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

**Action Agency:** NMFS, Northeast Fisheries Science Center

**Activity:** Endangered Species Act Section 7 Consultation on the Northeast Fisheries Science Center Research Vessel Activities [Consultation No. F/NER/2007/01541]
GARFO-2007-00003

**Consulting Agency:** NMFS, Northeast Region, through its Protected Resources Division

**Date Issued:** Aug 20, 2007

**Approved by:** [signature]

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**TABLE OF CONTENTS**

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.) requires that each federal agency shall ensure 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 threatened or endangered, that agency is required to consult with either NOAA Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (FWS), depending upon the species that may be affected. In instances where NMFS or FWS are themselves proposing 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 carried out by NMFS Northeast Fisheries Science Center (NEFSC), this office has requested formal intra-service section 7 consultation.

This document represents NMFS' biological opinion (Opinion) on the NEFSC research activities, and its effects on ESA-listed species under NMFS jurisdiction in accordance with section 7 of the Endangered Species Act of 1973, as amended. Formal intra-service section 7 consultation on the NEFSC Fisheries Research Vessel (FRV) research activities were initiated on March 30, 2007 [Consultation No. F/NER/2007/01541]. This Opinion is based on the information developed by NMFS NERO and other sources of information.

## 1.0. CONSULATION HISTORY

Since 1963, the NEFSC has been conducting annual research cruises to supply fishery managers with important information on the status of fishery stocks. Due to the type of gear, time of year, and location in which these research cruises were performed, incidental takes of ESA protected species have occurred. Though limited to loggerhead sea turtles takes, during the period of 1963 to 2006, 61 sea turtles have been captured using bottom trawl gear. Previously, these incidental takes were covered under the NEFSC's ESA Section 10(a)(1)(A) permit (#1295) that allowed the take of five loggerhead, two green, two Kemp's ridely, one hawksbill, and one leatherback sea turtle(s) per year. However, recent policy changes within NMFS no longer allows these incidental takes to be covered under the Section 10(a)(1)(A) permit, because these permits are intended for research that is targeting ESA protected species. The fishery surveys conducted by the NEFSC, which are not targeting ESA protected species, are now undergoing Section 7 consultation as activities carried out by a Federal agency.

## 2.0. DESCRIPTION OF THE PROPOSED ACTION

The NEFSC conducts approximately 30 surveys each year utilizing the FRVs Albatross IV, Delaware II, and Gloria Michelle. In 2006, the FRV Henry B. Bigelow was brought online to replace the Albatross IV; however, both the Albatross IV and Bigelow FRVs will be operating during 2007 and 2008, as differences in catch efficiency need to be calibrated. Similarly, the FRV Hugh B. Sharp will be brought online in 2008 to replace the Albatross IV for certain research activities. Of the approximately 30 surveys that are conducted each year, only 16 surveys are likely to adversely affect ESA protected species and are not covered under the NEFSC's section 10(a)(1)(A) permit (Memo from Nancy Thompson to Patricia Kurkul, dated

March 14, 2007). Overall, these 16 research activities are projected to cumulatively take between 246 - 389 days-at-sea (DAS) to complete per year, and will have sampled between 1,525 – 2,775 sites per year along the continental shelf ranging from North Carolina to the Gulf of Maine. The 16 surveys are:

- The NEFSC Winter Bottom Trawl Survey has been conducted annually since 1992, and samples waters off Cape Hatteras, NC to Cape Cod, MA using FRVs Albatross IV and Delaware II. Approximately 105 – 180 stations are sampled (variable due to weather) each year during the months of February and early March (~24 DAS). The survey uses standardized flat-net bottom trawls equipped with a rubber disc covered chain sweep, 30 and 450 kg polyvalent doors. The cod end and upper belly are lined with 1/2-inch mesh to retain young-of-the-year fish. The gear is towed at 3.8 knots for 30-minute tow intervals. This trawl survey will be discontinued in 2008; however, some of the effort (~100 stations) will be redirected into the NEFSC Spring Bottom Trawl Survey (described below).

- The NEFSC Spring Bottom Trawl Survey has been conducted annually since 1968 and samples waters off Cape Hatteras, NC to the Gulf of Maine (GOM) using FRVs Albatross IV and Delaware II. Approximately 330 stations are sampled each year during the months of March and April (~48 DAS). The survey uses a standardized #36 Yankee bottom trawl equipped with a rubber disc (spaced 15 inches apart) chain sweep, and 450 Kg polyvalent doors. The cod end and upper belly are lined with 1/2-inch mesh to retain young-of-the-year fish. The gear is towed at 3.8 knots for 30-minute tow intervals. In 2008 and subsequent years, the trawl survey will expand the number of sampling stations to approximately 430 stations, as the winter trawl survey (listed above) is being discontinued and a portion of that effort (~100 stations) will be redirected into the spring survey. As a result, the spring survey will begin its survey in mid February and end April (~62 DAS). Also in 2008, calibration trawls will be conducted by the FRV Bigelow (described below), which will be replacing the FRV's Albatross IV in 2009. In 2009 and subsequent years, the tow speed and tow time will be decreased to 3.0 knots for 20-minute tow intervals instead of 30 minutes.

- NEFSC Spring Bottom Trawl Calibration Trials: The NEFSC will be calibrating current surveys conducted with the Yankee 36 bottom trawls on the FRVs Albatross IV with future surveys conducted using a 4-seam, 3-bridle bottom trawl on the FRV Bigelow during the months of February – May in 2008. The calibration trials will consist of a total of 450 stations being sampled along the Atlantic Coast (North Carolina to the GOM) for each vessel. Three hundred and thirty of those stations will be similar to that sampled by the Albatross IV in the Spring Bottom Trawl Survey. The 3-bridle bottom trawl will be towed at 3.0 knots for 20-minute tow intervals.

- The NEFSC Autumn Bottom Trawl Survey has been conducted annually since 1963 and samples waters off Cape Hatteras, NC to the GOM using FRVs Albatross IV and Delaware II. Approximately 330 stations are sampled each year during the months of

September – October (~47 DAS). The survey uses standardized #36 Yankee bottom trawl equipped with a rubber disc (spaced 15 inches apart) chain sweep, and 450 Kg polyvalent doors. The cod end and upper belly are lined with 1/2-inch mesh to retain young-of-the-year fish. The gear is towed at 3.8 knots (reduced to 3.0 knots in 2008) for 30-minute tow intervals. In 2007 and 2008, calibration trawls will be conducted by the FRV Bigelow (described below), which will be replacing the FRV Albatross IV in 2009. In 2009 and subsequent years, the tow speed and tow time will be decreased to 3.0 knots for 20-minute tow intervals instead of 30 minutes.

- NEFSC Autumn Bottom Trawl Calibration Trials: The NEFSC will be calibrating current surveys with Yankee 36 bottom trawls on the FRV Albatross IV with future surveys conducted using a 4-seam, 3-bridle bottom trawl on the FRV Bigelow during the months of September – November in 2007 and 2008. The calibration trials will consist of a total of 450 stations being sampled along the Atlantic Coast (North Carolina to the GOM) for each vessel. Three hundred and thirty of those stations will be similar to that sampled by the Albatross IV in the Autumn Bottom Trawl Survey. The 4-seam, 3-bridle bottom trawl will be towed at 3.0 knots for 20-minute tow intervals.

- The NEFSC Scallop Dredge Survey has been conducted annually since 1982 and samples waters off Cape Hatteras, North Carolina to the Scotian Shelf, Canada using FRV Albatross IV. Approximately 520 stations are sampled each year during the months of July and August (~34 DAS). The survey uses a NEFSC 8-foot scallop dredge equipped with a 2-inch ring chain bag and lined with 1-1/2 inch mesh webbing to retain small scallops. The dredge is towed at 3.8 knots for 15-minute tow intervals. In 2008, calibration trawls will be conducted by the FRV Hugh B. Sharp (described below), which will be replacing the FRV Albatross IV in 2009. The total number of stations sampled (i.e., 520), tow speeds and tow times are expected to stay the same.

- NEFSC Scallop Dredge Calibration Trials: The NEFSC will be calibrating current surveys conducted with NEFSC 8-foot scallop dredge on the FRV Albatross IV with future surveys conducted using a modified NEFSC 8-foot scallop dredge on a UNOLS charter vessel during July and August of 2008. The calibration trials will consist of a total of 350 stations with the UNOLS vessel (modified dredge).

- The NEFSC Atlantic Herring Acoustics Survey has been conducted annually since 1997 and samples waters in Georges Bank and Gulf of Maine using FRV Delaware II. Approximately 50 stations are sampled each year during the month of September (~35 DAS). The survey uses a Gourock high speed midwater rope trawl with 53.1-m head and foot ropes, and towed at 4.0 knots for 5- to 30-minute tow intervals.

- The Atlantic States Marine Fisheries Commission (ASMFC) Northern Shrimp Survey has been conducted annually since 1984 and samples waters in the western Gulf of Maine (WGOM) using FRV Gloria Michelle. Approximately 60 stations are sampled each year during the months of July and August (~22 DAS). The survey uses a NEFSC shrimp survey bottom trawl towed at 2 knots for 15-minute tow intervals.

- The Georges Bank Benthic Habitat Survey has been conducted periodically since 1996 using FRVs Albatross IV and Delaware II. Approximately 40 stations are sampled each year during the months of October – November (~12 DAS). The survey uses the Yankee 36 bottom trawl previously described, and towed at 3.8 knots for 30-minute tow intervals.

- The Mid-Atlantic Benthic Habitat Survey has been conducted periodically since 1996 and samples waters in and around the Hudson Canyon off New Jersey using FRVs Albatross IV and Delaware II. Approximately 30 stations are sampled each year during the month of August (~12 DAS). Like the Georges Bank Benthic Habitat survey, gear and tow times are the same.

- Pelagic Trawl Testing: The NEFSC will be testing a pelagic mid-water trawl during the months of March – April, 2007. The mid-water trawl, a high speed mid-water rope trawl and Super Krub trawl doors, will be tested or towed approximately 15 times for 30 minute tow intervals by the FRV Bigelow. The area of operation is north of Long Island in the Gulf of Maine.

- Standardized Survey Protocol Development Trials: The NEFSC will be testing a 4-seam, 3-bridle bottom trawl on the FRV Bigelow during the months of May and June in 2007 (~ 24 DAS). The bottom trawl will be towed at 3.0 knots for 20-minute intervals, approximately 150 times. The gear will be tested in waters located in the Gulf of Maine and Georges Bank.

- Deepwater Trawling and Final Mission Trials: The NEFSC will be testing a 4-seam, 3-bridle bottom trawl with a roller sweep and deepwater floats during the spring and summer months (as early as June) (~5 DAS). The bottom trawl will be towed approximately 10 times for 20-minute intervals by the FRV Bigelow. In addition, 10 midwater trawls using an International Young Gadiod Pelagic Trawl (IYGPT) trawl with deepwater floats and Super Krub trawl doors will be tested. The area of operation is north of Long Island in the Gulf of Maine.

- Deepwater Systematics Trawling Survey: The NEFSC will be towing a 4-seam, 3-bridle bottom trawl with a roller sweep and deepwater floats during the spring and summer months (June - July) (~12 DAS). The bottom trawl will be towed approximately 10 times for 20 minute intervals. In addition, 10 midwater trawls using an International Young Gadiod Pelagic Trawl (IYGPT) trawl with deepwater floats and Super Krub trawl doors will be tested. The area of operation is north of Long Island in the Gulf of Maine.

- Preliminary Bottom and Mid-water Mission Trials: The NEFSC will be testing bottom and midwater trawls in the Southern New England Region (Gulf of Maine and Georges

Bank) during the spring months (March - April) (~ 5 DAS). Overall, various trawl gears will be towed approximately 25 times for 20-minute intervals at 3.0 knots.

## 2.1. Action area

For the purposes of this Opinion, the area encompassing the direct and indirect effects of the NEFSC FRV research activities (the action area) is the area in which the NEFSC FRV research activities are conducted, broadly defined as waters ranging from 0 – 200 fathoms in depth from Cape Hatteras, North Carolina to the Gulf of Maine and Georges Bank (Figure 1, 2, 3, 4). NMFS has determined that the only effect on ESA-listed species as a result of the NEFSC FRV research activities is the direct effect of interactions between sea turtles and the gear used in the NEFSC research surveys (i.e., trawls and scallop dredges). No indirect effects on ESA-listed species are expected.

## 3.0. STATUS OF THE SPECIES

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

| | | |
|---|---|---|
| Loggerhead sea turtle | (*Carretta carretta*) | Threatened |
| Leatherback sea turtle | (*Dermochelys coriacea*) | Endangered |
| Kemp's ridley sea turtle | (*Lepidochelys kempii*) | Endangered |
| Green sea turtle | (*Chelonia mydas*) | Endangered[1] |

NMFS has determined that the action being considered in the Opinion is not likely to adversely affect shortnose sturgeon (*Acipenser brevirostrum*), the Gulf of Maine distinct population segment (DPS) of Atlantic salmon (*Salmo salar*), hawksbill sea turtles (*Eretmochelys imbricata*), Northern right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaengliae*), 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. NMFS has also determined that the action is not likely to have any adverse effects on the habitat features in the specific areas designated as right whale critical habitat. The following discussion is NMFS' rationale for these determinations.

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They can be found in rivers along the western Atlantic coast from St. Johns River, Florida (possibly extirpated from this system), to 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). There have been no documented cases of shortnose sturgeon takes in the NEFSC bottom/midwater trawl or scallop dredge

[1] Green 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 turtles are considered endangered wherever they occur in U.S. waters

surveys or similar commercial fisheries that operate in the action area. Since the NEFSC research activities do not occur in or near the rivers where concentrations of shortnose sturgeon are most likely found, it is highly unlikely that the NEFSC research activities will affect shortnose sturgeon.

The wild populations of Atlantic salmon found in rivers and streams from the lower Kennebec River north to the U.S. - Canada border are listed as endangered under the ESA. These populations include those in the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers and Cove Brook (i.e., Downeast Maine subpopulations). Juvenile salmon in New England rivers typically migrate to sea in May after a two to three year period of development in freshwater streams. Juveniles leave the Gulf of Maine and migrate to wintering grounds in the vicinity of Greenland and remain there for one to two winters before returning to U.S. natal rivers in April and May. During the early fall, adults that have returned to their natal streams spawn in the upper reaches of the river, and overwinter until April in the lower river. Adults then return to their wintering grounds off Greenland beginning in April and May (Baum 1997). In 2001, a commercial fishing vessel engaged in fishing operations captured an adult salmon. Although this was subsequently determined to be an escaped aquaculture fish, it does show the potential for take of ESA-listed salmon in fishing gear. In addition, 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, the NEFSC research activities deploying small mesh active gear (pelagic trawls within 10-m of the surface) may have the potential to incidentally take smolts. To date however, only one Atlantic salmon has been captured in US waters during the NEFSC annual fishery surveys. The Atlantic salmon was captured in the Winter Bottom Trawl Survey in 1977 by FRV Delaware II along the coastline of downeast Maine. Another Atlantic salmon was captured by a cooperating foreign FRV in February of 1978. NMFS believes that the proposed action is unlikely to affect ESA-listed Atlantic salmon since 1) the number of tows occurring in areas were ESA-listed Atlantic salmon are likely to occur is limited to less than 10 tows per year on average in the Spring Bottom Trawl Survey (NMFS-NEFSC 2001, 2002, 2003, 2004, 2005, 2006); 2) tow duration is short (i.e., 30 minutes in 2007 and 2008, 20 minutes in 2009+[2]); and 3) mid-water and bottom trawl gear does not operate within 10-m of the surface except for the short duration when it is being deployed and retrieved. It is, therefore, unlikely that the action being considered in this Opinion will affect the Gulf of Maine DPS of Atlantic salmon. Thus, this species will not be considered further in this Opinion.

The hawksbill turtle is uncommon in the waters of the continental United States. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges but also consume bryozoans, coelenterates, and mollusks. The Culebra Archipelago of Puerto Rico contains especially important foraging habitat for hawksbills. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. There are accounts of hawksbills in south Florida and a number are encountered in Texas. In the north Atlantic, small hawksbills have stranded as far north as Cape Cod, Massachusetts (Sea Turtle Stranding and Salvage Network (STSSN) database). However, many

[2]Effort in 2009 and thereafter is expected to remain the same.

of these strandings were observed after hurricanes or offshore storms. No takes of hawksbill sea turtles have been recorded in northeast or Mid-Atlantic fisheries covered by the NEFSC observer program which include: sink gill net, bottom coastal gill net, drift coastal gill net, scallop dredge, lobster pot, purse seine and pelagic longline fisheries. Although observer coverage in many of these fisheries has typically been low, given the best available information regarding the range of hawksbill sea turtles and based on the lack of documented takes of hawksbill sea turtles in fisheries that operate in and near the action area, it is reasonable to conclude that the proposed action is unlikely to affect hawksbill sea turtles.

Right, humpback, and fin whales occur in Mid-Atlantic and New England waters over the continental shelf. Sei whales typically occur over the continental slope or in basins situated between banks (NMFS 1998b). During the CeTAP study, sperm whales were observed along the shelf edge, centered around the 1000 meter depth contour but extending seaward out to the 2000 meter depth contour (CeTAP 1982). Although blue whales are occasionally seen in U.S. waters, they are more commonly found in Canadian waters (Waring et al. 2000). The only known interaction between a cetacean and scallop gear occurred in 1983 when a humpback whale became entangled in the cables of scallop dredge gear off of Chatham, Massachusetts. The entanglement was reported and responded to by disentanglement personnel. Although this event shows that interactions between large cetaceans and scallop gear can occur, nevertheless such interactions are expected to be extremely unlikely to occur given that these whale species are larger than a scallop dredge or trawl opening, and have the speed and maneuverability to get out of the way of oncoming scallop fishing gear. Similarly, there have been no documented interactions between any endangered marine mammal and the North Atlantic bottom trawl fishery or the comparable GOM trawl groundfish bottom fishery. The use of trawl gear is not affected by the Atlantic Large Whale Take Reduction Plan because this gear type is not known to result in serious injuries or mortality to large whales (e.g., right, humpback or fin whales). Therefore, these species will not be considered further in this Opinion.

Critical habitat for right whales has been designated for Cape Cod Bay (CCB), Great South Channel (GSC), and coastal Florida and Georgia (outside of the action area for this Opinion). The habitat features identified in this designation include copepods (prey), and oceanographic conditions created by a combination of temperature and depth that are conducive for calving and nursing. There is no evidence to suggest that the NEFSC research activities will have any adverse effects on the habitat features in the specific areas designated as right whale critical habitat. Right whale critical habitat will, therefore, not be considered further in this Opinion.

The remainder of this section will focus on the status of the sea turtle species within the action area that are likely to be affected by the proposed action, summarizing the information necessary to establish the environmental baseline against which the effects of the proposed action will be assessed. Additional background information on the range-wide status of these species can be found in a number of published documents, including sea turtle status reviews and biological reports (NMFS and USFWS 1995; Hirth 1997; USFWS 1997; Marine Turtle Expert Working Group (TEWG) 1998, 2000), and recovery plans for the loggerhead sea turtle (NMFS and USFWS 1991a), leatherback sea turtle (NMFS and USFWS 1992, 1998a), Kemp's ridley sea turtle (USFWS and NMFS 1992), and green sea turtle (NMFS and USFWS 1991b, 1998b).

### 3.1. Status of sea turtles

Sea turtles continue to be affected by many factors occurring on the nesting beaches and in the water. Poaching, habitat loss (because of human development), and nesting predation by introduced species affect hatchlings and nesting females while on land. Fishery interactions from many sources affect sea turtles in the pelagic and benthic environments. As a result, sea turtles still face many of the original threats that were the cause of their listing under the ESA.

Sea turtles were listed under the ESA at the species level rather than as individual populations or recovery units. The action that is being consulted on effects only sea turtles in the Atlantic Ocean. However, because the listing under the ESA is at the species level the jeopardy analysis must ultimately address effects of the proposed action at the same level. Therefore, information on the range-wide status of each species, as listed, is included.

#### 3.1.1. Loggerhead sea turtles

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

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

Pacific Ocean. In the Pacific Ocean, major loggerhead nesting grounds are generally located in temperate and subtropical regions with scattered nesting in the tropics. The abundance of loggerhead turtles on nesting colonies throughout the Pacific basin has declined dramatically over the past 10-20 years. Loggerhead sea turtles in the Pacific are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead turtles (Bolten et al. 1996). More recent estimates are unavailable; however, qualitative reports infer that the Japanese nesting aggregation has declined since 1995 and continues to decline (Tillman 2000). Genetic analyses of female loggerheads nesting in Japan indicate the presence of genetically distinct nesting colonies (Hatase et al. 2002). As a result, Hatase et al. (2002) suggest that the loss of one of these colonies would decrease the genetic diversity of loggerheads that nest in Japan, and recolonization of the site would not be expected on an ecological time scale. In Australia, long-term census data has been collected at some rookeries since the late 1960's and early 1970's, and nearly all data show marked declines in nesting populations since the mid-1980's (Limpus and Limpus 2003). No recent, quantitative estimates of the size of the nesting aggregation in the southwest Pacific is available, but the nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

Pacific loggerhead turtles are captured, injured, or killed in numerous Pacific fisheries including Japanese longline fisheries in the western Pacific Ocean and South China Seas; direct harvest and commercial fisheries off Baja California, Mexico, commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru; purse seine fisheries for tuna in the eastern tropical Pacific Ocean, and California/Oregon drift gillnet fisheries.

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

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

Atlantic Ocean. In the Atlantic Ocean, loggerheads commonly occur throughout the inner continental shelf from Florida through Cape Cod, Massachusetts although their presence varies with the seasons due to changes in water temperature (Shoop and Kenney 1992; Epperly et al. 1995a, 1995b; Braun and Epperly 1996). Aerial surveys of loggerhead turtles north of Cape Hatteras indicate that they are most common in waters from 22 to 49 meters deep although they range from the beach to waters beyond the continental shelf (Shoop and Kenney 1992). The presence of loggerhead turtles in an area is also influenced by water temperature. Loggerheads have been observed in waters with surface temperatures of 7-30°C but water temperatures of at least 11°C are favorable to sea turtles (Shoop and Kenney 1992; Epperly et al. 1995b). As coastal water temperatures warm in the spring, loggerheads begin to migrate to North Carolina inshore waters (e.g., Pamlico and Core Sounds) and also move up the coast (Epperly et al. 1995a, 1995b, 1995c; Braun-McNeill and Epperly 2004) occurring in Virginia foraging areas as early as April and on the most northern foraging grounds in the Gulf of Maine in June. The trend is reversed in the fall as water temperatures cool. The large majority leaves the Gulf of Maine by mid-September but some may remain in Mid-Atlantic and Northeast areas until late November. By December, loggerheads have migrated from inshore North Carolina waters and more northern coastal waters to waters offshore of North Carolina, particularly off of Cape Hatteras, and waters further south where the influence of the Gulf Stream provides temperatures favorable to sea turtles (Shoop and Kenney 1992; Epperly et al. 1995b).

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. In 1996, the Turtle Expert Working Group (TEWG) met on several occasions and produced a report assessing the status of the loggerhead sea turtle population in the western North Atlantic. The southeastern U.S. nesting aggregation is the second largest and represents about 35 percent of the nests of this species. From a global perspective, this U.S. nesting aggregations is considered to be critical to the survival of this species. In the western Atlantic, there are at least five western Atlantic nesting beach subpopulations, divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29°N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29°N on the east coast to Sarasota on the west coast (approximately 83,400 nests in 1998); (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida (approximately 1,200 nests in 1998); (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (approximately 200 nests per year) (NMFS SEFSC 2001). Cohorts from three of these subpopulations, the south Florida, Yucatán, and northern subpopulations, are known to occur within the action area of this consultation (Rankin-Baransky et al. 2001; Bass et al. 2004), and there is genetics evidence that cohorts from the other two also likely occur within the action area (Bass et al. 2004).

Natal homing to the nesting beach is believed to provide the genetic barrier between these nesting aggregations, preventing recolonization from turtles from other nesting beaches. Fine-scale analysis of mtDNA work from Florida rookeries indicate that population separations begin to appear between nesting beaches separated by more than 50-100 km of coastline that does not host nesting (Francisco et al. 1999) and tagging studies are consistent with this result (Ehrhart 1979; Richardson 1982; LeBuff 1990; NMFS SEFSC 2001). Nest site relocations greater than 100 km occur, but are rare (LeBuff 1974, 1990; Ehrhart 1979; Bjorndal et al. 1983: in NMFS SEFSC 2001). In addition, a recent study by Bowen et al. (2004) lends support to the hypothesis that juvenile loggerhead sea turtles exhibit homing behavior with respect to using foraging areas in the vicinity of their nesting beach. Therefore, coastal hazards that affect declining nesting populations may also affect the next generation of turtles when they are feeding in nearby habitats (Bowen et al. 2004).

Further testing of loggerhead turtles from foraging areas north of Virginia is needed to assess the proportion of northern subpopulation turtles that occur on northern foraging grounds. Loggerheads from any of these nesting sites may occur within the action area. However, the majority of the loggerhead turtles in the action area are expected to have come from the northern nesting subpopulation and the south Florida nesting subpopulation with a smaller portion from the Yucatan subpopulation. A recent analysis of 82 loggerhead sea turtles that stranded from Virginia to Massachusetts[3] determined that the turtles originated from three nesting areas using maximum likelihood stock analysis programs: 1) south Florida (57% ± 14%); 2) northern subpopulation (25% ± 10%); and 3) Yucatan, Mexico (16% ± 7%) (Rankin-Baransky et al. 2001). Similarly, a study by Bass et al. (2004) examined a total of 295 loggerhead sea turtles that were collected from pound nets in the Pamlico Sound, North Carolina during the years of 1995, 1996, and 1997. Bass et al. (2004) used both maximum likelihood and Bayesian stock analysis programs to estimate the relative stock contributions, as maximum likelihood approaches can be biased by the many rare haplotypes in source populations of sea turtles. Bass et al. (2004) reported that the Bayesian approach that incorporated into the model the relative population sizes of sea turtles populations (referred to as Bayesian Model 3 in Bass et al. 2004) appeared to provide the most realistic estimates of stock composition, as maximum likelihood and other Bayesian analyses provided either inflated or very conservative estimates. Using the Bayesian stock analysis with relative populations sizes incorporated into the model, the analysis indicated that 80% of the sea turtles foraging in the Pamlico Sound originated from the south Florida nesting subpopulation, 12% were from the northern subpopulation, 6% from the Yucatan, and 2% were from other rookeries. Thus, these two studies (Rankin-Baransky et al. 2001 and Bass et al. 2004) provide new information on the complexity of loggerhead movements from the various nesting areas, and suggest that the number of loggerhead turtles originating from the northern, south Florida, and Yucatan subpopulations vary along the coast.

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

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

[3]However, the majority (N = 51; 62%) of the sampled turtles were obtained from the most north point of the study (Barnstable County, Massachusetts).

waters are distributed in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

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

A number of stock assessments (TEWG 1998, 2000; NMFS SEFSC 2001; Heppell et al. 2003) have examined the stock status of loggerheads in the waters of the United States, but have been unable to develop any reliable estimates of absolute population size. In the absence of comprehensive population surveys, nesting beach survey data has been used to index the status and trends of loggerhead subpopulations (TEWG 2000; USFWS and NMFS 2003). Nesting beach surveys count the number of loggerhead nests laid per season. From this, the number of reproductively mature females in the subpopulation is estimated based on the presumed remigration interval and the average number of nests laid by a female loggerhead sea turtle per season. The trend in the estimated number of reproductively mature females over time has been used in the past as an index of the status and trend of the loggerhead subpopulation, overall (TEWG 2000; USFWS and NMFS 2003). However, there are many caveats to using nest count data for indexing the status and trend of a turtle subpopulation or population. First, the detection of nesting trends (in the number of nests laid and the estimated number of reproductively mature females from those nest counts) requires consistent data collection methods over long periods of time (USFWS and NMFS 2003). In 1989, a statewide sea turtle Index Nesting Beach Survey (INBS) program was developed and implemented in Florida. There are currently 33 nesting beaches in the INBS program (letter to NMFS from the Director, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, October 25, 2006). As of 2006, 27 of the 33 beaches had reached the mandatory minimum of 10-years participation for their data to be included in trend evaluations (letter to NMFS from the Director, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, October 25, 2006). Nesting recorded by the INBS program on the 27 beaches represented an average of 65% of all annual nesting by loggerheads in the state for the period 2001-2005 (letter to NMFS from the Director, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, October 25, 2006). Standardized daily survey programs have been implemented in Georgia, South Carolina, and North Carolina as well (USFWS and NMFS 2003). As is the case with the Florida INBS program beaches, additional years of data are needed for many of the Georgia, South Carolina, and North Carolina beaches before their data can be used in trend analyses (Dodd 2003). In Mexico, nesting survey effort overall has been inconsistent among the Yucatán nesting beaches and no trend can be determined for this subpopulation given the currently available data (Zurita et al. 2003).

A second caveat for the use of nesting data is that the number of nests laid are a function of the number of reproductively mature females in the population. Therefore, the trend in the number of reproductively mature females in the subpopulation, based on annual nest counts, may not reflect the trend of mature males or of females and males that are not reproductively active (i.e., juveniles) (Ross 1996; Zurita et al. 2003; Hawkes et al. 2005). Without knowing the proportion of males to females and the age structure of the population, it is impossible to extrapolate the data from nesting beaches to the entire population (Meylan 1982; Zurita et al. 2003). Adding to the difficulties associated with using loggerhead nesting trend data as an indicator of subpopulation status is the late age to maturity for loggerhead sea turtles. Data from tag returns, strandings, and nesting surveys suggest estimated ages of maturity ranging from 20-38 years (NMFS SEFSC 2001). Given the late age to maturity, there is a greater risk that the factors affecting the survival of the loggerhead age classes have changed over the last couple of decades and the number of nesting females today is not a reflection of the number of juvenile females that are likely to reach maturity and nest in the future.

Nesting survey data is important, however, in that it provides information on the relative abundance of nesting, the estimated number of reproductively mature females in each subpopulation, and the contribution of each subpopulation to loggerhead nesting in the western Atlantic, overall. Between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,014 to 92,182, annually with a mean of 73,751 (TEWG 2000). Nests for the south Florida subpopulation make up the majority of all loggerhead nests counted along the U.S. Atlantic and Gulf coasts. Annual total nests for the south Florida nesting group have ranged from 48,531 - 83,442 over the past decade (USFWS and NMFS 2003). The northern subpopulation is the second largest loggerhead nesting assemblage within the United States but much smaller than the south Florida nesting group (USWFS and NMFS 2003). The total nests for this subpopulation have ranged from 4,370 - 7,887, annually, for the period 1989-1998 (USWFS and NMFS 2003). The remaining three subpopulations (the Dry Tortugas, Florida Panhandle, and Yucatán) are much smaller subpopulations. Annual total nests for the Florida Panhandle subpopulation ranged from 113-1,285 nests for the period 1989-2002 (USFWS and NMFS 2003). The Yucatán nesting group was reported to have had 1,052 nests in 1998 (TEWG 2000). Nest counts for the Dry Tortugas subpopulation ranged from 168-270 during the 9-year period from 1995-2003.

As is evident from the information above, the south Florida subpopulation is the largest known loggerhead nesting assemblage in the Atlantic and one of only two loggerhead nesting assemblages worldwide that has greater than 10,000 females nesting per year (USFWS and NMFS 2003; USFWS Fact Sheet). However, in 2006, information was presented at an international sea turtle symposium (Meylan et al. 2006) and in a letter to NMFS (letter to NMFS from the Director, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, October 25, 2006) that the south Florida loggerhead subpopulation was experiencing a decline in nesting. A trend analysis of the nesting data collected for Florida's INBS program showed a decrease in nesting of 22.3% in the annual nest density of surveyed shoreline over the 17-year period and a 39.5% decline since 1998 (letter to NMFS from the Director, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, October 25, 2006). It is unclear at this time whether the decline in nesting for

Florida loggerhead subpopulation reflects a decline in the population as well. NMFS has convened a new loggerhead TEWG to review all available information on Atlantic loggerheads in order to determine what can be said about the status of this species in the Atlantic. A final report from the TEWG is anticipated at the end of 2007.

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

NMFS SEFSC (2001) constructed four different models that differed based on the duration of life stages. Each model was run using three different inputs for population growth, and three different sex ratios (35%, 50%, and 80% female) for a total of 36 model runs. The models also included a 30% decrease in small benthic juvenile mortality based on research findings of (existing) TED effectiveness (Heppell et al. 2003; NMFS SEFSC 2001; Crowder et al. 1995). The results of the modeling indicated that the proposed change in the TED regulations that would allow larger benthic immature loggerheads and sexually mature loggerheads to escape from shrimp trawl gear would have a positive or at least stabilizing influence on the subpopulation (depending on the estimated growth rate of the subpopulation and proportion of females) in nearly all scenarios. Coupling the anticipated effect of the proposed TED changes with changes in the survival rate of pelagic immature loggerheads revealed that subpopulation status would be positive or at least stable when pelagic immature survival was changed by 0 to +10% in all but the most conservative model scenarios. Given the late age at maturity for loggerhead sea turtles and the normal fluctuations in nesting, changes in populations size as a result of the larger TED requirements and measures to address pelagic immature survival in the U.S. Atlantic longline fishery for swordfish are unlikely to be evident in nesting beach censuses for many years to come.

<u>Threats to recovery.</u> The diversity of a sea turtle's life history leaves them susceptible to many natural and human impacts, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms as well as wave action can appreciably reduce hatchling success. For example, in 1992, all of the eggs over a 90-mile

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

length of coastal Florida were destroyed by storm surges on beaches that were closest to the eye of Hurricane Andrew (Milton et al. 1994). Reports suggest that extensive loggerhead nest destruction occurred in Florida and other southern states in 2004 due to damage from multiple hurricanes and storm events. Other sources of natural mortality include cold stunning and biotoxin exposure. For example, as recorded in the national STSSN database, in the winter of 2004/2005, 2 loggerheads died due to cold stunning on Cape Cod beaches and in the winter of 2005/2006, six loggerheads were cold stunned, with 2 deaths.

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

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

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

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

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

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

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

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

### 3.1.2. Leatherback sea turtle

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

Pacific Ocean. Based on published estimates of nesting female abundance, leatherback populations have collapsed or have been declining at all major Pacific basin nesting beaches for the last two decades (Spotila et al. 1996, NMFS and USFWS 1998a, Sarti et al. 2000, Spotila et al. 2000). Leatherback turtles disappeared from India before 1930, have been virtually extinct in Sri Lanka since 1994, and appear to be approaching extinction in Malaysia (Spotila et al. 2000). For example, the nesting assemblage on Terengganu (Malaysia) - which was one of the most significant nesting sites in the western Pacific Ocean - has declined severely from an estimated 3,103 females in 1968 to 2 nesting females in 1994 (Chan and Liew 1996). Nesting assemblages of leatherback turtles along the coasts of the Solomon Islands, which historically supported important nesting assemblages, 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), leatherback turtles have only been known to nest in low densities and scattered colonies.

Only an Indonesian nesting assemblage has remained relatively abundant in the Pacific basin. The largest, extant leatherback nesting assemblage in the Indo-Pacific lies on the north Vogelkop coast of Irian Jaya (West Papua), Indonesia, with over 3,000 nests recorded annually (Putrawidjaja 2000; Suárez et al. 2000). During the early-to-mid 1980s, the number of female leatherback turtles nesting on the two primary beaches of Irian Jaya appeared to be stable. More recently, however, this population has come under increasing threats that could cause this population to experience a collapse that is similar to what occurred at Terengganu, Malaysia. In 1999, for example, local Indonesian villagers started reporting dramatic declines in sea turtle populations near their villages (Suárez 1999); unless hatchling and adult turtles on nesting beaches receive more protection, this population will continue to decline. Declines in nesting assemblages of leatherback turtles have been reported throughout the western Pacific region where observers report that nesting assemblages are well below abundance levels that were observed several decades ago (e.g., Suárez 1999).

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

In the eastern Pacific Ocean, nesting populations of leatherback turtles are declining along the Pacific coast of Mexico and Costa Rica. According to reports from the late 1970s and early 1980s, three beaches located on the Pacific coast of Mexico support as many as half of all leatherback turtle nests. Since the early 1980s, the eastern Pacific Mexican population of adult female leatherback turtles has declined to slightly more than 200 during 1998-99 and 1999-2000 (Sarti et al. 2000). Spotila et al. (2000) reported the decline of the leatherback turtle population at Playa Grande, Costa Rica, which had been the fourth largest nesting colony in the world. Between 1988 and 1999, the nesting colony declined from 1,367 to 117 female leatherback turtles. Based on their models, Spotila et al. (2000) estimated that the colony could fall to less than 50 females by 2003-2004. Commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru, purse seine fisheries for tuna in the eastern tropical Pacific Ocean, and California/Oregon drift gill net fisheries are known to capture, injure or kill leatherback turtles in the eastern Pacific Ocean. Although all causes of the declines in Pacific leatherback turtle colonies have not been documented, the Pacific population has continued to decline leading some researchers to conclude that the leatherback is on the verge of extinction in the Pacific Ocean (e.g., Spotila et al. 1996, 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 leatherbacks nest annually on Great Nicobar Island alone (Andrews et al. 2002). The number of nesting females using the Andaman and Nicobar Islands combined was estimated around 1000 (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).

Atlantic Ocean. Evidence from tag returns and strandings in the western Atlantic suggests that adult leatherback sea turtles engage in routine migrations between boreal, temperate and tropical waters (NMFS and USFWS 1992). A 1979 aerial survey of the outer Continental Shelf from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia showed leatherbacks to be present throughout the area with the most numerous sightings made from the Gulf of Maine south to Long Island. Leatherbacks were sighted in water depths ranging from 1-4151 m but 84.4% of sightings were in waters less than 180 m (Shoop and Kenney 1992). Leatherbacks were sighted in waters within a sea surface temperature range similar to that observed for loggerheads; from 7-27.2°C (Shoop and Kenney 1992). However, leatherbacks appear to have a greater tolerance for colder waters in comparison to loggerhead sea turtles since more leatherbacks were found at the lower temperatures as compared to loggerheads (Shoop and Kenney 1992). This aerial survey estimated the leatherback population for the northeastern 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 underestimates the leatherback population for the northeastern U.S. 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 (Palka 2000). Studies of satellite tagged leatherbacks suggest that they spend a 10% - 41% of their time at the surface, depending on the phase of their migratory cycle (James et al. 2005a). 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. 2005a).

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

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

Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1-11.5% increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NMFS SEFSC 2001). The largest leatherback rookery in the western Atlantic remains along the northern coast of South America in French Guiana and Suriname. More than half the present world leatherback population is estimated to be nesting on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana (Hilterman and Goverse 2004). Nest numbers in Suriname have shown an increase and the long-term trend for the Suriname and French Guiana nesting group seems to show an increase (Hilterman and Goverse 2004). In 2001, the number of nests for Suriname and French Guiana combined was 60,000, one of the highest numbers observed for this region in 35 years (Hilterman and Goverse 2004). Studies by Girondot et al. (2006) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing.

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

Leatherbacks are susceptible to entanglement in multiple types of fishing gear, including longlines, gill nets, pot/trap gear, and trawl gear. Sea turtles entangled in fishing gear generally have a reduced ability to feed, dive, surface to breathe or perform any other behavior essential to survival (Balazs 1985). They may be more susceptible to boat strikes if forced to remain at the surface, and entangling lines can constrict blood flow resulting in tissue necrosis.

Leatherbacks are exposed to pelagic longline fisheries in many areas of their range. 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). Since the U.S. fleet accounts for only 5-8% of the hooks fished in the Atlantic Ocean, adding up the under-represented observed takes of the other 23 countries actively fishing in the area would likely result in annual take estimates of thousands of leatherbacks over different life stages (NMFS SEFSC 2001).

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

Leatherback interactions with the southeast shrimp trawl fishery, which operates from North Carolina through southeast Florida (NMFS 2002a), are also common. Leatherbacks are likely to encounter shrimp trawls working in the coastal waters off the Atlantic coast (from Cape Canaveral, Florida through North Carolina) as they make their annual spring migration north. For many years, TEDs that were required for use in the southeast shrimp fishery were less effective for leatherbacks as compared to the smaller, hard-shelled turtle species, because the TED openings were too small to allow leatherbacks to escape (USFWS and NMFS 1992). To address this problem, on February 21, 2003, NMFS issued a final rule to amend the TED regulations. Modifications to the design of TEDs are now required in order to exclude leatherbacks as well as large benthic immature and sexually mature loggerhead and green turtles.

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

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

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

Leatherback sea turtles may be more susceptible to marine debris ingestion than other species due to their pelagic existence and the tendency of floating debris to concentrate in convergence zones that adults and juveniles use for feeding areas and migratory routes (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 and plastic debris (Mrosovsky 1981). Balazs (1985) speculated that the object may resemble a food item by its shape, color, size or even movement as it drifts about, and induce a feeding response in leatherbacks.

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

<u>Summary.</u> In the Pacific Ocean, the abundance of leatherback turtles on nesting colonies has declined dramatically. At current rates of decline, leatherback turtles in the Pacific basin are a critically endangered species with a low probability of surviving and recovering in the wild.

Leatherbacks nest in several areas around the Indian Ocean, including 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) and the number of nesting females using the Andaman and Nicobar Islands combined was estimated around 1000 (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).

The largest leatherback rookery in the western Atlantic remains along the northern coast of South America in French Guiana and Suriname. More than half the present world leatherback population is estimated to be nesting on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana (Hilterman and Goverse 2004). Nest numbers in Suriname have shown an increase and the long-term trend for the Suriname and French Guiana nesting group seems to show an increase (Hilterman and Goverse 2004). In 2001, the number of nests for Suriname and French Guiana combined was 60,000, one of the highest numbers observed for this region in 35 years (Hilterman and Goverse 2004). Studies by Girondot et al. (2006) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing.

Some of the same factors that led to precipitous declines of leatherbacks in the Pacific also affect leatherbacks in the Atlantic. Leatherbacks are captured and killed in many kinds of fishing gear and interact with fisheries in U.S. state and federal waters as well as in international waters. Poaching is a problem and affects leatherbacks that occur in U.S. waters. Leatherbacks also appear to be more susceptible to death or injury from ingesting marine debris than other turtle species.

### 3.1.3. Kemp's ridley sea turtle

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 in the Gulf of Mexico and the northern half of the Atlantic Ocean (USFWS and NMFS 1992). The only major nesting site for Kemp's ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). Estimates of the adult female nesting population reached a low of 300 in 1985 (TEWG 2000). 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). Current totals exceed 3000 nests per year, allowing cautious optimism that the population is on its way to recovery (TEWG 2000). Nevertheless, the estimated 2,000 nesting females in the current population is still far below historical numbers (Stephens and Alvarado-Bremer 2003).

Kemp's ridley nesting occurs from April through July each year. Little is known about mating but it is believed to occur at or before the nesting season in the vicinity of the nesting beach. Hatchlings emerge after 45-58 days. Once they leave the beach, neonates presumably enter the Gulf of Mexico where they feed on available sargassum and associated infauna or other epipelagic species (USFWS and NMFS 1992). The presence of juvenile turtles along both the Atlantic and Gulf of Mexico coasts of the U.S., 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).

Next to loggerheads, Kemp's ridleys are the second most abundant sea turtle in Virginia and Maryland state waters, arriving in these areas during May and June (Keinath et al. 1987, Musick and Limpus 1997). In the Chesapeake Bay, where the juvenile population of Kemp's ridley sea turtles is estimated to be 211 to 1,083 turtles (Musick and Limpus 1997), ridleys frequently forage in submerged aquatic grass beds for crabs (Musick and Limpus 1997). 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). Upon leaving Chesapeake Bay in autumn, juvenile 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).

Kemp's ridleys face many of the same natural threats as loggerheads, including destruction of nesting habitat from storm events, natural predators at sea, and oceanic events such as cold-stunning. Although cold-stunning can occur throughout the range of the species, it may be a greater risk for sea turtles that utilize the more northern habitats of Cape Cod Bay and Long Island Sound. For example, in the winter of 1999/2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green turtles were found on Cape Cod beaches (NMFS Sea Turtle Stranding Database). Annual cold stun events do not always occur at this magnitude; the extent of episodic major cold stun events may be associated with numbers of turtles utilizing Northeast waters in a given year, oceanographic conditions and the occurrence of storm events in the late fall. Although many cold-stun turtles can survive if found early enough, cold-stunning events can represent a significant cause of natural mortality.

Like other turtle species, the severe decline in the Kemp's ridley population appears to have been heavily influenced by a combination of exploitation of eggs and impacts from fishery interactions. From the 1940s through the early 1960s, nests from Ranch Nuevo were heavily exploited (USFWS and NMFS 1992), but beach protection in 1966 helped to curtail this activity (USFWS and NMFS 1992). Following World War II, there was a substantial increase in the number of trawl vessels, particularly shrimp trawlers, in the Gulf of Mexico where the adult Kemp's ridley turtles occur. Information from fishers helped to demonstrate the high number of turtles taken in these shrimp trawls (USFWS and NMFS 1992). Subsequently, NMFS has worked with the industry to reduce turtle takes in shrimp trawls and other trawl fisheries, including the development and use of TEDs.

Although changes in the use of shrimp trawls and other trawl gear have helped to reduce mortality of Kemp's ridleys, this species is also affected by other sources of anthropogenic impacts similar to those discussed above. For example, in the spring of 2000, a total of five Kemp's ridley carcasses were recovered from the same North Carolina beaches where 275 loggerhead carcasses were found. Cause of death for most of the turtles recovered was unknown, but the mass mortality event was suspected to have been from a large-mesh gill net fishery operating offshore in the preceding weeks. The five ridley carcasses that were found are likely to have been only a minimum count of the number of Kemp's ridleys that were killed or seriously injured as a result of the fishery interaction since it is unlikely that all of the carcasses washed ashore.

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

NMFS 1992). While there is cautious optimism that the Kemp's ridley sea turtle population is increasing, the estimated 2,000 nesting females in the current population is still far below historical numbers (Stephens and Alvarado-Bremer 2003). Anthropogenic impacts to the Kemp's ridley population are similar to those discussed above for loggerhead sea turtles.

### 3.1.4. Green sea turtle

Green turtles are distributed circumglobally in tropical and subtropical waters (NMFS and USFWS 1998b). Juveniles are also known to occur seasonally in temperate waters (Musick and Limpus 1997, Morreale and Standora 1998). Juvenile green sea turtles occupy pelagic habitats after leaving the nesting beach. At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas, shifting to a chiefly herbivorous diet but may also consume jellyfish, salps, and sponges (Bjorndal 1997).

Green sea turtle populations have declined in many areas. A review of 32 Index Sites[4] distributed globally revealed a 48% to 67% decline in the number of mature females nesting annually over the last 3-generations[5] (Seminoff 2004).

<u>Pacific Ocean.</u> Green turtles occur in the eastern, central, and western Pacific. Nesting is known to occur in the Hawaiian archipelago, American Samoa, Guam, and various other sites in the Pacific but none of these are considered large breeding sites (with 2,000 or more nesting females per year)(NMFS and USFWS 1998b). Foraging areas are also found throughout the Pacific and along the southwestern U.S. coast (NMFS and USFWS 1998b).

Historically, green 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 turtles in the Pacific continue to be affected by poaching, habitat loss or degradation, fishing gear interactions, and fibropapilloma (NMFS and USFWS 1998b, NEFMC 2004c).

<u>Indian Ocean.</u> 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 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).

<u>Atlantic Ocean.</u> In the western Atlantic green sea turtles range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999). Green turtles were

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[4] 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.

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

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

In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan et al. 1995). More recently, green turtle nesting occurred on Bald Head Island, North Carolina just east of the mouth of the Cape Fear River, on Onslow Island, and on Cape Hatteras National Seashore. Increased nesting has also been observed along the Atlantic Coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). Certain Florida nesting beaches have been designated index beaches. Index beaches were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of the index beaches in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan et al. 1995). Seminoff (2004) reviewed the population estimates for green sea turtles at five western Atlantic nesting sites. All of these showed increased nesting compared to prior estimates with the exception of nesting at Aves Island, Venezuela (Seminoff 2004).

Some of the principal green sea turtle foraging areas in the western Atlantic Ocean include the upper west coast of Florida 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). In North Carolina, green turtles are known to occur in estuarine and oceanic waters and to nest in low numbers along the entire coast. The summer developmental habitat for green turtles also encompasses estuarine and coastal waters of Chesapeake Bay and as far north as Long Island Sound (Musick and Limpus 1997).

Green turtles face many of the same natural threats as loggerhead and Kemp's ridley sea turtles. In addition, green turtles appear to be susceptible to fibropapillomatosis, an epizootic disease producing lobe-shaped tumors on the soft portion of a turtles body. Juveniles are most commonly affected. The occurrence of fibropapilloma tumors may result in impaired foraging, breathing, or swimming ability, leading potentially to death. Stranding reports indicate that between 200-400 green turtles strand annually along the Eastern U.S. coast from a variety of causes most of which are unknown (STSSN database).

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. Sea sampling coverage in the pelagic driftnet, pelagic longline, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles.

Summary. Green sea turtle populations have declined in many areas; as much as a 48% to 67% decline in the number of mature females nesting annually over the last 3-generations (Seminoff 2004). Seminoff (2004) concluded that declines in green 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).

In the Pacific, green turtles continue to be affected by poaching, fishing gear interactions, habitat degradation, and disease (notably fibropapillomatosis) (NMFS and USFWS 1998b, NEFMC 2004c). Green turtles face many of the same threats in the Atlantic. In the western Atlantic, green turtles range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999) and are exposed to many of the same anthropogenic threats as loggerhead and Kemp's ridley sea turtles. In addition, Atlantic green turtles are also susceptible to fibropapillomatosis which can result in death. In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in 1989. However, age at sexual maturity is estimated to be between 20 to 50 years (Balazs 1982, Frazer and Ehrhart 1985). Thus, caution is warranted about over interpreting nesting trend data collected for less than 15 years.

## 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 loggerhead, leatherback, Kemp's ridley, and green sea turtles in the action area. The activities that shape the environmental baseline in the action area of this consultation generally fall into the following three categories: fisheries, other impacts that cause death or otherwise impair a turtle's ability to function, and recovery activities associated with reducing those impacts.

## 4.1. Fishery Operations

### 4.1.1. Federal fisheries

Several commercial fisheries in the action area employ gear that has been known to capture, injure, and kill sea turtles. Several federally regulated fisheries that use gill net, longline, trawl, seine, dredge, and trap gear have been documented as unintentionally capturing or entangling sea turtles. In some cases, the entangled turtles are harmed, injured, or killed as a result of the interaction. Formal ESA section 7 consultation has been conducted on the American Lobster, Atlantic Bluefish, Atlantic Herring, Atlantic Mackerel/Squid/Atlantic Butterfish, Highly Migratory Species, Monkfish, Northeast Multispecies, Red Crab, Skate, Sea Scallop, Spiny Dogfish, Summer Flounder/Scup/Black Sea Bass, and Tilefish fisheries. An Incidental Take Statement (ITS) has been issued for the take of sea turtles in each of the fisheries (Appendix 1). A summary of each consultation is provided but more detailed information can be found in the respective Opinions.

The American lobster trap fishery has been identified as a source of gear causing serious injuries and mortality of endangered whales and leatherback sea turtles. Previous Opinions for this fishery have concluded that operation of the lobster trap fishery is likely to jeopardize the continued existence of right whales and may adversely affect leatherback sea turtles. A Reasonable and Prudent Alternative (RPA) to avoid the likelihood that the lobster fishery would jeopardize the continued existence of right whales was implemented. However, these measures were not expected to reduce the number or severity of leatherback sea turtle interactions with the fishery. Subsequently, the death of a right whale was determined to be entanglement related and NMFS concluded that the death provided evidence that the RPA was not effective at removing the likelihood of jeopardy for right whales from the lobster trap fishery. Consultation was reinitiated and is in progress.

American lobster 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). An Interstate Fishery Management Plan (ISFMP) developed through the ASMFC provides management measures for the fishery that are implemented by the states. NMFS has issued regulations for the Federal waters portion of the fishery based on recommendations from the ASMFC. Of the seven lobster management areas (LMAs), only LMA 3 occurs entirely within Federal waters. LMAs 1, 2, 4, 5, and the Outer Cape include both state and Federal waters (NMFS 1999; 2002b). Therefore, management of the Federal waters portion of LMAs 1, 2, 4, 5, and the Outer Cape must be consistent with management in the state waters portion of those areas to meet the objectives of the Lobster ISFMP. Management measures include a limited access permit system, gear restrictions, and other prohibitions on possession (e.g., of berried or scrubbed lobsters), landing limits for lobsters caught by non-trap gear, a trap tag requirement, and trap limits. These measures include reduction of effort and capping of effort. The commercial lobster fishery is frequently described as an inshore fishery (typically defined as within state waters; 0-3 nautical miles from shore) and an offshore fishery (typically defined as nearshore Federal waters and the deepwater offshore fishery) (NMFS 1999).

Most lobster trap effort occurs in the Gulf of Maine. Maine and Massachusetts produced 93% of the 2004 total U.S. landings of American lobster, with Maine accounting for 78% of these landings (NMFS 2005b). 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 Lobster ISFMP. Low landings of lobster in these *de minimus* states suggest that there is not a directed fishery for lobster in these territorial waters.

The Atlantic Bluefish fishery may pose a risk to protected marine mammals, but is most likely to interact with sea turtles (primarily Kemp's ridley and loggerheads) given the time and locations where the fishery occurs. Gill nets are the primary gear used to commercially land bluefish. Turtles can become entangled in the buoy lines of the gill nets or in the net panels.

The ASMFC and the MAFMC jointly manage bluefish under Amendment 1 to the Bluefish FMP (NEFSC 2005a). The management unit is defined as bluefish occurring in U.S. waters of the western Atlantic Ocean (NEFSC 2005a). The bluefish fishery is not a limited access fishery. Bluefish landings are controlled through a coastwide quota with 83% of the quota allocated to the recreational sector and 17% to the commercial sector (NEFSC 2005a). The portion of the quota allocated to the commercial sector can be increased if the recreational sector is not expected to land their entire quota allocation (NEFSC 2005a).

Gill nets accounted for over 40% of bluefish landings from 1950 – 2003 (NEFSC 2005a). 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 2005a). Bluefish migrate south as water temperatures decrease in late fall and winter (NEFSC 2005a). 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 2005a).

Since 2005, Rutgers University has been conducting the Bluefish Trawl Survey under the Bluefish Research-Set-Aside program, which uses landings set aside from the Bluefish FMP. A biological opinion on the action was completed on December 28, 2006 for survey effort occurring January 1, 2007 through July 31, 2008. The biological opinion determined that the survey may adversely affect ESA-protected sea turtles and provide an ITS. The project includes three survey areas and includes the inner continental shelf, ocean-beach, and outer estuarine habitats. The study uses several different types of gear, which vary with the survey area. The ocean-beach and estuarine habitats will be seined, to determine the presence and abundance of juvenile bluefish. The inner continental shelf survey area will be sampled with bottom otter trawls and planktonic/surface-water trawl along the Mid- and South Atlantic Bights. Overall, approximately 70 stations are sampled each month among the survey areas.

The FMP for the Atlantic Herring fishery was implemented on December 11, 2000. The biological opinion that considered the effects to ESA-listed species from the implementation of the Herring FMP concluded that sea turtle takes in fishing gear used in the herring fishery were reasonably likely to occur even though none had been observed. An ITS was provided based on the observed capture of sea turtles in other fisheries using comparable gear.

Three management areas, which may have different management measures, were established under the Herring FMP. Management Area 1 includes Gulf of Maine waters and is subdivided into inshore and offshore sub-areas. Management Area 2 is referred to as the South Coastal Area and includes state and Federal waters adjacent to the States of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina. Management Area 3 includes waters over Georges Bank (NEFMC 1999). The ASMFC's

Atlantic Herring ISFMP provides measures for the management of the herring fishery in state waters that are complementary to the Federal FMP.

Operation of the herring fishery was reviewed in a report by the NEFMC Herring Plan Development Team (PDT) and Technical Committee (NEFMC 2004). The primary gear types used in the fishery are midwater pair trawl, single vessel midwater trawl, purse seine, bottom trawl, and weirs (fixed gear). Of these, midwater pair trawl contributed 65% of the landings for 2003 (NEFMC 2004). Most of the herring sold in 2003 was from Area 1A (59%) (NEFMC 2004). Landings from Areas 1B, 2, and 3 contributed 4.9%, 16%, and 20% of the 2003 herring landings, respectively (NEFMC 2004). Thirty-four vessels landed nearly all of the 2003 landings for herring (NEFMC 2004). At present, the herring fishery is not a limited access fishery. However, limiting access to the fishery is one of the measures under consideration for Amendment 1 to the Atlantic Herring FMP that is currently being developed.

The Atlantic Mackerel/Squid/Butterfish fisheries are managed under a single FMP. 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 on each of the fisheries managed under the FMP has been updated in the draft supplemental environmental impact statement for Amendment 9 to the FMP, currently being prepared by the Mid-Atlantic Fishery Management Council (MAFMC). A brief summary of the information is presented below.

Trawl gear is the primary fishing gear for the fisheries. In 2003, bottom trawl gear accounted for 97%, and 99.4% of *Loligo*, and *Illex* landings, respectively (MAFMC, in prep). Mid-water trawl gear accounted for the majority (82%) of mackerel landings with an additional 17% of landings attributed to bottom trawls (MAFMC, in prep). Seasonal differences in landings are evident amongst the fisheries with the majority of mackerel landed January through April, the majority of *Loligo* landed September through March, and the majority of *Illex* landed June through October based on the 2003 fishing year (MAFMC, in prep). While the New England states of Massachusetts and Rhode Island are amongst the leading states in terms of landings for two or more of the FMP species, most fishing occurs in the Mid-Atlantic. Statistical areas 616, 612, 615, and 613 accounted for 90.4% of mackerel landed in 2003 (MAFMC, in prep). By comparison, statistical areas 632, 626 and 622 accounted for 91% of the 2003 *Illex* landings, and statistical areas 525, 537, 616, and 622 accounted for 68% of the 2003 *Loligo* landings (MAFMC, in prep).

Given the gear types used in these fisheries, the time of year when fishing occurs, and the areas where the fishery operates, interactions between sea turtles and gear used in one or more of the fisheries is likely to occur. An ITS for sea turtles was provided with the April 28, 1999 Opinion on the continued authorization of the FMP.

Components of the Highly Migratory Species (HMS) Atlantic pelagic fishery for swordfish/tuna/shark in the EEZ occur within the action area for this consultation. Use of pelagic longline, pelagic driftnet, bottom longline, hand line (including bait nets), and/or purse seine gear in this fishery has resulted in the take of sea turtles and whales. The Northeast swordfish driftnet portion of the fishery was prohibited during an emergency closure that began in December 1996, and was subsequently extended. A permanent prohibition on the use of driftnet gear in the swordfish fishery was published in 1999. In June 2001, NMFS completed consultation on the HMS pelagic longline fishery and concluded that the Atlantic HMS fisheries, particularly the pelagic longline fisheries, were likely to jeopardize the continued existence of loggerhead and leatherback sea turtles. An RPA was provided to avoid jeopardy to leatherback and loggerhead sea turtles as a result of operation of the HMS fisheries. Consultation was subsequently reinitiated on the HMS fishery following new information on the number of loggerhead and leatherback sea turtles captured in the fishery. Consultation was completed on June 1, 2004, and NMFS concluded that the continued prosecution of the HMS pelagic longline fishery was likely to jeopardize the continued existence of leatherback sea turtles. A new RPA was developed and implemented.

The Federal Monkfish fishery occurs in all waters under federal jurisdiction from Maine to the North Carolina/South Carolina border. The current commercial fishery operates primarily in the deeper waters of the Gulf of Maine, Georges Bank, and southern New England, and in the Mid-Atlantic. Monkfish have been found in depths ranging from the tide line to 840 meters with concentrations between 70 and 100 meters and at 190 meters. The monkfish fishery uses several gear types that may capture ESA-listed species, including gill net and trawl gear. A consultation conducted on the continued operation of the fishery concluded in 2001 that the fishery was likely to jeopardize the continued existence of right whales as a result of entanglement in gill net gear used in the fishery. An RPA was provided and implemented to remove the likelihood of jeopardy. The Opinion also concluded that sea turtles may be adversely affected by operation of the monkfish fishery as a result of entanglement in gear used in the fishery. Although the estimated capture of sea turtles in monkfish gill net gear is relatively low, there is concern that much higher levels of interaction could occur. In 2002, NMFS published new restrictions for the use of gill nets with larger than 8-inch (20.3 cm) stretched mesh, in Federal waters (3-200 nautical miles) off of North Carolina and Virginia. The rule was subsequently modified on April 26, 2006, by extending the restrictions to the use of gill nets with 7-inch stretched mesh or larger and by extending the area affected to North Carolina and Virginia state waters as well as federal waters from the North Carolina/South Carolina border to Chincoteague, VA.

The monkfish fishery is managed in the EEZ through a joint NEFMC and MAFMC Monkfish FMP (NEFSC 2005b). The FMP defines two management areas for monkfish (northern and southern) divided roughly by a line bisecting Georges Bank (NEFSC 2005b). Effort in the fishery is limited through a limited access permit program as well as DAS and trip allocations that were implemented as initial management measures of the FMP in 1999. Trip allocations differ between the two management areas.

Trawl, scallop dredge, and gill net gear are the primary gear types that land monkfish (NEFSC 2005b). During the period of 1998-2000, trawls accounted for 54% of the total landings, scallop dredges about 17%, and gill nets 29% (NEFSC 2005b). More recently, for the period from 2001-2003, trawl, gill net, and scallop dredge gear accounted for 55%, 36%, and 8% of landings, respectively (NEFSC 2005b).

The Northeast Multispecies fishery operates throughout the year with peaks in spring, and from October through February. Multiple gear types are used in the fishery. However, the gear type of greatest concern is sink gill net gear that can entangle whales and sea turtles (i.e., in buoy lines and/or net panels). Data indicate that sink gill net gear has seriously injured or killed northern right whales, humpback whales, fin whales, loggerhead and leatherback sea turtles. The northeast multispecies sink gill net fishery has historically occurred from the periphery of the Gulf of Maine to Rhode Island in water to 60 fathoms. In recent years, more of the effort in the fishery has occurred in offshore waters and into the Mid-Atlantic. However, 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 further reduce and control effort in the multispecies fishery.

The 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 400-800 meters along the continental shelf in the Northeast region, and is limited to waters north of 35° 15.3' N (Cape Hatteras, NC) and south of the Hague Line.

There has been a small, directed fishery for red crab off the coast of New England and the Mid-Atlantic since the 1970s. The fishery was fairly consistent through the 1980's but landings steadily increased from the mid-1990s (NEFMC 2002). Following concerns that red crab could be overfished, an FMP was developed and became effective on October 21, 2002. The FMP includes management measures to control effort in the fishery (e.g., a limited access permit program, trap limits, a fleet DAS allocation) (NEFMC 2005). Five vessels initially received limited access permits for the red crab fishery but one vessel opted out of the fishery in 2004.

There have been no recorded takes of ESA-listed species in the red crab fishery. However, given the type of gear used in the fishery, takes may be possible where gear overlaps with the distribution of loggerhead and leatherback sea turtles. Section 7 consultation was completed on the proposed implementation of the Red Crab FMP, and concluded that the action was not likely to result in jeopardy to any ESA-listed species under NMFS jurisdiction. An ITS was provided that addresses takes of loggerhead and leatherback sea turtles.

The Atlantic Sea Scallop fishery is also known to take sea turtles as a result of capture in scallop dredge and trawl gear. The U.S. Atlantic sea scallop fishery occurs in three areas: the Gulf of Maine, Georges Bank, and the Mid-Atlantic. The bulk of the Gulf of Maine landings are from relatively shallow waters (<40m) near-shore (NEFSC 2004a), and account for a very small portion of the annual scallop landings. The scallop fishery over Georges Bank and in the Mid-Atlantic is a deeper water fishery in comparison to the Gulf of Maine. Overall, most scallops are harvested at depths between 30 and 100 meters in the Mid-Atlantic and the Georges Bank areas (NEFSC 2004a).

The Atlantic sea scallop fishery is a limited access fishery. There are currently less than 400 limited access permit holders. Vessels that did not qualify for a scallop limited access permit can obtain a general category permit that allows them to retain and land up to 400 pounds of shucked scallops, or 50 U.S. bushels of in-shell scallops per trip. Dredge gear is the primary gear type used in the scallop fishery. Ninety-five percent of the scallop landings for the 2003 scallop fishing year were attributed to scallop dredge gear. Nearly all of the landings by trawl gear occur in the Mid-Atlantic (NMFS Preliminary Fisheries Statistics).

The most recent section 7 consultation on the Atlantic sea scallop fishery was completed September 18, 2006. An ITS was provided based, in large part, on the estimated take of loggerhead sea turtles in scallop dredge gear in 2003. However, the number of these that will result in death or the failure to reproduce is expected to be lessened given NMFS' rulemaking requiring the use of chain mats on scallop dredge gear fished by federally permitted scallop vessels in Mid-Atlantic waters south of 41° 9.0'N from the shoreline to the outer boundary of the EEZ during the period of May 1 through November 30 each year. The gear modification is expected to reduce the severity (e.g., mortality and serious injury) of some sea turtle interactions with scallop dredge gear by keeping turtles out of the dredge bag thus preventing injuries that occur to turtles once they are in the bag (e.g., crushing in the dredge bag, crushing on deck).

The Northeast Fisheries Science Center has finalized new information on the number of loggerhead sea turtles estimated to have been captured in scallop trawl gear during 2004 and 2005 (Murray 2007). This represents new information regarding the capture of sea turtles in scallop trawl gear. Therefore, given that the trigger for reinitiation mentioned above has been met, in accordance with the regulations at 50 CFR 402.16, NMFS has reinitiated formal consultation to reconsider the effects of the Atlantic Sea Scallop fishery on ESA-listed sea turtles.

The Skate fishery has typically been composed of both a directed fishery and an indirect fishery. The bait fishery is more historical and is a more directed skate fishery than the wing fishery. Vessels that participate in the bait fishery are primarily from Southern New England and direct primarily on little (90%) and winter skate (10%). The wing fishery is primarily an incidental fishery that takes place throughout the region. For section 7 purposes, NMFS considers the effects to ESA-listed species of the directed skate fishery. Fishing effort that contributes to landings of skate for the indirect fishery is considered during section 7 consultation on the directed fishery in which skate bycatch occurs.

Bottom trawl gear accounted for 94.5% of directed skate landings. Gill net gear is the next most common gear type, accounting for 3.5% of skate landings. The Northeast skate complex is comprised of seven different related skate species. There have been no recorded takes of ESA-listed species in the skate fishery. However, given that sea turtle interactions with trawl and gill net gear have been observed in other fisheries, sea turtle takes in gear used in the skate fishery may be possible where the gear and sea turtle distribution overlap. Section 7 consultation on the new Skate FMP was completed July 24, 2003, and concluded, based on a precautionary approach, that implementation of the Skate FMP may adversely affect ESA-listed sea turtles as a result of interactions with (capture in) gill net and trawl gear.

The Spiny dogfish fishery is managed under the Spiny Dogfish FMP for fishing in waters of the EEZ. The NEFMC and MAFMC jointly develop management measures for the fishery that occurs in federal waters. The ASMFC has also implemented an Interstate Fishery Management Plan (ISFMP) for spiny dogfish in order to coordinate coastwide quotas, and to help enforce state and federal regulations for the spiny dogfish fishery. In the Northwest Atlantic, spiny dogfish range from Florida to Labrador, but are most abundant from Nova Scotia to Cape Hatteras (NEFSC 2003). They make seasonal inshore-offshore and coastal migrations related to their preferred temperature range (7°-13°C) (NEFSC 2003).

U.S. landings of spiny dogfish increased in the 1990's, reaching 28,000 mt in 1996 before declining to approximately 20,000 mt in both 1997 and 1998 and then to 14,860 mt for 1999 (NEFSC 2003). As a result of the implementation of the Spiny Dogfish FMP in 2000, landings in 2001 and 2002 were sharply reduced to about 2,200 mt (NEFSC 2003). Most landings occur from June through September (NEFSC 2003). In calendar year 2002, Massachusetts accounted for the largest share of the landings (78.5%), followed by Rhode Island (13%), and New Hampshire (7.2%) (NEFSC 2003).

The primary gear types for the spiny dogfish fishery have historically been sink gill nets, otter trawls, bottom longline, and drift net gear (NEFSC 2003). The predominance of any one gear type has varied over time (NEFSC 2003). Landings of spiny dogfish in the 1990's were attributed primarily to sink gill net gear, followed by otter trawl, longline, and drift gill net gear (NEFSC 2003). In 2001 and 2002, following implementation of the Spiny Dogfish FMP, longline gear accounted for the majority of landings followed by sink gill net, and otter trawl gear (NEFSC 2003). Landings for drift gill net gear were reduced to near zero (NEFSC 2003). Sea turtles can be incidentally captured in all gear sectors of the spiny dogfish fishery. An ITS was provided in the June 2001 Opinion for the continued implementation of the FMP.

The Summer Flounder, Scup and Black Sea Bass fisheries are managed under one FMP. They are present in offshore waters throughout the winter and migrate and occupy inshore waters throughout the summer. The primary gear types used in the summer flounder, scup and black sea bass fisheries are mobile trawl gear, pots and traps, gill nets, pound nets, and handlines.

NMFS approved the first FMP for management of the summer flounder fishery in federal waters in 1988. Management measures for scup and black sea bass were subsequently added to the federal FMP under Amendments 8 and 9, respectively. Information on the status of the stocks managed by the Summer flounder, Scup, Black Sea Bass FMP, and information on the summer flounder, scup, and black sea bass fisheries were reviewed in the 41$^{st}$, 35$^{th}$, and 39$^{th}$ SAW assessment reports, respectively (NEFSC 2002, 2004, 2005a).

Summer flounder are taken principally by otter trawl. Since 1980, 70% of the commercial landings of summer flounder have come from the U.S. EEZ (NEFSC 2002). However, large variability in summer flounder landings exist among the states over time, and the percent total summer flounder landings taken from the EEZ has varied widely among the states (NEFSC 2002). Since the implementation of the annual commercial landings quota in 1993, the commercial landings have become concentrated during the first calendar quarter of the year with about 46% of the landings taken during the first quarter in 2001 (NEFSC 2002). In general, over 80% of the summer flounder landed in NMFS' Northeast Region from the commercial sector of the fishery have come from statistical areas 537-539 (Southern New England), areas 611-616 (New York Bight), areas 621, 622, 625 and 626 (Delmarva region), and areas 631-632 (Norfolk Canyon area) (NEFSC 2002). The total summer flounder landings for 2004 were 12,589 mt of which 7,748 mt were reported for the commercial sector of the fishery (NEFSC 2005a). These are substantially higher than the low of 4,200 mt landed in 1990 but also far below the peak landings of 26,100 mt reported in 1983 (NEFSC 2005a).

The otter trawl is also the principal commercial fishing gear for scup, accounting for an average 74% of the total catch in 1979-2001 (NEFSC 2002). The remainder of the commercial landings are taken by floating trap (12%), and hand lines (6%), with paired trawl, pound nets, and pot and traps each contributing 2-3%. About two-thirds of the commercial scup landings for the period 1979-2001 were in Rhode Island (37%) and New Jersey (28%). Landings in New York composed an average of 15% of the total. Landings fluctuated between 7000-10,000 mt from 1974-1986 but have since declined to less than 2000 mt per year (NEFSC 2002).

Commercial black sea bass landings in 2002-2003 were primarily from pot gear (42%), otter trawl (40%) and hook and line gear (12%) (NEFSC 2004a). Massachusetts, New Jersey, Virginia, and Maryland accounted for a majority of the landings (NEFSC 2004a).

Significant measures have been developed to reduce the take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl (which would include fisheries for other species like scup and black sea bass) by requiring the use TEDs throughout the year for trawl nets fished from the North Carolina/South Carolina border to Oregon Inlet, NC and seasonally (March 16-January 14) for trawl vessels fishing between Oregon Inlet, NC and Cape Charles, VA. Based on the occurrence of gill net entanglements in other fisheries, the gill net portion of this fishery could entangle endangered whales and sea turtles. The pot gear and staked trap sectors could also entangle whales and sea turtles. An ITS has been provided for the anticipated take of sea turtles as a result of the continued implementation of the Summer flounder, Scup, and Black Sea Bass FMP.

The effects of the Tilefish fishery on ESA-listed species were considered during formal consultation on the implementation of the Tilefish FMP, completed in March 2001. Anecdotal information available at that time suggested that loggerhead and leatherback sea turtles have been taken by hook gear in the tilefish bottom longline fishery (MAFMC 2000). Consultation was concluded on March 13, 2001, with the issuance of a biological opinion that includes an ITS for loggerhead and leatherback sea turtles.

A summary of the current tilefish fishery was provided in the 41$^{st}$ Northeast Regional Stock Assessment Report (NEFSC 2005a). 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 (MAFMC 2000). Tilefish have some unique habitat characteristics and are found in a warm water band (9-14° C) along the upper slope of the continental shelf in the southern New England and Mid-Atlantic areas at depths of 80 to 440m (NEFSC 2005a). 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. Over 75% of tilefish landings have come from this area (statistical areas 537 and 616; Appendix 2) since 1991 (NEFSC 2005a).

The directed tilefish fishery is a relatively small fishery in terms of the number of participants. Five vessels accounted for more than 49-93% of the landings during the period of 1995-2004 (NEFSC 2005a). Longline gear is the primary gear type used in the tilefish fishery. Since the 1980's, over 85% of the commercial landings of tilefish in the Mid-Atlantic/southern New England region have been taken by longline gear (NEFSC 2005a). The fishery changed from using "J" hooks to circle hooks after 1979 (NEFSC 2005a).

### 4.1.2. Non-Federally regulated fisheries

Several trap/pot fisheries, gill net and trawl fisheries for non-federally regulated species do occur in the action area. The amount of gear contributed to the environment by these fisheries is unknown.

Nearshore and inshore gill net fisheries occur throughout the Mid-Atlantic in state waters from Connecticut through North Carolina; areas where sea turtles also occur. Captures of sea turtles in these fisheries have been reported (NMFS SEFSC 2001). Two 10-14 inch mesh gill net fisheries, the black drum and sandbar shark gill net fisheries, occur in Virginia state waters along the tip of the eastern shore. These fisheries may take sea turtles given the gear type, but no interactions have been observed. Similarly, small mesh gill net fisheries occurring in Virginia state waters are suspected to take sea turtles but no interactions have been observed. During May - June 2001, NMFS observed 2% of the Atlantic croaker fishery and 12% of the dogfish fishery (which represent approximately 82% of Virginia's total small mesh gill net landings from offshore and inshore waters during this time), and no turtle takes were observed. In North Carolina, a large-mesh gill net fishery for summer flounder in the southern portion of Pamlico Sound was found to contribute to takes of sea turtles in gill net gear. In 2000, an Incidental Take Permit was issued to the North Carolina Department of Marine Fisheries for the take of sea turtles in the Pamlico Sound large-mesh gill net fishery. The fishery was closed when the incidental take level for green sea turtles was met (NMFS SEFSC 2001). Long haul seines and channel nets are also known to incidentally capture sea turtles in North Carolina sounds and inshore waters. As described in section 4.4.3.1. below, NMFS has recently taken regulatory action to address the potential for sea turtle interactions with gill net gear with 7-inch or greater stretched mesh in North Carolina and Virginia state waters.

An Atlantic croaker fishery using trawl gear also occurs within the action area. Turtle takes have been observed in Atlantic croaker trawl gear (1996 – 2007). Between the years of 1996 and 1998, five turtles (four loggerheads and one unidentified species) were taken in otter trawls targeting croaker. In October 2004, observers documented the capture of two loggerhead sea turtles in Atlantic croaker trawl gear operating off of Virginia, north of Cape Charles. Both turtles were released alive and uninjured. Lastly, in 2006 and 2007, 22 loggerhead (4 were dead) sea turtles were taken in bottom otter trawls targeting croaker. The majority (N = 14) these takes occurred in January of 2007 off the coast of Cape Hatteras, North Carolina.

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. Various crab fisheries using pot/trap gear also occur in federal and state waters such as horseshoe crab and blue crab. 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 and Musick 2001). Leatherbacks are known to become entangled in lines associated with trap/pot gear used in several fisheries including lobster, whelk, and crab species (D.Fletcher, pers. comm.. to Sheryan Epperly, NMFS SEFSC 2001; Dwyer et al. 2002).

In addition to these, NMFS is also concerned about the take of sea turtles in the Virginia pound net fishery. Pound nets with large-mesh leaders set in the Chesapeake Bay have been observed to (lethally) take turtles as a result of entanglement in the pound net leader. As described in section 4.4.3.4 below, NMFS has taken regulatory action to address turtle takes in the Virginia pound net fishery.

## 4.2. Vessel Activity

Potential adverse effects from federal vessel operations in the action area of this consultation include operations of the U.S. Navy (USN) and the U.S. Coast Guard (USCG), which maintain the largest federal vessel fleets, the Environmental Protection Agency (EPA), the Army Corps of Engineers (ACOE), and NOAA. NMFS has conducted formal consultations with the USCG, the USN and is currently in early phases of consultation with other federal agencies on their vessel operations (e.g., NOAA research vessels). Through the Section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid adverse effects to listed species. At the present time, however, there is the potential for some level of interaction.

## 4.3. Other Activities

### 4.3.1. Hopper Dredging

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 take of eight loggerhead turtles or one Kemp's ridley or green turtle. Actual dredging did not begin until May 1998, and no sea turtle takes 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 turtle due to the lack of observed takes in the previous cycle, along with the levels of anticipated and observed take in hopper dredging projects in nearby locations.

NMFS completed section 7 consultation on the Navy'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 take of ten loggerheads and one Kemp's ridley or green sea turtle during each dredge cycle. However, no takes were observed during the 1996 cycle. The Navy 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 take of four loggerheads and one Kemp's ridley or green sea turtle during each dredge cycle. NMFS concluded that this level of 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 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 entanglements. Listed species or critical habitat may also be affected by fuel oil spills resulting from vessel accidents. Fuel oil spills could affect animals directly or indirectly through the food chain. Fuel spills involving fishing vessels are common events. However, these spills typically involve small amounts of material that are unlikely to adversely affect listed species. Larger oil spills may result from accidents, although these events would be rare and involve small areas. No direct adverse effects on listed species or critical habitat resulting from fishing vessel fuel spills have been documented.

#### 4.3.3. Pollution

Sources of pollutants in coastal regions of 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 and sewage treatment effluent, and oil spills. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effect to larger embayments is unknown. Contaminants could indirectly degrade habitat if pollution and other factors reduce the food available to marine animals.

### 4.3.4. Catastrophic events

An increase in commercial vessel traffic/shipping increases the potential for oil/chemical spills. The pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986). There have been a number of documented oil spills in the northeastern U.S.

## 4.4. Reducing threats to ESA-listed sea turtles

### 4.4.1. Education and outreach activities

Education and outreach activities are considered one of the primary tools to reduce the threats to all protected species. NMFS has been active in public outreach to educate fishermen regarding sea turtle handling and resuscitation techniques. For example, NMFS has conducted workshops with longline fishermen to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines. NMFS intends to continue these outreach efforts in an attempt to increase the survival of protected species through education on proper release techniques.

### 4.4.2. Sea Turtle Stranding and Salvage Network (STSSN)

There is an extensive network of STSSN participants along the Atlantic and Gulf of Mexico coasts which 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.

### 4.4.3. Regulatory measures for sea turtles

#### 4.4.3.1. Final Rules for large-mesh gill nets

In March 2002, NMFS published new restrictions for the use of gill nets 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 gill net 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, gill nets with larger than 8 inch stretched mesh were 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 gill net restrictions. Specifically, the new final rule revises the gill net restrictions to apply to stretched mesh that is 7 inches or greater and extends the prohibition on the use of such gear to North Carolina and Virginia state waters. Federal and state waters north of Chincoteague, VA remain unaffected by the large-mesh gill net restrictions. These measures are in addition to Harbor Porpoise Take Reduction Plan measures that prohibit the use of large-mesh gill nets in southern Mid-Atlantic waters (territorial and federal waters from Delaware through North Carolina out to 72° 30'W longitude) from February 15-March 15, annually.

NMFS has also issued a rule addressing takes of sea turtles in gill net gear fished in the southern flounder fishery in Pamlico Sound. NMFS issued a final rule (67 FR 56931), effective September 3, 2002, that closes the waters of Pamlico Sound, NC, to fishing with gill nets 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. lat., north of 35°00' N. lat., and east of 76° 30' W. long.

#### 4.4.3.2. Revised use of TEDs for the Southeast and Gulf of Mexico Shrimp Fishery

On February 21, 2003, NMFS issued a final rule to amend regulations protecting sea turtles to enhance their effectiveness in reducing sea turtle mortality resulting from shrimp trawling in the Atlantic and Gulf Areas of the southeastern United States. 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 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.

#### 4.4.3.3. TED requirements for the summer flounder fishery

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

#### 4.4.3.4. 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 or greater (20.3 cm) 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 meters) 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 of May 6 to July 15 each year. Modifications to the pound net leader address: the maximum allowed mesh size, placement of the leader in relation to the sea floor, the height of the mesh from the sea floor in relation to the depth at mean lower low water, and 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).

#### 4.4.3.5. HMS sea turtle protection measures

As described in Section 4.1.1 above, NMFS completed the most recent biological opinion on the FMP for the Atlantic HMS fisheries for swordfish, tuna, and shark on June 1, 2004, and concluded that the Atlantic HMS fisheries, particularly the pelagic longline fisheries, were 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 operation of the HMS fisheries. Although the Opinion did not conclude jeopardy for loggerhead sea turtles, the RPA is also expected to benefit this species by reducing mortalities resulting from interactions with the gear. Regulatory components of the RPA have been implemented through rulemaking.

#### 4.4.3.6. 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) then modified by an emergency rule (71 FR 66466, November 15, 2006). The current regulations require 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° 9.0'N from the shoreline to the outer boundary of the EEZ during the period of May 1 through November 30 each year. The gear modification is expected to reduce the severity (e.g., mortality and serious injury) of some sea turtle interactions with scallop dredge gear. However, the gear modification is not expected to reduce the number of sea turtle interactions with scallop dredge gear. Based on the condition of turtles observed captured in the dredge bag of scallop dredge gear as well as the configuration of the gear and fishing method, interactions are likely occurring both on or near the bottom and in the water column. The chain mat is intended to keep turtles out of the dredge bag thus preventing injuries that occur to turtles once they are in the bag (e.g., crushing in the dredge bag, crushing on deck). Use of the chain mat on scallop dredges is not expected to eliminate or reduce injuries to sea turtles that occur as a result of the turtle coming into contact with that part of the scallop dredge gear forward of the chain mat (e.g., the frame and the cutting bar) when the gear is fishing on or near the bottom. Additional information on the use of chain mats in the fishery is presented in section 5.4.

#### 4.4.3.7. Sea turtle handling and resuscitation techniques

NMFS also 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.

#### 4.4.3.8. Sea turtle entanglements and rehabilitation

A final rule (70 FR 42508) published on July 25, 2005, allows any agent or employee of NMFS, the FWS, 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)).

## 4.5 Summary and synthesis of the status of species and environmental baseline

Sections 3.1.1 through 3.1.4 summarized the numerous hazards that loggerhead, leatherback, Kemp's ridley, and green sea turtles have been and continue to be exposed to in the action area and on a global scale. The hazards that appear to be having the greatest impact on these listed species are entanglements in fishing gear and poaching (of eggs from nests as well as mature animals). Other phenomena with anthropogenic causes, like water pollution and the disruption of marine food chains, may contribute to the status and trend of sea turtle subpopulations/ populations in the action area, although the specific impacts of these phenomena on these listed species remains unknown. Given what we do know, the aggregate impact of the environmental baseline on the status of loggerhead, leatherback, Kemp's ridley, and green sea turtle subpopulations/populations that occur in the action area can be summarized as follows.

Loggerhead Sea Turtles. NMFS recognizes that there are at least five subpopulations of loggerhead sea turtles in the western Atlantic. Cohorts from all of these are expected to occur within the action area (Bass et al. 2004). The south Florida nesting group is the largest known loggerhead nesting assemblage in the Atlantic and one of only two loggerhead nesting assemblages worldwide that have greater than 10,000 females nesting per year (Ehrhart et al. 2003, USFWS and NMFS 2003). The northern subpopulation is the second largest loggerhead nesting assemblage within the United States. The remaining three western Atlantic subpopulations (the Dry Tortugas, Florida Panhandle, and Yucatán) are much smaller subpopulations with nest counts of roughly 100 - 1000 nests per year.

The primary known threats to loggerhead sea turtles in the Atlantic are: fishing gear associated with fisheries in U.S. state and federal waters, and international waters; poaching, development and erosion on their nesting beaches, and ingestion of marine debris. Given the geographic range of loggerhead sea turtles at various life history stages, loggerheads may be affected by human activities far from the nesting beach. For example, Laurent et al. (1998) found that approximately 47% of pelagic loggerhead juveniles captured in the western Mediterranean longline fisheries originated from western Atlantic subpopulations. In and near the action area, loggerhead turtles are captured and injured or killed in interactions with fishing gear that includes pound net leaders, whelk pots, gill nets, pelagic longlines, trawls, and scallop dredges. Injuries and mortalities may also occur as a result of entrainment in power plant intakes or as a result of dredging for channel maintenance and beach nourishment projects within or adjacent to the action area. A recent study by Bowen et al. (2004) lends support to the hypothesis that juvenile loggerhead sea turtles exhibit homing behavior with respect to using foraging areas in the vicinity of their nesting beach. Therefore, coastal hazards that affect declining nesting populations may also affect the next generation of turtles when they are feeding in nearby habitats (Bowen et al. 2004).

NMFS is working to address loggerhead captures and mortality in many of the U.S. fisheries known to capture and injure or kill sea turtles. In 2003, NMFS issued a final rule that required increasing the size of TED openings to allow larger loggerheads to escape from shrimp trawl gear. As a result of the new rules, annual loggerhead mortality from capture in shrimp trawls is expected to decline from 62,294 to 3,947 turtles (Epperly et al. 2002). New rules have also been implemented in recent years for reducing turtle interactions and mortality in the U.S. pelagic longline fishery, the Virginia pound net fishery, the large-mesh gill net fisheries in federal waters off of North Carolina and Virginia, and the large-mesh southern flounder fishery in Pamlico Sound, NC. Most recently, NMFS has proposed regulatory measures that require modification of scallop dredge gear to reduce serious injuries and mortality of sea turtles that interact with scallop dredge gear.

Loggerheads are a long-lived species and reach sexual maturity relatively late (NMFS SEFSC 2001). The benefits of the most recently promulgated measures to address loggerhead capture and mortality in U.S. Atlantic fisheries may not be evident on the nesting beaches for many years given the late age to maturity. The most recent modeling data suggests that the change in TED regulations to increase survival of large, benthic immature and sexually mature loggerheads would have a positive or at least a stabilizing effect on subpopulation growth (NMFS SEFSC 2001). Nevertheless, NMFS recognizes that there are still many threats to the survival of loggerheads of various age classes both within and outside of U.S. jurisdiction.

Leatherback Sea Turtles. Leatherback sea turtles are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, and Indian Oceans, the Caribbean Sea, and the Gulf of Mexico (Ernst and Barbour 1972). 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 had declined to 34,500 (Spotila et al. 1996).

In the Pacific Ocean, the abundance of leatherback turtles on nesting colonies has declined dramatically over the past 10 to 20 years. Nesting colonies throughout the eastern and western Pacific Ocean have been reduced to a fraction of their former abundance by the combined effects of human activities that have reduced the number of nesting females, and by egg poaching. At current rates of decline, leatherback turtles in the Pacific basin are a critically endangered species with a low probability of surviving and recovering in the wild.

Leatherback populations in the eastern Atlantic (i.e., off Africa) and in the Caribbean appear to be stable, but there is conflicting information for some sites (Castroviejo et al. 1994; Troeng et al. 2004; Dutton et al. 2005) and it is certain that some nesting populations (e.g., St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS and USFWS 1995). Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1-11.5% increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NMFS SEFSC 2001). The largest leatherback rookery in the western Atlantic remains along the northern coast of South America in French Guiana and Suriname. More than half the present world leatherback population is estimated to be nesting on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana (Hilterman and Goverse 2004). 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. (2006) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing.

Fishing gear associated with fisheries in U.S. state and federal waters, and in international waters as well as poaching, development and erosion on their nesting beaches, and ingestion of marine debris are the primary known threats to leatherback turtles in the Atlantic Ocean. In and near the action area, leatherback turtles are captured and injured or killed in interactions with fishing gear that include gill nets, trawl gear, and trap/pot gear.

Kemp's Ridley Sea Turtles. The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). Estimates of the adult female nesting population reached a low of 300 in 1985. From 1985 to 1999, the number of nests observed at Rancho Nuevo, and nearby beaches increased at a mean rate of 11.3% per year. Current totals exceed 3000 nests per year, allowing cautious optimism that the population is on its way to recovery (TEWG 2000). However, like loggerhead sea turtles, Kemp's ridley sea turtles are affected by a number of anthropogenic and natural effects. Anthropogenic effects include fishing gear associated with fisheries in State, Federal and international waters; poaching, development and erosion on their nesting beaches. In and near the action area, Kemp's ridley sea turtles are captured and injured or killed in interactions with fishing gear such as gill nets and trawls, and are also injured or killed as a result of being struck by vessels operating within the action area. Nesting data suggests that this population is increasing despite the cumulative effects of these impacts. However, caution is warranted given that the estimated 2,000 nesting females in the current population is still far below historical numbers (Stephens and Alvarado-Bremer 2003).

Green Sea Turtles. Green turtles are distributed circumglobally in tropical and subtropical waters (NMFS and USFWS 1998b). Juveniles are also known to occur seasonally in temperate waters (Musick and Limpus 1997, Morreale and Standora 1998). Green sea turtle populations have declined in many areas. Using data collected from 32 Index Sites distributed globally, Seminoff (2004) estimated as much as a 48% to 67% decline in the number of mature females nesting annually over the last 3-green sea turtle generations (Seminoff 2004).

In all oceans, green turtles continue to be affected by poaching, fishing gear interactions, habitat degradation, and disease (notably fibropapillomatosis) (NMFS and USFWS 1998b, NEFMC 2004c). In the western Atlantic, green turtles range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999) and are exposed to many of the same anthropogenic threats as loggerhead and Kemp's ridley sea turtles. 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. Sea sampling coverage in the pelagic drift net, pelagic longline, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles. Stranding reports indicate that between 200-400 green turtles strand annually along the Eastern U.S. coast from a variety of causes most of which are unknown (STSSN database).

In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in 1989. Similarly, Seminoff (2004) reviewed the population estimates for green sea turtles at five western Atlantic nesting sites for which there was historical data for comparison, and concluded that all but one site demonstrated evidence of increased nesting. However, age at sexual maturity for green sea turtles is estimated to be between 20 to 50 years (Balazs 1982, Frazer and Ehrhart 1985). The U.S. index beach sites were only established in 1989, and four of five sites reviewed by Seminoff (2004) had historical nesting information dating back only as far as the 1970's and early 1980's. Thus, caution is warranted about over interpreting existing green sea turtle nesting trend data for the western Atlantic.

## 5.0. EFFECTS OF THE PROPOSED ACTION

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

The purpose of this assessment is to determine if it is reasonable to expect that the NEFSC research activities occurring off the mid-Atlantic, Georges Bank, and the Gulf of Maine, will have direct or indirect effects on threatened and endangered species (i.e., loggerhead, leatherback, Kemp's ridley and green sea turtles) that will appreciably reduce their likelihood of both survival and recovery in the wild by reducing the reproduction, numbers or distribution of that species (which is the "jeopardy" standard defined in 50 CFR 402.02).

### 5.1. Description of the gear used

#### 5.1.1. Trawling

The NEFSC research activities will include the use of both bottom and midwater trawls. During the years of 2007 – 2009, 1,005 – 1,720 individual tows will be completed each year; the majority of which will use bottom trawls (97.7%) that are towed at approximately 2 – 3.8 knots for 20 – 30 minute intervals. Trawls are cone-shaped nets that are towed on the bottom (i.e., bottom trawls) or through the middle of the water column (i.e., midwater trawls). They employ large rectangular doors attached to two cables used to tow the net to keep the mouth of the net open while deployed. The bottom of an otter trawl mouth is called the foot rope or ground rope, which can bear many heavy (tens to hundreds of kilograms) steel weights (bobbins) that keep the trawl on the seabed. Bottom trawls may be constructed with large (up to 40 cm in diameter rubber discs or steel bobbins (rock hoppers) that can ride over structures such as boulders and coral heads that might otherwise snag the net. Some bottom trawls are constructed with tickler chains that disturb the seabed ahead of the mouth of the net to flush the target species into the water column and into the net. The back of the net is called the cod end. The NEFSC uses seven separate types of trawls: 1) Winter flat-net bottom trawl, 2) 36 Yankee bottom trawl, 2) 4-seam, 3-bridle bottom trawl, 3) 4-seam, 3-bridle bottom trawl, 4) ASMFC northern shrimp survey trawl, 5) Gourock high speed midwater rope trawl, 6) IYGPT midwater trawl, and 7) Irish 19x17 herring midwater trawl:

- The winter flat-net bottom is 219.5 ft in length (door to wing) and uses 450 kg Portuguese Polyvalent oval doors. The average door spread is 63 m, average wingspread 13 m, and an average headrope height is approximately 1 meter. The wings and body of the trawl utilize 6 inch polyethylene (PE) mesh. The codend is 6.5 inch PE mesh with 0.5 inch knotless nylon liner in the aft belly and codend. The flat sweep (a.k.a. cookie sweep) is 80 ft long. The center section is 16 ft of 5/8 inch chain covered with 4.5 inch rubber disks (i.e., cookies). Each 32 ft wing section is 0.5 inch ground chain comprised of 15 links each, spaced every eight links on the sweep chain. There is one 17-link bight, spaced 10 links, on the first portion of each wing. The outer wing ends have five bights of 17 links of 0.5 inch ground chain spaced every eight links. The gear is towed at 3.8 knots for 30-minute tow intervals in 2007 only. This net and survey will be discontinued after 2007.
- The 36 Yankee bottom trawl is 39.5 ft in length (door to wing) and uses 450 kg Portuguese Polyvalent oval doors. The average door spread is 21 m, average wingspread 11 m, and the average headrope height is 1.5 – 2.0 meters. The wings and body of the trawl utilize 5 inch polyethylene (PE) mesh. The codend is 4.5 inch PE mesh with 0.5 inch knotless nylon liner in the aft belly and codend. The 80 ft long roller sweep is comprised of 19, 16 inch x 5 inch hard rubber rollers in the center spaced 15 inches apart. The remaining portion of the sweep (out to the wing tips) is 4 inch rubber disks. The gear is towed at 3.8 knots for 30-minute tow intervals in 2007 and 2008.
- The 4-seam, 3-bridle standard bottom trawl will be replacing the winter flat-net and 36 Yankee bottom trawls in 2008 and 2009. It is anticipated that the trawl will be 132 ft in length (door to wing) and use 66 inch Thyboron Type IV doors. Based on experimental testing, the average door spread is 32 m, 13 m wing spread, and 5 m headrope height. The forward section of the trawl utilizes 12 cm, 4 mm green PE webbing. The 1$^{st}$ lower belly is 12 cm, 4mm mesh also. The back sections of the trawl are 6 cm, 2.6 mm PE webbing. Selvedge, codend and jibs use 12 cm, double 4 mm webbing. The current design of this trawl utilizes two separate sweep designs, a rockhopper and flat sweep. Both sweeps are 83 ft long. The flat sweep is made of ¾ inch wire rope covered by 3 inch x 1 inch rubber cookies. The center section (29ft) has 112, 1.33 lbs lead evenly spaced throughout. Each wing section (27 ft) has 22, 1.33 lbs leads spaced evenly throughout. The rockhopper is strung on ¾ inch IWRC wire rope. The center section (29 ft) of the rockhopper sweep is made of 16 inch rubber rockhoppers with four 16 inch floppy disks between each rockhopper (30 rockhoppers, 166 floppies total in center), with 5 inch filler rubber. Each wing section (27 ft) is made of 14 inch rubber rockhoppers with two 14 inch rubber floppy disks between each rockhopper (27 rockhoppers, 52 floppies total on each wing) with 5 inch filler rubber. One-hundred pounds of lead is evenly spaced in the center

section and 20 lbs of lead is evenly spaced on each wing section between the 20th and 27th rockhoppers. The gear is towed at 2.0 – 3.2 knots for 20-minute tow intervals.

- The ASMFC northern shrimp trawl is 68 ft in length (door to wing) and uses 350 kg Portuguese Polyvalent oval doors. The average door spread is 30 – 35 m, average wingspread 13 m, and the average headrope height is 1.0 – 1.5 meters. The wings and body of the trawl utilize 1.63 inch black twisted nylon webbing. The codend is 1.25 inch black twisted nylon webbing. The 77.25 ft long roller sweep is comprised of 0.63 inch wire rope covered by 3 inch rubber cookies. The center section (8.25 ft) has six 14 inch rubber disks spaced 18 inches apart. Each wing section (34.5 ft) has 15, 10 inch rubber disks spaced 23 inches apart. A 0.57 inch bolshline is passed through a hole in each rubber disk and seized to the footrope between each disk to attach the sweep to the trawl. The gear is towed at 2.0 knots for 15-minute tow intervals in 2007 and 2008.
- Two High Speed Midwater Rope Trawl (HSMRT) were purchased from Gourock in 1997 for the NEFSC fisheries acoustic surveys. This pelagic four-seam rope trawl was designed with ropes instead of meshes in the wings to reduce drag so the trawl can be fished at higher speeds (up to 5.0 knots) so it can be used to capture a wide variety of pelagic fish and squid, including fast swimming mackerel. The HSMRT trawls are typically fished at 3.8-4.5 knots and have a mouth opening of roughly 15m vertically and 28m horizontally. Midwater doors used with the HSMRT are US Jet 1.8 sq m suberkrub type doors.
- The International Young Gadiod Pelagic Trawl (IYGPT) was originally designed as a small pelagic trawl for capturing young of the year cod and haddock. The NEFSC used the IYGPT trawl during juvenile gadiod studies during the mid-1980's and in recent years during the deep water studies. Although some attempts were made to use the IYGPT with over-sized doors (4 sq m Morgere doors), recent studies successfully utilized the US Jet 1.8 sq m doors with the IYGPT trawl deployments.
- The Irish 19x17 Herring Midwater Trawl (IHMT) is a new pelagic trawl delivered with the FRV Henry Bigelow, and will likely be the midwater trawl utilized on future NEFSC pelagic trawl and fisheries acoustic surveys. The IHMT has a similar net opening to the HSMRT, however the wings are netted (as opposed to just rope). Although this may prevent the ability to tow at speeds higher than 4.0 knots, this design is much easier to deploy in comparison to the rope trawl design.

### 5.1.2. Scallop Dredge

Scallop dredges are generally defined by the width of their frame with most commercial vessels towing either two 15-foot dredges in limited access areas (NEFMC 2003) or one 10.5-feet dredge if the commercial fishermen operate under a small dredge permit. The NEFSC sea scallop survey uses a "NEFSC 8-foot scallop dredge" equipped with a 2-inch ring chain bag and lined with 1-1/2 inch mesh webbing to retain small scallops. The dredge is towed at 3.8 knots for 15-minute tow intervals. Regardless of the frame width, the gear operates similarly. The front of the steel frame usually rides off the sea floor except in rocky locations where it might hit (Smolowitz 1998). The cutting bar, which is located on the bottom aft part of the frame, rides about four inches off of the seabed (Smolowitz 1998). In a flat area, it remains off of the bottom but in areas of sand waves, for example, the cutting bar hits the top of the sand waves and tends to knock them out (Smolowitz 1998). Shoes on the cutting bar in contact with and ride along the substrate surface (Northeast Region Essential Fish Habitat Steering Committee - NREFHSC 2002). A sweep chain in the form of an arc is attached to each shoe and the bottom of the ring bag (Smolowitz 1998). The bag is made up of metal rings with chafing gear on the bottom and twine mesh on the top (allows finfish to escape), and drags on the substrate when towed (NEFMC 2003). The very end of the ring bag is the club stick which is responsible for maintaining the shape of the ring bag, especially while on deck (Smolowitz 1998). A standard 15-foot dredge frame weighs about 2500 lbs; the dredge bag with chains and club stick weighs another 2000 lbs totaling 4500 lbs; although variations in materials may affect this weight by approximately +/- 15% [Letter from William DuPaul (VIMS) to Kelly Taranto (NEFSC) dated February 6, 2007].

As described in section 4.4.3.6 above, NMFS has recently published a final rule that requires federally permitted scallop vessels fishing with dredge gear to modify their gear by adding a chain mat between the sweep and the cutting bar when fishing in Mid-Atlantic waters south of 41° 9.0' N from the shoreline to the outer boundary of the EEZ during the period of May 1 through November 30 each year. However, because the NEFSC scallop dredge survey is conducting a standardized research survey it does not the meet either the definition of "fishing" under the MSA or the vessel permit requirement in 50 CFR 684.4(a)(2). As a result, the NEFSC Scallop Dredge Survey is not required to use a chain mat per this regulation (71 FR 66466, November 15, 2006).

## 5.2. Effects of capture in trawl and scallop gear

There are many factors that might contribute to the likelihood of a sea turtle becoming captured in trawl and scallop gear including a sea turtle's reaction to oncoming gear, attraction to the project area because of the presence of prey, geographical or oceanographic features. Observations by divers working with other types of trawl gear have found that turtles are unlikely to deviate from the path of oncoming gear and will instead keep swimming in front of it until they are caught or the trawl is removed (e.g., hauled up). Turtles have also been observed to dive to the bottom and hunker down when alarmed by loud noise or gear [Memo to Lynn Lankshear (NERO) from Cheryl Ryder (NEFSC) dated July 17, 2002], which could place it in the path of bottom trawl gear. Based on the known seasonal migrations of sea turtles and the temperature dependent movements as mentioned earlier, it is expected that two of the four species (leatherback and loggerhead) outlined above are more likely to occur in the spring, summer, and fall seasons while the NEFSC research activities are taking place off New York, New Jersey and Maryland, while the waters off of North Carolina and Virginia may have all four endangered and threatened species of sea turtles (outlined above) present during all phases of sampling (Shoop and Kenney 1992, Department of the Navy 2005).

There are two general risks to sea turtles as a result of interactions with trawl and/or dredge gear. These are forced submergence, and contact injuries.

### 5.2.1. Forced Submergence

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 showed that mortality was strongly dependent on trawling duration, with the proportion of dead or comatose 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 turtles 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, forcibly submerged turtles rapidly consume oxygen stores, and as a result activate anaerobic glycolysis causing acid-base balances to flux, 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.

Epperly et al. (2002) updated and re-analyzed the data set used by Henwood and Stuntz, and followed the recommendations of the NRC to reexamine the association between tow times and sea turtle deaths. The findings of Epperly et al. (2002) were comparable to Henwood and Stuntz (1987) but with some modifications. Epperly et al. (2002) concluded that, in general, tows of short duration have little effect on the likelihood of mortality for sea turtles caught in the trawl gear. Intermediate tow times result in a rapid escalation to mortality, and eventually reach a plateau of high mortality, but will not equal 100 percent as a turtle caught within the last hour of a long tow will likely survive (Epperly et al. 2002). Epperly et al. (2002) further concluded that the stress of being captured in a trawl is greater in cold water than in warm water, and gave the example that a 40 minute tow in the summer time was predicted to have a 3% mortality rate whereas a 40 minute tow in the winter time was predicted to have a 5% mortality rate. To achieve a negligible mortality rate (defined by the NRC as < 1 %), tow times for both seasons would have to be less than 10 minutes (Epperly et al. 2002). The NEFSC research trawl and scallop surveys are typically less than 30 minutes in duration. To date, the only trawl surveys to incidentally take sea turtles are the seasonal (Winter, Spring, Autumn) bottom trawl surveys. Currently, seasonal bottom trawl surveys are 30-minute hauls; however, in 2008 and 2009+ the tow time will be reduced to 20-minute intervals using the new 4-seam, 3-bridle survey trawl. Although, no takes have been observed the NEFSC scallop dredge survey (15-minute tow intervals), take has been observed in the commercial scallop dredge fishery. The occurrence of sea turtles in the commercial dredge fishery may be a result of tow time, as the majority of scallop dredge hauls (84%) that were observed to take turtles in the period 1996 - 2002 were between 45-80 minutes in duration. Assuming that the mortality rate for sea turtles from forced submergence in the NEFSC bottom trawl or dredge gear is comparable to mortality rates reported by Epperly et al. (2002), it is likely that sea turtle mortality rates will range between 1% and 5%.

### 5.2.2. Contact Injuries

There are several ways that a turtle might suffer cracks to the carapace and/or plastron during interactions with bottom trawl or scallop dredge gear; however, contact injuries are less likely to occur in trawl gear. As described above, scallop dredge gear is heavy and fishes with part of the gear in contact with the bottom. Given the shallow height of the frame, including the cutting bar, above the seabed as well as the weight of the gear and the force of its being towed along the bottom, it is reasonable to believe that a sea turtle occurring in the path of the dredge on or very near the bottom would suffer cracks to the shell (carapace and/or plastron) as a result of being struck by the dredge, and passing under the gear that is forward of the dredge bag opening before passing into the dredge bag. Once the turtle is in the dredge bag, it may be injured by large rocks that are also caught in the dredge bag. A fishery observer report of a sea turtle taken in 1999 (commercial scallop dredge fishery) indicated that there were large rocks in the bag along with the sea turtle, which had sustained a cracked carapace suggesting that the boulders may have caused the injury. Under typical fishing operations, the NEFSC dredge is hauled to the surface at the end of each tow, lifted above the deck of the vessel and emptied by turning the bag over. After the bag is dumped, the dredge frame is often dropped on top of the catch. So the dumping of the catch and the sudden lowering of the gear onto the deck are both times when turtles captured in the gear could be injured as a result of crushing and/or falls to the deck. To date, only one of the 61 sea turtles (all loggerheads) captured in the NEFSC bottom trawl and dredge surveys has been reported as injured. The lethally injured loggerhead sea turtle was captured in 1999 during a bottom trawl survey, and was brought onboard with a cracked carapace likely as a result from colliding with the trawl doors (Wesley Patrick pers. comm. with Linda Despres, NEFSC, Memo to the Record July 31, 2007).

### 5.2.3. Other Impacts

Other potential effects of this study on sea turtles are found in the destruction of benthic habitat caused by the trawl or dredge tow. Bottom trawl and dredge gear, when it contacts the bottom, will create a path of disruption in the benthic sediment. This may affect sea turtles by destroying important foraging habitat. Also, this disruption of the sediments may cause an increase in turbidity, thus potentially making it difficult for sea turtles to locate prey. Most sedentary organisms associated with the bottom sediment will likely be destroyed by the trawl/dredge tows. Most motile organisms, such as crabs and finfish, would probably be able to avoid the trawl/dredge gear. Re-colonization of the areas is expected to be rapid; studies have indicated that pre-dredging conditions in a channel can be reestablished in as little as one month after the dredging ceases. Therefore, habitat is expected to reestablish itself shortly after the survey has ended at each station. While the prey base for foraging sea turtles may be affected by the trawling/dredging within the action area, the small area of bottom that may be impacted by the survey make this potential effect insignificant. Sea turtles are highly mobile animals and will likely continue to forage and pursue prey in nearby areas.

## 5.3. Trawl – In General

The incidental take of sea turtles in otter trawls has been extensively documented. Sea turtle takes have occurred in several southern and mid-Atlantic fisheries including the U.S. shrimp trawl fishery (TEWG 1998, 2000), the Mid-Atlantic summer flounder winter trawl fishery (TEWG 1998, 2000; Murray 2006), Delaware horseshoe crab fishery (Spotila et al. 1998), the whelk trawl fishery in South Carolina and Georgia (NMFS SEFSC 2001), the Mid-Atlantic long and short-finned squid bottom trawl fishery (Murray 2006), the Mid-Atlantic groundfish trawl fishery (Murray 2006), and the croaker-weakfish fly-net trawl fishery (Murray 2006). However, the interaction between bottom trawl gear and sea turtles in more northern areas (i.e., Georges Bank and Gulf of Maine) is consider minor, as only one observed take (a loggerhead) has been recorded in NMFS observer coverage spanning from 1989 – 2005 (John Boreman Memo to Patricia Kurkul, dated March 16, 2005). Similarly, a survey conducted by Manomet Center for Conservation Science in 1998-1999 on the Stellwagen Bank groundfish fishery observed no takes of turtles, with high levels of observer coverage. A more complete study on the use of composite mesh codends that was completed in the Gulf of Maine under the auspices of the Northeast Consortium during 2000-2001 had a high proportion of observed trips and did not observe any sea turtle takes.

## 5.4. Dredge – In General

Sea turtles observed caught in scallop dredge gear are often injured; usually with damage to the carapace and/or plastron. Of the 62 sea turtles observed captured in commercial scallop dredge gear during the 1996-2006 fishing years only 4 were fresh dead (Murray 2004a, 2004b, 2005, 2006, 2007). However, many more of the turtles had injuries that appeared to be severe (e.g., cracks to the carapace and/or plastron with underlying soft tissue visible in some cases). Regulations require that fishermen return all turtles (regardless of injuries) to the water as soon as possible unless they require resuscitation. Based on the descriptions provided by the observers, it seemed probable that some of the injured turtles returned to the water alive would subsequently die as a result of those injuries. NMFS developed and defined three categories for making serious injury determinations for sea turtles captured in scallop dredge gear (Memo from Mary Colligan to Patricia A. Kurkul dated September 23, 2004). These categories were based on the advice of a panel of experts with experience in the treatment and care of sea turtles after their review of observer reports that documented sea turtle interactions with scallop dredge gear. To more fully assess the effects of the scallop fishery on sea turtles, the final working guidance also assigned rates of survival for each category. These are: for Category I injuries - 0% chance of survival; for Category II injuries - 50% chance of survival; for Category III injuries - 100% chance of survival (Memo from Mary Colligan to Patricia A. Kurkul dated September 23, 2004). To date, there have been no studies that have investigated the survivability of sea turtles following release from a scallop dredge, or their ability to function and reproduce. Therefore, it is possible that some turtles with Category III injuries will be seriously injured. Likewise, it is also possible that some turtles with Category I injuries will not die, otherwise fail to function or reproduce. Nevertheless, NMFS believes that they are reasonable measures of what to expect for sea turtles captured by scallop dredge gear, including that some sea turtles captured in scallop dredge gear and released back into the water alive will likely die as a result of those injuries.

Based on the final working guidance and observer reports, NMFS expects 64% of the turtles observed captured in 2003 commercial scallop dredge fishery suffered serious injuries (NMFS 2006).

### 5.5. NEFSC Research Trawl and Dredge Surveys

Determining the likelihood of capturing sea turtles in trawl gear is somewhat difficult to assess since the primary factors causing these interactions are unknown (e.g., tow time, trawl width, trawl depth, etc). However, it is reasonable to assume that the likelihood of interaction would be greater in areas where turtle abundance is higher. The NEFSC trawl surveys take place in areas and at times when sea turtles are expected to occur, namely the Mid-Atlantic and New York Bights (ranging from North Carolina to Rhode Island). Sea turtles are present in relatively high abundances during the spring, summer, and fall months; especially for temperature dependant loggerhead, green, and Kemp's ridley sea turtles. In more northern waters (i.e., Gulf of Maine and Georges Bank) sea turtles are also present, but abundances are relatively low. Shoop and Kenney (1992), as well as the Department of the Navy (2005) noted that sea turtle density in the Gulf of Maine and Georges Bank areas were practically zero throughout the year, except during the summer when loggerhead and leatherback sea turtles were observed in and around Georges Bank.

Given the distribution of sea turtles and the NEFSC trawl surveys, the risk from trawl gear would be expected to be greatest in Mid-Atlantic Bight (North Carolina to Maryland) during the fall and spring months (currently, there are no summer trawl surveys), while interactions may also occur further north in the New York Bight (Delaware to Rhode Island) but to a lesser extent. This assumption is further qualified by previous NEFSC trawl surveys (identical to those being reviewed in this opinion) that have incidentally captured 62 sea turtles during 35,571 tows. Of the 62 sea turtle takes (all loggerhead sea turtles), the majority were captured during the NEFSC Fall (74%) and Spring bottom trawl survey (22%) (Figure 5). The NEFSC winter trawl bottom trawl survey has only captured two sea turtles in over 3,026 tows, the latest occurring in February, 2007. The majority of these takes occurred off the coasts of North Carolina, Virginia, and Maryland (Figure 5). Other NEFSC trawl surveys being reviewed in this Opinion have not observed any takes, most likely due to the fact that they are located north of Maryland either in the Gulf of Maine/Georges Bank (i.e., Herring Acoustic Survey, Georges Bank Benthic Habitat Survey and ASMFC Northern Shrimp Survey) or New York Bight (i.e., Mid-Atlantic Benthic Habitat Survey) where turtle density is low during the fall and winter months, and their effort is relatively low (< 60 tows/year) compared to the NEFSC bottom trawl surveys (> 300 tows/year).

Unlike the NEFSC bottom trawl surveys, the NEFSC scallop dredge survey has yet to incidentally capture a sea turtle in their 8-foot scallop dredge in over 15,218 tows (ranging from North Carolina Coast to Georges Banks). This observation is unexpected, since commercial scallop fishermen operating in the same area (North Carolina to Rhode Island) and timeframe (July - August) incidentally capture sea turtles at an average rate of 0.00161 per hour of towing (Table 1; May – June and August – September Average Rates; Murray 2004a). Based on the average rate of interaction (0.00161 turtles/hr), correcting for width of NEFSC beam (8ft/13.3ft = 0.60; Table 2) and the number of hours that the NEFSC scallop dredge has been towed (15,218 tows; 15-minute intervals), approximately 3 sea turtles should have been observed (expected NEFSC scallop dredge bycatch rate: 0.00161 turtles/hr * 0.60 * 1hr/4 tows = 0.0002 turtles/15-min tow). It is unknown why there has been no sea turtles observed, as all survey vessels are staffed by crew who have the training to identify sea turtle species and document the interaction. Therefore, the lack of documented observations of sea turtle captures in scallop survey dredge gear is not the result of a failure to identify or report such events.

There are three possible explanations for the absence of observed sea turtle captures in scallop survey dredge gear: (1) turtles are able to avoid interactions with scallop survey dredge gear, (2) turtles are being struck by the dredge frame but are not captured in the dredge bag, or (3) no turtle interactions with any part of scallop survey dredge gear have yet occurred. Based on the information available, however, NMFS believes that neither 1 nor 2 provide a reasonable explanation for the lack of observed sea turtle captures in scallop survey dredge gear. In order for 1 to be true, turtles would have to be avoiding all contact with the scallop survey dredge. There is no information to suggest that the differences between a scallop survey dredge and a commercial dredge prevent turtle interactions with scallop survey dredge gear. While the survey dredge is smaller in width than the typical commercial scallop dredge, turtles have been observed captured in commercial dredge gear as small as 10 feet in width (Murray 2005). The scallop survey dredge has a lower profile (distance between the foot and the pressure plate) in comparison to a commercial scallop dredge (letter from VIMS to the NMFS, February 6, 2007). However, while this might prevent a large turtle from getting past this part of the dredge frame and into the dredge bag, to reach that point of the dredge frame the turtle would have already have been struck by that part of the frame that is forward of the shoe and pressure plate. Finally, a scallop survey dredge is typically towed at a slower rate of speed than a commercial dredge (letter from VIMS to NMFS, dated February 6, 2007). However, the difference is relatively small; 3.8-4 knots for a survey dredge and 4-5 knots for a commercial dredge (NREFHSC 2002; Murray 2004b, 2005). Sea turtles have been observed captured in commercial scallop dredge gear hauled at speeds of 4.0 knots (Murray 2004b) suggesting that the towing speed for a scallop survey dredge would not be a factor in preventing turtle interactions with the gear.

With respect to 2, above, some component of the scallop survey dredge would have to be different from a commercial dredge to the extent that it prevented turtles from being struck by the gear when it was on the bottom and/or entering the dredge bag, and prevented turtles encountered in the water column from entering the dredge bag. As mentioned above, the scallop survey dredge has a lower profile than the typically used 15-foot commercial dredge; 16.5 inches for a survey dredge (letter from VIMS to NMFS, February 6, 2007) compared to 22.5 inches for a 15 foot commercial dredge [Letter from William DuPaul (VIMS) to Kelly Taranto (NEFSC), dated February 6, 2007]. Nevertheless, NMFS does not believe that the lower profile would prevent turtles from entering the dredge bag since the estimated body depth measurement for sea turtles observed captured in commercial scallop dredge gear ranged from 7.9 to 15.4 inches. These figures are based on the range of curve carapace length (CCL) measured (not estimated) by observers for turtles captured in scallop dredge gear ((NEFSC, FSB, Observer database; Murray 2005), converted to straight carapace length (Teas 1993) and then to body depth (Epperly and Teas 2002) and reported here in inches. The largest of the turtles observed captured in 10-foot wide commercial scallop dredges were each 80cm CCL. Using the equations referenced (Teas 1993, Epperly and Teas 2002) the estimated body depth of the turtles would be 11.3 inches. Thus, it does not seem probable that the absence of observed captures of sea turtles in scallop survey dredge gear is the result of struck turtles being excluded from the dredge bag due to the lower profile of the survey dredge frame.

The most reasonable explanation for the absence of any observed capture of sea turtles in scallop survey dredge gear is that an interaction just has not happened yet. Turtle interactions with commercial scallop dredge gear have been described as rare events (Murray 2005). More specifically, using the highest bycatch rate (0.00612 turtles/hr; Table 1; Murray 2004b) and adjusting for the width of the survey dredge (0.6) and time (15 minutes tows/hr) the resulting survey dredge bycatch rate is estimated to be 0.00092 turtles/hr; thus, the rate of turtle interactions is 1 turtle per 1,087 survey tows. Of the 15,218 tows conducted by the NEFSC scallop survey, approximately 7,500 occurred in the Mid-Atlantic region were sea turtle are present in greater numbers during the summer months. Given that the highest rate of interaction ever observed in the commercial scallop dredge fishery was 1 turtle per 1,087 survey tows, it is conceivable that no turtle interactions with scallop survey dredge gear have yet occurred simply because the gear is in the water for a far smaller amount of time than commercial scallop fishing gear. Nevertheless, NMFS has concluded that interactions between sea turtles and scallop survey dredge gear could reasonably occur in the future given that the use of the gear overlaps in area with the seasonal presence of sea turtles in Mid-Atlantic waters and given the, as yet, unpredictable nature of sea turtle interactions with scallop dredge gear.

### 5.6. Other Possibilities to High Catch

Other possible factors influencing the likelihood of sea turtle captures in scallop dredge gear include geographic and oceanographic features. Intense biological activity is usually associated with oceanographic fronts because they are areas where water masses of different densities converge (Robison and Hamner; www.mbari.org/muse/Participants/Robison-Hamner.html, posted February 18, 2004). A review of the data associated with the 11 sea turtles captured by the scallop dredge fishery in 2001 concluded that the turtles appeared to have been near the shelf/slope front (Memo from John Boreman (NEFSC) to Patricia Kurkul (NERO), dated November 26, 2002). Such oceanographic features occurring in the same area as the operation of scallop dredge gear may increase the risk of interactions between scallop dredge gear and sea turtles.

Loggerheads are known to scavenge fish or fish parts or incidentally ingest fish in some circumstances (NMFS and USFWS 1991a), and have been known to bite a baited hook (NMFS SEFSC 2001). This characteristic of loggerheads raises concerns that loggerhead turtles may be attracted to the area where scallop dredge vessels are operating by the discard of scallop waste from the vessel as the catch is shucked thus increasing the risk of interaction with a dredge. However, there is currently no evidence that scallop discards attract loggerhead sea turtles to scallop vessels.

The NEFSC has attempted to identify a variable for predicting sea turtle bycatch in the dredge component of the scallop fishery (Murray 2004a, 2004b, 2005). Using a modeling approach, sea surface temperature, depth, time-of-day and tow time were identified as variables affecting observed bycatch rates of sea turtles with scallop dredge gear (Murray 2004a, 2004b, 2005). However, the variable(s) associated with the highest bycatch rates changed from one year to another (e.g., sea surface temperature, depth) or could not be further analyzed (e.g., time-of-day and tow time) because the information is not collected for the entire fishery (Murray 2004a, 2004b, 2005). Therefore, a single variable has not yet been found for forecasting sea turtle bycatch with scallop dredge gear.

**Summary**

While any or all of the factors described above may increase the risk of turtle interactions with bottom and mid-water trawl or scallop dredge gear, evidence for these is presently lacking. At the present time, the best that can be said is that interactions of sea turtles with NEFSC survey gear are likely where sea turtle distribution overlaps with operation of the NEFSC research surveys. With respect to the turtle species considered in this Opinion, the distributions of all four species overlap in part with the distribution of scallop dredge and trawl gear. Loggerhead, leatherback, Kemp's ridley, and green sea turtles occur seasonally in southern New England and Mid-Atlantic continental shelf waters north of Cape Hatteras. However, as described in sections 3.1.1 – 3.1.4, the occurrence of loggerhead, leatherback, Kemp's ridley, and green sea turtles in these waters is temperature dependent (Keinath et al. 1987; Shoop and Kenney 1992; Musick and Limpus 1997; Morreale and Standora 1998, 2005; Braun-McNeill and Epperly 2004; James et al. 2005b). In general, turtles move up the 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, 2005; Braun-McNeill and Epperly 2004; James et al. 2005b). The trend is reversed in the fall as water temperatures cool. By December, 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, 2005; Braun-McNeill and Epperly 2004; James et al. 2005b). Hard-shelled species are typically observed as far north as Cape Cod whereas the more cold-tolerant leatherbacks are observed in more northern Gulf of Maine waters in the summer and fall (Shoop and Kenney 1992; STSSN database). Extensive survey effort of the continental shelf from Cape Hatteras, NC to Nova Scotia, Canada in the 1980's (CeTAP 1982) revealed that loggerheads were observed in waters from the beach to depths of up to 4,481 m. However, they were generally found in waters from 22-49 m deep (the median value was 36.6 m; Shoop and Kenney 1992). The overall depth range of leatherback sightings in the CeTAP study (1982) was comparable to loggerheads. Leatherbacks were sighted in water depths ranging from 1-4,151 m (Shoop and Kenney 1992). However, leatherback depth distribution was broader than that of loggerheads with 84.4% of the sightings in waters less than 180 m (Shoop and Kenney 1992). By comparison, 84.5% of loggerhead sightings were in waters 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).

## 5.7. Anticipated take of sea turtles in the NEFSC research surveys

### 5.7.1. Trawl Surveys

Based on the data collected and recorded from the applicants own research program, which includes data dating back to 1963 and over 35,571 tows, 62 sea turtles (all loggerhead sea turtles) have been incidentally captured (Figure 5). All of these turtle takes occurred in the winter, spring, and fall bottom trawl surveys (1 take occurred in the summer bottom trawl, which was discontinued in 1995). Of these 62 loggerhead sea turtles captured, only one mortality has been reported. The mortality occurred in 1995 during the fall bottom trawl survey and likely resulted from damages caused by sea turtle colliding with the trawl doors, as the carapace of the turtle was cracked (Wendy Teas pers. comm. To Linda Despres, NEFSC, 2007). The remaining 61 loggerhead sea turtles were released in good condition. Since 1963, on average 1.3/yr loggerhead sea turtles have been captured; however, the NEFSC seasonal surveys did not include inshore sampling sites until 1968 and since then have not changed. The average number of loggerheads captured since 1968 is 1.5/yr. The majority (95 %) of these takes occurred off the coasts of North Carolina, Virginia, and Maryland; however, takes (N = 3) also occurred further north in the New York Bight. No incidental captures have occurred historically above 41° N in the Gulf of Maine or Georges Banks.

Rather than use an average bycatch rate to determine the potential number of sea turtles captured by the research gear, this Opinion is using the highest bycatch rates observed for trawl gear by season. By using the highest bycatch rate for each season, rather than the average, the take estimates are: 1) unlikely to be exceeded because bycatch from year to year is highly variable (0 – 6 interactions per year; Table 3) and, 2) seasonal bycatch rates can be applied to trawl surveys that have zero interactions with sea turtles to date, but are likely to occur. These seasonal bycatch rates were calculated from prior NEFSC research cruises that accidentally captured sea turtles (i.e., Winter – 0.0154 turt/hr; Spring – 0.0153 turt/hr; Summer – 0.0066 turt/hr; Fall – 0.0352 turt/hr; Table 3).

Using the seasonal bycatch rates for trawl gear (Table 3), estimates of turtle interactions were calculated for survey years 2007, 2008, and 2009 as effort differs among years (Table 4). Effort in the NEFSC trawl surveys are normally constant (~1040 stations; 15-30 minute tows; ~502 hrs total) with only a few variations occurring year to year due to prevailing weather conditions preventing some stations from being sampled. However, due to the FRV Bigelow coming online in late 2007 to replace the Albatross IV in late 2008, calibration trials tows are needed to account for differences in fishing efficiency. In 2007, effort is increasing from approximately 502 hrs of tow time to 734 hrs effort. In 2008, effort is still higher than normal (650 hrs) as calibration trials continue. In 2009, however, effort is reduced to 350 hrs and is expected to remain at that level of effort thereafter (Table 4). Based on the differing effort levels by season and year, the estimated total number of sea turtles interactions in the trawl surveys are 16.9 (2007), 14.9 (2008), 7.3 (2009+) (Table 4). These estimates are incorporated into the overall estimate of sea turtle interactions noted in Table 4 and summarized later in this section.

### 5.7.2. Dredge Surveys

Although no takes have been observed in the NEFSC scallop dredge survey, commercial scallop dredges operating in the same area and season have encountered sea turtles. Between the years of 2001 and 2005, 58 sea turtles have been observed in the commercial scallop dredge fishery (Murray 2004a, 2004b, 2005, 2006, 2007). Since 2001, observer coverage of the commercial scallop dredge fishery has ranged between 0.3 – 4.8% (2,053 – 16,902 observed hours). Using a Generalized Additive Model fitting techniques to examine environmental factors (i.e., surface water temperature and depth) and gear characteristics Murray (2004b, 2005, 2006, 2007) estimated that bycatch rates in the commercial scallop fishery ranged between 0.0000 and 0.00612 turtles/hour and averaged 0.00092 turtles/hour (Table 1). Though the average bycatch rate may be a good predictor of the catch in the NEFSC scallop dredge survey, this average bycatch rate encompasses takes that occur outside of the timeframe of the NEFSC scallop dredge survey (July – August) when turtle abundance is expected to be lower (fall and spring). To better assess the potential interactions of the NEFSC scallop dredge survey, this Opinion uses the highest bycatch rate observed during the period when the NEFSC scallop dredge survey will be conducted (July – August). The only scallop dredge report that notes bycatch rates on a monthly basis is Murray (2004b), and those rates are reported in bi-monthly increments (Table 1). The highest bycatch rate during the months of July – August was 0.00612 turtles/hour; occurring in the Virginia and Hudson Canyon Fishing Areas in water depths of 49 – 57 m and water temperatures >19° C. As noted in section 4.1.1, commercial scallop fisherman commonly use 10 and 15 ft scallop dredges; however, 13 ft scallop dredges were also used. Using observer data reported in Murray (2004b, 2005) the average width of the scallop dredge that incidentally captured sea turtles was 13.3 ft. To estimate the bycatch rate for the NEFSC 8 ft survey dredge, NMFS assumed that the likelihood of a sea turtle interacting with scallop dredge gear is proportional to the width of the scallop dredge (the greater the width, the greater the chance of interaction). NMFS also assumed that bycatch rate observed in the Virginia and Hudson Canyon Fishing Areas would be similar to that of the sampling area of the NEFSC scallop dredge survey (NC to Cape Cod). Thus, the proportional bycatch rate for the NEFSC 8 ft survey dredge is 0.00367 turtles/hr (0.00612 turtles/hr * 8 ft/13.3 ft = 0.00367 turtles/hr).

Using the adjusted bycatch rate for the NEFSC survey dredge (0.00367 turtles/hr), estimates of turtle interactions were calculated for survey years 2007, 2008, and 2009 as effort differs among years (Table 4). Effort in the NEFSC scallop survey is normally constant (~520 stations; 15-minute tows; 130 hrs total) with only a few variations occurring year to year due to prevailing weather conditions preventing some stations from being sampled. However, in 2008 effort in the scallop dredge survey is increasing by 67% due to the FRV Hugh B. Sharp conducting 350 calibration trial tows along side of the FRV Albatross IV (~870 stations; 15-minute tows; 217.5 hrs total). In 2009, the FRV Sharp will replace the FRV Albatross IV and effort will return to 520 tows per year. Thus, in 2007 and 2009+, the estimated number of sea turtles interactions is 0.5 turtles per year. While the estimated number of sea turtles interactions in 2008 is 0.8 turtles. These estimates are incorporated into the overall estimate of sea turtle interactions noted in Table 4 and summarized later in this section.

### 5.7.3. Expected Species Encountered

To date, incidental bycatch in the NEFSC research cruises have been limited to loggerhead sea turtles over the last 43 years (N = 35,571 tows). As described in section 3.1.1, cohorts from all five of the western Atlantic loggerhead subpopulations are expected to occur within the action area of this consultation based on genetic testing of benthic immature loggerhead sea turtles caught on the foraging grounds in the Pamlico-Albemarle Estuarine complex (North Carolina) during September - December in 1995 - 1997 (Bass et al. 2004). Results from this study indicate that the proportion of loggerhead sea turtles originating from each of these subpopulations varies within the action area with 80 percent originating from the south Florida subpopulation, 12 percent from the northeast Florida to North Carolina subpopulation, 6 percent from the Yucatán subpopulation, and 2 percent from other rookeries (including turtles originating from rookeries in Greece, Turkey, and Brazil) (Bass et al. 2004).

It is unknown why other species of sea turtles have not been observed in the NEFSC research surveys. It may be an artifact of the seasonal effort and action area, as the majority (92.8%) of tows were conducted during the winter, spring, and fall months when other species such as green and Kemp's ridley sea turtles are usually further south (Department of the Navy 2005).[6] However, Kemp's ridley and green are susceptible to being captured or interacting with the trawl and dredge gear. This is especially the case during the summer months when the majority of the effort (130 hours) is located in mid-Atlantic during the NEFSC scallop dredge survey. Though, no interactions have been recorded to date in the NEFSC scallop dredge survey, commercial scallop dredges operating in the same area have incidentally captured Kemp's ridley (one in 2005) and green sea turtles (one in 1997) (NMFS - Northeast Fisheries Observer Database). Takes of Kemp's ridley and green sea turtles has also been observed in fisheries using summer flounder trawls similar to that of NEFSC bottom trawling gear (NMFS – Northeast Fisheries Observer Database). In the winter of 1991/1992, a total of 2,745 hours of summer founder trawl fishing were observed in waters spanning from Cape Lookout, NC to Cape May, NJ (Epperly et al. 1995b). Eighty-three sea turtles were captured including: 50 loggerheads, 30 Kemp's ridleys, two greens, and one hawksbill (Epperly et al. 1995b). Sea turtles were more abundant south of Cape Hatteras and no takes were observed north of Cape Charles, VA. A portion of the study area (Cape Hatteras, NC to Cape May, NJ) overlaps with the action area of this consultation (Cape Hatteras, NC to the Gulf of Maine and Georges Bank) and within this overlap region 17 (20%) of the 83 takes of sea turtles where observed including 15 loggerheads and two Kemp's ridleys. While no green sea turtles were observed in the fishery north of Cape Hatteras, two green sea turtles were observed in the 115 km (75 mi) stretch of water between Cape Hatteras and Cape Lookout, NC. These observations provides evidence that Kemp's ridley and green sea turtles are susceptible to catch by bottom trawl gear. As a result of Epperly et al. (1995b) findings, since 1992, TEDs have been required in the summer flounder fishery south of Cape Charles. Following the implementation of TEDs regulations, sea turtles bycatch in the Summer Flounder Fishery is suspected to have been reduced by approximately 97% (55 FR 41092).

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[6] Green and Kemp's Ridley are usually observed further south; however, these sea turtles are also commonly observed in Long Island Sound during the months of July – November (Morreale and Standora 1994, 1998, 2005; Dwyer et al. 2002).

Based on the information above, NMFS believes that Kemp's ridley and green sea turtles could also be captured in the NEFSC scallop dredge survey or other seasonal bottom trawl surveys, which do not use TEDs.

Similarly, it is unknown why the cold tolerant leatherback has not been captured in the NEFSC dredge and trawl surveys. NMFS previously concluded that leatherbacks were not likely to be caught in scallop dredge gear or struck by the gear given that their typical prey (i.e., cnidarians, tunicates, and salps) is found within the water column rather than on the bottom. However, a vessel captain participating in the experimental fishery for chain-mat modified scallop dredge gear, reported the take of a leatherback sea turtle in the control (unmodified) dredge (DuPaul et al. 2004). Neither the principal investigators for the experiment or any NMFS trained observer was on board the vessel at the time of the take. The principal investigators did interview the captain and determined, based on the captains' description of the turtle, that it was likely to have been a leatherback. The turtle was, thus, reported as such in the final report of the experiment. However, the NEFSC protocol for confirmation of at-sea species identification requires that the species be considered unknown unless: (1) the observer is experienced and has confidence in the identification, or (2) the observer is inexperienced but can provide supporting information such as photographs or tissue samples. Since the captain appeared to be an inexperienced observer in terms of not having received prior training in turtle species identification, had no prior experience with the species, and was not able to provide supporting materials such as photographs or tissue samples, NEFSC determined that, in accordance with its protocol, the turtle was to be considered unidentified. Nevertheless, the event does demonstrate that very large turtles can be caught in the dredge bag (the captain estimated the turtle to be 5-5.5 feet in length, and required the use of a rope sling to get the turtle over the rail of the boat and back into the water). While NMFS still believes it is unlikely that a leatherback would be struck by or captured in scallop dredge gear when it was being towed along the bottom, based on observations of live and apparently uninjured loggerhead turtles taken in scallop dredge gear, NMFS believes some sea turtle interactions with scallop dredge gear occur within the water column. Similarly, at least one take of a leatherback sea turtle has been observed in the Loligo (squid) fishery in 2001; thus, providing evidence that leatherback sea turtles are susceptible to bottom trawl gear like that used by NEFSC seasonal bottom trawl surveys (NMFS – Northeast Fisheries Observer Program). Given that the presence of leatherback sea turtles in areas where the NEFSC scallop dredge survey occurs, and that the survey will be conducted for a minimum of three years and expected to be funded in perpetuity. NMFS believes that leatherback sea turtles may be captured in scallop dredge or bottom trawl gear when the gear is being towed through the water column.

### 5.8. Summary of anticipated incidental take of sea turtles

Overall, NMFS anticipates the incidental take of 9 – 18 sea turtles per year in the NEFSC research surveys based on varying rates of effort and bycatch rates from previous NEFSC survey data and observer data from commercial scallop dredges. Although, loggerheads have only been observed to date in the NEFSC surveys, it is expected that the trawl and the scallop dredge survey gear have the potential to take other sea turtles (i.e., leatherback, Kemp's ridley, and green sea turtles). Thus, NMFS anticipates the incidental take of:

- 2007: 18 sea turtles (17 released alive; 1 dead)
  - Trawl Gear
    - 16 Loggerhead sea turtles
    - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtle
  - Dredge Gear
    - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtle
- 2008: 16 sea turtles (15 released alive; 1 dead)
  - Trawl Gear
    - 14 Loggerhead sea turtles
    - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles
  - Dredge Gear
    - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles
- 2009+: 9 sea turtles per year and thereafter (8 released alive; 1 dead)
  - Trawl Gear
    - 7 Loggerhead sea turtles
    - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles
  - Dredge Gear
    - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles

Of these incidental takes, the majority are expected to be released alive in good condition based on previous NEFSC survey data. However, mortalities can occur as at least one incident was reported; a loggerhead was brought onboard with a cracked carapace (suspected to have collided with the trawl doors during towing). Similarly, although no turtles have been observed in the scallop dredge surveys, if a sea turtle does interact with dredge gear the chances of being severely wounded are high (64%; NMFS 2006a). Therefore, this Opinion has determined that one mortality of a loggerhead, leatherback, Kemp's ridley or green sea turtle may occur each year as a result of this action, based on historical NEFSC trawl survey data and the chances of being severely wounded in scallop dredge gear.

## 6.0. CUMULATIVE EFFECTS

Cumulative effects as defined in 50 CFR 402.02 include the effects of future state, tribal, local or private actions that are reasonably certain to occur within the action area considered in the biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Natural mortality of sea turtles, including disease (parasites), predation, and cold-stunning, occurs in mid-Atlantic waters. In addition to possible interaction with the proposed action, sources of human-induce effects on turtles in the action area include incidental takes in state-regulated fishing activities, vessel collisions, ingestion of plastic debris, and pollution. Adverse effects to sea turtle habitat are also expected to continue. While the combination of these unrelated, non-federal activities in mid-Atlantic/NewYork Bight(s), Gulf of Maine and Georges

Bank may adversely affect populations of endangered and threatened sea turtles, it is unclear to what extent this might occur.

NMFS believes that the fishing activities will continue in the future, and as a result, sea turtles will continue to be impacted by fishing gear used in the action area. Throughout their range, sea turtles have been taken in different types of gear, including gill net, pound net, rod and reel, trawl, pot and trap, long-lining, and dredge gear. Thus, it is likely that commercial and recreational fisheries in the action area will continue to impact sea turtles, albeit to an unknown extent.

Commercial and recreational vessels colliding with sea turtles will also continue in the future, and sea turtles will continue to be injured or killed from these interactions. Fifty to 500 loggerheads and 5 to 50 Kemp's ridley turtles are estimated to be killed by vessel traffic per year in the U.S. (NRC 1990). Although some of these strikes may be post-mortem, the data show that vessel traffic is a substantial cause of sea turtle mortality, as turtles transiting these waters exists. The Marine Mammal Stranding Center in Brigantine, New Jersey, reports an increase in the number of turtles hit by boats in New York, New Jersey and other parts of the action area, both in inshore and nearshore waters, as determined from sea turtles stranding records.

The activities in the action area that are reasonably certain to occur in the next three years (2007 – 2009) are Federally regulated commercial fisheries, non-Federally regulated recreational and commercial fisheries, non-Federal vessel operations, and activities resulting in excessive water turbidity and habitat degradation, such as dredging. NMFS does not have information indicating that these future activities would affect listed species differently than the activities described in the Environmental Baseline section.

Sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial development. Chemical contamination may have an effect on listed species reproduction and survival. While the effects of contaminants on sea turtles are not well documented, pollution may also make sea turtles more susceptible to disease by weakening their immune systems. Excessive turbidity due to coastal development and/or construction sites (e.g., bridge construction or demolition) may influence sea turtle migration. Additionally, excessive turbidity may impair sea turtle foraging by making it difficult to locate prey. These activities may affect sea turtles in the action area along the Mid- and South Atlantic Bight(s) and the Gulf of Maine in the future.

## 7.0. INTEGRATION AND SYNTHESIS OF EFFECTS

Loggerhead, leatherback, Kemp's ridley and green sea turtles are likely to be present in the action area. As defined by regulations implementing the ESA, an action is likely to jeopardize the continued existence of a species, if it 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.

Based on information provided in the "Effects of the Action" section of this Opinion, NMFS anticipates that no more than 18 sea turtles will be taken as a result of the operation of the proposed action in 2007, 16 in 2008, and 9 in 2009+. NMFS also anticipates that no more than 2 leatherback or Kemp's ridley or green sea turtles will be taken as result of the operations in 2007 (N = 2), 2008 (N = 2) and 2009+ (N = 2). One annual mortality (overall) is anticipated based on past information on catch in the bottom trawl surveys and the likelihood of serious injury if a sea turtle interacts with scallop dredge gear, as a result there will be no effect at the species level. The above expected and anticipated level of interaction (9 – 18 each year, only 1 lethal take each year) will not have short or long-term adverse effects on the overall survival or recovery of loggerhead, leatherback, Kemp's ridley, or green sea turtles, as a species.

In light of the current status and known trends for loggerhead, leatherback, Kemp's ridley, and green sea turtles, as well as potential effects caused by human activities and previously described in the Environmental Baseline of this Opinion, the level of take described above is not likely to reduce appreciably the likelihood of both the survival and recovery of these sea turtle species.

The following information is provided to support these conclusions.

## 7.1. Integration and synthesis of effects on sea turtles

### 7.1.1. Loggerhead sea turtle

Based on information provided in this Opinion, NMFS anticipates the capture of 9 – 18 loggerhead turtles annually as a result of the NEFSC research activities with one of these captures resulting in immediate death or injuries for which death is inevitable (see Section 5.8). The remaining 8 - 17 loggerhead turtles that are captured and released alive in the vicinity of the capture event are not expected to suffer any ill effects as a result of capture and there will be no negative impact to the species' numbers, distribution or reproduction from the capture of these turtles.

The origin, age class, and sex of the turtle seriously injured or killed in the past during the NEFSC survey (i.e., only one in 1999) is currently unknown. As a result, the past lethal capture cannot inform the analysis of the origin, age class and sex of the turtles expected to be captured and killed or seriously injured during the survey work in the coming years. However, based on two genetic studies that examined the origin of loggerhead sea turtles collected from the Pamlico Sound, North Carolina (Bass et al. 2004) and more northern locations (Virginia to Massachusetts; Rankin-Baransky et al. 2001), NMFS anticipates that the lethal take will likely originate from the south Florida (59 – 80% chance) or northern subpopulations (12 – 25%) given the size of these subpopulations relative to the other three.

Rather than consider the effects of the action on loggerheads for each combination of factors listed above given that there are so many possible combinations (e.g., lethal take of immature males from the south Florida subpopulation, non-lethal take of mature females from the northern subpopulation, etc.), the following analysis will only consider what is expected to be the "worst case scenario"; lethal takes of benthic immature or mature females from the northern subpopulation. Although the take of mature versus immature animals is generally considered to be a worst case scenario approach, NMFS chose not to make this distinction for this analysis given unknowns regarding the cumulative impacts to loggerheads for each of these age classes and the late age to maturity for loggerheads (i.e., even though a population is expected to have a greater number of benthic immature animals than mature animals, if the cumulative effects to loggerhead sea turtles over the past 20-38 years have disproportionately affected benthic immature loggerheads, additional negative impacts to this age class may be the "worst case scenario" as compared to reductions in the number of existing mature females).

As described in the Status of the Species section, the threatened loggerhead sea turtle is the most abundant of the sea turtles listed as threatened or endangered in U.S. waters but is also affected by numerous anthropogenic activities. A number of stock assessments (TEWG 1998; 2000; NMFS SEFSC 2001; Heppell et al. 2003) have examined the stock status of loggerheads in the waters of the United States, but have been unable to develop any reliable estimates of absolute population size. Nesting beach survey data can be used to index the status and trends of loggerheads (USFWS and NMFS 2003). However, detection of nesting trends requires consistent data collection methods over long periods of time (USFWS and NMFS 2003). The currently available nesting data is still too limited to indicate statistically reliable trends for the western Atlantic loggerhead subpopulations. NMFS SEFSC (2001) took an alternative approach for looking at trends in loggerhead subpopulations based on a model developed by Heppell et al. (2003)[7]. Using multiple model scenarios that varied based on differences in starting growth rates, sex ratios, and age to maturity, the model looked at the relative change in the northern loggerhead subpopulation trend when mortality of pelagic immature, benthic immature, and mature loggerhead sea turtles was reduced as a result of changes to the U.S. shrimp trawl fishery and the U.S. Atlantic pelagic longline fishery for swordfish. The modeling work suggests that western Atlantic loggerhead subpopulations should increase as a result of implementation of the new TED regulations that substantially reduce mortality of large, benthic immature and sexually mature loggerheads combined with a reduction in mortality of pelagic immature loggerheads resulting from implementation of new measures for the pelagic longline fishery. Even in the absence of a reduction in pelagic immature mortality from changes to the pelagic longline fishery, the model work supports the conclusion that the trend for western Atlantic loggerhead subpopulations will move from declining to stable (with an initial growth rate of 0.97, average age to maturity of 39 years, and a sex ratio of 35% females) or from declining to increasing (with an initial growth rate of 0.97, average age to maturity of 39 years, and female sex ratio of 50%) (NMFS SEFSC 2001) given the reduction in mortality of large benthic immature and mature loggerheads as a result of changes to the TED requirements for the shrimp trawl fishery.

As with any modeling approach, NMFS SEFSC (2001) made certain assumptions in developing the loggerhead model. NMFS NERO PRD considered these assumptions and discussed the modeling approach with the SEFSC. The SEFSC confirmed that the modeling approach did consider the effects to all western Atlantic loggerhead subpopulations although the northern subpopulation was specifically mentioned in many aspects because it was considered to have the

[7] As described in section 3.1.1, although Heppell et al. was published in 2003, NMFS SEFSC 2001 is actually the most up-to-date version of this modeling approach.

weakest status with respect to the other subpopulations. For example, NMFS SEFSC (2001) ran the model scenarios using 0.95, 0.97 and 1.0 as the starting growth rates based on information collected for the northern nesting subpopulation. In addition, NMFS SEFSC (2001) ran the model scenarios using 35%, 50%, and 80% as the proportion of females in the population, where 35% was thought to be representative of the northern subpopulation and 80% was believed to be representative of the south Florida subpopulation. The 50% was included since it was used in historical models (Heppell et al. 2003; NMFS SEFSC 2001). The range of sex ratios bracket the estimated sex ratio (69%) of the Yucatán subpopulation.

NMFS also recognizes that the modeling approach takes into account only those effects to the northern loggerhead subpopulation that have been on-going long enough for their effects to be measurable in the starting growth rates used in the model (i.e., the effects are subsumed in the starting growth rates). The model scenarios demonstrate changes in subpopulation status based on the predicted change in survivability of certain age classes as a result of one specific action, only-- the change in TED regulations for the U.S. shrimp fishery. The model then looks at how the subpopulation trends would be further affected by a change in pelagic immature survival of up to 10%, presumably as a result of subsequent changes in the operation of the U.S. pelagic longline fishery for swordfish. The model scenarios do not account for other subsequent changes that negatively affect loggerhead subpopulations (i.e., if a new activity develops that reduces the survivability of one or more loggerhead age classes; if an existing activity changes to the extent that the survivability of one or more loggerhead age classes is reduced).

As discussed in Section 3.1.1, NMFS received new information in 2006 regarding a decline in nest counts for the south Florida loggerhead subpopulation (A. Meylan, presentation at the 26th Annual Symposium on Sea Turtle Biology and Conservation, April 2006; letter to NMFS dated October 25, 2006 from the Director of the Florida Fish and Wildlife Research Institute of the Florida Fish and Wildlife Conservation Commission). NMFS NERO PRD contacted Sheryan Epperly of the SEFSC as to whether the new nesting trend information for the south Florida subpopulation would change the assumption of the SEFSC 2001 model that the northern subpopulation had the weakest status with respect to the other subpopulations. In response, PRD was informed that the information presented was still considered preliminary at that time. As a result, the SEFSC was not expected to make any changes to the SEFSC 2001 model based on the preliminary information [Lynn Lankshear (NERO) pers. comm. with Sheryan Epperly (SEFSC), Memo to the record July 30, 2007]. The Loggerhead TEWG is currently reviewing all available information on loggerhead sea turtles to assess the status of the subpopulations and the species in the Atlantic, overall. At this time a final report from the TEWG with their findings is expected in late 2007.

NMFS has implemented the new TED regulations as modeled for in NMFS SEFSC (2001) and has taken action to increase the survival of pelagic immature loggerheads by modification of the longline fisheries managed under the HMS FMP with the intent of increasing pelagic immature survival, overall, by 10% (NMFS 2004d). This suggests that the loggerhead subpopulations considered in this Opinion will experience positive population growth or, in the event that the 10% increase in pelagic immature survival is not realized, will at the very least stabilize in subsequent years. These changes are unlikely to be evident in nesting beach censuses for many years to come given the late age at maturity for loggerhead sea turtles and the normal fluctuations in nesting.

The lethal removal of up to 1 loggerhead sea turtle from the northern loggerhead subpopulation as a result of interactions with dredge or trawl gear used in NEFSC surveys would reduce the number of loggerhead sea turtles in this subpopulation as compared to the number of loggerheads that would be present in the absence of the proposed action. However, this does not necessarily mean that the northern subpopulation will experience reductions in reproduction, numbers or distribution in response to these effects to the extent that survival and recovery would be appreciably reduced. Action has been taken to reduce anthropogenic impacts to loggerhead sea turtles from various sources, particularly since the early 1990's, which are promoting the survival and recovery of turtles. These include lighting ordinances, predation control, and nest relocations to help increase hatchling survival, as well as measures to reduce anthropogenic mortality of pelagic immature, benthic immature and sexually mature age classes in various fisheries and other marine activities. In addition, current modeling data suggests that all western loggerhead subpopulations should experience positive or at least stabilizing subpopulation growth as a result of the change in TED regulations (NMFS SEFSC 2001). While these model results need to be viewed with all of the caveats in mind as described in NMFS SEFSC (2001), it is unlikely that, in the worst case scenario, the loss of one (1) benthic immature or mature female loggerhead sea turtle from the northern subpopulation that numbers approximately 1,000 nesting females will affect the numbers, reproduction or distribution of this loggerhead subpopulation to an extent that would reduce the subpopulation's likelihood of surviving and recovering in the wild. Since the likelihood of survival and recovery of the northern subpopulation is not reduced, the likelihood of survival and recovery for the larger south Florida subpopulation, which is also considered to be stable or increasing based on NMFS SEFSC (2001), would also not be reduced. Given that the likelihood of survival and recovery for each of these subpopulations is not reduced, the proposed action is not expected to reduce the species' likelihood of surviving and recovering in the wild. If the proposed action is not expected to reduce the likelihood of the species survival and recovery, then the final criteria for making a jeopardy determination - whether the reduction in a species' likelihood of surviving and recovering in the wild would be appreciable - is also not met.

Therefore, for the reasons provided above, NMFS has determined that the loss of up to one loggerhead sea turtle as a result of interactions with scallop dredge or bottom trawl gear used for NEFSC surveys, will not jeopardize the continued existence of ESA-listed loggerhead sea turtles.

#### 7.1.2. Leatherback sea turtle

Though no leatherback sea turtles have been observed in the NEFSC research surveys to date, NMFS is taking a precautionary approach because NMFS believes that interactions between leatherback sea turtles and dredge or trawl gear are likely to occur when the species distribution and operation of the gear overlap. Additionally, commercial fisheries operating in the same area with similar gear (i.e., *Loligo* squid bottom trawl fishery - 2001) have incidentally captured leatherback sea turtles. NMFS anticipates the annual take of up to two leatherback sea turtles each year in the NEFSC research surveys (2007 N = 2; 2008 N = 2; 2009+ N = 2). One of these takes could result in mortality (see Section 5.8). It is assumed that there is an equal chance of lethally taking a male or female leatherback sea turtle.

The lethal removal of one leatherback sea turtle annually would be expected to reduce the number of Atlantic leatherback sea turtles as compared to the number of leatherback sea turtles that would have been present in the absence of the proposed action (assuming all other variables remained the same). However, as discussed above, this does not necessarily mean that the population will experience reductions in reproduction, numbers or distribution in response to these effects to the extent that survival and recovery would be appreciably reduced. More than half the present world leatherback population is estimated to be nesting on the beaches in and close to the Marowijne River Estuary in Suriname and French Guiana (Hilterman and Goverse 2004). 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. (2006) also suggest that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing. The number of leatherback sea turtle nests in Florida and the U.S. Caribbean has been increasing at about 10.3% and 7.5%, respectively, per year since the early 1980s. In the 1990's the number of nesting females in the Caribbean Islands was estimated at 1,437-1,780 leatherbacks per year (Spotila et al. 1996). In addition, the U.S. has taken action to reduce the number and severity of leatherback interactions with the two leading known causes of leatherback fishing mortality in the U.S. - the U.S. Atlantic longline fisheries, and the southeast shrimp trawl fishery.

The status of leatherback sea turtles range-wide is of concern. The Pacific population of leatherback turtles has declined precipitously and is of grave concern. Leatherback survivability is affected by numerous natural and anthropogenic factors, including the effects of fisheries as described in the Environmental Baseline. Although the extent of impacts to this species are of concern, given that the trend for the Suriname - French Guiana nesting population over the last 36 years is stable or slightly increasing (Girondot et al. 2006), the number of nests for Suriname and French Guiana combined was 60,000 in 2001 (Hilterman and Goverse 2004), and leatherback sea turtle nests in Florida and the U.S. Caribbean has been increasing at about 10.3% and 7.5%, respectively, per year since the early 1980s and the population numbers in the thousands (based on the number of nesting females) the loss of one (1) leatherback sea turtles each year, either immature or mature, from the Atlantic population as a result of capture in dredge or trawl gear used for the NEFSC surveys is unlikely to reduce the numbers, reproduction or distribution of this leatherback population to an extent that would reduce the population's likelihood of surviving and recovering in the wild. Since the likelihood of survival and recovery for the population is not reduced, the proposed actions are not expected to reduce the species' likelihood of surviving and recovering in the wild. Given that the proposed actions are not expected to reduce the likelihood of the species survival and recovery, then the final criteria for making a jeopardy determination - whether the reduction in a species' likelihood of surviving and recovering in the wild would be appreciable - is also not met.

### 7.1.3. Kemp's ridley sea turtle

Though no Kemp's ridley sea turtles have been observed in the NEFSC research surveys to date, NMFS is taking a precautionary approach because NMFS believes that interactions between Kemp's ridley sea turtles and dredge or trawl gear are likely to occur when the species distribution and operation of the gear overlap (see Section 5.8). Additionally, commercial fisheries operating in the same area with similar gear (i.e., summer flounder bottom trawl – 1999, scallop dredge - 2005) have incidentally captured Kemp's ridley sea turtles (NMFS – Northeast Fisheries Observer Program). Based on the information provided above, NMFS anticipates the annual take of up to two Kemp's ridley sea turtle in the NEFSC research surveys (2007 N = 2; 2008 N = 2; 2009+ N = 2). One of these takes could result in mortality (see Section 5.8). It is assumed that there is an equal chance of lethally taking a male or female leatherback sea turtle.

The lethal removal of one Kemp's ridley annually from the Atlantic population would be expected to reduce the number of Kemp's ridley sea turtles in the action area as compared to the number of Kemp's ridleys that would have been present in the absence of the proposed action. However, the population is not static; 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 despite natural and anthropogenic losses to the population. Current totals exceed 3,000 nests per year, allowing cautious optimism that the population is on its way to recovery (TEWG 2000). Therefore, the loss of one Kemp's ridley sea turtles per year as a result of the NEFSC surveys is not expected to appreciably reduce the species' likelihood of surviving and recovering in the wild. Given that the proposed action is not expected to reduce the likelihood of the species survival and recovery, then the final criteria for making a jeopardy determination - whether the reduction in a species' likelihood of surviving and recovering in the wild would be appreciable - is also not met.

#### 7.1.4. Green sea turtle

Though no green sea turtles have been observed in the NEFSC research surveys to date, NMFS is taking a precautionary approach because NMFS believes that interactions between green sea turtles and dredge or trawl gear are likely to occur when the species distribution and operation of the gear overlap (see section 5.8). Based on the information provided above, NMFS anticipates the annual take of up to two green sea turtles in the NEFSC research surveys (2007 N = 2; 2008 N = 2; 2009+ N = 2). One of these takes could result in mortality (see Section 5.8). It is assumed that there is an equal chance of lethally taking a male or female leatherback sea turtle.

The lethal removal of one green sea turtle annually from the Atlantic green sea turtle population would be expected to reduce the number of green sea turtles in the action area as compared to the number of green sea turtles that would have been present in the absence of the proposed action. However, despite natural and anthropogenic losses to the population, green turtle nesting in the Atlantic shows a generally positive trend during the ten years of regular monitoring since establishment of the index beaches in 1989 perhaps due to increased protective legislation throughout the Caribbean (Meylan et al. 1995).

Therefore, the loss of up to 1 green sea turtle annually (2007 – 2009+) from the Atlantic population as a result of the NEFSC surveys is not expected to appreciably reduce the populations likelihood of surviving and recovering in the wild. Since the likelihood of survival and recovery for the population is not reduced, the proposed action is not expected to reduce the species' likelihood of surviving and recovering in the wild. Given that the proposed action is not expected to reduce the likelihood of the species survival and recovery, then the final criteria for making a jeopardy determination - whether the reduction in a species' likelihood of surviving and recovering in the wild would be appreciable - is also not met.

## 8.0. CONCLUSION

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

## 9.0. INCIDENTAL TAKE STATEMENT

Section 9 of the Endangered Species Act 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).

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 section of 7(o)(2).

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. Pursuant to Section 7(o) of the ESA, only those takes resulting from the agency action (including those caused by activities approved by the agency) that are identified in this statement and are in compliance with the specified reasonable and prudent alternatives and terms and conditions are exempt from the takings prohibition of Section 9(a), and those of federal regulations implemented pursuant to Section 4(d).

### 9.1. Anticipated amount or extent of incidental take

Based on data from observer reports for the scallop fishery, previous NEFSC research surveys, and the distribution of turtles in the action area, NMFS anticipates that the operation of the NEFSC research surveys in the future (2007, 2008, 2009+), may result in the annual taking of 9 – 18 sea turtles as follows:

- 2007: 18 sea turtles (17 released alive; 1 dead)
    - Trawl Gear
        - 16 Loggerhead sea turtles
        - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtle
    - Dredge Gear
        - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtle
- 2008: 16 sea turtles (15 released alive; 1 dead)
    - Trawl Gear
        - 14 Loggerhead sea turtles
        - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles
    - Dredge Gear
        - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles
- 2009+: 9 sea turtles per year and thereafter (8 released alive; 1 dead)
    - Trawl Gear
        - 7 Loggerhead sea turtles
        - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles
    - Dredge Gear
        - 1 Loggerhead, leatherback, Kemp's ridley or green sea turtles

In order to effectively monitor the effects of this action, it is necessary to examine the sea turtles trapped in the trawl or dredge gear. Monitoring and reporting provides information on the characteristics of the sea turtles encountered and may provide data which will help develop more effective measures to avoid future interactions with listed species. Reasonable and prudent measures and implementing terms and conditions requiring this monitoring and reporting are outline below.

## 9.2. Reasonable and Prudent Measures

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

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

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

3. NMFS Northeast Regional Office 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 surveys.

4. NMFS Northeast Regional Office must receive written reports regarding endangered or threatened species interactions with dredge gear and/or vessels used in the surveys.

### 9.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the following terms and conditions must be followed, which implement the reasonable and prudent measures described above, and outline required reporting/monitoring criteria. These terms and conditions are non-discretionary.

1. To comply with RPM #1, above, NEFSC Chief Scientist must have a copy of the sea turtle handling and resuscitation requirements found at 50 CFR 223.206(d)(1) and a copy of "How To for Sea Turtles" on board at all times during any of its research surveys reviewed in this Opinion (Appendix 3 and 4).

2. To comply with RPM #2, above, NEFSC Chief Scientists must ensure that there is at least one crew member who is experienced and available to assist in the identification of western North Atlantic sea turtles on the vessel(s) at all times that the on-water survey work for the NEFSC surveys are conducted. Experience would include personnel that have received training as a NMFS fisheries observer or who have career experience in the identification of western Atlantic sea turtles.

3. To comply with RPM #3 above, NEFSC Chief Scientists must notify within 24 hours the NMFS Northeast Regional Office 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 Northeast Regional Office staff to be contacted are: Lynn Lankshear at 987-281-9300 x 6523 or Lynn.Lankshear@noaa.gov and Pasquale Scida at 978-281-9208 or Pasquale.Scida@noaa.gov.

4. To comply with RPM's #3 and #4 above, NEFSC Chief Scientists must provide a written report to the NMFS Northeast Regional Office within 30 days of any interaction between an ESA-listed sea turtle and the gear and/or vessel used during their NEFSC research survey(s). 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; three measurements of width and length of the sea turtle in centimeters (see Appendix 5); 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: Endangered Species Coordinator, 1 Blackburn Drive, Gloucester, MA 01930.

5. To comply with RPM's #3 and #4 above, NEFSC Chief Scientist must provide a written report to the NMFS Northeast Regional Office within 60 days of completion of the on-water work, summarizing 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: Endangered Species Coordinator, 1 Blackburn Drive, Gloucester, MA 01930.

## 10.0. CONSERVATION RECOMMENDATIONS

In addition to section 7(a)(2), which requires agencies to ensure that proposed projects will not jeopardize the continued existence of listed species, section 7(a)(1) of the ESA places a responsibility on all Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species. Conservation Recommendations are discretionary activities designed to minimize or avoid adverse effects of a proposed action on listed species or critical habitat to help implement recovery plans, or to develop information. The following additional measures are recommended regarding incidental take and sea turtle conservation:

1. NEFSC Chief Scientists onboard the NEFSC FRVs should notify the vessel operators to be alert to the visible presence of sea turtles where trawl and dredge tows are to be conducted and avoid towing in such areas, if possible.

2. NEFSC Chief Scientists onboard the NEFSC FRVs should notify the crew members that:

    a. ESA-protected species are present in the survey area.
    b. Care must be taken when emptying the trawl and dredge to avoid damage to sea turtles that may be caught in the gear but are not visible upon retrieval.
    c. The gear should be emptied as quickly as possible after retrieval in order to determine whether or not sea turtles are present.

3. NEFSC Chief Scientists onboard the NEFSC FRVs should[8]:

    a. Tag sea turtles with inconel tag(s) on rear flippers(s): 1 for dead sea turtles, 2 for live sea turtles > 26 cm carapace length.[9]
    b. Scan and/or tag turtles with PIT tags.
    c. Obtain biopsy/tissue (genetic) samples.[9]

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[8] This discretionary activity will require a Section 10(a)(1)(a) permit.

[9] Refer to "Northeast Fisheries Observer Program Biological Sampling Manual" for directions on how and when to tag turtles with flipper tags and take biopsy samples, and how to measure the carapace of sea turtles (Appendix 5).

## 11.0. REINITIATING CONSULTATION

This concludes formal consultation on the NEFSC research activities in 2007, 2008, 2009+ not covered in their ESA Section 10 permit. 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 take is exceeded, NMFS, NEFSC must immediately request reinitiation of formal consultation.

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Table 3. Seasonal bycatch rates observed in the NEFSC bottom trawl surveys 1963 – 2006.

| | Winter | | | Spring | | | Summer | | | Fall | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Number of Stations* | Sea Turtles Captured | Bycatch Rate (turt/stat) | Number of Stations* | Sea Turtles Captured | Bycatch Rate (turt/stat) | Number of Stations* | Sea Turtles Captured | Bycatch Rate (turt/stat) | Number of Stations* | Sea Turtles Captured | Bycatch Rate (turt/stat) |
| 1963 | | | | | | | 181 | 0 | 0.0000 | 194 | 0 | 0.0000 |
| 1964 | 194 | 0 | 0.0000 | | | | 176 | 0 | 0.0000 | 185 | 0 | 0.0000 |
| 1965 | 177 | 0 | 0.0000 | | | | 186 | 0 | 0.0000 | 193 | 0 | 0.0000 |
| 1966 | 192 | 0 | 0.0000 | | | | | | | 194 | 0 | 0.0000 |
| 1967 | | | | | | | | | | 276 | 0 | 0.0000 |
| 1968 | | | | 265 | 0 | 0.0000 | | | | 279 | 0 | 0.0000 |
| 1969 | | | | 268 | 0 | 0.0000 | 267 | 0 | 0.0000 | 282 | 0 | 0.0000 |
| 1970 | | | | 342 | 0 | 0.0000 | | | | 312 | 0 | 0.0000 |
| 1971 | | | | 419 | 0 | 0.0000 | | | | 334 | 0 | 0.0000 |
| 1972 | 56 | 0 | 0.0000 | 366 | 0 | 0.0000 | | | | 646 | 0 | 0.0000 |
| 1973 | | | | 495 | 0 | 0.0000 | | | | 451 | 0 | 0.0000 |
| 1974 | | | | 416 | 0 | 0.0000 | | | | 379 | 0 | 0.0000 |
| 1975 | | | | 303 | 0 | 0.0000 | | | | 406 | 0 | 0.0000 |
| 1976 | | | | 384 | 0 | 0.0000 | | | | 340 | 0 | 0.0000 |
| 1977 | | | | 354 | 0 | 0.0000 | 291 | 0 | 0.0000 | 419 | 0 | 0.0000 |
| 1978 | 88 | 0 | 0.0000 | 398 | 0 | 0.0000 | 337 | 0 | 0.0000 | 556 | 0 | 0.0000 |
| 1979 | | | | 477 | 0 | 0.0000 | 303 | 1 | 0.0033 | 600 | 0 | 0.0000 |
| 1980 | | | | 468 | 0 | 0.0000 | 325 | 0 | 0.0000 | 420 | 0 | 0.0000 |
| 1981 | 86 | 0 | 0.0000 | 395 | 1 | 0.0025 | | | | 421 | 1 | 0.0024 |
| 1982 | | | | 443 | 2 | 0.0045 | | | | 449 | 1 | 0.0022 |
| 1983 | | | | 428 | 1 | 0.0023 | | | | 476 | 4 | 0.0084 |
| 1984 | | | | 407 | 1 | 0.0025 | | | | 433 | 0 | 0.0000 |
| 1985 | | | | 391 | 3 | 0.0077 | | | | 368 | 1 | 0.0027 |
| 1986 | | | | 368 | 0 | 0.0000 | | | | 364 | 3 | 0.0082 |
| 1987 | | | | 349 | 0 | 0.0000 | | | | 335 | 1 | 0.0030 |
| 1988 | | | | 321 | 0 | 0.0000 | | | | 326 | 1 | 0.0031 |
| 1989 | | | | 299 | 0 | 0.0000 | | | | 342 | 3 | 0.0088 |
| 1990 | | | | 322 | 0 | 0.0000 | | | | 345 | 2 | 0.0058 |
| 1991 | | | | 333 | 0 | 0.0000 | 84 | 0 | 0.0000 | 354 | 0 | 0.0000 |
| 1992 | 138 | 0 | 0.0000 | 326 | 0 | 0.0000 | 120 | 0 | 0.0000 | 353 | 1 | 0.0028 |
| 1993 | 125 | 0 | 0.0000 | 329 | 0 | 0.0000 | 149 | 0 | 0.0000 | 339 | 3 | 0.0088 |
| 1994 | 164 | 0 | 0.0000 | 345 | 0 | 0.0000 | 71 | 0 | 0.0000 | 341 | 6 | 0.0176 |
| 1995 | 155 | 0 | 0.0000 | 335 | 0 | 0.0000 | 82 | 0 | 0.0000 | 360 | 2 | 0.0056 |
| 1996 | 140 | 0 | 0.0000 | 350 | 0 | 0.0000 | | | | 365 | 1 | 0.0027 |
| 1997 | 130 | 0 | 0.0000 | 345 | 1 | 0.0029 | | | | 369 | 3 | 0.0081 |
| 1998 | 138 | 0 | 0.0000 | 374 | 0 | 0.0000 | | | | 374 | 2 | 0.0053 |
| 1999 | 148 | 0 | 0.0000 | 329 | 0 | 0.0000 | | | | 346 | 4 | 0.0116 |
| 2000 | 130 | 1 | 0.0077 | 333 | 0 | 0.0000 | | | | 337 | 2 | 0.0059 |
| 2001 | 175 | 0 | 0.0000 | 325 | 0 | 0.0000 | | | | 339 | 2 | 0.0059 |
| 2002 | 159 | 0 | 0.0000 | 331 | 2 | 0.0060 | | | | 342 | 1 | 0.0029 |
| 2003 | 107 | 0 | 0.0000 | 332 | 0 | 0.0000 | | | | 336 | 0 | 0.0000 |
| 2004 | 140 | 0 | 0.0000 | 332 | 0 | 0.0000 | | | | 319 | 1 | 0.0031 |
| 2005 | 108 | 0 | 0.0000 | 334 | 0 | 0.0000 | | | | 332 | 1 | 0.0030 |
| 2006 | 132 | 0 | 0.0000 | 344 | 2 | 0.0058 | | | | 367 | 0 | 0.0000 |
| 2007 | 144 | 1 | 0.0069 | | | | | | | | | |
| **Average Bycatch Rate (turt/stat)** | | | **0.0007** | | | **0.0009** | | | **0.0003** | | | **0.0029** |
| **Average Bycatch Rate (turt/hr)** | | | **0.0013** | | | **0.0018** | | | **0.0005** | | | **0.0058** |
| **Max Bycatch Rate (turt/stat)** | | | **0.0077** | | | **0.0077** | | | **0.0033** | | | **0.0176** |
| **Max Bycatch Rate (turt/hr)** | | | **0.0154** | | | **0.0153** | | | **0.0066** | | | **0.0352** |

* Each tow is 30 minutes in durations.

Table 4. Summary of bycatch estimates in trawl and scallop gear for 2007, 2008, 2009+.

| Gear | Season | Hours of Effort 2007 | Hours of Effort 2008 | Hours of Effort 2009+ | Bycatch Rate (turt/hr) | Estimated Sea Turtle Bycatch 2007 | Estimated Sea Turtle Bycatch 2008 | Estimated Sea Turtle Bycatch 2009+ |
|---|---|---|---|---|---|---|---|---|
| Trawl | Winter | 90.0 | | | 0.0154 | 1.4 | 0.0 | 0.0 |
| | Spring | 190.8 | 301.7 | 151.7 | 0.0153 | 2.9 | 4.6 | 2.3 |
| | Summer | 118.3 | 68.3 | 68.3 | 0.0066 | 0.8 | 0.5 | 0.5 |
| | Fall | 335.0 | 280.0 | 130.0 | 0.0352 | 11.8 | 9.9 | 4.6 |
| **Trawl Total** | | **734.2** | **650.0** | **350.0** | | **16.9** | **14.9** | **7.3** |
| | **Trawl Total (Rounded Up)** | | | | | **17.0** | **15.0** | **8.0** |
| Dredge | Summer | 130.0 | 217.5 | 130.0 | 0.0037 | 0.5 | 0.8 | 0.5 |
| **Dredge Total** | | **130.0** | **217.5** | **130.0** | | **0.5** | **0.8** | **0.5** |
| | **Dredge Total (Rounded Up)** | | | | | **1.0** | **1.0** | **1.0** |
| **Overall Total** | | **864.2** | **867.5** | **480.0** | | **17.4** | **15.7** | **7.8** |
| | **Overall Total (Rounded Up)** | | | | | **18.0** | **16.0** | **9.0** |

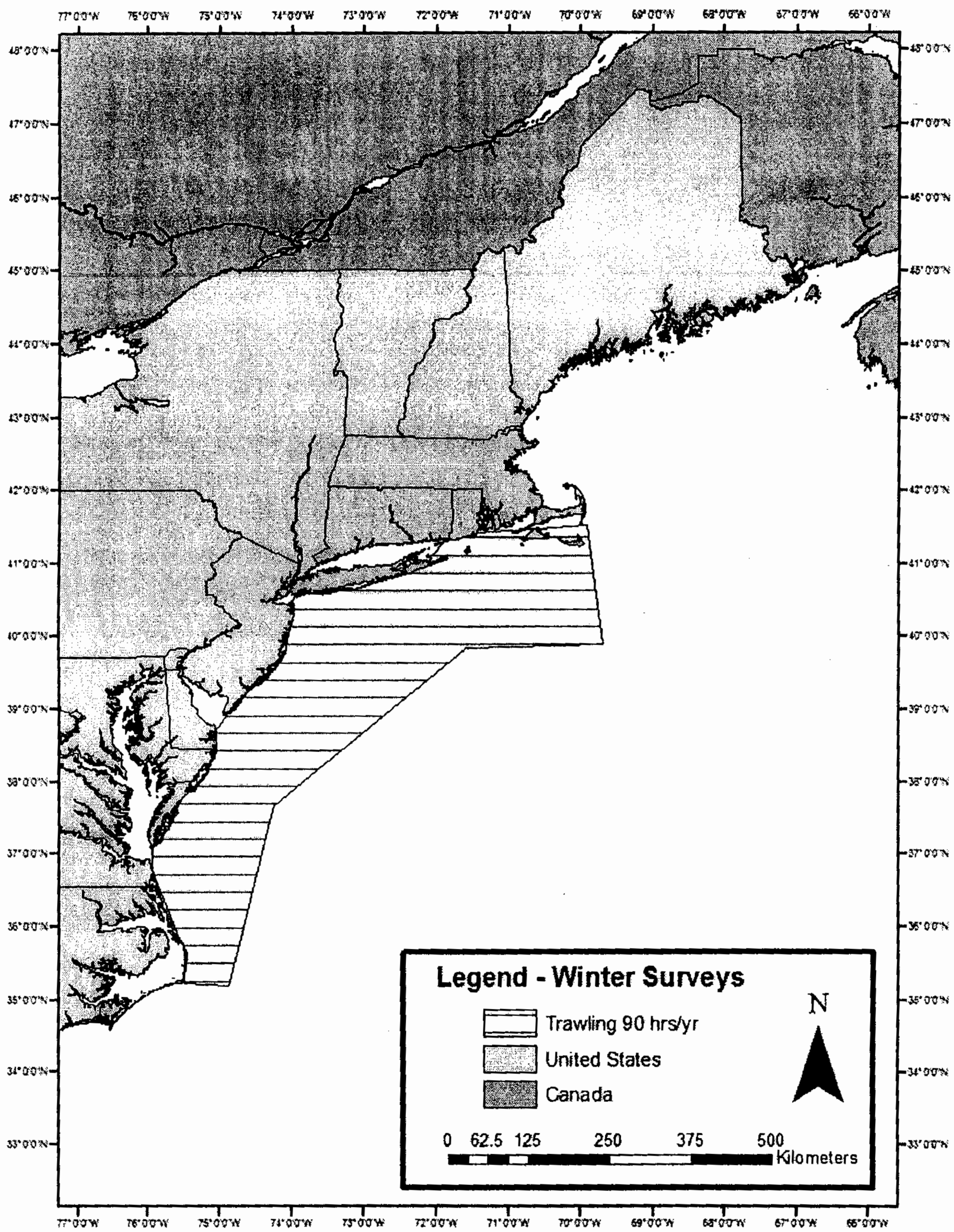



Figure 1. A map of the action noting areas of effort during the winter (January - March). The only survey operating during this timeframe is the Winter Bottom Trawl Survey. This project is being discontinued in 2008.

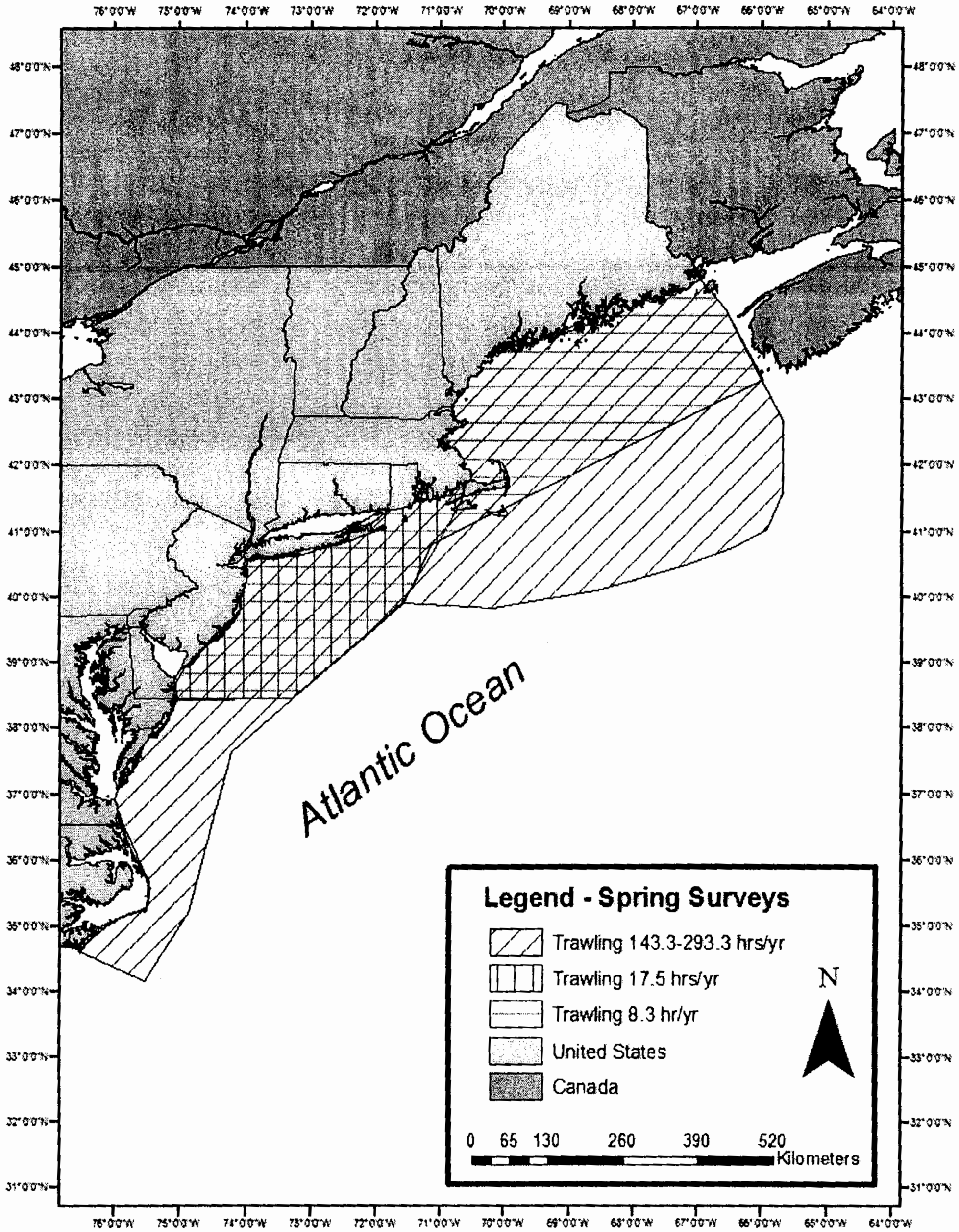



Figure 2. A map of the action noting areas of effort during the spring (April - June). Surveys operating during this timeframe area: Spring Bottom Trawl, Spring Bottom Trawl Calibration Trials, Pelagic Trawl Testing, Preliminary Bottom and Mid-water Mission Trials.

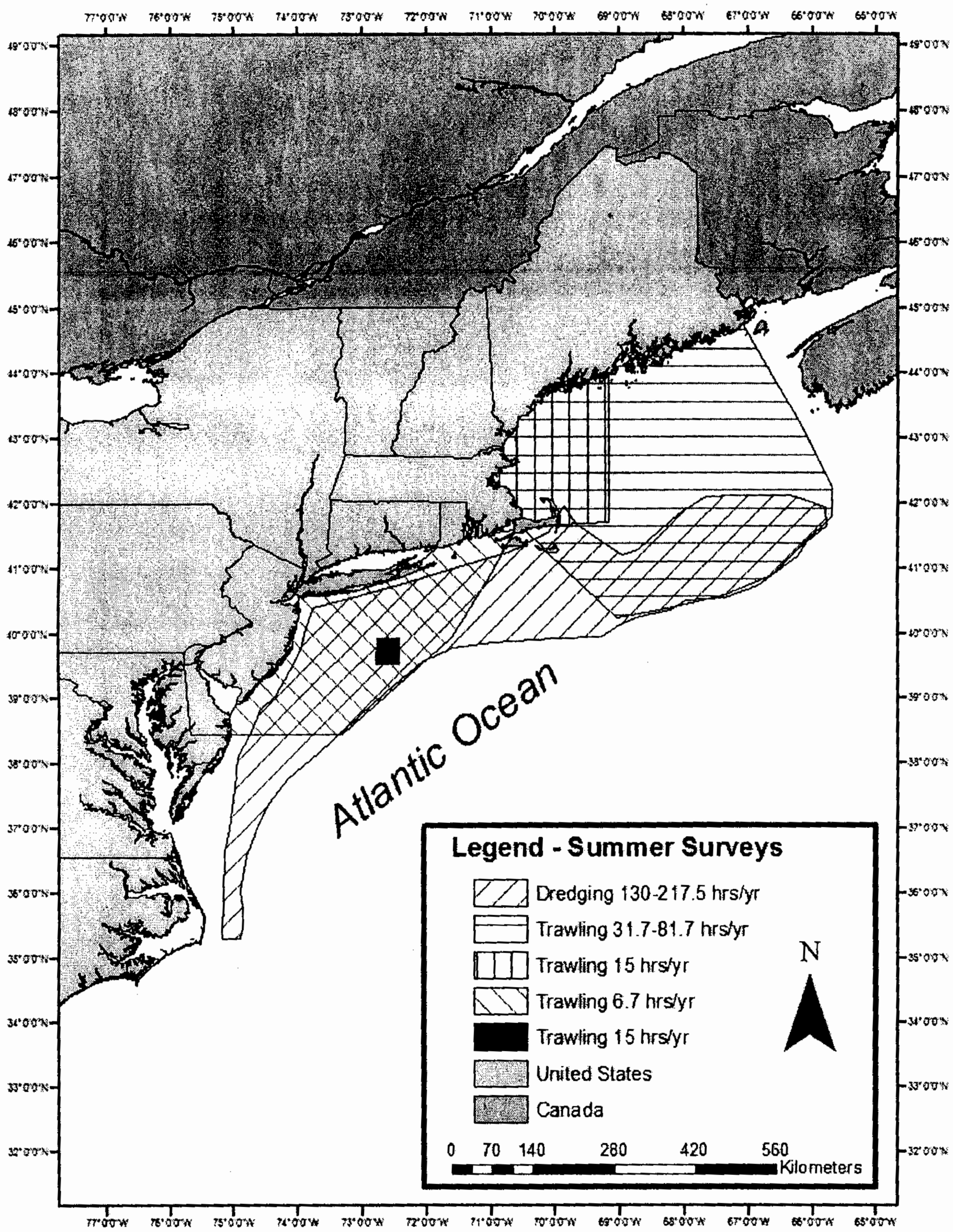



Figure 3. . A map of the action noting areas of effort during the summer (July - September). Surveys operating during this timeframe are: Scallop Dredge, Scallop Dredge Calibration Trials, Atlantic Herring Acoustics, ASMFC Northern Trawl, Mid-Atlantic Benthic Habitat Trawl, Standardized Survey Protocol Development Trials, Deepwater Trawling and Final Mission Trials, and Deepwater Systematics Trawl.

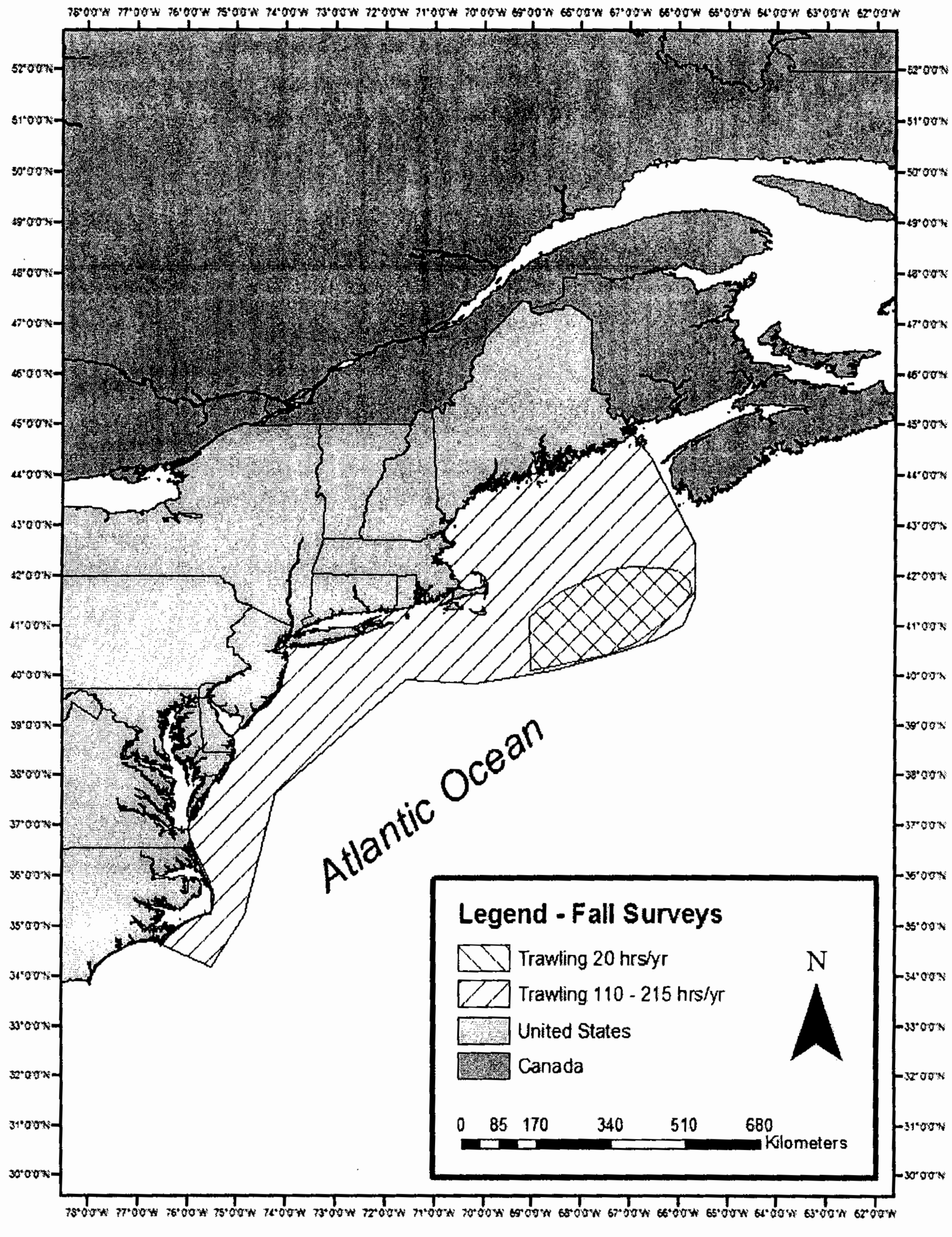



Figure 4. A map of the action noting areas of effort during the fall (October - December). Surveys operating during this timeframe are: Autumn Bottom Trawl, Autumn Bottom Trawl Calibration Trials, and Georges Bank Benthic Habitat Trawl.

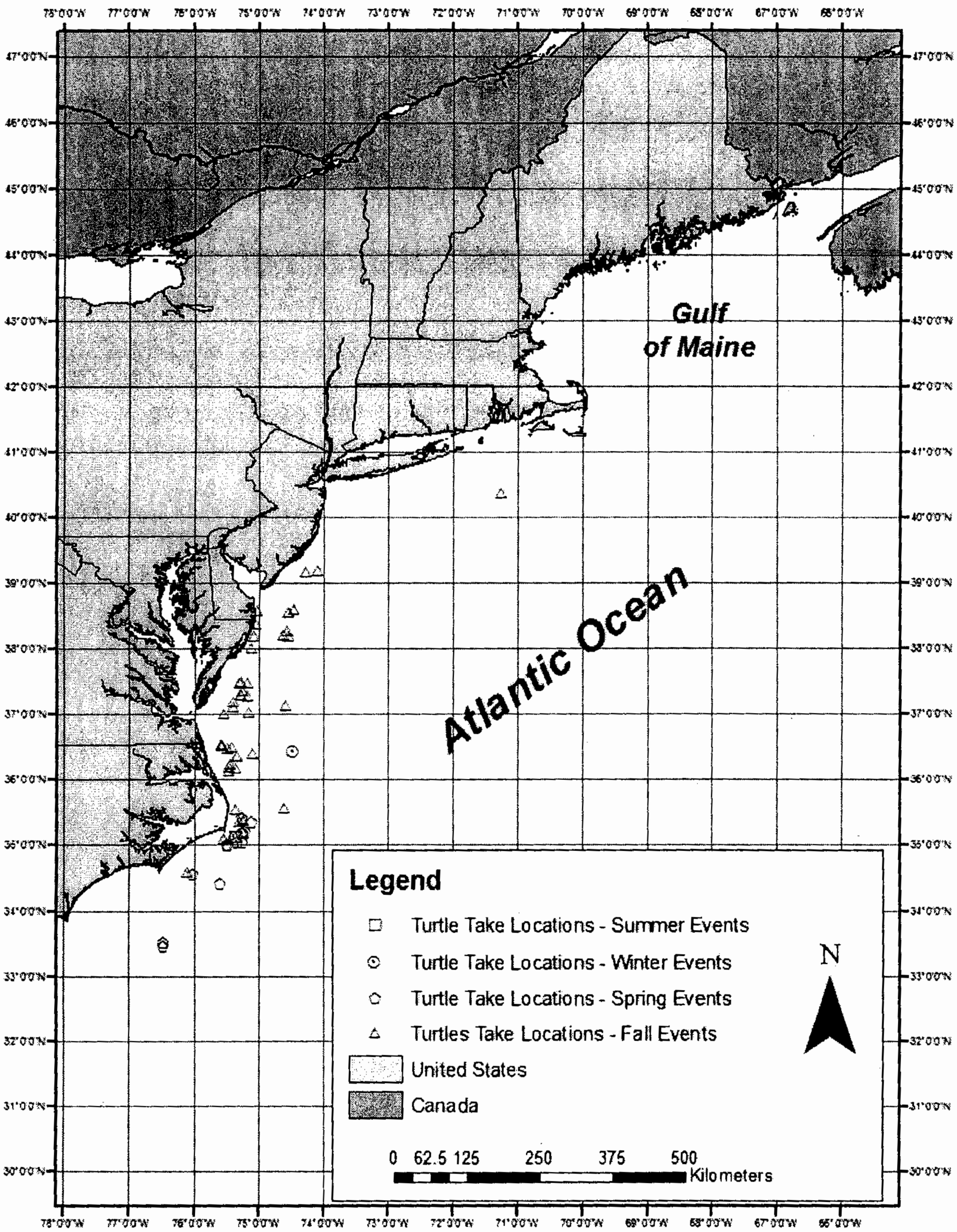
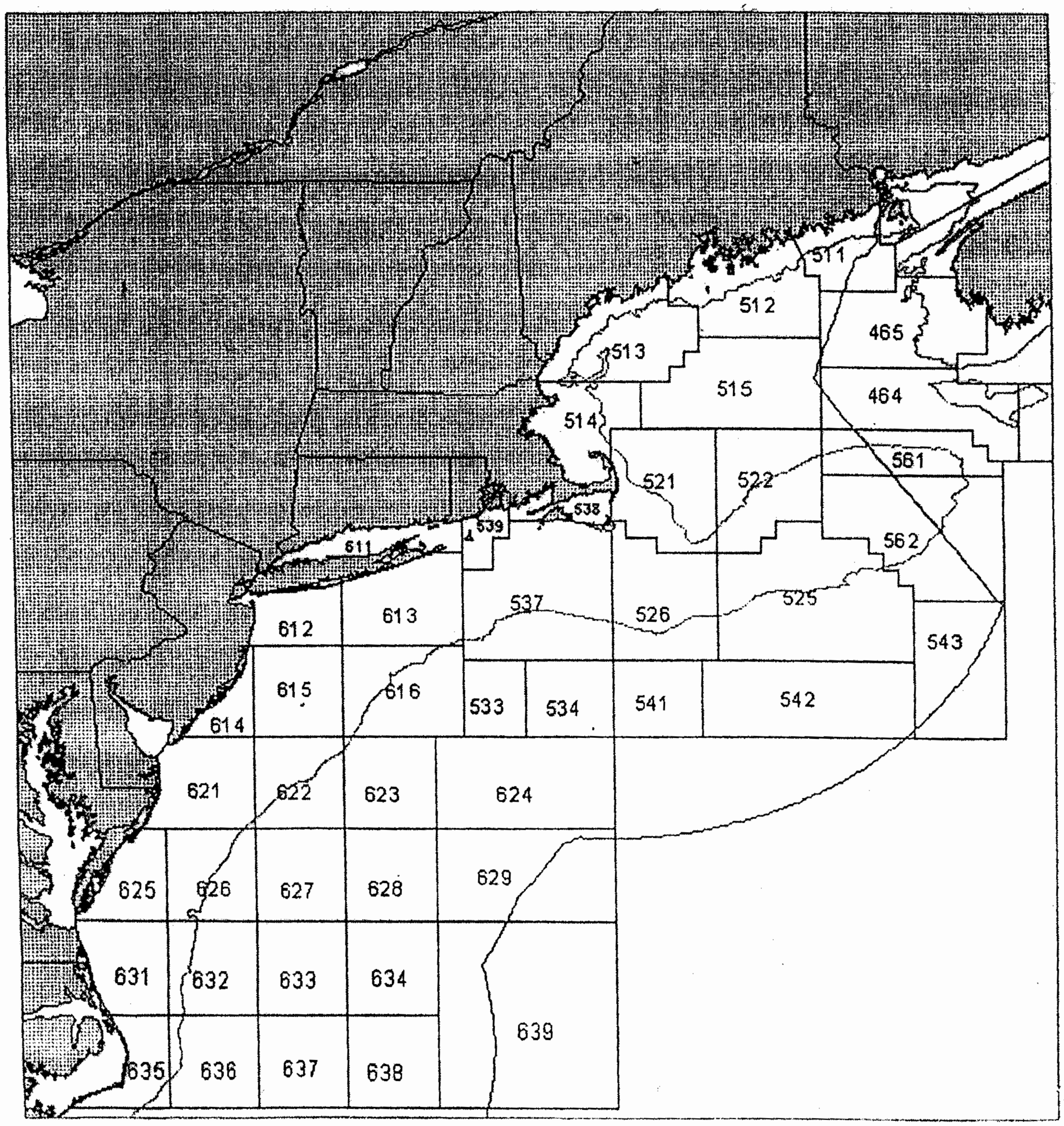



Figure 5. Sea turtle bycatch during the years of 1979 – 2006, by season.

**Appendix 1.** The anticipated Incidental Take of loggerhead, leatherback, Kemp's ridley and green sea turtles as currently determined in the most recent Biological Opinion's for NOAA Fisheries implementation of the Bluefish, Herring, Multispecies, Mackerel/Squid/Butterfish, Red Crab, Monkfish, Skate, Spiny Dogfish, Summer Flounder/Scup/Black Sea Bass, Tilefish, and Highly Migratory Species fishery management plans as well as for the American Lobster fishery operating in Federal waters, and hopper dredging projects of the ACOE and USN operating off of Virginia. Takes are represented as anticipated annual take unless otherwise noted.

| **Fishery** | **Sea Turtle Species** | | | |
|---|---|---|---|---|
| | **Loggerhead** | **Leatherback** | **Kemp's Ridley** | **Green** |
| Bluefish | 6-no more than 3 lethal | None | 6 lethal or non-lethal | None |
| Bluefish Trawl Survey | 2 non-lethal | None | None | None |
| Herring | 6-no more than 3 lethal | 1 lethal or non-lethal | 1 lethal or non-lethal | 1 lethal or non-lethal |
| HMS | 1869 for 2004-2006 and 1905 for each subsequent 3-year period | 1981 for 2004-2006 and 1764 for each subsequent 3-year period | 105 total for each 3-year period beginning 2004-2006 (Kemp's ridleys, green, olive ridley or hawksbill in combination) | |
| Lobster | 2 lethal or non-lethal | 4 lethal or non-lethal | None | None |
| Mackerel/Squid/ Butterfish | 6-no more than 3 lethal | 1 lethal or non-lethal | 2 lethal or non-lethal | 2 lethal or non-lethal |
| Monkfish (gill net) | 3 | 1 leatherback, Kemp's ridley or green | | |
| Monkfish (trawl) | 1 loggerhead, leatherback, Kemp's ridley or green | | | |
| Multispecies | 1 lethal or non-lethal | 1 lethal or non-lethal | 1 lethal or non-lethal | 1 lethal or non-lethal |
| Red Crab | 1 lethal or non-lethal | 1 lethal or non-lethal | None | None |
| Scallop | Dredge Gear: 749 no more than 479 lethal. Trawl Gear: 5 lethal or non-lethal. | Dredge Gear: 1 non-lethal. Trawl Gear: 1 lethal or non-lethal. | Dredge Gear: 1 non-lethal. Trawl Gear: 1 lethal or non-lethal. | Dredge Gear: 1 non-lethal. Trawl Gear: 1 lethal or non-lethal. |
| Skate | 1 (either a loggerhead, leatherback, Kemp's ridley or green) - lethal or non-lethal | | | |
| Spiny Dogfish | 3-no more than 2 lethal | 1 lethal or non-lethal | 1 lethal or non-lethal | 1 lethal or non-lethal |
| Summer Flounder/Scup/ Black Sea Bas | 19-no more than 5 lethal (total either loggerheads or Kemp's ridley) | None | see loggerhead entry | 2 lethal or non-lethal |
| Tilefish | 6-no more than 3 lethal or having ingested the hook | 1 lethal or non-lethal take (includes having ingested the hook) | None | None |
| (ACOE) Sandbridge Protection Project | 5 | None | 1 Kemp's ridley or green | |
| (USN) Dam Neck Nourishment Project | 4 per dredge cycle | None | 1 Kemp's ridley or green per dredge cycle | |

**Appendix 2.** A map of Northeast Region Statistical Areas.



# Appendix 3. A copy of 50 CFR 223.206(d)(1) – handling and resuscitation requirements.

**§ 223.206 Exceptions to prohibitions relating to sea turtles**

* * * * * * * *

(d)

(1) *Handling and resuscitation requirements.* (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 paragraph (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 rightside 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, carapace, 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.

(ii) Notwithstanding the provisions of paragraph (d)(1)(i) of this section, a person aboard a pelagic longline vessel in the Atlantic issued an Atlantic permit for highly pelagic species under 50 CFR 635.4, must follow the handling and resuscitation requirements in 50 CFR 635.21.

(iii) Any specimen taken incidentally during the course of fishing or scientific research activities must not be consumed, sold, landed, offloaded, transshipped, or kept below deck.

* * * * *

Appendix 4. How to resuscitate sea turtles.

## *Sea Turtle Handling and Resuscitation*

Sea turtle interactions which may occur with trawl gear should follow the procedures and guidelines as described below. These guidelines are adapted from 50 CFR § 223.206(d)(1).

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

**Dead sea turtles**

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

**Live sea turtles**

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

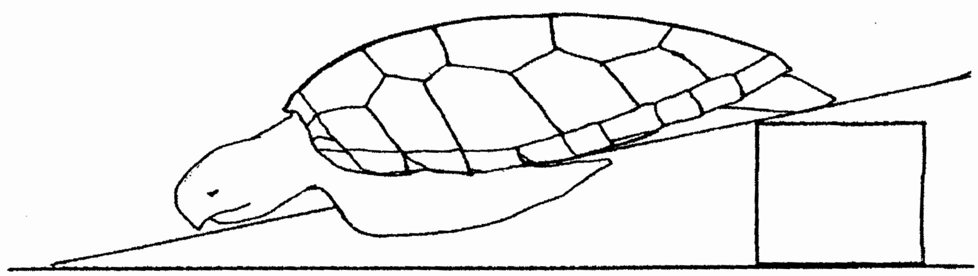
- **If the turtle is actively moving**, it should be retained onboard until evaluated for injuries by a permitted rehabilitation facility. Due to the potential for internal injuries associated with hopper entrainment, it is necessary to transport the live turtle to the nearest rehabilitation facility as soon as possible, following these steps:
  1) Contact the nearest rehabilitation facility to inform them of the incident. If the rehabilitation personnel cannot be reached immediately, please contact Peter Kelliher at (978) 281-9300 ext. 6524 or Pat Scida at (978) 281-9128.
  2) Keep the turtle shaded and moist (e.g., with a water-soaked towel over the eyes, carapace, and flippers), and in a confined location free from potential injury.
  3) Contact the crew boat to pick up the turtle as soon as possible from the dredge (within 12 to 24 hours maximum). The crew boat should be aware of the potential for such an incident to occur and should develop an appropriate protocol for transporting live sea turtles.
  4) Transport the live turtle to the closest permitted rehabilitation facility able to handle such a case.

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

- **If a turtle appears to be comatose** (unconscious), contact the designated stranding/rehabilitation personnel immediately. Once the rehabilitation personnel has been informed of the incident, attempts should be made to revive the turtle at once. Sea turtles have been known to revive up to 24 hours after resuscitation procedures have been followed.

  - Place the animal on its bottom shell (plastron) so that the turtle is right side up and elevate the hindquarters at least 6 inches for a period of 4 up to 24 hours. The degree of elevation depends on the size of the turtle; greater elevations are required for larger turtles.

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



**Stranding/Rehabilitation contacts**

*Sea Turtles in Virginia*

- Mark Swingle and/or Susan Barco, Virginia Marine Science Museum
  Phone: (757) 437-4949
- Jack Musick, Virginia Institute of Marine Science
  Phone: (804) 684-73

Appendix 5. Sea turtle sampling protocols noted in the Northeast Fisheries Observer Program Biological Sampling Manual (2006 version).

## SEA TURTLE SAMPLING PROTOCOLS

Minimum requirements:

1. Identify and photograph.
2. Note any new or old injuries and scars.
3. Obtain 3 body measurements and 6 identification criteria.
4. Tag with inconel tag(s) on rear flipper(s): 1 for dead sea turtles, 2 for live sea turtles >26 cm carapace length.
5. Scan for PIT tags on flippers and all soft tissues.
6. Obtain biopsy/tissue (genetic) sample(s).

   Live Animals: Turtle must be greater than 25 cm carapace length.
   Dead Animals: Obtain animals whole. If not possible then obtain biopsy/tissue sample.

   Biopsy Location: Dorsal surface rear flipper 5-10 cm from trailing edge and close to body. **One biopsy per rear flipper.**