 m of the surface) in nearshore waters of the Gulf of Maine may have the potential to incidentally take smolts. Since in-water work for the trawl survey will not occur in or near rivers where Atlantic salmon are likely to be found and the gear will operate in the ocean at or near the bottom rather than near the surface, Atlantic salmon belonging to the Gulf of Maine DPS are not expected to be present in the areas where trawl effort for the survey will occur.

The hawksbill sea turtle is uncommon in the waters of the continental U.S. Hawksbills prefer coral reef habitats, such as those found in the Caribbean and Central America. Mona Island (Puerto Rico) and Buck Island (St. Croix, U.S. Virgin Islands) contain especially important foraging and nesting habitat for hawksbills. Within the continental U.S., nesting is restricted to the southeast coast of Florida and the Florida Keys, but nesting is rare in these areas. Hawksbills have been recorded from all the Gulf States and along the east coast of the U.S. as far north as Massachusetts, but sightings north of Florida are rare. Aside from Florida, Texas is the only other U.S. state where hawksbills are sighted with any regularity. Since hawksbill sea turtles are not expected to be present in the areas where trawl effort for the survey will occur, it is highly unlikely that the proposed action will affect this sea turtle species.

Sperm whales and blue whales are also unlikely to occur in areas where bottom otter trawl gear for the survey will operate. During surveys for the Cetacean and Turtle Assessment Program (CeTAP), sperm whales were observed along the shelf edge, centered around the 1,000 m depth contour but extending seaward out to the 2,000 m depth contour (CeTAP 1982). Although blue whales are occasionally seen in U.S. waters, they are more commonly found in Canadian waters and are rare in continental shelf waters of the eastern U.S. (Waring *et al.* 2000). Given the predominantly offshore distribution of these two cetacean species, both are highly unlikely to be affected by the NEAMAP surveys.

North Atlantic right whales, humpback whales, fin whales, and sei whales do occur in the area where the surveys will be conducted. Nevertheless, none of these are expected to be affected by the use of bottom otter trawl gear for the survey given the following. Right whales, humpback whales, and fin whales occur in Mid-Atlantic and New England waters over the continental shelf. Sei whales are also observed over the continental shelf although they typically occur over the continental slope or in basins situated between banks (NMFS 1998b). All four species follow a similar, general pattern of foraging at high latitudes (*e.g.*, southern New England and Canadian waters) in the spring and summer months and calving in lower latitudes (*i.e.*, off of Florida for right whales and in the West Indies for humpback whales) in the winter months (CeTAP 1982; Hain *et al.* 1992; Clark 1995; Perry *et al.* 1999; Horwood 2002; Kenney 2002). Some non-breeding animals may remain in higher latitudes during the calving season or move offshore. Therefore, in-water work for the survey may overlap with the distribution of these cetacean species during part of the proposed project. However, large cetaceans have the speed and maneuverability to get out of the way of oncoming mobile gear, including trawl gear. Observer coverage of many fishing trips using mobile gear (*e.g.*, dredge, trawl gear) have shown that these gear types do not pose a reasonable risk of entanglement or capture for large cetaceans.

NMFS has also determined that in-water work for the survey will not have any adverse effects on cetacean prey. Right and sei whales feed on copepods (Horwood 2002; Kenney 2002). The use of trawl gear for the proposed project will not affect the availability of copepods for foraging right and sei whales because copepods are very small organisms that will pass through the gear rather than being captured in it. Blue whales feed on euphausiids (krill) (Sears 2002) which, likewise, are too small to be captured in the gear. Humpback and fin whales also feed on krill as well as small schooling fish (*e.g.*, sand lance, herring, and mackerel) found within the water column (Aguilar 2002; Clapham 2002). The trawl gear used for the survey will operate on or very near the bottom. Therefore, the fish species caught in such gear would be species that live in benthic habitats (on or very near the bottom) such as flounders and other groundfish versus schooling fish such as herring and mackerel that occur within the water column. Therefore, the in-water work for the 2010-2012 NEAMAP surveys will not affect the availability of prey for foraging humpback or fin whales. Sperm whales feed on larger organisms that inhabit the deeper ocean regions (Whitehead 2002). Bottom otter trawl gear for the 2010-2012 NEAMAP surveys will not operate in these deep water areas. Therefore, the 2010-2012 NEAMAP surveys will not affect the availability of prey for foraging sperm whales.

The in-water work for the Spring and Fall 2010-2012 NEAMAP surveys will not occur in low latitude waters where calving and nursing occurs for these large cetacean species (Aguilar 2002; Clapham 2002; Horwood 2002; Kenney 2002; Sears 2002; Whitehead 2002). Therefore, the use of trawl gear in relation to the proposed action will not affect the oceanographic conditions that are conducive for these behaviors.

### 3.1 Status of Loggerhead Sea Turtles

Loggerhead sea turtles are found in temperate and subtropical waters and occupy a range of habitats including offshore waters, continental shelves, bays, estuaries, and lagoons. The loggerhead is the most abundant species of sea turtle in U.S. waters. Genetic differences exist between loggerhead sea turtles that nest and forage in the different ocean basins (Bowen 2003; Bowen and Karl 2007). Differences in the maternally inherited mitochondrial DNA also exist between loggerhead nesting groups that occur within the same ocean basin (TEWG 2000; Pearce 2001; Bowen 2003; Bowen *et al.* 2005; Shamblin 2007). Site fidelity of females to one or more nesting beaches in an area is believed to account for these genetic differences (TEWG 2000; Bowen 2003). However, loggerhead sea turtles are currently listed under the ESA at the species level rather than as subspecies or DPSs. The ESA requires NMFS to ultimately conclude whether the action under consultation, in light of the Environmental Baseline (Section 4.0) and Cumulative Effects (Section 5.0), is likely to jeopardize the species as it is listed. Therefore, information on the range-wide status of the species is included as follows.

*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 sea turtles at nesting colonies throughout the Pacific basin has declined dramatically over the past ten to twenty years. Loggerhead sea turtles in the Pacific Ocean are represented by a northwestern Pacific nesting group (located in Japan) and a smaller southwestern Pacific nesting group that occurs in eastern Australia and New Caledonia. Data from 1995 estimated the Japanese nesting group at 1,000 adult females (Bolten *et al.* 1996). More recent information suggests that nest numbers have increased gradually over the period of 1998-2004 (NMFS and USFWS 2007a). However, this time period is too short to make a determination of the overall trend in nesting (NMFS and USFWS 2007a). Genetic analyses of loggerhead females nesting in Japan indicate the presence of genetically distinct nesting colonies (Hatase *et al.* 2002).

In Australia, long-term census data have been collected at some rookeries since the late 1960s and early 1970s, and nearly all the data show marked declines in nesting since the mid-1980s. The nesting group in Queensland, Australia is now less than 500 adult females, which represents an 86% reduction in the size of the annual nesting population in 23 years (Limpus and Limpus 2003).

Pacific loggerhead sea turtles are captured, injured, or killed in numerous Pacific fisheries including gillnet, longline, pound net, and trawl fisheries in the western and/or eastern Pacific Ocean (NMFS and USFWS 2007a). In Australia, where sea turtles are taken in bottom trawl and longline fisheries, efforts have been made to reduce fishery bycatch (NMFS and USFWS 2007a). Loggerheads in the Pacific are also impacted by a reduction in nesting habitat from erosion and extensive beach use, predation (by humans and animals), boat strikes, and marine pollution.

*Indian Ocean.* Loggerhead sea turtles are distributed throughout the Indian Ocean, along most mainland coasts and island groups (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 predation and/or egg harvesting.

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 groups are still affected by subsistence hunting of adults and eggs (Baldwin *et al.* 2003). The largest known nesting group 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). In the eastern Indian Ocean, all known nesting sites are found in Western Australia (Dodd 1988). Nesting numbers are disproportionate within the area with the majority of nesting occurring at a single location; Dirk Hartog Island hosts approximately 70%-75% of the nesting loggerheads in the southeastern Indian Ocean (Baldwin *et al.* 2003). The depletion of nesting at other Western Australia sites may, however, be the result of longstanding red fox predation on eggs (Baldwin *et al.* 2003).

*Mediterranean Sea.* Nesting in the Mediterranean Sea is confined almost exclusively to the eastern basin (Margaritoulis *et al.* 2003). The greatest numbers of nests in the Mediterranean are found in Greece with an average of 3,050 nests per year (Margaritoulis *et al.* 2003; NMFS and USFWS 2007a). Turkey has the second largest number of nests with 2,000 nests per year (NMFS and USFWS 2007a). There is a long history of exploitation of loggerheads in the Mediterranean (Margaritoulis *et al.* 2003). Although much of this is now prohibited, some directed captures still occur (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). Longline fisheries, in particular, are believed to catch thousands of juvenile loggerheads each year (NMFS and USFWS 2007a), although genetic analyses indicate that only a portion of the loggerheads captured originate from loggerhead nesting groups in the Mediterranean (Laurent *et al.* 1998).

*Atlantic Ocean.* Ehrhart *et al.* (2003) provided a summary of the literature identifying known nesting habitats and foraging areas for loggerheads within the Atlantic Ocean. Detailed information is also provided in the 5-year status review for loggerheads (NMFS and USFWS 2007a) and the final revised recovery plan for loggerheads in the Northwest Atlantic Ocean (NMFS and USFWS 2008), which is a second revision to the original recovery plan that was approved in 1984 and subsequently revised in 1991.

Briefly, nesting occurs on island and mainland beaches on both sides of the Atlantic and both north and south of the Equator (Ehrhart *et al.* 2003). By far, the majority of Atlantic nesting occurs on beaches of the southeastern U.S. (NMFS and USFWS 2007a). Annual nest counts for loggerhead sea turtles on beaches from other countries are in the hundreds with the exception of Brazil, where a total of 4,837 nests were reported for the 2003-2004 nesting season (Marcovaldi and Chaloupka 2007; NMFS and USFWS 2007a), and Mexico, where several thousand nests are estimated to be laid each year. For example, the Yucatán nesting population had a range of 903-2,331 nests per year from 1987-2001 (Zurita *et al.* 2003; NMFS and USFWS 2008). In both the eastern and western Atlantic, waters as far north as 41°N to 42°N latitude are used for foraging by juveniles as well as adults (Shoop 1987; Shoop and Kenney 1992; Ehrhart *et al.* 2003; Mitchell *et al.* 2003).

In U.S. Atlantic waters, loggerheads commonly occur throughout the inner continental shelf from Florida to Cape Cod, Massachusetts and in the Gulf of Mexico from Florida to Texas, although their presence varies with the seasons due to changes in water temperature (Shoop and Kenney 1992; Epperly *et al.* 1995a, 1995b; Braun and Epperly 1996; Epperly and Braun-

McNeill 2002; Mitchell *et al.* 2003). Loggerheads have been observed in waters with surface temperatures of 7° to 30°C, but water temperatures ≥11°C are most favorable (Shoop and Kenney 1992; Epperly *et al.* 1995b). The presence of loggerhead sea turtles in U.S. Atlantic waters is also influenced by water depth. Aerial surveys of continental shelf waters north of Cape Hatteras, North Carolina indicated that loggerhead sea turtles were most commonly sighted in waters with bottom depths ranging from 22 to 49 m deep (Shoop and Kenney 1992). However, more recent survey and satellite tracking data support that they occur in waters from the beach to beyond the continental shelf (Mitchell *et al.* 2003; Braun-McNeill and Epperly 2004; Blumenthal *et al.* 2006; Hawkes *et al.* 2006; McClellan and Read 2007).

Loggerhead sea turtles occur year round in ocean waters off North Carolina, South Carolina, Georgia, and Florida. In these areas of the South Atlantic Bight, water temperature is influenced by the proximity of the Gulf Stream. As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the southeast U.S. (*e.g.*, Pamlico and Core Sounds) and also move up the U.S. Atlantic coast (Epperly *et al.* 1995a, 1995b, 1995c; Braun-McNeill and Epperly 2004), occurring in Virginia foraging areas as early as April/May and on the most northern foraging grounds in the Gulf of Maine in June (Shoop and Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the Gulf of Maine by mid-September but some turtles may remain in Mid-Atlantic and Northeast areas until late fall. By December, loggerheads have migrated from inshore 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 (Shoop and Kenney 1992; Epperly *et al.* 1995b; Epperly and Braun-McNeill 2002).

In the southeastern U.S., loggerheads mate from late March to early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs (Dodd 1988). 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 to 3 years, but can vary from 1 to 7 years (Dodd 1988; NMFS and USFWS 2008). Age at sexual maturity for loggerheads has been estimated at 32 to 35 years (NMFS and USFWS 2008).

For the past decade or so, the scientific literature has recognized five distinct nesting groups, or subpopulations, of loggerhead sea turtles in the Northwest Atlantic, divided geographically as follows: (1) a northern group of nesting females that nest from North Carolina to northeast Florida at about 29°N latitude; (2) a south Florida group of nesting females that nest from 29°N latitude on the east coast to Sarasota on the west coast; (3) a Florida Panhandle group of nesting females that nest around Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán group of nesting females that nest on beaches of the eastern Yucatán Peninsula, Mexico (Márquez 1990; TEWG 2000); and (5) a Dry Tortugas group that nests on beaches of the islands of the Dry Tortugas, near Key West, Florida (NMFS SEFSC 2001). Genetic analyses of mitochondrial DNA, which a sea turtle inherits from its mother, indicate that there are genetic differences between loggerheads that nest at and originate from the beaches used by each of the five identified nesting groups of females (TEWG 2000). However, analyses of microsatellite loci from nuclear DNA, which represents the genetic contribution from both parents, indicates little to no genetic differences between loggerheads originating from nesting beaches of the five Northwest Atlantic nesting groups (Pearce and Bowen 2001; Bowen 2003; Bowen *et al.* 2005; Shamblin 2007). These results suggest that female loggerheads have site fidelity to nesting beaches within a particular area, while males provide an avenue of gene flow between nesting groups by mating with females that originate from different nesting groups (Bowen 2003; Bowen *et al.* 2005). The extent of such gene flow, however, is unclear (Shamblin 2007).

The lack of genetic structure makes it difficult to designate specific boundaries for the nesting subpopulations based on genetic differences alone. Therefore, the Loggerhead Recovery Team recently used a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to reassess the designation of these subpopulations to identify recovery units in the 2008 recovery plan.

In the 2008 recovery plan, the Loggerhead Recovery Team designated five recovery units for the Northwest Atlantic population of loggerhead sea turtles based on the aforementioned nesting groups and inclusive of a few other nesting areas not mentioned above. The first four of these recovery units represent nesting assemblages located in the southeast U.S. The fifth recovery unit is composed of all other nesting assemblages of loggerheads within the Greater Caribbean, outside the U.S., but which occur within U.S. waters during some portion of their lives. The five recovery units representing nesting assemblages are: (1) the Northern Recovery Unit (NRU: Florida/Georgia border through southern Virginia), (2) the Peninsular Florida Recovery Unit (PFRU: Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (DTRU: islands located west of Key West, Florida), (4) the Northern Gulf of Mexico Recovery Unit (NGMRU: Franklin County, Florida through Texas), and (5) the Greater Caribbean Recovery Unit (GCRU: Mexico through French Guiana, Bahamas, Lesser Antilles, and Greater Antilles).

The Recovery Team evaluated the status and trends of the Northwest Atlantic loggerhead population for each of the five recovery units, using nesting data available as of October 2008 (NMFS and USFWS 2008). The level and consistency of nesting coverage varies among recovery units, with coverage in Florida generally being the most consistent and thorough over time. Since 1989, nest count surveys in Florida have occurred in the form of statewide surveys (a near complete census of entire Florida nesting) and index beach surveys (Witherington *et al.* 2009). Index beaches were established to standardize data collection methods and maintain a constant level of effort on key nesting beaches over time.

From the beginning of standardized index surveys in 1989 until 1998, the PFRU, the largest nesting assemblage in the Northwest Atlantic by an order of magnitude, had a significant increase in the number of nests. However, from 1998 through 2008, there was a 41% decrease in annual nest counts from index beaches, which represent an average of 70% of the statewide nesting activity (NMFS and USFWS 2008). From 1989-2008, the PFRU had an overall declining nesting trend of 26% (95% CI: -42% to -5%; NMFS and USFWS 2008). In 2008, an increase in nest counts from the previous four years was reported, but this did not alter the declining trend. The Loggerhead Recovery Team acknowledged that this dramatic change in status for the PFRU is a serious concern and requires immediate attention to determine the cause(s) of this change and the actions needed to reverse it. The NRU, the second largest nesting assemblage of loggerheads in the U.S., has been declining at a rate of 1.3% annually since 1983 (NMFS and USFWS 2008). The NRU dataset included 11 beaches with an uninterrupted time series of coverage of at least 20 years; these beaches represent approximately 27% of NRU nesting (in 2008). Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline. Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. However, the NGMRU has shown a significant declining trend of 4.7% annually since index nesting beach surveys were initiated in 1997 (NMFS and USFWS 2008). No statistical trends in nesting abundance can be determined for the DTRU because of the lack of long-term data. Similarly, statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses (NMFS and USFWS 2008).

Sea turtle census nesting surveys are important in that they provide information on the relative abundance of nesting each year, and the contribution of each nesting group to total nesting of the species. Nest counts can also be used to estimate the number of reproductively mature females nesting annually. The 2008 recovery plan compiled the most recent information on mean number of loggerhead nests and the approximated counts of nesting females per year for four of the five identified recovery units (i.e., nesting groups). They are: (1) for the NRU, a mean of 5,215 loggerhead nests per year (from 1989-2008) with approximately 1,272 females nesting per year; (2) for the PFRU, a mean of 64,513 nests per year (from 1989-2007) with approximately 15,735 females nesting per year; (3) for the DTRU, a mean of 246 nests per year (from 1995-2004, excluding 2002) with approximately 60 females nesting per year; and (4) for the NGMRU, a mean of 906 nests per year (from 1995-2007) with approximately 221 females nesting per year. For the GCRU, the only estimate available for the number of loggerhead nests per year is from Quintana Roo, Yucatán, Mexico, where a range of 903-2,331 nests per year was estimated from 1987-2001 (NMFS and USFWS 2007a). There are no annual nest estimates available for the Yucatán since 2001 or for any other regions in the GCRU, nor are there any estimates of the number of nesting females per year for any nesting assemblage in this recovery unit. Note that the above values for average nesting females per year were based upon 4.1 nests per female per Murphy and Hopkins (1984).

Unlike nesting surveys, in-water studies of sea turtles typically sample both sexes and multiple age classes. In-water studies have been conducted in some areas of the Northwest Atlantic and provide data by which to assess the relative abundance of loggerhead sea turtles and changes in abundance over time (Maier *et al.* 2004; Morreale *et al.* 2005; Mansfield 2006; Ehrhart *et al.* 2007; Epperly *et al.* 2007). The 2008 loggerhead recovery plan includes a full discussion of in-water population studies for which trend data have been reported, and a brief summary will be provided here. Maier *et al.* (2004) used fishery-independent trawl data to establish a regional index of loggerhead abundance for the southeast coast of the U.S. (Winyah Bay, South Carolina to St. Augustine, Florida) during the period 2000-2003. A comparison of loggerhead catch data from this study with historical values suggested that in-water populations of loggerhead sea turtles along the southeast U.S. coast appear to be larger, possibly an order of magnitude higher than they were 25 years ago, but the authors caution a direct comparison between the two studies given differences in sampling methodology (Maier *et al.* 2004). A comparison of catch rates for sea turtles in pound net gear fished in the Pamlico-Albemarle Estuarine Complex of North Carolina between the years 1995-1997 and 2001-2003 found a significant increase in catch rates for loggerhead sea turtles for the latter period (Epperly *et al.* 2007). A long-term, on-going study of loggerhead abundance in the Indian River Lagoon System of Florida found a significant increase in the relative abundance of loggerheads over the last 4 years of the study (Ehrhart *et al.* 2007). However, there was no discernible trend in loggerhead abundance during the 24-year time period of the study (1982-2006) (Ehrhart *et al.* 2007). At St. Lucie Power Plant, data collected from 1977-2004 show an increasing trend of loggerheads at the power plant intake structures (FPL and Quantum Resources 2005).

In contrast to these studies, Morreale *et al.* (2005) observed a decline in the percentage and relative numbers of loggerhead sea turtles incidentally captured in pound net gear fished around Long Island, New York during the period 2002-2004 in comparison to the period 1987-1992, with only two loggerheads (of a total 54 turtles) observed captured in pound net gear during the period 2002-2004. This is in contrast to the previous decade's study where numbers of individual loggerheads ranged from 11 to 28 per year (Morreale *et al.* 2005). No additional loggerheads were reported captured in pound net gear through 2007, although 2 were found cold-stunned on Long Island bay beaches in the fall of 2007 (Memo to the File, L. Lankshear, December 2007). Potential explanations for this decline include major shifts in loggerhead foraging areas and/or increased mortality in pelagic or early benthic stage/age classes (Morreale *et al.* 2005). Using aerial surveys, Mansfield (2006) also found a decline in the densities of loggerhead sea turtles in Chesapeake Bay over the period 2001-2004 compared to aerial survey data collected in the 1980s. Significantly fewer loggerheads ($p<0.05$) were observed in both the spring (May-June) and the summer (July-August) of 2001-2004 compared to those observed during aerial surveys in the 1980s (Mansfield 2006). A comparison of median densities from the 1980s to the 2000s suggested that there had been a 63.2% reduction in densities during the spring residency period and a 74.9% reduction in densities during the summer residency period (Mansfield 2006). The decline in observed loggerhead populations in Chesapeake Bay may be related to a significant decline in prey, namely horseshoe crabs and blue crabs, with loggerheads redistributing outside of Bay waters (NMFS and USFWS 2008).

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 neritic environment, and in the oceanic environment. Recent studies have established that the loggerhead's life history is more complex than previously believed. Rather than making discrete developmental shifts from oceanic to neritic environments, research is showing that both adults and (presumed) neritic stage juveniles continue to use the oceanic environment and will move back and forth between the two habitats (Witzell 2002; Blumenthal *et al.* 2006; Hawkes *et al.* 2006; McClellan and Read 2007). One of the studies tracked the movements of adult post-nesting females and found that differences in habitat use were related to body size with larger adults staying in coastal waters and smaller adults traveling to oceanic waters (Hawkes *et al.* 2006). A tracking study of large juveniles found that the habitat preferences of this life stage were also diverse with some remaining in neritic waters and others moving off into oceanic waters (McClellan and Read 2007). However, unlike the Hawkes *et al.* (2006) study, there was no significant difference in the body size of turtles that remained in neritic waters versus oceanic waters (McClellan and Read 2007). In either case, the research demonstrates that threats to loggerheads in both the neritic and oceanic environments are likely impacting multiple life stages of this species.

The 5-year status review and 2008 recovery plan provide a summary of natural as well as anthropogenic threats to loggerhead sea turtles (NMFS and USFWS 2007a, 2008). Amongst those of natural origin, hurricanes are known to be destructive to sea turtle nests. Sand accretion, rainfall, and wave action that result from these storms can appreciably reduce hatchling success. Other sources of natural mortality include cold stunning, biotoxin exposure, and native species predation.

Anthropogenic factors that impact hatchlings and adult females on land, or the success of nesting and hatching include: beach erosion, beach armoring, and nourishment; artificial lighting; beach cleaning; beach pollution; increased human presence; recreational beach equipment; vehicular and pedestrian traffic; coastal development/construction; exotic dune and beach vegetation; removal of native 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 nests and feed on turtle eggs (NMFS and USFWS 2007a, 2008). 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.

Loggerheads are affected by a completely 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.

A 1990 National Research Council (NRC) report concluded that for juveniles, subadults, and breeders in coastal waters, the most important source of human caused mortality in U.S. Atlantic waters was fishery interactions. Of the many fisheries known to adversely affect loggerheads, the U.S. south Atlantic and Gulf of Mexico shrimp fisheries were considered to pose the greatest threat of mortality to neritic juvenile and adult age classes of loggerheads, accounting for an estimated 5,000 to 50,000 loggerhead deaths each year (NRC 1990). Significant changes to the south Atlantic and Gulf of Mexico shrimp fisheries have occurred since 1990, and the effects of these shrimp fisheries on ESA-listed species, including loggerhead sea turtles, have been assessed several times through section 7 consultation. There is also a lengthy regulatory history with regard to the use of Turtle Excluder Devices (TEDs) in the U.S. south Atlantic and Gulf of Mexico shrimp fisheries (Epperly and Teas 2002; NMFS 2002a; Lewison *et al.* 2003). Section 7 consultation on shrimp trawling in the southeastern U.S. was reinitiated in 2002, in part, to consider the effect of a new rulemaking that would require increasing the size of TED escape openings to allow larger loggerheads (as well as green and leatherback sea turtles) to escape from shrimp trawl gear. The resulting Opinion was completed in December 2002 and concluded that, as a result of the new rule, annual loggerhead mortality from capture in shrimp trawls would decline from an estimated 62,294 to 3,948 turtles assuming that all TEDs were installed properly and that compliance was 100% (Epperly *et al.* 2002; NMFS 2002a). The total annual level of take for loggerhead sea turtles as a result of the U.S. south Atlantic and Gulf of Mexico shrimp fisheries was estimated to be 163,160 loggerhead interactions (the total number of turtles that enter a shrimp trawl, which may then escape through the TED or fail to escape and be captured) with 3,948 of those takes being lethal (NMFS 2002a). On February 21, 2003, NMFS issued the final rule in the *Federal Register* to require the use of the larger opening TEDs (68 FR 8456). The rule also provided the measures to disallow several previously approved TED designs that did not function properly under normal fishing conditions, and to require modifications to the trynet and bait shrimp exemptions to the TED requirements to decrease mortality of sea turtles.

In addition to improvements in TED designs and TED enforcement, interactions between loggerheads and the shrimp fishery have also been declining because of reductions in fishing effort unrelated to fisheries management actions. The 2002 Opinion take estimates are based in part on fishery effort levels. In recent years, low shrimp prices, rising fuel costs, competition with imported products, and the impacts of recent hurricanes in the Gulf of Mexico have all impacted the shrimp fleets; in some cases reducing fishing effort by as much as 50% for offshore waters of the Gulf of Mexico (GMFMC 2007). As a result, loggerhead interactions and mortalities in the Gulf of Mexico have been substantially less than projected in the 2002 Opinion. Currently, the estimated annual number of interactions between loggerheads and shrimp trawls in the Gulf of Mexico shrimp fishery is 23,336, with 647 (2.8%) of those interactions resulting in mortality (Memo from Dr. B. Ponwith, Southeast Fisheries Science Center [SEFSC] to Dr. R. Crabtree, Southeast Region [SERO], PRD, December 2008).

Loggerhead sea turtles are also known to interact with non-shrimp trawl, gillnet, longline, dredge, pound net, pot/trap, and hook and line fisheries. The NRC (1990) report stated that other U.S. Atlantic fisheries collectively accounted for 500 to 5,000 loggerhead deaths each year, but recognized that there was considerable uncertainty in the estimate. The first estimate of loggerhead sea turtle bycatch in U.S. Mid-Atlantic bottom otter trawl gear was completed in September 2006 and later updated in November 2008 (Murray 2006, 2008). Observers reported 66 loggerhead sea turtle interactions with bottom otter trawl gear from 1994-2004 of which 38 were reported as alive and uninjured and 28 were reported as dead, injured, resuscitated, or of unknown condition (Murray 2006, 2008). Seventy-seven percent of observed sea turtle interactions occurred on vessels fishing for summer flounder (50%) and Atlantic croaker (27%). The remaining 23% of observed interactions occurred on vessels targeting weakfish (11%), long-finned squid (8%), groundfish (3%), and short-finned squid (1%). Based on observed interactions and fishing effort as reported on VTRs, the average annual loggerhead bycatch in these bottom otter trawl fisheries combined was estimated to be 616 sea turtles per year for the period 1996-2004 (Murray 2006, 2008).

The 2008 update also reported loggerhead bycatch from 2000-2004 by main species (fish or invertebrate) group caught, which is a proxy for FMP group (which is not well reported in the observer data). The average annual bycatch estimate of loggerhead sea turtles from 2000-2004 (based on the rate from 1994-2004) over FMP groups identified by NERO was 411 turtles, with an additional 77 estimated bycatch events unassigned. An estimated 192 (47%) of assigned takes occurred annually in the summer flounder/scup/black sea bass group, 62 (15%) in the Atlantic mackerel/squid/butterfish group, 43 (10%) in the Northeast multispecies group, and 41 (10%) in the Atlantic croaker group. A total of 20 loggerheads (4.8%) were estimated as having been taken annually in bottom otter trawl gear catching sea scallops, which is in addition to the estimated 81-191 loggerheads reported by Murray (2007) as being caught annually in trawl gear designed specifically to harvest scallops based on data from 2004-2005 (Murray 2008).

There have been several published estimates of the number of loggerheads taken annually as a result of the dredge fishery for Atlantic sea scallops, ranging from a low of zero in 2005 (Murray 2007) to a high of 749 in 2003 (Murray 2004). An estimate of the number of loggerheads taken annually in U.S. Mid-Atlantic gillnet fisheries has recently been published in Murray (2009a). From 1995-2006, the average annual bycatch of loggerheads in U.S. Mid-Atlantic gillnet gear was estimated to be around 350 turtles (95% CI: 234 to 504). Bycatch rates were correlated with latitude, sea surface temperature, and mesh size. The highest predicted bycatch rates occurred in warm waters of the southern Mid-Atlantic in large-mesh gillnets (Murray 2009b).

The U.S. tuna and swordfish longline fisheries that are managed under the Highly Migratory Species (HMS) FMP are estimated to capture 1,905 loggerheads (no more than 339 mortalities) for each 3-year period starting in 2007 (NMFS 2004a). NMFS has mandated gear changes for the HMS fishery to reduce sea turtle bycatch and the likelihood of death from those incidental takes that would still occur (Garrison *et al.* 2009). In 2008, there were 82 observed interactions between loggerhead sea turtles and longline gear used in the HMS fishery. All of the loggerheads were released alive, but the vast majority with injuries (Garrison *et al.* 2009). Most of the injured loggerheads had been hooked in the mouth or beak or swallowed the hook (Garrison *et al.* 2009). Based on the observed take, an estimated 771.6 (95% CI: 481.4-1236.6) loggerhead sea turtles are estimated to have been taken in the longline fisheries managed under the HMS FMP in 2008 (Garrison *et al.* 2009). The 2008 estimate is higher than that in 2007 and is consistent with historical averages since 2001 (Garrison *et al.* 2009). This fishery represents just one of several longline fisheries operating in the Atlantic Ocean. Lewison *et al.* (2004) estimated that 150,000-200,000 loggerheads were taken in all Atlantic longline fisheries in 2000 (including the U.S. Atlantic tuna and swordfish longline fisheries as well as others).

*Summary of Status for Loggerhead Sea Turtles*
Loggerheads are a long-lived species and reach sexual maturity relatively late at around 32-35 years in the Northwest Atlantic (NMFS and USFWS 2008). The species continues to be affected by many factors occurring on nesting beaches and in the water. These include poaching, habitat loss, and nesting predation that affects eggs, hatchlings, and nesting females on land, as well as fishery interactions, vessel interactions, marine pollution, and non-fishery (e.g., dredging) operations affecting all sexes and age classes in the water (NRC 1990; NMFS and USFWS

2007a). As a result, loggerheads still face many of the original threats that were the cause of their listing under the ESA.

As mentioned previously, a final revised recovery plan for loggerhead sea turtles in the Northwest Atlantic was recently published by NMFS and FWS in December 2008. The revised recovery plan is significant in that it identifies five unique recovery units, which comprise the population of loggerheads in the Northwest Atlantic, and describes specific recovery criteria for each recovery unit. Based on the most recent information, a decline in annual nest counts has been measured or suggested for three of the five recovery units for loggerheads in the Northwest Atlantic. This includes the PFRU, which is the largest (in terms of number of nests laid) in the Atlantic Ocean. The nesting trends for the other two recovery units could not be determined due to an absence of long term data.

NMFS has convened a new Loggerhead Turtle Expert Working Group (TEWG) to review all available information on Atlantic loggerheads in order to evaluate the status of this species in the Atlantic. A final report from the Loggerhead TEWG was recently published in July 2009. In this report, the TEWG indicated that it could not determine whether or not the decreasing annual numbers of nests among the Northwest Atlantic loggerhead subpopulations were due to stochastic processes resulting in fewer nests, a decreasing average reproductive output of adult females, decreasing numbers of adult females, or a combination of these factors. Many factors are responsible for past or present loggerhead mortality that could impact current nest numbers; however, no single mortality factor stands out as a likely primary factor. It is likely that several factors compound to create the current decline, including incidental capture (in fisheries, power plant intakes, and dredging operations), lower adult female survival rates, increases in the proportion of first-time nesters, continued directed harvest, and increases in mortality due to disease. Regardless, the TEWG stated that the current levels of hatchling output will no doubt result in depressed recruitment to subsequent life stages over the coming decades (TEWG 2009).

Currently, there are no population estimates for loggerhead sea turtles in any of the ocean basins in which they occur. However, a recent loggerhead assessment prepared by NMFS states that the loggerhead adult female population in the western North Atlantic ranges from 20,000 to 40,000 or more, with a large range of uncertainty in total population size (NMFS SEFSC 2009).

Based on their 5-year status review of the species, NMFS and FWS determined that loggerhead sea turtles should not be delisted or reclassified as endangered. However, it was also determined that an analysis and review of the species should be conducted in the future to determine whether DPSs should be identified for the loggerhead (NMFS and USFWS 2007a). In 2008, NMFS and FWS established a Loggerhead Biological Review Team (BRT) to assess the global loggerhead population structure to determine whether DPSs exist and, if so, the status of each DPS. The BRT report was recently completed in August 2009 (Conant *et al.* 2009). In this report, the BRT identified the following nine loggerhead DPSs distributed globally: (1) North Pacific Ocean, (2) South Pacific Ocean, (3) North Indian Ocean, (4) Southeast Indo-Pacific Ocean, (5) Southwest Indian Ocean, (6) Northwest Atlantic Ocean, (7) Northeast Atlantic Ocean, (8) Mediterranean Sea, and (9) South Atlantic Ocean. According to an analysis using expert opinion in a matrix model framework used in the BRT report, all loggerhead DPSs have the potential to decline in the future. Although some DPSs are indicating increasing trends at nesting beaches (Southwest Indian Ocean and South Atlantic Ocean), available information about anthropogenic threats to juveniles and adults in neritic and oceanic environments indicate possible unsustainable additional mortalities. According to the threat matrix analysis in the BRT report, the potential for future decline is greatest for the North Indian Ocean, Northwest Atlantic Ocean, Northeast Atlantic Ocean, Mediterranean Sea, and South Atlantic Ocean DPSs (Conant *et al.* 2009).

On March 16, 2010, NMFS and USFWS published a proposed rule in the Federal Register to divide the worldwide population of loggerhead sea turtles into nine DPSs, as described in the 2009 Status Review. Two of the DPSs are proposed to be listed as threatened and seven of the DPSs, including the Northwest Atlantic Ocean DPS, are proposed to be listed as endangered. NMFS and the USFWS are accepting comments on the proposed rule through July 14, 2010 (75 FR 12597, March 16, 2010).

### 3.2 Status of Kemp's Ridley Sea Turtles

The Kemp's ridley is one of the least abundant of the world's sea turtle species. In contrast to loggerhead, leatherback, and green sea turtles, which are found in multiple oceans of the world, Kemp's ridleys typically occur only in the Gulf of Mexico and the northwestern Atlantic Ocean (USFWS and NMFS 1992).

The majority of Kemp's ridleys nest along a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963; USFWS and NMFS 1992; NMFS and USFWS 2007b). There is a limited amount of scattered nesting to the north and south of the primary nesting beach (NMFS and USFWS 2007b). The number of nesting adult females reached an estimated low of fewer than 250 in 1985 (USFWS and NMFS 1992; TEWG 2000; NMFS and USFWS 2007b). Conservation efforts by Mexican and U.S. agencies have aided this species by eliminating egg harvest, protecting eggs and hatchlings, and reducing at-sea mortality through fishing regulations (TEWG 2000). From 1985 to 1999, the number of nests observed at Rancho Nuevo and nearby beaches increased at a mean rate of 11.3% (95% C.I. slope = 0.096-0.130) per year (TEWG 2000). An estimated 5,500 females nested in the State of Tamaulipas over a 3-day period in May 2007 and over 4,000 of those nested at Rancho Nuevo (NMFS and USFWS 2007b). There is limited nesting in the U.S., most of which is located in south Texas. In 2006, approximately 100 nests were laid in Texas (NMFS and USFWS 2007b).

Kemp's ridleys mature at 10-17 years (Caillouet *et al.* 1995; Schmid and Witzell 1997; Snover *et al.* 2007; NMFS and USFWS 2007b). Nesting occurs from April through July each year with hatchlings emerging after 45-58 days (USFWS and NMFS 1992). Once they leave the nesting 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 U.S. Atlantic and Gulf of Mexico coasts, 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 STSSN suggests that benthic immature developmental areas occur in many areas along the U.S. coast and that these areas may change given resource quality and quantity (TEWG 2000). Developmental habitats are defined by several characteristics, including coastal areas sheltered from high winds and waves such as embayments and estuaries, and nearshore temperate waters shallower than 50 m (NMFS and USFWS 2007b). The suitability of these habitats depends on resource availability, with optimal environments providing rich sources of crabs and other invertebrates. Kemp's ridleys consume a variety of crab species, including *Callinectes* sp., *Ovalipes* sp., *Libinia* sp., and *Cancer* sp. Mollusks, shrimp, and fish are consumed less frequently (Bjorndal 1997). A wide variety of substrates have been documented to provide good foraging habitat, including seagrass beds, oyster reefs, sandy and mud bottoms, and rock outcroppings (NMFS and USFWS 2007b).

Foraging areas documented along the U.S. Atlantic coast include Charleston Harbor, Pamlico Sound (Epperly *et al.* 1995c), Chesapeake Bay (Musick and Limpus 1997), Delaware Bay, and Long Island Sound (Morreale and Standora 1993). For instance, in the Chesapeake Bay, where the seasonal juvenile population of Kemp's ridley sea turtles is estimated to be 211-1,083 individuals, Kemp's ridleys frequently forage in submerged aquatic grass beds for crabs (Musick and Limpus 1997). Upon leaving Chesapeake Bay in autumn, juvenile Kemp's ridleys migrate down the coast, passing Cape Hatteras in December and January (Musick and Limpus 1997). These larger juveniles 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 (Epperly *et al.* 1995a, 1995b; Musick and Limpus 1997).

Adult Kemp's ridleys are found in the coastal regions of the Gulf of Mexico and southeastern U.S., but are typically rare in the northeastern U.S. waters of the Atlantic (TEWG 2000). Adults are primarily found in near-shore waters of 37 m or less that are rich in crabs and have a sandy or muddy bottom (NMFS and USFWS 2007b).

Kemp's ridleys face many of the same natural threats as loggerheads, including destruction of nesting habitat from storm events, natural predators, 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, as reported in the national STSSN database, in the winter of 1999/2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green sea turtles were found on Cape Cod beaches. 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 U.S. waters in a given year, oceanographic conditions, and the occurrence of storm events in the late fall. Although many cold-stunned turtles can survive if found early enough, cold-stunning events can represent a significant cause of natural mortality.

Like other sea 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, 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 sea turtles occur. Information from fishermen 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 sea turtle takes in shrimp trawls and other trawl fisheries, including the development and use of TEDs. As described in Section 3.1 above, there is lengthy regulatory history with regard to the use of TEDs in the U.S. south Atlantic and Gulf of Mexico shrimp fisheries (Epperly and Teas 2002; NMFS 2002a; Lewison *et al.* 2003). The Biological Opinion on shrimp trawling in the southeastern U.S. completed in 2002 concluded that 155,503 Kemp's ridley sea turtles would be taken annually in the fishery with 4,208 of the takes resulting in mortality (NMFS 2002a).

Although modifications to shrimp trawls have helped to reduce mortality of Kemp's ridleys, this species is also affected by other sources of anthropogenic impacts (fishery and non-fishery related) 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. The cause of death for most of the turtles recovered was unknown, but the mass mortality event was suspected by NMFS to have been from a large-mesh gillnet fishery for monkfish and dogfish operating offshore in the preceding weeks (67 FR 71895). The five Kemp's 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.

*Summary of Status for Kemp's Ridley Sea Turtles*
The majority of Kemp's ridleys nest along a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963; USFWS and NMFS 1992; NMFS and USFWS 2007b). The number of nesting females in the Kemp's ridley population declined dramatically from the late 1940s through the mid 1980s, with an estimated 40,000 nesting females in a single *arribada* in 1947 and fewer than 250 nesting females in the entire 1985 nesting season (USFWS and NMFS 1992; TEWG 2000). However, the total annual number of nests at Rancho Nuevo gradually began to increase in the 1990s (NMFS and USFWS 2007b). Based on the number of nests laid in 2006 and the remigration interval for Kemp's ridley sea turtles (1.8-2 years), there were an estimated 7,000-8,000 adult female Kemp's ridley sea turtles in 2006 (NMFS and USFWS 2007b). The number of adult males in the population is unknown, but sex ratios of hatchlings and immature Kemp's ridleys suggest that the population is female biased, suggesting that the number of adult males is less than the number of adult females (NMFS and USFWS 2007b).

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.

Based on their 5-year status review of the species, NMFS and USFWS (2007b) determined that Kemp's ridley sea turtles should not be reclassified as threatened under the ESA.

### 3.3 Status of Green Sea Turtles

Green sea turtles are distributed circumglobally, and can be found in the Pacific, Indian, and Atlantic Oceans as well as the Mediterranean Sea (NMFS and USFWS 1991; Seminoff 2004; NMFS and USFWS 2007c). 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, in water all green sea turtles are considered endangered.

*Pacific Ocean.* Green sea turtles occur in the western, central, and eastern Pacific. Foraging areas are also found throughout the Pacific and along the southwestern U.S. coast (NMFS and USFWS 1998a). In the western Pacific, major nesting rookeries at four sites including Heron Island (Australia), Raine Island (Australia), Guam, and Japan were evaluated and determined to be increasing in abundance, with the exception of Guam which appears stable (NMFS and USFWS 2007c). In the central Pacific, nesting occurs on French Frigate Shoals, Hawaii, which has also been reported as increasing with a mean of 400 nesting females from 2002-2006 (NMFS and USFWS 2007c). The main nesting sites for the green sea turtle in the eastern Pacific are located in Michoacan, Mexico and in the Galapagos Islands, Ecuador (NMFS and USFWS 2007c). The number of nesting females per year exceeds 1,000 females at each site (NMFS and USFWS 2007c). However, historically, greater than 20,000 females per year are believed to have nested in Michoacan alone (Cliffton *et al.* 1982; NMFS and USFWS 2007c). Thus the current number of nesting females is still far below what has historically occurred. Again, the Pacific Mexico green turtle nesting population (also called the black turtle) is considered endangered.

Historically, green sea turtles were used in many areas of the Pacific for food. They were also commercially exploited and this, coupled with habitat degradation, led to their decline in the Pacific (NMFS and USFWS 1998b). Green sea turtles in the Pacific continue to be affected by poaching, habitat loss or degradation, fishing gear interactions, and fibropapilloma (NMFS and USFWS 1998a; NMFS 2004b).

*Indian Ocean.* There are numerous nesting sites for green sea turtles in the Indian Ocean. One of the largest nesting sites for green sea turtles worldwide occurs on the beaches of Oman where an estimated 20,000 green sea turtles nest annually (Hirth 1997; Ferreira *et al.* 2003). Based on a review of the 32 Index Sites used to monitor green sea turtle nesting worldwide, Seminoff (2004) concluded that declines in green sea turtle nesting were evident for many of the Indian Ocean Index Sites. While several of these had not demonstrated further declines in the more recent past, only the Comoros Island Index Site in the Western Indian Ocean showed evidence of increased nesting (Seminoff 2004).

*Mediterranean Sea.* There are four nesting concentrations of green sea turtles in the Mediterranean from which data are available, including those in Turkey, Cyprus, Israel, and Syria. Currently, approximately 300-400 females nest each year—about two-thirds of which nest in Turkey and one-third in Cyprus. Although this population is depleted from historic levels

(Kasparek *et al.* 2001), nesting data gathered since the early 1990s in Turkey, Cyprus, and Israel show no apparent trend in any direction. However, a declining trend is apparent along the coast of Palestine/Israel, where 300-350 nests were deposited each year in the 1950s (Sella 1982) compared to a mean of 6 nests per year from 1993-2004 (Kuller 1999; Y. Levy, Israeli Sea Turtle Rescue Center, unpublished data). A recent discovery of green sea turtle nesting in Syria adds roughly 100 nests per year to green sea turtle nesting activity in the Mediterranean (Rees *et al.* 2005). That such a major nesting concentration could have gone unnoticed until recently (the Syria coast was surveyed in 1991, but nesting activity was attributed to loggerheads) bodes well for the ongoing speculation that the unsurveyed coast of Libya may also host substantial nesting.

*Atlantic Ocean.* As has occurred in other oceans of its range, green sea turtles were once the target of directed fisheries in the U.S. and throughout the Caribbean. In 1890, over one million lbs of green sea 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).

In the western Atlantic, green sea turtles range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999). Green sea turtles occur seasonally in Mid-Atlantic and Northeast waters such as Chesapeake Bay and Long Island Sound (Musick and Limpus 1997; Morreale and Standora 1998; Morreale *et al.* 2005), which serve as foraging and developmental habitats.

Some of the principal feeding pastures in the western Atlantic Ocean include the upper west coast of Florida, the Florida Keys, and the northwestern coast of the Yucatán 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). The waters surrounding the island of Culebra, Puerto Rico, and its outlying keys are considered critical habitat for the green sea turtle.

Age at maturity for green sea turtles is estimated to be 20-50 years (Balazs 1982; Frazer and Ehrhart 1985; Seminoff 2004). As is the case with the other sea turtle species described above, adult females may nest multiple times in a season (average 3 nests/season with approximately 100 eggs/nest) and typically do not nest in successive years (NMFS and USFWS 1991; Hirth 1997).

As is also the case for the other sea turtle species described above, nest count information for green sea turtles provides information on the relative abundance of nesting, and the contribution of each nesting group to total nesting of the species. Nest counts can also be used to estimate the number of reproductively mature females nesting annually. The 5-year status review for the species identified eight geographic areas considered to be primary sites for threatened green sea turtle nesting in the Atlantic/Caribbean, and reviewed the trend in nest count data for each (NMFS and USFWS 2007c). These include: (1) Yucatán Peninsula, Mexico, (2) Tortuguero, Costa Rica, (3) Aves Island, Venezuela, (4) Galibi Reserve, Suriname, (5) Isla Trindade, Brazil,

(6) Ascension Island, United Kingdom, (7) Bioko Island, Equatorial Guinea, and (8) Bijagos Achipelago, Guinea-Bissau (NMFS and USFWS 2007c). Nesting at all of these sites was considered to be stable or increasing with the exception of Bioko Island, which may be declining, and the Bijagos Archipelago, which may be stable; however, the lack of sufficient data precluded a meaningful trend assessment for either site (NMFS and USFWS 2007c).

Seminoff (2004) likewise reviewed green sea turtle nesting data for eight sites in the western, eastern, and central Atlantic, including all of the above threatened nesting sites with the exception that nesting in Florida was reviewed in place of Isla Trindade, Brazil. Seminoff (2004) concluded that all sites in the central and western Atlantic showed increased nesting with the exception of nesting at Aves Island, Venezuela, while both sites in the eastern Atlantic demonstrated decreased nesting. These sites are not inclusive of all green sea turtle nesting in the Atlantic Ocean. However, other sites are not believed to support nesting levels high enough that would change the overall status of the species in the Atlantic (NMFS and USFWS 2007c).

By far, the most important nesting concentration for green sea turtles in the western Atlantic is in Tortuguero, Costa Rica (NMFS and USFWS 2007c). Nesting in the area has increased considerably since the 1970s and nest count data from 1999-2003 suggest nesting by 17,402-37,290 females per year (NMFS and USFWS 2007c). The number of females nesting per year on beaches in the Yucatán, at Aves Island, Galibi Reserve, and Isla Trindade number in the hundreds to low thousands, depending on the site (NMFS and USFWS 2007c).

The status of the endangered Florida breeding population was also evaluated in the 5-year review (NMFS and USFWS 2007c). The pattern of green sea turtle nesting shows biennial peaks in abundance, with a generally positive trend since establishment of the Florida index beach surveys in 1989 to 2006. This is perhaps due to increased protective legislation throughout the Caribbean (Meylan *et al.* 1995), as well as protections in Florida and throughout the U.S. (NMFS and USFWS 2007c).

The statewide Florida surveys (2000-2006) have shown that a mean of approximately 5,600 nests are laid annually in Florida, with a low of 581 in 2001 to a high of 9,644 in 2005 (NMFS and USFWS 2007c). Most nesting occurs along the east coast of Florida, but occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches in the Florida Panhandle (Meylan *et al.* 1995). More recently, green sea turtle nesting occurred on Bald Head Island, North Carolina (just east of the mouth of the Cape Fear River), on Onslow Island, and at Cape Hatteras National Seashore.

Green sea turtles face many of the same natural threats as loggerhead and Kemp's ridley sea turtles. In addition, green sea turtles appear to be susceptible to fibropapillomatosis, an epizootic disease producing lobe-shaped tumors on the soft portion of a turtle's body. Juveniles appear to be most affected in that they have the highest incidence of disease and the most extensive lesions, whereas lesions in nesting adults are rare. Also, green sea turtles frequenting nearshore waters, areas adjacent to large human populations, and areas with low water turnover, such as lagoons, have a higher incidence of the disease than individuals in deeper, more remote waters.

The occurrence of fibropapilloma tumors may result in impaired foraging, breathing, or swimming ability, leading potentially to death (George 1997).

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

*Summary of Status of Green Sea Turtles*

A review of 32 Index Sites[2] distributed globally revealed a 48%-67% decline in the number of mature females nesting annually over the last three generations[3] (Seminoff 2004). An evaluation of green sea turtle nesting sites was also conducted as part of the 5-year status review of the species (NMFS and USFWS 2007c). Of the 23 threatened nesting groups assessed in that report for which nesting abundance trends could be determined, 10 were considered to be increasing, 9 were considered stable, and 4 were considered to be decreasing (NMFS and USFWS 2007c). Nesting groups were considered to be doing relatively well (the number of sites with increasing nesting were greater than the number of sites with decreasing nesting) in the Pacific, western Atlantic, and central Atlantic (NMFS and USFWS 2007c). However, nesting populations were determined to be doing relatively poorly in Southeast Asia, Eastern Indian Ocean, and perhaps the Mediterranean. Overall, based on mean annual reproductive effort, the report estimated that 108,761 to 150,521 females nest each year among the 46 threatened and endangered nesting sites included in the evaluation (NMFS and USFWS 2007c). However, given the late age to maturity for green sea turtles, caution is urged regarding the status for any of the nesting groups since no area has a dataset spanning a full green sea turtle generation (NMFS and USFWS 2007c).

There is cautious optimism that green sea turtle abundance in the Atlantic Ocean may be increasing. Seminoff (2004) and NMFS and USFWS (2007c) made comparable conclusions with regard to nesting for four nesting sites in the western Atlantic. Each also concluded that nesting at Tortuguero, Costa Rica represented the most important nesting area for green sea turtles in the western Atlantic and that nesting had increased markedly since the 1970s (Seminoff 2004; NMFS and USFWS 2007c). However, the 5-year review also noted that the Tortuguero nesting stock continued to be affected by ongoing directed take at their primary foraging area in Nicaragua (NMFS and USFWS 2007c). The endangered breeding population in Florida appears to be increasing based upon index nesting data from 1989-2006 (NMFS and USFWS 2007c).

[2] The 32 Index Sites include all of the major known nesting areas as well as many of the lesser nesting areas for which quantitative data are available.

[3] Generation times ranged from 35.5 years to 49.5 years for the assessment depending on the Index Beach site

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.

Based on its 5-year status review of the species, NMFS and USFWS (2007c) determined that the listing classification for green sea turtles should not be changed. However, it was also determined that an analysis and review of the species should be conducted in the future to determine whether DPSs should be identified (NMFS and USFWS 2007c).

### 3.4 Status of Leatherback Sea Turtles

Leatherback sea turtles are widely distributed throughout the oceans of the world, including the Atlantic, Pacific, and Indian Oceans, and the Mediterranean Sea (Ernst and Barbour 1972). Leatherbacks are the largest living turtles and range farther than any other sea turtle species. Their large size and tolerance of relatively low water temperatures allows them to occur in northern boreal waters such as those 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 was estimated to have declined to 34,500 (Spotila *et al.* 1996). However, the most recent population size estimate for the North Atlantic alone is a range of 34,000-94,000 adult leatherbacks (TEWG 2007). Thus, there is substantial uncertainty with respect to global population estimates of leatherback sea turtles.

*Pacific Ocean.* Leatherback nesting has been declining at all major Pacific basin nesting beaches for the last two decades (Spotila *et al.* 1996, 2000; NMFS and USFWS 1998b, 2007d; Sarti *et al.* 2000). In the western Pacific, major nesting beaches occur in Papua New Guinea, Papua, Indonesia, Solomon Islands, and Vanuatu, with an approximate 2,700-4,500 total breeding females, estimated from nest counts (Dutton *et al.* 2007). However, leatherbacks appear to be approaching extinction in Malaysia (Spotila *et al.* 2000). For example, the nesting group on Terengganu, which was once one of the most significant nesting sites in the western Pacific, declined from an estimated 3,103 females in 1968 to 2 females in 1994 (Chan and Liew 1996). Nesting groups of leatherback sea turtles along the coasts of the Solomon Islands, which historically supported important nesting groups, are also reported to be declining (D. Broderick, pers. comm., *in* Dutton *et al.* 1999). In Fiji, Thailand, Australia, and Papua New Guinea (East Papua), leatherbacks have only been known to nest in low densities and scattered colonies.

The largest, extant leatherback nesting group in the Indo-Pacific lies on the north Vogelkop coast of Irian Jaya (West Papua), Indonesia, with 3,000-5,000 nests reported annually in the 1990s (Suárez *et al.* 2000). However, in 1999, local Indonesian villagers started reporting dramatic declines in sea turtles near their villages (Suárez 1999). Declines in nesting groups have been reported throughout the western Pacific region where observers report that nesting groups are well below abundance levels that were observed several decades ago (*e.g.*, Suárez 1999).

Leatherback sea turtles in the western Pacific are 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, major leatherback nesting beaches are located in Mexico and Costa Rica, where nest numbers have been declining. According to reports from the late 1970s and early 1980s, beaches located on the Mexican Pacific coasts of Michoacán, Guerrero, and Oaxaca sustained a large portion, perhaps fully one half, of all global nesting by leatherbacks (Sarti *et al.* 1996). A dramatic decline has been seen on nesting beaches in Pacific Mexico, where aerial survey data was used to estimate that tens of thousands of leatherback nests were laid on the beaches in the 1980s (Pritchard 1982), but a total of only 120 nests on the four primary index beaches (combined) were counted in the 2003-2004 season (Sarti Martinez *et al.* 2007). Since the early 1980s, the Mexican Pacific population of adult female leatherback turtles has declined to slightly more than 200 during 1998-1999 and 1999-2000 (Sarti *et al.* 2000). Spotila *et al.* (2000) reported the decline of the leatherback nesting at Playa Grande, Costa Rica, which had been the fourth largest nesting group in the world and the most important nesting beach in the Pacific. Between 1988 and 1999, the nesting group declined from 1,367 to 117 female leatherback sea turtles. Based on their models, Spotila *et al.* (2000) estimated that the group could fall to less than 50 females by 2003-2004. An analysis of the Costa Rican nesting beaches indicates a decline in nesting during 15 years of monitoring (1989-2004) with approximately 1,504 females nesting in 1988-1989 to an average of 188 females nesting in 2000-2001 and 2003-2004 (NMFS and USFWS 2007d).

Leatherbacks in the eastern Pacific face a number of threats to their survival. For example, commercial and artisanal swordfish fisheries off Chile, Colombia, Ecuador, and Peru; purse seine fisheries for tuna in the eastern tropical Pacific Ocean; and California/Oregon drift gillnet fisheries are known to capture, injure, or kill leatherbacks in the eastern Pacific Ocean. Given the declines in leatherback nesting in the Pacific, some researchers have concluded that the leatherback is on the verge of extinction in the Pacific Ocean (*e.g.,* Spotila *et al.* 1996, 2000).

*Indian Ocean.* Leatherbacks nest in several areas around the Indian Ocean. These sites include Tongaland, South Africa (Pritchard 2002) and the Andaman and Nicobar Islands (Andrews *et al.* 2002). Intensive survey and tagging work in 2001 provided new information on the level of nesting in the Andaman and Nicobar Islands (Andrews *et al.* 2002). Based on the survey and tagging work, it was estimated that 400-500 female leatherbacks nest annually on Great Nicobar Island (Andrews *et al.* 2002). The number of nesting females using the Andaman and Nicobar Islands combined was estimated around 1,000 (Andrews and Shanker 2002). Some nesting also occurs along the coast of Sri Lanka, although in much smaller numbers than in the past (Pritchard 2002). Spotila *et al.* (2000) indicated that leatherback sea turtles have been virtually extinct in Sri Lanka since 1994 and disappeared from India before 1930.

*Mediterranean Sea.* Casale *et al.* (2003) reviewed the distribution of leatherback sea turtles in the Mediterranean. Among the 411 individual records of leatherback sightings in the Mediterranean, there were no nesting records. Nesting in the Mediterranean is not known or is believed to be extremely rare. Leatherbacks found in Mediterranean waters originate from the Atlantic Ocean (P. Dutton, NMFS, unpublished data).

*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). Leatherbacks are frequently thought of as a pelagic species that feed on jellyfish (*e.g.*, *Stomolophus*, *Chryaora*, and *Aurelia* spp.) and tunicates (*e.g.*, salps, pyrosomas) in oceanic habitats (Rebel 1974; Davenport and Balazs 1991). However, leatherbacks are also known to use coastal waters of the U.S. continental shelf (James *et al.* 2005a; Eckert *et al.* 2006; Murphy *et al.* 2006) as well as the European continental shelf on a seasonal basis (Witt *et al.* 2007). The waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands have been designated as critical habitat for the leatherback sea turtle.

The CETAP aerial survey of the outer continental shelf from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia conducted between 1978 and 1982 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 to 4,151 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 (Shoop and Kenney 1992). This aerial survey estimated the summer leatherback population for the northeastern U.S. 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 underestimated the leatherback population for the northeastern U.S. at the time of the survey. 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). Studies of satellite tagged leatherbacks suggest that they spend 10%-41% of their time at the surface, depending on the phase of their migratory cycle (James *et al.* 2005b). The greatest amount of surface time (up to 41%) was recorded when leatherbacks occurred in continental shelf and slope waters north of 38°N (James *et al.* 2005b).

Leatherbacks are a long lived species (>30 years). They were originally believed to mature at a younger age than loggerhead sea turtles, with a previous 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). However, new sophisticated analyses suggest that leatherbacks in the Northwest Atlantic may reach maturity at 24.5-29 years of age (Avens *et al.* 2009). In the U.S. 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 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. Therefore, the actual proportion of eggs that can result in hatchlings is less than the total number of eggs produced per season. 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 centimeters (cm) curved carapace length (CCL), Eckert (1999) found that leatherback juveniles remain in waters warmer than 26°C until they exceed 100 cm CCL.

As described in Section 3.1, sea turtle nesting survey data is important in that it provides information on the relative abundance of nesting, and the contribution of each population/ subpopulation to total nesting of the species. Nest counts can also be used to estimate the number of reproductively mature females nesting annually, and as an indicator of the trend in the number of nesting females in the nesting group. The 5-year review for leatherback sea turtles (NMFS and USFWS 2007d) compiled the most recent information on mean number of leatherback nests per year for each of the seven leatherback populations or groups of populations that were identified by the Leatherback TEWG as occurring within the Atlantic. These are: Florida, North Caribbean, Western Caribbean, Southern Caribbean, West Africa, South Africa, and Brazil (TEWG 2007). In the U.S., the Florida Statewide Nesting Beach Survey program has documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests in the early 2000s (NMFS and USFWS 2007d). An analysis of Florida's index nesting beach sites from 1989-2006 shows a substantial increase in leatherback nesting in Florida during this time, with an annual growth rate of approximately 1.17 (TEWG 2007). The TEWG reports an increasing or stable trend for all of the seven populations or groups of populations with the exception of the Western Caribbean and West Africa. However, caution is also warranted even for those that were identified as stable or increasing. In St. Croix, for example, researchers have noted a declining presence of neophytes (first-time nesters) since 2002 (Garner and Garner 2007). In addition, the leatherback rookery along the northern coast of South America in French Guiana and Suriname supports the majority of leatherback nesting in the western Atlantic (TEWG 2007), and represents more than half of total nesting by leatherback sea turtles worldwide (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). The TEWG (2007) report indicates that using nest numbers from 1967-2005, a positive population growth rate was found over the 39-year period for French Guinea and Suriname, with a 95% probability that the population was growing. Nevertheless, given the magnitude of leatherback nesting in this area compared to other nest sites, impacts to this area that negatively affect leatherback sea turtles could have profound impacts on the species, overall.

Tagging and satellite telemetry data indicate that leatherbacks from the western North Atlantic nesting beaches use the entire North Atlantic Ocean (TEWG 2007). 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 sea turtles tagged in Puerto Rico, Trinidad, and the Virgin Islands have also been subsequently found on U.S. beaches of southern, Mid-Atlantic, and northern states (STSSN database). Animals from the South Atlantic nesting assemblages have not been re-sighted in the western North Atlantic (TEWG 2007).

The 5-year status review (NMFS and USFWS 2007d) and TEWG (2007) report provide summaries of natural as well as anthropogenic threats to leatherback sea turtles. Of the Atlantic sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear, trap/pot gear in particular. 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. Leatherbacks 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). In addition to drowning from forced submergence, 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 have been documented interacting with longline, trap/pot, trawl, and gillnet fishing gear. For instance, according to observer records, an estimated 6,363 leatherback sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992-1999, of which 88 were released dead (NMFS SEFSC 2001). Currently, the U.S. tuna and swordfish longline fisheries managed under the HMS FMP are estimated to capture 1,764 leatherbacks (no more than 252 mortalities) for each 3-year period starting in 2007 (NMFS 2004a). In 2008, there were 90 observed interactions between leatherback sea turtles and longline gear used in the HMS fishery. Four of the leatherbacks were dead upon release and one was in unknown condition. The vast majority of leatherbacks that were released alive had injuries due to external hooking (Garrison *et al.* 2009). Based on the observed take, an estimated 381.3 (95% CI: 288.7-503.7) leatherback sea turtles are estimated to have been taken in the longline fisheries managed under the HMS FMP in 2008 (Garrison *et al.* 2009). The 2008 estimate is consistent with the annual numbers since 2005 and remains well below the average prior to implementation of gear regulations (Garrison *et al.* 2009). Since the U.S. fleet accounts for only 5%-8% of the longline 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). Lewison *et al.* (2004) estimated that 30,000-60,000 leatherbacks were taken in all Atlantic longline fisheries in 2000 (including the U.S. Atlantic tuna and swordfish longline fisheries as well as others).

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). More recently, from 2002 to 2007, NMFS received 144 reports of entangled sea turtles in vertical lines from Maine to Virginia, with 96 events confirmed (verified by photo documentation or response by a trained responder; NMFS 2008a). Of the 96 confirmed events during this period, 87 events involved leatherbacks. NMFS identified the gear type and fishery for 42 of the 96 confirmed events, which included lobster, whelk, sea bass, crab, and research pot gear. 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 line inside Hatteras Inlet (NMFS SEFSC 2001). A third leatherback was reported entangled in a crab pot buoy line in Pamlico Sound off of Ocracoke. This turtle was disentangled and released alive; however, lacerations on the front flippers from the lines were evident (NMFS SEFSC 2001). In the southeast U.S., leatherbacks are vulnerable to entanglement in Florida's lobster pot and stone crab fisheries as documented on stranding forms. In the U.S. 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).

Leatherback interactions with the U.S. south Atlantic and Gulf of Mexico shrimp fisheries are also known to occur (NMFS 2002a). Leatherbacks are likely to encounter shrimp trawls working in the coastal waters off the U.S. 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 U.S. south Atlantic and Gulf of Mexico shrimp fisheries 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, NMFS issued a final rule on February 21, 2003 to amend the TED regulations (68 FR 8456). 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 sea turtles (see section 3.1 above for further information on the shrimp trawl fishery).

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 currently required in this fishery. In November 2007, fisheries observers reported the capture of a leatherback sea turtle in bottom otter trawl gear fishing for summer flounder.

Gillnet fisheries operating in the waters of the Mid-Atlantic states are also known to capture, injure, and/or kill leatherbacks when these fisheries and leatherbacks co-occur. Data collected by the NEFSC Fisheries Observer Program from 1994-1998 (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%-92%. In North Carolina, six additional leatherbacks were reported captured in gillnet sets in the spring (NMFS SEFSC 2001). In addition to these, in September 1995, two dead leatherbacks were removed from an 11-inch (28.2-cm) monofilament shark gillnet set in the nearshore waters off of Cape Hatteras (STSSN unpublished data reported in NMFS SEFSC 2001).

Fishing gear interactions 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 sea turtles in the waters of coastal Nicaragua also incidentally catch leatherback sea turtles (Lagueux 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-M. 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 sea turtles do not die as a result of drowning, but rather because the fishermen cut them out of their nets (NMFS SEFSC 2001).

Leatherbacks may be more susceptible to marine debris ingestion than other sea turtle species due to the tendency of floating debris to concentrate in convergence zones that juveniles and adults use for feeding areas (Shoop and Kenney 1992; Lutcavage *et al.* 1997). 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 (e.g., jellyfish) and plastic debris (Mrosovsky 1981). Balazs (1985) speculated that plastic objects may resemble food items by their shape, color, size, or even movements as they drift about, and induce a feeding response in leatherbacks.

*Summary of Status for Leatherback Sea Turtles*

In the Pacific Ocean, the abundance of leatherback sea turtles on nesting beaches has declined dramatically over the past 10 to 20 years. Nesting groups 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) (NMFS and USFWS 2007d). No reliable long term trend data for the Indian Ocean populations are currently available. While leatherbacks are known to occur in the Mediterranean Sea, nesting in this region is not known to occur (NMFS and USFWS 2007d).

Nest counts in many areas of the Atlantic Ocean show increasing trends, including for beaches in Suriname and French Guiana which support the majority of leatherback nesting (NMFS and USFWS 2007d). The species as a whole continues to face numerous threats at nesting and marine habitats. 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 pollution and habitat destruction account for an unknown level of other mortality. The long term recovery potential of this species may be further threatened by observed low genetic diversity, even in the largest nesting groups like French Guiana and Suriname (NMFS and USFWS 2007d).

Based on its 5-year status review of the species, NMFS and USFWS (2007d) determined that endangered leatherback sea turtles should not be delisted or reclassified. However, it was also determined that an analysis and review of the species should be conducted in the future to determine whether DPSs should be identified (NMFS and USFWS 2007d).

## 4.0 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 Opinion includes the effects of several activities that may affect the survival and recovery of sea turtles in the action area. The activities generally fall into one of the following three categories: (1) fisheries, (2) other activities that cause death or otherwise impair a sea turtle's ability to function, and (3) recovery activities associated with reducing impacts to sea turtles.

Many of the fisheries and other activities causing death or injury to sea turtles that are identified in this section have occurred for years, even decades. Similarly, while some recovery activities have been in place for years (*e.g.*, nesting beach protection in portions of the species' nesting habitat), others have been undertaken more recently following new information on the impact of certain activities on sea turtles.

The overall impacts of each state, Federal, and private action or other human activity in the action area cannot be assessed in their entirety. However, to the extent they have manifested themselves at the population level, such past impacts are subsumed in the information presented on the status and trends of the species considered in this Opinion, recognizing that the benefits to sea turtles as a result of recovery activities already implemented may not be evident in the status and trend of the population for years given the relatively late age to maturity for sea turtles, and depending on the age class(es) affected.

## 4.1 Fishery Operations

### 4.1.1 Federal fisheries

Commercial and recreational fisheries in the action area employ gear that is known to harass, injure, and/or kill sea turtles. Several federally regulated fisheries that use gillnet, longline, trawl, dredge, and pot/trap gear have been documented as unintentionally capturing, entangling, hooking, entraining, or colliding with sea turtles. In some cases, the sea turtles are harmed, injured, or killed as a result of the interaction. Available information suggests that sea turtles can be captured, entangled, hooked, or entrained in these gear types when the operation of the gear overlaps with the distribution of the species.

Sea turtles are also known to be killed and injured as a result of being struck by vessels on the water. However, for the following reasons, the operation of fishing vessels used in the aforementioned fisheries will have discountable effects on sea turtles. First, fishing vessels operate at relatively slow speeds, particularly when towing or hauling gear. Thus, sea turtles in the path of a fishing vessel would likely be able to move out of the vessel's path before being struck. Second, fishing effort for all of the Federal fisheries within the action area is constrained in some way, either through a limited access permit system or by fishing quotas, thus limiting the amount of time that vessels are on the water. The less the time that vessels are on the water, the less opportunity for vessel collisions with sea turtles. Finally, sea turtles do not occur strictly at or within close proximity to the water surface (Morreale 1999), meaning that they spend part of their time at depths out of range of a collision with boats. For these reasons, the impacts of federally permitted fishing vessels themselves on sea turtles are negligible.

The types of gear used in the Federal fisheries described below are also expected to have an insignificant effect on sea turtle sea turtle prey and the habitats sea turtles utilize. Sea turtle prey items such as crabs and mollusks are removed from the marine environment as fisheries bycatch in one or more of the aforementioned fisheries. While some of the bycatch is likely returned to the water dead or injured to the extent that the organisms will shortly die, they would still be available as prey for sea turtles, which are known to eat a variety of live prey as well as scavenge dead organisms (Lutcavage and Musick 1985; Keinath *et al.* 1987; Dodd 1988; Burke *et al.* 1993; Morreale and Standora 2005).

Several of the fisheries described below use bottom otter trawl gear. The Northeast Region Essential Fish Habitat Steering Committee (NREFHSC), a panel of experts in the fields of benthic ecology, fishery ecology, geology, fishing gear technology, and fisheries gear operations, has previously concluded that the effects of even light-weight otter trawl gear would include: (1) the scraping or plowing of the doors on the bottom, sometimes creating furrows along their path, (2) sediment suspension resulting from the turbulence caused by the doors and the ground gear on the bottom, (3) the removal or damage to benthic or demersal species, and (4) the removal or damage to structure forming biota. The panel also concluded that the greatest impacts from otter trawls occur in high and low energy gravel habitats and in hard clay outcroppings, and that sand habitats were the least likely to be impacted (NREFHSC 2002). The action area in which these Federal fisheries occur along the U.S. Atlantic coast includes very few habitats that are purely gravel or hard clay (Amato 1994). Fixed gear (e.g., pots, traps, and sink gillnets) is expected to have less of an effect on bottom habitat than mobile gear. For sea turtles, the effects on habitat due to bottom otter trawl gear would be felt as an effect on their benthic prey species. As stated above, the effects on sea turtle prey items are expected to be insignificant.

In the Northeast Region (Maine through Virginia), formal ESA section 7 consultations have been conducted on the American lobster, Atlantic bluefish, Atlantic herring, Atlantic mackerel/squid/ butterfish, Atlantic sea scallop, monkfish, northeast multispecies, red crab, spiny dogfish, summer flounder/scup/black sea bass, and tilefish fisheries. An ITS has been issued for the incidental take of sea turtles in each of these fisheries. The ITS reflects the incidental take of sea turtles and other listed species anticipated from the date of the ITS and forward in time. In the Southeast Region (North Carolina through Texas), formal ESA section 7 consultations have been conducted on the coastal migratory pelagics, swordfish/tuna/shark/ billfish, snapper/grouper, dolphin/wahoo, southern flounder gillnet, and the Southeast shrimp trawl fisheries. An ITS has been issued for the incidental take of sea turtles in each of these fisheries as well.

The only fishery that has been determined by NMFS to reduce the reproduction, numbers, or distribution of ESA-listed sea turtles, and thereby reduce appreciably their likelihood of survival and recovery, is the pelagic longline component of the Atlantic highly migratory species fishery. On June 14, 2001, NMFS released an Opinion that found that the continued operation of the Atlantic pelagic longline fishery was likely to jeopardize the continued existence of both loggerhead and leatherback sea turtles. To avoid jeopardy to these species, a Reasonable and Prudent Alternative (RPA) was developed. The RPA required the closure of the Northeast Distant (NED) Statistical Area of the Atlantic Ocean to pelagic longlining and the enactment of a research program to develop or modify fishing gear and techniques to reduce sea turtle interactions and mortality associated with such interactions. On June 1, 2004, NMFS released another Opinion on the Atlantic pelagic longline fishery which stated that the fishery was still likely to jeopardize the continued existence of leatherback sea turtles. Another RPA was then developed to attempt to remove jeopardy. The RPA required that NMFS (1) reduce post-release mortality of leatherbacks, (2) improve monitoring of the effects of the fishery, (3) confirm the effectiveness of the hook and bait combinations that are required as part of the proposed action, and (4) take management action to avoid long-term elevations in leatherback takes or mortality. NMFS stated in the Opinion that this RPA must be implemented in its entirety to avoid jeopardy.

A summary of each fishery that has been subject to section 7 consultation is provided below, but more detailed information can be found in the respective biological opinions. The information describes times and areas where the fishery presently operates in order to qualitatively assess the likelihood of overlap between operation of the fishery and distribution of sea turtles.

The *American lobster trap fishery*, which is managed in Federal waters by NMFS under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA), has been identified as a source of gear causing injuries to and mortality of loggerhead and leatherback sea turtles as a result of entanglement in buoy lines of the pot/trap gear. Loggerhead and leatherback sea turtles caught/wrapped in the buoy lines of lobster pot/trap gear can die as a result of forced submergence or incur injuries leading to death as a result of severe constriction of a flipper from the entanglement. Given the seasonal distribution of loggerheads and leatherbacks in Mid-Atlantic and New England waters and the operation of the lobster fishery, these species are expected to overlap with the placement of lobster pot/trap gear in the fishery during the months of May through October in waters off of Maine through New Jersey.

American lobsters occur within U.S. waters from Maine to Virginia. They are most abundant from Maine to New Jersey with abundance declining from north to south (ASMFC 1997). Most lobster trap effort occurs in the Gulf of Maine. In 2006, Maine and Massachusetts produced 90% of the total U.S. landings of American lobster, with Maine accounting for 79% of these landings (NMFS 2007a). Lobster landings in the other New England states as well as New York and New Jersey account for most of the remainder of U.S. American lobster landings. However, declines in lobster abundance and landings have occurred from Rhode Island through New Jersey in recent years. The Mid-Atlantic states from Delaware through North Carolina have been granted *de minimus* status under the Atlantic States Marine Fisheries Commission's (ASMFC) Interstate Fishery Management Plan (ISFMP). The ISFMP includes measures to constrain or reduce fishing effort in the lobster fishery. Such measures are of benefit to sea turtles by reducing the amount of gear (specifically buoy lines) in waters where sea turtles also occur.

Given the distribution of lobster fishing effort, leatherback sea turtles are the most likely sea turtle to be affected since this species occurs regularly in Gulf of Maine waters. The most recent Opinion for this fishery, completed on October 31, 2002, concluded that operation of the Federally-regulated portion of the lobster trap fishery may adversely affect loggerhead and leatherback sea turtles as a result of entanglement in the groundlines and/or buoy lines associated with this type of gear. An ITS was issued with the 2002 Opinion, exempting the annual incidental take (lethal or non-lethal) of 2 loggerhead sea turtles and the biennial incidental take (lethal or non-lethal) of 9 leatherback sea turtles. However, due to new information on the effects of the fishery on North Atlantic right whales and sea turtles, section 7 consultation has been reinitiated.

The *Atlantic bluefish fishery* has been operating in the U.S. Atlantic for at least the last half century, although its popularity did not heighten until the late 1970s and early 1980s (MAFMC and ASMFC 1998; NEFSC 2006a). Gillnets and bottom otter trawls are the predominant gear types used in the commercial bluefish fishery (MAFMC 2007a). In 2006, gillnet gear accounted for 32.4% of the total commercial trips targeting bluefish, and landed 72% of the commercial catch for that year (MAFMC 2007a). Bottom otter trawls accounted for 44% of the total commercial trips targeting bluefish and landed 20.4% of the catch (MAFMC 2007a).

The majority of commercial fishing activity in the North and Mid-Atlantic occurs in the late spring to early fall, when bluefish are most abundant in these areas (NEFSC 2006a). Bluefish migrate south as water temperatures decrease in late fall and winter (NEFSC 2006a). Overall, the majority of bluefish commercial landings are taken in the Mid-Atlantic, with North Carolina reporting the highest landings, followed by New York and New Jersey (NEFSC 2006a).

This fishery is known to interact with loggerhead sea turtles, given the time and locations where the fishery occurs. No captures of loggerheads have been reported in bottom otter trawl gear for trips that were targeting bluefish (where >50% of the catch was bluefish) (NMFS 1999a). However, loggerhead captures have been observed in bottom otter trawl gear where bluefish was caught but constituted less than 50% of the catch (NMFS 1999a). In August 2007, NMFS received an estimate of loggerhead sea turtle bycatch in bottom otter trawl gear used in the bluefish fishery (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD). Using VTR data from 2000-2004 and the average annual bycatch of sea turtles as described in Murray (2006), the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the bluefish fishery was estimated to be 3 loggerhead sea turtles a year (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD). This information has since been published in a NMFS NEFSC Reference Document (Murray 2008). Due to this and other new information on sea turtle takes, formal section 7 consultation on the continued operation of the bluefish fishery under the Bluefish FMP was reinitiated on December 18, 2007.

Formal section 7 consultation was conducted on the *Atlantic herring fishery* on September 17, 1999 (NMFS 1999b), shortly before its FMP was approved. This fishery is managed under the Northeast Atlantic Herring FMP, which was implemented on December 11, 2000. In 1999, NMFS concluded that operation of the Federal herring fishery under the Atlantic Herring FMP may adversely affect green, Kemp's ridley, leatherback, and loggerhead sea turtles, but was not likely to jeopardize their continued existence. Purse seines, mid-water trawls (single), and pair trawls are the three primary gears involved in the Atlantic herring fishery (NEFMC 2006). Since 2000, pair trawl gear has accounted for the majority of herring landed each year (NEFMC 2006). Although there is no direct evidence of takes of ESA-listed species in this fishery from NMFS's sea sampling program, observer coverage of this fishery has been minimal. An ITS for sea turtles was provided with the biological opinion, based on the observed capture of sea turtles in other fisheries using comparable gear. It exempted the annual incidental take of 6 loggerheads, 1 leatherback, 1 Kemp's ridley, and 1 green sea turtle. Consultation on the Atlantic herring fishery was reinitiated on March 23, 2005 due to new information on the effects of the fishery on the Gulf of Maine DPS of Atlantic salmon and sea turtles. This consultation was completed on February 9, 2010 and determined that the Atlantic herring fishery is no longer likely to adversely affect ESA-listed species sea turtles, nor is it likely to adversely affect Atlantic salmon.

The *Atlantic mackerel/squid/butterfish fisheries* are managed under a single FMP, which was first implemented on April 1, 1983. The FMP covers management of four species, given that both short-finned squid (*Illex illecebrosus*) and long-finned squid (*Loligo pealei*) are managed under the FMP. Information for the fisheries was summarized in the Environmental Assessment for the 2008 Atlantic Mackerel, Squid, and Butterfish Specifications (MAFMC 2007b).

The most recent biological opinion completed on these federal fisheries was completed on April 28, 1999. The Opinion concluded that the continued operation of the fishery under the FMP was likely to adversely affect sea turtles, but not jeopardize their continued existence (NMFS 1999c). Trawl gear is the primary fishing gear for these fisheries, but several other types of gear may also be used, including hook-and-line, pot/trap, dredge, pound net, and bandit gear. Entanglements or entrapments of sea turtles have been recorded in one or more of these gear types. An ITS for sea turtles was provided with the Opinion. In August 2007, NMFS received a new estimate of loggerhead sea turtle takes in bottom otter trawl gear used in the mackerel, squid, and butterfish fisheries (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD). This information has since been published in a NMFS NEFSC Reference Document (Murray 2008). Using VTR data from 2000-2004 and the average annual bycatch of sea turtles as described in Murray (2006), the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the mackerel, squid, and butterfish fisheries was estimated to be 62 loggerhead sea turtles per year (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD; Murray 2008). Based on this new information on the capture of loggerhead sea turtles in the mackerel, squid, and butterfish fisheries, section 7 consultation on the continued operation of the fishery under the Squid/Mackerel/Butterfish FMP was reinitiated on March 6, 2008.

The *Atlantic sea scallop* fishery has a long history of operation in Mid-Atlantic, as well as New England waters (NEFMC 1982, 2003a). The fishery operates in areas and at times that it has traditionally operated and uses traditionally fished gear (NEFMC 1982, 2003a). Landings from

Georges Bank and the Mid-Atlantic dominate the fishery (NEFSC 2007a). On Georges Bank and in the Mid-Atlantic, sea scallops are harvested primarily at depths of 30-100 m, while the bulk of landings from the Gulf of Maine are from relatively shallow nearshore waters (<40 m) (NEFSC 2007a). Effort (in terms of days fished) in the Mid-Atlantic is about half of what it was prior to implementation of Amendment 4 to the Scallop FMP in the 1990s (NEFSC 2007a).

The Scallop FMP was originally implemented on May 15, 1982 (NEFSC 2007a). Amendment 4 to the FMP, implemented in 1994, changed the management strategy from meat count regulation to effort control for the entire U.S. EEZ (NEFSC 2007a). The limited access program, first established under Amendment 4, remains the basic effort control measure for the scallop fishery. Vessels that did not qualify for a limited access permit can obtain an open access, general category scallop permit (type 1A or 1B). An increase in active general category permits and the increase in landings by general category permitted vessels prompted the initiation of Amendment 11 to the Scallop FMP. In particular, it was noted that in these last several years there has been an increasing percentage of general category landings by vessels with homeports in the Mid-Atlantic region, and shifts in fishing effort by general category vessels to Mid-Atlantic fishing grounds (NEFMC 2007). Amendment 11 is expected to contribute to the management objectives of the fishery by reducing or constraining effort in the general category sector.

Loggerhead, Kemp's ridley, and green sea turtles have been reported by NMFS-trained observers as being captured in scallop dredge and or trawl gear. The first reported capture of a sea turtle in the scallop fishery occurred in 1996 during an observed trip of a scallop dredge vessel. Single sea turtle captures in scallop dredge gear were reported in both 1997 and 1999 as well. At the time, each of these events was thought to be an anomaly that only happened on extremely rare occasions. However, in 2001, thirteen sea turtle captures in scallop dredge gear were observed and/or reported by NMFS trained observers. All of these occurred in the re-opened Hudson Canyon and Virginia Beach Access Areas where observer coverage of the scallop fishery was higher in comparison to outside of the Access Areas. Although NMFS was not aware until 2001 that sea turtle interactions with scallop fishing gear occurred at more than a very low level (as was thought due to the single observed takes in 1996, 1997, and 1999), there is no information to suggest that turtle interactions with scallop fishing gear are a new event or are occurring at a greater rate than what has likely occurred in the past. To the contrary, the methods used to detect any sea turtle interactions with scallop fishing gear (dredge or trawl gear) were insufficient prior to increased observer coverage in 2001. In addition, there have been no known changes to the seasonal distribution of loggerhead sea turtles in the Mid-Atlantic north of Cape Hatteras (CeTAP 1982; Lutcavage and Musick 1985; Keinath *et al.* 1987; Shoop and Kenney 1992; Burke *et al.* 1993, 1994) with the exception of recent studies (Morreale *et al.* 2005; Mansfield 2006) which suggest a decrease rather than an increase in the use of some Mid-Atlantic loggerhead foraging areas for unknown reasons. Therefore, it is likely that the effect of the scallop fishery on sea turtles, while only quantified and recognized within the last 8 or so years, has been present for decades.

Formal section 7 consultation on the continued operation of the scallop fishery was last reinitiated on April 3, 2007, with an Opinion issued by NMFS on March 14, 2008. The ITS for the Opinion was amended on February 4, 2009. In this Opinion, NMFS determined that the continued operation of the fishery under the Scallop FMP (including the seasonal use of chain mat modified scallop dredge gear in Mid-Atlantic waters) may adversely affect but was not likely to jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley, and green sea turtles. Of the four species of sea turtles considered in the Opinion, loggerheads are expected to be the most frequently captured in the fishery. The ITS provided with the Opinion exempts the anticipated incidental take of up to 929 loggerheads biennially (up to 595 may be lethal) in scallop dredge gear and 154 loggerheads annually (up to 20 may be lethal) in scallop trawl gear. The number of loggerhead sea turtles expected to be killed or suffer serious injuries as a result of interactions with scallop dredge gear is based on data collected in the 2003 fishing year, prior to the use of chain mats. Therefore, while the estimated 595 loggerhead incidental takes, biennially, resulting in immediate death or serious injury is based on the best currently available information, it is also likely a worst case scenario. RPMs to minimize the impact of these incidental takes are also included in the Opinion, including an RPM to limit scallop dredge fishing effort in the mid-Atlantic area (NMFS 2008b).

The federal *monkfish fishery* occurs from Maine to the North Carolina/South Carolina border and is jointly managed by the NEFMC and MAFMC under the Monkfish FMP (NEFSC 2005a). A section 7 consultation conducted in 2001 concluded that the operation of the fishery may adversely affect sea turtles, but was not likely to jeopardize their continued existence. In 2003, proposed changes to the Monkfish FMP led to reinitiation of consultation to determine the effects of those actions on ESA-listed species. The resulting biological opinion concluded the continued operation of the fishery under the proposed changes was likely to adversely affect green, Kemp's ridley, loggerhead, and leatherback sea turtles, but was not likely to jeopardize their continued existence (NMFS 2003a). The ITS issued with the 2003 Opinion exempted the annual incidental take of 3 loggerhead and 1 non-loggerhead sea turtles in monkfish gillnet gear and one sea turtle (either a loggerhead, leatherback, Kemp's ridley, or green) in monkfish trawl gear. Although the estimated capture of sea turtles in monkfish gillnet gear is relatively low, there is concern that much higher levels of interaction could occur. Following an event in which over 200 sea turtle carcasses washed ashore in an area where large-mesh gillnetting had been occurring, NMFS published new restrictions preventing the use of gillnets with larger than 8-inch stretched mesh in the EEZ off of North Carolina and Virginia (67 FR 71895, December 3, 2002). The rule was subsequently modified on April 26, 2006 to prohibit the use of gillnets with ≥7-inch (17.9 cm) stretched mesh when fished in Federal waters from the North Carolina/South Carolina border to Chincoteague, Virginia.

In August 2007, NMFS received an estimate of loggerhead sea turtle bycatch in bottom otter trawl gear used in the monkfish fishery (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD). This information has since been published in a NMFS NEFSC Reference Document (Murray 2008). Using VTR data from 2000-2004 and the average annual bycatch of sea turtles as described in Murray (2006), the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the monkfish fishery was estimated to be 2 loggerhead sea turtles a year (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD; Murray 2008). This information represents new information on the capture of loggerhead sea turtles in the monkfish fishery. As a result, NMFS reinitiated formal section 7 consultation on the continued operation of the monkfish fishery under the Monkfish FMP on April 2, 2008.

The *northeast multispecies fishery* operates throughout the year, with peaks in the spring and from October through February. Multiple gear types are used in the fishery including sink gillnet gear and trawl gear, which are known to be a source of injury and mortality to loggerhead and leatherback sea turtles as a result of forced submergence from entanglement and capture in the gear (NMFS 2001a). The Northeast multispecies sink gillnet fishery has historically occurred from the periphery of the Gulf of Maine to Rhode Island in water as deep as 360 feet. In recent years, more of the effort in the fishery has occurred in offshore waters and into the Mid-Atlantic. Participation in this fishery has declined since extensive groundfish conservation measures have been implemented; particularly since implementation of Amendment 13 to the Multispecies FMP. Additional management measures (*i.e.,* Framework Adjustment 42) are expected to have further reduced effort in the fishery. The exact relationship between multispecies fishing effort and the number of sea turtle interactions with gear used in the fishery is unknown. However, in general, less fishing effort results in less time that gear is in the water and therefore less opportunity for sea turtles to be captured or entangled in multispecies fishing gear.

In August 2007, NMFS received an estimate of loggerhead sea turtle bycatch in bottom otter trawl gear used in the northeast multispecies fishery (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD). This information has since been published in a NMFS NEFSC Reference Document (Murray 2008). Using VTR data from 2000-2004 and the average annual bycatch of sea turtles as described in Murray (2006), the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the northeast multispecies fishery was estimated to be 43 loggerhead sea turtles a year (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD; Murray 2008). This information represents new information on the capture of loggerhead sea turtles in the northeast multispecies fishery. NMFS has, therefore, reinitiated formal section 7 consultation on the continued operation of the multispecies fishery under the Northeast Multispecies FMP.

The *deep-sea red crab fishery* is a pot/trap fishery that occurs in deep waters along the continental slope. The primary fishing zone for red crab, as reported by the fishing industry, is at a depth of 1,300-2,600 feet along the continental shelf in the Northeast region, and is limited to waters north of 35°15.3'N (Cape Hatteras, North Carolina) and south of the Hague Line. Following concerns that red crab could be overfished, an FMP was developed and became effective on October 21, 2002. Section 7 consultation was completed on the fishery during the proposed implementation of the Red Crab FMP (NMFS 2002b). The Opinion concluded that the action was not likely to result in jeopardy to any ESA-listed species under NMFS jurisdiction. An ITS was provided for leatherback and loggerhead sea turtles, which exempts the incidental take of 1 loggerhead and 1 leatherback sea turtle annually as a result of entanglement in groundlines and/or buoy lines associated with the pot/trap gear utilized in the fishery.

The *skate fishery* has been operating in the U.S. Atlantic for at least the last half century, although its popularity did not heighten until the 1990s (NEFMC 2003b; NEFSC 2007b). This fishery is known to interact with sea turtles, given the time and locations where the fishery occurs. Section 7 consultation on the Skate FMP was completed on July 24, 2003 (NMFS 2003b), and concluded that operation of the skate fishery under the Skate FMP may adversely affect sea turtles as a result of interactions with gillnet and trawl gear. Although there have been no recorded takes of loggerheads in the skate fishery, given that loggerhead interactions with trawl and gillnet gear have been observed in other fisheries, takes in gear used in the skate fishery may be possible where the gear and loggerhead distributions overlap. In August 2007, NMFS received an estimate of loggerhead sea turtle takes in bottom otter trawl gear used in the skate fishery (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD). This information has since been published in a NMFS NEFSC Reference Document (Murray 2008). Using VTR data from 2000-2004 and the average annual bycatch of sea turtles as described in Murray (2006), the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the skate fishery was estimated to be 24 loggerhead sea turtles a year (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD; Murray 2008). An additional 9 loggerheads are estimated to be taken annually in the U.S. Mid-Atlantic sink gillnet fishery for skates based on fisheries observer data and commercial landings (Murray 2009a).

There is no information to suggest that sea turtle interactions with skate fishing gear are a new event or are occurring at a greater rate than what has likely occurred in the past. To the contrary, the methods used to detect any sea turtle interactions with skate fishing gear (gillnet or trawl gear) were insufficient prior to increased observer coverage in recent years. In addition, there have been no known changes to the seasonal distribution of loggerhead sea turtles in the Mid-Atlantic north of Cape Hatteras (CeTAP 1982; Lutcavage and Musick 1985; Keinath *et al.* 1987; Shoop and Kenney 1992; Burke *et al.* 1993) with the exception of recent studies (Morreale *et al.* 2005; Mansfield 2006) which suggest a decrease rather than an increase in the use of some Mid-Atlantic loggerhead foraging areas for unknown reasons. Therefore, it is likely that the effect of the skate fishery on loggerhead sea turtles, while only quantified and recognized within the last few years, has been present for decades.

The *spiny dogfish fishery* in the U.S. EEZ is managed under the Spiny Dogfish FMP. The primary gear types for the spiny dogfish fishery are sink gillnets, otter trawls, bottom longline, and driftnet gear (NEFSC 2003). The predominance of any one gear type has varied over time (NEFSC 2003). In 2005, 62.1% of landings were taken by sink gillnet gear, followed by 18.4% in otter trawl gear, 2.3% in line gear, and 17.1% in gear defined as "other" (excludes drift gillnet gear) (NEFSC 2006b). Sea turtles can be incidentally captured in all gear sectors of the spiny dogfish fishery, which can lead to injury and death as a result of forced submergence in the gear.

NMFS reinitiated section 7 consultation on the Spiny Dogfish FMP on May 4, 2000, to reevaluate, in part, the effects of the spiny dogfish gillnet fishery on sea turtles (NMFS 2001b). The FMP for spiny dogfish called for a 30% reduction in quota allocation levels for 2000 and a 90% reduction in 2001. Although there were delays in implementing the plan, quota allocations were substantially reduced over the 4.5 year rebuilding schedule; this has resulted in a substantial decrease in effort directed at spiny dogfish. The reduction in effort has likely benefited protected species by reducing the number of gear interactions that occur. As a result, the June 14, 2001 Opinion on the fishery concluded that its operation under the Spiny Dogfish FMP may adversely affect but was not likely to jeopardize the continued existence of ESA-listed sea turtles. An ITS was provided for the incidental take of sea turtles in the fishery. It exempted the annual incidental take of 3 loggerheads (no more than 2 lethal), 1 leatherback, 1 Kemp's ridley, and 1 green sea turtle in gear used in the fishery. Section 7 consultation on the continued operation of the fishery under the Spiny Dogfish FMP was reinitiated by NMFS on April 2, 2008 due to new information on the effects of the fishery on ESA-listed whales as a result of changes to Atlantic Large Whale Take Reduction Plan (ALWTRP) regulations.

The *summer flounder, scup, and black sea bass fisheries* are managed under one FMP. Bottom otter and beam trawl gear are used most frequently in the commercial fisheries for all three species (MAFMC 2007c). Gillnets, handlines, dredges, and pots/traps are also occasionally used (MAFMC 2007c). In 2001, NMFS prepared an Opinion on the effects of these three fisheries on ESA-listed sea turtles. An ITS was provided for the anticipated capture of sea turtles in trawl and gillnet gear used in these fisheries. It currently exempts the annual incidental take of up to 19 loggerhead or Kemp's ridley sea turtles (up to five lethal takes) and 2 green sea turtles (NMFS 2001c). In 2006, the NEFSC released an estimate of loggerhead sea turtle takes in bottom otter trawl gear fished in Mid-Atlantic waters during the period 1996-2004 (Murray 2006). Fifty-percent of the observed 66 takes occurred on vessels targeting summer flounder. However, it should also be noted that some of the observed interactions occurred on vessels fishing with TEDs using an allowed (at that time) TED extension with a minimum 5.5" mesh (Murray 2006). Numerous problems were noted by observers with respect to the mesh used in the TED extension including entanglement of sea turtles in the mesh and blocking of the TED by debris (Murray 2006). NMFS addressed these problems in 1999 by requiring that webbing in the TED extension be no more than 3.5" stretched mesh (Murray 2006). Given these changes, the bycatch rates used for the estimate may be higher than current conditions.

Significant measures have been developed to reduce the incidental take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl (which includes fisheries for other species like scup and black sea bass). TEDs are required throughout the year for trawl nets fished from the North Carolina/South Carolina border to Oregon Inlet, North Carolina, and seasonally (March 16-January 14) for trawl vessels fishing between Oregon Inlet, North Carolina, and Cape Charles, Virginia. Effort in the summer flounder, scup, and black sea bass fisheries has also declined since the 1980s and since each fishery became managed under the FMP. Effects to sea turtles are expected, in general, to have declined as a result of the decline in fishing effort. Nevertheless, the fisheries primarily operate in Mid-Atlantic waters in areas and times when sea turtles occur. Thus, there is a continued risk of sea turtle captures causing injury and death in summer flounder, scup, and black sea bass fishing gear.

In August 2007, NMFS received an estimate of loggerhead sea turtle takes in bottom otter trawl gear used in the summer flounder, scup, black sea bass fisheries (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD). This information has since been published in a NMFS NEFSC Reference Document (Murray 2008). Using VTR data from 2000-2004 and the average annual bycatch of sea turtles as described in Murray (2006), the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the summer flounder, scup, black sea bass fisheries was estimated to be 200 loggerhead sea turtles a year (Memo from K. Murray, NEFSC to L. Lankshear, NERO, PRD; Murray 2008). This information represents new information on the capture of loggerhead sea turtles in the summer flounder, scup, and black sea bass fisheries. NMFS has, therefore, reinitiated section 7 consultation on the continued operation of the summer flounder, scup, and black sea bass fisheries. Consultation is on-going.

A summary of the current *tilefish fishery* is provided in the 41st Northeast Regional Stock Assessment Report (NEFSC 2005b). The management unit for the Tilefish FMP is all golden tilefish under U.S. 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 (8°-18°C) approximately 250 to 1,200 feet deep on the outer continental shelf and upper slope of the U.S. 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. Bottom longline gear equipped with circle hooks is the primary gear type used in the tilefish fishery.

The effects of the Northeast and Mid-Atlantic tilefish fishery on ESA-listed species were considered during formal section 7 consultation on the implementation of a new Tilefish FMP, concluded on March 13, 2001, with the issuance of a non-jeopardy biological opinion. The Opinion included an ITS for loggerhead and leatherback sea turtles, exempting the annual incidental take of 6 loggerheads and 1 leatherback as a result of capture, entanglement, or hooking in bottom longline and/or bottom trawl gear associated with the fishery (NMFS 2001d).

NMFS recently completed a section 7 consultation on the continued operation of the *coastal migratory pelagic* fishery in the Gulf of Mexico and South Atlantic (NMFS 2007b). In the Gulf of Mexico, hook-and-line, gillnet, and cast net gears are used. Gillnets are the primary gear type used by commercial fishermen in the South Atlantic regions as well, while the recreational sector uses hook-and-line gear. The hook-and-line effort is primarily trolling. The biological opinion concluded that green, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by operation of the fishery. However, the proposed action was not expected to jeopardize the continued existence of any of these species and an ITS was provided. The ITS exempts the incidental take of up to 33 loggerhead, 14 green, 4 Kemp's ridley, and 2 leatherback sea turtles over a three-year period as a result of interactions with gear used in the fishery.

The *Atlantic pelagic fisheries for swordfish, tuna, sharks, and billfish (highly migratory species)* are known to incidentally capture sea turtles, particularly in the pelagic longline component. Pelagic longline, pelagic driftnet, bottom longline, and/or purse seine gear have all been documented to hook, capture, or entangle sea turtles. 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. NMFS reinitiated consultation on the pelagic longline component of this fishery as a result of exceeded incidental take levels for loggerhead and leatherback sea turtles (NMFS 2004a). The resulting biological opinion stated the long-term continued operation of the pelagic longline fishery for tuna and swordfish was likely to jeopardize the continued existence of leatherback sea turtles, but RPAs were implemented allowing for the continued operation of the fishery in a manner that would not jeopardize leatherbacks. In 2006, the Atlantic HMS pelagic longline fishery had an estimated 771.6 interactions with loggerhead sea turtles and 381.3 interactions with leatherback sea turtles (Garrison *et al.* 2009).

A section 7 consultation on the *South Atlantic snapper-grouper fishery* (NMFS 2006) has also recently been completed by NMFS. The fishery uses spear and powerhead, black sea bass pot, and hook-and-line gear. Hook-and-line gear used in the fishery includes commercial bottom longline gear and commercial and recreational vertical line gear (e.g., handline, bandit gear, rod-and-reel). The consultation found that only hook-and-line gear is likely to adversely affect green, Kemp's ridley, leatherback, and loggerhead sea turtles. The consultation concluded the proposed action was not likely to jeopardize the continued existence of any of these species, and an ITS was provided. The ITS exempts the incidental take of up to 202 loggerhead, 39 green, 25 leatherback, and 19 Kemp's ridley sea turtles over a three-year period as a result of interactions with gear used in the fishery (NMFS 2006).

An FMP for the South Atlantic *dolphin-wahoo fishery* was approved in December 2003. The stated purpose of the Dolphin and Wahoo FMP is to adopt precautionary management strategies to maintain the current harvest level and historical allocations of dolphin (90% recreational) and ensure no new fisheries develop. NMFS conducted a formal section 7 consultation to consider the effects on sea turtles of authorizing fishing under the FMP (NMFS 2003c). The August 27, 2003 Opinion concluded that the longline component of the fishery may adversely affect but would not jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley, and green sea turtles. An ITS for sea turtles was provided with the Opinion, exempting the incidental take of up to 12 loggerheads, 12 leatherbacks, and any combination of 3 incidental takes for Kemp's ridley, green, and hawksbill sea turtles over a three-year period (NMFS 2003c). Also, pelagic longline vessels can no longer target dolphin-wahoo with smaller hooks because of hook size requirements in the pelagic longline fishery.

On December 2, 2002, NMFS completed an Opinion for *shrimp trawling in the southeastern U.S.* under proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). This Opinion determined that the shrimp trawl fishery under the revised TED regulations may adversely affect but would not jeopardize the continued existence of any sea turtle species (NMFS 2002a). This determination was based, in part, on the Opinion's analysis that showed that the revised TED regulations were expected to reduce shrimp trawl related mortality by 94% for loggerheads and 97% for leatherbacks. The ITS included with the Opinion exempted the annual incidental take of up to 163,160 loggerheads (3,948 mortalities), 3,090 leatherbacks (80 mortalities), 155,503 Kemp's ridleys (4,208 mortalities), and 18,757 greens (514 mortalities).

Recently, however, NMFS has estimated that the annual take levels and mortalities of sea turtles in the Gulf of Mexico shrimp fishery are significantly lower than what is exempted by the 2002 Opinion. In addition to improvements in TED designs and TED enforcement, interactions between sea turtles and the shrimp fishery have also been declining because of reductions in fishing effort unrelated to fisheries management actions. The 2002 Opinion take estimates are based in part on fishery effort levels. In recent years, low shrimp prices, rising fuel costs, competition with imported products, and the impacts of recent hurricanes in the Gulf of Mexico have all impacted the shrimp fleets; in some cases reducing fishing effort by as much as 50% for offshore waters of the Gulf of Mexico (GMFMC 2007). As a result, sea turtle interactions and mortalities in the Gulf of Mexico, most notably for loggerheads and leatherbacks, have been substantially less than projected in the 2002 Opinion. For the U.S. south Atlantic shrimp fishery, there is currently no new information on the number of takes and mortalities occurring annually, although NMFS is currently researching this as well.

### 4.1.2 Non-federally regulated fisheries

Nearshore and inshore gillnet fisheries occur throughout the Mid- and South Atlantic in state waters from Connecticut through Florida, in areas where sea turtles also occur. Captures of sea turtles in these fisheries have been reported (NMFS SEFSC 2001). Two, 10-14 inch (25.6-35.9 cm) mesh gillnet fisheries, the black drum and sandbar shark gillnet fisheries, occur in Virginia state waters along the tip of the eastern shore. These fisheries may capture or entangle sea turtles given the gear type, but no interactions have been observed. Similarly, small mesh gillnet fisheries occurring in Virginia state waters are suspected of capturing or entangling sea turtles, but no interactions have been observed.

In North Carolina, a large-mesh gillnet fishery for summer and southern flounder in the southern portion of Pamlico Sound was found to contribute to captures of sea turtles in gillnet gear. In particular, the North Carolina inshore fall southern flounder gillnet fishery was identified as a source of large numbers of sea turtle mortalities in 1999 and 2000, especially loggerhead sea turtles. In 2000, 2001, and 2002, NMFS issued an ESA section 10 permit to the North Carolina Department of Marine Fisheries (NCDMF) for the take of sea turtles in the Pamlico Sound large-mesh gillnet fishery and provided mitigative measures for the southern flounder fishery. Subsequently, sea turtle mortalities in these fisheries were drastically reduced. The reduction of sea turtle mortalities in these fisheries reduces the negative effects these fisheries have on the environmental baseline. NMFS issued another ESA section 10 permit to the NCDMF in 2005 covering incidental takes through 2010. As described in section 4.4.1 below, NMFS has also taken regulatory action to address the potential for sea turtle interactions with gillnet gear with ≥7 inch (17.9 cm) stretched mesh fished in Federal waters off of North Carolina and Virginia.

Strict regulations are in place for nearshore gillnetting off South Carolina, Georgia, and Florida as well. Georgia and South Carolina prohibit gillnets for all but the shad fishery, and Florida banned all but very small nets in state waters. Although many states have imposed strict regulations on gillnetting, the practice still occurs off some states' waters and in Federal waters. The nearshore and inshore gillnet fisheries off North Carolina are of particular concern due to the incidental captures (both lethal and non-lethal) of loggerhead, leatherback, Kemp's ridley, and green sea turtles (W. Teas, pers. comm., J. Braun-McNeill pers. comm.). In June 2009, 11 sea turtle captures (6 greens, 3 Kemp's ridleys, and 2 loggerheads) occurred over a one-week period in the southern flounder anchored sink gillnet fishery in Core Sound, North Carolina (NEFSC Fisheries Sampling Branch [FSB] database). Illegal gillnet incidental captures have also been reported in South Carolina and Florida (NMFS SEFSC 2001).

An *Atlantic croaker fishery* using trawl gear also occurs in state waters within the action area. Sea turtle captures have been observed in Atlantic croaker trawl gear (Murray 2006). Between 1994 and 2004, observers documented the capture of 18 loggerhead sea turtles in trawl gear targeting croaker in waters from 41°30'N/66°W to 35°N/75°30'W (Murray 2006). Additional observed interactions have occurred with 5 captures of loggerhead sea turtles observed in 2006 and 17 captures of loggerhead sea turtles observed in 2007 (NEFSC FSB database). NMFS is investigating the use of a TED for trawl gear used in the Atlantic croaker fishery (72 FR 7382).

The *weakfish fishery* occurs in both state and Federal waters, but the majority of commercially and recreationally caught weakfish are caught in state waters (ASMFC 2002). Commercial gears include gillnets, pound nets, haul seines, and trawls, with the majority of landings occurring in the fall and winter months (ASMFC 2002). Weakfish landings were dominated by the trawl fishery through the mid-1980s after which gill net landings began to account for most weakfish landed (ASMFC 2002). North Carolina has accounted for the majority of the annual landings since 1972 while Virginia ranks second, followed by New Jersey (ASMFC 2002). As described in section 3.1, sea turtle bycatch in the weakfish fishery has occurred (Murray 2006). Seven of the sixty-six observed loggerhead sea turtle interactions in bottom otter trawl gear fished in Mid-Atlantic waters during the period 1994-2004 were on vessels targeting weakfish. Since observer coverage was low and the fishery uses other gear types known to incidentally take sea turtles, the incidental take of sea turtles in the fishery is likely to have been higher than that which was observed for just the trawl sector.

A *whelk fishery* using pot/trap gear is known to occur in several parts of the action area, including waters off of Maine, Connecticut, Massachusetts, Delaware, Maryland, and Virginia. Landings data for Delaware suggests that the greatest effort in the whelk fishery for waters off of that state occurs in the months of July and October; times when sea turtles are present. Whelk pots, which unlike lobster traps are not fully enclosed, have been suggested as a potential source of entrapment for loggerhead sea turtles that may be enticed to enter the trap to get the bait or whelks caught in the trap (Mansfield *et al.* 2001). Leatherbacks are known to become entangled in lines associated with trap/pot gear used in several fisheries including lobster, whelk, and crab species (NMFS SEFSC 2001; Dwyer *et al.* 2002). The whelk fishery has been verified as the fishery involved in 13 sea turtle entanglements collectively in Massachusetts, New Jersey, and Virginia from 2002 to 2008. These whelk pot incidental takes have involved 8 leatherbacks, 4 loggerheads, and 1 green sea turtle, and have occurred in the months of May, June, July, August, and October (Northeast Region Sea Turtle Disentanglement Network [STDN] database).

Various *crab fisheries*, such as horseshoe crab and blue crab, also occur in Federal and state waters and may be detrimental to sea turtles as a result of entanglement or entrapment in the pot/trap gear used. The Virginia blue crab fishery has been verified as the fishery involved in three sea turtle entanglements from 2002 to 2008. Two events involved a leatherback sea turtle entanglement and one involved a loggerhead entanglement (Northeast Region STDN database).

These crab fisheries may also have detrimental impacts on sea turtles beyond entanglement in the fishing gear itself. Loggerheads are known to prey on crab species, including horseshoe and blue crabs. In a study of the diet of loggerhead sea turtles in Virginia waters from 1983-2002, Seney and Musick (2007) found a shift in the diet of loggerheads in the area from horseshoe and blue crabs to fish, particularly menhaden and Atlantic croaker. The authors suggested that a decline in the crab species have resulted in the shift and loggerheads are likely foraging on fish captured in fishing nets or on discarded fishery bycatch (Seney and Musick 2007). The physiological impacts of this shift are uncertain although it was suggested as a possible explanation for the declines in loggerhead abundance noted by Mansfield (2006). Other studies have detected seasonal declines in loggerhead abundance coincident with seasonal declines of horseshoe and blue crabs in the same area (Maier *et al.* 2005). While there is no evidence of a decline in horseshoe crab abundance in the southeast during the period 1995-2003, declines were evident in some parts of the Mid-Atlantic (ASMFC 2004; Eyler *et al.* 2007). Given the variety of loggerheads prey items (Dodd 1988; Burke *et al.* 1993; Bjorndal 1997; Morreale and Standora 1998) and the differences in regional abundance of horseshoe crabs and other prey items (ASMFC 2004; Eyler *et al.* 2007), a direct correlation between loggerhead sea turtle abundance and horseshoe crab and blue crab availability cannot be made at this time. Nevertheless, the decline in loggerhead abundance in Virginia waters (Mansfield 2006), and possibly Long Island waters (Morreale *et al.* 2005), commensurate with noted declines in the abundance of horseshoe crab and other crab species raises concerns that crab fisheries may be significantly impacting the forage base for loggerheads in some areas of their range.

An *American lobster trap fishery* also occurs in state waters of New England and the Mid-Atlantic and is managed under the ASMFC's ISFMP. Like the Federal waters component of the fishery, the state waters fishery has also been identified as a source of gear causing injuries to and mortality of loggerhead and leatherback sea turtles as a result of entanglement in vertical buoy lines of the pot/trap gear. Between 2002 and 2008, the lobster trap fishery in state waters was verified as the fishery involved in at least 27 leatherback entanglements in the Northeast Region. All entanglements involved the vertical line of the gear. These verified/confirmed entanglements occurred in Maine, Massachusetts, and Rhode Island state waters from June through October (Northeast Region STDN database).

The *Virginia pound net fishery* has also been documented as a source of sea turtle interactions. Pound nets with large-mesh leaders set in the Chesapeake Bay have been observed to lethally capture sea turtles as a result of entanglement in the pound net leader. As described in section 4.4.4 below, NMFS has taken regulatory action to address sea turtle interactions with the Virginia pound net fishery.

Incidental captures of loggerheads in fish traps have also been reported from several Atlantic coast states (Shoop and Ruckdeschel 1989; W. Teas, pers. comm.). Long haul seines and channel nets are also known to incidentally capture loggerheads and other sea turtles in sounds and other inshore waters along the U.S. Atlantic coast, although no lethal takes have been reported (NMFS SEFSC 2001).

Observations of state recreational fisheries have shown that loggerhead, leatherback, and green sea turtles are known to bite baited hooks, and loggerheads frequently ingest the hooks. Hooked sea turtles have been reported by the public fishing from boats, piers, beaches, banks, and jetties, and from commercial fishermen fishing for snapper, grouper, and sharks with both single rigs and bottom longlines (NMFS SEFSC 2001). A summary of known impacts of hook-and-line captures on loggerhead sea turtles can be found in the TEWG (1998, 2000, 2009) reports.

## 4.2 Vessel Activity and Military Operations

Potential sources of adverse effects to sea turtles from Federal vessel operations in the action area include operations of the U.S. Navy (USN), U.S. Coast Guard (USCG), Environmental Protection Agency (EPA), Army Corps of Engineers (ACOE), and NOAA to name a few.

NMFS has previously conducted formal consultations with the USN, USCG, and NOAA on their vessel-based operations. NMFS has also conducted section 7 consultations with the Minerals Management Service (MMS), Federal Energy Regulatory Commission (FERC), and Maritime Administration (MARAD) on vessel traffic related to energy projects in the Northeast Region and has implemented conservation measures. Through the section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species.

Although consultations on individual USN and USCG activities have been completed, only one formal consultation on overall military activities in all of the Atlantic has been completed at this time. In June 2009, NMFS prepared an Opinion on USN activities in each of their four training range complexes along the U.S. Atlantic coast—Northeast, Virginia Capes, Cherry Point, and Jacksonville (NMFS 2009d). In addition, the following Opinions for the USN (NMFS 1996, 1997a, 2008c, 2009e) and USCG (NMFS 1995, 1998c) contain details on the scope of vessel operations for these agencies and the conservation measures that are being implemented as standard operating procedures. In the U.S. Atlantic, the operation of USCG boats and cutters is estimated to take no more than one individual sea turtle, of any species, per year (NMFS 1995).

Military activities such as ordnance detonation also affect listed species of sea turtles. A section 7 consultation was conducted in 1997 for USN aerial bombing training in the ocean off the southeast U.S. coast, involving drops of live ordnance (500 and 1,000-lb bombs). The resulting Opinion for this consultation determined that the activity was likely to adversely affect sea turtles but would not jeopardize their continued existence. In the ITS included within the Opinion, these training activities were estimated to have the potential to injure or kill, annually, 84 loggerheads, 12 leatherbacks, and 12 greens or Kemp's ridleys, in combination (NMFS 1997a).

NMFS has also conducted more recent section 7 consultations on USN explosive ordnance disposal, mine warfare, sonar testing (e.g., AFAST, SURTASS LFA), and other major training exercises (e.g., bombing, Naval gunfire, combat search and rescue, anti-submarine warfare, and torpedo and missile exercises) in the Atlantic Ocean. These consultations have determined that the proposed USN activities may adversely affect but would not jeopardize the continued existence of ESA-listed sea turtles (NMFS 2008c, 2009c, 2009d). NMFS estimated that five loggerhead and six Kemp's ridley sea turtles are likely to be harmed as a result of training activities in the Virginia Capes Range Complex from June 2009 to June 2010, and that nearly 1,500 sea turtles, including 10 leatherbacks, are likely to experience harassment (NMFS 2009d).

Similarly, operations of vessels by other Federal agencies within the action area (NOAA, EPA, and ACOE) may adversely affect sea turtles. However, vessel activities of those agencies are often limited in scope, as they operate a limited number of vessels or are engaged in research/ operational activities that are unlikely to contribute a large amount of risk. From 2009 on, NOAA research vessels conducting fisheries surveys for the NEFSC are estimated to take no more than nine sea turtles per year (eight alive, one dead). This includes up to seven loggerheads as well as an additional loggerhead, leatherback, Kemp's ridley, or green sea turtle per year during bottom trawl surveys and one loggerhead, leatherback, Kemp's ridley, or green sea turtle per year during scallop dredge surveys (NMFS 2007c).

## 4.3 Other Activities

### 4.3.1 Hopper Dredging

The construction and maintenance of federal navigation channels and sand mining ("borrow") areas have also been identified as sources of sea turtle mortality. Hopper dredges move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving sea turtle. Along the Atlantic coast of the southeastern U.S., NMFS estimates that annual observed injury or mortality of sea turtles from hopper dredging may reach 35 loggerhead, 7 green, 7 Kemp's ridley, and 2 hawksbill sea turtles (NMFS 1997b).

Further north, the Sandbridge Shoal is an approved Minerals Management Service borrow site located approximately 3 miles off Virginia Beach. This site has been used in the past for both the Navy's Dam Neck Annex beach renourishment project and the Sandbridge Beach Erosion and Hurricane Protection Project, and is likely to be used in additional beach nourishment projects in the future. The Sandbridge Beach Erosion and Hurricane Protection Project involved hopper dredging of approximately 972,000 cubic yards (cy) of sand during the first year of the project and an anticipated 500,000 cy every two years thereafter. NMFS completed section 7 consultation on this project in April 1993, and anticipated the incidental take of eight loggerhead sea turtles and one Kemp's ridley or green sea turtle. Actual dredging did not begin until May 1998, and no sea turtle interactions were observed during the 1998 dredge cycle. In June 2001, the ACOE indicated that the next dredge cycle, which was scheduled to begin in the summer of 2002, would require 1.5 million cy of sand initially, with an anticipated 1.1 million cy every two years thereafter. Although the volume of sand had increased from the previous cycle, NMFS reduced the ITS to five loggerheads and one Kemp's ridley or green sea turtle due to the lack of observed interactions in the previous cycle, along with the levels of anticipated and observed incidental take in hopper dredging projects in nearby locations.

NMFS completed section 7 consultation on the USN's Dam Neck Annex beach nourishment project in January 1996, which involved the removal of 635,000 cy of material beginning in 1996 and continuing on a 12-year cycle thereafter. NMFS anticipated the incidental take of 10 loggerheads and one Kemp's ridley or green sea turtle during each dredge cycle. However, no interactions were observed during the 1996 cycle. The USN reinitiated consultation on June 27, 2003, based on an accelerated dredge cycle (from 12 years to 8 years), an increase in the volume of sand required, and new information on the status of loggerhead sea turtles since the original Opinion was issued in 1996. The consultation was concluded on December 12, 2003, and anticipated the incidental take of four loggerheads and one Kemp's ridley or green sea turtle during each dredge cycle. NMFS concluded that this level of incidental take was not likely to jeopardize the continued existence of any of these species.

### 4.3.2 Maritime Industry

Private and commercial vessels, including fishing vessels, operating in the action area of this consultation also have the potential to interact with sea turtles. The effects of fishing vessels, recreational vessels, or other types of commercial vessels on ESA-listed species may involve disturbance or injury/mortality due to collisions or entanglement in anchor lines. It is important to note that minor vessel collisions may not kill an animal directly, but may weaken or otherwise affect it so it is more likely to become vulnerable to effects such as entanglement. Listed species may also be affected by fuel oil spills resulting from vessel accidents. Fuel oil spills could affect animals through the food chain. However, these spills typically involve small amounts of material that are unlikely to adversely affect listed species. Larger oil spills may result from severe accidents, although these events would be rare and involve small areas. No direct adverse effects on listed sea turtles resulting from fishing vessel fuel spills have been documented.

NMFS has completed section 7 consultations for the issuance of permits to allow for the construction and operation of three Liquid Natural Gas (LNG) terminals within the action area of this consultation (Broadwater, Neptune, and Northeast Gateway). NMFS has concluded that the construction and operation of these facilities will not adversely affect ESA-listed loggerhead, leatherback, Kemp's ridley, or green sea turtles (NMFS 2007d, 2007e).

### 4.3.3 Pollution

Anthropogenic sources of marine pollution, while difficult to attribute to a specific Federal, state, local, or private action, may affect sea turtles in the action area. Sources of pollutants in the action area include atmospheric loading of pollutants such as PCBs; storm water runoff from coastal towns, cities, and villages; runoff into rivers emptying into bays; groundwater discharges; sewage treatment plant effluents; and oil spills. The pathological effects of oil spills on sea turtles have been documented in several laboratory studies (Vargo *et al.* 1986).

Nutrient loading from land-based sources, such as coastal communities and agricultural operations, is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effect to larger embayments is unknown. Contaminants could degrade habitat if pollution and other factors reduce the food available to marine animals.

### 4.3.4 Coastal development

Beachfront development, lighting, and beach erosion control all are ongoing activities along the Mid- and South Atlantic coastlines of the U.S. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, more and more coastal counties are adopting stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting.

### 4.3.5 Global climate change and ocean acidification

There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. The EPA's climate change webpage (http://www.epa.gov/climatechange/index.html) provides background information on these and other measured or anticipated effects. Activities in the action area that may have contributed to global warming include the combustion of fossil fuels by vessels.

The effects of global climate change are typically viewed as being detrimental to sea turtles (NMFS and USFWS 2007a, 2007b, 2007c, 2007d). Changes in water temperature would be expected to affect prey distribution and/or abundance, salinity, and water circulation patterns perhaps even to the extent that the Gulf Stream in the Atlantic is disrupted (Gagosian 2003; NMFS and USFWS 2007a, 2007b, 2007c, 2007d). The effects of these on sea turtles cannot, for the most part, be accurately predicted at this time. However, several studies have investigated the effects of changes in sea surface temperature and air temperatures on sea turtle reproductive behavior. For loggerhead sea turtles, warmer sea surface temperatures in the spring have been correlated to an earlier onset of nesting (Weishampel *et al.* 2004; Hawkes *et al.* 2007), shorter internesting intervals (Hays *et al.* 2002), and a decrease in the length of the nesting season (Pike *et al.* 2006). Green sea turtles also exhibited shorter internesting intervals in response to warming water temperatures (Hays *et al.* 2002).

Air temperatures also play a role in sea turtle reproduction. In marine turtles, sex is determined by temperatures in the middle third of the incubation period with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Based on modeling, a 2°C increase in air temperature is expected to result in a sex ratio of over 80% female offspring for loggerhead nesting beaches in the vicinity of Southport, North Carolina. Farther to the south at Cape Canaveral, Florida, a 2°C increase in air temperature would likely result in production of 100% females while a 3°C increase in air temperature would likely exceed the thermal threshold of sea turtle clutches resulting in death (Hawkes *et al.* 2007). Thus, changes in air temperature as a result of global climate change may alter sex ratios and may reduce hatchling production in the most southern nesting areas of the U.S. Given that the south Florida nesting group is the largest loggerhead nesting group in the Atlantic (in terms of nests laid), a decline in the success of nesting as a result of global climate change could have profound effects on the abundance and distribution of the loggerhead species in the Atlantic.

For green sea turtles, incubation temperatures also appear to affect hatchling size with smaller turtles produced at higher incubation temperatures (Glen *et al.* 2003). It is unknown whether this effect is species-specific and what impact it has on the survival of the offspring.

While the type and extent of effects to sea turtles as a result of global climate change are still speculative, a disruption of the Gulf Stream, such as might occur as a result of global climate change (Gagosian 2003), would be expected to have profound effects on every aspect of sea turtle life history including hatching success, oceanic migrations at all life stages, foraging, and nesting.

Ocean acidification related to global warming would also reasonably be expected to negatively affect sea turtles. The term "ocean acidification" describes the process of ocean water becoming corrosive as a result of carbon dioxide ($CO_2$) being absorbed from the atmosphere. The absorption of atmospheric $CO_2$ into the ocean lowers the pH of the waters. Evidence of corrosive water caused by the ocean's absorption of $CO_2$ was found less than 20 miles off the west coast of North America during a field study from Canada to Mexico in the summer of 2007 (Feely *et al.* 2008). This was the first time "acidified" ocean water was found on the continental shelf of western North America. While the ocean's absorption of $CO_2$ provides a great service to humans by significantly reducing the amount of greenhouse gases in the atmosphere and decreasing the effects of global warming, the resulting change in ocean chemistry could adversely affect marine life, particularly organisms with calcium carbonate shells such as corals, mussels, mollusks, and small creatures in the early stages of the food chain (*e.g.*, plankton). A number of these organisms serve as important prey items for sea turtles.

## 4.4 Reducing Threats to ESA-listed Sea Turtles

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries in the action area. These include sea turtle release gear requirements for Atlantic HMS; TED requirements for Southeast shrimp trawl fishery and the southern part of the summer flounder trawl fishery; mesh size restrictions in the North Carolina gillnet fishery and Virginia's gillnet and pound net fisheries; modified leader requirements in the Virginia Chesapeake Bay pound net fishery; area closures in the North Carolina gillnet fishery; and gear modifications in the Atlantic sea scallop dredge fishery. In addition to regulations, outreach programs have been established and data on sea turtle interactions and strandings are collected. The summaries below discuss all of these measures in more detail.

### 4.4.1 Final Rules for Large-Mesh Gillnets

In March 2002, NMFS published new restrictions for the use of gillnets with larger than 8-inch (20.3 cm) stretched mesh, in Federal waters (3-200 nautical miles) off of North Carolina and Virginia. These restrictions were published in an interim final rule under the authority of the ESA (67 FR 13098) and were implemented to reduce the impact of the monkfish and other large-mesh gillnet fisheries on ESA-listed sea turtles in areas where sea turtles are known to concentrate. Following review of public comments submitted on the interim final rule, NMFS published a final rule on December 3, 2002, that established the restrictions on an annual basis. As a result, gillnets with larger than 8-inch (20.3 cm) stretched mesh are not allowed in Federal waters (3-200 nautical miles) in the areas described as follows: (1) North of the North Carolina/South Carolina border at the coast to Oregon Inlet at all times; (2) north of Oregon Inlet to Currituck Beach Light, NC from March 16 through January 14; (3) north of Currituck Beach Light, NC, to Wachapreague Inlet, VA, from April 1 through January 14; and (4) north of Wachapreague Inlet, VA, to Chincoteague, VA, from April 16 through January 14. On April 26, 2006, NMFS published a final rule (71 FR 24776) that included modifications to the large-mesh gillnet restrictions. The new final rule revised the gillnet restrictions to apply to stretched mesh that is $\geq$7 inches (17.9 cm). Federal waters north of Chincoteague, VA, remain unaffected by the large-mesh gillnet restrictions. 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 through March 15, annually. The measures are also in addition to comparable North Carolina and Virginia regulations for large-mesh gillnet fisheries in their respective state waters that were enacted in 2005.

NMFS has also issued a rule addressing capture of sea turtles in gillnet gear fished in the southern flounder fishery in Pamlico Sound. NMFS issued a final rule (67 FR 56931), effective September 3, 2002, that closed the waters of Pamlico Sound, NC, to fishing with gillnets with larger than 4 ¼-inch (10.8 cm) stretched mesh from September 1 through December 15 each year to protect migrating sea turtles. The closed area includes all inshore waters of Pamlico Sound south of 35°46.3'N latitude, north of 35°00'N latitude, and east of 76°30'W longitude.

### 4.4.2 Revised use of TEDs for U.S. Southeast shrimp trawl fisheries

On February 21, 2003, NMFS issued a final rule (68 FR 8456) to amend regulations for reducing sea turtle mortality resulting from shrimp trawling in the Atlantic and Gulf areas of the southeastern U.S. TEDs have proven to be effective at excluding sea turtles from shrimp trawls. However, NMFS determined that modifications to the design of TEDs needed to be made to exclude leatherbacks, as well as large, benthic, immature and sexually mature loggerhead and green sea turtles. In addition, several previously approved TED designs did not function properly under normal fishing conditions. Therefore, NMFS disallowed these TEDs (*e.g.*, weedless TEDs, Jones TEDs, hooped hard TED, and the use of accelerator funnels) as described in the final rule. Finally, the rule also required modifications to the trynet and bait shrimp exemptions to the TED requirements to decrease mortality of sea turtles.

In 1993 (with a final rule implemented in 1995), NMFS established a Leatherback Conservation Zone to restrict shrimp trawl activities from the coast of Cape Canaveral, Florida, to the North Carolina/Virginia border. This provided for short-term closures when high concentrations of normally pelagically distributed leatherbacks are recorded in near coastal waters where the shrimp fleet operates. This measure was necessary because, due to their size, adult leatherbacks were larger than the escape openings of most NMFS-approved TEDs. With the implementation of the new TED rule requiring larger opening sizes on all TEDs, the reactive emergency closures within the Leatherback Conservation Zone became unnecessary, and the Leatherback Conservation Zone was removed from the regulations.

### 4.4.3 TED requirements for the summer flounder fishery

As mentioned in Section 4.1.1, significant measures have been developed to reduce the incidental take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl (which would include fisheries for other species like scup and black sea bass) by requiring TEDs in trawl nets fished in trawls used in the area of greatest turtle bycatch off the North Carolina and part of the Virginia coast from North Carolina/South Carolina border to Cape Charles, Virginia. The TED requirements for the summer flounder trawl fishery do not, however, require the use of larger TEDs that are required to be used in the U.S. Southeast shrimp trawl fisheries.

### 4.4.4 Modification of Gear for Virginia Pound Nets

Existing information indicates that pound nets with traditional large mesh and stringer leaders, as used in the Chesapeake Bay, incidentally take sea turtles. NMFS published a temporary rule in June 2001 (66 FR 33489) that prohibited fishing with pound net leaders with a mesh size measuring 8-inches (20.3 cm) or greater, and pound net leaders with stringers in mainstream waters of the Chesapeake Bay and its tributaries for a 30-day period beginning June 19, 2001. NMFS subsequently published an interim final rule in 2002 (67 FR 41196, June 17, 2002) that further addressed the take of sea turtles in large-mesh pound net leaders and stringer leaders used in the Chesapeake Bay and its tributaries. Following new observations of sea turtle entanglements in pound net leaders in the spring of 2003, NMFS issued a temporary final rule (68 FR 41942, July 16, 2003) that restricted all pound net leaders throughout Virginia's waters of the Chesapeake Bay and a portion of its tributaries from July 16 - July 30, 2003.

A new final rule was published May 5, 2004 (69 FR 24997) to address sea turtle entanglements with pound net gear that might occur in the Chesapeake Bay during the period May 6 - July 15 each year. That rule prohibited the use of all pound net leaders, set with the inland end of the leader greater than 10 horizontal feet (3 m) from the mean low water line, from May 6 - July 15 each year in the Virginia waters of the mainstream Chesapeake Bay, south of 37°19'N and west of 76°13'W, and all waters south of 37°13'N to the Chesapeake Bay Bridge Tunnel at the mouth of the Chesapeake Bay, and the James and York Rivers downstream of the first bridge in each tributary. Outside of this area, the prohibition of leaders with greater than or equal to 12 inches (30.5 cm) stretched mesh and leaders with stringers, as established by the June 17, 2002, interim final rule, applied from May 6 - July 15 each year.

In response to new information acquired through gear research, on April 17, 2006, NMFS published a proposed rule in the *Federal Register* that would allow the use of offshore pound net leaders meeting the definition of a *modified pound net leader* in a portion of the Chesapeake Bay during the period May 6 to July 15 each year. Modifications to the pound net leader address: (1) the maximum allowed mesh size; (2) placement of the leader in relation to the sea floor; (3) the height of the mesh from the sea floor in relation to the depth at mean lower low water; and (4) the use of vertical lines to hold the mesh in place. Following review of public comments received on the proposed rule, NMFS published a final rule implementing the action on June 23, 2006 (71 FR 36024).

### 4.4.5 HMS Sea Turtle Protection Measures

NMFS completed the most recent biological opinion on the FMP for the Atlantic HMS fisheries for tuna and swordfish on June 1, 2004, and concluded that the pelagic longline component of the fishery was likely to jeopardize the continued existence of leatherback sea turtles. An RPA was provided to avoid jeopardy to leatherback sea turtles as a result of the operation of this component of the fishery. The RPA was also expected to benefit loggerhead sea turtles by reducing the likelihood of mortality resulting from interactions with the gear. Regulatory components of the RPA have been implemented through rulemaking. Since 2004, bycatch estimates for both loggerheads and leatherbacks in pelagic longline gear have been well below the average prior to implementation of gear regulations under the RPA (Garrison *et al.* 2009).

#### 4.4.6 Use of a Chain-Mat Modified Scallop Dredge in the Mid-Atlantic

In response to the observed capture of sea turtles in scallop dredge gear, including serious injuries and sea turtle mortality as a result of capture, NMFS proposed a modification to scallop dredge gear (70 FR 30660, May 27, 2005). The rule was finalized as proposed (71 FR 50361, August 25, 2006) and required federally permitted scallop vessels fishing with dredge gear to modify their gear by adding an arrangement of horizontal and vertical chains (hereafter referred to as a "chain mat") between the sweep and the cutting bar when fishing in Mid-Atlantic waters south of 41°9'N from the shoreline to the outer boundary of the EEZ during the period of May 1-November 30 each year. The requirement was subsequently modified by emergency rule on November 15, 2006 (71 FR 66466), and by a final rule published on April 8, 2008 (73 FR 18984). On May 5, 2009, NMFS proposed additional minor modifications to the regulations on how chain mats are configured (74 FR 20667). In general, the chain mat gear modification is expected to reduce the severity of some sea turtle interactions with scallop dredge gear. However, this modification is not expected to reduce the overall number of sea turtle interactions with scallop dredge gear.

#### 4.4.7 Sea Turtle Handling and Resuscitation Techniques

NMFS has developed and published as a final rule in the *Federal Register* (66 FR 67495, December 31, 2001) sea turtle handling and resuscitation techniques for sea turtles that are incidentally caught during scientific research or fishing activities. Persons participating in fishing activities or scientific research are required to handle and resuscitate (as necessary) sea turtles as prescribed in the final rule. These measures help to prevent mortality of hard-shelled turtles caught in fishing or scientific research gear.

#### 4.4.8 Sea Turtle Entanglements and Rehabilitation

A final rule (70 FR 42508) published on July 25, 2005, allows any agent or employee of NMFS, the USFWS, the U.S. Coast Guard, or any other Federal land or water management agency, or any agent or employee of a state agency responsible for fish and wildlife, when acting in the course of his or her official duties, to take endangered sea turtles encountered in the marine environment if such taking is necessary to aid a sick, injured, or entangled endangered sea turtle, or dispose of a dead endangered sea turtle, or salvage a dead endangered sea turtle that may be useful for scientific or educational purposes. NMFS already affords the same protection to sea turtles listed as threatened under the ESA (50 CFR 223.206(b)).

### 4.4.9 Education and Outreach Activities

Education and outreach activities do not directly reduce the threats to ESA-listed sea turtles. However, education and outreach are a means of better informing the public of steps that can be taken to reduce impacts to sea turtles (*i.e.*, reducing light pollution in the vicinity of nesting beaches) and increasing communication between affected user groups (*e.g.*, the fishing community). For the HMS fishery, 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 these outreach efforts in an attempt to increase the survival of protected species through education on proper release techniques.

### 4.4.10 Sea Turtle Stranding and Salvage Network (STSSN)

As is the case with education and outreach, the STSSN does not directly reduce the threats to sea turtles. However, the extensive network of STSSN participants along the Atlantic and Gulf of Mexico coasts not only collects data on dead sea turtles, but also rescues and rehabilitates live stranded turtles. Data collected by the STSSN are used to monitor stranding levels and identify areas where unusual or elevated mortality is occurring. 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 tag live turtles when encountered (either via the stranding network through incidental takes or in-water studies). Tagging studies help provide an understanding of sea turtle movements, longevity, and reproductive patterns, all of which contribute to our ability to reach recovery goals for the species.

## 5.0 CUMULATIVE EFFECTS

Cumulative effects include the effects in the action area of future State, tribal, local, or private actions that are reasonably certain to occur. 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.

Sources of human-induced mortality, injury, and/or harassment of sea turtles in the action area that are reasonably certain to occur in the future include incidental takes in state-regulated fishing activities, vessel collisions, ingestion of plastic debris, and pollution. While the combination of these activities may affect populations of endangered and threatened sea turtles, preventing or slowing a species' recovery, the magnitude of these effects is currently unknown.

*State Water Fisheries* - Fishing activities are considered one of the most significant causes of death and serious injury for sea turtles. The NRC (1990) report estimated that 550 to 5,500 sea turtles (juvenile and adult loggerheads and Kemp's ridleys) die each year from all other fishing activities besides shrimp fishing. Fishing gear in state waters, including bottom trawls, gillnets, trap/pot gear, and pound nets, take sea turtles each year. NMFS is working with state agencies to address the take of sea turtles in state water fisheries within the action area of this consultation where information exists to show that these fisheries take sea turtles. Action has been taken by some states to reduce or remove the likelihood of sea turtle takes in one or more gear types. However, given that state managed commercial and recreational fisheries along the Atlantic coast are reasonably certain to occur within the action area in the foreseeable future, additional takes of sea turtles in these fisheries are anticipated. There is insufficient information to quantify the number of sea turtle takes presently occurring as a result of state water fisheries as well as the number of sea turtles injured or killed as a result of such takes. While actions have been taken to reduce sea turtle takes in some state water fisheries, the overall effect of these actions on reducing the take of sea turtles in state water fisheries is unknown, and the future effects of state water fisheries on sea turtles cannot be quantified. Further information on past effects of state water fisheries on sea turtles is available in Section 4.1.2.

*Vessel Interactions* - NMFS STSSN data indicate that vessel interactions are responsible for a large number of sea turtle strandings within the action area each year. In the U.S. Atlantic from 1997-2005, 14.9% of all stranded loggerheads were documented as having sustained some type of propeller or collision injuries (NMFS and USFWS 2007a). The incidence of propeller wounds rose from approximately 10% in the late 1980s to a record high of 20.5% in 2004 (STSSN database). Such collisions are reasonably certain to continue into the future. Collisions with boats can stun, injure, or kill sea turtles, and many live-captured and stranded sea turtles have obvious propeller or collision marks (Dwyer *et al.* 2003). However, it is not always clear whether the collision occurred pre- or post-mortem. As a result, an estimate of the number of sea turtles that will likely be killed by vessels is not possible.

*Pollution and Contaminants* - Human activities causing pollution are reasonably certain to continue in the future, as are impacts from them on sea turtles in the action area. However, the level of impacts cannot be projected. Marine debris (*e.g.*, discarded fishing line or lines from boats) can entangle sea turtles in the water and drown them. Sea turtles commonly ingest plastic or mistake debris for food. Chemical contaminants may also have an effect on sea turtle reproduction and survival. Excessive turbidity due to coastal development and/or construction sites could influence sea turtle foraging ability. As mentioned previously, sea turtles are not very easily affected by changes in water quality or increased suspended sediments, but if these alterations make habitat less suitable for them and hinder their capability to forage, eventually they would leave or avoid these less desirable areas (Ruben and Morreale 1999). Noise pollution has been raised, primarily, as a concern for marine mammals but may be a concern for other marine organisms, including sea turtles. As described above, global climate change is likely to negatively affect sea turtles – affecting when females lay their eggs, the survival of the eggs, sex ratios of offspring, and the stability of the Gulf Stream. To the extent that air pollution, for example from the combustion of fossil fuels by vessels, contributes to global warming, then it is also expected to negatively affect sea turtles in the action area.

## 5.1 Summary and Synthesis of the Status of Species, Environmental Baseline, and Cumulative Effects sections

The *Status of the Species*, *Environmental Baseline*, and *Cumulative Effects* sections, taken together, establish a "baseline" against which the effects of 2010-2012 NEAMAP trawl surveys are analyzed to determine whether the action is likely to jeopardize the continued existence of listed species in the action area. To the extent available information allows, this baseline (which does not include the effects of the survey) would be compared to the baseline plus the effects of the 2010-2012 NEAMAP survey. The difference in the two trajectories would be reviewed to determine whether the 2010-2012 NEAMAP survey is likely to jeopardize the continued existence of these species. This section synthesizes the *Status of the Species*, *Environmental Baseline*, and *Cumulative Effects* sections as best as possible given that some information on sea turtles is quantified, yet much remains qualitative or unknown.

Leatherback and Kemp's ridley sea turtles are endangered species, meaning that they are in danger of extinction throughout all or a significant portion of their ranges. The loggerhead sea turtle is currently listed as a threatened species, meaning that it is likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range. Green sea turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. For purposes of this Opinion, NMFS considers the trend of the sea turtle species considered in this Opinion to be declining for loggerhead, leatherback, and green sea turtles, and increasing for Kemp's ridley sea turtles. These trends are the result of past, present, and likely future human activities and natural events, some effects of which are positive, some negative, and some unknown, as discussed previously in the *Status of the Species*, *Environmental Baseline*, and *Cumulative Effects* sections taken together. Additional information is provided below.

*Loggerhead Sea Turtles*. Loggerhead sea turtles are listed as a single species classified as "threatened" under the ESA. Loggerhead nesting occurs on beaches of the Pacific, Indian, and Atlantic Oceans, and the Mediterranean Sea. Genetic analyses of maternally inherited mitochondrial DNA demonstrate the existence of separate, genetically distinct nesting groups between as well as within the ocean basins (TEWG 2000; Bowen and Karl 2007). The Loggerhead BRT has recently identified the following nine loggerhead DPSs distributed globally: (1) North Pacific Ocean, (2) South Pacific Ocean, (3) North Indian Ocean, (4) Southeast Indo-Pacific Ocean, (5) Southwest Indian Ocean, (6) Northwest Atlantic Ocean, (7) Northeast Atlantic Ocean, (8) Mediterranean Sea, and (9) South Atlantic Ocean.

It takes decades for loggerhead sea turtles to reach maturity. Once they have reached maturity, females typically lay multiple clutches of eggs within a season, but do not typically lay eggs every season (NMFS and USFWS 2008). There are many natural and anthropogenic factors affecting the survival of loggerheads prior to their reaching maturity as well as for those adults who have reached maturity. As described in sections 3.1 and 4.0, negative impacts causing death of various age classes occur both on land and in the water. In addition, given the distances traveled by loggerheads in the course of their development, actions to address the negative impacts require the work of multiple countries at both the national and international level (NMFS and USFWS 2007a). Many actions have been taken to address known negative impacts to loggerhead sea turtles. However, many remain unaddressed, have not been sufficiently addressed, or have been addressed in some manner but whose success cannot be quantified.

Sea turtle nesting data, in terms of the number of nests laid each year, is collected for loggerhead sea turtles for at least some nesting beaches within each of the ocean basins and the Mediterranean Sea. From this, the number of reproductively mature females utilizing those nesting beaches can be estimated based on the presumed remigration interval and the average number of nests laid by a female loggerhead sea turtle per season. These estimates provide a minimum count of the number of loggerhead sea turtles in any particular nesting group. The estimates do not account for adult females who nest on beaches with no or little survey coverage, and do not account for adult males or juveniles of either sex. The proportion of adult males to females from each nesting group, and the age structure of each loggerhead nesting group is currently unknown. For these reasons, nest counts cannot be used to estimate the total population size of a nesting group and, similarly, trends in the number of nests laid cannot be used as an indicator of the population trend (whether decreasing, increasing, or stable) (Meylan 1982; Ross 1996; Zurita *et al.* 2003; Hawkes *et al.* 2005; letter to J. Lecky, NMFS Office of Protected Resources, from N. Thompson, NMFS Northeast Fisheries Science Center, December 4, 2007; TEWG 2009).

Nevertheless, nest count data are a valuable source of information for each loggerhead nesting group and for loggerheads as a species since the number of nests laid reflects the reproductive output of the nesting group each year, and also provides insight on the contribution of each nesting group to the species. Based on a comparison of the available nesting data, the world's largest known loggerhead nesting group (in terms of estimated number of nesting females) occurs in Oman in the northern Indian Ocean, where an estimated 20,000-40,000 females nest each year (Baldwin *et al.* 2003). The world's second largest known loggerhead nesting group, the PFRU, occurs along the southeast coast of the U.S. from the Florida/Georgia border through Pinellas County on Florida's west coast, where approximately 15,735 females nest per year (based on a mean of 64,513 nests laid per year from 1989-2007; NMFS and USFWS 2008). The world's third largest loggerhead nesting group also occurs in the U.S., from the Florida/Georgia border through southern Virginia. However, the approximate number of females nesting annually is 1,272 (based on a mean number of 5,215 nests laid per year from 1989-2008; NMFS and USFWS 2008), which is less than 1/10$^{th}$ the size of the PFRU. Thus, while loggerhead nesting occurs at multiple sites within multiple ocean basins and the Mediterranean Sea, the extent of nesting is disproportionate amongst the various sites and only two geographic areas, Oman and peninsular Florida, account for the majority of nesting for the species worldwide.

Declines in loggerhead nesting have been noted at nesting beaches throughout the range of the species. The 2008 revised recovery plan by NMFS and FWS identified five unique recovery units of loggerheads in the Northwest Atlantic. Based on the most recent information, a decline in annual nest counts has been measured or suggested for three of the five recovery units. These include nesting for the PFRU – the second largest loggerhead nesting group in the world and the largest of all of the loggerhead nesting groups in the Atlantic (Meylan *et al.* 2006; NMFS and USFWS 2008). The final revised plan reviews and discusses the species' ecology, population status and trends, and identifies the many threats to loggerhead sea turtles in the Northwest Atlantic Ocean. It lays out a recovery strategy to address the threats, based on the best available science, and includes recovery goals and criteria. In addition, the plan identifies substantive actions needed to address the threats to the species and achieve recovery. In 2009, the TEWG indicated that it could not determine whether or not the decreasing annual numbers of nests among the Northwest Atlantic loggerhead subpopulations were due to stochastic processes resulting in fewer nests, a decreasing average reproductive output of adult females, decreasing numbers of adult females, or a combination of these factors. The TEWG (2009) report noted there were likely several factors contributing to the decline. These factors include incidental capture (in fisheries, power plant intakes, and dredging operations), lower adult female survival rates, increases in the proportion of first-time nesters, continued directed harvest, and increases in mortality due to disease. The current levels of hatchling output will no doubt result in depressed recruitment to subsequent life stages over the coming decades (TEWG 2009).

In light of the above, for purposes of this Opinion, NMFS considers the trend for loggerheads as a species to be declining. Although some DPSs are indicating increasing trends at nesting beaches (Southwest Indian Ocean and South Atlantic Ocean), available information about anthropogenic threats to juveniles and adults in neritic and oceanic environments indicate possible unsustainable additional mortalities. NMFS recognizes that the available nest count data only provides information on the number of females currently nesting, and is not necessarily a reflection of the number of mature females available to nest or the number of immature females that will reach maturity and nest in the future. Also, the trend in the number of nests laid is not a reflection of the overall trend in any nesting group given that the proportion of adult males to females, and the age structure of each loggerhead nesting group is currently unknown. According to the threat matrix analysis in the BRT report, the potential for future decline is greatest for the North Indian Ocean, Northwest Atlantic Ocean, Northeast Atlantic Ocean, Mediterranean Sea, and South Atlantic Ocean DPSs (Conant *et al.* 2009). This determination that the trend for loggerheads as a species is declining provides benefit of the doubt to the species given its threatened classification under the ESA, the many on-going negative impacts to the species across all areas of its range and to all age classes, and information to suggest that fewer nests are being laid (potentially reducing the number of offspring that will mature and contribute to the species' continued existence).

*Kemp's Ridley Sea Turtles.* Kemp's ridley sea turtles are listed as a single species classified as "endangered" under the ESA. Kemp's ridleys occur in the Atlantic Ocean and Gulf of Mexico. The only major nesting site for Kemp's ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963; USFWS and NMFS 1992; NMFS and USFWS 2007b). Approximately 60% of its nesting occurs here with a limited amount of scattered nesting to the north and south of the primary nesting beach (NMFS and USFWS 2007b).

Age to maturity for Kemp's ridley sea turtles occurs earlier than for either loggerhead or leatherback sea turtles. However, maturation may still take 10-17 years (NMFS and USFWS 2007b). As is the case with the other sea turtle species, adult female Kemp's ridleys typically lay multiple nests in a nesting season but do not typically nest every nesting season (TEWG 2000; NMFS and USFWS 2007b). Although actions have been taken to protect the nesting beach habitat and to address activities known to negatively impact Kemp's ridley sea turtles, Kemp's ridleys continue to be impacted by anthropogenic activities (see sections 3.2 and 4.0).

Nest count data provides the best available information on the number of adult females nesting each year. As is the case with the other sea turtles species discussed above, nest count data must be interpreted with caution given that these estimates provide a minimum count of the number of nesting Kemp's ridley sea turtles. In addition, the estimates do not account for adult males or juveniles of either sex. Without information on the proportion of adult males to females, and the age structure of the Kemp's ridley population, nest counts cannot be used to estimate the total population size and, similarly, trends in the number of nests laid cannot be used as an indicator of the population trend (whether decreasing, increasing, or stable) (Meylan 1982; Ross 1996; Zurita *et al.* 2003; Hawkes *et al.* 2005; letter to J. Lecky, NMFS Office of Protected Resources, from N. Thompson, NMFS Northeast Fisheries Science Center, December 4, 2007). Nevertheless, the nesting data does provide valuable information on the extent of Kemp's ridley nesting and the trend in the number of nests laid. Estimates of the adult female nesting population reached a low of approximately 250-300 in 1985 (USFWS and NMFS 1992; TEWG 2000). 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 (TEWG 2000). Current estimates suggest an adult female population of 7,000-8,000 Kemp's ridleys (NMFS and USFWS 2007b).

The most recent review of the Kemp's ridley as a species suggests that it is in the early stages of recovery (NMFS and USFWS 2007b). Nest count data indicate increased nesting and increased numbers of nesting females in the population. In light of this information, for purposes of this Opinion, NMFS considers the trend for Kemp's ridleys to be increasing. This determination also takes into account a number of recent conservation actions including the protection of females, nests, and hatchlings on nesting beaches since the 1960s and the enhancement of survival in marine habitats through the implementation of TEDs in the early 1990s and a decrease in the amount of shrimping off the coast of Tamaulipas and in the Gulf of Mexico in general (NMFS and USFWS 2007b).

*Green Sea Turtles.* Green sea turtles are listed as both threatened and endangered under the ESA. Breeding colony populations in Florida and on the Pacific coast of Mexico are considered endangered while all others are considered threatened. Due to the inability to distinguish between these populations away from the nesting beach, for this Opinion, green sea turtles are considered endangered wherever they occur in U.S. waters. Green sea turtles are distributed circumglobally and can be found in the Pacific, Indian, and Atlantic Oceans as well as the Mediterranean Sea (NMFS and USFWS 1991; Seminoff 2004; NMFS and USFWS 2007c).

Green sea turtles appear to have the latest age to maturity of all of the sea turtles with age at maturity occurring after 2-5 decades (NMFS and USFWS 2007c). As is the case with all of the other sea turtle species mentioned here, mature green sea turtles typically nest more than once in a nesting season but do not nest every nesting season. As is also the case with the other sea turtle species, green sea turtles face numerous threats on land and in the water that affect the survival of all age classes.

A review of 32 Index Sites distributed globally revealed a 48% to 67% decline in the number of mature females nesting annually over the last three generations (Seminoff 2004). For example, in the eastern Pacific, the main nesting sites for the green sea turtle are located in Michoacan, Mexico, and in the Galapagos Islands, Ecuador, where the number of nesting females exceeds 1,000 females per year at each site (NMFS and USFWS 2007c). Historically, however, greater than 20,000 females per year are believed to have nested in Michoacan alone (Cliffton *et al.* 1982; NMFS and USFWS 2007c). However, the decline is not consistent across all green sea turtle nesting areas. Increases in the number of nests counted and, presumably, the numbers of mature females laying nests were recorded for several areas (Seminoff 2004; NMFS and USFWS 2007d). Of the 32 index sites reviewed by Seminoff (2004), the trend in nesting was described as: increasing for 10 sites, decreasing for 19 sites, and stable (no change) for 3 sites. Of the 46 green sea turtle nesting sites reviewed for the 5-year status review, the trend in nesting was described as increasing for 12 sites, decreasing for 4 sites, stable for 10 sites, and unknown for 20 sites (NMFS and USFWS 2007c). The greatest abundance of green sea turtle nesting in the western Atlantic occurs on beaches in Tortuguero, Costa Rica (NMFS and USFWS 2007c). Nesting in the area has increased considerably since the 1970s and nest count data from 1999-2003 suggest nesting by 17,402-37,290 females per year (NMFS and USFWS 2007c). One of the largest nesting sites for green sea turtles worldwide is still believed to be on the beaches of Oman in the Indian Ocean (Hirth 1997; Ferreira *et al.* 2003; NMFS and USFWS 2007c). However, nesting data for this area has not been published since the 1980s and updated nest numbers are needed (NMFS and USFWS 2007c).

The results of genetic analyses show that green sea turtles in the Atlantic do not contribute to green sea turtle nesting elsewhere in the species' range (Bowen and Karl 2007). Therefore, increased nesting by green sea turtles in the Atlantic is not expected to affect green sea turtle abundance in other ocean basins in which the species occurs. However, the ESA-listing of green sea turtles as a species across ocean basins means that the effects of a proposed action must, ultimately, be considered at the species level for section 7 consultations. In light of the above, for purposes of this Opinion, NMFS considers the trend for green sea turtles, as a species, to be declining. NMFS recognizes that the nest count data available for green sea turtles in the Atlantic clearly indicates increased nesting at many sites. However, NMFS also recognizes that the nest count data, including data for green sea turtles in the Atlantic, only provides information on the number of females currently nesting, and is not necessarily a reflection of the number of mature females available to nest or the number of immature females that will reach maturity and nest in the future. Also, the trend in the number of green sea turtle nests laid is not an indication of the overall population trend given that the proportion of adult males to females and the age structure of the population(s) are unknown. Finally, given the late age to maturity for green sea turtles (20 to 50 years) (Balazs 1982; Frazer and Ehrhart 1985; Seminoff 2004), caution is urged regarding the trend for any of the nesting groups since no area has a dataset spanning a full green sea turtle generation (NMFS and USFWS 2007c). This determination that the trend for green sea turtles as a species is declining provides benefit of the doubt to the species given its endangered and threatened classification under the ESA, the many on-going negative impacts to the species across all areas of its range and to all age classes, the declining or uncertain trend in nesting for the majority of the world's nesting sites for green sea turtles, and the lack of up-to-date nesting information for the largest green sea turtle nesting site in the Indian Ocean and possibly the world.

*Leatherback Sea Turtles*. Leatherback sea turtles are listed as a single species classified as "endangered" under the ESA. Leatherbacks are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, and Indian Oceans, the Caribbean Sea, Mediterranean Sea, and the Gulf of Mexico (Ernst and Barbour 1972). Leatherback nesting occurs on beaches of the Atlantic, Pacific, and Indian Oceans as well as in the Caribbean (NMFS and USFWS 2007d).

Like loggerheads, sexually mature female leatherbacks typically nest in non-successive years and lay multiple clutches in each of the years that nesting occurs. Leatherbacks face a multitude of threats that can cause death prior to and after reaching maturity. Some activities resulting in leatherback mortality have been addressed. However, many others remain to be addressed. Given their range and distribution, international efforts are needed to address all known threats to leatherback sea turtle survival (NMFS and USFWS 2007d).

There are some population estimates for leatherback sea turtles although there appears to be considerable uncertainty in the numbers. In 1980, the global population of adult leatherback females was estimated to be approximately 115,000 (Pritchard 1982). By 1995, this global population of adult females was estimated to be 34,500 (Spotila *et al.* 1996). However, the most recent population size estimate for the North Atlantic alone is 34,000-94,000 adult leatherbacks (TEWG 2007; NMFS and USFWS 2007d).

Leatherback nesting in the eastern Atlantic (*i.e.*, off Africa) and in the Caribbean appears to be stable, but there is conflicting information for some sites and it is certain that some nesting groups (*e.g.*, St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS and USFWS 1995). Data collected for some nesting beaches in the western Atlantic, including leatherback nesting beaches in the U.S., clearly indicate increasing numbers of nests (NMFS SEFSC 2001; NMFS and USFWS 2007d). However, declines in nesting have been noted for beaches in the western Caribbean (NMFS and USFWS 2007d). 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 nest on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana (Hilterman and Goverse 2004). 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.* (2007) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing.

Increased nesting by leatherbacks in the Atlantic is not expected to affect leatherback abundance in the Pacific where the abundance of leatherback sea turtles on nesting beaches has declined dramatically over the past 10 to 20 years (NMFS and USFWS 2007d). Although genetic analyses suggest little difference between Atlantic and Pacific leatherbacks (Bowen and Karl 2007), it is generally recognized that there is little to no genetic exchange between these turtles.

In addition, Atlantic and Pacific leatherbacks are impacted by different activities (NMFS and USFWS 1992, 1998b). However, the ESA-listing of leatherbacks as a species means that the effects of a proposed action must, ultimately, be considered at the species level for section 7 consultations. In light of the above, for purposes of this Opinion, NMFS considers the trend for leatherbacks, as a species, to be declining. NMFS recognizes that the nest count data available for leatherbacks in the Atlantic clearly indicates increased nesting at many sites, and that the activities affecting declines in nesting by leatherbacks in the Pacific are not the same as those activities affecting leatherbacks in the Atlantic. However, NMFS also recognizes that the nest count data, including data for leatherbacks in the Atlantic, only provides information on the number of females currently nesting, and is not necessarily a reflection of the number of mature females in the Atlantic that are available to nest or the number of immature females that will reach maturity and nest in the future. Also, the trend in the number of nests laid is not a reflection of the overall trend in any leatherback population given that the proportion of adult males to females and the age structure of the population(s) are unknown. This determination that the trend for leatherbacks as a species is declining provides benefit of the doubt to the species given its endangered classification under the ESA, the many on-going negative impacts to the species across all areas of its range and to all age classes, the uncertainty in the population estimates, the dramatic decline in leatherback nesting in the Pacific, and the disproportionate nesting of leatherbacks with more than half of the species' nesting occurring in one area of the world (thus, negative impacts to this area could have very large impacts on reproductive success of the species).

## 6.0 EFFECTS OF THE ACTION

As discussed in the *Description of the Proposed Action*, the proposed Federal action is the 2010-2012 NEAMAP Near Shore Trawl Surveys to be funded by NMFS's allocation of pounds of summer flounder, scup, black sea bass, bluefish, and *Loligo* squid to VIMS under the Mid-Atlantic RSA Program. The 2010-2012 NEAMAP survey will use bottom otter trawl gear in areas and at times when sea turtles are also likely to be present. As described in Section 1.0, NMFS has determined that the use of trawl gear for the 2010-2012 NEAMAP surveys may adversely affect loggerhead, Kemp's ridley, green, and leatherback sea turtles as a result of capture in the trawl gear. Given that determination, section 7 of the ESA requires NMFS to further determine whether the use of trawl gear for the 2010-2012 NEAMAP surveys is likely to jeopardize the continued existence of these species of sea turtles and to present its conclusion in this Opinion. Section 6.0, therefore, examines the likely effects of the 2010-2012 NEAMAP survey on these species within the action area in order for NMFS to make a final determination as to whether the proposed action will jeopardize their continued existence.

### 6.1 Approach to the Assessment

Sea turtles are known to be injured and/or killed as a result of being struck by vessels on the water and as a result of capture in or physical contact with fishing gear. Sea turtles may also be negatively affected by the loss of prey as a result of mobile fishing gear that removes or incidentally kills such prey during commercial fishing or marine survey activities.

With respect to the 2010-2012 NEAMAP survey, the effects to sea turtles as a result of vessel activities are discountable. The single vessel that will operate on the water as a result of the proposed action is unlikely to strike sea turtles in the action area given that: (a) the vessel will operate/travel at a slow speed such that a sea turtle would have the speed and maneuverability to avoid contact with the vessel and (b) sea turtles spend part of their time at depths out of range of a vessel collision.

The use of bottom trawl gear for the Spring and Fall 2010-2012 NEAMAP surveys will not reduce the availability of prey for loggerhead, Kemp's ridley, green, or leatherback sea turtles. The trawl gear is expected to catch a variety of organisms including fish and crab species (VIMS 2010). None of these are typical prey species of leatherback sea turtles or of neritic juvenile or adult green sea turtles (Rebel 1974; Mortimer 1982; Bjorndal 1985, 1997; USFWS and NMFS 1992). Those organisms that are caught in the trawl will be sampled according to the survey protocol (VIMS 2010). Species that meet the sampling criteria will be sampled for scientific purposes and not returned to the water, while the other species will be returned to the water alive, dead, or injured to the extent that they will subsequently die. All of the species that will be retained for further study are fish. Crabs, on the other hand, which are the preferred prey of loggerhead and Kemp's ridley sea turtles, will not be retained for further study, and thus would still be available as prey for loggerheads and Kemp's ridleys when returned to the water, as both of these species of sea turtles are known to eat a variety of live prey as well as scavenge dead organisms (Lutcavage and Musick 1985; Keinath *et al.* 1987; Dodd 1988; Burke *et al.* 1993, 1994; Morreale and Standora 2005). Thus, the 2010-2012 NEAMAP surveys are not expected to affect the availability of prey for loggerhead and Kemp's ridley sea turtles in the action area given that: (a) the sea turtle food items that are returned to the water could still be preyed upon by loggerheads and Kemp's ridleys, (b) the number of trawl tows for the study are limited in scope and duration, (c) the priority species that will be retained for scientific analysis are all fish species, which are not the preferred prey for loggerhead and Kemp's ridley sea turtles (Keinath *et al.* 1987; Lutcavage and Musick 1985; Burke *et al.* 1993, 1994; Morreale and Standora 2005), and (d) and there is no evidence loggerhead or Kemp's ridley sea turtles are prey limited.

With respect to the effect of the survey tows on bottom habitat, the area to be surveyed is principally sand substrate (NEFMC 2007). A panel of experts has previously concluded that the effects of even light weight otter trawl gear would include: (1) the scraping or plowing of the doors on the bottom, sometimes creating furrows along their path, (2) sediment suspension resulting from the turbulence caused by the doors and the ground gear on the bottom, (3) the removal or damage to benthic or demersal species, and (4) the removal or damage to structure forming biota. The panel also concluded that the greatest impacts from otter trawls occur in high and low energy gravel habitats and in hard clay outcroppings, and that sand habitats were the least likely to be impacted (NREFHSC 2002). The areas to be surveyed for the 2010-2012 NEAMAP survey include very few habitats that are purely gravel or hard clay—so few that the area encompassed by these habitats is insignificant compared to the area encompassed by sand and silt type habitats, which are more resilient to bottom trawling. For sea turtles, the effects on habitat due to bottom otter trawl gear would be felt as an effect on their benthic prey species. As stated above, the effects on sea turtle prey items are expected to be insignificant. The remainder of this section focuses on the effects to sea turtles as a result physical contact with (capture in) bottom otter trawl that will be used for the survey.

There have been four captures of ESA-listed species in the NEAMAP surveys since 2007. These include two loggerhead sea turtles in the Spring 2008 survey, and a Kemp's ridley and a green sea turtle in the Fall 2009 survey. Loggerheads, as well as a single leatherback (in the Fall of 2009) have also been captured in trawl gear used by the NEFSC for their spring and fall surveys of Mid-Atlantic and New England waters. These species have also been captured in bottom otter trawl gear used in commercial fishing operations in Mid-Atlantic and New England waters. In order to identify, describe, and assess the effects to sea turtles resulting from the use of bottom otter trawl survey gear for the 2010-2012 NEAMAP surveys, NMFS is, therefore, using: (1) information on captures of sea turtles in NEAMAP and NEFSC trawl surveys and NMFS observed commercial fishing operations, (2) information on the description and operation of bottom otter trawl gear, (3) life history information for sea turtles, and (4) the effects of fishing gear entanglements on sea turtles that has been published in a number of documents. These documents include sea turtle status reviews and biological reports (NMFS and USFWS 1995, 2007a, 2007b, 2007c, 2007d; NMFS SEFSC 2001; TEWG 1998, 2000, 2007, 2009), sea turtle recovery plans (NMFS and USFWS 1991, 1992, 2008; USFWS and NMFS 1992), and numerous other sources of information from the published literature as cited below.

### 6.1.1 Description of the Trawl Gear

Bottom otter trawls are comprised of a net to catch the target species, and doors attached to two cables that are used to keep the mouth of the net open while deployed (NEFMC 2003a). A sweep runs along the bottom of the net mouth (NEFMC 2003a). Depending on the bottom type and species targeted, the sweep may be configured with chains, "cookies" (small rubber disks), or larger rubber disks (rock-hoppers or roller gear) that help to prevent the net from snagging on bottom that contains rocks or other structures (NREFHSC 2002; NEFMC 2003a). The bottom trawl that will be used in the 2010-2012 NEAMAP surveys is described as follows:

- a three bridle, four seam design with varying mesh sizes in different panels;
- the net has a 2.4 inch stretch mesh in the body and codend, a 4.8 inch stretch mesh in the wings, and a 1 inch stretch mesh in the codend liner;
- the headrope length is 77 ft;
- the footrope length is 87 ft;
- approximately 60, 8 inch HD center hole plastic floats will be used;
- two different sweeps will be used for use on rough versus "good" bottom;
- the rough bottom sweep has 16 and 14 inch rock hoppers with floppies without leads and weighs 2,560 and 448 pounds in air and water, respectively; and,
- the "good bottom" sweep consists of 3 inch rubber discs, and weighs 643 and 371 pounds in air and water, respectively (VIMS 2010).

### 6.1.2 Effects to Sea Turtles from Capture in Trawl Gear

Sea turtles forcibly submerged in any type of restrictive gear eventually suffer fatal consequences from prolonged anoxia and/or seawater infiltration of the lung (Lutcavage *et al.* 1997). A study examining the relationship between tow time and sea turtle mortality in the shrimp trawl fishery showed that mortality was strongly dependent on trawling duration, with the proportion of dead or comatose sea turtles rising from 0% for the first 50 minutes of capture to 70% after 90 minutes of capture (Henwood and Stuntz 1987). However, metabolic changes that can impair a sea turtle's ability to function can occur within minutes of a forced submergence. While most voluntary dives appear to be aerobic, showing little if any increases in blood lactate and only minor changes in acid-base status, the story is quite different in forcibly submerged sea turtles, where oxygen stores are rapidly consumed, anaerobic glycolysis is activated, and acid-base balance is disturbed, sometimes to lethal levels (Lutcavage and Lutz 1997). Forced submergence of Kemp's ridley sea turtles in shrimp trawls resulted in an acid-base imbalance after just a few minutes (times that were within the normal dive times for the species) (Stabenau *et al.* 1991). Conversely, recovery times for acid-base levels to return to normal may be prolonged. Henwood and Stuntz (1987) found that it took as long as 20 hours for the acid-base levels of loggerhead sea turtles to return to normal after capture in shrimp trawls for less than 30 minutes. This effect is expected to be worse for sea turtles that are recaptured before metabolic levels have returned to normal.

Following the recommendations of the NRC to reexamine the association between tow times and sea turtle deaths, the data set used by Henwood and Stuntz (1987) was updated and re-analyzed (Epperly *et al.* 2002; Sasso and Epperly 2006). Seasonal differences in the likelihood of mortality for sea turtles caught in trawl gear were apparent. For example, the observed mortality exceeded 1% after 10 minutes of towing in the winter (defined in Sasso and Epperly (2006) as the months of December-February), while the observed mortality did not exceed 1% until after 50 minutes in the summer (defined as March-November; Sasso and Epperly 2006). In general, tows of short duration (<10 minutes) in either season have little effect on the likelihood of mortality for sea turtles caught in the trawl gear and would likely achieve a negligible mortality rate (defined by the NRC as <1%). Intermediate tow times (10-200 minutes in summer and 10-150 minutes in winter) result in a rapid escalation of mortality, and eventually reach a plateau of high mortality, but will not equal 100%, as a sea turtle caught within the last hour of a long tow will likely survive (Epperly *et al.* 2002; Sasso and Epperly 2006). However, in both seasons, a rapid escalation in the mortality rate did not occur until after 50 minutes (Sasso and Epperly 2006) as had been found by Henwood and Stuntz (1987). Although the data used in the reanalysis were specific to bottom otter trawl gear in the U.S. south Atlantic and Gulf of Mexico shrimp fisheries, the authors considered the findings to be applicable to the impacts of forced submergence in general (Sasso and Epperly 2006).

During spring and fall bottom otter trawl surveys conducted by the NEFSC from 1963-2009, a total of 71 loggerhead sea turtles were observed captured. Only one of the 71 loggerheads suffered injuries (cracks to the carapace) causing death (Wendy Teas, SEFSC, pers. comm. to Linda Despres, NEFSC, 2007). All others were alive and returned to the water unharmed. The one leatherback sea turtle captured in the NEFSC trawl survey was released alive and uninjured.

All four sea turtles captured in the NEAMAP surveys have also been released alive and uninjured. NEFSC trawl survey tows are approximately 30 minutes in duration. NEAMAP surveys are 20 minutes in duration. In contrast, commercial fisheries typically tow bottom otter trawl gear in excess of one hour (Murray 2006). Of the 91 documented loggerhead interactions with commercial bottom otter trawl gear from January 1994 to February 2007, 54 (59%) were alive and uninjured, and 37 (41%) were dead, injured, resuscitated, or of unknown condition (Murray 2006; NEFSC FSB on-line database). Of the 17 documented loggerhead interactions with commercial bottom otter trawl gear from March 2007 to December 2008, 14 were alive (12 were injured or uninjured and 2 required resuscitation) and 3 were fresh dead (NEFSC FSB on-line database).

### 6.1.3 Factors contributing to interactions between sea turtles and trawl gear

As described in sections 3.1 – 3.4, the occurrence of loggerhead, Kemp's ridley, green, and leatherback sea turtles in New England, Mid-Atlantic, and south Atlantic waters is primarily temperature dependent (Thompson 1984; Keinath *et al.* 1987; Shoop and Kenney 1992; Musick and Limpus 1997; Morreale and Standora 1998; Mitchell *et al.* 2003; Braun-McNeill and Epperly 2004; James *et al.* 2005a; Morreale and Standora 2005). In general, sea turtles move up the U.S. Atlantic coast from southern wintering areas as water temperatures warm in the spring (Keinath *et al.* 1987; Shoop and Kenney 1992; Musick and Limpus 1997; Morreale and Standora 1998; Mitchell *et al.* 2003; Braun-McNeill and Epperly 2004; James *et al.* 2005a; Morreale and Standora 2005). The trend is reversed in the fall as water temperatures cool. By December, sea turtles have passed Cape Hatteras, returning to more southern waters for the winter (Keinath *et al.* 1987; Shoop and Kenney 1992; Musick and Limpus 1997; Morreale and Standora 1998; Mitchell *et al.* 2003; Braun-McNeill and Epperly 2004; James *et al.* 2005a; Morreale and Standora 2005). Recreational anglers have reported sightings of sea turtles in waters defined as inshore waters (bays, inlets, rivers, or sounds; Braun-McNeill and Epperly 2004) as far north as New York as early as March-April, but in relatively low numbers (Braun-McNeill and Epperly 2004). Greater numbers of loggerheads, Kemp's ridleys, and greens are found in inshore, nearshore, and offshore waters of North Carolina and Virginia from May through November and in inshore, nearshore, and offshore waters of New York from June through October (Keinath *et al.* 1987; Morreale and Standora 1993; Braun-McNeill and Epperly 2004). The hard-shelled sea turtles (loggerheads, Kemp's ridleys, and greens) appear to be temperature limited to water no further north than Cape Cod. Leatherback sea turtles have a similar seasonal distribution but have a more extensive range in the Gulf of Maine compared to the hard-shelled species (Shoop and Kenney 1992; Mitchell *et al.* 2003; STSSN database).

Extensive survey effort of the continental shelf from Cape Hatteras to Nova Scotia, Canada in the 1980s (CeTAP 1982) revealed that loggerheads were observed at the surface in waters from the beach to waters with bottom depths of up to 4,481 m. However, they were generally found in waters where bottom depths ranged from 22-49 m deep (the median value was 36.6 m; Shoop and Kenney 1992). Leatherbacks were sighted at the surface in waters with bottom depths ranging from 1-4,151 m deep (Shoop and Kenney 1992). However, 84.4% of leatherback sightings occurred in waters where the bottom depth was less than 180 m (Shoop and Kenney 1992), whereas 84.5% of loggerhead sightings occurred in waters where the bottom depth was less than 80 m (Shoop and Kenney 1992). Neither species was commonly found in waters over Georges Bank, regardless of season (Shoop and Kenney 1992). The CeTAP study did not include Kemp's ridley and green sea turtle sightings, given the difficulty of sighting these smaller sea turtle species (CeTAP 1982).

The Southeast Turtle Survey (SeTS), an aerial survey research program initiated by the NMFS Southeast Fisheries Science Center (SEFSC) in 1982 through 1984, was conducted from Cape Hatteras to Key West over coastal waters from the coastline to the approximate mean western boundary of the Gulf Stream (Thompson 1984). Seasonal surveys that corresponded to spring (April-May) and summer (July-August) were completed in all three years. Fall (October-November) surveys were completed in 1982 and 1983 and a single winter survey was completed in January/February 1983 (Thompson and Huang 1993). The study area was designed as a southern extension of the CeTAP aerial surveys. These surveys showed that sea turtles in the south Atlantic region are distributed randomly from the coast out to the Gulf Stream except in the winter. During the winter, sea turtles appear to aggregate within the western Gulf Stream boundary waters which can be 5°-6°C warmer than coastal waters (Thompson 1988).

Given the seasonal occurrence patterns and water depth preferences of turtles off the Mid-Atlantic and southern New England coasts, the distribution of sea turtles is likely to overlap with the use of trawl gear for the 2010-2012 NEAMAP surveys throughout the area of operation; which includes nearshore waters from Montauk, NY to Cape Hatteras, NC as well as Block Island and Rhode Island Sounds.

Sea turtle behaviors may influence the likelihood of them being captured in bottom trawl gear. Video footage recorded by the NMFS, Southeast Fisheries Science Center (SEFSC), Pascagoula Laboratory indicated that sea turtles will keep swimming in front of an advancing shrimp trawl, rather than deviating to the side, until they become fatigued and are caught by the trawl or the trawl is hauled up (NMFS 2002a). Sea turtles have also been observed to dive to the bottom and hunker down when alarmed by loud noise or gear (Memo to the File, L. Lankshear, December 4, 2007), which could place them in the path of bottom gear such as a bottom otter trawl. With respect to oceanographic features, a review of the data associated with the 11 sea turtles captured by the scallop dredge fishery in 2001 concluded that the sea turtles appeared to have been near the shelf/slope front (D. Mountain, pers. comm.).

Based on previous Mid-Atlantic trawl surveys by the NEFSC, invertebrate species including horseshoe crabs and blue crabs are expected to be captured during the 2010-2012 NEAMAP surveys. These as well as other crab and mollusk species are known to be prey items for loggerhead and Kemp's ridley sea turtles (Lutcavage and Musick 1985; Burke *et al.* 1993; Keinath *et al.* 1987; Morreale and Standora 2005; Seney and Musick 2005). Although invertebrate bycatch is expected to be returned to the water (therefore, no expected impact on the amount of prey available to loggerheads and Kemp's ridleys in the area), the capture of these species at a time of year when loggerheads and Kemp's ridley are known to be foraging in nearshore waters increases the likelihood that some sea turtles may be exposed to trawl gear while they are feeding on or near the bottom.

At present, the best that can be said is that interactions between sea turtles and the trawl gear used in the 2010-2012 NEAMAP surveys are likely to occur whenever the distribution of sea turtles overlaps with the operation of trawl gear for the survey. Given the times of year the surveys will occur, the seasonal occurrence patterns of sea turtles in the action area, and the water depth preferences of these animals, sea turtles are likely to occur wherever trawl gear for the 2010-2012 NEAMAP surveys is being towed.

### 6.1.4 Anticipated Incidental Take of Sea Turtles in the 2010-2012 NEAMAP Near Shore Trawl Surveys

As described in Section 2.0, the NEAMAP surveys follow the same protocol as the NEFSC spring and fall bottom trawl surveys with the exception that a different (smaller draft) vessel is used and the areas surveyed are waters at depths that have been undersampled by the NEFSC bottom trawl surveys, and the trawl times are 20 minutes instead of 30 minutes. Extensive survey effort of the continental shelf from Cape Hatteras, NC, to Nova Scotia, Canada, in the 1980s (CeTAP 1982) revealed that loggerhead sea turtles were observed at the surface in waters from the beach to waters with bottom depths of up to 4,481 m. However, they were generally found in waters where bottom depths ranged from 22-49 m deep (the median value was 36.6 m; Shoop and Kenney 1992). The bottom depth range identified for loggerheads during the CeTAP surveys encompasses the water depths previously sampled by the NEFSC bottom trawl surveys, and the water depths proposed to be sampled by the 2010-2012 NEAMAP surveys. Therefore, the likelihood of capturing a loggerhead sea turtle in gear used for the 2010-2012 NEAMAP surveys is expected to be the same as what has been reported for the NEFSC bottom trawl surveys.

Based on data compiled by the NEFSC, NMFS has previously determined the bycatch rates for loggerhead sea turtles captured in bottom otter trawl gear used in the NEFSC spring and fall bottom trawl surveys (NMFS 2007c; Tables 1 and 2). For purposes of this Opinion, NMFS is using the highest bycatch rates for each season, and thus is assuming somewhat of a worst case scenario as far as the number of captures is concerned.

Captures of sea turtles in trawl surveys have been highly variable from season to season and year to year, and given that the highest bycatch rates represent levels of loggerhead captures known to have occurred in the past. As previously described, in general, the distribution of loggerheads in the areas where the surveys will be conducted is not expected to be different than the distribution of loggerheads in the areas where the NEFSC spring and fall bottom trawl surveys are conducted. While using the highest bycatch rates may overestimate the effect of the Spring and Fall 2010-2012 NEAMAP surveys on loggerhead sea turtles, lower bycatch rates may underestimate the effects of the surveys.

Based on the highest bycatch rate observed in the NEFSC spring surveys (0.015 turtles per tow hours), and an anticipated total tow time of 50 hours for the Spring 2010-2012 NEAMAP survey, 0.75 loggerhead sea turtles are anticipated to be captured in the bottom otter trawl gear used in the survey. Since a part of a loggerhead turtle cannot be captured, this number is rounded up to 1. Based on the highest bycatch rate observed in the NEFSC fall surveys (0.035 turtles per tow

Table 1. Number of bottom otter trawl tows, number of loggerhead sea turtles captured, and calculated bycatch rate (no. of turtles ÷ (no. of tows x 0.5 hours per tow)) by year for the NEFSC Spring Bottom Trawl Surveys.

| Year | No. of Tows | No. of Turtles Captured | Bycatch rate (turtles/tow hr) | | Year | No. of Tows | No. of Turtles Captured | Bycatch rate (turtles/tow hr) |
|---|---|---|---|---|---|---|---|---|
| 1963 | N/A | N/A | N/A | | 1987 | 349 | 0 | 0 |
| 1964 | N/A | N/A | N/A | | 1988 | 321 | 0 | 0 |
| 1965 | N/A | N/A | N/A | | 1989 | 299 | 0 | 0 |
| 1966 | N/A | N/A | N/A | | 1990 | 322 | 0 | 0 |
| 1967 | N/A | N/A | N/A | | 1991 | 333 | 0 | 0 |
| 1968 | 265 | 0 | 0 | | 1992 | 326 | 0 | 0 |
| 1969 | 268 | 0 | 0 | | 1993 | 329 | 0 | 0 |
| 1970 | 342 | 0 | 0 | | 1994 | 345 | 0 | 0 |
| 1971 | 419 | 0 | 0 | | 1995 | 335 | 0 | 0 |
| 1972 | 366 | 0 | 0 | | 1996 | 350 | 0 | 0 |
| 1973 | 495 | 0 | 0 | | 1997 | 345 | 1 | 0.006 |
| 1974 | 416 | 0 | 0 | | 1998 | 374 | 0 | 0 |
| 1975 | 303 | 0 | 0 | | 1999 | 329 | 0 | 0 |
| 1976 | 384 | 0 | 0 | | 2000 | 333 | 0 | 0 |
| 1977 | 354 | 0 | 0 | | 2001 | 325 | 0 | 0 |
| 1978 | 398 | 0 | 0 | | 2002 | 331 | 2 | 0.012 |
| 1979 | 477 | 0 | 0 | | 2003 | 332 | 0 | 0 |
| 1980 | 468 | 0 | 0 | | 2004 | 332 | 0 | 0 |
| 1981 | 395 | 1 | 0.005 | | 2005 | 334 | 0 | 0 |
| 1982 | 443 | 2 | 0.009 | | 2006 | 344 | 2 | 0.012 |
| 1983 | 428 | 1 | 0.005 | | 2007 | 363 | 0 | 0 |
| 1984 | 407 | 1 | 0.005 | | 2008 | 344 | 0 | 0 |
| 1985 | 391 | 3 | 0.015 | | 2009 | 437 | 0 | 0 |
| 1986 | 368 | 0 | 0 | | Avg bycatch rate = 0.002 turtles/trawl hr | | | |
| | | | | | Highest bycatch rate = 0.015 turtles/trawl hr | | | |

* Note: The spring bottom otter trawl surveys conducted by the NEFSC did not begin until 1968.

** In 2008, 6 loggerhead sea turtles were incidentally captured during the NEFSC spring surveys, but all of these occurred south of Cape Hatteras, outside of the action area for this consultation.

hours), and an anticipated total tow time of 50 hours for the Fall 2010-2012 NEAMAP survey, 1.75 loggerhead sea turtles are anticipated to be captured in the bottom otter trawl gear used in the survey. Since a part of a loggerhead turtle cannot be captured, this number is rounded up to 2. Therefore, a total of 3 loggerhead sea turtles are anticipated to be incidentally captured annually during the 2010-2012 NEAMAP surveys.

For Kemp's ridley and green sea turtles, there has been only one observation of each species in the NEAMAP survey (both in the Fall of 2009). Those takes showed that the possibility exists for these species to be caught in the survey. Due to the takes of these species, NMFS anticipates that one Kemp's ridley and one green sea turtle may be captured annually in the 2010-2012 NEAMAP surveys.

Table 2. Number of bottom otter trawl tows, number of loggerhead sea turtles captured, and calculated bycatch rate (no. of turtles ÷ (no. of tows x 0.5 hours per tow)) by year for the NEFSC Fall Bottom Trawl Surveys.

| Year | No. of Tows | No. of Turtles Captured | Bycatch rate (turtles/tow hr) | | Year | No. of Tows | No. of Turtles Captured | Bycatch rate (turtles/tow hr) |
|---|---|---|---|---|---|---|---|---|
| 1963 | 194 | 0 | 0 | | 1987 | 335 | 1 | 0.006 |
| 1964 | 185 | 0 | 0 | | 1988 | 326 | 1 | 0.006 |
| 1965 | 193 | 0 | 0 | | 1989 | 342 | 3 | 0.017 |
| 1966 | 194 | 0 | 0 | | 1990 | 345 | 2 | 0.012 |
| 1967 | 276 | 0 | 0 | | 1991 | 354 | 0 | 0 |
| 1968 | 279 | 0 | 0 | | 1992 | 353 | 1 | 0.006 |
| 1969 | 282 | 0 | 0 | | 1993 | 339 | 3 | 0.018 |
| 1970 | 312 | 0 | 0 | | 1994 | 341 | 6 | 0.035 |
| 1971 | 334 | 0 | 0 | | 1995 | 360 | 2 | 0.011 |
| 1972 | 646 | 0 | 0 | | 1996 | 365 | 1 | 0.005 |
| 1973 | 451 | 0 | 0 | | 1997 | 369 | 3 | 0.016 |
| 1974 | 379 | 0 | 0 | | 1998 | 374 | 2 | 0.011 |
| 1975 | 406 | 0 | 0 | | 1999 | 346 | 4 | 0.023 |
| 1976 | 340 | 0 | 0 | | 2000 | 337 | 2 | 0.012 |
| 1977 | 419 | 0 | 0 | | 2001 | 339 | 2 | 0.012 |
| 1978 | 556 | 0 | 0 | | 2002 | 342 | 1 | 0.006 |
| 1979 | 600 | 0 | 0 | | 2003 | 336 | 0 | 0 |
| 1980 | 420 | 0 | 0 | | 2004 | 319 | 1 | 0.006 |
| 1981 | 421 | 1 | 0.005 | | 2005 | 332 | 1 | 0.006 |
| 1982 | 449 | 1 | 0.004 | | 2006 | 367 | 0 | 0 |
| 1983 | 476 | 4 | 0.017 | | 2007 | 349 | 2 | 0.011 |
| 1984 | 433 | 0 | 0 | | 2008 | 346 | 1 | 0.006 |
| 1985 | 368 | 1 | 0.005 | | 2009 | 381 | 0 | 0 |
| 1986 | 364 | 3 | 0.016 | | Avg bycatch rate = 0.006 turtles/trawl hr | | | |
| | | | | | Highest bycatch rate = 0.035 turtles/trawl hr | | | |

Similarly, for leatherback sea turtles, the first capture of a leatherback sea turtle in a NEFSC or NEAMAP survey occurred in the Fall of 2009 (on the Fall NEFSC trawl survey cruise). Due to this capture, and the fact that the NEAMAP surveys use similar protocols to the NEFSC surveys, NMFS anticipates that one leatherback sea turtle may be captured annually in the 2010-2012 NEAMAP surveys.

Tows for the Spring and Fall 2010-2012 NEAMAP surveys will be 20 minutes in duration; a typical tow time for these surveys. Based on the analysis by Sasso and Epperly (2006) and Epperly *et al.* (2002) as well as information on captured sea turtles from the NEAMAP and NEFSC trawl surveys, as well as the NEFSC FSB observer program, a 20-minute tow time for the bottom otter trawl gear to be used in the survey will likely eliminate the risk of death from forced submergence for sea turtles caught in the bottom otter trawl survey gear.

## 7.0 INTEGRATION AND SYNTHESIS OF EFFECTS

The *Status of Affected Species*, *Environmental Baseline*, and *Cumulative Effects* sections of this Opinion discuss the natural and human-related phenomena that caused loggerhead, Kemp's ridley, green, and leatherback sea turtles to become threatened or endangered and may continue to place these species at high risk of extinction. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The present section of this Opinion applies that definition by examining the effects of the proposed action in the context of information presented in the status of the species, environmental baseline, and cumulative effects sections to determine: (a) if the effects of the proposed action would be expected to reduce the reproduction, numbers, or distribution of loggerhead, Kemp's ridley, green, and leatherback sea turtles, and (b) if any reduction in the reproduction, numbers, or distribution of loggerhead, Kemp's ridley, green, and leatherback sea turtles causes an appreciable reduction in the likelihood of the species surviving and recovering in the wild.

### 7.1 Integration and Synthesis of Effects

As described above, the use of bottom otter trawl gear for the proposed activity is expected to adversely affect sea turtles as a result of interactions with the gear resulting in capture within the gear. This Opinion has identified in Section 6.0 that the proposed activity, the 2010-2012 NEAMAP Near Shore Trawl Surveys to be funded by NMFS with pounds of summer flounder, scup, black sea bass, bluefish, and *Loligo* squid under the Mid-Atlantic RSA Program, will directly affect sea turtles by capturing up to three (3) loggerhead, one (1) Kemp's ridley, one (1) green, and one (1) leatherback sea turtles annually in the bottom otter trawl gear used for the surveys. The towing of trawl gear on benthic habitat and the temporary removal of sea turtle prey from the environment (which may be returned to the water alive or dead) as a result of the surveys will have an insignificant effect on sea turtles. The operation of a fishing vessel on the water as a result of the survey will also have discountable effects on sea turtles.

Sea turtles captured in trawl gear used in the 2010-2012 NEAMAP surveys are not expected to be killed or injured. The capture of sea turtles in comparable trawl gear used in commercial fishing operations and for the NEAMAP and NEFSC trawl surveys has shown that the risk to sea turtles from capture in trawl gear is submergence injuries (asphyxiation or drowning as a result of forced submergence). However, tow times for trawl gear used in the surveys will be 20 minutes or less. The tow time is part of the study protocol and is not expected to change. Based on the results of studies examining tow time and sea turtle mortality from forced submergence (Henwood and Stuntz 1987; Epperly *et al.* 2002; Sasso and Epperly 2006), a sea turtle caught in trawl gear used in the 2010-2012 NEAMAP surveys is not likely to be killed or injured even if it is captured at the beginning of a 20-minute tow. Therefore, its capture is not likely to have any deleterious effects on the sea turtle.

As no sea turtles will be injured or killed by the proposed action, either directly, through loss of prey and/or habitat, or other means, the action will not reduce the number of loggerhead, Kemp's ridley, green, or leatherback sea turtles. Additionally, as the action will not affect the reproductive success of any individual sea turtle, it will not reduce the reproduction of loggerhead, Kemp's ridley, green, or leatherback sea turtles. Therefore, the proposed action will not affect the numbers, reproduction, or distribution of sea turtles in the western North Atlantic, and will not reduce their likelihood of survival. Since the proposed action has no direct or indirect effects on sea turtles that occur elsewhere in the Atlantic or outside of the Atlantic, the proposed action will not appreciably reduce the likelihood of survival of any species of sea turtle.

Section 4(a)(1) of the ESA requires listing of a species if it is in danger of extinction throughout all or a significant portion of its range (i.e., "endangered"), or likely to become in danger of extinction throughout all or a significant portion of its range in the foreseeable future (i.e., "threatened") because of any of the following five listing factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range, (2) overutilization for commercial, recreational, scientific, or educational purposes, (3) disease or predation, (4) the inadequacy of existing regulatory mechanisms, (5) other natural or manmade factors affecting its continued existence. Recovery of a species occurs when listing it as an endangered or threatened species is no longer warranted. The proposed action will not appreciably reduce the likelihood of recovery of any sea turtle species because it will not affect the numbers, reproduction, or distribution of loggerhead, Kemp's ridley, green, or leatherback sea turtles. Also, it is not expected to modify, curtail, or destroy the range of the species since it does not reduce the number of loggerhead, Kemp's ridley, green, or leatherback sea turtles in any geographic area or nesting group and since it will not affect the overall distribution of sea turtles other than to cause minor temporary adjustments in movements within the action area. The proposed action will not utilize loggerhead, Kemp's ridley, green, or leatherback sea turtles for recreational, scientific, or commercial purposes, affect the adequacy of existing regulatory mechanisms to protect any of these species of sea turtles, or affect their continued existence. The effects of the proposed action will not hasten the extinction timeline or otherwise increase the danger of extinction since the action will not result in mortality of any sea turtle species or its ability to survive and reproduce. Therefore, the proposed action will have no effect on the ESA listing factors or the likelihood that loggerhead, Kemp's ridley, green, or leatherback sea turtles can be brought to the point at which they are no longer listed as endangered or threatened. In light of the conclusions of the effect of the action relative to the ESA-listing factors, the proposed action will not appreciably reduce the likelihood of recovery for any of the sea turtle species.

## 8.0 CONCLUSION

After reviewing the current status of loggerhead, Kemp's ridley, green, and leatherback sea turtles, the environmental baseline and cumulative effects in the action area, and the effects of the proposed action, it is NMFS's biological opinion that the proposed activity may adversely affect but is not likely to jeopardize the continued existence of these sea turtle species.

As described above, on March 16, 2010, NMFS and USFWS published a proposed rule in the Federal Register to divide the currently listed worldwide population of loggerhead sea turtles into nine DPSs. The Northwest Atlantic Ocean DPS, the DPS to which the loggerheads captured in the NEAMAP surveys belong, is proposed to be listed as endangered. The ESA requires a conference on any Federal action that is likely to jeopardize the continued existence of any species proposed to be listed. As no loggerhead sea turtles will be injured or killed as a result of the proposed NEAMAP surveys, the funding of the surveys is not likely to jeopardize the proposed endangered Northwest Atlantic Ocean DPS (for the same reasons as described above in Section 7.0 of this Opinion), and no conference is required.

## 9.0 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, unless a special exemption has been granted. Take is defined as "to harass, harm, pursue, hunt, shoot, capture, or collect, or to attempt to engage in any such conduct." Incidental take is defined as take that is incidental to, and not the purpose of, the execution of an otherwise lawful activity. Under the terms of sections 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

When a proposed NMFS action 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 incidental taking, if any. It also states that reasonable and prudent measures necessary to minimize impacts of any incidental take be provided along with implementing terms and conditions. The measures described below are non-discretionary and must therefore be undertaken in order 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).

**Anticipated Amount or Extent of Incidental Take**
Based on data collected from past NEAMAP surveys, NEFSC spring and fall trawl surveys, the similarity of gear to be used in the project and that used in the NEFSC trawl surveys, and the distribution and abundance of sea turtles in the action area, NMFS anticipates that the NMFS-funded 2010-2012 NEAMAP surveys conducted by VIMS through the Mid-Atlantic RSA Program will result in the capture of three (3) loggerhead, one (1) Kemp's ridley, one (1) green, and one (1) leatherback sea turtles annually.

None of these interactions/captures are expected to result in death or injury. This level of incidental take is anticipated for each year (consisting of a Spring and Fall survey) of the three years of the survey considered in this opinion, based on the description of the proposed action.

**Anticipated Impact of Incidental Take**
In the accompanying Opinion, NMFS has determined that this level of anticipated take is not likely to result in jeopardy to loggerhead, Kemp's ridley, green, and leatherback sea turtles. Nevertheless, NMFS must take action to minimize the impacts of these takes. The following Reasonable and Prudent Measures (RPMs) have been identified as having a reasonable likelihood of minimizing sea turtle interactions. These measures are non-discretionary and must be implemented by NMFS.

**Reasonable and Prudent Measures**
NMFS has determined that the following RPMs are necessary and appropriate to minimize impacts of the incidental take of sea turtles and to comply with the requirement for reporting and monitoring. RPM #1 and the accompanying Term and Condition establish the requirements for handling sea turtles captured in gear used in the 2010-2012 NEAMAP surveys in order to avoid the likelihood of injury to sea turtles that are captured in the gear from the hauling, handling, and emptying of the trawl gear. RPMs #2-#4 and the accompanying Terms and Conditions specify the collection of information for any ESA-listed species, including sea turtles, observed captured in the gear. This information is necessary to cross check conclusions made in this Opinion and to determine the necessity for reinitiating consultation in the event the ITS is exceeded, or ESA-listed species other than loggerhead, Kemp's ridley, green, or leatherback sea turtles are captured in or struck by the gear.

These RPMs have been determined to be reasonable and prudent and constitute no more than a minor change to the action since they do not require any changes to the scope, duration, or location of the proposed action. RPMs that would require a change in the timing or location of the survey in order to avoid an overlap with the distribution of sea turtles in the area would constitute more than a minor change to the proposed action since the primary purpose of the 2010-2012 NEAMAP surveys is to collect biological information in a comparable area and at comparable times to surveys conducted by the NEFSC Spring and Fall Bottom Trawl surveys. Similarly, the NEAMAP surveys need to use a gear type that is identical to that used in the NEFSC Bottom trawl surveys in order to meet the objectives of the study. Therefore, requiring a different gear type would constitute more than a minor change to the proposed action. In addition, the selected gear type is already expected to minimize the likelihood of injury to sea turtles that encounter the gear given the configuration of the gear and the relatively short tow time that will be used. Therefore, requiring a different gear type would be expected to have the same likelihood of capturing sea turtles and to also have an increased likelihood of injuring or killing any sea turtle captured. The RPMs and corresponding Terms and Conditions are:

1. Any sea turtles caught during the survey must be handled and resuscitated according to established procedures.

2. Any sea turtle caught and retrieved in trawl gear must be identified to species.

3. NMFS NERO must be notified by telephone or e-mail within 24 hours of an interaction between any endangered or threatened species, including but not limited to sea turtles, and the gear and/or vessel used in the survey.

4. NMFS NERO must receive written reports within 30 days regarding endangered or threatened species interactions with trawl gear and/or vessels used in the survey.

**Terms and Conditions**
In order to be exempt from the prohibitions of section 9 of the ESA, NMFS must comply with the following terms and conditions, which implement the reasonable and prudent measures

described above and which outline required minimization, reporting, and monitoring requirements. These terms and conditions are non-discretionary.

1. To comply with RPM #1 above, NMFS must add the following special programmatic award condition: "VIMS must provide copies of the sea turtle handling and resuscitation requirements found at 50 CFR 223.206(d)(1) and as reproduced in Attachment A to the vessel operator prior to the commencement of any on-water activity in order for the funds to be drawn for that activity."

2. To comply with RPM #2 above, NMFS must add the following special programmatic award condition: "VIMS must ensure that there is at least one crew member who is experienced in the identification of western North Atlantic sea turtles on the vessel(s) at all times that the on-water survey work is conducted." Experience would include personnel that have received training as a NMFS fisheries observer or who have career experience in the identification of western North Atlantic sea turtles.

3. To comply with RPM #3 above, NMFS must add the following special programmatic award condition: "VIMS must notify within 24 hours the NMFS NERO staff identified below of the details of any interaction with an endangered or threatened species, including but not limited to sea turtles, during the course of the survey work. NMFS NERO staff to be contacted are: Bill Barnhill, Section 7 Biologist, at (978) 282-8460 or William.Barnhill@noaa.gov and Pat Scida, Section 7/Sea Turtle Coordinator, at (978) 281-9208 or Pasquale.Scida@noaa.gov."

4. To comply with RPMs #3 and #4 above, NMFS must add the following special programmatic award condition: "VIMS must provide a written report to NMFS NERO within 30 days of any interaction between an ESA-listed sea turtle and the gear and/or vessel used during the survey." The report must include: a clear photograph of the animal (multiple views if possible, including at least one photograph of the head scutes); identification of the animal to the species level; GPS or Loran coordinates describing the location of the interaction; time of interaction; date of interaction; condition of the animal upon retrieval (alive uninjured, alive injured, fresh dead, decomposed, comatose or unresponsive); the condition of the animal upon return to the water; GPS or Loran coordinates of the location at which it was released; and a description of the care or handling provided. This report must be sent to the NMFS Northeast Regional Office, Attn: Section 7/Sea Turtle Coordinator, 55 Great Republic Drive, Gloucester, MA 01930.

5. To comply with RPMs #3 and #4 above, NMFS must add the following special programmatic award condition: "VIMS must provide a written report to NMFS NERO within 60 days of completion of the on-water work, indicating either that no interactions with ESA-listed species occurred, or providing the total number of interactions that occurred with ESA-listed species." This report must be sent to the NMFS Northeast Regional Office, Attn: Section 7/Sea Turtle Coordinator, 55 Great Republic Drive, Gloucester, MA 01930.

**Monitoring**
For purposes of monitoring the incidental take of sea turtles during the 2010-2012 NEAMAP surveys, any sea turtle: (a) found alive, dead, or injured within the trawl gear; (b) found alive, dead, or injured and retained on any portion of the trawl gear outside of the net bag; or (c) interacting with the vessel and gear in any other way must be reported to NMFS.

## 10.0 CONSERVATION RECOMMENDATIONS

In addition to section 7(a)(2), which requires agencies to ensure that proposed actions are not likely to 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 the ESA by carrying out programs for the conservation of endangered and threatened 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. The following additional measures are recommended regarding incidental take and sea turtle conservation:

1. NMFS should advise the Principal Investigator for the 2010-2012 NEAMAP surveys to provide guidance, before each survey cruise, to the vessel crew members (including scientific crew and vessel operators) to the effect that: (a) all personnel are alert to the possible presence of sea turtles in the study area, (b) care must be taken when emptying the trawl gear to avoid damage to sea turtles that may be caught in the trawl but are not visible upon retrieval of the gear, and (c) the trawl is emptied as quickly as possible after retrieval in order to determine whether sea turtles are present in the gear.

## 11.0 REINITIATING CONSULTATION

This concludes formal consultation on the 2010-2012 NEAMAP surveys to be funded by NMFS. 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) 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; (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) a new species is listed or critical habitat designated that may be affected by the action. In the event that the amount or extent of incidental take is exceeded, NMFS NEFSC must immediately request reinitiation of formal consultation.

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**Attachment A. Sea turtle and resuscitation measures as found at 50 CFR 223.206(d)(1).**

(d) (1) (i) Any specimen taken incidentally during the course of 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 the following procedures.

(A) Sea turtles that are actively moving or determined to be dead as described in (d)(1)(i)(C) of this section must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

(B) Resuscitation must be attempted on sea turtles that are comatose, or inactive, as determined in paragraph (d)(1) of this section by:

(1) placing the turtle on its bottom shell (plastron) so that the turtle is right side up, and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 up to 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed 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 (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

(2) sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, neck, and flippers is the most effective method in keeping a turtle moist.

(3) sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

(C) A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.