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ENDANGERED SPECIES ACT SECTION 7 CONSULTATION
BIOLOGICAL OPINION

Action Agency: National Marine Fisheries Service, Northeast Region, through its Sustainable Fisheries Division

Activity: Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the American Lobster Fishery [Consultation No. F/NER/2012/01456]

GARFO-2012-00009

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

Date Issued: 8/3/12

Approved by:

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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 authorized by the NMFS Northeast Region (NERO), this office has requested formal intra-service section 7 consultation.

NMFS NERO has reinitiated formal intra-service consultation (Memo to the Record, D. Morris, February 9, 2012) [Consultation No. F/NER/2012/01456] on the continued operation of the American lobster fishery, in accordance with section 7(a)(2) of the ESA and 50 CFR 402.16 given two final rules (77 FR 5880-5912; 77FR 5914-5982) issued on February 6, 2012, listing five Distinct Population Segments (DPS) of Atlantic sturgeon as threatened or endangered. This document represents NMFS' biological opinion (Opinion) on the continued operation of the American lobster fishery and its effects on ESA-listed species under NMFS jurisdiction in accordance with section 7 of the ESA, as amended, based on the information developed by NMFS NERO and other sources of information, as cited in the Literature Cited section of this document.

1.0 CONSULTATION HISTORY

1.1 Overview of Past Consultations

Formal consultation on the lobster fishery was first initiated in 1988 for the implementation of the Marine Mammal Exemption Program; this consultation concluded that the lobster fishery may adversely affect but was not likely to jeopardize the continued existence of any listed species.

A formal section 7 consultation for the American lobster fishery in federal waters was concluded with the issuance of a Biological Opinion on March 23, 1994, for implementation of Amendment 5 to the American Lobster Fishery Management Plan (FMP). Amendment 5 was developed to prevent over-fishing within the U.S. Exclusive Economic Zone (EEZ) using management principles developed by the Lobster Industry Work Group (LIWG). We concluded that fishing activities under the amendment and its implementing regulations may affect endangered or threatened species but were not likely to jeopardize the continued existence of any listed species under our jurisdiction or result in the destruction or adverse modification of any critical habitat.

In 1996, six right whale deaths were reported from the Southeast right whale calving grounds off Georgia and Florida. This even caused us to reinitiate consultation on the lobster fishery. In an Opinion dated December 13, 1996, we concluded that the lobster trap fishery was likely to jeopardize the continued existence of Northern right whales[1]. A reasonable and prudent alternative (RPA) was provided to avoid the likelihood that operation of the fishery would jeopardize the continued existence of right whales. The primary element of the RPA included the seasonal prohibition of all lobster pot/trap gear in the Great South Channel critical habitat area. An additional provision to the RPA required NMFS to analyze fishing effort and whale distribution in order to avoid clumping fixed gear effort in high-risk/overlap areas and/or sensitive whale areas such as right whale critical habitat. This RPA was supplemented in 1997 by the inclusion of measures developed per the Atlantic Large Whale Take Reduction Plan (ALWTRP). The ALWTRP was designed to reduce the risk of serious injury to or mortality of large whales due to incidental entanglement in U.S. commercial trap/pot and gillnet fishing gear.

In 1997 we conducted a formal consultation on the ALWTRP and issued a biological opinion on July 22, 1997, that concluded the continued operation of the American lobster fishery, including the measures implemented by the ALWTRP, may adversely affect but were not likely to jeopardize the continued existence of any listed species under NMFS jurisdiction. This Opinion replaced the 1996 Opinion. Effective November 15, 1997, NMFS substituted the ALWTRP for the RPA issued with the 1996 biological opinion, thereby removing the likelihood of jeopardy to the right whale from the proposed lobster fishing activities.

In December 1998, NMFS proposed to replace the American Lobster FMP authorized under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) with a new plan to be authorized under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). A new 1998 Opinion concluded that the proposed lobster fishery, as conducted under the ACFCMA, with modifications to reduce impacts of entanglement through the ALWTRP, may affect but was not likely jeopardize ESA-listed species and would also not likely destroy or adversely modify critical habitat that has been designated for the right whale. The Opinion also included an Incidental Take Statement (ITS) for loggerhead and leatherback sea turtles. This ITS exempted the take of up to 10 loggerhead sea turtles and/or 4 leatherback sea turtles annually. Non-discretionary Reasonable and Prudent Measures were also included to minimize the level of incidental take of sea turtles in the lobster fishery. Federal authority for management of American lobster was transferred from the MSFCMA to the ACFCMA, effective January 5, 2000.

Formal consultation was reinitiated in 2000 to consider new information on the status of right whales and changes to the ALWTRP. This consultation was completed with the issuance of a June 14, 2001 Opinion. This Opinion concluded that the continued operation of the American lobster fishery, including measures previously implemented as part of the ALWTRP, was likely to jeopardize the continued existence of right whales. The Opinion also concluded that the operation of the American lobster fishery was likely to adversely affect but not jeopardize the continued existence of other ESA-listed species. An RPA was provided that included a revised

[1] The North Atlantic right whale was originally listed as the "northern right whale" as endangered under the Endangered Species Conservation Act, the precursor the ESA in June 1970. NMFS listed the endangered northern right whale (*Eubalaena spp.*) as two separate endangered species: the North Atlantic right whale (*E. glacialis*) and North Pacific right whale (*E. japonica*) (73 FR 12024; March 6, 2008).

ALWTRP which implemented, in part, the Seasonal Area Management (SAM) and Dynamic Area Management (DAM) programs.

Formal consultation was reinitiated on July 11, 2001 upon review of a proposed action to displace lobster trap gear from Federal Lobster Management Areas (FLMA) 3, 4, and 5 to nearshore lobster management areas where ESA-listed right whales, humpback whales, fin whales, sei whales, leatherback sea turtles, and loggerhead sea turtles could have potentially been adversely affected. The action also implemented a mechanism for conservation equivalency and associated trap limits for federal lobster permit holders fishing in New Hampshire state waters. Consultation concluded with the issuance of an Opinion on October 31, 2002. This Opinion concluded that operation of the federally-regulated portion of the lobster trap fishery, including measures previously implemented as part of the ALWTRP, would likely not jeopardize the continued existence of any listed species under NMFS jurisdiction.

On October 5, 2007, NMFS published a final rule in the *Federal Register* (72 FR 57104; October 5, 2007) that made many changes to the ALWTRP affecting the use of pot/trap gear in the American lobster fishery, amongst others. These changes included elimination of the DAM program as of April 7, 2008, and elimination of the SAM program as of October 6, 2008[2] in lieu of broad-based gear modifications. The changes to the ALWTRP, therefore, modified the action in a manner that could potentially cause an effect to listed species not considered in the 2002 Opinion for the fishery. NMFS reinitiated formal consultation on the American lobster fishery on July 29, 2003, to consider the effects of the continued operation of the American lobster fishery on ESA-listed cetaceans and sea turtles. Consultation concluded with the issuance of an October 29, 2010 Opinion which concluded that operation of the Federally-regulated portion of the lobster trap fishery would not likely jeopardize the continued existence of any listed species under NMFS jurisdiction.

Outside of these formal consultations, NMFS PRD routinely reviewed framework adjustments and amendments to the American Lobster FMP. None of these met the triggers for reinitiating formal consultation.

1.2 Cause for Reinitiating

As provided at 50 CFR 402.16, reinitiation of formal consultation is required where discretionary 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 the Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

[2] Effective October 5, 2008, NMFS reinstituted the DAM program under the ALWTRP pursuant to a preliminary injunction issued in the case The Humane Society of the United States, *et al.* v. Gutierrez, *et al.* (Civil Action No. 08-cv-1593 (ESH)). The DAM program was effective through 2400 hrs April 4, 2009, and expired at this time when the broad-based sinking groundline requirement for Atlantic trap/pot fisheries became effective on April 5, 2009.

On February 6, 2012, NMFS published two final rules (77 FR 5880-5912; 77 FR 5914-5982) listing five DPSs of Atlantic sturgeon as threatened or endangered under the ESA. Four DPSs (New York Bight, Chesapeake Bay, Carolina, and South Atlantic) are listed as endangered and one DPS (Gulf of Maine) is listed as threatened. The effective date of the listing was April 6, 2012. We have reinitiated formal section 7 consultation on the American lobster fishery due to the new listing of Atlantic sturgeon DPSs (Memo to the Record, D. Morris, February 9, 2012).

2.0 DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the continued operation of the American lobster fishery in federal waters managed by NMFS within the constraints of the Atlantic States Marine Fisheries Commission's Interstate Fishery Management Plan (FMP) for American Lobster.

Recently, stock assessments and essential fish habitat analyses for the American lobster fishery have been conducted at five-year intervals. Due to frequent changes in the fishery, habitat, and status of the lobster resource, using stock and Essential Fish Habitat (EFH) assessments to inform management decisions beyond five years is not realistic. Due to the availability of staff resources, our time frames for producing new bycatch estimates for loggerheads in trawl, gillnet, and dredge fisheries are also proposed to occur on staggered five-year cycles, with additional periods of time to assess whether there have been significant changes in bycatch rates from one time period to the next. Large whale stock assessment reports also analyze data in five year intervals. Therefore, taking into account the different timelines for all these assessments, we expect that we will have to evaluate whether there is a need reinitiate consultation on the fishery at some point in the next ten years, and that beyond ten years the effects of the fishery in combination with environmental changes on ESA-listed species may be completely different than they are currently.

Given the timeframes related to the data on which management of the fishery are based, we do not believe that it is possible to analyze reliably effects of the action far into the future. Anticipating that the American lobster fishery will operate the same way for more than ten years is not only speculative, but the history and pace of change in the fishery described in sections 1.0 and 2.0 suggests that it is not reasonable to expect the fishery to continue to operate as it is currently beyond ten years from now. Longer-term effects of the fishery on ESA-listed species, whatever they may be, are much more difficult to pinpoint and extrapolate beyond ten years. Since the distribution of effort in the fishery and the status of the resource can change over just a few years, the scope of the action assessed in this Opinion is the next ten years. A summary of the characteristics of the fishery relevant to the analysis of its potential effects on ESA-listed species and critical habitat is presented below.

2.1 Description of the Gear

The American lobster fishery uses trap/pot gear to harvest lobster. Lobster trap/pot gear consists of the trap, buoy/surface line, groundline, buoys and/or highflyers. The traps are baited and rest on the bottom until the trap is retrieved. Buoy line(s) connect to the trap and rise vertically to the surface. Lobster traps may be set singly with each trap having its own surface line and buoy, or can be fished in trawls consisting of two or more traps per trawl. Multiple traps are linked together by groundline, with at least one, but most often two surface lines and buoys. The surface lines are typically at an end of a series of traps to mark the location of the gear (Sainsbury 1971). Offshore gear includes additional line at or near the surface that connects a radar reflector highflyer to one of the buoys to aid in relocation and "visibility" of the gear. Excess buoy line is restricted from floating at the surface and all buoys, flotation devices and/or weights must be attached to the buoy with a weak link. All gear is required to be hauled out of the water at least once every 30 days. Fishermen are encouraged, but not required to maintain knot-free buoy lines.

2.2 Description of the Current American Lobster Fishery

American lobsters (*Homarus americanus*) are managed under a dual state and federal regulatory combination of authorities, whereby the Atlantic States Marine Fisheries Commission (ASMFC) manages the lobster fishery in state waters (0-3 nautical miles from shore) and NMFS manages the lobster fishery in federal waters, from 3-200 miles from shore, or the EEZ, both under the authority of the Atlantic Coastal Fisheries Cooperative Management Act. The predominant area of harvest in the United States is the Gulf of Maine, in depths up to 40 meters (ASMFC 1999). Since the 1960s, a secondary offshore fishing area has developed; this area is located from Cape Hatteras, NC to Corsair Canyon (off MA) in depths up to 600 meters. Although lobster traps are set at various depths, it is unlikely that the level of effort is consistent at all depths throughout the range of the fishery, partly because approximately 80% of the American lobster trap fishery occurs in state waters. The landings and revenue figures described in this document refer to state and federal fisheries combined.

Multiple gear types are used in the lobster fishery including trap/pot, otter trawl, gillnet, dredge and hand harvested by SCUBA divers (50 FR 600.725(v)). Between 1981 and 2007, trap/pot gear accounted for an average of 98% of total landings. All other gear types (otter trawl, gillnet, dredge, SCUBA) combined accounted for the remaining 2% and will not be discussed in this Opinion due to their negligible activity in the fishery (ASMFC 2009). The lobster trap/pot fishery is the most active fixed-gear fishery in the Northeast Region. Lobsters harvested recreationally only represent a small percentage of the total landings. The recreational trap fishery only occurs in state waters, therefore these components of the fishery are not subject to federal regulations and are outside the scope of this consultation.

Federally authorized commercial lobster fishing occurs year-round, although the fishery peaks in summer and early fall months. Landings typically follow a seasonal pattern that is tied into the biological cycle of the American lobster, much of which is temperature-dependent. Seasonal distribution has remained largely unchanged over the past 35 years even as landed quantities have increased. January through April typically represent less than 4% of the total annual landings. Landings begin to pick up in May and the majority of lobsters are landed between July and October, typically peaking in August. Compared to the Gulf of Maine, landings tend to increase earlier in the year south of Cape Cod due to warming ocean temperatures.

The American lobster fishery is conducted in three stock units – Gulf of Maine (GOM), Georges Bank (GBK), and southern New England (SNE) (Figure 1). While each stock area has an inshore and offshore component to the fishery, GOM and SNE areas are predominantly inshore fisheries and the GBK area is predominantly an offshore fishery. The GOM stock is primarily fished by Maine, Massachusetts, and New Hampshire fishermen. The GBK stock is primarily fished by Massachusetts, New Hampshire and Rhode Island fishermen. The SNE stock is primarily fished by Connecticut, Massachusetts, New York, and Rhode Island fishermen, with smaller contributions from New Jersey, Delaware, and Maryland. American lobster landings by state for 2009 are depicted in Figure 2.

GOM supports the largest fishery, constituting 76% of the U.S. landings between 1981 and 2007, and 87% since 2002. Landings in the GOM were stable between 1981 and 1989, averaging 14,600 metric tons, then increased dramatically from 1990 (19,200 metric tons) to 2006 (37,300 metric tons). Landings averaged 33,000 metric tons from 2000-2007.

GBK constitutes the smallest portion of the U.S. fishery, averaging 5% of the landings from 1981 to 2007. Between 1981-2002, landings from the GBK fishery have remained stable (averaging 1,300 metric tons). Landings nearly doubled between 2003-2007, reaching a high of 2,400 metric tons in 2005; they have remained at similar levels since.

SNE has the second largest fishery, accounting for 19% of the U.S. landings between 1981 and 2007. Landings increased sharply from the early 1980s to the late 1990s, reaching a time series high of 9,935 metric tons in 1997. Landings remained near the time series high until 1999, when the fishery experienced dramatic declines to an average of 2,600 metric tons between 2003 and 2007 likely due to a lobster stock collapse. From 2000 to 2007, landings from the SNE accounted for only 9% of the U.S. landings, reaching a time-series low of 6% in 2004.

Lobster resources are managed in seven Lobster Conservation Management Areas (LCMAs, Figure 3): Area 1 – Inshore Gulf of Maine (GOM); Area 2 – Inshore Southern New England (SNE); Area 3 – Offshore Waters; Area 4 – Inshore Northern Mid-Atlantic; Area 5 – Inshore Southern Mid-Atlantic; Area 6 – New York and Connecticut State Waters (primarily Long Island Sound); and Outer Cape Cod (OCC).

Effort in the lobster fishery is controlled by limiting the number of eligible participating vessels (permits) and the number of traps that may be fished per vessel. The fishery is termed a “limited access” fishery meaning that no new entrants are allowed, although permits may be bought, sold and transferred to another vessel. Beginning in 1994, NMFS has generally limited access into the federal lobster fishery to those who documented participation in the fishery prior to 1991. In subsequent years, the ASMFC approved measures to limit access to the lobster trap fishery in all LCMAs to only those who could document fishing history in those areas. Qualified participants are allocated a number of traps within that management area based on their documented past fishing effort in that LCMA.

Figure 1. American lobster stock units.

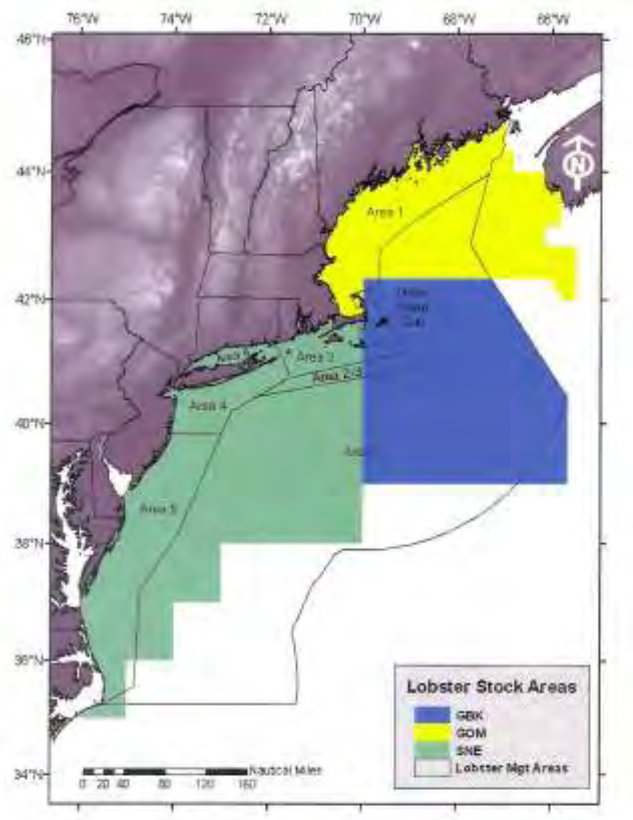


Figure 2. American Lobster Landings by State, 2009

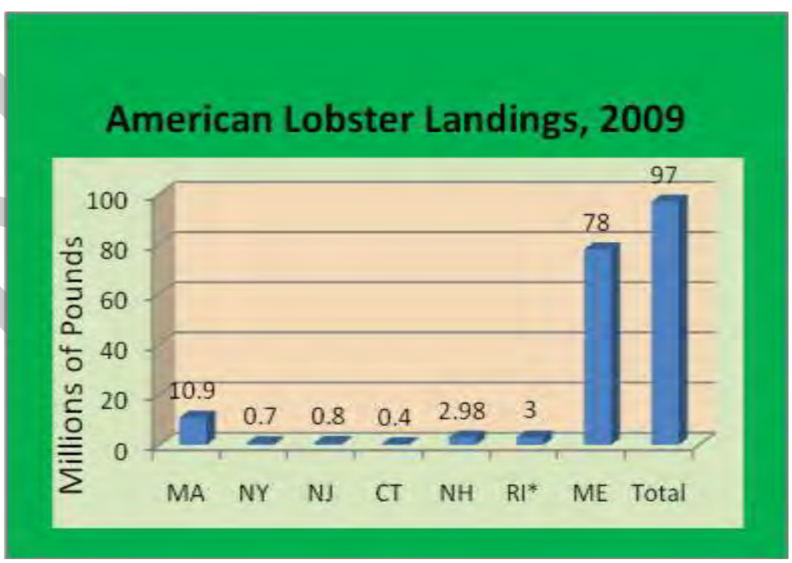
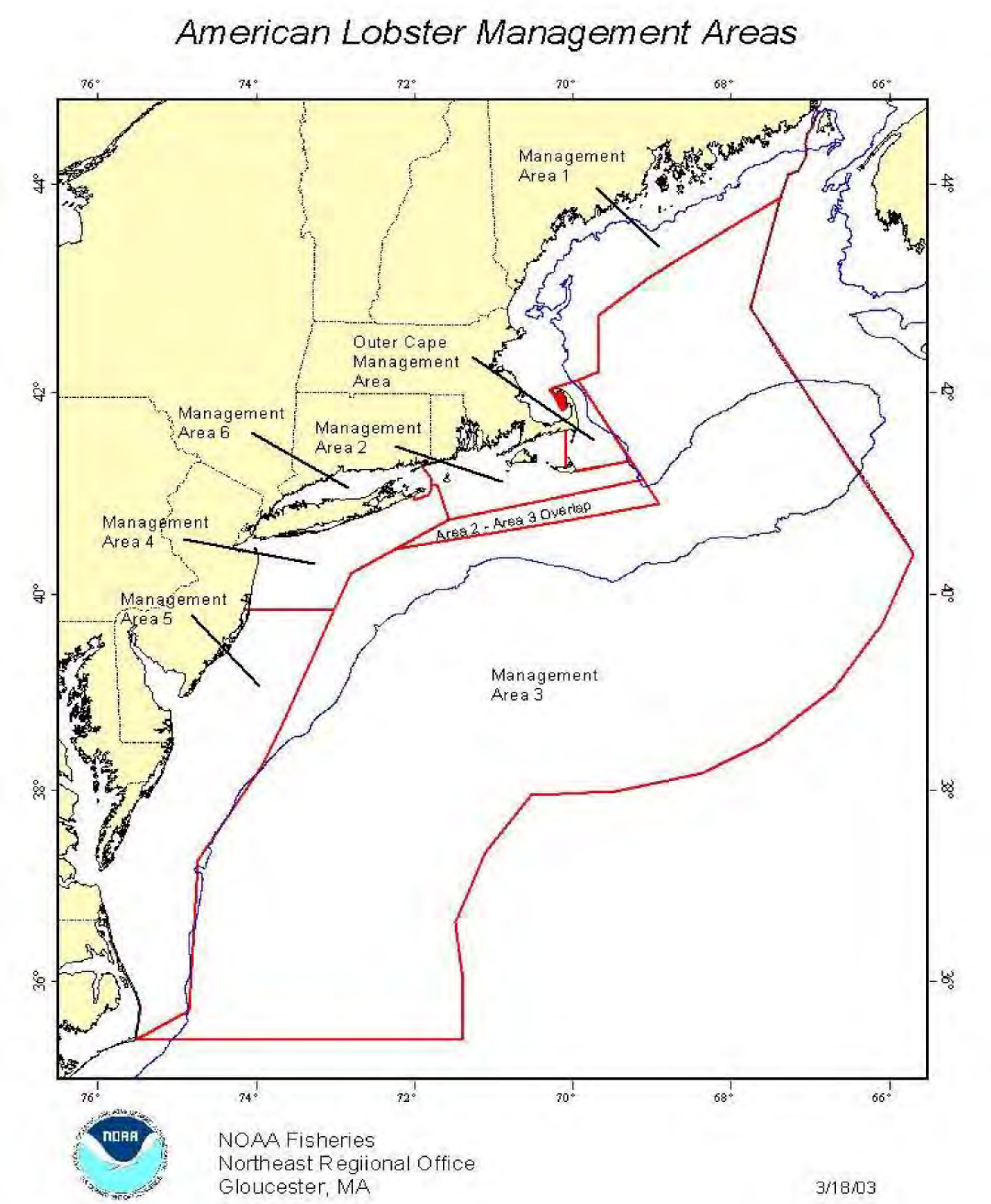


Figure 3. Lobster Conservation Management Areas



2.2.1 Summary of Lobster Trap Fishery Limiting Access Programs

The New England Fishery Management Council's Lobster FMP, and more recently, the Commission's ISFMP, includes several actions to control fishing effort and restrict the movement of federal permits across management areas. In 1994, NMFS limited access to the federal lobster fishery to those who could document participation in the fishery prior to 1991 (59 FR 31943 – June 1994). In August 1999, the Commission passed Addendum I, which limited access to the lobster trap fishery in LCMAs 3, 4, and 5 to those who could document fishing history in those areas. The Commission has also proposed an addenda aimed at controlling effort by limiting access to other LCMAs (see Table 1). NMFS has responded by implementing a limited entry program in the Area 1 lobster trap fishery in 2012, and continues to evaluate and develop management measures to address a limited entry program for the Area 2 and Outer Cape Cod trap fisheries which includes the potential implementation of a trap transferability program.

Table 1. Limited Entry Actions in the American Lobster Fishery

Area of Limited Entry	Commission Action	Corresponding Federal Action
EEZ	March 1994 – Amendment 5[3]	June 1994 (59 FR 31943)
Area 6 (Long Island Sound – state waters of CT/New York (NY))	1995 – by State Action	None
Area 3 (Offshore EEZ)	August 1999 – Addendum I	March 2003 (68 FR 14902)
Area 4 (Northern Nearshore Mid-Atlantic)	August 1999 – Addendum I	March 2003 (68 FR 14902)
Area 5 (Southern Nearshore Mid-Atlantic)	August 1999 – Addendum I	March 2003 (68 FR 14902)
Outer Cape Cod Area	February 2002 – Addendum III	Under analysis
Area 2	December 2003 – Addendum IV[4]	Under analysis
Area 1	November 2009 – Addendum XV	June 2012 (77 FR 32420)

As noted above, NMFS has carried out an area-specific eligibility process in the federal lobster fishery for Areas 3, 4 and 5 with the publication of a final rule (68 FR 14902) on March 27, 2003. Area 3 is the largest lobster management area and is located exclusively in federal waters. It begins on the eastern boundary of the nearshore lobster management areas, extending from the

[3] New England Fishery Management Council document. This action occurred prior to the 1999 transfer of Federal lobster management to the Commission under the Atlantic Coastal Act.
[4] Addendum IV was rescinded and replaced by Addendum VI in February 2005.

GOM to Cape Hatteras, NC and out to the Hague Line (EEZ 200-mile limit). Area 3 overlaps all three lobster stock areas. Area 4 is the northern nearshore Mid-Atlantic lobster management area, extending from east of Montauk, New York, southwesterly to mid-coast New Jersey and eastward to approximately 50 miles from shore. Area 5 is the southern nearshore Mid-Atlantic lobster management area, extending from mid-coast New Jersey to Cape Hatteras, NC and eastward approximately 60 miles from shore.

The 2003 rule was implemented to support measures recommended by the fishing industry and adopted by the Commission in the Addendum I to Amendment 3 of the ISFMP. The intent of the action was to cap and control fishing effort in these three management areas as part of an overall program to end overfishing and rebuild lobster stocks. The final rule included criteria, consistent with those established by the Commission in the ISFMP, to determine Federal permit holder eligibility in each specific management area. The criteria, which varied by area, included a minimum landings requirement (Area 3) and proof of participation of the historical number of traps fished, as well as proof that the vessel fished at least 200 traps in the area over a two consecutive month period. Ultimately, vessels were assigned individual trap allocations for each qualified area. The Area 4 and 5 programs established a trap limit of 1,440 lobster traps per vessel. In Area 3, qualified vessels were capped at 2,656 traps, with subsequent annual trap reductions bringing the maximum Area 3 trap limit to no more than 2,267 traps in 2006. In a 2007 final rule (72 FR 56935), additional annual trap reductions of 2.5% per vessel were imposed in Area 3. At the end of the reduction schedule, the trap limit for each vessel in Area 3 was reduced to no more than 1,945 traps as of July 1, 2010. Initial qualification for each area reduced the number of vessels eligible to fish to the following numbers of permits as shown in Table 2.

Table 2. Number of Qualified and Active Permits in LCMAs 3, 4 and 5

Limited Access Management Area	Total Permits Qualified 2006	Active Permits 2009[5]	Total Eligible Permits 2009[6]
Area 3	139	101	137
Area 4	81	68	80
Area 5	42	40	41

2.2.2 Federal Lobster Trap Limited Entry Programs Currently Under Evaluation

NMFS is currently assessing the impacts of various alternatives associated with the Commission's recommendations for a limited entry program in Area 2 and the Outer Cape Cod

[5] The 2009 values reflect the number of permit holders who selected Area 3, 4 or 5 during the 2009 Federal fishing year and represent a lower value than the current number of Federal permits eligible for these areas.
[6] Indicates the number of existing permit "histories" that qualify for each area. They have decreased slightly for each area since 2006 due to the voluntary relinquishment of the lobster permit due to permit consolidation.

Management Area based on historical participation. NMFS published a Draft Environmental Impact Statement in April 2010, to evaluate a program to cap and control fishing effort within these two management areas. NMFS is now preparing a proposed rule which will offer a suite of alternatives for public review and comment that would address the Commission's recommendations for a limited entry program for the Area 2 and Outer Cape Cod lobster trap fisheries that could also include a program for trap transferability in these areas as well as in Offshore Area 3. This trap transferability component, called an individual transferable trap (ITT) program, would allow permit holders to buy and sell portions of their trap allocations, which will provide a means for lobstermen to adjust their businesses. As part of the program, with each transfer, the number of traps allowed in the water would be reduced by either 10 or 20 percent, depending on the number of traps sold (a conservation "tax").

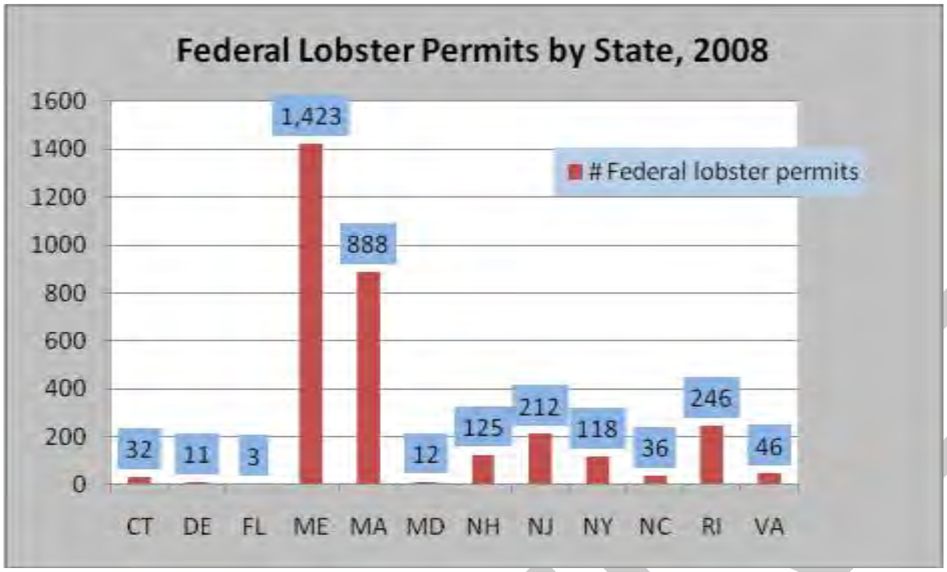
The Commission, concerned that federal lobster permits that don't qualify for the trap fishery in certain management areas may migrate into Area 1, adopted Addendum XV to Amendment 3 of the ISFMP in 2009 and recommended that NMFS implement a limited entry program for the Area 1 lobster trap fishery to cap effort at current levels. NMFS published a final rule on June 1, 2012 (77 FR 32420), to implement this program which will cap the number of Federal Area 1 lobster trap permits at 2008 levels. The new rules address the concerns of the Gulf of Maine lobster industry, scientists, and the Commission's lobster management board that unchecked fishing effort in Area 1 could have long-term negative impacts on the Gulf of Maine lobster stock and fishery. Beginning May 1, 2013, only those Federal lobster permits that meet the eligibility critieria set forth in the final rule will be authorized to fish with lobster traps in the federal waters of Area 1.

2.2.3 American Lobster Fishing Effort

Fishing effort is difficult to define in the American lobster fishery as there is no linear relationship between the number of traps fished and fishing effort. The lack of systematic record keeping of commercial lobster fishing has historically made it a challenge for NMFS to develop comprehensive analysis of American lobster fishery data. One cannot, for example, assume that an individual fisher who purchases 800 trap tags actually fishes traps for all of those trap tags, and there is no official record keeping of what is actually fished. The analysis in this Opinion uses best available data, largely from federal and state sources, to measure inputs, such as the number of federal lobster permit holders by area, associated trap tag allocations and purchases, and outputs, such as landings data. Where data gaps remain, other best-available sources have been used and are appropriately described and cited within this Opinion.

The total number of fishing permits in the U.S. lobster fishery (state and federal) varies around a time series mean of 11,900 from 1981 to 2000. The total number of permits began to steadily decline in 2001 and reached a low of 10,763 in 2007 (ASMFC 2009). As of 2008, there were approximately 3,152 federal lobster permits, but not all are active on an annual basis (Figure 4).

Figure 4. Federal Lobster Permits by State, 2008.



Federal permit data can be used to estimate the total amount of effort potentially fishing in an LCMA in any given year. Approximately 2,800 federal lobster permits were issued to vessels using trap/pot gear in 2009, each of which must be renewed annually or relinquished (Table 3). However, many individuals designate LCMAs on their permits despite having little intention of actually fishing there. Just over 1,700 American lobster federal permit holders actually purchased trap tags in each fishing year. Trap tags are required to be present on all lobster trap/pot gear being fished in the EEZ. Assuming vessel owners that purchase trap tags actually participate in the lobster trap fishery, approximately 70% of all permitted trap vessels are active in federal waters. Trap tag data represents how many trap tags each permit holder ordered each year and for which LCMA. Trap tag data is limited in its ability to provide a more precise estimate of fishing effort in LCMA, but may be the best estimate of the upper boundary of fishing effort in LCMA.

2.3 Management of American Lobster Exempted Fishing, Scientific Research, and Exempted Educational Activity

Regulations at 50 CFR 600.745 allow the Northeast Regional Administrator to authorize the targeting or incidental harvest of species managed under an FMP or fishing activities that would otherwise be prohibited for scientific research, limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, hazardous waste removal purposes, or educational activity. Every year, the NERO may issue a small number of exempted fishing permits (EFPs) and/or exempted educational activity authorizations (EEAA) exempting the collection of a limited number of American lobster from Northeast federal waters from American Lobster FMP regulations. For example, between 2007 and 2011, NERO issued four EFPs relative to the American lobster fishery. EFPs and EEAAs typically involve fishing by commercial or research vessels, similar or identical to the fishing methods of the lobster fishery,

Table 3. Federal Lobster Trap Permits by Management Area[7]

Lobster Management Area	Number of Federal Lobster Permits
A1 - Gulf of Maine	**1,960**
A2 - Southern New England	**427**
A3 - Offshore	**110**
A4 - Northern Mid-Atlantic	**70**
A5 – Southern Mid-Atlantic	**30**
A6 – Long Island Sound	**64**
OC - Outer Cape Cod	**160**
TOTAL Federal Trap Permits	**2,821**

which is the primary subject of this Opinion. For the four EFPs examined between 2007 and 2011, we were able to conclude that in all cases, the types and rates of interactions with listed species from the EFP activities would be expected to be similar to those analyzed in this Opinion. Given our past experience, we would expect that future EFPs and/or EEAAs would propose fishing types and associated fishing effort similar to that analyzed in this Opinion and therefore not introducing significant increase over effort levels for the overall fishery considered in this Opinion. Therefore, the issuance of some EFPs and EEAAs would be expected to fall within the level of effort and impacts considered in this opinion. For example, issuance of an EFP to an active commercial vessel likely does not add additional effects than would not otherwise accrue from the vessel's normal commercial activities. Similarly, issuance of an EFP or EEAA to a vessel to conduct a minimal number of lobster trips with trap/pot gear likely would not add sufficient fishing effort to produce a detectable change in the overall amount of fishing effort in a given year. Therefore, we consider the issuance of EFPs and EEAAs by the NERO to be within the scope of this Opinion. If an EFP or EEAA is proposed which modifies this agency action in a manner that causes an effect to listed species or critical habitat not considered in this Opinion then consultation will be reinitiated.

2.4 Summary of the American Lobster Fishery

The U.S. American lobster resource occurs in continental shelf waters from Maine to North Carolina. The American lobster fishery is conducted in each of three stock units –GOM, GBK, and SNE. Between 1981 and 2007 the GOM, SNE and GBK landed 76%, 19%, and 5% of U.S. landings respectively.

[7] These numbers were not screened for specific permit histories and they are overestimated in the case of Area 1 and underestimated for Areas 3, 4, and 5. This data was obtained from a simple query of the NMFS vessel permit database to provide the reader with a rough estimate of the number of permits by areas. These numbers are less accurate than the numbers used to analyze this action as evidenced in Chapter 4.

The fishery is the most active fixed-gear fishery in the Northeast Region. Between 1981 and 2007, trap/pot gear accounted for an average of 98% of total landings. Lobster trap/pot gear consists of the trap, buoy/surface line, groundline, buoys and/or highflyers. The traps are baited and rest on the bottom until the trap is retrieved. Buoy line(s) connect to the trap and rise vertically to the surface. Federally authorized commercial lobster fishing occurs year-round, although the fishery peaks in summer and early fall months.

While the total number of active federal permits declined from 2001 through 2007, the recorded landings increased through the 1990s and continued to increase through 2006. In general, the 2009 Stock Assessment Report concluded that "(t)he American lobster fishery resource presents a mixed picture, with stable abundance for much of the GOM stock, increasing abundance for the GBK stock, and decreased abundance and recruitment yet continued high fishing mortality for the SNE stock."

2.5 Action Area

Current federal lobster regulations manage the lobster fishery in the EEZ from Maine through North Carolina, and affect federal lobster permit holders regardless of whether they fish in federal or state waters. For the purposes of this Opinion, the area to be directly and indirectly affected by the American lobster fishery (the action area) is the area in which the American lobster fishery operates, broadly defined as all EEZ waters from Maine through Cape Hatteras, NC, and the adjoining state waters that are affected through the regulation of activities of federal American lobster permit holders fishing in those waters.

3.0 STATUS OF THE SPECIES

NMFS has determined that the action being considered in this Opinion may affect the following ESA-listed species in a manner that will likely result in adverse effects:

North Atlantic right whale	(*Eubalaena glacialis*)	Endangered
Humpback whale	(*Megaptera novaeangliae*)	Endangered
Fin whale	(*Balaenoptera physalus*)	Endangered
Sei whale	(*Balaenoptera borealis*)	Endangered
Loggerhead sea turtle - NWA DPS[8]	(*Caretta caretta*)	Threatened
Leatherback sea turtle	(*Dermochelys coriacea*)	Endangered

NMFS has determined that the action being considered in this Opinion will not effect any DPS of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), the Gulf of Maine DPS of Atlantic salmon (*Salmo salar*), Kemp's ridley sea turtles (*Lepidochelys kempii*), green sea turtles (Chelonia mydas), hawksbill sea turtles (*Eretmochelys imbricata*) blue whales (*Balaenoptera musculus*), and sperm whales (*Physeter macrocephalus*), all of which are listed as threatened or endangered species under the ESA[9].

[8] NWA DPS = Northwest Atlantic DPS, the only loggerhead DPS expected to occur in the action area

[9] 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.

Additionally, the operation of the American lobster fishery is not likely to adversely affect the designated critical habitat for the GOM DPS of Atlantic salmon or critical habitat for North Atlantic right whales. Thus, these species or critical habitat will not be considered in this Opinion. The following is NMFS' rationale for these determinations.

Atlantic sturgeon are distributed along the eastern coast of North America from Labrador, Canada to Cape Canaveral, Florida. Based on the joint NMFS and U.S. Fish and Wildlife Service policy for identifying DPSs (61 FR 4722; February 7, 1996), NMFS has concluded that the Atlantic sturgeon that originate from U.S. rivers are discrete from Atlantic sturgeon that originate from Canadian rivers, and comprise five DPSs, as follows: (1) Gulf of Maine (GOM) DPS; (2) New York Bight (NYB) DPS; (3) Chesapeake Bay (CB) DPS; (4) Carolina DPS; and, (5) South Atlantic DPS. NMFS has listed the GOM DPS as threatened and has listed the other DPSs as endangered [77 FR 5880-5912; 77 FR 5914-5982]. Atlantic sturgeon are a long lived (approximately 60 years; Mangin, 1964; Stevenson and Secor, 1999), late maturing, estuarine dependent, anadromous species (ASSRT, 2007). Atlantic sturgeon can reach lengths of up to 14 feet (4.26 meters) and weigh more than 800 pounds (~364 kilograms). Atlantic sturgeon are anadromous; adults spawn in freshwater in the spring and early summer and migrate into estuarine and marine waters where they spend most of their lives. Subadults and adults live in coastal waters and estuaries when not spawning, generally in shallow (10-50 meter depth) nearshore areas dominated by gravel and sand substrates. Long distance migrations away from spawning rivers are common. As stated in ASMFC (2007) and Stein *et al*. (2004), the American lobster fishery is not likely to adversely affect Atlantic sturgeon since trap/pot gear does not have any documented record of interactions with Atlantic sturgeon; therefore it is unlikely that this operation would affect this species. We have reviewed all available records and there have been no observed captures of Atlantic sturgeon in trap/pot gear or any other gear when the primary trip or haul target was lobster. Because there are no proposed changes to the lobster fishery that would increase the likelihood of interactions between Atlantic sturgeon and lobster trap/pot gear, we do not anticipate any future interactions. Because of this, we do not expect any effects to any DPS of Atlantic sturgeon from this fishery.

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. Shortnose sturgeon have been described as anadromous but for some shortnose sturgeon populations that rarely leave their natal river, freshwater amphidromous may be a better description (Kieffer and Kynard, 1993). A freshwater amphidromous species is defined as a species that spawns and remains in freshwater for most of its life cycle but spends some time in saline water. Most researchers previously believed that coastal movements were rare (Dadswell, 1984; NMFS 1998) and that shortnose sturgeon seldom ventured beyond their natal rivers. However, there is conclusive evidence that shortnose sturgeon make coastal movements to adjacent rivers from both tagging data and genetic analysis. Telemetry data and genetic analyses have demonstrated that inter-riverine movements of shortnose sturgeon may be relatively common in some areas (*e.g.* Maine Rivers based on Fernandes 2008; Southeast Rivers based on J. Fleming, GADNR, pers. comm. 2008; and T. King, USGS, pers. comm. 2009). Since the American lobster fishery does not operate in or near the rivers where concentrations of shortnose sturgeon are most likely found, it is highly unlikely that the American lobster fishery will affect shortnose sturgeon. We have reviewed all available records, and there have been no observed captures of shortnose sturgeon in trap/pot gear or any other gear when the primary trip or haul target was lobster. Because there are no proposed changes to the lobster fishery that would increase the likelihood of interactions between shortnose sturgeon and lobster trap/pot gear, we do not anticipate any future interactions. Because of this, we do not expect any effects to shortnose sturgeon from this fishery.

The wild populations of Atlantic salmon, whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, are listed as endangered under the ESA. Juvenile salmon in New England rivers typically migrate to sea in May after a two-to-three year period of development in freshwater streams, and remain at sea for two winters before returning to their U.S. natal rivers to spawn (Reddin 2006). The preferred habitat of post-smolt salmon in the open ocean is principally the upper 10 meters of the water column (ICES SGBYSAL, 2005), although there is evidence of forays into deeper water for shorter periods; in contrast adult Atlantic salmon demonstrate a wider depth profile (ICES SGBYSAL, 2005). Results from a 2001-2003 post-smolt trawl survey in 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 (Lacroix and Knox 2005). Therefore, fishing at the bottom, as practiced in the American lobster fishery, reduces the potential for catching Atlantic salmon as either post-smolts or adults. It is highly unlikely that the action being considered in this Opinion will affect the Gulf of Maine DPS of Atlantic salmon given that operation of the American lobster fishery does not occur in or near the rivers where concentrations of Atlantic salmon are likely to be found and pot/trap gear operates in the ocean at the bottom rather than near the surface. We have reviewed all available records, and there have been no observed captures of Atlantic salmon in trap/pot gear or any other gear when the primary trip or haul target was lobster. Because there are no proposed changes to the lobster fishery that would increase the likelihood of interactions between Atlantic salmon and lobster trap/pot gear, we do not anticipate any future interactions. Because of this, we do not expect any effects to Atlantic salmon from this fishery.

The hawksbill sea 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 individuals have been sighted along the East Coast as far north as Massachusetts, although sightings north of Florida are rare. Hawksbills occasionally have been found stranded as far north as Cape Cod, Massachusetts, but many of these strandings were observed after hurricanes or offshore storms. Since operation of the American lobster fishery does not occur in waters that are typically used by hawksbill sea turtles, it is highly unlikely that the American lobster fishery will affect this turtle species.

The Kemp's ridley sea turtle is one of the least abundant of the world's sea turtle species. Kemp's ridley typically occur only in the Gulf of Mexico and the northwestern Atlantic Ocean (USFWS and NMFS 1992). Foraging areas documented along the U.S. Atlantic coast include Charleston Harbor, Pamlico Sound (Epperly *et al*. 1995c), Chesapeake Bay (Musick and Limpus

1997), Delaware Bay, and Long Island Sound (Morreale and Standora 1993). Adult Kemp's ridleys are found in the coastal regions of the Gulf of Mexico and southeastern U.S., but are typically rare in the northeastern U.S. waters of the Atlantic (TEWG 2000). Gear interactions of Kemp's ridley turtles have been recorded by sea sampling coverage in the Northeast otter trawl fishery, pelagic longline fishery, and Southeast shrimp and summer flounder bottom trawl fisheries. There are no documented interactions of Kemp's ridley sea turtles with gear from the lobster trap/pot fishery; because there are no proposed changes to the lobster fishery that would increase the likelihood of interactions between Kemp's ridleys and lobster trap/pot gear, we do not anticipate any future interactions. Because of this, we do not expect any effects to Kemp's ridleys from this fishery.

In the western Atlantic, green sea turtles range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999). Green sea turtles occur seasonally in Mid-Atlantic and Northeast waters such as Chesapeake Bay and Long Island Sound (Musick and Limpus 1997, Morreale and Standora 1998, Morreale *et al*. 2005), which serve as foraging and developmental habitats. As with the other sea turtle species, incidental fishery mortality accounts for a large proportion of annual human-caused mortality outside the nesting beaches. Gear interactions of green sea turtles have been recorded by sea sampling coverage in the pelagic driftnet, pelagic longline, Southeast shrimp trawl, and summer flounder bottom trawl fisheries. There are no documented interactions of green sea turtles with gear from the lobster trap/pot fishery; because there are no proposed changes to the lobster fishery that would increase the likelihood of interactions between greens and lobster trap/pot gear, we do not anticipate any future interactions. Because of this, we do not expect any effects to green sea turtles from this fishery.

Blue whales do not regularly occur in waters of the U.S. Exclusive Economic Zone (EEZ) (Waring *et al*. 2010). In the North Atlantic, blue whales are most frequently sighted in the St. Lawrence from April to January (Sears 2002). No blue whales were observed during the Cetacean and Turtle Assessment Program (CeTAP) surveys of the Mid- and North Atlantic areas of the outer continental shelf (CeTAP 1982). Calving for the species occurs in low latitude waters outside of the area where the American lobster fishery operates. Blue whales feed on euphausiids (krill) (Sears 2002), which are too small to be captured in American lobster fishing gear. Given that the species is unlikely to occur in areas where the American lobster fishery operates, and given that the operation of the American lobster fishery will not affect the availability of blue whale prey or areas where calving and nursing of young occurs, NMFS has determined that the continued operation of the American lobster fishery will not affect blue whales.

Sperm whales do regularly occur in waters of the U.S. EEZ in the Atlantic Ocean. However, sperm whales are generally found on the continental shelf edge, over the continental slope, and into mid-ocean regions (Waring *et al*. 2007). In contrast, the American lobster fishery operates in continental shelf waters. The average depth of sperm whale sightings observed during the CeTAP surveys was 1,792 meters (CeTAP 1982). Female sperm whales and young males almost always inhabit waters deeper than 1,000 meters and at latitudes less than 40° N (Whitehead 2002). Sperm whales feed on larger organisms that inhabit the deeper ocean regions (Whitehead 2002). Calving for the species occurs in low latitude waters outside of the area where the American lobster fishery operates. Given that sperm whales are unlikely to occur in areas (based on water depth) where the American lobster fishery operates, and given that the operation of the American lobster fishery will not affect the availability of sperm whale prey or areas where calving and nursing of young occurs, NMFS has determined that the continued operation of the American lobster fishery will not affect sperm whales.

On June 3, 1994, NMFS designated critical habitat in the Atlantic for the northern right whale (59 FR 28793). This designation includes areas in Cape Cod Bay and Great South Channel which are located within the action area. NMFS has been, and continues to be, in rulemaking to designate critical habitat for the North Atlantic right whale following the 2008 change in the way the three species of right whales were listed under the ESA (73 FR 12024, March 6, 2008). On October 1, 2009, NMFS received a petition to revise the 1994 critical habitat designation. In an October 2010 Federal Register notice(75 FR 61690), we announced that we intend to revise existing critical habitat by continuing our ongoing rulemaking process to designate critical habitat for North Atlantic right whales with the expectation that a proposed critical habitat rule for the North Atlantic right whale will be published in 2011. To date, we have not yet published a proposed rule so the 1994 critical habitat designation for northern right whales is the only critical habitat for right whales in the Atlantic.

NMFS has determined that the action being considered in the Opinion is not likely to adversely affect right whale critical habitat. This determination is based on the action's effects on the conservation value of the habitat that has been designated. Specifically, we considered whether the action was likely to affect the physical or biological features that afford the designated area value for the conservation of right whales. Critical habitat for right whales has been designated in the Atlantic Ocean in Cape Cod Bay, Great South Channel, and in nearshore waters off Georgia and Florida (50 CFR 226.13). The features important for right whales are the factors that result in high densitys of certain species of copepods. The lobster fishery will not affect the availability of copepods for foraging right whales because copepods are very small organisms that are not expected to be captured or injured in lobster fishing gear. Additionally, the action will not affect the oceanographic features that act to aggregate copepods. Since the action being considered in this Opinion is not likely to affect the availability of copepods or the factors that serve to aggregate copepods, and these were the biological feature that characterized feeding habitat, this action is not likely to affect designated critical habitat for right whales and, therefore, right whale critical habitat will not be considered further in this Opinion.

Coincident with the June 19, 2009, endangered listing, NMFS designated critical habitat for the GOM DPS of Atlantic salmon (74 FR 29300; June 19, 2009). Designation of critical habitat is focused on the known primary constituent elements (PCEs) within the occupied areas of a listed species that are deemed essential to the conservation of the species. Within the GOM DPS, the PCEs for Atlantic salmon are 1) sites for spawning and rearing and 2) sites for migration (excluding marine migration; although successful marine migration is essential to Atlantic salmon, NMFS was not able to identify the essential features of marine migration and feeding habitat or their specific locations at the time critical habitat was designated). While there is potential for lobster fishing activity to occur within the GOM DPS of Atlantic salmon critical habitat, the placement of lobster traps and trawls is expected to allow adequate passage for migrating salmon. Likewise, the associated fishing activities (*i.e.,* hauling gear and vessel movements) are not expected to alter water chemistry or physical attributes to levels that would affect migration patterns of smolts or adult salmon.

3.1 Status of Large Whales

All of the cetacean species considered in this Opinion were once the subject of commercial whaling which likely caused their initial decline. Commercial whaling for right whales along the U.S. Atlantic coast peaked in the 18th century, but right whales continued to be taken opportunistically along the coast and in other areas of the North Atlantic into the early 20th century (Kenney 2002). Worldwide, humpback whales were often the first species to be taken and frequently hunted to commercial extinction (Clapham *et al.* 1999), meaning that their numbers had been reduced so low by commercial exploitation that it was no longer profitable to target the species. Wide-scale exploitation of the more offshore fin whale occurred later with the introduction of steam-powered vessels and harpoon gun technology (Perry *et al.* 1999). Sei whales became the target of modern commercial whalers primarily in the late 19th and early 20th century after populations of other whales, including right, humpback, fin, and blue, had already been depleted. The species continued to be exploited in Iceland until 1986 even though measures to stop whaling of sei whales in other places had been put into place in the 1970s (Perry *et al.* 1999). Today, the greatest known threats to cetaceans are ship strikes and gear interactions, although the number of each species affected by these activities does vary.

Information on the range-wide status of each species as it is listed under the ESA is included here to provide the reader with information on the status of each species, overall. Additional background information on the range-wide status of these species can be found in a number of published documents, including recovery plans (NMFS 1991a,b; 2005a; 2010; 2011), the Marine Mammal Stock Assessment Reports (SAR) (*e.g*., Waring *et al.* 2011), status reviews (*e.g*., Conant *et al.* 2009), and other publications (*e.g.,* Clapham *et al.* 1999; Perry *et al.* 1999; Best *et al.* 2001).

3.1.1 North Atlantic Right Whales

Historically, right whales have occurred in all the world's oceans from temperate to subarctic latitudes (Perry *et al.* 1999). In both hemispheres, they are observed at low latitudes and in nearshore waters where calving takes place in the winter months, and in higher latitude foraging grounds in the summer (Clapham *et al.* 1999; Perry *et al.* 1999).

The North Atlantic right whale (*Eubalaena glacialis*) has been listed as endangered under the ESA since 1973. It was originally listed as the "northern right whale" as endangered under the Endangered Species Conservation Act, the precursor to the ESA in June 1970. The species is also designated as depleted under the Marine Mammal Protection Act (MMPA).

In December 2006, NMFS completed a comprehensive review of the status of right whales in the North Atlantic and North Pacific Oceans. Based on the findings from the status review, NMFS concluded that right whales in the northern hemisphere exist as two species: North Atlantic right whale (*Eubalaena glacialis*) and North Pacific right whale (*Eubalaena japonica*). NMFS determined that each of the species is in danger of extinction throughout its range. In 2008, based on the status review, NMFS listed the endangered northern right whale (*Eubalaena spp.*) as two separate endangered species: the North Atlantic right whale (*E. glacialis*) and North Pacific right whale (*E. japonica*) (73 FR 12024; March 6, 2008).

Habitat and Distribution
Western North Atlantic right whales generally occur from the Southeast U.S. to Canada (*e.g.*, Bay of Fundy and Scotian Shelf) (Kenney 2002; Waring *et al.* 2011). Like other right whale species, they follow an annual pattern of migration between low latitude winter calving grounds and high latitude summer foraging grounds (Perry *et al.* 1999; Kenney 2002).

The distribution of right whales seems linked to the distribution of their principal zooplankton prey, calanoid copepods (Winn *et al.* 1986; NMFS 2005; Baumgartner and Mate 2005; Waring *et al.* 2011). Right whales are most abundant in Cape Cod Bay between February and April (Hamilton and Mayo 1990; Schevill *et al.* 1986; Watkins and Schevill 1982) and in the Great South Channel in May and June (Kenney *et al.* 1986; Payne *et al.* 1990; Kenney *et al.* 1995; Kenney 2001) where they have been observed feeding predominantly on copepods of the genera *Calanus* and *Pseudocalanus* (Baumgartner and Mate 2005; Waring *et al.* 2011). Right whales also frequent Stellwagen Bank and Jeffrey's Ledge, as well as Canadian waters including the Bay of Fundy, Browns, and Baccaro Banks in the summer through fall (Mitchell *et al.* 1986; Winn *et al*. 1986; Stone *et al.* 1990). The consistency with which right whales occur in such locations is relatively high, but these studies also highlight the high interannual variability in right whale use of some habitats. Calving is known to occur in the winter months in coastal waters off Georgia and Florida (Kraus *et al.* 1988). Calves have also been sighted off the coast of North Carolina during winter months suggesting the calving grounds may extend as far north as Cape Fear, NC. In the North Atlantic, it appears that not all reproductively active females return to the calving grounds each year (Kraus *et al.*, 1986; Payne, 1986). Patrician *et al.* (2009) analyzed photographs of a right whale calf sighted in the Great South Channel in June 2007 and determined the calf appeared too young to have been born in the known southern calving area. Although it is possible the female traveled south to New Jersey or Delaware to give birth, evidence suggests that calving in waters of the northeastern U.S. is possible. The location of some portion of the population during the winter months remains unknown (NMFS 2005a). However, recent aerial surveys conducted under the North Atlantic Right Whale Sighting Survey (NARWSS) program have indicated that some individuals may reside in the northern Gulf of Maine during the winter. In 2008, 2009, and 2010, right whales were sighted on Jeffreys and Cashes Ledges, Stellwagen Bank, and Jordan Basin from December to February (Khan *et al*. 2009, 2010, 2011).

While right whales are known to congregate in the aforementioned areas, much is still not understood about their seasonal distribution, and movements within and between these areas (Waring *et al.* 2011). In the winter, only a portion of the known right whale population is seen on the calving grounds. The winter distribution of the remaining right whales remains uncertain (NMFS 2005, Waring *et al.* 2011). Results from winter surveys and passive acoustic studies suggest that animals may be dispersed in several areas including Cape Cod Bay (Brown *et al.* 2002) and offshore waters of the southeastern U.S. (Waring *et al.* 2011). On multiple days in December 2008, congregations of more than 40 individual right whales were observed in the Jordan Basin area of the Gulf of Maine, leading researchers to believe this may be a wintering ground (NOAA 2008). Telemetry data have shown lengthy and somewhat distant excursions into deep water off the continental shelf (Mate *et al.* 1997) as well as extensive movements over the continental shelf during the summer foraging period (Mate *et al.* 1992; Mate *et al.* 1997; Bowman 2003; Baumgartner and Mate 2005). Knowlton *et al.* (1992) reported several long-distance movements as far north as Newfoundland, the Labrador Basin, and southeast of Greenland; in addition, resightings of photographically identified individuals have been made off Iceland, arctic Norway, and in the old Cape Farewell whaling ground east of Greenland. The Norwegian sighting (September 1999) is one of only two sightings in the 20th century of a right whale in Norwegian waters, and the first since 1926. Together, these long-range matches indicate an extended range for at least some individuals and perhaps the existence of important habitat areas not presently well described. Similarly, records from the Gulf of Mexico (Moore and Clark, 1963; Schmidly *et al.*, 1972) represent either geographic anomalies or a more extensive historic range beyond the sole known calving and wintering ground in the waters of the southeastern United States. The frequency with which right whales occur in offshore waters in the southeastern U.S. remains unclear (Waring *et al.* 2011).

Abundance estimates and trends
An estimate of the pre-exploitation population size for the North Atlantic right whale is not available. As is the case with most wild animals, an exact count of North Atlantic right whales cannot be obtained. However, abundance can be reasonably estimated from the extensive study of western North Atlantic right whale population. IWC participants from a 1999 workshop agreed to a minimum direct-count estimate of 263 right whales alive in 1996 and noted that the true population was unlikely to be greater than this estimate (Best *et al.* 2001). Based on a census of individual whales using photo-identification techniques and an assumption of mortality for those whales not seen in seven years, a total of 299 right whales was estimated in 1998 (Kraus *et al*. 2001), and a review of the photo-ID recapture database on July 6, 2010, indicated that 396 individually recognized whales were known to be alive during 2007 (Waring *et al.* 2011). Because this 2009 review was a nearly complete census, it is assumed this estimate represents a minimum population size. The minimum number alive population index for the years 1990-2007 suggests a positive trend in numbers. These data reveal a significant increase in the number of catalogued whales alive during this period, but with significant variation due to apparent losses exceeding gains during 1998-1999. Mean growth rate for the period was 2.4% (Waring *et al*. 2011).

A total of 297 right whale calves were born during the years 1993-2009 (Waring *et al*. 2011). The mean calf production for this 15-year period is estimated to be 17.2/year (Waring *et al.* 2011). Calving numbers have been variable, with large differences among years, including a second largest calving season in 2000/2001 with 31 right whale births (Waring *et al.* 2011). The three calving years (97/98; 98/99; 99/00) prior to this record year provided low recruitment levels with only 11 calves born. The last nine calving seasons (2000-2009) have been remarkably better with 31, 21, 19, 17, 28, 19, 23, 23, and 39 births, respectively (Waring *et al.* 2011). However, the western North Atlantic stock has also continued to experience losses of calves, juveniles, and adults.

As is the case with other mammalian species, there is an interest in monitoring the number of females in this western North Atlantic right whale population since their numbers will affect the population trend (whether declining, increasing or stable). Kraus *et al.* (2007) reported that as of 2005, 92 reproductively active females had been identified and Schick *et al.* (2009) estimated 97 breeding females. From 1983 to 2005, the number of new mothers recruited to the population (with an estimated age of 10 for the age of first calving), varied from 0-11 each year with no significant increase or decline over the period (Kraus *et al.* 2007). By 2005, 16 right whales had produced at least six calves each, and four cows had at least seven calves. Two of these cows were at an age that indicated a reproductive life span of at least 31 years (Kraus *et al.* 2007). As described above, the 2000/2001 through 2006/2007 calving seasons had relatively high calf production and have included several first-time mothers (*e.g.*, eight new mothers in 2000/2001). However, over the same time period, there have been continued losses to the western North Atlantic right whale population, including the death of mature females, as a result of anthropogenic mortality (including that described in Henry *et al.* 2011, below). Of the 12 serious injuries and mortalities between 2005 and 2009, at least six were adult females, three of which were carrying near-term fetuses and four of which were just starting to bear calves (Waring *et al.* 2011). Since the average lifetime calf production is 5.25 calves (Fujiwara and Caswell 2001), the deaths of these six females represent a loss of reproductive potential of as many as 32 animals. However, it is important to note that not all right whale mothers are equal with regards to calf production. Right whale #1158 had only one calf over a 25-year period (Kraus *et al.* 2007). In contrast, one of the largest right whales on record was a female nicknamed "Stumpy," who was killed in February 2004 of an apparent ship strike (NMFS 2006). She was first sighted in 1975 and known to be a prolific breeder, successfully rearing calves in 1980, 1987, 1990, 1993, and 1996 (Moore *et al.* 2007). At the time of her death, she was estimated to be 30 years of age and carrying her sixth calf; the near-term fetus also died (NMFS 2006).

Abundance estimates are an important part of assessing the status of the species. However, for section 7 purposes, the population trend (*i.e.,* whether increasing or declining) provides better information for assessing the effects of a proposed action on the species. As described in previous biological opinions, data collected in the 1990s suggested that right whales were experiencing a slow but steady recovery (Knowlton *et al.* 1994). However, Caswell *et al.* (1999) used photo-identification data and modeling to estimate survival and concluded that right whale survival decreased from 1980 to 1994. Modified versions of the Caswell *et al.* (1999) model as well as several other models were reviewed at a 1999 IWC workshop (Best *et al.* 2001). Despite differences in approach, all of the models indicated a decline in right whale survival in the 1990s compared to the 1980s, with female survival, in particular, apparently affected (Best *et al.* 2001). In 2002, NMFS' Northeast Fisheries Science Center (NEFSC) hosted a workshop to review right whale population models to examine: (1) potential bias in the models and (2) changes in the subpopulation trend based on new information collected in the late 1990s (Clapham *et al.* 2002). Three different models were used to explore right whale survivability and to address potential sources of bias. Although biases were identified that could negatively affect the results, all three modeling techniques resulted in the same conclusion; survival has continued to decline and seems to be focused on females (Clapham *et al.* 2002). Increased mortalities in 2004 and 2005 were cause for serious concern (Kraus *et. al* 2005). Calculations indicate that this increased mortality rate would reduce population growth by approximately 10% per year (Kraus *et. al* 2005). Despite the preceding, examination of the minimum number alive population index calculated from the individual sightings database (as it existed on July 6, 2010) suggest a positive trend in numbers for the years 1990-2007 (Waring *et al.* 2011). These data reveal a significant increase in the number of catalogued right whales alive during this period, but with significant variation due to apparent losses exceeding gains during 1998-1999 (Waring *et al.* 2011). Recently, NMFS NEFSC developed a population viability analysis (PVA) to examine the influence of anthropogenic mortality reduction on the recovery prospects for the species (Pace, unpublished). The PVA evaluated several scenarios on how the populations would fare without entanglement mortalities compared to the status quo. Only two of 1,000 projections (with the status quo simulation) ended with a smaller total population size than the starting population size, and no projections resulted in extinction. As described above, the mean growth rate estimated in the latest stock assessment report, for the period 1990-2007, was 2.4% (Waring *et al.* 2011). The potential biological removal (PBR)[10] for the Western Atlantic stock of North Atlantic right whale is 0.8

Reproduction
Healthy reproduction is critical for the recovery of the North Atlantic right whale (Kraus *et al.* 2007). Researchers have suggested that the population has been affected by a decreased reproductive rate (Best *et al.* 2001; Kraus *et al.* 2001). Kraus *et al.* (2007) reviewed reproductive parameters for the period 1983-2005, and estimated calving intervals to have changed from 3.5 years in 1990 to more than 5 years between 1998-2003, and then decreased to just over 3 years in 2004 and 2005.

Factors that have been suggested as affecting the right whale reproductive rate include reduced genetic diversity (and/or inbreeding), contaminants, biotoxins, disease, and nutritional stress. Although it is believed that a combination of these factors is likely affecting right whales (Kraus *et al.* 2007), there is currently no evidence to support this. The dramatic reduction in the North Atlantic right whale population due to commercial whaling may have resulted in a loss of genetic diversity, which could affect the ability of the current population to successfully reproduce (*i.e.*, decreased conceptions, increased abortions, and increased neonate mortality). One hypothesis is that the low level of genetic variability in this species produces a high rate of mate incompatibility and unsuccessful pregnancies (Frasier *et al.* 2007). Analyses are currently under way to assess this relationship further as well as the influence of genetic characteristics on the potential for species recovery (Frasier *et al.* 2007). Studies by Schaeff *et al.* (1997) and Malik *et al.* (2000) indicate that western North Atlantic right whales are less genetically diverse than southern right whales. While contaminant studies have confirmed that right whales are exposed to and accumulate contaminants, researchers could not conclude that these contaminant loads were negatively affecting right whale reproductive success since concentrations were lower than those found in other marine mammals proven to be affected by PCBs and DDT (Weisbrod *et al.* 2000). Another suite of contaminants (i.e. antifouling agents and flame retardants) that disrupt reproductive patterns and have been found in other marine animals, raises new concerns (Kraus *et al.* 2007). Recent data also support a hypothesis that chromium, an industrial pollutant, may be a concern for the health of the North Atlantic right whales and that inhalation may be an important exposure route (Wise *et al.* 2008).

[10] Potential biological removal is the product of minimum population size, one-half the maximum net productivity rate and a "recovery" factor for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population.

A number of diseases could be also affecting reproduction, although tools for assessing disease factors in free-swimming large whales currently do not exist (Kraus *et al*. 2007). Once developed, such methods may allow for the evaluation of diseases on right whales. Impacts of biotoxins on marine mammals are also poorly understood, yet there are some data showing that marine algal toxins may play significant roles in mass mortalities of large whales (Rolland *et al.* 2007). Although there are no published data concerning the effects of biotoxins on right whales, researchers are certain that right whales are being exposed to measurable quantities of paralytic shellfish poisioning (PSP) toxins and domoic acid via trophic transfer through the presence of these biotoxins in their prey (Durbin *et al.* 2002, Rolland *et al.* 2007).

Data on food-limitation are difficult to evaluate (Kraus *et al.* 2007). North Atlantic right whales seem to have thinner blubber than right whales from the South Atlantic (Kenney 2002; Miller *et al.* 2011). Miller *et al*. 2011 suggest that lipids in the blubber are used as energetic support for reproduction in female right whales. In the same study, blubber thickness was also compared among years of differing prey abundances. During a year of low prey abundances, right whales had significantly thinner blubber than during years of greater prey abundances. The results suggest that blubber thickness is indicative of right whale energy balance and that the marked fluctuations in the North Atlantic right whale reproduction have a nutritional component (Miller *et al*. 2011).

Modeling work by Caswell *et al.* (1999) and Fujiwara and Caswell (2001) suggests that the North Atlantic Oscillation (NAO), a naturally occurring climatic event, affects the survival of mothers and the reproductive rate of mature females, and it also seems to affect calf survival (Clapham *et al.* 2002). Greene *et al.* (2003) described the potential oceanographic processes linking climate variability to the reproduction of North Atlantic right whales. Climate-driven changes in ocean circulation have had a significant impact on the plankton ecology of the Gulf of Maine, including effects on *Calanus finmarchicus*, a primary prey resource for right whales. Researchers found that during the 1980s, when the NAO index was predominately positive, *C. finmarchicus* abundance was also high; when a record drop occurred in the NAO index in 1996, *C. finamarchicus* abundance levels also decreased significantly. Right whale calving rates since the early 1980s seem to follow a similar pattern, where stable calving rates were noted from 1982 to 1992, but then two major, multi-year declines occurred from 1993 to 2001, consistent with the drops in copepod abundance. It has been hypothesized that right whale calving rates are thus a function of food availability as well as the number of females available to reproduce (Greene *et al.* 2003, Greene and Pershing 2004). Such findings suggest that future climate change may emerge as a significant factor influencing the recovery of right whales. Some believe the effects of increased climate variability on right whale calving rates should be incorporated into future modeling studies so that it may be possible to determine how sensitive right whale population numbers are to variable climate forcing (Greene and Pershing 2004).

Anthropogenic Mortality
Right whale recovery is negatively affected by anthropogenic mortality. From 2005 to 2009, right whales had the highest proportion of reported entanglement and ship strike events for a species (Waring *et al.* 2011). Given the small population size and low annual reproductive rate of right whales, human sources of mortality may have a greater effect on population growth rate than for other large whale species (Waring *et al.* 2011). For the period 2005-2009, the annual

human-caused mortality and serious injury rate for the North Atlantic right whale averaged 2.4 per year (2.0 in U.S. waters; 0.4 in Canadian waters) (Waring *et al*. 2011). Twenty confirmed right whale mortalities were reported along the U.S. East Coast and adjacent Canadian Maritimes from 2005 to 2009 (Henry *et al*. 2011). These numbers represent the minimum values for serious injury and mortality for this period. Given the range and distribution of right whales in the North Atlantic, and the fact that positively buoyant species like right whales may become negatively buoyant if injury prohibits effective feeding for prolonged periods, it is highly unlikely that all carcasses will be observed (Moore *et. al.* 2004, Glass *et al.* 2009). Moreover, carcasses floating at sea often cannot be examined sufficiently and may generate false negatives if they are not towed to shore for further necropsy (Glass *et al*. 2009). Decomposed and/or unexamined animals represent lost data, some of which may relate to human impacts (Waring *et al.* 2011).

Considerable effort has been made to examine right whale carcasses for the cause of death (Moore *et al*. 2004). Examination is not always possible or conclusive because carcasses may be discovered floating at sea and cannot be retrieved, or may be in such an advanced stage of decomposition that a complete examination is not possible. Wave action and post-mortem predation by sharks can also damage carcasses, and preclude a thorough examination of all body parts. It should also be noted that mortality and serious injury event judgments are based upon the best available data and later information may result in revisions (Henry *et al.* 2011). Of the 20 total, confirmed right whale mortalities (2005-2009) described in Henry *et al.* (2011), 2 were confirmed to be entanglement mortalities (1 female calf, 1 male calf) and 6 were confirmed to be ship strike mortalities (3 adult females, 1 female of unknown age, 1 male calf, and 1 yearling male). Serious injury involving right whales was documented for 2 entanglement events (juvenile sex unknown, juvenile male) and 2 ship strike events (1 adult female and 1 yearling male).

Although disentanglement is either unsuccessful or not possible for the majority of cases, during the period of 2005-2009, there were at least three documented cases of entanglements for which the intervention of disentanglement teams likely averted a serious injury (Waring *et al.* 2011). Even when entanglement or vessel collision does not cause direct mortality, it may weaken or compromise individuals so that subsequent injury or death is more likely (Waring *et. al* 2011). Some right whales that have been entangled were later involved in ship strikes (Hamilton *et al*. 1998), suggesting that the animal may have become debilitated by the entanglement to such an extent that it was less able to avoid a ship. Similarly, skeletal fractures and/or broken jaws sustained during a vessel collision may heal, but then compromise a whale's ability to efficiently filter feed (Moore *et al.* 2007). A necropsy of right whale #2143 ("Lucky") found dead in January 2005 suggested the animal (and her near-term fetus) died after healed propeller wounds from a ship strike re-opened and became infected as a result of pregnancy (Moore *et al.* 2007, Glass *et al.* 2008). Sometimes, even with a successful disentanglement, an animal may die of injuries sustained by fishing gear (e.g. RW #3107) (Waring *et al.* 2011).

NMFS' entanglement records from 1990 to 2009 include 94 confirmed right whale entanglement events (Waring *et al.* 2011). Because whales often free themselves of gear following an entanglement event, scarification analysis of living animals may provide better indications of fisheries interactions than entanglement records (Waring *et al.* 2011). Data presented in

Knowlton *et al.* (2008) indicate the annual rate of entanglement interaction remains at high levels. Four hundred and ninety-three individual, catalogued right whales were reviewed and 625 separate entanglement interactions were documented between 1980 and 2004. Approximately 358 out of 493 animals (72.6% of the population) were entangled at least once; 185 animals bore scars from a single entanglement, however one animal showed scars from 6 different entanglement events. The number of male and female right whales bearing entanglement scars was nearly equivalent (142/202 females, 71.8%; 182/224 males, 81.3%), indicating that both sexes are equally vulnerable to entanglement. However, juveniles appear to become entangled at a higher rate than expected if all age groups were equally vulnerable. For all years but one (1998), the proportion of juvenile, entangled right whales exceeded their proportion within the population. Based on photographs of catalogued animals from 1935 through 1995, Hamilton *et al.* (1998) estimated that 6.4% of the North Atlantic right whale population exhibit signs of injury from vessel strikes. Reports received from 2005 to 2009 indicate that right whales had the greatest number of ship strike mortalities (n=6) and serious injuries (n=2) compared to other large whales in the Northwest Atlantic (Henry *et al.* 2011). In 2006 alone, four reported mortalities and one serious injury of right whales resulted from ship strikes (Henry *et al.* 2011).

Right whales are expected to be affected by climate change; however, no significant climate change-related impacts to right whales have been observed to date. The impact of climate change on cetaceans is likely to be related to changes in sea temperatures, potential freshening of sea water due to melting ice and increased rainfall, sea level rise, the loss of polar habitats, and the potential decline of forage.

The North Atlantic right whale currently has a range of sub-polar to sub-tropical waters. An increase in water temperature would likely result in a northward shift of range, with both the northern and southern limits moving poleward. The northern limit, which may be determined by feeding habitat and the distribution of preferred prey, may shift to a greater extent than the southern limit, which requires ideal temperature and water depth for calving. This may result in an unfavorable effect on the North Atlantic right whale due to an increase in the length of migrations (Macleod 2009) or a favorable effect by allowing them to expand their range. The indirect effects to right whales, that may be associated with sea level rise, are the construction of sea-wall defenses and protective measures for coastal habitats, which may impact coastal marine species and may interfere with migration (Learmonth *et al.* 2006). The effect of sea level rise to cetaceans is likely negligible.

The direct effects of increased CO_2 concentrations, and associated decrease in pH (ocean acidification), on marine mammals are unknown (Learmonth *et al.* 2006). Marine plankton is a vital food source for many marine species. Studies have demonstrated adverse impacts from ocean acidification on the ability of free-swimming zooplankton to maintain protective shells as well as a reduction in the survival of larval marine species. A decline in marine plankton could have serious consequences for the marine food web.

Summary of Right Whale Status

In March 2008, NMFS listed the North Atlantic right whale as a separate, endangered species (*Eubalaena glacialis*) under the ESA. This decision was based on an analysis of the best scientific and commercial data available. The decision took into consideration current population trends and abundance, demographic risk factors affecting the continued survival of the species, and ongoing conservation efforts. NMFS determined that the North Atlantic right whale is in danger of extinction throughout its range because of: (1) overutilization for commercial, recreational, scientific or educational purposes; (2) the inadequacy of existing regulatory mechanisms; and (3) other natural and manmade factors affecting its continued existence.

Previous models estimated that the right whale population in the Atlantic numbered 300 (+/-10%) (Best *et al*. 2001). However, a review of the photo-ID recapture database on July 6, 2010, indicated that 396 individually recognized right whales were known to be alive in 2007 (Waring *et al.* 2011). The 2000/2001-2008/2009 calving seasons have had relatively high calf production (31, 21, 19, 17, 28, 19, 23, 23, and 39 calves, respectively) and have included additional first time mothers (*e.g.*, eight new mothers in 2000/2001) (Waring *et al*. 2009, 2011).

Over the five-year period 2005-2009, right whales had the highest proportion of reported entanglements and ship strikes for a species: of 60 reports involving right whales, 29 were confirmed entanglements and 17 were confirmed ship strikes. There were 20 verified right whale mortalities, 2 due to entanglements, and 6 due to ship strikes (Henry *et al.* 2011). This represents an absolute minimum number of the right whale mortalities for this period. Given the range and distribution of right whales in the North Atlantic, it is highly unlikely that all carcasses will be observed. Scarification analysis indicates that some whales do survive encounters with ships and fishing gear. However, the long-term consequences of these interactions are unknown. Right whale recovery is negatively affected by human causes of mortality. This mortality appears to, have a greater impact on the population growth rate of right whales, compared to other baleen whales in the western North Atlantic, given the small population size and low annual reproductive rate of right whales (Waring *et al.* 2011).

A variety of modeling exercises and analyses indicate that survival probability declined in the 1990s (Best *et al.* 2001), and mortalities in 2004-2005, including a number of adult females, also suggested an increase in the annual mortality rate (Kraus *et al*. 2005). Nonetheless, a census of the minimum number alive population index calculated from the individual sightings database as of July 6, 2010, for the years 1990-2007 suggest a positive trend in the population growth rate of right whales (Waring *et al.* 2011). In addition, calving intervals appear to have declined to three years in recent years (Kraus *et al.* 2007), and calf production has been relatively high over the past several seasons.

3.1.2 Humpback Whales

Humpback whales inhabit all major ocean basins from the equator to subpolar latitudes. With the exception of the northern Indian Ocean population, they generally follow a predictable migratory pattern in both hemispheres, feeding during the summer in the higher near-polar latitudes and migrating to lower latitudes in the winter where calving and breeding takes place (Perry *et al.* 1999). Humpbacks are listed as endangered under the ESA at the species level and are considered depleted under the MMPA. Therefore, information is presented below regarding the status of humpback whales throughout their range.

North Pacific, Northern Indian Ocean, and Southern Hemisphere
Humpback whales in the North Pacific feed in coastal waters from California to Russia and in the Bering Sea. They migrate south to wintering destinations off Mexico, Central America, Hawaii, southern Japan, and the Philippines (Carretta *et al*. 2011). Although the IWC only considered one stock (Donovan 1991) there is evidence to indicate multiple populations migrating between their summer/fall feeding areas to winter/spring calving and mating areas within the North Pacific Basin (Angliss and Outlaw 2007, Carretta *et al.* 2011).

NMFS recognizes three management units within the U.S. EEZ in the Pacific for the purposes of managing this species under the MMPA. These are: the California-Oregon-Washington stock (feeding areas off the U.S. West Coast), the central North Pacific stock (feeding areas from Southeast Alaska to the Alaska Peninsula) and the western North Pacific stock (feeding areas from the Aleutian Islands, the Bering Sea, and Russia) (Carretta *et al.* 2011). Because fidelity appears to be greater in feeding areas than in breeding areas, the stock structure of humpback whales is defined based on feeding areas (Carretta *et al.* 2011). Recent research efforts via the Structure of Populations, Levels of Abundance, and Status of Humpback Whales (SPLASH) Project estimate the abundance of humpback whales to be just under 20,000 whales for the entire North Pacific, a number that doubles previous population predictions (Calambokidis *et al.* 2008). There are indications that the California-Oregon-Washington stock was growing in the 1980s and early 1990s with a best estimate of 8% growth per year (Carretta *et al.* 2011). The best available estimate for the California-Oregon-Washington stock is 2,043 whales (Carretta *et al*. 2011). The central North Pacific stock is estimated at 4,005 (Allen and Angliss 2011), and various studies report that it appears to have increased in abundance at rates of 6.6%-10% per year (Allen and Angliss 2011). Although there is no reliable population trend data for the western North Pacific stock, as surveys of the known feeding areas are incomplete and many feeding areas remain unknown, minimum population size is currently estimated at 732 whales (Allen and Angliss 2011).

The Northern Indian Ocean population of humpback whales consists of a resident stock in the Arabian Sea, which apparently does not migrate (Minton *et al.* 2008). The lack of photographic matches with other areas suggests this is an isolated subpopulation. The Arabian Sea subpopulation of humpback whales is geographically, demographically, and genetically isolated, residing year round in sub-tropical waters of the Arabian Sea (Minton *et al.* 2008). Although potentially an underestimate due to small sample sizes and insufficient spatial and temporal coverage of the population's suspected range, based on photo-identification, the abundance estimate off the coast of Oman is 82 animals [60-111 95% confidence interval (CI)](Minton *et al.* 2008).

The Southern Hemisphere population of humpback whales is known to feed mainly in the Antarctic, although some have been observed feeding in the Benguela Current ecosystem on the migration route west of South Africa (Reilly *et al.* 2008a). The IWC Scientific Committee recognizes seven major breeding stocks, some of which are tentatively further subdivided into substocks. The seven major breeding stocks, with their respective breeding ground estimates in parenthesis, include Southwest Atlantic (6,251), Southeast Atlantic (1,594), southwestern Indian Ocean (5,965), southeastern Indian Ocean (10,032), Southwest Pacific (7,472), Central South

Pacific (not available), and Southeast Pacific (2,917) (Reilly *et al.* 2008a). The total abundance estimate of 36,600 humpback whales for the Southern Hemisphere is negatively biased due to no available abundance estimate for the central South Pacific subpopulation and only a partial estimate for the Southeast Atlantic subpopulation. Additionally, these abundance estimates have been obtained on each subpopulation's wintering grounds, and the possibility exists that the entire population does not migrate to the wintering grounds (Reilly *et al.* 2008a).

Like other whales, southern hemisphere humpback whales were heavily exploited for commercial whaling. Although they were given protection by the IWC in 1963, Soviet whaling data made available in the 1990s revealed that 48,477 southern hemisphere humpback whales were taken from 1947 to 1980, contrary to the original reports to the IWC that accounted for the take of only 2,710 humpbacks (Zemsky *et al.* 1995, IWC 1995, Perry *et al.* 1999).

Gulf of Maine (North Atlantic)
Humpback whales from most Atlantic feeding areas calve and mate in the West Indies and migrate to feeding areas in the northwestern Atlantic during the summer months. Most of the humpbacks that forage in the Gulf of Maine visit Stellwagen Bank and the waters of Massachusetts and Cape Cod Bay. Previously, the North Atlantic humpback whale population was treated as a single stock for management purposes; however due to the strong fidelity to the region displayed by many whales, the Gulf of Maine stock was reclassified as a separate feeding stock (Waring *et al.* 2011). The Gulf of St. Lawrence, Newfoundland/Labrador, western Greenland, Iceland, and northern Norway are the other regions that represent relatively discrete subpopulations. Sightings are most frequent from mid-March through November between 41°N and 43°N, from the Great South Channel north along the outside of Cape Cod to Stellwagen Bank and Jeffreys Ledge (CeTAP 1982) and peak in May and August. Small numbers of individuals may be present in this area year-round, including the waters of Stellwagen Bank. They feed on a number of species of small schooling fishes, particularly sand lance and Atlantic herring, targeting fish schools and filtering large amounts of water for their associated prey. Humpback whales may also feed on euphausiids (krill) as well as capelin (Waring *et al*. 2011, Stevick *et al.* 2006).

In winter, whales from waters off New England, Canada, Greenland, Iceland, and Norway, migrate to mate and calve primarily in the West Indies, where spatial and genetic mixing among these groups occurs (Waring *et al.* 2011). Various papers (Clapham and Mayo 1990; Clapham 1992; Barlow and Clapham 1997; Clapham *et al.* 1999) summarize information gathered from a catalogue of photographs of 643 individuals from the western North Atlantic population of humpback whales. These photographs identified reproductively mature western North Atlantic humpbacks wintering in tropical breeding grounds in the Antilles, primarily on Silver and Navidad Banks north of the Dominican Republic. The primary winter range also includes the Virgin Islands and Puerto Rico (NMFS 1991a).

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

Abundance Estimates and Trends

Photographic mark-recapture analyses from the Years of the North Atlantic Humpback (YONAH) project gave an ocean-basin-wide estimate of 11,570 animals during 1992/1993 and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400 whales (95% c.i. = 8,000-13,600) (Waring *et al.* 2011). For management purposes under the MMPA, the estimate of 11,570 individuals is regarded as the best available estimate for the North Atlantic population (Waring *et al.* 2011). The best recent estimate for the Gulf of Maine stock is 847 whales, derived from a 2006 line-transect aerial sighting survey (Waring *et al.* 2011).

Population modeling, using data obtained from photographic mark-recapture studies, estimates the growth rate of the Gulf of Maine stock to be 6.5% for the period 1979-1991 (Barlow and Clapham 1997). More recent analysis for the period 1992-2000 estimated lower population growth rates ranging from 0% to 4.0%, depending on calf survival rate (Clapham *et al.* 2003 in Waring *et al.* 2011). However, it is unclear whether the apparent decline in growth rate is a biased result due to a shift in distribution documented for the period 1992-1995, or whether the population growth rates truly declined due to high mortality of young-of-the-year whales in U.S. Mid-Atlantic waters (Waring *et al.* 2011). Regardless, calf survival appears to have increased since 1996, presumably accompanied by an increase in population growth (Waring *et al.* 2011). Stevick *et al.* (2003) calculated an average population growth rate of 3.1% in the North Atlantic population overall for the period 1979-1993. The PBR for the Gulf of Maine stock of humpback whale is 1.1.

Anthropogenic Injury and Mortality

As with other large whales, the major known sources of anthropogenic mortality and injury of humpback whales occur from fishing gear entanglements and ship strikes. For the period 2005-2009, the minimum annual rate of human-caused mortality and serious injury to the Gulf of Maine humpback whale stock averaged 5.2 animals per year (U.S. waters, 4.8; Canadian waters, 0.4) (Waring *et al.* 2011). Between 2005 and 2009, humpback whales were involved in 94 confirmed entanglement events and 18 confirmed ship strike events (Henry *et al.* 2011). Over the five-year period, humpback whales were the most commonly observed entangled whale species; entanglements accounted for 6 mortalities and 12 serious injuries (Henry *et al.* 2011). Of the 18 confirmed ship strikes, 7 of the events were fatal (Henry *et al*. 2011). It was assumed that all of these events involved members of the Gulf of Maine stock of humpback whales unless a whale was confirmed to be from another stock. In reports prior to 2007, only events involving whales confirmed to be members of the Gulf of Maine stock were included. There were also many carcasses that washed ashore or were spotted floating at sea for which the cause of death could not be determined. Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or no necropsy performed) represent 'lost data' some of which may relate to human impacts (Henry *et al.* 2011, Waring *et al.* 2011).

Based on photographs taken from 2000 to 2002 of the caudal peduncle and fluke of humpback whales, Robbins and Mattila (2004) estimated that at least half (48-57%) of the sample (187 individuals) was coded as having a high likelihood of prior entanglement. Evidence suggests that entanglements have occurred at a minimum rate of 8-10% per year. Scars acquired by Gulf of Maine humpback whales between 2000 and 2002 suggest a minimum of 49 interactions with gear. Based on composite scar patterns, male humpback whales appear to be more vulnerable to entanglement than females. Males may be subject to other sources of injury that could affect scar pattern interpretation. Of the images obtained from a humpback whale breeding ground, 24% showed raw injuries, presumably a result from agonistic interactions. However, current evidence suggests that breeding ground interactions alone cannot explain the higher frequency of healed scar patterns among Gulf of Maine male humpback whales (Robbins and Matilla 2004).

Humpback whales, like other baleen whales, may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources resulting from a variety of activities including fisheries operations, vessel traffic, and coastal development. Currently, there is no evidence that these types of activities are affecting humpback whales. However, Geraci *et al*. (1989) provide strong evidence that a mass mortality of humpback whales in 1987-1988 resulted from the consumption of mackerel whose livers contained high levels of saxitoxin, a naturally occurring red tide toxin, the origin of which remains unknown. The occurrence of a red tide event may be related to an increase in freshwater runoff from coastal development, leading some observers to suggest that such events may become more common among marine mammals as coastal development continues (Clapham *et al.* 1999). There have been three additional known cases of a mass mortality involving large whale species along the East Coast between 1998 and 2008. In the 2006 mass mortality event, 21 dead humpback whales were found between July 10 and December 31, 2006, triggering NMFS to declare an unusual mortality event (UME) for humpback whales in the Northeast United States. The UME was officially closed on December 31, 2007 after a review of 2007 humpback whale strandings and mortality showed that the elevated numbers were no longer being observed. The cause of the 2006 UME has not been determined to date, although investigations are ongoing.

Changes in humpback whale distribution in the Gulf of Maine have been found to be associated with changes in herring, mackerel, and sand lance abundance associated with local fishing pressures (Stevick *et al.* 2006, Waring *et al.* 2011). Shifts in relative finfish species abundance correspond to changes in observed humpback whale movements (Stevick *et al.* 2006). However, there is no evidence that humpback whales were adversely affected by these trophic changes.

Humpback whales are expected to be affected by climate change; however, no significant climate change-related impacts to humpback whales have been observed to date. The impact of climate change on cetaceans is likely to be related to changes in sea temperatures, potential freshening of sea water due to melting ice and increased rainfall, sea level rise, the loss of polar habitats, and the potential decline of forage.

Of the main factors affecting distribution of cetaceans, water temperature appears to be the main influence on geographic ranges of cetacean species (Macleod 2009). Humpback whales are distributed in all water temperature zones, therefore, it is unlikely that their range will be directly affected by an increase in water temperature.

The indirect effects to humpback whales, that may be associated with sea level rise, are the construction of sea-wall defenses and protective measures for coastal habitats, which may impact coastal marine species and may interfere with migration (Learmonth *et al.* 2006). Cetaceans are unlikely to be directly affected by sea level rise, although important coastal bays for humpback breeding could be affected (IWC 1997).

The direct effects of increased CO_2 concentrations, and associated decrease in pH (ocean acidification), on marine mammals are unknown (Learmonth *et al.* 2006). Marine plankton is a vital food source for many marine species. Studies have demonstrated adverse impacts from ocean acidification on the ability of free-swimming zooplankton to maintain protective shells as well as a reduction in the survival of larval marine species.

Summary of Humpback Whale Status
The best available population estimate for humpback whales in the North Atlantic Ocean is 11,570 animals, and the best, recent estimate for the Gulf of Maine stock is 847 whales (Waring *et al.* 2011). Anthropogenic mortality associated with fishing gear entanglements and ship strikes remains significant. In the winter, mating and calving occurs in areas located outside of the U.S. where the species is afforded less protection. Despite all of these factors, current data suggest that the Gulf of Maine humpback stock is steadily increasing in size (Waring *et al.* 2011). This is consistent with an estimated average trend of 3.1% in the North Atlantic population overall for the period 1979-1993 (Stevick *et al*. 2003). With respect to the species overall, there are also indications of increasing abundance for the California-Oregon-Washington, central North Pacific, and Southern Hemisphere stocks: Southwest Atlantic, Southeast Atlantic, Southwest Indian Ocean, Southeast Indian Ocean, and Southwest Pacific. Trend data is lacking for the western North Pacific stock, the central South Pacific and Southeast Pacific subpopulations of the southern hemisphere humpback whales, and the northern Indian Ocean humpbacks.

3.1.3 Fin Whales

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

Pacific Ocean
Within U.S. waters of the Pacific, fin whales are found seasonally off the coast of North America and Hawaii and in the Bering Sea during the summer (Allen and Angliss 2010). Although stock structure in the Pacific is not fully understood, NMFS recognizes three fin whale stocks in U.S. Pacific waters for the purposes of managing this species under the MMPA. These are: Alaska (Northeast Pacific), California/Washington/Oregon, and Hawaii (Carretta *et al*. 2011). Reliable estimates of current abundance for the entire Northeast Pacific fin whale stock are not available (Allen and Angliss 2010). A provisional population estimate of 5,700 was calculated for the Alaska stock west of the Kenai Peninsula by adding estimates from multiple surveys (Allen and Angliss 2010). This can be considered a minimum estimate for the entire stock because the surveys covered only a portion of its range (Allen and Angliss 2010). An annual population increase of 4.8% between 1987 and 2003 was estimated for fin whales in coastal waters south of the Alaska Peninsula (Allen and Angliss 2010). This is the first estimate of population trend for North Pacific fin whales; however, it must be interpreted cautiously due to the uncertainty in the initial population estimate and the population structure (Allen and Angliss 2010). The best available estimate for the California/Washington/Oregon stock is 3,044, which is likely an underestimate (Carretta *et al*. 2011). The best available estimate for the Hawaii stock is 174, based on a 2002 line-transect survey (Carretta *et al*. 2011).

Stock structure for fin whales in the southern hemisphere is unknown. Prior to commercial exploitation, the abundance of southern hemisphere fin whales was estimated at 400,000 (IWC 1979, Perry *et al.* 1999). There are no current estimates of abundance for southern hemisphere fin whales. Since these fin whales do not occur in U.S. waters, there is no recovery plan or stock assessment report for the southern hemisphere fin whales.

North Atlantic
NMFS has designated one population of fin whales in U.S. waters of the North Atlantic (Waring *et al.* 2011). This species is commonly found from Cape Hatteras northward. Researchers have suggested the existence of fin whale subpopulations in the North Atlantic based on local depletions resulting from commercial overharvesting (Mizroch and York 1984) or genetics data (Bérubé *et al.* 1998). Photo-identification studies in western North Atlantic feeding areas, particularly in Massachusetts Bay, have shown a high rate of annual return by fin whales, both within years and among years (Seipt *et al.* 1990), suggesting some level of site fidelity. The Scientific Committee of the International Whaling Commission (IWC) has proposed stock boundaries for North Atlantic fin whales. Fin whales off the eastern U.S., Nova Scotia, and southeastern coast of Newfoundland are believed to constitute a single stock of fin whales under the present IWC scheme (Donovan 1991). However, it is uncertain whether the proposed boundaries define biologically isolated units (Waring *et al.* 2011).

During the 1978-1982 aerial surveys, fin whales accounted for 24% of all cetaceans and 46% of all large whales sighted over the continental shelf between Cape Hatteras and Nova Scotia (Waring *et al.* 2011). Underwater listening systems have also demonstrated that the fin whale is the most acoustically common whale species heard in the North Atlantic (Clark 1995). The single most important area for this species appeared to be from the Great South Channel, along the 50 meter isobath past Cape Cod, over Stellwagen Bank, and past Cape Ann to Jeffreys Ledge (Hain *et al.*1992).

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

Fin whales achieve sexual maturity at 6-10 years of age in males and 7-12 years in females (Jefferson *et al.* 2008), although physical maturity may not be reached until 20-30 years (Aguilar and Lockyer 1987). Conception is believed to occur in tropical and subtropical areas during the winter, with the birth of a single calf after an 11-12 month gestation (Jefferson *et al.* 2008). The calf is weaned 6-11 months after birth (Perry *et al.* 1999). The mean calving interval is 2.7 years (Agler *et al.* 1993).

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

Population Trends and Status

Various estimates have been provided to describe the current status of fin whales in western North Atlantic waters. One method used the catch history and trends in Catch Per Unit Effort (CPUE) to obtain an estimate of 3,590 to 6,300 fin whales for the entire western North Atlantic (Perry *et al.* 1999). Hain *et al.* (1992) estimated that about 5,000 fin whales inhabit the Northeastern U.S. continental shelf waters. The 2011 Stock Assessment Report (SAR) gives a best estimate of abundance for fin whales in the western North Atlantic of 3,985 (CV = 0.24). However, this estimate must be considered extremely conservative in view of the incomplete coverage of the known habitat of the stock and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas (Waring *et al*. 2011). The minimum population estimate for the western North Atlantic fin whale is 3,269 (Waring *et al.* 2011). However, there are insufficient data at this time to determine population trends for the fin whale (Waring *et al.* 2011). The PBR for the western North Atlantic fin whale is 6.5.

Other estimates of the abundance of fin whales in the North Atlantic are presented in Pike *et al.* (2008) and Hammond *et al.* (2011). Pike *et al.* (2008) estimates the abundance of fin whales to be 27,493 (CV 0.2) in waters around Iceland and the Denmark Strait. Hammond *et al.* (2008) estimates the abundance of 19,354 (CV 0.24) fin whales in the eastern North Atlantic.

Anthropogenic Injury and Mortality
The major known sources of anthropogenic mortality and injury of fin whales include entanglement in commercial fishing gear and ship strikes. The minimum annual rate of confirmed human-caused serious injury and mortality to North Atlantic fin whales from 2005 to 2009 was 2.6 (U.S. waters, 2.0; Canadian waters, 0.6) (Waring *et al*. 2011). During this five-year period, there were 14 confirmed entanglements (2 fatal; 2 serious injuries) and 12 ship strikes (9 fatal) (Henry *et al.* 2011). Fin whales are believed to be the cetacean most commonly struck by large vessels (Laist *et al.* 2001). In addition, hunting of fin whales continued well into the 20th century. Fin whales were given total protection in the North Atlantic in 1987, with the exception of an aboriginal subsistence whaling hunt for Greenland (Gambell 1993, Caulfield 1993). However, Iceland has increased its whaling activities in recent years and reported a catch of 136 whales in the 1988/89 and 1989/90 seasons (Perry *et al.* 1999), 7 in 2006/07, and 273 in 2009/2010. Fin whales may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources resulting from a variety of activities.

Fin whales are expected to be affected by climate change; however, no significant climate change-related impacts to fin whales have been observed to date. The impact of climate change on cetaceans is likely to be related to changes in sea temperatures, potential freshening of sea water due to melting ice and increased rainfall, sea level rise, the loss of polar habitats, and the potential decline of forage.

Of the main factors affecting distribution of cetaceans, water temperature appears to be the main influence on geographic ranges of cetacean species (Macleod 2009). Fin whales are distributed in all water temperature zones, therefore, it is unlikely that their range will be directly affected by an increase in water temperature.

The indirect effects to fin whales, that may be associated with sea level rise, are the construction of sea-wall defenses and protective measures for coastal habitats, which may impact coastal marine species and may interfere with migration (Learmonth *et al.* 2006). The effect of sea level rise to fin whales is likely negligible.

The direct effects of increased CO_2 concentrations, and associated decrease in pH (ocean acidification), on marine mammals are unknown (Learmonth *et al.* 2006). Marine plankton is a vital food source for many marine species. Studies have demonstrated adverse impacts from ocean acidification on the ability of free-swimming zooplankton to maintain protective shells as well as a reduction in the survival of larval marine species. A decline in marine plankton could have serious consequences for the marine food web.

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

fin whales. As noted above, the best population estimate for the western North Atlantic fin whale is 3,985 and the minimum population estimate is 3,269. The 2011 SAR indicates that there are insufficient data at this time to determine population trends for the fin whale. Fishing gear appears to pose less of a threat to fin whales in the North Atlantic than to North Atlantic right or humpback whales. However, commercial whaling for fin whales in the North Atlantic has resumed and fin whales continue to be struck by large vessels. Based on the information currently available, for the purposes of this Opinion, NMFS considers the population trend for fin whales to be undetermined.

3.1.4 Sei Whales

The sei whale (*Balaenoptera borealis*) has been listed as endangered under the ESA. The species is also designated as depleted under the MMPA. Sei whales are a widespread species in the world's temperate, subpolar, subtropical, and even tropical marine waters. Sei whales reach sexual maturity at 5-15 years of age. The calving interval is believed to be two to three years (Perry *et al.* 1999).

North Pacific and Southern Hemisphere
The IWC only considers one stock of sei whales in the North Pacific (Donovan 1991), but for NMFS management purpose under the MMPA, sei whales within the Pacific U.S. EEZ are divided into three discrete non-contiguous areas: 1) waters around Hawaii, 2) California, Oregon, and Washington waters, and 3) Alaskan waters (Carretta *et al.* 2011). There are no abundance estimates for sei whales in the entire eastern North Pacific. The best estimate of abundance for California, Oregon, and Washington waters out to 300 nautical miles is 126 (CV=0.53) sei whales (Barlow and Forney 2007; Forney 2007; Carretta *et al.* 2011). No fishery related serious injuries or mortalities have been documented from 2004 through 2008 in the eastern North Pacific stock of sei whales (Carretta *et al*. 2011). During 2002-2008, there was one reported ship strike mortality in Washington in 2003 (NMFS Northwest Regional Office, unpublished data). The Hawaiian stock includes animals found both within the Hawaiian Islands EEZ and in adjacent international waters; however, because data on abundance, distribution, and human-caused impacts are largely lacking for international waters, the status of this stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (Carretta *et al.* 2011). The best estimate of abundance for the Hawaiian stock of sei whales is 77 (CV=1.06). Between 2004 and 2008, no human-caused serious injury or mortality was documented in the Hawaiian stock of sei whales (Carretta *et al.* 2011).

The stock structure of sei whales in the southern hemisphere is unknown. Like other whale species, sei whales in the southern hemisphere were heavily impacted by commercial whaling, particularly in the mid-20th century as humpback, fin, and blue whales became scarce. Sei whales were protected by the IWC in 1977 after their numbers had substantially decreased and they also became more difficult to find (Perry *et al.* 1999). Since southern hemisphere sei whales do not occur in U.S. waters, there is no stock assessment report for southern hemisphere sei whales.

North Atlantic
NMFS considers sei whales in the North Atlantic as one stock known as the Nova Scotia stock (formerly known as the Western North Atlantic stock). Sei whales occur in deep water throughout their range, typically over the continental slope or in basins situated between banks (NMFS 1998). In the Northwest Atlantic, it is speculated that the whales migrate from south of Cape Cod along the eastern Canadian coast in June and July, and return on a southward migration again in September and October (Waring *et al.* 2011). Olsen *et al.* (2009) tracked a tagged sei whale that moved from the Azores to off eastern Canada; however, such a migration remains unverified. Within the U.S. Atlantic EEZ, the sei whale is most common on Georges Bank and into the Gulf of Maine/Bay of Fundy region during spring and summer, primarily in deeper waters. Recent springtime research in the Southwestern Gulf of Maine, suggests sei whales are reasonably common in this area in most years (Baumgartner *et al.* 2011).

Although sei whales may prey upon small schooling fish and squid, available information suggests that calanoid copepods and euphausiids are the primary prey of this species (Flinn *et al*. 2002). Sei whales are occasionally seen feeding in association with right whales in the southern Gulf of Maine and in the Bay of Fundy. However, there is no evidence to demonstrate interspecific competition between these species for food resources.

There is limited information on the stock identity of sei whales in the North Atlantic (Waring *et al*. 2011). For purposes of the Marine Mammal Stock Assessment Reports, and based on a proposed IWC stock definition, NMFS recognizes the sei whales occurring from the U.S. East Coast to Cape Breton, Nova Scotia, and east to 42°W longitude as the "Nova Scotia stock" of sei whales (Waring *et al*. 2011).

Abundance Estimates and Trends
The abundance estimate of 386 sei whales (CV=0.85), obtained from a line-transect sighting survey conducted during June 12 to August 4, 2004, by a ship and a plane, covering 10,761 kilometers of trackline in the region from the 100 meter depth contour on the southern edge of Georges Bank to the lower Bay of Fundy, is considered the best available for the Nova Scotia stock of sei whales according to the 2011 SAR (Waring *et al*. 2011). This estimate is considered extremely conservative in view of the known range of the sei whale in the western North Atlantic, and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas. Hammond *et al*. (2011) estimates the abundance of sei whales in European Atlantic waters to be 619 (CV of 0.34) for identified sightings identified to species. The minimum population estimate for this sei whale stock is 208 (Waring *et al*. 2011). Current and maximum net productivity rates are unknown for this stock. There are insufficient data to determine trends of the sei whale population (Waring *et al.* 2011). The PBR for the Nova Scotia stock sei whale is 0.4.

Anthropogenic Injury and Mortality
Few instances of injury or mortality of sei whales due to entanglement or vessel strikes have been recorded in U.S. waters, possibly because sei whales typically inhabit waters farther offshore than most commercial fishing operations, or perhaps entanglements do occur but are less likely to be observed. The mean annual rate of confirmed human-caused serious injury and mortality to Nova Scotian sei whales from 2005 to 2009 was 1.2 (Waring *et al*. 2011), which

includes 0.6 fishery interaction records and 0.6 vessel collision records. During this five-year period, there were three confirmed entanglements (one fatal; two serious injuries) and three ship strikes (all fatal) (Waring *et al.* 2011). Other impacts noted above for other baleen whales may also occur in this species (e.g., habitat degradation, etc.).

Sei whales are expected to be affected by climate change; however, no significant climate change-related impacts to sei whales have been observed to date. The impact of climate change on cetaceans is likely to be related to changes in sea temperatures, potential freshening of sea water due to melting ice and increased rainfall, sea level rise, the loss of polar habitats and the potential decline of forage.

Of the main factors affecting distribution of cetaceans, water temperature appears to be the main influence on geographic ranges of cetacean species (Macleod 2009). Sei whales currently range from sub-polar to tropical waters. An increase in water temperature may be a favorable affect on sei whales, allowing them to expand their range into higher latitudes (Macleod 2009).

The indirect effects to sei whales, that may be associated with sea level rise, are the construction of sea-wall defenses and protective measures for coastal habitats, which may impact coastal marine species and may interfere with migration (Learmonth *et al.* 2006). The effect of sea level rise to sei whales is likely negligible.

The direct effects of increased CO_2 concentrations, and associated decrease in pH (ocean acidification), on marine mammals are unknown (Learmonth *et al.* 2006). Marine plankton is a vital food source for many marine species. Studies have demonstrated adverse impacts from ocean acidification on the ability of free-swimming zooplankton to maintain protective shells as well as a reduction in the survival of larval marine species. A decline in marine plankton could have serious consequences for the marine food web.

Summary of Sei Whale Status

The best estimate of abundance for the Nova Scotia stock of sei whales is 386 (Waring *et al*. 2011). There are insufficient data to determine trends of the Nova Scotian sei whale population. Two sei whale serious injuries and one mortality from fisheries interactions and three mortalities from ship strikes have been recorded in U.S. waters between 2005 and 2009 (Waring *et al.* 2011). Information on the status of sei whale populations worldwide is similarly lacking. There are no abundance estimates for sei whales in the entire eastern North Pacific, however the best estimate of abundance for California, Oregon, and Washington waters out to 300 nautical miles is 126 (Carretta *et al.* 2011). The stock structure of sei whales in the southern hemisphere is unknown. Based on the information currently available, for the purposes of this Opinion, NMFS considers the population trend for sei whales to be undetermined.

3.2 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, and nesting predation by introduced species affect hatchlings and nesting females while on land. Fishery interactions, vessel interactions, and channel dredging operations, for example, affect sea turtles in the neritic zone (defined as the marine environment extending from mean low water down to 200 meters (660 foot) depths, generally corresponding to the continental shelf (Lalli and Parsons 1997; Encyclopedia Britannica 2011)). Fishery interactions also affect sea turtles when these species and the fisheries co-occur in the oceanic zone (defined as the open ocean environment where bottom depths are greater than 200 meters (Lalli and Parsons 1997))[11]. As a result, sea turtles still face many of the original threats that were the cause of their listing under the ESA.

Unlike loggerheads, leatherback sea turtles are listed under the ESA at the species level rather than as subspecies or distinct population segments (DPS). Therefore, information on the range-wide status of leatherback sea turtles is included to provide the status of the species, overall. Information on the status of loggerheads will only be presented for the DPS affected by this action. 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; Marine Turtle Expert Working Group [TEWG] 1998, 2000, 2007, 2009; NMFS and USFWS 2007a, 2007b; Conant *et al*. 2009), and recovery plans for the loggerhead sea turtle (NMFS and USFWS 2008) and leatherback sea turtle (NMFS and USFWS 1992, 1998a.

2010 BP Deepwater Horizon Oil Spill

The April 20, 2010, explosion of the Deepwater Horizon oil rig affected sea turtles in the Gulf of Mexico. There is an on-going assessment of the long-term effects of the spill on Gulf of Mexico marine life, including sea turtle populations. Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil and/or had ingested oil. Approximately 536 live adult and juvenile sea turtles were recovered from the Gulf and brought into rehabilitation centers; of these, 456 were visibly oiled (these and the following numbers were obtained from http://www.nmfs.noaa.gov/pr/health/oilspill/). To date, 469 of the live recovered sea turtles have been successfully returned to the wild, 25 died during rehabilitation, and 42 are still in care but will hopefully be returned to the wild eventually. During the clean up period, 613 dead sea turtles were recovered in coastal waters or on beaches in Mississippi, Alabama, Louisiana, and the Florida Panhandle. As of February 2011, 478 of these dead turtles had been examined. Many of the examined sea turtles showed indications that they had died as a result of interactions with trawl gear, most likely used in the shrimp fishery, and not as a result of exposure to or ingestion of oil.

During the spring and summer of 2010, nearly 300 sea turtle nests were relocated from the northern Gulf to the East Coast of Florida with the goal of preventing hatchlings from entering the oiled waters of the northern Gulf. From these relocated nests, 14,676 sea turtles, including 14,235 loggerheads, 125 Kemp's ridleys, and 316 greens, were ultimately released from Florida beaches.

[11] As described in Bolten (2003), oceanographic terms have frequently been used incorrectly to describe sea turtle life stages. In turtle literature the terms benthic and pelagic were used incorrectly to refer to the neritic and oceanic zones, respectively. The term benthic refers to occurring on the bottom of a body of water, whereas the term pelagic refers to in the water column. Turtles can be "benthic" or pelagic" in either the neritic or oceanic zones.

As noted above, a thorough assessment of the long-term effects of the spill on sea turtles has not yet been completed. However, the spill resulted in the direct mortality of many sea turtles and may have had sublethal effects or caused environmental damage that will impact other sea turtles into the future. The population level effects of the spill and associated response activity are likely to remain unknown for some period into the future.

3.2.1 Loggerhead Sea Turtle

The loggerhead is the most abundant species of sea turtle in U.S. waters. Loggerhead sea turtles are found in temperate and subtropical waters and occupy a range of habitats including offshore waters, continental shelves, bays, estuaries, and lagoons. They are also exposed to a variety of natural and anthropogenic threats in the terrestrial and marine environment.

Listing History

Loggerhead sea turtles were listed as threatened throughout their global range on July 28, 1978. Since that time, several status reviews have been conducted to review the status of the species and make recommendations regarding its ESA listing status. Based on a 2007 five-year status review of the species, which discussed a variety of threats to loggerheads including climate change, NMFS and FWS determined that loggerhead sea turtles should not be delisted or reclassified as endangered. However, it was also determined that an analysis and review of the species should be conducted in the future to determine whether DPSs should be identified for the loggerhead (NMFS and USFWS 2007a). Genetic differences exist between loggerhead sea turtles that nest and forage in the different ocean basins (Bowen 2003; Bowen and Karl 2007). Differences in the maternally inherited mitochondrial DNA also exist between loggerhead nesting groups that occur within the same ocean basin (TEWG 2000; Pearce 2001; Bowen 2003; Bowen *et al.* 2005; Shamblin 2007; TEWG 2009; NMFS and USFWS 2008). Site fidelity of females to one or more nesting beaches in an area is believed to account for these genetic differences (TEWG 2000; Bowen 2003).

In part to evaluate those genetic differences, in 2008, NMFS and FWS established a Loggerhead Biological Review Team (BRT) to assess the global loggerhead population structure to determine whether DPSs exist and, if so, the status of each DPS. The BRT evaluated genetic data, tagging and telemetry data, demographic information, oceanographic features, and geographic barriers to determine whether population segments exist. The BRT report was completed in August 2009 (Conant *et al.* 2009). In this report, the BRT identified the following nine DPSs as being discrete from other conspecific population segments and significant to the species: (1) North Pacific Ocean, (2) South Pacific Ocean, (3) North Indian Ocean, (4) Southeast Indo-Pacific Ocean, (5) Southwest Indian Ocean, (6) Northwest Atlantic Ocean, (7) Northeast Atlantic Ocean, (8) Mediterranean Sea, and (9) South Atlantic Ocean.

The BRT concluded that although some DPSs are indicating increasing trends at nesting beaches (Southwest Indian Ocean and South Atlantic Ocean), available information about anthropogenic threats to juveniles and adults in neritic and oceanic environments indicate possible unsustainable additional mortalities. According to an analysis using expert opinion in a matrix model framework, the BRT report stated that all loggerhead DPSs have the potential to decline in the foreseeable future. Based on the threat matrix analysis, the potential for future decline was reported as greatest for the North Indian Ocean, Northwest Atlantic Ocean, Northeast Atlantic Ocean, Mediterranean Sea, and South Atlantic Ocean DPSs (Conant *et al.* 2009). The BRT concluded that the North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Southeast Indo-Pacific Ocean, Northwest Atlantic Ocean, Northeast Atlantic Ocean, and Mediterranean Sea DPSs were at risk of extinction. The BRT concluded that although the Southwest Indian Ocean and South Atlantic Ocean DPSs were likely not currently at immediate risk of extinction, the extinction risk was likely to increase in the foreseeable future.

On March 16, 2010, NMFS and USFWS published a proposed rule (75 FR 12598) to divide the worldwide population of loggerhead sea turtles into nine DPSs, as described in the 2009 Status Review. Two of the DPSs were proposed to be listed as threatened and seven of the DPSs, including the Northwest Atlantic Ocean DPS, were proposed to be listed as endangered. NMFS and USFWS accepted comments on the proposed rule through September 13, 2010 (75 FR 30769, June 2, 2010). On March 22, 2011 (76 FR 15932), NMFS and USFWS extended the date for a final determination on the listing action to September 16, 2011. This action was taken to address the interpretation of the existing data on status and trends and its relevance to the assessment of risk of extinction for the Northwest Atlantic Ocean DPS, as well as the magnitude and immediacy of the fisheries bycatch threat and measures to reduce this threat. New information or analyses to help clarify these issues were requested by April 11, 2011.

On September 22, 2011, NMFS and USFWS issued a final rule (76 FR 58868), determining that the loggerhead sea turtle is composed of nine DPSs (as defined in Conant *et al*., 2009) that constitute species that may be listed as threatened or endangered under the ESA. Five DPSs were listed as endangered (North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea), and four DPSs were listed as threatened (Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and Southwest Indian Ocean). Note that the Northwest Atlantic Ocean (NWA) DPS and the Southeast Indo-Pacific Ocean DPS were originally proposed as endangered. The NWA DPS was determined to be threatened based on review of nesting data available after the proposed rule was published, information provided in public comments on the proposed rule, and further discussions within the agencies. The two primary factors considered were population abundance and population trend. NMFS and USFWS found that an endangered status for the NWA DPS was not warranted given the large size of the nesting population, the overall nesting population remains widespread, the trend for the nesting population appears to be stabilizing, and substantial conservation efforts are underway to address threats. This final listing rule became effective on October 24, 2011.

The September 2011 final rule also noted that critical habitat for the two DPSs occurring within the U.S. (NWA DPS and North Pacific DPS) will be designated in a future rulemaking. Information from the public related to the identification of critical habitat, essential physical or biological features for this species, and other relevant impacts of a critical habitat designation was solicited. Currently, no critical habitat is designated for any DPS of loggerhead sea turtles, and therefore, no critical habitat for any DPS occurs in the action area.

Presence of Loggerhead Sea Turtles in the Action Area

The effects of this proposed action are only experienced within the Atlantic Ocean. NMFS has considered the available information on the distribution of the nine DPSs to determine the origin of any loggerhead sea turtles that may occur in the action area. As noted in Conant *et al*. (2009), the range of the four DPSs occurring in the Atlantic Ocean are as follows: NWA DPS – north of the equator, south of 60°N latitude, and west of 40°W longitude; Northeast Atlantic Ocean (NEA) DPS – north of the equator, south of 60°N latitude, east of 40°W longitude, and west of 5° 36'W longitude; South Atlantic DPS – south of the equator, north of 60°S latitude, west of 20°E longitude, and east of 60°W longitude; Mediterranean DPS – the Mediterranean Sea east of 5° 36'W longitude. These boundaries were determined based on oceanographic features, loggerhead sightings, thermal tolerance, fishery bycatch data, and information on loggerhead distribution from satellite telemetry and flipper tagging studies. While adults exhibit highly structured use of ocean areas with no overlap among DPSs, there may be some degree of overlap by juveniles of the NWA, NEA, and Mediterranean DPSs on oceanic foraging grounds (Laurent *et al*. 1993, 1998; Bolten *et al*. 1998; LaCasella *et al*. 2005; Carreras *et al*. 2006, Monzón-Argüello *et al*. 2006; Revelles *et al*. 2007). Previous literature (Bowen *et al*. 2004) has suggested that there is the potential, albeit small, for some juveniles from the Mediterranean DPS to be present in U.S. Atlantic coastal foraging grounds. These conclusions must be interpreted with caution however, as they may be representing a shared common haplotype and lack of representative sampling at Eastern Atlantic rookeries rather than an actual presence of Mediterranean DPS turtles in U.S. Atlantic coastal waters. A re-analysis of the data by the Atlantic Loggerhead Turtle Expert Working Group has found that that it is unlikely that U.S. fishing fleets are interacting with either the Northeast Atlantic DPS or the Mediterranean DPS (Peter Dutton, NMFS, Marine Turtle Genetics Program, Program Leader, personal communication, September 10, 2011). Given that the action area is a subset of the area fished by U.S. fleets, it is reasonable to assume that based on this new analysis, no individuals from the Mediterranean DPS or Northeast Atlantic DPS would be present in the action area. Sea turtles of the South Atlantic DPS do not inhabit the action area of this consultation (Conant *et al*. 2009). Thus, the remainder of this consultation will only focus on the NWA DPS, which is listed as threatened.

Distribution and Life History

Ehrhart *et al.* (2003) provided a summary of the literature identifying known nesting habitats and foraging areas for loggerheads within the Atlantic Ocean. Detailed information is also provided in the five-year status review for loggerheads (NMFS and USFWS 2007a), the TEWG report (2009), and the final revised recovery plan for loggerheads in the Northwest Atlantic Ocean (NMFS and USFWS 2008), which is a second revision to the original recovery plan that was approved in 1984 and subsequently revised in 1991.

In the western Atlantic, waters as far north as 41°N to 42°N latitude are used for foraging by juveniles and adults (Shoop 1987; Shoop and Kenney 1992; Ehrhart *et al.* 2003; Mitchell *et al.* 2003). In U.S. Atlantic waters, loggerheads commonly occur throughout the inner continental shelf from Florida to Cape Cod, Massachusetts and in the Gulf of Mexico from Florida to Texas, although their presence varies with the seasons due to changes in water temperature (Shoop and Kenney 1992; Epperly *et al.* 1995a, 1995b; Braun and Epperly 1996; Braun-McNeill *et al.* 2008; Mitchell *et al.* 2003). Loggerheads have been observed in waters with surface temperatures of 7°C to 30°C, but water temperatures ≥11°C are most favorable (Shoop and Kenney 1992; Epperly *et al.* 1995b). The presence of loggerhead sea turtles in U.S. Atlantic waters is also influenced by water depth. Aerial surveys of continental shelf waters north of Cape Hatteras, NC indicated that loggerhead sea turtles were most commonly sighted in waters with bottom depths ranging from 22 to 49 meters deep (Shoop and Kenney 1992). However, more recent survey and satellite tracking data support that they occur in waters from the beach to beyond the continental shelf (Mitchell *et al.* 2003; Braun-McNeill and Epperly 2004; Mansfield 2006; Blumenthal *et al.* 2006; Hawkes *et al.* 2006; McClellan and Read 2007; Mansfield *et al*. 2009).

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

Recent studies have established that the loggerhead's life history is more complex than previously believed. Rather than making discrete developmental shifts from oceanic to neritic environments, research is showing that both adults and (presumed) neritic stage juveniles continue to use the oceanic environment and will move back and forth between the two habitats (Witzell 2002; Blumenthal *et al.* 2006; Hawkes *et al.* 2006; McClellan and Read 2007; Mansfield *et al*. 2009). One of the studies tracked the movements of adult post-nesting females and found that differences in habitat use were related to body size, with larger adults staying in coastal waters and smaller adults traveling to oceanic waters (Hawkes *et al.* 2006). A tracking study of large juveniles found that the habitat preferences of this life stage were also diverse, with some remaining in neritic waters and others moving off into oceanic waters (McClellan and Read 2007). However, unlike the Hawkes *et al.* (2006) study, there was no significant difference in the body size of turtles that remained in neritic waters versus oceanic waters (McClellan and Read 2007).

Pelagic and benthic juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988; NMFS and USFWS 2008). Sub-adult and adult loggerheads are primarily coastal-dwelling and typically prey on benthic invertebrates, such as mollusks and decapod crustaceans, in hard-bottom habitats (NMFS and USFWS 2008).

As presented below, Table 4 (taken from the 2008 loggerhead recovery plan) highlights the key life history parameters for loggerheads nesting in the United States.

Table 3. Typical values of life history parameters for loggerheads nesting in the U.S.

Life History Parameter	**Data**
Clutch size	100-126 eggs[1]
Egg incubation duration (varies depending on time of year and latitude)	42-75 days[2,3]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	29.0°C[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70%[2,6]
Clutch frequency (number of nests/female/season)	3-5.5 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Juvenile (<87 cm CCL) sex ratio	65-70% female[4]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

1 Dodd 1988.
2 Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
3 Blair Witherington, FFWCC, personal communication, 2006 (information based on nests monitored throughout Florida beaches in 2005, n=865).
4 National Marine Fisheries Service (2001); Allen Foley, FFWCC, personal communication, 2005.
5 Mrosovsky (1988).
6 Blair Witherington, FFWCC, personal communication, 2006 (information based on nests monitored throughout Florida beaches in 2005, n=1,680).
7 Murphy and Hopkins (1984); Frazer and Richardson (1985); Ehrhart, unpublished data; Hawkes *et al*. 2005; Scott 2006; Tony Tucker, Mote Marine Laboratory, personal communication, 2008.
8 Caldwell (1962), Dodd (1988).
9 Richardson *et al*. (1978); Bjorndal *et al*. (1983); Ehrhart, unpublished data.
10 Melissa Snover, NMFS, personal communication, 2005; see Table A1-6.
11 Dahlen *et al*. (2000).

Population Dynamics and Status

By far, the majority of Atlantic nesting occurs on beaches of the southeastern United States (NMFS and USFWS 2007a). For the past decade or so, the scientific literature has recognized five distinct nesting groups, or subpopulations, of loggerhead sea turtles in the Northwest Atlantic, divided geographically as follows: (1) a northern group of nesting females that nest from North Carolina to Northeast Florida at about 29°N latitude; (2) a South Florida group of nesting females that nest from 29°N latitude on the East Coast to Sarasota on the West Coast; (3)

a Florida Panhandle group of nesting females that nest around Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán group of nesting females that nest on beaches of the eastern Yucatán Peninsula, Mexico; and (5) a Dry Tortugas group that nests on beaches of the islands of the Dry Tortugas, near Key West, Florida and on Cal Sal Bank (TEWG 2009). Genetic analyses of mitochondrial DNA, which a sea turtle inherits from its mother, indicate that there are genetic differences between loggerheads that nest at and originate from the beaches used by each of the five identified nesting groups of females (TEWG 2009). However, analyses of microsatellite loci from nuclear DNA, which represents the genetic contribution from both parents, indicates little to no genetic differences between loggerheads originating from nesting beaches of the five Northwest Atlantic nesting groups (Pearce and Bowen 2001; Bowen 2003; Bowen *et al.* 2005; Shamblin 2007). These results suggest that female loggerheads have site fidelity to nesting beaches within a particular area, while males provide an avenue of gene flow between nesting groups by mating with females that originate from different nesting groups (Bowen 2003; Bowen *et al.* 2005). The extent of such gene flow, however, is unclear (Shamblin 2007).

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

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

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

Note that NMFS and USFWS (2008), Witherington *et al*. (2009), and TEWG (2009) analyzed the status of the nesting assemblages within the NWA DPS using standardized data collected over periods ranging from 10-23 years. These analyses used different analytical approaches, but all found that there had been a significant overall nesting decline within the NWA DPS. However, with the addition of nesting data from 2008 to 2010, the trend line changes, showing a very slight negative trend, but the rate of decline is not statistically different from zero (76 FR 58868, September 22, 2011). The nesting data presented in the Recovery Plan (through 2008) is described below, with updated trend information through 2010 for two recovery units.

From the beginning of standardized index surveys in 1989 until 1998, the PFRU, the largest nesting assemblage in the Northwest Atlantic by an order of magnitude, had a significant increase in the number of nests. However, from 1998 through 2008, there was a 41% decrease in annual nest counts from index beaches, which represent an average of 70% of the statewide nesting activity (NMFS and USFWS 2008). From 1989 to 2008, the PFRU had an overall declining nesting trend of 26% (95% CI: -42% to -5%; NMFS and USFWS 2008). With the addition of nesting data through 2010, the nesting trend for the PFRU does not show a nesting decline statistically different from zero (76 FR 58868, September 22, 2011). The NRU, the second largest nesting assemblage of loggerheads in the United States, has been declining at a rate of 1.3% annually since 1983 (NMFS and USFWS 2008). The NRU dataset included 11 beaches with an uninterrupted time series of coverage of at least 20 years; these beaches represent approximately 27% of NRU nesting (in 2008). Through 2008, there was strong statistical data to suggest the NRU has experienced a long-term decline, but with the inclusion of nesting data through 2010, nesting for the NRU is showing possible signs of stabilizing (76 FR 58868, September 22, 2011). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. However, the NGMRU has shown a significant declining trend of 4.7% annually since index nesting beach surveys were initiated in 1997 (NMFS and USFWS 2008). No statistical trends in nesting abundance can be determined for the DTRU because of the lack of long-term data. Similarly, statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses (NMFS and USFWS 2008).

Sea turtle census nesting surveys are important because they provide information on the relative abundance of nesting each year, and the contribution of each nesting group to total nesting of the species. Nest counts can also be used to estimate the number of reproductively mature females nesting annually. The 2008 recovery plan compiled information on mean number of loggerhead nests and the approximated counts of nesting females per year for four of the five identified recovery units (*i.e*., nesting groups). They are: (1) for the NRU, a mean of 5,215 loggerhead nests per year (1989-2008) with approximately 1,272 females nesting per year; (2) for the PFRU, a mean of 64,513 nests per year (from 1989-2007) with approximately 15,735 females nesting per year; (3) for the DTRU, a mean of 246 nests per year (1995-2004, excluding 2002) with approximately 60 females nesting per year; and (4) for the NGMRU, a mean of 906 nests per year (1995-2007) with approximately 221 females nesting per year. For the GCRU, the only estimate available for the number of loggerhead nests per year is from Quintana Roo, Yucatán, Mexico, where a range of 903-2,331 nests per year was estimated from 1987-2001 (NMFS and

USFWS 2007a). There are no annual nest estimates available for the Yucatán since 2001 or for any other regions in the GCRU, nor are there any estimates of the number of nesting females per year for any nesting assemblage in this recovery unit. Note that the above values for average nesting females per year were based upon 4.1 nests per female (Murphy and Hopkins 1984).

Genetic studies of juvenile and a few adult loggerhead sea turtles collected from Northwest Atlantic foraging areas (beach strandings, a power plant in Florida, and North Carolina fisheries) show that the loggerheads that occupy East Coast U.S. waters originate from these Northwest Atlantic nesting groups; primarily from the nearby nesting beaches of southern Florida, as well as the northern Florida to North Carolina beaches, and finally from the beaches of the Yucatán Peninsula, Mexico (Rankin-Baransky *et al*. 2001; Witzell *et al*. 2002; Bass *et al.* 2004; Bowen *et al*. 2004). The contribution of these three nesting assemblages varies somewhat among the foraging habitats and age classes surveyed along the East Coast. The distribution is not random and bears a significant relationship to the proximity and size of adjacent nesting colonies (Bowen *et al*. 2004). Bass *et al*. (2004) attribute the variety in the proportions of sea turtles from loggerhead turtle nesting assemblages documented in different East Coast foraging habitats to a complex interplay of currents and the relative size and proximity of nesting beaches.

Unlike nesting surveys, in-water studies of sea turtles typically sample both sexes and multiple age classes. In-water studies have been conducted in some areas of the Northwest Atlantic and provide data by which to assess the relative abundance of loggerhead sea turtles and changes in abundance over time (Maier *et al.* 2004; Morreale *et al.* 2005; Mansfield 2006; Ehrhart *et al.* 2007; Epperly *et al.* 2007). The TEWG (2009) used raw data from six in-water study sites to conduct trend analyses. They identified an increasing trend in the abundance of loggerheads from three of the four sites located in the Southeast United States, one site showed no discernible trend, and the two sites located in the Northeast United States showed a decreasing trend in abundance of loggerheads. The 2008 loggerhead recovery plan also includes a full discussion of in-water population studies for which trend data have been reported, and a brief summary will be provided here.

Maier *et al.* (2004) used fishery-independent trawl data to establish a regional index of loggerhead abundance for the Southeast Coast of the U.S. (Winyah Bay, South Carolina to St. Augustine, Florida) during the period 2000-2003. A comparison of loggerhead catch data from this study with historical values suggested that in-water populations of loggerhead sea turtles along the Southeast U.S. coast appear to be larger, possibly an order of magnitude higher than they were 25 years ago, but the authors caution a direct comparison between the two studies given differences in sampling methodology (Maier *et al.* 2004). A comparison of catch rates for sea turtles in pound net gear fished in the Pamlico-Albemarle Estuarine Complex of North Carolina between the years 1995-1997 and 2001-2003 found a significant increase in catch rates for loggerhead sea turtles for the latter period (Epperly *et al.* 2007). A long-term, on-going study of loggerhead abundance in the Indian River Lagoon System of Florida found a significant increase in the relative abundance of loggerheads over the last four years of the study (Ehrhart *et al.* 2007). However, there was no discernible trend in loggerhead abundance during the 24-year time period of the study (1982-2006) (Ehrhart *et al.* 2007). At St. Lucie Power Plant, data collected from 1977 to 2004 show an increasing trend of loggerheads at the power plant intake structures (FPL and Quantum Resources 2005).

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

As with other turtle species, population estimates for loggerhead sea turtles are difficult to determine, due to their life history characteristics. However, a recent loggerhead assessment using a demographic matrix model estimated that the loggerhead adult female population in the western North Atlantic ranges from 16,847 to 89,649, with a median size of 30,050 (NMFS SEFSC 2009). The model results for population trajectory suggest that the population is most likely declining, but this result was very sensitive to the choice of the position of the parameters within their range and hypothesized distributions. The pelagic stage survival parameter had the largest effect on the model results. As a result of the large uncertainty in our knowledge of loggerhead life history, predicting the future populations or population trajectories of loggerhead sea turtles with precision is not possible. It should also be noted that additional analyses are underway which will incorporate any newly available information.

As part of the Atlantic Marine Assessment Program for Protected Species (AMAPPS), line transect aerial abundance surveys and turtle telemetry studies were conducted along the Atlantic Coast in the summer of 2010. AMAPPS is a multi-agency initiative to assess marine mammal, sea turtle, and seabird abundance and distribution in the Atlantic. Aerial surveys were conducted from Cape Canaveral, Florida to the Gulf of St. Lawrence, Canada. Satellite tags on juvenile loggerheads were deployed in two locations: off the coasts of northern Florida to South Carolina (n=30) and off the New Jersey and Delaware coasts (n=14). As presented in NMFS NEFSC (2011), the 2010 survey found a preliminary total surface abundance estimate within the entire study area of about 60,000 loggerheads (CV=0.13) or 85,000 if a portion of unidentified hard-shelled sea turtles were included (CV=0.10). Surfacing times were generated from the satellite tag data collected during the aerial survey period, resulting in a 7% (5%-11% inter-quartile range) median surface time in the South Atlantic area and a 67% (57%-77% inter-quartile range) median surface time to the north. The calculated preliminary regional abundance estimate is about 588,000 loggerheads along the U.S. Atlantic coast, with an inter-quartile range of 382,000-817,000 (NMFS NEFSC 2011). The estimate increases to approximately 801,000 (inter-quartile range of 521,000-1,111,000) when based on known loggerheads and a portion of unidentified turtle sightings. The density of loggerheads was generally lower in the north than the south; based on number of turtle groups detected, 64% were seen south of Cape Hatteras, North Carolina, 30% in the southern Mid-Atlantic Bight, and 6% in the northern Mid-Atlantic Bight. Although they have been seen farther north in previous studies (*e.g.*, Shoop and Kenney 1992), no loggerheads were observed during the aerial surveys conducted in the summer of 2010 in the more northern zone encompassing Georges Bank, Cape Cod Bay, and the Gulf of Maine. These estimates of loggerhead abundance over the U.S. Atlantic continental shelf are considered very preliminary. A more thorough analysis will be completed pending the results of further studies related to improving estimates of regional and seasonal variation in loggerhead surface time (by increasing the sample size and geographical area of tagging) and other information needed to improve the biases inherent in aerial surveys of sea turtles (*e.g.*, research on depth of detection and species misidentification rate). This survey effort represents the most comprehensive assessment of sea turtle abundance and distribution in many years. Additional aerial surveys and research to improve the abundance estimates are anticipated in 2011-2014, depending on available funds.

Threats

The diversity of a loggerhead sea turtle's life history leaves it susceptible to many natural and human impacts, including impacts while it is on land, in the neritic environment, and in the oceanic environment. The five-year status review and 2008 recovery plan provide a summary of natural and anthropogenic threats to loggerhead sea turtles (NMFS and USFWS 2007a, 2008). Among those of natural origin, hurricanes are known to be destructive to sea turtle nests. Sand accretion, rainfall, and wave action that result from these storms can appreciably reduce hatchling success. Other sources of natural mortality include cold-stunning, biotoxin exposure, and native species predation.

Anthropogenic factors that impact hatchlings and adult females on land, or the success of nesting and hatching include: beach erosion, beach armoring, and nourishment; artificial lighting; beach cleaning; beach pollution; increased human presence; recreational beach equipment; vehicular and pedestrian traffic; coastal development/construction; exotic dune and beach vegetation; removal of native vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (*e.g.*, raccoons, armadillos, and opossums), which raid nests and feed on turtle eggs (NMFS and USFWS 2007a, 2008). Although sea turtle nesting beaches are protected along large expanses of the Northwest Atlantic Coast (in areas like Merritt Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection. Sea turtle nesting and hatching success on unprotected high density East Florida nesting beaches from Indian River to Broward County are affected by all of the above threats.

Loggerheads are affected by a completely different set of anthropogenic threats in the marine environment. These include oil and gas exploration, coastal development, and transportation;

marine pollution; underwater explosions; hopper dredging; offshore artificial lighting; power plant entrainment and/or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; poaching; and fishery interactions.

A 1990 National Research Council (NRC) report concluded that for juveniles, subadults, and breeders in coastal waters, the most common cause of human related mortality in U.S. Atlantic waters was fishery interactions. The sizes and reproductive values of sea turtle interactions by fisheries vary significantly, depending on the location and season of the fishery, and size-selectivity of gear. Therefore, it is possible for a fishery that interacts with fewer, more reproductively valuable turtles to have a greater detrimental effect on the population than one that interacts with greater numbers of less reproductively valuable turtles (Wallace *et al*. 2008). The Loggerhead BRT determined that the greatest threats to the NWA DPS result from cumulative fishery bycatch in neritic and oceanic habitats (Conant *et al*. 2009). Attaining a more thorough understanding of the characteristics, as well as the quantity of sea turtle bycatch across all fisheries is of great importance.

Finkbeiner *et al*. (2011) compiled cumulative sea turtle bycatch information in U.S. fisheries from 1990 through 2007, before and after implementation of bycatch mitigation measures. Information was obtained from peer reviewed publications and NMFS documents (e.g., biological opinions and bycatch reports). In the Atlantic, a mean estimate of 137,700 bycatch interactions, of which 4,500 were mortalities, occurred annually after implementation of bycatch mitigation measures. Kemp's ridleys interacted with fisheries most frequently, with the highest level of mean annual mortality (2,700), followed by loggerheads (1,400), greens (300), and leatherbacks (40). The Southeast/Gulf of Mexico shrimp trawl fishery was responsible for the vast majority of U.S. interactions (up to 98%) and mortalities (more than 80%). While this provides an initial cumulative bycatch assessment, there are a number of caveats that should be considered when interpreting this information, such as sampling inconsistencies and limitations.

Of the many fisheries known to adversely affect loggerheads, the U.S. South Atlantic and Gulf of Mexico shrimp fisheries were considered to pose the greatest threat of mortality to neritic juvenile and adult age classes of loggerheads (NRC 1990, Finkbeiner *et al*. 2011). Significant changes to the South Atlantic and Gulf of Mexico shrimp fisheries have occurred since 1990, and the effects of these shrimp fisheries on ESA-listed species, including loggerhead sea turtles, have been assessed several times through section 7 consultations. There is also a lengthy regulatory history with regard to the use of Turtle Excluder Devices (TEDs) in the U.S. South Atlantic and Gulf of Mexico shrimp fisheries (Epperly and Teas 2002; NMFS 2002a; Lewison *et al.* 2003). A section 7 consultation on the U.S. South Atlantic and Gulf of Mexico shrimp fisheries completed in 2002 estimated the total annual level of take for loggerhead sea turtles to be 163,160 interactions (the total number of turtles that enter a shrimp trawl, which may then escape through the TED or fail to escape and be captured) with 3,948 of those takes being lethal (NMFS 2002a).

In addition to improvements in TED designs and TED enforcement, interactions between loggerheads and the shrimp fishery have also been declining because of reductions in fishing effort unrelated to fisheries management actions. The 2002 biological opinion take estimates were based in part on fishery effort levels. In recent years, low shrimp prices, rising fuel costs, competition with imported products, the impacts of recent hurricanes in the Gulf of Mexico, and the Deepwater Horizon oil spill of 2010 have all impacted the shrimp fleets; in some cases reducing fishing effort by as much as 50% for offshore waters of the Gulf of Mexico (GMFMC 2007). As a result, loggerhead interactions and mortalities in the Gulf of Mexico have been substantially less than projected in the 2002 biological opinion. In 2008, the NMFS Southeast Fisheries Science Center (SEFSC) estimated annual number of interactions between loggerheads and shrimp trawls in the Gulf of Mexico shrimp fishery is 23,336, with 647 (2.8%) of those interactions resulting in mortality (Memo from Dr. B. Ponwith, Southeast Fisheries Science Center to Dr. R. Crabtree, Southeast Region, PRD, December 2008). However, the most recent section 7 consultation on the shrimp fishery, completed in May 2012, was unable to estimate the total annual level of take for loggerheads at present. Instead, it qualitatively estimated that the shrimp fishery, as currently operating, would result in at least thousands and possibly tens of thousands of interactions annually, of which at least hundreds and possibly thousands are expected to be lethal (NMFS 2012).

Loggerhead sea turtles are also known to interact with non-shrimp trawl, gillnet, longline, dredge, pound net, pot/trap, and hook and line fisheries. The NRC (1990) report stated that other U.S. Atlantic fisheries collectively accounted for 500 to 5,000 loggerhead deaths each year, but recognized that there was considerable uncertainty in the estimate. The reduction of sea turtle captures in fishing operations is identified in recovery plans and five-year status reviews as a priority for the recovery of all sea turtle species. In the threats analysis of the loggerhead recovery plan, trawl bycatch is identified as the greatest source of mortality. While loggerhead bycatch in U.S. Mid-Atlantic bottom otter trawl gear was previously estimated for the period 1996-2004 (Murray 2006, 2008), a recent bycatch analysis estimated the number of loggerhead sea turtle interactions with U.S. Mid-Atlantic bottom trawl gear from 2005-2008 (Warden 2011a). Northeast Fisheries Observer Program data from 1994-2008 were used to develop a model of interaction rates and those predicted rates were applied to 2005-2008 commercial fishing data to estimate the number of interactions for the trawl fleet. The number of predicted average annual loggerhead interactions for 2005-2008 was 292 (CV=0.13, 95% CI=221-369), with an additional 61 loggerheads (CV=0.17, 95% CI=41-83) interacting with trawls but being released through a TED. Of the 292 average annual observable loggerhead interactions, approximately 44 of those were adult equivalents. Warden (2011b) found that latitude, depth and sea surface temperature (SST) were associated with the interaction rate, with the rates being highest south of 37°N latitude in waters < 50 meters deep and SST > 15°C. This estimate is a decrease from the average annual loggerhead bycatch in bottom otter trawls during 1996-2004, estimated to be 616 sea turtles (CV=0.23, 95% CI over the 9-year period: 367-890) (Murray 2006, 2008).

Published estimates of annual loggerhead interactions with the Atlantic sea scallop dredge fishery range from a low of zero in 2005 (Murray 2007) to a high of 749 in 2003 (Murray 2004). Murray (2011) recently re-evaluated loggerhead sea turtle interactions in scallop dredge gear from 2001 to 2008. Murray (2011) estimated the average number of annual observable interactions of hard-shelled sea turtles in the Mid-Atlantic scallop dredge fishery prior to the implementation of chain mats (January 1, 2001 through September 25, 2006) to be 288 turtles (CV = 0.14, 95% CI: 209-363) [equivalent to 49 adults], 218 of which were loggerheads [equivalent to 37 adults]. After the implementation of chain mats, the average annual number of observable interactions was estimated to be 20 hard-shelled sea turtles (CV = 0.48, 95% CI: 3-

42), 19 of which were loggerheads. If the rate of observable interactions from dredges without chain mats had been applied to trips with chain mats, the estimated number of observable and inferred interactions of hard-shelled sea turtles after chain mats were implemented would have been 125 turtles per year (CV = 0.15, 95% CI: 88-163) [equivalent to 22 adults], 95 of which were loggerheads [equivalent to 16 adults]. Interaction rates of hard-shelled turtles were correlated with SST, depth, and use of a chain mat. Results from this recent analysis suggest that chain mats and fishing effort reductions have contributed to the post-2006 decline in estimated loggerhead sea turtle interactions with scallop dredge gear (Murray 2011).

An estimate of the number of loggerhead interactions annually in U.S. Mid-Atlantic gillnet fisheries has also recently been published (Murray 2009a, b). From 1995 to 2006, the annual bycatch of loggerheads in U.S. Mid-Atlantic gillnet gear was estimated to average 350 turtles (CV=0.20, 95% CI over the 12-year period: 234 to 504). Bycatch rates were correlated with latitude, SST, and mesh size. The highest predicted bycatch rates occurred in warm waters of the southern Mid-Atlantic in large-mesh gillnets (Murray 2009a).

The U.S. tuna and swordfish longline fisheries that are managed under the Highly Migratory Species (HMS) FMP are estimated to capture 1,905 loggerheads (no more than 339 mortalities) for each three-year period since 2007 (NMFS 2004a). NMFS has mandated gear changes for the HMS fishery to reduce sea turtle bycatch and the likelihood of death from those ineteractions that would still occur (Garrison and Stokes 2010). In 2010, there were 40 observed interactions between loggerhead sea turtles and longline gear used in the HMS fishery (Garrison and Stokes 2011a, 2011b). All of the loggerheads were released alive, with the vast majority released with all gear removed. While 2010 total estimates are not yet available, in 2009, 242.9 (95% CI: 167.9-351.2) loggerhead sea turtles are estimated to have interacted with the longline fisheries managed under the HMS FMP based on the observed interactions (Garrison and Stokes 2010). The 2009 estimate is considerably lower than estimates in 2006 and 2007, and is consistent with historical averages since 2001 (Garrison and Stokes 2010). This fishery represents just one of several longline fisheries operating in the Atlantic Ocean. Lewison *et al.* (2004) estimated that 150,000-200,000 loggerheads interacted with all Atlantic longline fisheries in 2000 (including the U.S. Atlantic tuna and swordfish longline fisheries as well as others).

Documented interactions also occur in other fishery gear types and by non-fishery mortality sources (*e.g.*, hopper dredges, power plants, vessel collisions), although quantitative/qualitative estimates are only available for activites on which NMFS has consulted.

The 2008 Recovery Plan for loggerhead sea turtles and the 2009 Status Review Report both identify global climate change as a threat to loggerhead sea turtles. However, trying to assess the likely effects of climate change on loggerhead sea turtles is extremely difficult given the uncertainty in all climate change models, the difficulty in determining the likely rate of temperature increases, and the scope and scale of any accompanying habitat effects. Additionally, no significant climate change-related impacts to loggerhead sea turtle populations have been observed to date. Over the long-term, climate change related impacts are expected to influence biological trajectories on a century scale (Parmesan and Yohe 2003). As noted in the 2009 Status Review (Conant *et al*. 2009), impacts from global climate change are likely to become more apparent in future years (Intergovernmental Panel on Climate Change (IPCC)

2007). Climate change related increasing temperatures, sea level rise, changes in ocean productivity, and increased frequency of storm events may affect loggerhead sea turtles.

Increasing temperatures are expected to result in rising sea levels (Titus and Narayanan 1995 in Conant *et al*. 2009), which could result in increased erosion rates along nesting beaches. Sea level rise could result in the inundation of nesting sites and decrease available nesting habitat (Daniels *et al*. 1993; Fish *et al*. 2005; Baker *et al*. 2006). The BRT noted that the loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes, such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis *et al*. 2006; Baker *et al*. 2006; both in Conant *et al*. 2009). Along developed coastlines, and especially in areas where erosion control structures have been constructed to limit shoreline movement, rising sea levels may cause severe effects on nesting females and their eggs as nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation. However, if global temperatures increase and there is a range shift northwards, beaches not currently used for nesting may become available for loggerhead sea turtles, which may offset some loss of accessibility to beaches in southern portions of the range.

Climate change also has the potential to result in changes at nesting beaches that may affect loggerhead sex ratios. Loggerhead sea turtles exhibit temperature-dependent sex determination. Rapidly increasing global temperatures may result in warmer incubation temperatures and highly female-biased sex ratios (*e.g.*, Glen and Mrosovsky 2004; Hawkes *et al*. 2009); however, to the extent that nesting can occur at beaches farther north where sand temperatures are not as warm, these effects may be partially offset. The BRT specifically identified climate change as a threat to loggerhead sea turtles in the neritic/oceanic zone where climate change may result in future trophic changes, thus impacting loggerhead prey abundance and/or distribution. In the threats matrix analysis, climate change was considered for oceanic juveniles and adults and eggs/hatchlings. The report states that for oceanic juveniles and adults, "although the effect of trophic level change from…climate change…is unknown it is believed to be very low." For eggs/hatchlings, the report states that total mortality from anthropogenic causes, including sea level rise resulting from climate change, is believed to be low relative to the entire life stage. However, only limited data are available on past trends related to climate effects on loggerhead sea turtles; current scientific methods are not able to reliably predict the future magnitude of climate change, associated impacts, whether and to what extent some impacts will offset others, or the adaptive capacity of this species.

While there is a reasonable degree of certainty that some climate change related effects will be experienced globally (*e.g.*, rising temperatures and changes in precipitation patterns), due to a lack of scientific data, the specific effects to sea turtles resulting from climate change are not predictable or quantifiable at this time (Hawkes *et al*. 2009). Based on the BRT report, it is unlikely that impacts from climate change will have a significant effect on the status of loggerheads over the scope of the action assessed in this Opinion, which, as explained in section 2.0, is the next ten years. This is because significant changes to biological trajectories resulting from climate change are expected to occur gradually over time (on a century scale), rather than immediately (Parmesan and Yohe 2003). However, significant impacts from climate change in the future beyond ten years are to be expected, but the severity of and rate at which these impacts will occur is currently unknown. It is likely that once climate change impacts get to a certain level, there will be feedback loops that may cause indications of climate change (*e.g.*, increases in greenhouse gas concentrations, rising global temperatures, and sea level rise) to get much worse much more quickly (Torn and Harte 2006).

In terms of "climate forcing" (which is different from what we are defining as "climate change," in that it also factors in the effects of cyclical climate patterns such as the North Atlantic and Pacific Decadal Oscillations in addition to ongoing effects from anthropogenically-induced changes in climate under IPCC projections), Van Houtan and Halley (2011) recently developed climate based models to investigate loggerhead nesting (considering juvenile recruitment and breeding remigration) in the North Pacific and Northwest Atlantic. These models found that climate conditions/oceanographic influences explain loggerhead nesting variability, with climate models alone explaining an average 60% (range 18%-88%) of the observed nesting changes over the past several decades. Hindcasts indicate that climatic conditions may have been a factor in past nesting declines in both the Atlantic and Pacific. However, in terms of future nesting projections, modeled climate data show a future positive trend for Florida nesting, with substantial increases through 2040 as a result of the Atlantic Multidecadal Oscillation signal (Van Houton and Halley 2011). Thus, independent of any dramatic losses of sea turtle nesting habitat in the Northwest Atlantic due to climate change, NWA DPS loggerheads are expected to increase their nesting output over the next few decades. Van Houton and Halley (2011) did not project nesting trends in the Northwest Atlantic beyond 2040 as forecasting beyond that point was not deemed possible given their methods. Much like our analyses of climate change, climate forcing analyses can only predict so far into the future.

Summary of Status for Loggerhead Sea Turtles

Loggerheads are a long-lived species and reach sexual maturity relatively late, at around 32-35 years in the Northwest Atlantic (NMFS and USFWS 2008). The species continues to be affected by many factors occurring on nesting beaches and in the water. These include poaching, habitat loss, and nesting predation that affects eggs, hatchlings, and nesting females on land, as well as fishery interactions, vessel interactions, marine pollution, and non-fishery (*e.g.*, dredging) operations affecting all sexes and age classes in the water (NRC 1990; NMFS and USFWS 2007a, 2008). Loggerheads still face many of the original threats that were the cause of their listing under the ESA.

As mentioned previously, the 2008 recovery plan identifies five unique recovery units, which comprise the population of loggerheads in the Northwest Atlantic, and describes specific recovery criteria for each recovery unit. The recovery plan noted a decline in annual nest counts for three of the five recovery units for loggerheads in the Northwest Atlantic, including the PFRU, which is the largest (in terms of number of nests laid) in the Atlantic Ocean. The nesting trends for the other two recovery units could not be determined due to an absence of long-term data.

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

While several documents reported the decline in nesting numbers in the NWA DPS (NMFS and USFWS 2008, TEWG 2009), when nest counts through 2010 are analyzed, the nesting trends from 1989 to 2010 are not significantly different than zero for all recovery units within the NWA DPS for which there are enough data to analyze (76 FR 58868, September 22, 2011). The SEFSC (2009) estimated the number of adult females in the NWA DPS at 30,000, and if a 1:1 adult sex ratio is assumed, the result is 60,000 adults in this DPS. Based on the reviews of nesting data, as well as information on population abundance and trends, NMFS and USFWS determined in the September 2011 listing rule that the NWA DPS should be listed as threatened. They found that an endangered status for the NWA DPS was not warranted given the large size of the nesting population, the widespread nature of the nesting population, the stabilizing trend for the nesting population, and the substantial conservation efforts underway to address threats.

Based on the information presented above, for purposes of this Opinion, we consider that the status of NWA DPS of loggerheads over the next ten years will be no worse than it is currently. Actions have been taken to reduce anthropogenic impacts to loggerhead sea turtles from various sources, particularly since the early 1990s. These include lighting ordinances, predation control, and nest relocations to help increase hatchling survival, as well as measures to reduce the mortality of pelagic immatures, benthic immatures, and sexually mature age classes from various fisheries and other marine activities (Conant *et al*. 2009). Recent actions have taken significant steps towards reducing the recurring sources of mortality and improving the status of all nesting stocks. For example, TED and chain mat regulations represent a significant improvement in the baseline effects of trawl and dredge fisheries on loggerheads in the Northwest Atlantic, although shrimp trawling is still considered to be one of the largest sources of anthropogenic mortality on loggerheads (SEFSC 2009). Nevertheless, loggerhead nesting has been on the rise since 2008 and Van Houton and Halley (2011) indicate that nesting in Florida, which contains by far the largest loggerhead rookery in the DPS, could substantially increase over the next few decades.

3.2.2 Leatherback Sea Turtle

Leatherback sea turtles are widely distributed throughout the oceans of the world, including the Atlantic, Pacific, and Indian Oceans, and the Mediterranean Sea (Ernst and Barbour 1972).

Leatherbacks are the largest living turtles and range farther than any other sea turtle species. Their large size and tolerance of relatively low water temperatures allows them to inhabit boreal waters, such as those off Labrador and in the Barents Sea (NMFS and USFWS 1995).

In 1980, the leatherback population was estimated at approximately 115,000 adult females globally (Pritchard 1982). By 1995, this global population of adult females was estimated to have declined to 34,500 (Spotila *et al.* 1996). The most recent population size estimate for the North Atlantic alone is a range of 34,000-94,000 adult leatherbacks (TEWG 2007). Thus, there is substantial uncertainty with respect to global population estimates of leatherback sea turtles.

Pacific Ocean
Leatherback nesting has been declining at all major Pacific Basin nesting beaches for the last two decades (Spotila *et al.* 1996, 2000; NMFS and USFWS 1998a, 2007b; Sarti *et al.* 2000). The western Pacific major nesting beaches are in Papua New Guinea, Indonesia, Solomon Islands, and Vanuatu, with an approximate 2,700-4,500 total breeding females, estimated from nest counts (Dutton *et al.* 2007). While there appears to be overall long-term population decline, the Indonesian nesting aggregation at Jamursba-Medi is currently stable (since 1999), although there is evidence to suggest a significant and continued decline in leatherback nesting in Papua New Guinea and Solomon Islands over the past 30 years (NMFS 2011). Leatherback sea 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). In Fiji, Thailand, and Australia, leatherback sea turtles have only been known to nest in low densities and at scattered sites.

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

Leatherback sea turtles in the western Pacific are threatened by poaching of eggs, killing of nesting females, human encroachment on nesting beaches, incidental capture in fishing gear, beach erosion, and egg predation by animals.

In the eastern Pacific Ocean, major leatherback nesting beaches are located in Mexico and Costa Rica, where nest numbers have been declining. According to reports from the late 1970s and early 1980s, beaches located on the Mexican Pacific coasts of Michoacán, Guerrero, and Oaxaca sustained a large portion, perhaps 50%, of all global nesting by leatherbacks (Sarti *et al.* 1996). A dramatic decline has been seen on nesting beaches in Pacific Mexico, where aerial survey data were used to estimate that tens of thousands of leatherback nests were laid on the beaches in the 1980s (Pritchard 1982), but a total of only 120 nests on the four primary index beaches (combined) were counted in the 2003-2004 season (Sarti Martinez *et al.* 2007). Since the early 1980s, the Mexican Pacific population of adult female leatherback turtles has declined to slightly more than 200 during 1998-1999 and 1999-2000 (Sarti *et al.* 2000). Spotila *et al.* (2000) reported the decline of the leatherback nesting at Playa Grande, Costa Rica, which had been the fourth largest nesting group in the world and the most important nesting beach in the Pacific. Between 1988 and 1999, the nesting group declined from 1,367 to 117 female leatherback sea turtles. An analysis of the Costa Rican nesting beaches indicates a decline in nesting during 15 years of monitoring (1989-2004) with approximately 1,504 females nesting in 1988-1989 to an average of 188 females nesting in 2000-2001 and 2003-2004 (NMFS and USFWS 2007b), indicating that the reductions in nesting females were not as extreme as the reductions predicted by Spotila *et al*. (2000).

On September 26, 2007, NMFS received a petition to revise the critical habitat designation for leatherback sea turtles to include waters along the U.S. West Coast. On December 28, 2007, NMFS published a positive 90-day finding on the petition and convened a critical habitat review team. On January 26, 2012, NMFS published a final rule to revise the critical habitat designation to include three particular areas of marine habitat. The designation includes approximately 43,796 square kilometers (16,910 square miles) along the California coast from Point Arena to Point Arguello east of the 3,000 meter depth contour, and 64,760 square kilometers (25,004 square miles) from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 meter depth contour. The areas comprise approximately 108,556 square kilometers (41,914 square miles) of marine habitat and include waters from the ocean surface down to a maximum depth of 80 meters (262 feet). The designated critical habitat areas contain the physical or biological feature essential to the conservation of the species that may require special management conservation or protection. In particular, the team identified one Primary Constituent Element: the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae, of sufficient condition, distribution, diversity, abundance, and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks.

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

Indian Ocean

Leatherbacks nest in several areas around the Indian Ocean. These sites include Tongaland, South Africa (Pritchard 2002) and the Andaman and Nicobar Islands (Andrews *et al.* 2002). Intensive survey and tagging work in 2001 provided new information on the level of nesting in the Andaman and Nicobar Islands (Andrews *et al.* 2002). Based on the survey and tagging work, it was estimated that 400-500 female leatherbacks nest annually on Great Nicobar Island (Andrews *et al.* 2002). The number of nesting females using the Andaman and Nicobar Islands combined was estimated to be around 1,000 (Andrews and Shanker 2002). Some nesting also occurs along the coast of Sri Lanka, although in much smaller numbers than in the past (Pritchard 2002).

Mediterranean Sea
Casale *et al.* (2003) reviewed the distribution of leatherback sea turtles in the Mediterranean. Among the 411 individual records of leatherback sightings in the Mediterranean, there were no nesting records. Nesting in the Mediterranean is believed to be extremely rare, if it occurs at all. Leatherbacks found in Mediterranean waters originate from the Atlantic Ocean (P. Dutton, NMFS, unpublished data).

Atlantic Ocean
Distribution and Life History
Evidence from tag returns and strandings in the western Atlantic suggests that adult leatherback sea turtles engage in routine migrations between northern temperate and tropical waters (NMFS and USFWS 1992). Leatherbacks are frequently thought of as a pelagic species that feed on jellyfish (*e.g.*, *Stomolophus, Chryaora*, and *Aurelia* species) and tunicates (*e.g.*, salps, pyrosomas) (Rebel 1974; Davenport and Balazs 1991). However, leatherbacks are also known to use coastal waters of the U.S. continental shelf, (James *et al.* 2005a; Eckert *et al.* 2006; Murphy *et al.* 2006), as well as the European continental shelf on a seasonal basis (Witt *et al.* 2007).

Tagging and satellite telemetry data indicate that leatherbacks from the western North Atlantic nesting beaches use the entire North Atlantic Ocean (TEWG 2007). For example, leatherbacks tagged at nesting beaches in Costa Rica have been found in Texas, Florida, South Carolina, Delaware, and New York (STSSN database). Leatherback sea turtles tagged in Puerto Rico, Trinidad, and the Virgin Islands have also been subsequently found on U.S. beaches of southern, Mid-Atlantic, and northern states (STSSN database). Leatherbacks from the South Atlantic nesting assemblages (West Africa, South Africa, and Brazil) have not been re-sighted in the western North Atlantic (TEWG 2007).

The CETAP aerial survey of the outer continental shelf from Cape Hatteras, NC to Cape Sable, Nova Scotia conducted between 1978 and 1982 showed leatherbacks to be present throughout the area with the most numerous sightings made from the Gulf of Maine south to Long Island. Leatherbacks were sighted in water depths ranging from 1 to 4,151 meters, but 84.4% of sightings were in waters less than 180 meters (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 than loggerhead sea turtles, since more leatherbacks were found at the lower temperatures (Shoop and Kenney 1992). Studies of satellite tagged leatherbacks suggest that they spend 10-41% of their time at the surface, depending on the phase of their migratory cycle (James *et al.* 2005b). The greatest amount of surface time (up to 41%) was recorded when leatherbacks occurred in continental shelf and slope waters north of 38°N (James *et al.* 2005b).

In 1979, the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands were designated as critical habitat for the leatherback sea turtle. On February 2, 2010, NMFS received a petition to revise the critical habitat designation for leatherback sea turtles to include waters adjacent to a major nesting beach in Puerto Rico. NMFS published a 90-day finding on the petition on July 16, 2010, which found that it did not present substantial scientific information indicating that the petitioned revision was warranted. The original petitioners submitted a second petition on

November 2, 2010, to again revise the critical habitat designation to include waters adjacent to a major nesting beach in Puerto Rico, and this time included additional information on the usage of the waters. NMFS determined on May 5, 2011, that a revision to critical habitat off Puerto Rico may be warranted, and an analysis is underway. Note that on August 4, 2011, USFWS issued a determination that revision to critical habitat along Puerto Rico should be made and will be addressed during the future planned status review.

Leatherbacks are a long-lived species (>30 years). They were originally believed to mature at a younger age than loggerhead sea turtles, with a previous estimated age at sexual maturity of about 13-14 years for females with 9 years reported as a likely minimum (Zug and Parham 1996) and 19 years as a likely maximum (NMFS SEFSC 2001). However, new sophisticated analyses suggest that leatherbacks in the Northwest Atlantic may reach maturity at 24.5-29 years of age (Avens *et al.* 2009). In the U.S. and Caribbean, female leatherbacks nest from March through July. In the Atlantic, most nesting females average between 150-160 centimeters curved carapace length (CCL), although smaller (<145 cm CCL) and larger nesters are observed (Stewart *et al*. 2007, TEWG 2007). They nest frequently (up to seven nests per year) during a nesting season and nest about every two to three years. They produce 100 eggs or more in each clutch and can produce 700 eggs or more per nesting season (Schultz 1975). However, a significant portion (up to approximately 30%) of the eggs can be infertile. As with other sea turtle species, leatherback hatchlings enter the water soon after hatching. Based on a review of all sightings of leatherback sea turtles of <145 centimeters CCL, Eckert (1999) found that leatherback juveniles remain in waters warmer than 26°C until they exceed 100 centimeters CCL.

Population Dynamics and Status

As described earlier, sea turtle nesting survey data are important because it provides information on the relative abundance of nesting, and the contribution of each population/subpopulation to total nesting of the species. Nest counts can also be used to estimate the number of reproductively mature females nesting annually, and as an indicator of the trend in the number of nesting females in the nesting group. The five-year review for leatherback sea turtles (NMFS and USFWS 2007b) compiled the most recent information on mean number of leatherback nests per year for each of the seven leatherback populations or groups of populations that were identified by the Leatherback TEWG as occurring within the Atlantic. These are: Florida, North Caribbean, Western Caribbean, Southern Caribbean, West Africa, South Africa, and Brazil (TEWG 2007).

In the United States, the Florida Statewide Nesting Beach Survey program has documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests in the early 2000s (NMFS and USFWS 2007b). Stewart *et al*. (2011) evaluated nest counts from 68 Florida beaches over 30 years (1979-2008) and found that nesting increased at all beaches with trends ranging from 3.1%-16.3% per year, with an overall increase of 10.2% per year. An analysis of Florida's index nesting beach sites from 1989 to 2006 shows a substantial increase in leatherback nesting in Florida during this time, with an annual growth rate of approximately 1.17 (TEWG 2007). The TEWG reports an increasing or stable nesting trend for five of the seven populations or groups of populations, with the exceptions of the Western Caribbean and West Africa groups. The leatherback rookery along the northern coast of South America in French

Guiana and Suriname supports the majority of leatherback nesting in the western Atlantic (TEWG 2007), and represents more than half of total nesting by leatherback sea turtles worldwide (Hilterman and Goverse 2004). Nest numbers in Suriname have shown an increase and the long-term trend for the Suriname and French Guiana nesting group seems to show an increase (Hilterman and Goverse 2004). In 2001, the number of nests in Suriname and French Guiana combined was 60,000, one of the highest numbers observed for this region in 35 years (Hilterman and Goverse 2004). The TEWG (2007) report indicates that a positive population growth rate was found for French Guinea and Suriname using nest numbers from 1967 to 2005, a 39-year period, and that there was a 95% probability that the population was growing. Given the magnitude of leatherback nesting in this area compared to other nest sites, negative impacts in leatherback sea turtles in this area could have profound impacts on the entire species.

The CETAP aerial survey conducted from 1978-1982 estimated the summer leatherback population for the northeastern United States at approximately 300-600 animals (from near Nova Scotia, Canada to Cape Hatteras, NC) (Shoop and Kenney 1992). However, the estimate was based on turtles visible at the surface and does not include those that were below the surface out of view. Therefore, it likely underestimated the leatherback population for the northeastern United States. Estimates of leatherback abundance of 1,052 turtles (C.V. = 0.38) and 1,174 turtles (C.V. = 0.52) were obtained from surveys conducted from Virginia to the Gulf of St. Lawrence in 1995 and 1998, respectively (Palka 2000). However, since these estimates were also based on sightings of leatherbacks at the surface, the author considered the estimates to be negatively biased and the true abundance of leatherbacks may be 4.27 times higher (Palka 2000).

Threats

The five-year status review (NMFS and USFWS 2007b) and TEWG (2007) reports both provide summaries of natural as well as anthropogenic threats to leatherback sea turtles. Of the Atlantic sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear, particularly trap/pot gear. This susceptibility may be the result of their body type (large size, long pectoral flippers, and lack of a hard shell), their diving and foraging behavior, their distributional overlap with the gear, their possible attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, and perhaps to the lightsticks used to attract target species in longline fisheries. Leatherbacks entangled in fishing gear generally have a reduced ability to feed, dive, surface to breathe, or perform any other behavior essential to survival (Balazs 1985). In addition to drowning from forced submergence, they may be more susceptible to boat strikes if forced to remain at the surface, and entangling lines can constrict blood flow resulting in tissue necrosis. The long-term impacts of entanglement on leatherback health remain unclear. Innis *et al*. (2010) conducted a health evaluation of leatherback sea turtles during direct capture (n=12) and disentanglement (n=7), and found no significant difference in many of the measured health parameters between entangled and directly captured turtles. However, blood parameters, including but not limited to sodium, chloride, and blood urea nitrogen, for entangled turtles showed several key differences that were most likely due to reduced foraging and associated seawater ingestion, as well as a general stress response.

Finkbeiner *et al*. (2011) compiled cumulative sea turtle bycatch information in U.S. fisheries from 1990 through 2007, before and after implementation of bycatch mitigation measures. Information was obtained from peer reviewed publications and NMFS documents (e.g., biological opinions and bycatch reports). In the Atlantic, a mean estimate of 137,700 bycatch interactions, of which 4,500 were mortalities, occurred annually (since implementation of bycatch mitigation measures). Kemp's ridleys interacted with fisheries most frequently, with the highest level of mean annual mortality (2,700), followed by loggerheads (1,400), greens (300), and leatherbacks (40). The Southeast/Gulf of Mexico shrimp trawl fishery was responsible for the vast majority of U.S. interactions (up to 98%) and mortalities (more than 80%). While this provides an initial cumulative bycatch assessment, there are a number of caveats that should be considered when interpreting this information, such as sampling inconsistencies and limitations. The most recent section 7 consultation on the shrimp fishery, completed in May 2012, was unable to estimate the total annual level of take for leatherbacks at present. Instead, it qualitatively estimated that the shrimp fishery, as currently operating, would result in a few hundred interactions annually, of which a subset are expected to be lethal (NMFS 2012a).

Leatherbacks have been documented interacting with longline, trap/pot, trawl, and gillnet fishing gear. For instance, U.S. Atlantic tuna and swordfish longline fisheries caught an estimated 6,363 leatherback sea turtles between 1992 and 1999 (NMFS SEFSC 2001). Currently, the U.S. tuna and swordfish longline fisheries managed under the HMS FMP are estimated to capture 1,764 leatherbacks (no more than 252 mortalities) for each three-year period starting in 2007 (NMFS 2004a). In 2010, there were 26 observed interactions between leatherback sea turtles and longline gear used in the HMS fishery (Garrison and Stokes 2011a, 2011b). All leatherbacks were released alive, with all gear removed in 14 (53.8%) of the 26 captures. A total of 170.9 (95% CI: 104.3-280.2) leatherback sea turtles are estimated to have interacted with the longline fisheries managed under the HMS FMP in 2010 based on the observed bycatch events (Garrison and Stokes 2012). The 2010 estimate continues a downward trend since 2007 and remains well below the average prior to implementation of gear regulations (Garrison and Stokes 2012). Since the U.S. fleet accounts for only 5-8% of the longline hooks fished in the Atlantic Ocean, adding up the under-represented observed interactions of the other 23 countries actively fishing in the area would likely result in annual interaction estimates of thousands of leatherbacks (NMFS SEFSC 2001). Lewison *et al.* (2004) estimated that 30,000-60,000 leatherbacks interacted with all Atlantic longline fisheries in 2000 (including the U.S. Atlantic tuna and swordfish longline fisheries).

Leatherbacks are susceptible to entanglement in lines associated with trap/pot gear used in several fisheries. From 1990 to 2000, 92 entangled leatherbacks were reported from New York through Maine (Dwyer *et al.* 2002). Additional leatherbacks stranded wrapped in line of unknown origin or with evidence of a past entanglement (Dwyer *et al.* 2002). More recently, from 2002 to 2010, NMFS received 137 reports of sea turtles entangled in vertical lines from Maine to Virginia, with 128 confirmed events (verified by photo documentation or response by a trained responder; NMFS 2008a). Of the 128 confirmed events, 117 involved leatherbacks. NMFS identified the gear type and fishery for 72 of the 117 confirmed events, which included lobster (42[12]), whelk/conch (15), black sea bass (10), crab (2), and research pot gear (1). 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).

[12] One case involved both lobster and whelk/conch gear.

Leatherback interactions with the U.S. South Atlantic and Gulf of Mexico shrimp fisheries are also known to occur (NMFS 2002). Leatherbacks are likely to encounter shrimp trawls working in the coastal waters off the U.S. Atlantic coast (from Cape Canaveral, Florida through North Carolina) as they make their annual spring migration north. For many years, TEDs that were required for use in the U.S. South Atlantic and Gulf of Mexico shrimp fisheries were less effective for leatherbacks than for the smaller, hard-shelled turtle species, because the TED openings were too small to allow leatherbacks to escape. To address this problem, NMFS issued a final rule on February 21, 2003, to amend the TED regulations (68 FR 8456, February 21, 2003). Modifications to the design of TEDs are now required in order to exclude leatherbacks as well as large benthic immature and sexually mature loggerhead and green sea turtles. Given those modifications, Epperly *et al*. (2002) anticipated an average of 80 leatherback mortalities a year in shrimp gear interactions, dropping to an estimate of 26 leatherback mortalities in 2009 due to effort reduction in the Southeast shrimp fishery (Memo from Dr. B. Ponwith, SEFSC, to Dr. R. Crabtree, SERO, January 5, 2011).

Other trawl fisheries are also known to interact with leatherback sea turtles, though on a much smaller scale. In October 2001, for example, a NMFS fisheries observer documented the interaction of a leatherback in a bottom otter trawl fishing for *Loligo* squid off Delaware. TEDs are not currently required in this fishery. In November 2007, fisheries observers reported the capture of a leatherback sea turtle in bottom otter trawl gear fishing for summer flounder.

Gillnet fisheries operating in the waters of the Mid-Atlantic states are also known to capture, injure, and/or kill leatherbacks when these fisheries and leatherbacks co-occur. Data collected by the NEFSC Fisheries Observer Program from 1994 to 1998 (excluding 1997) indicate that a total of 37 leatherbacks were incidentally captured (16 lethally) in drift gillnets set in offshore waters from Maine to Florida during this period. Observer coverage for this period ranged from 54% to 92%. In North Carolina, six additional leatherbacks were reported captured in gillnet sets in the spring (NMFS SEFSC 2001). In addition to these, in September 1995, two dead leatherbacks were removed from a 28.2-centimeter (11-inch) monofilament shark gillnet set in the nearshore waters off of Cape Hatteras (STSSN unpublished data reported in NMFS SEFSC 2001). Murray (2009a) also reported five observed leatherback captures in Mid-Atlantic sink gillnet fisheries between 1994 and 2008.

Fishing gear interactions can occur throughout the range of leatherbacks, including in Canadian waters. Goff and Lien (1988) reported that 14 of 20 leatherbacks encountered off the coast of Newfoundland/Labrador were entangled in salmon nets, herring nets, gillnets, trawl lines, and crab pot lines. Leatherbacks are known to drown in fish nets set in coastal waters of Sao Tome, West Africa (Castroviejo *et al.* 1994; Graff 1995). Gillnets are one of the suspected causes for the decline in the leatherback sea turtle population in French Guiana (Chevalier *et al.* 1999), and gillnets targeting green and hawksbill sea turtles in the waters of coastal Nicaragua also incidentally catch leatherback sea turtles (Lagueux *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-M. 2000). An estimated 1,000 mature female leatherback sea turtles are caught annually in fishing nets off Trinidad and Tobago, with mortality estimated to be between 50% and 95% (Eckert and Lien 1999). Many of the sea turtles do not die as a result of drowning, but rather because the fishermen butcher them to get them out of their nets (NMFS SEFSC 2001).

Leatherbacks may be more susceptible to marine debris ingestion than other sea turtle species due to the tendency of floating debris to concentrate in convergence zones that juveniles and adults use for feeding (Shoop and Kenney 1992; Lutcavage *et al.* 1997). Necropsy results of leatherback sea turtles revealed that a substantial percentage (34% of the 408 leatherback necropsies recorded between 1885 and 2007) reported plastic within the turtles' stomach contents, and in some cases (8.7% of those cases in which plastic was reported), blockage of the gut may have caused the mortality (Mrosovsky *et al*. 2009). An increase in reports of plastic ingestion was evident in leatherback necropsies conducted after the late 1960s (Mrosovsky *et al.* 2009). Along the coast of Peru, intestinal contents of 19 of 140 (13%) leatherback carcasses were found to contain plastic bags and film (Fritts 1982). The presence of plastic debris in the digestive tract suggests that leatherbacks might not be able to distinguish between prey items (*e.g*., jellyfish) and plastic debris (Mrosovsky 1981). Balazs (1985) speculated that plastic objects may resemble food items in their shape, color, size, or even movements as they drift about, and induce a feeding response in leatherbacks.

Global climate change has been identified as a factor that may affect leatherback habitat and biology (NMFS and USFWS 2007b); however, no significant climate change related impacts to leatherback sea turtle populations have been observed to date. Over the long term, climate change related impacts will likely influence biological trajectories in the future on a century scale (Parmesan and Yohe 2003). Changes in marine systems associated with rising water temperatures, changes in ice cover, salinity, oxygen levels, and circulation, including shifts in ranges and changes in algal, plankton, and fish abundance, could affect leatherback prey distribution and abundance. Climate change is expected to expand foraging habitats into higher latitudes and some concern has been noted that increasing temperatures may increase the female:male sex ratio of hatchlings on some beaches (Morosovsky *et al*. 1984 and Hawkes *et al*. 2007 in NMFS and USFWS 2007b). However, due to the tendency of leatherbacks to have individual nest placement preferences and deposit some clutches in the cooler tide zone of beaches, so the effects of long-term climate on sex ratios may be mitigated (Kamel and Mrosovsky 2004 in NMFS and USFWS 2007b). Additional potential effects of climate change on leatherbacks include range expansion and changes in migration routes as increasing ocean temperatures shift range-limiting isotherms north (Robinson *et al*. 2008). Leatherbacks have expanded their range in the Atlantic north by 330 kilometers in the last 17 years as warming has caused the northerly migration of the 15°C sea surface temperature (SST) isotherm, the lower limit of thermal tolerance for leatherbacks (McMahon and Hays 2006). Leatherbacks may be the best able to cope with climate change of all the sea turtle species due to their wide geographic distribution and relatively weak beach fidelity. Leatherback distribution and foraging behavior are likely affected by any changes in the distribution of their primary jellyfish prey (NMFS and USFWS 2007b). Jellyfish populations may increase due to ocean warming and other factors (Brodeur *et al*. 1999; Attrill *et al*. 2007; Richardson *et al*. 2009). However, any increase in jellyfish populations may or may not impact leatherbacks as there is no evidence that any leatherback populations are currently food-limited.

As discussed for loggerheads, increasing temperatures are expected to result in rising sea levels (Titus and Narayanan 1995 in Conant *et al*. 2009), which could result in increased erosion rates along nesting beaches. Sea level rise could result in the inundation of nesting sites and decrease available nesting habitat (Fish *et al*. 2005). This effect could potentially be accelerated due to a combination of other environmental and oceanographic changes, such as an increase in the frequency of storms and/or changes in prevailing currents. While there is a reasonable degree of certainty that climate change related effects will be experienced globally (*e.g.*, rising temperatures and changes in precipitation patterns), due to a lack of scientific data, the specific effects of climate change on this species are not predictable or quantifiable at this time (Hawkes *et al*. 2009). Based on the most recent five-year status review (NMFS and USFWS 2007b), and following from the climate change discussion in the previous section on NWA DPS loggerheads, it is unlikely that impacts from climate change will have a significant effect on the status of leatherbacks over the scope of the action assessed in this Opinion, which is the next ten years. However, significant impacts from climate change in the future beyond ten years are to be expected, but the severity of and rate at which these impacts will occur is currently unknown.

Summary of Status for Leatherback Sea Turtles
In the Pacific Ocean, the abundance of leatherback sea turtles on nesting beaches has declined dramatically during the past 10 to 20 years. Nesting groups throughout the eastern and western Pacific Ocean have been reduced to a fraction of their former abundance due to human activities that have reduced the number of nesting females and reduced the reproductive success of females (for example, by egg poaching) (NMFS and USFWS 2007b). No reliable long-term trend data for the Indian Ocean populations are currently available. While leatherbacks are known to occur in the Mediterranean Sea, nesting in this region is not known to occur (NMFS and USFWS 2007b).

Nest counts in many areas of the Atlantic Ocean show increasing trends, including for beaches in Suriname and French Guiana, which support the majority of leatherback nesting in this region (NMFS and USFWS 2007b). The species as a whole continues to face numerous threats in nesting and marine habitats. As with the other sea turtle species, mortality due to fisheries interactions accounts for a large proportion of annual human-caused mortality outside the nesting beaches, while other activities like pollution and habitat destruction account for an unknown level of other anthropogenic mortality. The long-term recovery potential of this species may be further threatened by observed low genetic diversity, even in the largest nesting groups (NMFS and USFWS 2007b).

Based on its five-year status review of the species, NMFS and USFWS (2007b) determined that endangered leatherback sea turtles should not be delisted or reclassified. However, it also was determined that an analysis and review of the species should be conducted in the future to determine whether DPSs should be identified (NMFS and USFWS 2007b). Based on the information presented above, for purposes of this Opinion, we consider that the status of leatherbacks over the next ten years will be no worse than it is currently and that the status of the species in the Atlantic Ocean may actually be stable or improving due to increased nesting.

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 right, humpback, fin, and sei whales, as well as loggerhead and leatherback sea turtles, in the action area. The activities generally fall into one of the following three categories: (1) fisheries, (2) other activities that cause death or otherwise impair a whale's and/or turtle's ability to function, and (3) recovery activities associated with reducing impacts to ESA-listed sea turtles and/or cetaceans.

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

The overall impacts that each state, federal, and private action or other human activity in the action area have on ESA-listed species is largely unknown. However, to the extent they have manifested themselves at the population level, such past impacts are subsumed in the information presented on the status of each species considered in this Opinion, recognizing that the benefits to each species as a result of recovery activities already implemented may not be evident in the status of the respective population for years, or even decades, given the relatively late age the species reach maturity, and depending on the age class(es) affected.

4.1 Fishery Operations

4.1.1 Federal Fisheries

ESA section 7 consultation has been conducted on all federal fisheries authorized under a federal fishery management plan. The action area of the American Lobster FMP overlaps areas of other fishery activity that may adversely affect threatened and endangered species. These fisheries include the Atlantic bluefish, Atlantic herring, Atlantic mackerel/squid/Atlantic butterfish, Atlantic sea scallop, highly migratory species, monkfish, Northeast multispecies, red crab, skate, spiny dogfish, summer flounder/scup/black sea bass, and tilefish. Given the broad action area for this consultation, and the broad area of operation for the fisheries, a portion of the fishing effort for each of these previously mentioned fisheries is expected to occur within the action area of this consultation.

ESA-listed cetaceans and sea turtles are known to be killed and injured as a result of being struck by vessels on the water. However, the operation of fishing vessels used in the aforementioned fisheries will have discountable effects on these species. Fishing vessels operate at relatively slow speeds, particularly when towing or hauling gear. Thus, large cetaceans and sea turtles in the path of a fishing vessel are more likely to have time to move away before being struck.

Gear used in the federal fisheries described below is expected to have an insignificant effect on cetacean or turtle prey. As described in section 3.0, right whales and sei whales feed on copepods (Horwood 2002, Kenney 2002). Copepods are very small organisms that will pass through fishing gear rather than being captured in it. Humpback whales and fin whales also feed on krill as well as small schooling fish (*e.g.,* sand lance, herring, mackerel) (Aguilar 2002, Clapham *et al.* 2002). Some fisheries described below do target fish (*i.e.,* herring, mackerel) that are food items for humpback and fin whales. Nevertheless, given the diversity of their diet, the harvesting of some humpback and fin whale prey as part of commercial fishery operations is not expected to have a significant effect on the availability of humpback and fin whale prey species.

Sea turtle prey items such as horseshoe crabs, other crabs, whelks, and fish are removed from the marine environment as fisheries bycatch in one or more of the aforementioned fisheries. None of these are typical prey species of leatherback sea turtles. Therefore, the aforementioned fisheries will not affect the availability of prey for leatherback sea turtles in the action area.

Neritic juveniles and adults of loggerhead sea turtles are known to feed on species that are caught as bycatch in numerous fisheries (Keinath *et al.* 1987, Lutcavage and Musick 1985, Dodd 1988, Burke *et al.* 1993, Burke *et al.* 1994, Morreale and Standora 2005, Seney and Musick 2005). While some of the bycatch is likely returned to the water dead or injured to the extent that the organisms will shortly die, they would still be available as prey for loggerheads, which are known to eat a variety of live prey and scavenge dead organisms (Keinath *et al.* 1987, Lutcavage and Musick 1985, Dodd 1988, Burke *et al.* 1993, Morreale and Standora 2005).

Gear used in the federal fisheries described below is believed to have the potential to adversely affect bottom habitat in the action area (NMFS 2003a). A panel of experts have previously concluded that the effects of even light weight otter trawl gear would include: (1) scraping or plowing of the doors on the bottom, sometimes creating furrows along their path; (2) sediment suspension resulting from the turbulence caused by the doors and the ground gear on the bottom; (3) removal or damage to benthic or demersal species; and (4) removal or damage to structure forming biota. The panel also concluded that the greatest impacts from otter trawls occur in high and low energy gravel habitats and in hard clay outcroppings, and that sand habitats were the least likely to be impacted (NREFHSC 2002). The action area does not include hard clay outcroppings, although gravel habitats may occur. The foraging distribution of loggerhead sea turtles in Mid-Atlantic and New England waters as far north as approximately Cape Cod, do not typically occur in gravel habitats. Leatherback sea turtles have a broader distribution in New England waters, which more likely includes clay outcroppings, but are pelagic feeders and should be less affected by alterations to benthic habitat. For these reasons and the lack of any evidence that fishing practices affect habitats in degrees that harm or harass ESA-listed species, NMFS finds while continued American lobster fishing efforts may potentially alter benthic habitats, these alterations will be insignificant to ESA-listed species.

Factors affecting food availability for leatherbacks are likely to be oceanographic conditions rather than bottom habitat. As is the case of leatherback sea turtles, prey availability (*i.e.,* copepods, schooling fish) for foraging right, humpback, fin and sei whales is associated with oceanographic conditions rather than bottom habitat (Baumgartner *et al.* 2003, IWC 1992, Pace and Merrick 2008, Perry *et al.* 1999) that may be temporarily disturbed by the use of bottom fishing gear.

The Atlantic bluefish, Atlantic mackerel/squid/butterfish, Atlantic sea scallop, highly migratory species, monkfish, Northeast multispecies, red crab, skate, spiny dogfish, summer flounder/scup/black sea bass, and tilefish fisheries employ gear in a time/area/manner that has been known to capture, injure, and kill sea turtles. Some of these fisheries also use gear known to injure and kill right, humpback, fin, or sei whales as a result of entanglements in the gear (Johnson *et al.* 2005, Waring *et al.* 2011, Henry *et al.* 2011). A summary of the impacts of each of these fisheries that has been subject to section 7 consultation is provided below.

The only fishery that has been determined by NMFS to reduce the reproduction, numbers, or distribution of ESA-listed sea turtles, and reduce appreciably their likelihood of survival and recovery, is the pelagic longline component of the Atlantic highly migratory species fishery. On June 14, 2001, NMFS released a biological opinion that found that the continued operation of the Atlantic pelagic longline fishery was likely to jeopardize the continued existence of both loggerhead and leatherback sea turtles. To avoid jeopardy to these species, a Reasonable and Prudent Alternative (RPA) was developed. The RPA required the closure of the Northeast Distant (NED) Statistical Area of the Atlantic Ocean to pelagic longlining and the enactment of a research program to develop or modify fishing gear and techniques to reduce sea turtle interactions and mortality associated with such interactions. On June 1, 2004, NMFS released another biological opinion on the Atlantic pelagic longline fishery that stated that the fishery was still likely to jeopardize the continued existence of leatherback sea turtles. Another RPA was then developed to attempt to remove jeopardy. The RPA required that NMFS (1) reduce post-release mortality of leatherbacks, (2) improve monitoring of the effects of the fishery, (3) confirm the effectiveness of the hook and bait combinations that are required as part of the proposed action, and (4) take management action to avoid long-term elevations in leatherback takes or mortality. The biological opinion specified an RPA that allows the continuation of the Atlantic highly migratory species fishery without jeopardizing ESA-listed species.

As described in Sections 1.0 and 2.1, consultation has also been previously conducted on the continued operation of the American lobster fishery. Pot/trap gear used in the American lobster fishery is known to entangle ESA-listed cetaceans and sea turtles, with some events resulting in injuries and death. Therefore, the environmental baseline for this action also includes the effects of the past operation of the American lobster fishery.

The *American lobster fishery* has been identified as causing injuries to and mortality of loggerhead and leatherback sea turtles as a result of entanglement in buoy lines of the pot/trap gear (NMFS 2010a). Loggerhead or leatherback sea turtles caught/wrapped in the buoy lines of lobster pot/trap gear can die as a result of forced submergence or incur injuries, such as severe constriction of a flipper, leading to death. Given the seasonal distribution of loggerhead sea turtles in Mid-Atlantic and New England waters and the operation of the lobster fishery, loggerhead sea turtles are expected to overlap with the placement of lobster pot/trap gear during the months of May through October in waters off New Jersey through Massachusetts. Compared to loggerheads, leatherback sea turtles have a similar seasonal distribution in Mid-Atlantic and New England waters, but with a more extensive distribution in the Gulf of Maine (Shoop and Kenney 1992; James *et al.* 2005a). Therefore, leatherback sea turtles are expected to overlap with the placement of lobster pot/trap gear in the fishery during the months of May through October in waters off of New Jersey through Maine.

Given the distribution of lobster fishing effort, leatherback sea turtles are the most likely sea turtle to be affected, since they occur regularly in Gulf of Maine waters. The most recent biological opinion for this fishery, completed on October 29, 2010, concluded that operation of the federally-regulated portion of the lobster trap fishery may adversely affect loggerhead and leatherback sea turtles as a result of entanglement in the groundlines and/or buoy lines associated with this type of gear. An ITS was issued with the 2010 biological opinion, exempting the annual incidental take (lethal or non-lethal) of one loggerhead sea turtle and the annual incidental take (lethal or non-lethal) of five leatherback sea turtles (NMFS 2010a).

Pot/trap gear has also been identified as a gear type causing injuries and mortality of right, humpback, and fin whales (Johnson *et al.* 2005, Waring *et al.* 2011, Henry *et al.* 2011, 73 FR 73032, December 1, 2008). Large whales are known to become entangled in lines associated with multiple gear types. For pot/trap gear, vertical lines (also known as buoy lines) attach buoys at the surface to the gear at the ocean bottom while groundlines attach the pots/traps in a series. Lines wrapped tightly around an animal can cut into the flesh, leading to injuries, infection, and death (Moore *et al.* 2004).

A right whale entanglement in pot/trap gear used in the inshore lobster fishery resulting in death occurred in 2001 (Waring *et al.* 2007). A mortality of a humpback whale in pot/trap gear in the state lobster fishery occurred in 2002 (Waring *et al.* 2007). Other mortalities and serious injuries to ESA-listed cetaceans as a result of pot/trap gear consistent with that used in the lobster fishery have occurred as reported in Moore *et al.* (2004), Johnson *et al.* (2005), and Glass *et al.* (2010). However, it cannot be determined in all cases whether the gear was set in state waters as part of a state lobster fishery or in federal waters. In all waters regulated by the ALWTRP, commercial pot/trap gear set by the American lobster fishery is required to follow regulations set by the plan.

American lobster occurs 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 1999). Most lobster trap effort occurs in the Gulf of Maine, constituting 76% of the U.S. landings between 1981 and 2007, and 87% since 2002. 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 ASMFC's Interstate Fishery Management Plan (ISFMP). The ISFMP includes measures to constrain or reduce fishing effort in the lobster fishery. In fact, the ASFMC is currently evaluating additional management options to address a May 2010, technical committee report that determined there is a lobster recruitment failure in the SNE stock area. In response, the ASMFC adopted Addendum 17 to its Interstate Fishery Management Plan for American Lobster in February 2012. This addendum serves as the first phase to rebuild the SNE stock by adopting measures intended to reduce fishing exploitation by 10 % beginning in 2013. The management measures include a requirement for lobstermen to v-notch all legal-sized egg-bearing lobsters in LCMAs 2, 4 and 5; a minimum size increase for lobster harvested in offshore LCMA 3; and various closed seasons in LCMAs 2, 4, 5 and 6. The ASMFC is currently developing Addendum 18 which will serve as the next phase to rebuild the SNE stock. That addendum, expected to be formally adopted by the ASMFC in late 2012, proposes measures to address latent (unfished) effort and reduce the overall number of traps allocated in LCMAs 2 and 3 to scale the fishery to the size of the SNE resource. Some management tools include trap reductions, trap banking, and controlled growth using plans specialized for each affected management area. The ASMFC expects that additional action through subsequent addenda will be needed to complete the SNE rebuilding plan. NMFS is involved in the development of Addendum 18 through participation on the ASMFC's Lobster Management Board and will address the ASMFC's recommendations for federal action in Addendum 17. The trap reduction measures associated with these actions are of benefit to large whales and sea turtles by reducing the amount of gear (specifically buoy lines) in the water where whales and sea turtles also occur.

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

The most recent formal consultation on the bluefish fishery was completed on October 29, 2010. An ITS was provided with the 2010 biological opinion along with non-discretionary RPMs to minimize the impacts of incidental take. As described in the ITS, NMFS anticipates the annual take of up to three loggerheads over a five-year average in trawl gear, of which, up to two per year may be lethal and the annual take of up to 79 individuals over a five-year average in gillnet gear, of which up to 32 per year may be lethal. The ITS also exempted four leatherbacks, four Kemp's ridleys, and five green sea turtles in bluefish gear (NMFS 2010b).

The anticipated incidental take of ESA-listed sea turtles in bluefish fishing gear exempted by the 2010 biological opinion was based on observed interactions from sea sampling data for gear types targeting or capable of catching bluefish (NMFS 1999). The anticipated incidental take of loggerhead sea turtles was taken from the annual bycatch reports published by Murray (2006, 2008). At the time of the 2010 biological opinion, the bluefish fishery was believed to interact with these species given the time and locations where the fishery occurred. Although no interactions of ESA-listed sea turtles had been reported in bottom otter trawl gear for trips that were targeting bluefish (where greater than 50% of the catch was bluefish), interactions of loggerhead and Kemp's ridley sea turtles were observed in bottom otter trawl gear where bluefish were caught but constituted less than 50% of the catch (NMFS 1999).

A new estimate of loggerhead sea turtle bycatch in bottom otter trawl gear used in the bluefish fishery has been published in a NMFS NEFSC Reference Document (Warden 2011). Using Northeast Fisheries Observer Program (NEFOP) data from 1996 to 2008 applied to VTR days fished, the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the bluefish fishery between 2005 and 2008 was estimated to be four (Warden 2011). The 2010 biological opinion anticipated the annual incidental take of three loggerhead sea turtles. The trawl bycatch estimate described above represents new information on the effects of the bluefish fishery on ESA-listed sea turtles.

Although NMFS was not aware until 2003 that sea turtle interactions with fishing gear targeting bluefish were likely to occur, there is no information to suggest that sea turtle interactions with bluefish fishing gear are a new event or are occurring at a greater rate than what has likely occurred in the past. To the contrary, the methods used to detect any sea turtle interactions with bluefish fishing gear were insufficient prior to increased observer coverage in recent years. In addition, there have been no known changes to the seasonal distribution of loggerhead sea turtles in the U.S. Atlantic (CeTAP 1982; Lutcavage and Musick 1985; Keinath *et al.* 1987; Thompson 1988; Shoop and Kenney 1992; Burke *et al.* 1993, 1994) with the exception of recent studies (Morreale *et al.* 2005; Mansfield 2006), which suggest a decrease in the use of some Mid-Atlantic loggerhead foraging areas for unknown reasons.

The commercial bluefish fishery does not typically operate in areas where and at times when large whales occur, however interactions between whales and the bluefish fishery are possible. Right, humpback, and fin whales are known to have been seriously injured and/or killed by gear types used by the bluefish fishery, specifically gillnet gear. Although the gillnet gear has never been traced back to the bluefish fishery specifically, often the gear responsible cannot be identified. The fishery's gear is required to follow regulations set by the ALWTRP.

As a result of the information discussed above, formal consultation on the bluefish fishery was reinitiated on February 6, 2012, to consider effects of the fishery on Atlantic sturgeon and to reevaluate the effects of the fishery on ESA-listed whales and sea turtles.

Sea turtle interactions with gear used in the *Atlantic herring fishery* have not been reported or observed by NMFS observers. However, in past consultations, NMFS concluded that sea turtle interactions with fishing gear used in the fishery are reasonably likely to occur due to the observed capture of sea turtles in other fisheries that use comparable gear. Purse seines, midwater trawls (single), and pair trawls are the three primary gears involved in the Atlantic herring fishery (NEFMC 2006). However, the gear type accounting for the majority of herring landings changed over the ten-year period from 1995 to 2005 (NEFMC 2006). During the 1990's, purse seine and mid-water trawl gear accounted for the majority of annual herring landings. Since 2000, pair trawl gear has accounted for the majority of annual herring landings (NEFMC 2006). An ITS was issued in the September 17, 1999 biological opinion anticipating the take of six (no more than three lethal) loggerheads, one leatherback, one green, and one Kemp's ridley.

An FMP for the Atlantic herring fishery was implemented on December 11, 2000. Three management areas, which may have different management measures, were established under the Herring FMP. In 2007, amendment 1 to the Herring FMP (72 FR 11252, March 12, 2007), made changes to the management of the herring fishery, including making it a limited access fishery (NEFMC 2006). As a result of these changes, effort in the fishery is expected to be reduced or constrained. 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. The most recent reinitiated (due to the Atlantic salmon listing) consultation on the herring fishery was completed on February 9, 2010. After review and evaluation of observer data (no observed interactions of ESA-listed species, despite increased observer coverage in recent years) and information on where and when the fishery operates, NMFS concluded the consultation informally due to the discountable nature of sea turtle or Atlantic salmon interactions.

The *Atlantic mackerel/squid/butterfish fisheries* are managed under a single FMP that includes both the short-finned squid (*Illex illecebrosus*) and long-finned squid (*Loligo pealei*) fisheries. Bottom otter trawl gear is the primary gear type used to land *Loligo* and *Illex* squid. Based on NMFS dealer reports, the majority of *Loligo* and *Illex* squid are fished in Mid-Atlantic waters within the action area of this consultation where loggerheads also occur. While squid landings occur year round, the majority of *Loligo* squid landings occur in the fall through winter months while the majority of *Illex* landings occur from June through October (MAFMC 2007a); time periods that overlap in whole or in part with the distribution of loggerhead sea turtles in Mid-Atlantic waters. Gillnets account for a small amount of landings in the mackerel fishery, and all gillnet gear use by this fishery is subject to the requirements of the ALWTRP.

Loggerhead sea turtles are captured in bottom-otter trawl gear used in the *Loligo* and *Illex* squid fisheries, and in gillnet gear used by the mackerel fishery. Loggerheads may be injured or killed as a result of forced submergence in the gear. The most recent biological opinion completed on these federal fisheries was completed on October 29, 2010. The biological opinion concluded that the continued operation of the fishery under the FMP was likely to adversely affect sea turtles, but not jeopardize their continued existence. An ITS was provided with the 2010 biological opinion along with non-discretionary RPMs to minimize the impacts of incidental take. As described in the ITS, NMFS anticipates the annual take of up to 62 loggerheads over a five-year average, of which up to 27 per year may be lethal. The ITS also exempted two leatherbacks, two Kemp's ridleys, and two green sea turtles in squid/mackerel/butterfish gear (NMFS 2010c). NMFS has reinitiated section 7 consultation on the continued operation of the mackerel, squid, butterfish fisheries under the Atlantic Mackerel, Squid, Butterfish FMP in light of the recent listing of Atlantic sturgeon DPSs.

Atlantic pelagic fisheries for swordfish, tuna, sharks, and billfish (highly migratory species) are known to incidentally capture large numbers of sea turtles, particularly in the pelagic longline component. Pelagic longline, pelagic driftnet, bottom longline, and/or purse seine gear have all been documented to hook, capture, or entangle sea turtles. The Northeast swordfish driftnet portion of the fishery was prohibited during an emergency closure that began in December 1996, and was subsequently extended. A permanent prohibition on the use of driftnet gear in the swordfish fishery was published in 1999. NMFS reinitiated consultation on the pelagic longline component of this fishery as a result of exceeded incidental take levels for loggerhead and leatherback sea turtles (NMFS 2004a). The resulting biological opinion stated the long-term continued operation of the pelagic longline fishery for tuna and swordfish was likely to jeopardize the continued existence of leatherback sea turtles, but RPAs were implemented allowing for the continued authorization of the fishery that would not jeopardize leatherbacks. In

2006, the Atlantic HMS pelagic longline fishery had an estimated 771.6 interactions with loggerhead sea turtles and 381.3 interactions with leatherback sea turtles (Garrison *et al.* 2009).

The *Atlantic sea scallop fishery* has a long history of operation in Mid-Atlantic and New England waters (NEFMC 1982, 2003). The fishery operates in areas and at times that it has traditionally operated and uses traditionally fished gear, which includes dredges and bottom trawls (NEFMC 1982, 2003). Landings from Georges Bank and the Mid-Atlantic dominate the fishery (NEFSC 2007). On Georges Bank and in the Mid-Atlantic, scallops are harvested primarily at depths of 30-100 meters, while the bulk of landings from the Gulf of Maine are from relatively shallow nearshore waters (<40 meters) (NEFSC 2007).

The Scallop FMP was originally implemented on May 15, 1982 (NEFSC 2007). Amendment 4 to the FMP, implemented in 1994, changed the management strategy from meat count regulation to effort control for the entire U.S. EEZ (NEFSC 2007). The limited access program, first established under Amendment 4, remains the basic effort control measure for the scallop fishery. From 2004 through 2008, vessels that did not qualify for a full-time, part-time, or occasional limited access permit could have obtained an open access, general category scallop permit. Effort (in terms of days fished) in the Mid-Atlantic is now about half of what it was prior to implementation of Amendment 4 to the Scallop FMP (NEFSC 2007).

An increase in active general category permits and landings from these vessels prompted the initiation of Amendment 11 to the Scallop FMP. In particular, it was noted that from 2000 to 2005 there was an increasing percentage of general category landings by vessels with homeports in the Mid-Atlantic region, and shifts in fishing effort by general category vessels to Mid-Atlantic fishing grounds (NEFMC 2007). In 2008, the implementation of Amendment 11 established a limited access general category program consisting of three permit types: Northern Gulf of Maine (NGOM), Incidental, and Individual Fishing Quota (IFQ). The IFQ program became effective March 1, 2010. The implementation of the LAGC fleet contributes to the management objectives of the fishery by reducing or constraining effort in the general category sector.

Loggerhead, Kemp's ridley, and green sea turtles have been reported by NMFS observers as being captured in scallop dredge and or trawl gear. The first reported capture of a sea turtle in the scallop fishery occurred in 1996 during an observed trip of a scallop dredge vessel. A single capture in scallop dredge gear was reported for each of 1997 and 1999, as well. In 2001, 13 sea turtle captures in scallop dredge gear were observed and/or reported by NMFS observers. All of these occurred in the re-opened Hudson Canyon and Virginia Beach Access Areas where observer coverage of the scallop fishery was higher in comparison to outside of the Access Areas. Although NMFS was not aware until 2001 that sea turtle interactions with scallop fishing gear occurred, there is no information to suggest that turtle interactions with scallop fishing gear are a new event or are occurring at a greater rate than what has likely occurred in the past. The methods used to detect any sea turtle interactions with scallop fishing gear (dredge or trawl gear) were insufficient prior to increased observer coverage in 2001. The average number of annual observable interactions of hard-shelled sea turtles in the Mid-Atlantic dredge fishery prior to the implementation of chain mats (January 1, 2001, through September 25, 2006) was estimated to be 288 turtles, of which 218 could be confirmed as loggerheads (Murray 2011). After the implementation of chain mats (September 26, 2006, through December 31, 2008), the average annual number of observable plus unobservable, quantifiable interactions in the Mid-Atlantic dredge fishery was estimated to be 125 turtles, of which 95 could be confirmed as loggerheads (Murray 2011). An estimate of loggerhead bycatch in Mid-Atlantic scallop trawl gear from 2005-2008 averaged 95 turtles annually (Warden 2011a). There have been no known changes to the seasonal distribution of loggerhead sea turtles in the Mid-Atlantic north of Cape Hatteras (CeTAP 1982; Lutcavage and Musick 1985; Keinath *et al.* 1987; Shoop and Kenney 1992; Burke *et al.* 1993, 1994) with the exception of recent studies (Morreale *et al.* 2005; Mansfield 2006) which suggest a decrease in the use of some Mid-Atlantic loggerhead foraging areas for unknown reasons. Therefore, it is likely that the effect of the scallop fishery on sea turtles, while only quantified and recognized within the last nine or so years, has been present for decades.

Formal section 7 consultation on the continued authorization of the scallop fishery was last reinitiated on February 28, 2012, with an Opinion issued by NMFS on July 12, 2012. In this Opinion, NMFS determined that the continued authorization of the Scallop FMP (including the seasonal use of turtle deflector dredges [TDDs] in Mid-Atlantic waters starting in 2013) may adversely affect but was not likely to jeopardize the continued existence of loggerhead, leatherback, Kemp's ridley, and green sea turtles, or the five DPSs of Atlantic sturgeon, and issued an ITS. The number of loggerhead and hard-shelled sea turtles expected to interact with scallop dredge gear annually is based on an analysis of sea turtle interactions in the dredge fishery from 2001-2008 as presented in Murray (2011). The number of loggerheads expected to interact with scallop trawl gear annually is based on data presented in Warden (2011a). For the other sea turtle species and Atlantic sturgeon, annual estimated interactions are based on observer data from the NEFOP and/or other bycatch reports. In the ITS, the scallop fishery is estimated to interact annually with up to 301 loggerhead, two leatherback, three Kemp's ridley, and two green sea turtles, as well as one Atlantic sturgeon from any of the five DPSs. Of the loggerheads interactions, up to 112 per year are anticipated to be lethal from 2013 going forward. RPMs to minimize the impact of these incidental takes are also included in the Opinion, including an RPM to monitor fishing effort in the scallop dredge in the Mid-Atlantic during times when sea turtles are known to interact with the fishery (NMFS 2012). Additional measures to minimize the impact of sea turtle interactions with the scallop fishery have been implemented through Frameworks 22 and 23 to the Scallop FMP and will be re-evaluated in future Frameworks.

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 900 meters with concentrations between 70 and 100 meters and at 190 meters. The directed monkfish fishery uses several gear types that may entangle protected species, including gillnet and trawl gear.

Gillnet gear used in the monkfish fishery is known to capture ESA-listed sea turtles. Two unusually large stranding events occurred in April and May 2000 during which 280 sea turtles (275 loggerheads and 5 Kemp's ridleys) washed ashore on ocean facing beaches in North Carolina. Although there was not enough information to specifically determine the cause of the sea turtle deaths, there was information to suggest that the turtles died as a result of entanglement with large-mesh gillnet gear. The monkfish gillnet fishery, which uses a large-mesh gillnet, was known to be operating in waters off North Carolina at the time the stranded turtles would have died. As a result, in March 2002, NMFS published new restrictions for the use of gillnets with larger than 8 inch (20.3 cm) stretched mesh in federal waters (3-200 nautical miles) off of North Carolina and Virginia. These restrictions were published in an Interim Final Rule under the authority of the ESA (67 FR 13098; March 21, 2002) and were implemented to reduce the impact of the monkfish and other large-mesh gillnet fisheries on endangered and threatened species of 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.

A section 7 consultation conducted in 2001 concluded that the operation of the fishery may adversely affect sea turtles, but was not likely to jeopardize their continued existence. In 2003, proposed changes to the Monkfish FMP led to reinitiation of consultation to determine the effects of those actions on ESA-listed species. The resulting biological opinion concluded the continued operation of the fishery under the proposed changes was likely to adversely affect green, Kemp's ridley, loggerhead, and leatherback sea turtles, but was not likely to jeopardize their continued existence (NMFS 2003b). In 2008, new information on the capture of loggerhead sea turtles in the monkfish fishery led to reinitiation of consultation. The resulting biological opinion, issued on October 29, 2010, concluded the continued operation of the monkfish fishery under the proposed changes was likely to adversely affect green, Kemp's ridley, loggerhead and leatherback sea turtles, but was not likely to jeopardize their continued existence. The ITS issued with the 2010 biological opinion exempted the annual incidental take of up to two loggerheads over a five-year average in trawl gear, of which up to one per year may be lethal. The ITS also exempted four leatherbacks, four Kemp's ridleys, and five green sea turtles in monkfish gear (NMFS 2010d).

An estimate of loggerhead sea turtle bycatch in bottom otter trawl gear used in the monkfish fishery has been published in a 2011 NEFSC Reference Document (Warden 2011). Using NEFOP data from 1996-2008 applied to VTR days fished. The average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the monkfish fishery between 2005 and 2008 was estimated to be two loggerhead sea turtles a year (Warden 2011).

Use of gillnet gear in the fishery is also affected by measures implemented under the ALWTRP. In the June 2001 biological opinion, NMFS determined that the continued operation of the fishery would jeopardize the continued existence of right whales as a result of entanglement in gillnet gear used in the fishery, causing serious injury or death. The RPA issued to the monkfish fishery in the 2001 biological opinion, and reissued in the 2003 biological opinion, included the SAM and DAM programs under the ALWTRP. There have been no confirmed entanglements of right whales in gillnet gear set to target monkfish. However, right, humpback, and fin whale entanglements in gillnet gear of unidentified origin have occurred (Johnson *et al.* 2005; Waring *et al.* 2011). The SAM and DAM programs have been replaced with broad based gear modifications under the ALWTRP. Section 7 consultation has been reinitiated for the monkfish fishery due to the recent listing of Atlantic sturgeon DPSs.

The *Northeast multispecies fishery* operates throughout the year, with peaks in the spring and from October through February. Multiple gear types are used in the fishery including sink gillnet, trawl, and pot/trap gear, which are known to be a source of injury and mortality to right, humpback, and fin whales as well as loggerhead, Kemp's ridley, and leatherback sea turtles as a result of entanglement and capture in the gear (NMFS 2001a). The Northeast multispecies sink gillnet fishery has historically occurred from the periphery of the Gulf of Maine to Rhode Island in water as deep as 110 meters (360 feet). In recent years, more of the effort in the fishery has occurred in offshore waters and into the Mid-Atlantic. Participation in this fishery has declined since extensive groundfish conservation measures have been implemented; particularly since implementation of Amendment 13 and Amendment 16 to the NE Multispecies FMP. Additional management measures (*i.e.,* Framework Adjustment 42) are expected to have further reduced effort in the fishery. The exact relationship between multispecies fishing effort and the number of endangered species interactions with gear used in the fishery is unknown. However, in general, less fishing effort results in less time that gear is in the water and therefore less opportunity for sea turtles or cetaceans to be captured or entangled in multispecies fishing gear.

In 2008, new information on the capture of loggerhead sea turtles in the NE multispecies fishery led to reinitiation of consultation. The resulting biological opinion, issued on October 29, 2010, concluded the continued operation of the monkfish fishery under the proposed changes was likely to adversely affect green, Kemp's ridley, loggerhead, and leatherback sea turtles, but was not likely to jeopardize their continued existence. The ITS issued with the 2010 biological opinion exempted the annual incidental take of up to 43 loggerheads over a five-year average in trawl gear, of which up to 19 per year may be lethal and the annual take of up to three loggerheads over a five-year average in gillnet gear, of which up to two per year may be lethal. The ITS also exempted four leatherbacks, four Kemp's ridleys, and five green sea turtles in monkfish gear (NMFS 2010e).

New information estimating loggerhead bycatch in bottom trawl gear has recently been published in Warden (2011). Using NEFOP data from 1996 to 2008 applied to VTR days fished, the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the NE multispecies fishery between 2005 and 2008 was estimated to be five loggerhead sea turtles per year (Warden 2011).

Gillnet and trap/pot gear in the fishery is also affected by measures implemented under the ALWTRP. In the June 2001 Northeast multispecies biological opinion, NMFS determined that the continued operation of the fishery would jeopardize the continued existence of right whales due to entanglement in gillnet gear used in the fishery, causing serious injury or death. The RPA issued in the 2001 biological opinion led to implementation of the SAM and DAM programs under the ALWTRP. The SAM and DAM programs have been replaced with broad based gear modifications under the ALWTRP. Section 7 consultation has been reinitiated with the NE multispecies fishery due to the recent listing of Atlantic sturgeon DPSs.

Section 7 consultation was completed on the *red crab fishery* during the proposed implementation of the Red Crab FMP (NMFS 2002c). The biological opinion concluded that the action was not likely to result in jeopardy to any ESA-listed species under NMFS' jurisdiction. The 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 (1,300-2,600 feet) along the continental shelf in the Northeast region, and is limited to waters north of 35°15.3'N (Cape Hatteras, NC) and south of the Hague Line. To address concerns that red crab could be overfished, an FMP was developed and became effective on October 21, 2002. In the 2002 biological opinion, an ITS was provided for leatherback and loggerhead sea turtles which exempts the incidental take of one loggerhead and one leatherback sea turtle annually as a result of entanglement in lines associated with the pot/trap gear utilized in the fishery. Right, humpback, fin and sei whales are also at risk of entanglement in gear used by the red crab fishery. Gear used by this fishery is required to be in compliance with the ALWTRP. One exemption from the ALWTRP that affects the red crab fishery is the deep water exemption. The sinking groundline requirement does not apply to gear that is fished at depths greater than 280 fathoms. Whales and sea turtles in the action area are not known to commonly dive to depths greater than 275 fathoms. Therefore, this exemption is unlikely to have an adverse impact on entanglement risks.

The *skate fishery* has typically been composed of both a directed fishery and an indirect fishery. The bait fishery has a longer history 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 target primarily 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.

New information estimating loggerhead bycatch in bottom trawl gear has recently been published in Warden (2011). Using NEFOP data from 1996 to 2008 applied to VTR days fished, the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the skate fishery between 2005 to 2008 was estimated to be five loggerhead sea turtles per year (Warden 2011).

Bottom trawl gear accounts for 94.5% of directed skate landings. Gillnet gear is the next most common gear type, accounting for 3.5% of skate landings. Section 7 consultation on the Skate FMP was completed October 29, 2010, and concluded that operation of the skate fishery may adversely affect ESA-listed sea turtles as a result of interactions with (capture in) gillnet and trawl gear. The ITS issued with the 2010 biological opinion exempted the annual incidental take of up to 24 loggerheads over a five-year average in trawl gear, of which up to 11 per year may be lethal and the annual take of up to 15 loggerheads over a five-year average in gillnet gear, of which up to six per year may be lethal. The ITS also exempted four leatherbacks, four Kemp's ridleys, and five green sea turtles in skate gear (NMFS 2010f). New information estimating loggerhead bycatch in bottom trawl gear has recently been published in Warden (2011). Using NEFOP data from 1996 to 2008 applied to VTR days fished, the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the skate fishery between 2005 and 2008 was estimated to be seven loggerhead sea turtles per year (Warden 2011). Section 7 consultation has been reinitiated with the skate fishery due to the recent listing of Atlantic sturgeon DPSs.

ESA-listed cetaceans have also been known to interact with gillnet gear, thus interaction may occur where the gear and the cetacean distributions overlap. The 2010 biological opinion concluded that the skate fishery was not likely to jeopardize the continued existence of any ESA-listed species under NMFS jurisdiction. Gillnet gear used in the skate fishery is required to be in compliance with the ALWTRP.

The *spiny dogfish fishery* in the U.S. EEZ is managed under the Spiny Dogfish FMP. The primary gear types for the spiny dogfish fishery are sink gillnets, otter trawls, bottom longline, and driftnet gear (NMFS NEFSC 2003). The predominance of any one gear type has varied over time (NMFS NEFSC 2003). In 2005, 62.1% of landings were taken by sink gillnet gear, followed by 18.4% in otter trawl gear, 2.3% in line gear, and 17.1% in gear defined as "other" (excludes drift gillnet gear) (NMFS NEFSC 2006). More recently, data from fish dealer reports in FY 2008 indicate that spiny dogfish landings came mostly from sink gillnets (68.2%), and hook gear (15. 2%), with some landings from bottom otter trawls (4.9%), unspecified (7.7%), and other gear (3.9%) (MAFMC 2010). Sea turtles can be incidentally captured in all gear sectors of the spiny dogfish fishery, which can lead to injury and death from forced submergence. ESA-listed cetaceans are also known to be seriously injured or killed from interaction with sink gillnet gear.

Section 7 consultation on the continued operation of the fishery under the Spiny Dogfish FMP was reinitiated by NMFS on April 2, 2008. Section 7 consultation on the Spiny Dogfish FMP was completed October 29, 2010, and concluded that operation of the skate fishery may adversely affect ESA-listed sea turtles as a result of interactions with (capture in) gillnet and trawl gear. The ITS issued with the 2010 biological opinion exempted the annual incidental take of up to one loggerhead over a five-year average in trawl gear, which may be lethal or non-lethal and the annual take of up to one loggerhead over a five-year average in gillnet gear, which may be lethal or non-lethal. The ITS also exempted four leatherbacks, four Kemp's ridleys, and five green sea turtles in spiny dogfish gear (NMFS 2010g).

New information estimating loggerhead bycatch in bottom trawl gear has recently been published in Warden (2011). Using NEFOP data from 1996 to 2008 applied to VTR days fished, the average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the spiny dogfish fishery between 2005 and 2008 was estimated to be zero loggerhead sea turtles per year (Warden 2011).

ESA-listed cetaceans have also been known to interact with gillnet gear, thus interaction may occur where the gear and the cetacean distributions overlap. The 2010 biological opinion concluded that the spiny dogfish fishery was not likely to jeopardize the continued existence of any ESA-listed species under NMFS jurisdiction. Gillnet gear used in the spiny dogfish fishery is required to be in compliance with the ALWTRP. Section 7 consultation has been reinitiated with the spiny dogfish fishery due to the recent listing of Atlantic sturgeon DPSs.

The *summer flounder, scup, and black sea bass fisheries* are managed under one FMP. Bottom otter and beam trawl gear are used most frequently in the commercial fisheries for all three species (MAFMC 2007b). Gillnets, handlines, dredges, and pots/traps are also occasionally used (MAFMC 2007b). In 2006, the NEFSC released an estimate of loggerhead sea turtle interactions in bottom otter trawl gear fished in Mid-Atlantic waters during the period 1996-2004 (Murray 2006). Fifty-percent of the observed 66 interactions occurred on vessels targeting summer flounder. However, it should also be noted that some of the observed interactions occurred on vessels fishing with TEDs using an allowed (at that time) TED extension with a minimum 5.5 ince mesh (Murray 2006). Numerous problems were noted by observers with respect to the mesh used in the TED extension including entanglement of sea turtles in the mesh and blocking of the TED by debris (Murray 2006). NMFS addressed these problems in 1999 by requiring that webbing in the TED extension be no more than 3.5 ince stretched mesh (Murray 2006).

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

Section 7 consultation on the continued operation of the fishery under the Summer Flounder, Scup and Black Sea Bass FMP was reinitiated by NMFS on April 2, 2008, and completed October 29, 2010. The consultation concluded that operation of the summer flounder, scup and black sea bass fishery may adversely affect ESA-listed sea turtles as a result of interactions with (capture in) trawl, gillnet, and trap/pot gear. An ITS has been provided for the anticipated capture of sea turtles in gear used in the summer flounder, scup, and black sea bass fisheries. It currently exempts the annual incidental take of up to 205 loggerheads over a five-year average in trawl, pot/trap and gillnet gear, of which up to 85 may be lethal. The ITS also exempted six leatherbacks, four Kemp's ridleys, and five green sea turtles in summer flounder, scup, and black sea bass gear (NMFS 2010h).

Section 7 consultation has been reinitiated with the summer flounder, scup, black sea bass fishery due to the recent listing of Atlantic sturgeon DPSs. A thorough analysis of ESA-listed whales and sea turtle interactions with gillnet gear is being included in that consultation. All gillnet and pot/trap gear used by the summer flounder, scup, and black sea bass fishery are subject to complying with the ALWTRP.

A summary of the current *tilefish fishery* is provided in the 48th Northeast Regional Stock Assessment Report (NMFS NEFSC 2009). The management unit for the Tilefish FMP is all golden tilefish under U.S. jurisdiction in the Atlantic Ocean north of the Virginia/North Carolina border. Tilefish have some unique habitat characteristics, and are found in a warm water band (9º-14ºC) approximately 76-365 meters (250 to 1,200 feet) deep on the outer continental shelf and upper slope of the U.S. Atlantic coast. Because of their restricted habitat and low biomass, the tilefish fishery in recent years has occurred in a relatively small area in the Mid-Atlantic

Bight, south of New England and west of New Jersey. Bottom longline gear equipped with circle hooks is the primary gear type used in the tilefish fishery.

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

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

Recently, however, NMFS has estimated that the annual interaction levels and mortalities of sea turtles in the Gulf of Mexico shrimp fishery are significantly lower than what is exempted by the 2002 biological opinion. In addition to improvements in TED designs and enforcement, interactions between sea turtles and the shrimp fishery have also been declining because of reductions in fishing effort unrelated to fisheries management actions. The 2002 biological opinion take estimates are based in part on fishery effort levels. In recent years, low shrimp prices, rising fuel costs, competition with imported products, the BP Deepwater Horizon oil spill, recent hurricanes in the Gulf of Mexico have all impacted the shrimp fleets. For example, the offshore waters of the Gulf of Mexico have seen a 50% decline in fishing effort (GMFMC 2007). As a result, loggerhead and leatherback interactions and mortalities in the Gulf of Mexico have been substantially less than projected in the 2002 biological opinion. For the U.S. south Atlantic shrimp fishery, there is currently no new information on the number of interactions and mortalities occurring annually, although NMFS is currently researching this as well.

On August 16, 2010, NMFS reinitiated formal section 7 consultation on the shrimp trawl fishery in the southeastern U.S. to reanalyze its effects on sea turtles. This was primarily due to the after-effects of the April 20, 2010 BP Deepwater Horizon oil spill, from which NMFS has documented extraordinarily high numbers of sea turtle strandings in the Gulf of Mexico, particularly Mississippi Sound. NMFS suspects that much of the increased level of strandings is attributable to shrimp fishing activity, as there is recent evidence of a lack of compliance with TED regulations and tow time provisions. In addition, there is also new information that trawl CPUE of sea turtles in Louisiana nearshore waters is elevated. That consultation is ongoing.

4.1.2 Non-federally Regulated Fisheries

Like federally authorized fisheries sea turtles may be vulnerable to capture, injury and mortality in fisheries occurring in state waters. The action area includes portions of some state waters from Maine through North Carolina. Captures of sea turtles in these fisheries have been reported (NMFS SEFSC 2001).

The amount of gear contributed to the environment by these fisheries is largely unknown. In most cases, there is limited observer coverage of these fisheries and the extent of interactions with ESA-listed species is unknown. Where available, specific information on sea turtle interactions in state fisheries is provided below.

Nearshore and inshore gillnet fisheries occur throughout the Mid-Atlantic in state waters from Connecticut through North Carolina; where sea turtles also occur. Captures of sea turtles in these fisheries have been reported (NMFS SEFSC 2001). Two 10-14 inch mesh gillnet fisheries, the black drum and sandbar shark gillnet fisheries, occur in Virginia state waters along the tip of the eastern shore. These fisheries may interact with sea turtles given the gear type, but no interactions have been observed. Similarly, small mesh gillnet fisheries occurring in Virginia state waters are suspected to interact with 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 gillnet landings from offshore and inshore waters during this time), and no turtle interactions were observed (NMFS 2004b). In North Carolina, a large-mesh gillnet fishery for summer flounder in the southern portion of Pamlico Sound was found to interact with sea turtles. A Section 10 incidental take permit was issued to this fishery in 2001 based on take levels set by NMFS during the 2000 fishing season for large mesh gillnet fisheries in both shallow and deep water. The annual estimated lethal and live takes for the 2002-2004 fishing seasons was 24 lethal and 164 live takes of each Kemp's ridley, green, and loggerhead sea turtles. The permit was renewed for the 2005-2010 fishing years and new take estimates were derived from the 2001-2004 at-sea monitoring program. The new ITS exempted the take of 41, 168, and 41 for Kemp's ridley, green, and loggerhead turtles respectively.

An *Atlantic croaker fishery* using trawl and gillnet gear also occurs within the action area, and turtle interactions have been observed in the fishery. The average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the Atlantic croaker fishery was estimated to be 70 (Warden 2011). Additional information on sea turtle interactions with gillnet gear, including gillnet gear used in the Atlantic croaker fishery, has also been recently published by Murray (2009a, 2009b). The average annual bycatch of loggerhead sea turtles in gillnet gear used in the Atlantic croaker fishery, based on VTR data from 2002 to 2006, was estimated to be 11 per year with a 95% CI of 3-20 (Murray 2009b). ESA-listed cetaceans have also been known to interact with gillnet gear; thus, interaction may occur where the gear and the cetacean distributions overlap.

The *weakfish fishery* occurs in both state and federal waters, but the majority of commercially and recreationally caught weakfish are caught in state waters (ASMFC 2002). The dominant commercial gears include gillnets, pound nets, haul seines, and trawls, with the majority of landings occurring in the fall and winter months (ASMFC 2002). Weakfish landings were dominated by the trawl fishery through the mid-1980s after which gillnet landings began to account for most weakfish landed (ASMFC 2002). North Carolina has accounted for the majority of the annual landings since 1972 while Virginia ranks second, followed by New Jersey (ASMFC 2002). As described in section 3.2, sea turtle bycatch in the weakfish fishery has occurred (Warden 2011; Murray 2009a, 2009b). The average annual bycatch of loggerhead sea turtles in bottom otter trawl gear used in the weakfish fishery was estimated to be 1 loggerhead sea turtle (Warden 2011). Additional information on sea turtle interactions with gillnet gear, including gillnet gear used in the weakfish fishery, has also been recently published by Murray (2009a, 2009b). The average annual bycatch of loggerhead sea turtles in gillnet gear used in the weakfish fishery, based on VTR data from 2002 to 2006, was estimated to be one per year (95% CI of 0-1) (Murray 2009b). ESA-listed cetaceans have also been known to interact with gillnet gear, thus interaction may occur where the gear and the cetacean distributions overlap.

A *whelk fishery* using pot/trap gear is known to occur in several parts of the action area, including waters off Maine, Connecticut, Massachusetts, Delaware, Maryland, and Virginia. Landings data for Delaware suggests that the greatest effort in the whelk fishery for waters off that state occurs in the months of July and October; when sea turtles are present. Whelk pots, which unlike lobster traps are not fully enclosed, have been suggested as a potential source of entrapment for loggerhead sea turtles that may be enticed by the bait or whelks in the trap (Mansfield *et al.* 2001). Leatherback and loggerhead sea turtles as well as right, humpback, and fin whales are known to become entangled in lines associated with trap/pot gear used in several fisheries including lobster, whelk, and crab species (NMFS SEFSC 2001; Dwyer *et al.* 2002: NMFS 2007a).

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

Sea turtle interactions in the *Virginia pound net fishery* have been observed. Pound nets with large-mesh leaders set in the Chesapeake Bay have been observed to (lethally) capture turtles as a result of entanglement in the pound net leader. As described in section 4.4.4 below, NMFS has taken regulatory action to address turtle interactions in the Virginia pound net fishery. Although no incidental captures have been documented from fish traps set off North Carolina, they are another potential anthropogenic impact to loggerheads and other sea turtles (NMFS SEFSC 2001).

Observations of state recreational fisheries have shown that loggerhead, leatherback, and green sea turtles are known to bite baited hooks, and loggerheads frequently ingest the hooks. Hooked sea turtles have been reported by the public fishing from boats, piers, beaches, banks, and jetties, and from commercial fishermen fishing for snapper, grouper, and sharks with both single rigs and bottom longlines (NMFS SEFSC 2001). A summary of known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG (1998, 2000) reports. Although no incidental captures have been documented in fish traps set off North Carolina, they are another potential anthropogenic impact to loggerheads and other sea turtles (NMFS SEFSC 2001).

4.2 Military Vessel Activity and Operations

Potential sources of adverse effects to sea turtles from federal vessel operations in the action area include operations of the U.S. Navy (USN), U.S. Coast Guard (USCG), Environmental Protection Agency (EPA), Army Corps of Engineers (ACOE), and NOAA. NMFS has previously conducted formal consultations with the USN, USCG, and NOAA on their vessel-based operations. NMFS has also conducted section 7 consultations with the Minerals Management Service (MMS) (now the Bureau of Ocean Energy Management, Regulation and , Federal Energy Regulatory Commission (FERC), and Maritime Administration (MARAD) on vessel traffic related to energy projects in the Northeast Region and has implemented conservation measures. Through the section 7 process NMFS has and will continue to identify conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species.

Several biological opinion for USN activities (NMFS 1996, 1997, 2006b, 2008c, 2009a,b) and USCG (NMFS 1995, 1998c) contain details on the scope of vessel operations for these agencies and the conservation measures that are being implemented as standard operating procedures. In the U.S. Atlantic, the operation of USCG boats and cutters is not expected to jeopardize the continued existence of the ESA-listed species with an estimated take of no more than one individual sea turtle, of any species, per year (NMFS 1995, 1998c).

In June 2009, NMFS prepared a biological opinion on USN activities in each of their four training range complexes along the U.S. Atlantic coast—Northeast, Virginia Capes, Cherry Point, and Jacksonville (NMFS 2009b). That biological opinion found that no whales are likely to die or be wounded as a result of their exposure to U.S. Navy training in the Atlantic Ocean. However, the Virginia Capes Range Complex was assigned potential take in the form of harassment of fin, sei and humpback whales. Regarding impacts to sea turtles, the Virginia

Capes Range Complex and Jacksonville Range Complex were attributed with potential harassment of leatherback sea turtles and hard shell turtles, and the Virginia Capes Range Complex has been characterized as having the potential to harm loggerhead and Kemp's ridley turtles.

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

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

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

In addition to the NEFSC surveys which occur throughout the year, NMFS also funds the Northeast Area Monitoring and Assessment Program (NEAMAP) nearshore trawl surveys which are conducted for one month every spring and fall by the Virginia Institute of Marine Science (VIMS) in shallow, nearshore waters (up to 120 feet) from Cape Hatteras, NC to Montauk, NY. The 2012 surveys conducted by VIMS, and funded by NMFS through the Mid-Atlantic RSA Program, are expected to result in the annual capture of six NWA DPS loggerhead sea turtles, four Kemp's ridley sea turtles, one green sea turtle, one leatherback sea turtle, and no more than 32 Atlantic sturgeon. No mortalities of any ESA-listed species are expected.

4.3 Other Activities

4.3.1 Hopper Dredging

The construction and maintenance of federal navigation channels and sand mining ("borrow") areas have also been identified as sources of sea turtle mortality. Atlantic sturgeon may also be killed during hopper dredging operations, although this is rare. All hopper dredging projects are authorized or carried out by the U.S. Army Corps of Engineers. In the action area, these projects are under the jurisdiction of the districts within the North Atlantic Division or the Wilmington District. Hopper dredging projects in this area have resulted in the recorded mortality of approximately 87 loggerheads, 4 greens, 9 Kemp's ridleys and 4 unidentified hard shell turtles since observer records began in 1993. Nearly all of these interactions resulted in the death of the turtle. To date, nearly all of these interactions have occurred in nearshore coastal waters with very few interactions in the open ocean. NMFS Northeast and Southeast regions have completed several ESA Section 7 consultations with the Corps to consider effects of these hopper dredging projects on listed sea turtles. Many of these consultations will be reinitiated to consider effects to Atlantic sturgeon. The table below provides information on Biological Opinions considering dredging projects in the action area and the associated ITS for sea turtles (unless otherwise noted, take estimates are per dredge cycle):

Table 5. Information on Consultations conducted by NMFS for dredging projects that occur in the action area

Project	Date of Opinion	Loggerhead	Kemp's ridley	Green	Leatherback	Notes
USCOE - Continued Hopper Dredging of Channels and Borrow Areas in the SE U.S.	9/25/1997	24	7	7	0	Annual Estimate
Dredging of Sandbr[illegible]dge Shoals, [illegible]	4/2[illegible]/1993	5	1 Kemp's ridley or green		0	
Long Island, NY to Manasquan NJ Beach Nourishment	12/15/1995	5 turtles total: combination of any species				
Sandy Hook Channel Dredging	6/10/1996	2	1	2	1	2 loggerheads/green inclusive; and 1 Kemp's/leatherback
ACOE Philadelphia District	11/26/1996	4	1	1	0	Annual Estimate

Dredging						
MD Coastal Beach Protection Project (includes several projects with different ITSs)	4/6/1998	10	1	2	0	total takes over 25 year Assateague Island project
		6	1	1	0	takes per dredge cycle for MD shoreline protection project
Thimble Shoals and Atlantic Ocean Channels Dredging	4/25/2002	4 (≤1 million cy) 10 (>1 to ≤3 million cy) 18 (>3 to ≤5 million cy)	1 (≤1 million cy) 2 (>1 to ≤3 million cy 4 (>3 to ≤5 million cy)	0	0	
Ambrose Channel, NJ Sand Mining	10/11/2002	2	1	1	1	1 leatherback OR Kemp's
Cape Henry, York Spit, York River Entrance, and Rappahannock Shoal Channels - Maintenance Dredging	7/24/2003	4 (≤1 million cy); 10 (>1 to ≤3 million cy); 18 (>3 to ≤5 million cy)	1 (≤1 million cy); 2 (>1 to ≤3 million cy); 4 (>3 to ≤5 million cy)	0	0	
		Relocation Trawling: 120 non-lethal takes for any combination of the four species.				
Dam Neck Naval Facility Beach Dredging and Beach Nourishment	12/12/2003	4	1 green or Kemp's ridley		0	
VA Beach Hurricane Protection Project	12/2/2005	4	0	0	1	
		Relocation Trawling: Up to 45 takes in any combination of loggerheads, greens, leatherbacks, and Kemps ridleys. 1 lethal take of a loggerhead, green, leatherback OR Kemps ridley.				

Atlantic Coast of Maryland Shoreline Protection Project	11/30/2006	1 (≤0.5 million cy); 2 (>0.5 to ≤1 million cy); 3 (>1 to ≤1.5 million cy); 4 (>1.5 to ≤1.6 million cy)			2	Over life of project (through 2044), ~ 10-12 million cy will be dredged with an anticipated total of 24 turtles killed (2 Kemp's, 22 loggerheads)
NASA's Wallops Island Shoreline Restoration and Infrastructure Protection Program	7/22/2010	9			1	total ... 50 year project life

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 ESA-listed species. 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 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 oil spills involving fishing vessels are common events, but typically involve only small amounts of material. Larger fuel oil spills may result from accidents, although these events would are rare. No direct adverse effects on listed species from fishing vessel fuel oil spills have been documented.

4.3.3 Pollution

Anthropogenic sources of marine pollution, while difficult to attribute to a specific federal, state, local, or private action, may affect ESA-listed species in the action area. 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. Marine debris (*e.g.*, discarded fishing line or lines from boats) can entangle cetaceans or sea turtles causing serious injury or mortality. Turtles commonly ingest plastic or mistake debris for food, as observed with the leatherback sea turtle. Jellyfish are a preferred prey for leatherbacks, and similar looking plastic bags are often found in the turtle's stomach contents (Magnuson *et al.* 1990).

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 affect ESA-listed species if the pollution reduces the food available to marine animals.

4.3.4 Coastal Development

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

4.3.5 Catastrophic Events

Commercial vessel traffic/shipping imposes the potential for oil/chemical spills. With human population rising and commerce becoming increasingly globalized, so too does the demand for more ships. 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. Oil spills outside the action area also have the potential to affect ESA-listed species that occur within the action area. For instance, on April 20, 2010 the BP Deepwater Horizon oil spill occurred in the Gulf of Mexico off the coast of Louisiana. As ESA-listed species (*e.g.*, loggerhead and Kemp's ridley sea turtles) are known to migrate through, forage, and/or nest along the coastal waters of the Gulf of Mexico, the oil spill is likely to affect their populations; however, because all the information on sea turtle and other ESA-listed species' stranding, deaths, and recoveries has not yet been documented, the effects of the oil spill on their populations cannot be determined at this time.

4.4.1 Education and Outreach Activities

Education and outreach activities are considered some of the primary tools we can use to reduce the threats to protected species. For example, NMFS has been active in public outreach to educate fishermen regarding sea turtle handling and resuscitation techniques and has issued guidelines for recreational fishermen and boaters on how to avoid the likelihood of interactions with marine mammals. NMFS is engaged in a number of education and outreach activities aimed specifically at increasing mariner awareness of the threat of ship strike to right whales. NMFS intends to continue these outreach efforts in an attempt to reduce interactions with protected species, and to reduce the likelihood of injury to protected species when interactions do occur.

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 that collects data on dead sea turtles and rescues and rehabilitates live stranded turtles, reducing mortality of injured or sick animals. Data collected by the STSSN are used to monitor stranding levels and identify areas where unusual or elevated mortality is occurring, and to identify sources of mortality. These data are also used to monitor incidence of disease, study toxicology and contaminants, and conduct genetic studies to determine population structure. All of the states that participate in the STSSN tag live turtles when encountered (either via the stranding network through incidental takes or in-water studies). Tagging studies help improve our 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 Sea Turtle Disentanglement Network (STDN)

NMFS Northeast Region established the Northeast Sea Turtle Disentanglement Network (STDN) in 2002 in response to the high number of leatherback sea turtles found entangled in pot gear along the U.S. Northeast Atlantic coast. The STDN is considered a component of the larger STSSN program and operates in all states in the region. The STDN responds to entangled sea turtles in order to disentangle and release live animals, thereby reducing serious injury and mortality. In addition, the STDN collects data on these events, providing valuable information for management purposes. The NMFS Northeast Regional Office oversees the STDN program and manages the STDN database.

4.4.4 Regulatory Measures for Sea Turtles

4.4.4.1 Large-Mesh Gillnet Requirements in the Mid-Atlantic

Since 2002, NMFS has regulated the use of large mesh gillnets in federal waters off North Carolina and Virginia (67 FR 13098, March 21, 2002) to reduce the impact of these fisheries on ESA-listed sea turtles. These restrictions were revised in 2006 (73 FR 24776, April 26, 2006). Currently, gillnets with stretched mesh size 7 inches (17.8 cm) or larger are prohibited in the Exclusive Economic Zone (as defined in 50 CFR 600.10) during the following times and in the following areas: (1) north of the NC/SC border 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.

NMFS has also issued regulations to address the interaction of sea turtles in gillnet gear fished in Pamlico Sound, NC. Waters of Pamlico Sound are closed to fishing with gillnets with a stretched mesh size larger than 4 ¼ inch (10.8 cm) from September 1 through December 15 each year to protect sea turtles. The closed area includes all inshore waters of Pamlico Sound, and all contiguous tidal waters, south of 35E46.3' N, north of 35E00' N, and east of 76E 30' W.

4.4.4.2 TED Requirements in Trawl Fisheries

Turtle Excluder Devices (TEDs) are required in the shrimp and summer flounder fisheries. TEDs allow sea turtles to escape the trawl net, reducing injury and mortality resulting from capture in the net. Approved TEDs are required in the shrimp trawl fishery operating in the

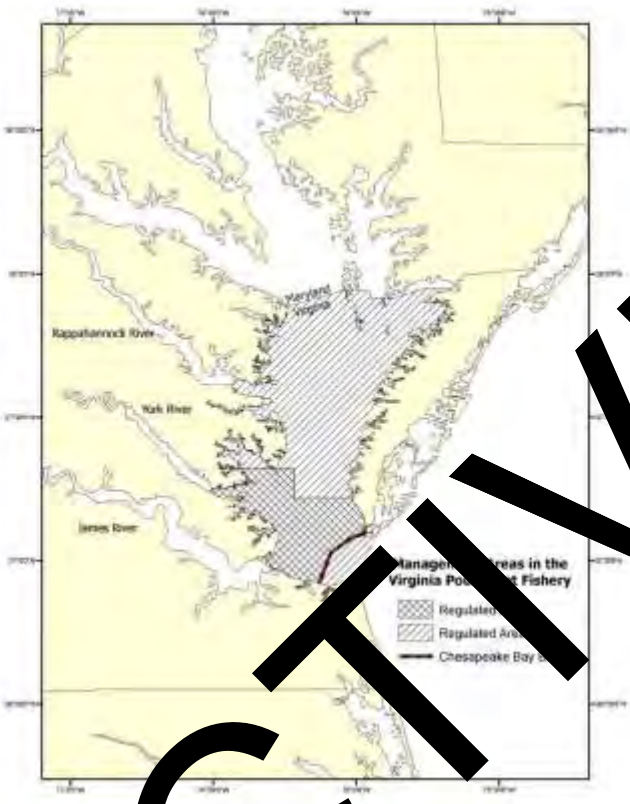
Atlantic and Gulf areas unless the trawler is fishing under one of the exemptions (*e.g*., skimmer trawl, try net) and all requirements of the exemption (50 CFR 223.206) are met. On February 21, 2003, NMFS issued a final rule to amend the TED regulations to enhance their effectiveness in reducing sea turtle mortality resulting from shrimp trawling in the Atlantic and Gulf areas of the southeastern United States by requiring an escape opening designed to exclude leatherbacks as well as large loggerhead and green turtles (68 FR 8456; February 21, 2003). In 2011, NMFS published a Notice of Intent to prepare an Environmental Impact Statement (EIS) and to conduct scoping meetings. NMFS is considering a variety of regulatory measures to reduce the bycatch of threatened and endangered sea turtles in the southeastern U.S. shrimp fishery in light of new concerns regarding the effectiveness of existing TED regulations in protecting sea turtles (76 FR 37050, June 24, 2011).

TEDs are also required for summer flounder trawlers in the summer flounder fishery-sea turtle protection area. This area is bounded on the north by a line extending along 37° [illegible]'N (Cape Charles, VA) and on the south by a line extending out from the North Carolina-South Carolina border. Vessels north of Oregon Inlet, NC are exempt from the TED requirement from January 15 through March 15 each year (50 CFR 223.206). The TED requirements for the summer flounder trawl fishery do not require the use of the larger escape opening. NMFS is considering increasing the size of the TED escape opening currently required in the summer flounder fishery and implementing sea turtle conservation requirements in other trawl fisheries and in other areas (72 FR 7382, February 15, 2007; 74 FR 216[illegible], May [illegible], 2009).

4.4.4.3 Sea Turtle Conservation Requirements in the Virginia Pound Net Fishery

NMFS has issued several regulations to help protect sea turtles from entanglement in and impingement on Virginia pound net gear (66 FR 3[illegible]89, June 22 2001; 67 FR 41196; June 17, 2002; 68 FR 41942, July 16, 2003; 69 FR 24997, May 5, 2004). Currently, all offshore pound leaders in Pound Net Regulated Area I (see Figure 5 below) must meet the definition of a modified pound net leader from May 6 through July 15. The modified leader has been found to be effective in reducing sea turtle interactions. Nearshore pound net leaders in Pound Net Regulated Area I and all pound net leaders in Pound Net Regulated Area II (see Figure 5 below) must have mesh size less than 12 inches (30.5 cm) stretched mesh and may not employ stringers (50 CFR 223.206) from May 6 through July 15 each year. A pound net leader is exempt from these measures only if it meets the definition of a modified pound net leader. In addition, there are monitoring and reporting requirements in this fishery (50 CFR 223.206). Since the 2010 fishing season, the state of Virginia has required modified pound net leaders (as defined by federal regulations) east of the Chesapeake Bay Bridge year round, and in offshore leaders in Regulated Area I (also as defined by Federal regulations) from May 6 to July 31. This is a 16 day extension of the federal regulations in this area.

Figure 5. Managements Areas in the Virginia Pound Net Fishery



4.4.4.4 Sea Turtle Conserva[illegible]n Requirem[illegible]ts in the HMS Fishery

NMFS completed the m[illegible] biologic[illegible]pinion on the FMP for the Atlantic HMS fisheries for swordfish, tuna, and s[illegible]rk on [illegible]1, 2004, and concluded that the Atlantic HMS fisheries, particularly the p[illegible]lagic lon[illegible]ine [illegible]sheries, were likely to jeopardize the continued existence of leatherback sea tu[illegible]s. An [illegible]A was provided to avoid jeopardy to leatherback sea turtles as a result of operation o[illegible] HM[illegible] fisheries. Although the biological opinion did not conclude jeopardy [illegible] loggerhead [illegible]a tu[illegible]es, the RPA is also expected to benefit this species by reducing mortalitie[illegible] [illegible]eractions with the gear. A number of requirements have been put in place as a re[illegible] of the biological opinion and subsequent research. These include measures related to the fi[illegible]g gear, bait, disentanglement gear and training.

In 2008, NMFS completed a section 7 consultation on the continued authorization of HMS Atlantic shark fisheries. The commercial fishery uses bottom longline and gillnet gear. The recreational sector of the fishery uses only hook-and-line gear. To protect declining shark stocks the proposed action seeks to greatly reduce the fishing effort in the commercial component of the fishery. These reductions are likely to greatly reduce the interactions between the commercial component of the fishery and sea turtles. The biological opinion concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by operation of the fishery. However, the proposed action was not expected to jeopardize the continued existence of any of these species, and an ITS was provided. Formal section 7 consultation on the continued authorization of HMS Atlantic shark fisheries has been reinitiated and a new biological opinion is expected by October, 2012.

4.4.4.5 Modified Gear in the Atlantic Sea Scallop Fishery

To reduce serious injury and mortality to sea turtles resulting from capture in the sea scallop dredge bag, NMFS has required the use of a chain-mat modified dredge in the Atlantic sea scallop fishery since 2006 (71 FR 50361, August 25, 2006; 71 FR 66466, November 15, 2006; 73 FR 18984, April 8, 2008; 74 FR 20667, May 5, 2009). Federally permitted scallop vessels south of 41°09'N. from the shoreline to the outer boundary of the EEZ are required to modify their dredge gear by adding an arrangement of horizontal and vertical chains (a "chain mat") over the opening of the dredge bag from of May 1 through November 30 each year. This mondification is not expected to reduce the overall number of sea turtle interactions with gear. However, it is expected to reduce the severity of some sea turtle interactions with scallop dredge gear.

Beginning May 1, 2013, all limited access scallop vessels, as well as Limited Access General Category vessels with a dredge width of 10.5 feet or greater, must use a Turtle Deflector Dredge (TDD) in the Mid-Atlantic (west of 71° W longitude) from May 1 through October 31 each year (77 FR 20728, April 6, 2012). The purpose of the TDD requirement is to deflect sea turtles over the dredge frame and bag rather than under the cutting bar so as to reduce sea turtle injuries due to contact with the dredge frame on the ocean bottom (including being crushed under the dredge frame). The TDD has specific components which are defined in the regulations. When combined with the effects of chain mats, which decrease captures in the dredge bag, the TDD should provide greater sea turtle benefits by reducing serious injury and mortality due to interactions with the dredge frame, compared to a standard New Bedford dredge.

4.4.4.6 Sea Turtle Handling and Resuscitation Requirements

NMFS published a final rule in the *Federal Register* (66 FR 67495, December 31, 2001) specifying handling and resuscitation requirements 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 regulations (50 CFR 223.206). These measures help to prevent mortality of turtles caught in fishing or scientific research gear.

4.4.4.7 Exception for Injured, Dead, or Stranded Specimens

Any agent or employee of NMFS, the USFWS, the U.S. Coast Guard, or any other federal land or water management agency, or any agent or employee of a state agency responsible for fish and wildlife, when acting in the course of his or her official duties, is allowed to take threatened or 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 or salvage a dead endangered or threatened sea turtle (50 CFR 223.206(b); 50 CFR 222.310). This take exemption extends to NMFS' Sea Turtle Stranding and Salvage Network.

4.4.5 Atlantic Large Whale Take Reduction Plan

The ALWTRP reduces the risk of serious injury to or mortality of large whales due to incidental entanglement in U.S. commercial trap/pot and gillnet fishing gear. The ALWTRP focuses on the critically endangered North Atlantic right whale, but is also intended to reduce entanglement of endangered humpback and fin whales. The plan is required by the Marine Mammal Protection Act (MMPA) and has been developed by NMFS. The ALWTRP covers the U.S. Atlantic EEZ from Maine through Florida (26°46.5'N). The requirements are year-round in the Northeast, and seasonal in the Mid and South Atlantic.

The plan has been developed in collaboration with the Atlantic Large Whale Take Reduction Team (ALWTRT), which consists of fishing industry representatives, environmentalists, state and federal officials, and other interested parties. The ALWTRP is an evolving plan that changes as NMFS and the ALWTRT learn more about why whales become entangled and how fishing practices might be modified to reduce the risk of entanglement. Regulatory actions are directed at reducing serious entanglement injuries and mortalities of right, humpback, and fin whales from fixed gear fisheries (*i.e.*, trap/pot and gillnet fisheries). The non-regulatory component of the ALWTRP is composed of four principal parts: (1) gear research and development, (2) disentanglement, (3) the Sighting Advisory System (SAS), and (4) education/outreach**.** These components will be discussed in more detail below. The first ALWTRP went into effect in 1997.

4.4.5.1 Regulatory Measures to Reduce the Threat of Entanglement on Whales

The regulatory component of the ALWTRP includes a combination of broad fishing gear modifications and time-area restrictions supplemented by progressive gear research to reduce the chance that entanglements will occur, or that whales will be seriously injured or die as a result of an entanglement. The long-term goal, established by the 1994 Amendments to the MMPA, is to reduce entanglement related serious injuries and mortalities of right, humpback and fin whales to insignificant levels approaching zero within five years of its implementation. Despite these measures, entanglements, some of which resulted in serious injuries or mortalities, continued to occur. Data on whale distribution, gear distribution and configuration, and all gear observed on or taken off whales was examined. The ALWTRP is an evolving plan, and revisions are made to the regulations as new information and technology becomes available. Because serious injury and mortality of right, humpback, and fin whales have continued to occur due to gear entanglements, new and revised regulatory measures have been issued since the original plan was developed.

The ALWTRT initially concluded that all parts of gillnet and trap/pot gear can and have caused entanglements. Initial measures in the ALWTRP addressed both parts of the gear, and since then, the ALWTRT has identified the need to further reduce risk posed by both vertical and horizontal portions of gear. Research and testing has been ongoing to identify risk reduction measures that are feasible. The regulations recently placed in effect focused on reducing the risk associated with horizontal (ground line) lines.

The ALWTRP measures vary by designated area that roughly approximate the federal Lobster Management Areas (FLMAs) designated in the Federal lobster regulations. The major requirements of the ALWTRP are:

- No buoy line floating at the surface.
- No wet storage of gear (all gear must be hauled out of the water at least once every 30 days).
- Surface buoys and buoy line need to be marked to identify the vessel or fishery.
- All buoys, flotation devices, and/or weights must be attached to the buoy line with a weak link. This measure is designed so that if a large whale does become entangled, it could extert enough force to break the weak link and break free of the gear, reducing the risk of injury or mortality.
- All groundline must be made of sinking line (year-round in the Northeast, seasonal in the Mid- and South Atlantic).

In addition to gear modification requirements, the ALWTRP prohibits all trap/pot and gillnet fishing in the Great South Channel from April 1 to June 30. Cape Cod Bay is also closed to gillnet fishing from January 1 to May 15. These time periods coincide with the presence of right whales in these areas.

In addition to the regulatory measures recently implemented to reduce the risk of entanglement in horizontal/ground lines, NMFS, in collaboration with the ALWTRT, has developed a strategy to further reduce risk associated with vertical lines.

It is anticipated that the final regulations implementing the vertical line strategy will prioritize risk reduction in areas where there is the greatest co-occurrence of vertical lines and large whales. There are two ways to achieve a reduced risk: (1) maintain the same number of active lines but decrease the risk from each one (not currently feasible), or (2) reduce the number of lines in the water column.

Whale distribution data are being used to help prioritize areas for implementation of future vertical line action(s). These data are overlaid with the vertical line distribution data to look at the combined densities by area. A model has been developed and was constructed to allow gear configurations to be manipulated and determine what relative co-occurrence reductions (as a proxy for risk) can be achieved by gear configuration changes and/or effort reductions by area. This co-occurrence analysis is an integral component of the vertical line strategy that will further minimize the risk of large whale entanglement and associated serious injury and death. The actions and timeframe for the implementation of the vertical line strategy are as follows:

- Vertical line model development for all areas to gather as much information as possible regarding the distribution and density of vertical line fishing gear. Status: completed;

- Compile and analyze whale distribution and density data in a manner to overlay with vertical line density data. Status: completed;

- Development of vertical line and whale distribution co-occurrence overlays. Status: completed;

- Develop an ALWTRP monitoring plan designed to track implementation of vertical line strategy, including risk reduction. Status: completed, with annual interim reports beginning in July 2012.

- Analyze and develop potential management measures. Time frame: throughout 2012;

- Develop and publish proposed rule to implement risk reduction from vertical lines. Time frame: by Mid- 2013;

- Develop and publish final rule to implement risk reduction from vertical lines. Time frame: by Mid- 2014;

- Implement final rule to implement risk reduction from vertical lines. Time frame: by early 2015;

4.4.5.2 Non-regulatory Components of the ALWTRP

4.4.5.2.1 Gear Research and Development

Gear research and development is a critical component of the ALWTRP, with the aim of finding new ways of reducing the number and severity of protected species-gear interactions while still allowing for fishing activities. At the outset, the gear research and development program followed two approaches: (a) reducing the number of lines in the water while still allowing fishing, and (b) devising lines that are weak enough to allow whales to break free and at the same time strong enough to allow continued fishing. Development of gear modifications are ongoing and are primarily used to minimize risk of large whale entanglement. The ALWTRT has now moved into the next phase with the focus and priority being research to reduce risk associated with vertical lines. This aspect of the ALWTRP is important because it incorporates the knowledge and encourages the participation of industry in the development and testing of modified and experimental gear. Currently, NMFS is refining a co-occurrence risk model that allows us to examine the density of whales and vertical lines in time and space to identify those areas and times that pose the greatest vertical line risk. These areas would be prioritized for management. The current schedule would result in a proposed rule for additional vertical line risk reduction to be published in 2013.

The NMFS, in consultation with the ALWTRT, has developed a monitoring plan for the ALWTRP. While the number of serious injuries and mortalities caused by entanglements is higher than our goal, it is still a relatively small number, which makes monitoring difficult. Specifically, we want to know if the most recent management measures, which became fully effective April 2009, have resulted in a reduction in entanglement related serious injuries and mortalities of right, humpback and fin whales. Because these are relatively rare events and the data obtained from each event is sparse, this is a difficult question to answer. The NEFSC has identified proposed metrics that will be used to monitor progress. They project that five years of data would be required before a change may be able to be detected. Therefore, data from 2010 to 2014 may be required to answer this question. The analysis of that data would not be able to occur until 2016 due to the availability of the five years of data after new regulations have been in place.

4.4.5.2.2 Large Whale Disentanglement Program

Entanglement of marine mammals in fishing gear and/or marine debris is a significant problem throughout the world's oceans. NMFS created and manages a Whale Disentanglement Network, purchasing equipment to be located at strategic spots along the Atlantic coastline, supporting training for fishermen and biologists, purchasing telemetry equipment, etc. This has resulted in an expanded capacity for disentanglement along the Atlantic seaboard including offshore areas. Along the U.S. eastern seaboard, reports of entangled humpback whales and North Atlantic right whales, and to a lesser extent fin whales and sei whales, have been received. In 1984 the Provincetown Center for Coastal Studies (PCCS) in partnership with NMFS developed a technique for disentangling free-swimming large whales from life threatening entanglements. Over the next decade, PCCS and NMFS continued working on the development of the technique to safely disentangle both anchored and free swimming large whales. In 1995 NMFS issued a permit to PCCS to disentangle large whales. Additionally, NMFS and PCCS have established a large whale disentanglement program, also referred to as the Atlantic Large Whale Disentanglement Network (ALWDN), based on successful disentanglement efforts by many researchers and partners. Memoranda of Agreement were also issued between NMFS and other federal government agencies to increase the resources available to respond to reports of entangled large whales anywhere along the U.S. eastern seaboard. NMFS has established agreements with many coastal states to collaboratively monitor and respond to entangled whales. As a result of the success of the disentanglement network, NMFS believes whales that may otherwise have succumbed to complications from entangling gear have been freed and have survived.

4.4.5.2.3 Sighting Advisory System (SAS)

Although the Sighting Advisory System (SAS) was developed primarily as a method of locating right whales and alerting mariners to right whale sighting locations in a real time manner, the SAS also addresses entanglement threats. Fishermen can obtain SAS sighting reports and make necessary adjustments in operations to decrease the potential for interactions with right whales. Some of these sighting efforts have resulted in successful disentanglement of right whales. The SAS is discussed further in section 4.4.7.5.

4.4.5.2.4 Educational Outreach

Education and outreach activities are considered some of the primary tools needed to reduce the threats to all protected species from human activities, including fishing activities. Outreach efforts for fishermen under the ALWTRP are fostering a more cooperative relationship between all parties interested in the conservation of threatened and endangered species. Type of outreach/education include website updates, attendance at industry meetings and outreach events, publications in industry trade journals, training for observer program and Coast Guard and state/federel enforcement agents.

4.4.6 Ship Strike Reduction Program

The Ship Strike Reduction Program is currently focused on protecting the North Atlantic right whale, but the operational measures are expected to reduce the incidence of ship strike on other large whales to some degree. The program consists of five basic elements and includes both regulatory and non-regulatory components: 1) operational measures for the shipping industry, including speed restrictions and routing measures, 2) section 7 consultations with federal agencies that maintain vessel fleets, 3) education and outreach programs, 4) a bilateral conservation agreement with Canada, and 5) continuation of ongoing measures to reduce ship strikes of right whales (*e.g.*, SAS, ongoing research into the factors that contribute to ship strikes, and research to identify new technologies that can help mariners and whales avoid each other).

4.4.7 Regulatory Measures to Reduce Vessel Strikes to Large Whales

4.4.7.1 Restricting Vessel Approach to Right Whales

In one recovery action aimed at reducing vessel-related impacts, including disturbance, NMFS published a proposed rule in August 1996 restricting vessel approach to right whales (61 FR 41116, August 7, 1996) to a distance of 500 yards. The Recovery Plan for the North Atlantic right whale identified anthropogenic disturbance as one of many factors that had some potential to impede right whale recovery (NMFS 2005a). Following public comment, NMFS published an interim final rule in February 1997 codifying the regulations. With certain exceptions, the rule prohibits both boats and aircraft from approaching any right whale closer than 500 yards. Exceptions for closer approach are provided for the following situations, when: (a) compliance would create an imminent and serious threat to a person, vessel, or aircraft; (b) a vessel is restricted in its ability to maneuver around the 500-yard perimeter of a whale; (c) a vessel is investigating or involved in the rescue of an entangled or injured right whale; or (d) the vessel or aircraft is participating in a permitted activity, such as a research project. If a vessel operator finds that he or she has unknowingly approached closer than 500 yards, the rule requires that a course be steered away from the whale at slow, safe speed. In addition, all aircraft, except those involved in whale watching activities, are exempted from these approach regulations. This rule is expected to reduce the potential for vessel collisions and other adverse vessel-related effects in the environmental baseline.

4.4.7.2 Mandatory Ship Reporting System (MSR)

In April 1998, the USCG submitted, on behalf of the US, a proposal to the International Maritime Organization (IMO) requesting approval of a mandatory ship reporting system (MSR) in two areas off the east coast of the U.S., the right whale feeding grounds in the Northeast, and the right whale calving grounds in the Southeast. The USCG worked closely with NMFS and other agencies on technical aspects of the proposal. The package was submitted to the IMO's Subcommittee on Safety and Navigation for consideration. It was then submitted to the Marine

Safety Committee at IMO and approved in December 1998. The USCG and NOAA play important roles in helping to operate the MSR system, which was implemented on July 1, 1999. Ships entering the northeast and southeast MSR boundaries are required to report the vessel identity, date, time, course, speed, destination, and other relevant information. In return, the vessel receives an automated reply with the most recent right whale sightings or management areas and information on precautionary measures to take while in the vicinity of right whales.

4.4.7.3 Vessel Speed Restrictions

A key component of NOAA's right whale ship strike reduction program is the implementation of speed restrictions for vessels transiting the US Atlantic in areas and seasons where right whales predictably occur in high concentrations. The Northeast Implementation Team (NEIT)-funded report "Recommended Measures to Reduce Ship Strikes of North Atlantic Right Whales" found that seasonal speed and routing measures could be an effective means of reducing the risk of ship strike along the U.S. East Coast. Based on these recommendations, NMFS published an Advance Notice of Proposed Rulemaking (ANPR) in June 2004 (69 FR 30857; June 1, 2004), and subsequently published a proposed rule on June 26, 2006 (71 FR 36299; June 26, 2006). NMFS published regulations on October 10, 2008 to implement a 10-knot speed restriction for all vessels 19.8 meters (65 feet) or longer in Seasonal Management Areas (SMAs) along the East Coast of the U.S. Atlantic seaboard at certain times of the year (73 FR 60173; October 10, 2008).

SMAs are supplemented by Dynamic Management Areas (DMAs) that are implemented for 15 day periods in areas in which right whales are sighted outside of SMA boundaries. When NOAA aerial surveys or other reliable sources report aggregations of three or more right whales in a density that indicates the whales are likely to persist in the area, NOAA calculates a buffer zone around the aggregation and announces the boundaries of the zone to mariners via various mariner communication outlets, including NOAA Weather Radio, USCG Broadcast Notice to Mariners, MSR return messages, email distribution lists, and the Right Whale Sighting Advisory System (SAS). NOAA requests mariners route around these zones or transit through them at 10 knots or less. Compliance with these zones is voluntary.

The rule will expire five years from the date of effectiveness. NOAA is currently analyzing data on compliance with, and effectiveness of the rule since its implementation to determine the next steps as the expiration in December 2013 approaches.

4.4.7.4 Vessel Routing Measures to Reduce the Co-occurrence of Ships and Whales

Another critical, non-regulatory component of NOAA's right whale ship strike reduction program involves the development and implementation of routing measures that reduce the co-occurrence of vessels and right whales, thus reducing the risk of vessel collisions. Recommended routes were developed for the Cape Cod Bay feeding grounds and Southeast calving grounds by overlaying right whale sightings data on existing vessel tracks, and plotting alternative routes where vessels could expect to encounter fewer right whales. Full implementation of these routes was completed at the end of November 2006. The routes are now charted on all NOAA electronic and printed charts, published in US Coast Pilots, and sent to mariners through USCG Notices to Mariners.

Through a joint effort between NOAA and the USCG, the U.S. also submitted a proposal to the IMO to shift the northern leg of the existing Boston Traffic Separation Scheme (TSS) 12 degrees to the north. Overlaying sightings of right whales and all baleen whales on the existing TSS revealed that the existing TSS directly overlaps with areas of high whale densities, while an area slightly to the north showed a considerable decrease in sightings. Separate analyses by the SBNMS and the NEFSC both indicated that the proposed TSS would overlap with 58% fewer right whale sightings and 81% fewer sightings of all large whales, thus considerably reducing the risk of collisions between ships and whales. The proposal was submitted to the IMO in April 2006, and was adopted by the Maritime Safety Committee in December 2006. The shift took effect on July 1, 2007. In 2009, this TSS was modified by narrowing the width of the north-south portion by one mile to reduce the threat of ship collisions with endangered right whales and other whale species.

In 2009 NOAA and the USCG established the Great South Channel as an Area to be Avoided (ATBA). This is a voluntary seasonal ATBA for ships weighing 300 gross tons or more. The ATBA will be in effect each year from April 1 to July 31 when right whales are known to congregate around the Great South Channel. Implementing this ATBA coupled with narrowing the TSS by one nautical mile will reduce the relative risk of right whale ship strikes by an estimated 74% during April-July (63% from the ATBA and 11% from the narrowing of the TSS).

4.4.7.5 Sighting Advisory System (SAS)

The right whale Sighting Advisory System (SAS) was initiated in early 1997 as a partnership among several federal and state agencies and other organizations to conduct aerial and ship board surveys to locate right whales and to alert mariners to right whale sighting locations in a near real time manner. The SAS surveys and opportunistic sightings reports document the presence of right whales and are provided to mariners via fax, email, NAVTEX, Broadcast Notice to Mariners, NOAA Weather Radio, several websites, and the Traffic Controllers at the Cape Cod Canal. Fishermen and other vessel operators can obtain SAS sighting reports, and make necessary adjustments to operations to decrease the potential for interactions with right whales. The SAS has also served as the only form of active entanglement monitoring in the Cape Cod Bay and Great South Channel feeding areas. Some of these sighting efforts have resulted in successful disentanglement of right whales. SAS flights have also contributed sightings of dead floating animals that can occasionally be retrieved to increase our knowledge of the biology of the species and effects of human impacts.

In 2009, with the implementation of the new ship strike regulations and the DMA program, the SAS alerts were modified to provide current SMA and DMA information to mariners on a weekly basis in an effort to maximize compliance with all active right whale protection zones.

4.4.8 Marine Mammal Health and Stranding Response Program (MMHSRP)

NMFS was designated the lead agency to coordinate the MMHSRP which was formalized by the 1992 Amendments to the MMPA. The program consists of the following components, all of which contribute important information on endangered large whales through stranding response and data collection:

- All coastal states established volunteer stranding networks and are authorized through Letters of Authority from NMFS regional offices to respond to marine mammal strandings.

- Biomonitoring helps assess the health and contaminant loads of marine mammals, but also to assist in determining anthropogenic impacts on marine mammals, marine food chains and marine ecosystem health.

- The Analytical Quality Assurance (AQA) was designed to ensure accuracy, precision, level or detection, and intercomparability of data in the chemical analyses of marine mammal tissue samples.

- NMFS established a Working Group on Marine Mammal Unusual Mortality Events to provide criteria to determine when a UME is occurring and how to direct responses to such events. The group meets annually to discuss many issues including recent mortality events involving endangered species both in the United States and abroad.

- The National Marine Mammal Tissue Bank provides protocols and techniques for the long-term storage of tissues from marine mammals for retrospective contaminant analyses. Additionally, a serum bank and long-term storage of histopathology tissue are being developed.

4.4.9 Harbor Porpoise Take Reduction Plan (HPTRP)

NMFS has implemented the HPTRP to decrease interactions between harbor porpoises and commercial gillnet gear in waters off New England and the Mid-Atlantic. The HPTRP includes time and area closures and gear modification requirements. Gear modifications vary by region and include restriction on twine size, gillnet floatline length, tie-down usage, and requirements to equip gillnets with pingers (New England only), among others. Pingers are acoustic deterrent devices that broadcast a 10 kHz (+/- 2 kHz) sound underwater at 132 dB(+/- 4 dB) re one micropascal at one meter lasting 300 milliseconds (+/- 15 milliseconds), and repeating every 4 seconds (+/- 0.2 seconds). Time and area closures implemented by the HPTRP may decrease the chance of interactions between ESA-listed species that are present in the area at the time of the closure and gillnet gear. The HPTRP is an evolving plan and amendments have been made as members of the take reduction team, including fishermen, environmental organizations, researchers, and representatives from state and federal government, identify the need for improvements by monitoring the progress of the plan and learning more about harbor porpoise abundance and bycatch rates. The most recent HPTRP amendments were published by NMFS in a final rule on February 19, 2010 (75 FR 7383). In New England, amendments included the expansion of seasonal and temporal requirements within some existing HPTRP management areas, incorporation of additional management areas, and establishment of a consequence closure area strategy as an incentive to increase compliance and reduce bycatch levels in areas with historically high levels of harbor porpoise bycatch. In the Mid-Atlantic, amendments included the establishment of an additional management area, and modification to tie-down requirements for large mesh gillnet gear. Consequence closure areas are specified areas of historically high levels of harbor porpoise bycatch that will seasonally close if bycatch rates over two consecutive management seasons exceed a specific rate. When triggered, consequence closure areas will remain in effect until bycatch levels achieve the zero mortality rate goal or until the HPTRT and NMFS develop and implement new measures. The final rule also incorporated a research provision and amended some existing regulatory text for minor corrections and clarifications. For more information on the HPTRP including time and area closures visit: www.nero.noaa.gov/hptrp.

4.4.10 Bottlenose Dolphin Take Reduction Plan (BDTRP)

Gear restrictions are currently implemented under the BDTRP, affecting small, medium, and large-mesh gillnets, along the Atlantic coast from New Jersey to Florida. The regulatory requirements reduce soak times and modify fishing practices to limit bycatch of bottlenose dolphins. These regulations may also benefit ESA-listed species that are present in the area when BDTRP regulatory measures are in effect. The take reduction team meets periodically to monitor implementation and effectiveness of the plan. For more information on the BDTRP visit: http://www.nmfs.noaa.gov/pr/interactions/trt/bdtrp.htm.

4.4.11 Atlantic Trawl Gear Take Reduction Strategy (ATGTRS)

NMFS convened an Atlantic Trawl Gear Take Reduction Team (ATGTRT) in 2006 to address the incidental mortality and serious injury of long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), common dolphins (*Delphinus delphis*), and white sided dolphins (*Lagenorhynchus acutus*) incidental to bottom and mid-water trawl fisheries operating in both the Northeast and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are classified as a "strategic stock," nor do they currently interact with a Category I fishery, it was determined that development of a take reduction plan was not necessary.

In lieu of a take reduction plan, the ATGTRT agreed to develop an ATGTRS. The ATGTRS identifies several operational and research tasks as well as education and outreach needs the ATGTRT believes are necessary to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero mortality and serious injury rates. The ATGTRS also identifies several potential voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals. These voluntary measures are as follows:

- Reducing the numbers of turns made by the fishing vessel and tow times while fishing at night; and
- Increasing radio communications between vessels about the presence and/or incidental capture of a marine mammal to alert other fishermen of the potential for additional interactions in the area.

While these measures have been recommended to reduce take of the four species of marine mammals listed above, ESA-listed species may also benefit from implementation of these measures, although interactions between trawl gear and endangered large whales have not been documented.

4.4.12 Magnuson-Stevens Fishery Conservation and Management Act

There are numerous regulations mandated by the Magnuson-Stevens Fishery Conservation and Management Act that may benefit ESA-listed species. Many fisheries are subject to different time and area closures. These area closures can be seasonal or year-round. Closure areas may benefit ESA-listed species due to elimination of active gear in areas where sea turtles and cetaceans are present. However, if closures shift effort to areas or seasons with a comparable or higher density of marine mammals or sea turtles, then risk of interactions could actually increase. Fishing effort reduction (*i.e.*, landing/possession limits or trap allocation) measures may also benefit ESA-listed species by limiting the amount of time that gear is present in the species environment. Additionally, gear restrictions and modifications required for fishing regulations may also decrease the risk of entanglement with endangered species. For a complete listing of fishery regulations in the action area visit: http://www.nero.noaa.gov/nero/regs/info.html.

5.0 CLIMATE CHANGE

In addition to the information on climate change presented in the *Status of the Species* section for whales and sea turtles, the discussion below presents further background information on global climate change as well as past and predicted future effects of global climate change throughout the range of the ESA-listed species considered here. Additionally, we present the available information on predicted effects of climate change in the action area and how listed whales and sea turtles may be affected by those predicted environmental changes over a time span of the proposed action for which we can realistically analyze impacts. Climate change is also relevant to the *Environmental Baseline and Cumulative Effects* sections of this Opinion, but rather than include partial discussions in several sections of this Opinion, we are synthesizing this additional information into one discussion.

The global mean temperature has risen 0.76ºC (1.36°F) over the last 150 years, and the linear trend over the last 50 years is nearly twice that for the last 100 years (IPCC 2007). Precipitation has increased nationally by 5%-10%, mostly due to an increase in heavy downpours (NAST 2000). There is high confidence, based on substantial new evidence, that observed changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. Ocean acidification resulting from massive amounts of carbon dioxide and other pollutants released into the air can have major adverse impacts on the calcium balance in the oceans. Changes to the marine ecosystem due to climate change include shifts in ranges and changes in algal, plankton, and fish abundance (IPCC 2007); these trends are most apparent over the past few decades.

Climate model projections exhibit a wide range of plausible scenarios for both temperature and precipitation over the next century. Both of the principal climate models used by the National Assessment Synthesis Team (NAST) project warming in the southeast by the 2090s, but at different rates (NAST 2000): the Canadian model scenario shows the Southeast U.S. experiencing a high degree of warming, which translates into lower soil moisture as higher temperatures increase evaporation; the Hadley model scenario projects less warming and a significant increase in precipitation (about 20%). The scenarios examined, which assume no major interventions to reduce continued growth of world greenhouse gases (GHGs), indicate that temperatures in the U.S. will rise by about 3º-5ºC (5º-9ºF) on average in the next 100 years which is more than the projected global increase (NAST 2000). A warming of about 0.2ºC (0.4°F) per decade is projected for the next two decades over a range of emission scenarios (IPCC 2007). This temperature increase will very likely be associated with more extreme precipitation and faster evaporation of water, leading to greater frequency of both very wet and very dry conditions. Climate warming has resulted in increased precipitation, river discharge, and glacial and sea-ice melting (Greene *et al.* 2008).

The past three decades have witnessed major changes in ocean circulation patterns in the Arctic, and these were accompanied by climate associated changes as well (Greene *et al.* 2008). Shifts in atmospheric conditions have altered Arctic Ocean circulation patterns and the export of freshwater to the North Atlantic (IPCC 2007; Greene *et al.* 2008). With respect specifically to the North Atlantic Oscillation (NAO), changes in salinity and temperature are thought to be the result of changes in the earth's atmosphere caused by anthropogenic forces (IPCC 2007). The NAO impacts climate variability throughout the northern hemisphere (IPCC 2007). Data from the 1960s through the present show that the NAO index has increased from minimum values in the 1960s to strongly positive index values in the 1990s and somewhat declined since (IPCC 2007). This warming extends over 1,000 meters (0.62 miles) deep and is deeper than anywhere in the world oceans and is particularly evident under the Gulf Stream/North Atlantic Current system (IPCC 2007). On a global scale, large discharges of freshwater into the North Atlantic subarctic seas can lead to intense stratification of the upper water column and a disruption of North Atlantic Deepwater (NADW) formation (IPCC 2007; Greene *et al.* 2008). There is evidence that the NADW has already freshened significantly (IPCC 2007). This in turn can lead to a slowing down of the global ocean thermohaline (large-scale circulation in the ocean that transforms low-density upper ocean waters to higher density intermediate and deep waters and returns those waters back to the upper ocean), which can have climatic ramifications for the whole earth system (Greene *et al.* 2008).

While predictions are available regarding potential effects of climate change globally, it is more difficult to assess the potential effects of climate change over the next few decades on coastal and marine resources on smaller geographic scales, such as the action area, especially as climate variability is a dominant factor in shaping coastal and marine systems. The effects of future change will vary greatly in diverse coastal regions for the U.S. Additional information on potential effects of climate change specific to the action area is discussed below. Warming is very likely to continue in the U.S. over the next 25 to 50 years regardless of reduction in GHGs, due to emissions that have already occurred (NAST 2000). It is very likely that the magnitude and frequency of ecosystem changes will continue to increase in the next 25 to 50 years, and it is possible that they will accelerate. Climate change can cause or exacerbate direct stress on ecosystems through high temperatures, a reduction in water availability, and altered frequency of extreme events and severe storms. Information below on impacts to rivers is relevant to sea turtles to the extent rivers affect conditions in estuaries, bays, and coastal areas where sea turtles forage, seek refuge, and use for other purposes. Water temperatures in streams and rivers are likely to increase as the climate warms and are very likely to have both direct and indirect effects on aquatic ecosystems. Changes in temperature will be most evident during low flow periods when they are of greatest concern (NAST 2000). In some marine and freshwater systems, shifts in geographic ranges and changes in algal, plankton, and fish abundance are associated with high confidence with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels and circulation (IPCC 2007).

A warmer and drier climate is expected to result in reductions in stream flows and increases in water temperatures. Expected consequences could be a decrease in the amount of DO in surface waters and an increase in the concentration of nutrients and toxic chemicals due to reduced flushing rate (Murdoch *et al.* 2000). Because many rivers are already under a great deal of stress due to excessive water withdrawal or land development, and this stress may be exacerbated by changes in climate, anticipating and planning adaptive strategies may be critical (Hulme 2005). A warmer-wetter climate could ameliorate poor water quality conditions in places where human-caused concentrations of nutrients and pollutants currently degrade water quality (Murdoch *et al.* 2000). Increases in water temperature and changes in seasonal patterns of runoff will very likely disturb fish habitat and affect recreational uses of lakes, streams, and wetlands. Surface water resources in the southeast are intensively managed with dams and channels and almost all are affected by human activities; in some systems water quality is either below recommended levels or nearly so. A global analysis of the potential effects of climate change on river basins indicates that due to changes in discharge and water stress, the area of large river basins in need of reactive or proactive management interventions in response to climate change will be much higher for basins impacted by dams than for basins with free-flowing rivers (Palmer *et al.* 2008). Human-induced disturbances also influence coastal and marine systems, often reducing the ability of the systems to adapt so that systems that might ordinarily be capable of responding to variability and change are less able to do so. Because stresses on water quality are associated with many activities, the impacts of the existing stresses are likely to be exacerbated by climate change. Within 50 years, river basins that are impacted by dams or by extensive development will experience greater changes in discharge and water stress than unimpacted, free-flowing rivers (Palmer *et al.* 2008).

While debated, researchers anticipate: 1) the frequency and intensity of droughts and floods will change across the nation; 2) a warming of about 0.2ºC (0.4°F) per decade; and 3) a rise in sea level (NAST 2000). A warmer and drier climate will reduce stream flows and increase water temperature resulting in a decrease of DO and an increase in the concentration of nutrients and toxic chemicals due to reduced flushing. Sea level is expected to continue rising: during the 20th century global sea level has increased 15 to 20 centimeters (6 to 8 inches).

Effects of climate change in the action area

As there is significant uncertainty in the rate and timing of change, as well as the effect of any changes that may be experienced in the action area due to climate change, it is difficult to predict the impact of these changes on whales and sea turtles. Generally speaking, the American lobster fishery is expected to continue in the near and mid-term future in similar areas, at similar times, and with similar levels of effort, but there is no way to predict at this point in time whether the lobster resource and other environmental conditions will support a fishery that is similar to the proposed action in the long-term future or indefinitely. Since the distribution of effort in the fishery and the status of the resource can change over just a few years, we will primarily consider the effects of climate change over the next ten years. Longer-term effects of the fishery and climate change on ESA-listed species, whatever they may be, are much more difficult to pinpoint and extrapolate beyond ten years.

Whales and sea turtles have persisted for millions of years and throughout this time have experienced wide variations in global climate conditions and have successfully adapted to these changes. As such, climate change at normal rates (thousands of years) is not thought to have historically been a problem for whales or sea turtles. As explained in the *Status of the Species* sections above, sea turtles are most likely to be affected by climate change due to increasing sand temperatures at nesting beaches which in turn would result in increased female:male sex ratio among hatchlings, sea level rise which could result in a reduction in available nesting beach habitat, increased risk of nest inundation, and changes in the abundance and distribution of forage species which could result in changes in the foraging behavior and distribution of sea turtle species. Recent studies suggest that up to half of the currently available sea turtle nesting areas globally could be lost with predicted sea level rise (Fish *et al*. 2008; Mazaris *et al*. 2009; Witt *et al*. 2010), particularly at islands where no retreat options exist (Baker *et al*. 2006) or where anthropogenic coastal fortification causes 'coastal squeeze' (Fish *et al*. 2008). However, translocation, artificial shading, and watering of sea turtle nests have been offered up as a few stop-gap ways to help ameliorate the effects of climate change on sea turtles when it comes to nesting (Witt *et al*. 2010; Patino-Martinez *et al*. 2012). Studies into the success of these measures are ongoing.

In the action area, it is possible that changing seasonal temperature regimes could result in changes in the timing of seasonal migrations through the area as whales sea turtles move amongst calving/nesting areas, summer foraging areas, and overwintering grounds. There could be shifts in the timing of calving/nesting, presumably, if water temperatures warm earlier in the spring, calving/nesting migrations and calving/nesting events could occur earlier in the year (as water temperature is a primary calving/nesting cue). For loggerhead sea turtles, warmer sea surface temperatures in the spring have been correlated to an earlier onset of nesting (Weishampel *et al*. 2004; Hawkes *et al*. 2007), shorter internesting intervals (Hays *et al*. 2002), and a decrease in the length of the nesting season (Pike *et al*. 2006). Green sea turtles also exhibited shorter internesting intervals in response to warming water temperatures (Hays *et al*. 2002). However, because calving/nesting is not triggered solely by water temperature, it is difficult to predict how any change in water temperature alone will affect the seasonal movements of whales and sea turtles through the action area.

Any forage species that are temperature dependent may also shift in distribution as water temperatures warm. However, because we do not know the adaptive capacity of these individuals or how much of a change in temperature would be necessary to cause a shift in distribution, it is not possible to predict how these changes may affect foraging whales or sea turtles. If the distribution of sea turtles shifted along with the distribution of their prey, it is likely that sea turtles would experience minimal, if any, impact due to the availability of food. Similarly, if sea turtles shifted to areas where different forage was available and they were able to obtain sufficient nutrition from that new source of forage, any effect would be minimal. The greatest potential for effect to forage resources would be if sea turtles shifted to an area or time where insufficient forage was available; however, the likelihood of this happening seems low because sea turtles feed on a wide variety of forage items and in a wide variety of habitats.

There are many direct and indirect effects that global climate change may have on marine mammal prey species. More information is needed in order to determine the potential impacts global climate change will have on the timing and extent of population movements, abundance, recruitment, distribution and species composition of prey (Learmonth *et al.* 2006). Changes in climate patterns, ocean currents, storm frequency, rainfall, salinity, melting ice, and an increase in river inputs/runoff (nutrients and pollutants) will all directly affect the distribution, abundance and migration of prey species (Waluda *et al.* 2001; Tynan & DeMaster 1997; Learmonth *et al.* 2006). These changes will likely have several indirect effects on marine mammals, which may include changes in distribution including displacement from ideal habitats, decline in fitness of individuals and population size due to the potential loss of foraging opportunities, changes in abundance, migration, and community structure, increased susceptibility to disease and contaminants, and decreased reproductive success (Macleod 2009). Global climate change may also result in changes to the range and abundance of competitors and predators which will also indirectly affect marine mammals (Learmonth *et al.* 2006).

As described above, over the long term, global climate change may affect whales and sea turtles by affecting calving/nesting patterns, distribution of prey, and water temperature. However, there is significant uncertainty, due to a lack of scientific data, on the degree to which these effects may be experienced and the degree to which whales or sea turtles will be able to successfully adapt to any such changes. Any activities occurring within and outside the action area that contribute to global climate change are also expected to affect whales and sea turtles in the action area. While we can make some predictions on the likely effects of climate change on these species, without modeling and additional scientific data, a high degree of uncertainty characterizes these predictions. Additionally, these predictions do not take into account the adaptive capacity of these species which may allow them to deal with change better than predicted. We do believe, however, that there will not be any new effects of climate change in the action area over the time frame assessed in this Opinion (*i.e.*, the next ten years) that may affect any of these species in a manner that was not already considered in the *Status of the Species* sections above.

6.0 EFFECTS OF THE PROPOSED ACTION ON ESA-LISTED CETACEANS AND SEA TURTLES

Pursuant to Section 7(a)(2) of the ESA (16 USC 1536), federal agencies are required to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. This Opinion examines the likely effects of the proposed action on listed species within the action area to determine if continued operation of the American Lobster FMP over the next ten years is likely to jeopardize the continued existence of any listed species. This analysis is done after careful review of the listed species status and the factors that affect the survival and recovery of those species, as described above.

In this section, we assess the direct and indirect effects of the proposed action on threatened and endangered species. The purpose of the assessment is to determine if it is reasonable to conclude that the fishery is likely to have direct or indirect effects on threatened and endangered species that appreciably reduce their likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution. Since the proposed action will not affect designated critical habitat, this Opinion will focus only on the jeopardy analysis.

6.1 Approach to the Assessment

NMFS generally approaches jeopardy analyses in three steps. The first step identifies the probable direct and indirect effects of an action on the physical, chemical, and biotic environment of the action area, including the effects on individuals of threatened or endangered species. The second step determines the reasonableness of expecting threatened or endangered species to experience reductions in reproduction, numbers or distribution in response to these effects. The third step determines if any reductions in a species' reproduction, numbers or distribution (identified in the second step of our analysis) will appreciably reduce a listed species' likelihood of surviving and recovering in the wild.

The final step of the analysis - relating reductions in a species' reproduction, numbers, or distribution to reductions in the species likelihood of surviving and recovering in the wild - is the most difficult step because (a) the relationship is not linear; (b) to persist over geologic time, most species have evolved to withstand some level of variation in their birth and death rates without a corresponding change in their likelihood of surviving and recovering in the wild; and (c) our knowledge of the population dynamics of other species and their response to human perturbation is usually too limited to support anything more than rough estimates. Nevertheless, our analysis must distinguish between anthropogenic reductions in a species' reproduction, numbers, and distribution that can reasonably be expected to affect the species likelihood of survival and recovery in the wild and other (natural) declines. To comply with direction from the U.S. Congress to provide the "benefit of the doubt" to threatened and endangered species [House of Representatives Conference Report No. 697, 96th Congress, Second Session, 12 (1979)], jeopardy analyses are designed to avoid concluding that actions have no effect on listed species or critical habitat when, in fact, there is an effect.

In order to identify, describe, and assess the effects to ESA-listed cetaceans and sea turtles resulting from fishing gear used in the American lobster fishery, NMFS is using: (1) Information on entanglement of right, humpback, fin, and sei whales and loggerhead and leatherback sea turtles in fishing gear of known and/or unknown origin (Johnson *et al.* 2005, Waring *et al.* 2011, Henry *et al.* 2011, STDN 2012); (2) information on the entanglement of right, humpback, fin, and sei whales and loggerhead and leatherback sea turtle species in pot/trap gear in other fisheries where the American lobster fishery also operates (Waring *et al.* 2011, Henry *et al.* 2011, STDN 2012); (3) life history information for cetaceans and sea turtles, and (4) the effects of fishing gear entanglements on cetaceans and sea turtles that has been published in a number of documents. These sources include status reviews and biological reports (NMFS and USFWS 1995, 2007a, 2007b; TEWG 1998, 2000, 2007, 2009; NMFS SEFSC 2001, Moore *et al.* 2004, Johnson *et al.* 2005, Waring *et al.* 2011, Henry *et al.* 2011), recovery plans (NMFS 1991a, b, NMFS and USFWS 1992, 2008; USFWS and NMFS 1992, NMFS 2005a, NMFS and USFWS 2008), commercial fishery databases (NMFS fisheries statistics database) and numerous other sources of information from the published literature as cited within this Opinion. Below, we first describe available information on past interactions between listed whales, sea turtles and lobster gear and then describe anticipated future effects of the continued operation of the fishery.

6.1.1 Description of the use of the Action Area by ESA-listed Species

Western North Atlantic right whales occur from the southeastern U.S. (waters off of Georgia and Florida) to Canada (Kenney 2002, Waring *et al.* 2011). Generally, they follow an annual pattern of migration from foraging areas to calving areas in Florida. However, only a portion of the known North Atlantic right whale population has been observed on the calving grounds. Results from winter surveys and passive acoustic studies suggest that animals may be dispersed in several areas including Cape Cod Bay (Brown *et al.* 2002) and offshore waters of the southeastern U.S. (Waring *et al.* 2011).

Generally, Atlantic humpback whales calve and mate in the West Indies and foraging in the northwestern Atlantic during the summer months. Sightings of humpbacks in the New England area are most frequent from mid-March through November, but small numbers of individuals may remain in the area between Cape Cod and Jeffreys bank year-round (CeTAP 1982). The Mid-Atlantic may also be an important feeding ground for juvenile humpbacks. Since 1989, observations of juvenile humpbacks in the Mid-Atlantic have been in January through March (Swingle *et al.* 1993).

Fin whales are believed to use the North Atlantic water primarily for feeding and more southern waters for calving. Movement of fin whales from the Labrador/Newfoundland region south into the West Indies during the fall have been reported (Clark 1995). However, neonate strandings along the U.S. Mid-Atlantic coast from October through January indicate a possible offshore calving area (Hain *et al.* 1992).

The sei whale is often found in the deeper waters characteristic of the continental shelf edge region (Hain *et al.*1985) and NMFS aerial surveys found substantial numbers of sei whales in this region south of Nantucket, in the spring of 2001. Spring is the period of greatest sei whale abundance in New England waters, with sightings concentrated along the eastern margin of Georges Bank and into the Northeast Channel area, and along the southwestern edge of Georges Bank in the area of Hydrographer Canyon (CeTAP 1982). NMFS aerial surveys in 1999, 2000 and 2001 found concentrations of sei and right whales along the northern edge of Georges Bank in the spring. In years of greater abundance of copepod prey sources, sei whales are reported in more inshore locations, such as the Great South Channel (in 1987 and 1989) and Stellwagen Bank (in 1986) (Waring *et al.* 2011).

As described in sections 3.2.1 – 3.2.2, the occurrence of loggerhead and leatherback sea turtles in New England waters and Mid-Atlantic waters north of Cape Hatteras, NC is temperature dependent (Keinath *et al.* 1987, Shoop and Kenney 1992, Musick and Limpus 1997, Morreale and Standora 1998, Mitchell *et al.* 2003, Braun-McNeill and Epperly 2004, James *et al.* 2005b, Morreale and Standora 2005). 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, Mitchell *et al.* 2003, Braun-McNeill and Epperly 2004, James *et al.* 2005b, Morreale and Standora 2005). 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, Mitchell *et al.* 2003, Braun-McNeill and Epperly 2004, James *et al.* 2005b, Morreale and Standora 2005). Recreational anglers have reported sightings of sea turtles in waters defined as inshore waters (bays, inlets, rivers, or sounds; Braun-McNeill and Epperly 2004) as far north as New York as early as March-April, but in relatively low numbers (Braun-McNeill and Epperly 2004). Greater numbers of loggerheads are found in Virginia's inshore, nearshore and offshore waters from May through November and in New York's inshore, nearshore and offshore waters from June through October (Keinath *et al.* 1987, Morreale and Standora 1993, Braun-McNeill and Epperly 2004). The hard-shelled turtles appear to be temperature limited becoming much less abundant in areas north of Cape Cod. Leatherback sea turtles have a similar seasonal distribution but have a more extensive range in the Gulf of Maine compared to the hard-shelled species (Shoop and Kenney 1992, Mitchell *et al.* 2003, STSSN database).

Extensive survey effort of the continental shelf from Cape Hatteras, NC, to Nova Scotia, Canada, in the 1980's (CeTAP 1982) revealed that loggerheads were observed at the surface in waters from the beach to waters with bottom depths of up to 4,481 m. However, they were generally found in waters where bottom depths ranged from 22-49 m deep (the median value was 36.6 m; Shoop and Kenney 1992). Leatherbacks were sighted at the surface in waters with bottom depths ranging from 1-4,151 m deep (Shoop and Kenney 1992). However, 84.4% of leatherback sightings occurred in waters where the bottom depth was less than 180 m (Shoop and Kenney 1992), whereas 84.5% of loggerhead sightings occurred in waters where the bottom depth was less than 80 m (Shoop and Kenney 1992). Neither species was commonly found in waters over Georges Bank, regardless of season (Shoop and Kenney 1992).

The American lobster fishery is expected to overlap with the distribution of endangered sea turtles in May in nearshore and offshore waters off of North Carolina and Virginia, and until June in nearshore and offshore waters off of New York. Given the seasonal distribution of sea turtles and the times and areas when the American lobster fishery operates, both species of sea turtles are likely to overlap with operation of the fishery from May to November in Mid-Atlantic waters, and waters of southern Georges Bank.

6.1.2 Description of ESA-listed Species Interactions in Lobster Trap/pot Gear

Lobster pot/traps are left in the water for a discrete period, after which time the traps are hauled and the catch retrieved. While the gear is in the water, whales or sea turtles may become entangled in the lines of the pot/trap gear. Johnson *et al.* (2005) noted that any part of the trap gear (the buoy line, groundline, and surface system line) creates a risk of entanglement. Determining which part of fixed gear creates the most entanglement risk for ESA-listed species is difficult due to uncertainties surrounding the nature of the entanglement event, as well as unknown biases associated with reporting effort and the lack of information about the types and amounts of gear being used (Johnson *et al.* 2005). The vertical and ground lines of several different fisheries have been found to entangle ESA-listed species in the region. In many events, the animal was entangled in more than one set of pot gear. The animal may be entangled in the line of one set, which then becomes tangled with the bottom gear or vertical line of a second or third set of gear.

Large whales and sea turtles cannot get caught in the trap itself since the opening is far smaller than any of these species. In addition, with the possible exception of loggerhead sea turtles, these species would not be expected to be attracted to the bait used in lobster traps since the bait is inconsistent with their typical prey (*i.e.,* zooplankton, jellyfish, live fish, crabs).

We have also determined that the continued operation of the lobster fishery will not have any adverse effects on the availability of prey for humpback, fin, and sei whales. Like right whales, sei whales feed on copepods (Perry *et al.* 1999). As indicated above, the lobster fishery will not affect the availability of copepods for foraging sei whales because copepods are very small organisms that will pass through lobster fishing gear rather than being captured in it. Dense aggregations of late stage and diapausing *Calanus finmarchicus* in the Gulf of Maine and Georges Bank region will not be affected by the lobster fishery. In addition, the physical and biological conditions and structures of the Gulf of Maine and Georges Bank region and the oceanographic conditions in Jordan, Wilkinson, and Georges Basin that aggregate and distribute *Calanus finmarchicus* are not affected by the lobster fishery.

Humpback and fin whales feed on krill as well as small schooling fish (*e.g.*, sand lance, herring, mackerel) (Aguilar 2002; Clapham 2002). Lobster fishing gear operates on or very near the bottom. Fish species caught in lobster gear are species that live in benthic habitat (on or very near the bottom) such as flounders versus schooling fish such as herring and mackerel that occur within the water column. The herring fishery does land potential forage fish for humpback and fin whales, which is made unavailable to the whales and imported to the lobster fishery. Approximately [illegible]% of herring landed in New England is used as bait in the lobster fishery (Grabowski *et al.* [illegible]); however, there are no data currently that would suggest that baleen whales that feed on small pelagic fish are food limited. Therefore, the continued operation of the lobster fishery is not expected to affect the availability of prey for foraging humpback or fin whales. In addition, the lobster fishery does not operate in low latitude waters where the overwhelming majority of calving and nursing occurs for these large whale species (Aguilar 2002; Clapham 2002; Horwood 2002; Kenney 2002; Sears 2002). Therefore, the continued operation of the lobster fishery will not affect the oceanographic conditions that are conducive for calving and nursing.

Many protected species exhibit feeding behavior that increases their susceptibility to entanglements, which is described in more detail below. The effects of entanglement can range from no injury to death.

6.1.2.1 Large Whale Interactions in Lobster Trap/pot Gear

Large whales are known to become entangled in gear used by the American lobster fishery. The ALWTRT has the most complete and up to date large whale entanglement data set, which includes data from the ALWDN. The ALWDN receives reports from a variety of sources, such as recreational boaters, commercial fishermen, USCG, NMFS aerial surveys, and research vessels. The MMHSRP also contributes to the collection of fishery interaction data. The Stranding Network evaluates stranded cetaceans and determines if commercial fishing activity was involved. NMFS has collectively analyzed both datasets and a summary is presented below.

Table 6 summarizes documented fishing gear interactions with large whales in the Atlantic for 2005-2009, showing the number of documented entanglements, and how many of those [illegible] to serious injury or mortality (NMFS NERO 2012).

Table 6. NMFS gear analysis for entangled/entrapped North Atlantic right whales, humpback whales, fin whales, and sei whales for the years 2005-2009. For the purposes of this evaluation, entanglement/entrapment events with gear determined to be from Canadian fisheries were not included. Results of gear analysis were the criteria used to categorize these events to U.S., Canada, or undefined origin; where not known, the NOAA Stock Assessment Reports for Marine Mammals use the location the animal was first sighted, which may be quite a distance from the original location of entanglement. For this analysis, animals entangled in gear of undefined origin are assumed to be entangled in gear from U.S. fisheries. Confirmed serious injury/mortality (SI/M) events are presented in parentheses.

	Entanglement events with gear of U.S. and unidentified origins	# of North Atlantic right whale events	Mean annual North Atlantic right whale events	# of humpback whale events	Mean annual humpback whale events	# of fin whale events	Mean annual fin whale events	# of sei whale events	Mean annual sei whale events
Sink gillnet gear	4	0	0	4	0.8	0	0	0	0
Unspecified gillnet gear	[illegible]	[illegible]	0.2(0.2)	1	0.2	0	0	0	0
Lobster gear	7(1)	1	0.2	6(1)	1.2(0.2)	0	0	0	0
Other pot/trap gear	1(1)	[illegible]	0.2(0.2)	0	0	0	0	0	0
Hook and line	[illegible]	0	0	7	1.4	0	0	0	0
Bottom longline	1	1	0.2	0	0	0	0	0	0
Purse seine	1	0	0	1	0.2	0	0	0	0
Unknown gear	99(22)	22(2)	4.4(0.4)	62 (13)	12.4(2.6)	12(4)	2.4(0.8)	3(3)	0.6(0.6)
Totals	122(25)	26(4)	5.2(0.8)	81(14)	16.2(2.8)	12(4)	2.4(0.8)	3(3)	0.6(0.6)

To look at the range of entanglements that may result in SI/M per year as a result of U.S. fishing gear, we looked at the past 10 years of data to increase the sample size. Between 2000 and 2009, the range of entanglements resulting in SI/M as a result of U.S. fishing gear was zero to three for North Atlantic right whales, zero to three for fin whales, zero to five for humpback whales, and zero to two for sei whales (NMFS NERO 2012).

Serious injury has been defined in 50 CFR 229.2 as an injury that is likely to lead to mortality. Currently, NMFS Regional Offices and Science Centers utilize regional techniques for assessing and quantifying the serious injuries of marine mammals based on the results of a 1997 workshop (Angliss and DeMaster 1998). Although these regional techniques helped to accomplish the MMPA's mandates, NMFS recognizes the need for a nationally consistent and transparent process of determining SI for effective conservation of marine mammal stocks and management of human activities impacting these stocks. NMFS convened a Serious Injury Technical Workshop in 2007 to review performance under existing processes, and gather the best available and current scientific information (Andersen *et al*., 2008).

Based on results of the 2007 workshop and input from marine mammal scientists, veterinary experts, and the MMPA Scientific Review Groups, NMFS has developed a policy and procedural directives describing national guidance and criteria for distinguishing serious from non-serious injuries of marine mammals (76 FR 42116, July 18, 2011). The directives serve as the basis for analyzing marine mammal injury reports (*e.g.*, observer, disentanglement, and stranding program reports) and incorporating the results into marine mammal stock assessment reports (SAR) and marine mammal conservation management regimes (*e.g.*, MMPA List of Fisheries (LOF), take reduction plans (TRP), ship speed regulations). The directives will ensure the consistent interpretation of what constitutes a serious injury and addresses the issues of accounting for injury cases where the outcome cannot be determined as well as accounting for successful mitigation efforts. The national standard federal register notice was published on January 23, 2012 (77 FR 3233, January 23, 2012). Historic serious injury information is expected to change the NEFSC SI/M data in the future. However, due to the recent publication of the directives, historic SI/M information has not yet been changed. Therefore, for the purpose of this Opinion, current NEFSC SI/M data will be used.

Between January 2005 and December 2009, one right whale and six humpback whales were verified to have been entangled in lobster gear that was set by U.S. fisheries or has not been identified to a country of origin (NMFS NERO 2012). Since many entanglement events go unobserved and because the gear type, fishery, and/or country of origin for observed entanglement events are often not traceable, identified entanglement events are assumed to be an under-representation of actual numbers of entanglements.

There is information that needs to be considered when SI/M and identified gear are looked at together. The identified gear is only looking at gear recovered or identified in the field by markings from the entanglement case. Frequently, entangled whales have numerous physical body locations of entanglement trauma without gear present; this means that the original entanglement configuration is no longer present and has changed since the first observation. Portions of the gear such as weak links and even the physical struggle of the initial entanglement could break free portions of the gear. For example, if an entanglement case had recovered sinking groundline, it is possible that the animal could have become entangled in other parts of the gear and carried off a significant portion of the entire set, with the sinking line being the only part recovered. Also, although uncommon, gear is sometimes lost during disentanglement operations.

Large whale data for 2010 and 2011 are presented below. These data are preliminary and will often change when cases are looked at more thouroughly, therefore, these data will not be considered in this Opinion. Additional information outside of the production timeframe of this Opinion may add or delete cases including altering the determination or status of any known case. Cases include animals that had gear present. Deceased animals that had entanglement trauma but no gear present are not included in these numbers. Reported numbers should be considered a minimum number and not comprehensive.

2010 Preliminary Large Whale Data

Table 7. 2010* Preliminary Large Whale Entanglement Summary[1]
United States and Canadian Waters

	Reports of Individual Animals with Previously Unreported Entanglements[2]
Right Whale	5
Humpback Whale	[illegible]
Fin Whale	0
Sei Whale	0
Minke Whale	3
Sperm Whale	0
Unknown Baleen Whale	0
Bryde's Whale	0
Unknown	1
TOTAL	25

* Up to and including April 18, 2012

[1] This is preliminary data and has not been formally disseminated by the National Marine Fisheries Service. It does not represent and should not be construed to represent any agency determination or policy. Additional information gathered after the release of this summary may alter, add or delete cases.

[2] Numbers include live and dead animals

As of April 18, 2012, there were 25 whales that were reported and confirmed entangled by survey aircraft, fishermen, whale watch vessels and various other sources within the United States and Canadian waters in 2010. The reports of animals within Canadian waters should not be considered comprehensive. Of the 25 individuals, sixteen of the animals were assessed and responded to; the remaining animals were not responded to due to the fact that they were lost by the reporting platform, were not found by the responder (typically because no one stood by), conditions (sea state, time of day, range offshore) did not allow a response, animal was deceased or were reported to have a minor entanglement or shed the gear during the initial observation of the animal.

Breakdowns of the first and important sightings of new entangled cases are listed below (identification of individual is unknown unless stated):

- **Humpback whale on 03/07/10**
- **Humpback whale on 05/05/10**
- Humpback whale on 05/08/10, deceased
- **Right whale #2470 on 05/13/10, disentangled**
- **Humpback whale "Pinch" on 05/18/10**
- Humpback whale on 05/28/10, deceased
- **Humpback whale on 06/19/10, partially disentangled, wounds severe**
- Right whale on 06/27/10, deceased
- **Humpback whale "Swallowtail" on 07/05/10, gear shed**
- **Humpback whale "Vault" on 07/23/10, gear shed on 10/19/10 although health of the animal appeared poor**
- Humpback whale on 07/26/10
- Humpback whale "Sodapop" on 07/[illegible]7/10, gear shed
- **Humpback whale, "Bearclaw", on 07/27/10, disentangled**
- **Humpback whale on 08/13/10, partially disentangled**
- **Minke whale on 08/14/10, disentangled**
- **Minke whale on 08/19/10, disentangled**
- **Humpback whale, 2008 calf of "Trident", on 08/20/10**
- **Minke whale on 08/2[illegible]/10**
- **Humpback whale, "Bearclaw" (new entanglement), on 08/31/10, disentangled**
- Right whale #1503 on 09/10/10
- Humpback whale on 10/02/10, possibly the same whale as 08/20/10 case but insufficient documentation prevents confirmation
- Right whale #3120 on 10/20/10, gear shed
- Unknown whale on 11/15/10
- Humpback whale on 11/27/10
- **Right whale #3911 on 12/25/10, deceased**

* Cases in bold are when a disentanglement response was possible. Some gear may have been removed in previous sightings which could have lead to a gear free status or the whale with some entangling gear remaining. Gear remaining on a whale does not necessarily mean the whale is in a life-threatening entanglement.

2011 Preliminary Large Whale Data

Table 8. 2011* Preliminary Large Whale Entanglement Summary[1]
United States and Canadian Waters

	Reports of Individual Animals with Previously Unreported Entanglements[2]
Right Whale	11
Humpback Whale	19
Fin Whale	1
Sei Whale	0
Minke Whale	5
Sperm Whale	0
Unknown Beaked Whale	0
Bryde's Whale	0
Unknown	0
TOTAL	[illegible]

* Up to and including April [illegible] 2012

[1] This is preliminary data and has [illegible] been [illegible] disseminated by the National Marine Fisheries Service. It does not represent and should not be construed to repr[illegible]t an[illegible] agency [illegible]rmination or policy. Additional information gathered after the release of this summary may alt[illegible]dd or delet[illegible]

[2] Numbers include live a[illegible]ead anim[illegible]

As of A[illegible] 2012, there were 36 whales that were reported and confirmed entangled by survey aircraft, fishermen, whale watch vessels and various other sources within the United States and Canadian waters in 2011. The reports of animals within Canadian waters should not be considered comprehensive. Of the 36 individuals, 12 of the animals were assessed and responded to; the remaining animals were not responded to due to the fact that they were lost by the reporting platform, were not found by the responder (typically because no one stood by), conditions (sea state, time of day, range offshore) did not allow a response, animal was deceased or were reported to have a minor entanglement or shed the gear during the initial observation of the animal.

Breakdowns of the first and important sightings of new entangled cases are listed below (identification of individual is unknown unless stated):

- **Humpback whale on 01/07/11**
- **Right whale #3010 (current mother) on 01/19/11, gear shed**
- **Right whale #3712 on 01/30/11, gear shed**
- **Humpback whale “EKG” on 02/01/11**
- **Right whale #3760 on 02/13/11, gear shed**
- Right whale #3993 on 02/13/11
- Right whale on 3/16/11, deceased
- **Right whale #3893 on 3/17/11, gear shed**
- Humpback whale on 4/11/11
- Humpback whale on 4/15/11, gear shed
- **Right whale #4040 on 4/22/11, disentangled**
- Right whale #3302 on 4/22/11
- Right whale #3123 on 4/29/11, gear shed
- Minke whale on 5/6/11, deceased
- Humpback whale on 5/30/11
- **Humpback whale, 2009 calf of “Lavalier” on [illegible]/8/11, disentangled**
- Humpback whale on 7/9/11
- Finback whale on 7/9/11, gear shed
- Humpback whale on 7/10/11
- Minke whale on 7/17/11
- **Humpback whale “Reflection” on 7/18/11, disentangled**
- Humpback whale on 7/21/11
- Minke whale on 7/24/11
- **Humpback whale “Ganesh” on 7/25/11, gear shed**
- Humpback whale “Reflection” (new entanglement) on 7/30/11, gear shed
- Humpback whale, 20[illegible] calf of “Rapier” on 7/30/11, gear shed
- Humpback whale, 201[illegible] calf of “Canopy” on 7/31/11, gear shed
- Humpback whale “Artillery” on 8/2/11, gear shed
- Humpback whale “Echo” on 8/14/11
- Humpback whale “Checkmark” gear shed
- Right whale, 2010 calf of #[illegible]360, on 9/18/11
- Right whale #3111 on [illegible]/27/11
- **Humpback whale “Hippocampus” on 9/30/11, disentangled**
- **Minke whale on 10/5/11, disentangled**
- Minke whale on 10/6/11, deceased
- Humpback whale “Clutter” on 10/10/11

* Cases in bold are when a disentanglement response was possible. Some gear may have been removed in previous sightings which could have lead to a gear free status or the whale with some entangling gear remaining. Gear remaining on a whale does not necessarily mean the whale is in a life-threatening entanglement.

Additionally, as of April 18, 2012, there are seven new cases in 2012. These include three right whales (all considered monitor/minor; likely the whale will shed the gear on its own), three humpback whales (two cases are of the same animal and both times the animal was disentangled; the third case is still entangled), and one monitor/minor minke whale case.

Because whales often free themselves of gear following an entanglement event, scarring may be another useful indicator in monitoring fisheries interactions with large whales. A study conducted by Robbins (2009) analyzed entanglement scars observed in photographs taken during 2003-2006. This analysis suggests high rates of entanglements of Gulf of Maine humpback whales in fishing gear. In an analysis of the scarification of right whales, 358 of 493 (72.6%) whales examined during 1980-2004 were scarred at least once by fishing gear (Knowlton *et al.* 2008). Further research using the North Atlantic Right Whale Catalogue has indicated that, annually, between 14% and 54% of right whales have been involved in entanglements (Knowlton *et al.* 2008). On November 9, 2009, NMFS convened a workshop of the Atlantic Large Whale Take Reduction Team Scarring Rates Work Group to examine the potential of utilizing scarring rates as an ALWTRP monitoring metric. Workshop conclusions recommended continued research on analyzing scarring rates for use in ALWTRP monitoring. NMFS continues to support and monitor research on methods to determine how analyses of scarring rates can best support conservation objectives, as outlined in the ALWTRP Monitoring Strategy that has been developed by NMFS.

As noted previously, observed entanglement events are not a complete count of all entanglements that occur on an annual basis. We do not currently have an accepted method to extrapolate those observed events to obtain a complete count. For that reason, the observed entanglement events (and therefore the number of entanglement related serious injuries or mortalities) are an underestimate. Recently, a methodology has been proposed for humpback whales that uses scar-based entanglement rates to extrapolate total entanglement mortality (Robbins *et al* 2009). Robbins *et al* (2009) used scar-based inference to estimate the annual frequency of non-lethal entanglement in the Gulf of Maine humpback whale population. For the period 1997-2006, annual estimates averaged 12.1%. The fraction of entanglements that were non-lethal was calculated using NMFS serious injury and mortality determinations. For the period 2002-2006, there were 49 (76.6%) non-lethal entanglements documented and 15 (23.4%) that were considered serious injuries or mortalities. Robbins *et al* (2009) assumed a minimum population estimate of 5[illegible] whales and a scar based entanglement rate of 18.8% to calculate that approximately 103 Gulf of Maine humpback whales survived entanglement in 2003. If the survivors represented 76.6% of the entanglements that occurred that year then there were an additional approximately 32 entanglements that resulted in serious injury or mortality. While documented entanglement related serious injuries or mortalities are approximately 3%, this method for estimating actual entanglement related serious injuries or mortalities results in an estimate of 23.4%, which is significantly higher. The authors note that it is a crude, preliminary estimate of entanglement mortality and state that the approach and its input values require further examination and refinement.

While this approach does provide a methodology for estimating the total number of entanglements, including those that result in serious injury or mortality, given its preliminary nature and questions regarding the approach and the input values, we have not utilized the results for humpbacks in this Opinion and furthermore have not attempted to apply the approach to North Atlantic right whales or other large whales.

While we are not utilizing this approach for attempting to estimate the overall number or rate of serious injuries or mortalities caused by entanglement, we recognize the importance of attempting to calculate a reasonable and scientifically supportable estimate. We also note that the estimate using this approach indicates that the magnitude of the impact may be significantly higher than is documented and provides further support for ongoing efforts to implement and enhance risk reduction measures.

6.1.2.2 Sea Turtle Interactions in Lobster Trap/pot Gear

Sea turtles are known to become entangled in lobster trap/pot gear. Sea turtles incidentally captured in fishing gear are required to be reported to NMFS on Vessel Trip Reports (VTRs); however, this requirement does not apply to the federal lobster fishery. Any fishing vessel with a federal finfish and/or shellfish permit must report the catch, location of catch, method of catch and interactions with ESA-listed species on a form. In 2008, approximately 61% of federal Lobster Permit holders had to report their catch on VTRs by virtue of holding another Federal finfish and/or shellfish permit. Compliance with the regulations that states federally permitted fishermen must report sea turtle interactions on their VTRs is very low. Since the 2002 initiation of the VTR reporting requirement for turtle interactions, [illegible] reports of turtle interactions have been recorded in VTR submissions for federally permitted fisheries. VTR reported interactions do not accurately indicate the frequency of turtle interactions. Additionally, no dedicated observer programs exist to provide estimates of interactions and mortality from the lobster trap/pot fisheries. The VTR form has the potential to provide the best estimation of interaction levels, but is unreliable for the lobster fishery because of the lack of required reporting and low levels of compliance when reporting is required.

In response to the high number of leatherback sea turtles found entangled in the vertical lines of pot gear in the Northeast U.S., NMFS' NER established the Northeast Region Sea Turtle Disentanglement Network (STDN). Formally established in 2002, the STDN is a component of the National Sea Turtle Stranding and Salvage Network (STSSN). The STDN works to reduce serious injuries and mortalities caused by entanglements. The STDN operates as an event response network, not as an active observer program. The STDN receives the majority of reports from private boaters and recreational fishermen who encounter entangled turtles in the water. These reports may come directly from the reporting individual or routed through the US Coast Guard (USCG), state agencies (*e.g.,* Maine Marine Patrol, Massachusetts Environmental Police) or local harbor-masters. The level of reporting from the pubic depends on many factors, including the location and visibility of the turtle and the knowledge of the public regarding who to call when reporting an entanglement. Additionally, since the majority of entanglements are reported by recreational boaters, these data may be skewed to show more coastal entanglements in waters that are easily accessible and highly utilized by boaters. Reports may also be skewed towards entanglements in buoy lines due to those entanglements being visable at the surface. Given the limitations on the STDN dataset, it is difficult to correlate the number of entanglements reported to the STDN and the actual number of entanglements that are occurring in coastal and off-shore waters. The data presented below are a summary of the existing STDN entanglement data. Since this dataset is the most complete and best available consolidation of sea turtle entanglement data in the Northeast region, it will be used to estimate sea turtle interactions in the American lobster fishery.

There are few recorded interactions of loggerheads with American lobster fishery gear. As summarized in past biological opinions for the lobster fishery, there have been three loggerheads reported entangled in lobster gear. One dead turtle was reported in New Jersey in July 1983; one was reported as released alive in New York in August 1987; and one was reported dead, entangled by the right flipper, in a pot line located in New Jersey in July 19[illegible]. In addition, for 1980-2000 there was one loggerhead (alive) entangled in lobster gear in Massachusetts (S[illegible]SC STSSN database). More recent data (2002-2010) has confirmed reports of 10 loggerhead entanglements in vertical line gear. Five of the entanglements were in whelk pot gear, and two entanglements were confirmed to be from a crab fishery. Gear from three of the loggerhead entanglements was never identified.

Between 2002 and 2010, a total of 138 sea turtle entanglements in vertical line gear were reported to the STDN and NMFS NER. Of these 138 reports, 129 were classified with a probable or confirmed, high confidence rating. Of the 129 confirmed events, 118 events involved leatherback sea turtles, 10 involved loggerhead sea turtles, and 1 involved a green turtle.

The American lobster fishery has been verified as the gear/fishery involved in 43 leatherback entanglements in the Northeast Region between 2002 and 2010 (STDN 2012). All of the 43 entanglements involved vertical line of the gear. These probable/confirmed entanglements have occurred in ME, MA, RI, and one in CT. Collectively these entanglements have occurred in the following months:

May (1-MA)
June (2-MA, 2-RI)
July (3-ME, 9-MA, [illegible]-RI)
August (13-MA, 1-RI, 1-CT)
September ([illegible]-ME, 7-MA)
October (1-MA)

Gear has been verified through the buoy/gear identification numbers, which can be traced in the various state agency and federal permit systems. Of the 43 confirmed or probable sets of gear, 1 has been verified as MA recreational lobster pot gear (entangled a leatherback in August 2006), and two sets of gear have been identified to a fisherman with both MA State and federal permits for lobster pot gear. Four of the entanglements involved gear from fishermen with state permits, and possibly federal permits, but this could not be confirmed. In seven of the entanglements, it was unknown if the gear came from a state, federal, or recreational fishery. All other lobster gear has been confirmed to be state commercial (ME, MA, CT or RI) coastal lobster pot gear.

6.1.3 Factors Affecting Cetacean Entanglement in Lobster Gear

Any line rising into the water column has the potential to entangle a whale (Johnson *et al.* 2005). The general scenario that leads to a whale becoming entangled in gear begins with a whale encountering a line. It may then move along that line until it comes up against something such as a buoy. The buoy can then be caught in the whale's baleen, against a pectoral fin, or on some other body part. When the animal feels the resistance of the gear, it is likely to thrash, which may cause it to become further entangled in the lines associated with trap gear. For large whales, there are generally three areas of entanglement: (1) the gape of the mouth, (2) around the flippers, and (3) around the tail stock. Right whales spend a substantial amount of time feeding below the surface; this species feeds by swimming continuously with their mouths open. They also roll and lift their flippers about the water's surface, behaviors that may add to entanglement risk, especially from vertical buoy lines and surface system lines. Humpback whales commonly use their mouths, flippers, and tails to aid in feeding. Thus, while foraging, all body parts are at risk of entanglement.

Susceptibility to entanglement depends on a species' physical characteristics and behavior. The probability that a marine mammal will initially survive an entanglement in fishing gear depends on the species and age of the marine mammal involved. This is due in part to variations in size, diving behavior, and foraging behavior, as well as to location and time of the entanglement. If the gear attached to the line is too heavy for the whale, drowning may result immediately. But many whales have been observed swimming with portions of the line, with or without additional fishing gear, wrapped around a pectoral fin, the tail stock, the neck or the mouth. Documented cases show that entangled animals may travel for extended periods of time and over long distances before freeing themselves, being disentangled by humans, or dying as a result of the entanglement (Angliss and Demaster 1998). Entanglement may lead to exhaustion and starvation due to increased drag (Wallace 1985). Other effects include infections and deformations. A sustained stress response, such as repeated or prolonged entanglement in gear, makes marine mammals less able to fight infection or disease, and may make them more prone to ship strikes. Younger animals are particularly at risk if the entangling gear is tightly wrapped since the gear will become more constricting as they grow. The majority of large cetaceans that become entangled are juveniles (Angliss and Demaster 1998).

The location of the fishery in relation to the species is also a factor influencing the likelihood that gear entanglement will occur. For example, the majority of the lobster fishery effort is concentrated in northeastern waters and peaks in the summer and early fall months when whales use New England waters for feeding and nursing young. Atlantic large whales are at risk of becoming entangled in fishing gear because the whales feed and travel in many of the same ocean areas in the action area. As described in detail in sections 3.1.1-3.1.4, North Atlantic right whales, humpback whales, and fin whales occur in Mid-Atlantic and New England waters over the continental shelf. Sei whales are also observed over the continental shelf although they typically occur over the continental slope or in basins situated between banks (Waring *et al.* 2011). All four species follow a similar pattern of foraging at high latitudes (*e.g.,* southern New England and Canadian waters) in the spring and summer months and calving in lower latitudes (*i.e.,* off of Florida for right whales and in the West Indies for humpback whales) in the winter months (CeTAP 1982, Hain *et al.* 1992, Clark 1995, Perry *et al.* 1999, Horwood 2002, Kenney 2002). Consequently, entanglement risk from lobster pot gear may occur at low levels throughout the year along the Atlantic coast, but the greatest risk occurs during the summer and fall in New England waters when whales and lobster trap gear are both more concentrated in these waters.

The American lobster fishery operates throughout the year, with peak fishing during the spring and summer. Since the highest abundances of North Atlantic right, humpback, fin, and sei whale populations occur from March through November in New England waters and peak abundances of sei whales have been identified during the spring season, the presence of these whales overlaps peak fishing periods with the American lobster fishery. Humpback and fin whales use the Mid-Atlantic waters during October-March with seemingly increasing frequency, and low numbers of whales may reside in New England waters through the winters. Because of substantial interannual and geographic variation in whale occurrences and lack of complete data for seasonal distributions, the potential exists for whale interactions with the American lobster fishery throughout the seasons and extent of the action area. However, given the seasonal distribution of ESA-listed whales and the times and areas when the American lobster fishery operates, North Atlantic right, humpback, fin, and sei whales are most likely to overlap with operation of the fishery from May through November in New England waters and throughout the fall and winter in Mid-Atlantic waters.

6.1.4 Factors Affecting Sea Turtle Entanglements in Lobster Gear

The primary effect on sea turtles from lobster gear is entanglement in buoy lines. Sea turtles can also become entangled in groundline or surface system line. Sea turtles are particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles indicate that fishing debris can wrap around the neck, flipper, or body of the sea turtle and severely restrict swimming or feeding (Balazs 1985). If a sea turtle is entangled when young, the line could become tighter and more constricting as the sea turtle grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

Drowning may occur immediately as a result of the weight of the gear or, at a later time, if trailing gear becomes lodged between rocks and ledges below the surface. Entangled sea turtles are sometimes released alive but are also found dead (as a result of forced submergence) upon retrieval of the gear as a result of forced submergence. Sea turtles released alive may later succumb to injuries sustained at the time of capture (NMFS 2008d). Of the entangled sea turtles that do not die from their wounds, some may suffer impaired swimming or foraging abilities, altered migratory behavior, or altered breeding or reproductive patterns due to injuries resulting from the entanglement.

Leatherback sea turtles seem to be the most vulnerable turtle to entanglement in fishing gear. This susceptibility may be a result of their body type (larger size, long pectoral flippers, and the lack of a hard shell), and their attraction to the gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface. The leatherback's diet is composed predominantly of jellyfish species. A number of researchers have suggested that leatherbacks may be attracted to the buoys which could appear as jellyfish. Similarly, leatherback entanglements in lobster gear may be more prevalent at certain times of the year when these turtles are feeding on jellyfish species in nearshore waters (*i.e.,* Cape Cod Bay) where lobster fishing gear is concentrated.

Anecdotal evidence indicates that when leatherbacks encounter lobster pot gear, they may swim in circles resulting in multiple wraps around a flipper. Long pectoral flippers along with extremely active behavior make leatherback sea turtles vulnerable to entanglement. Leatherbacks may also be more susceptible to drowning as compared to other sea turtles due to their unusual physiology and metabolic processes. The dive behavior of leatherbacks consists of continuous aerobic activity. When entanglement occurs, available oxygen decreases allowing anaerobic glycolysis to take over producing high levels of lactic acid in the blood (Lutcavage and Lutz 1997). Leatherbacks lack calcium which aids in neutralizing the build up of lactic acid by increasing bicarbonate levels. The softer epidermal tissue of leatherbacks may also make them more susceptible to serious injuries from entangling gear. Constriction of the neck and flippers can amputate limbs which may lead to death by infection. If the turtle is cut loose with line attached, the flipper may eventually become occluded, infected and necrotic. Entangled leatherbacks are also more vulnerable to collision with boats, particularly if the entanglement occurs at or near the surface (Lutcavage *et al.* 1997).

There have not been any documented entanglements of loggerhead sea turtles in lobster trap gear during the recording period 2002-2010 according to the STSSN database. During the same time period, 10 loggerhead sea turtle entanglements in other trap/pot gear (*i.e.*, crab, whelk, and unknown) have been documented. The factors influencing loggerhead sea turtle entanglements in pot/trap fishing gear are unclear.

NMFS has considered other factors that might affect the likelihood that sea turtle will become entangled in American lobster fishing gear. These other factors include the behavior of sea turtles in the presence of fishing gear, as well as the effect of certain oceanographic features and fishery practices on population distributions and abundances.

Intensity of biological activity in the Gulf of Maine has been associated with oceanographic fronts, including nutrient fluxes and biological productivity. Particular oceanographic features and processes that influence biological activity are vertical mixing by tides; the seasonal cycle of heating and cooling that leads to winter convection and vertical stratification in summer; pressure gradients from density contrasts set up by deep water inflows and lower salinity waters; and influxes of the cold, but fresher waters associated with Scotian Shelf Water (Townsend *et al.* 2006). Such oceanographic features occurring in the same area as the operation of lobster gear may increase the risk of interactions between lobster gear and ESA-listed species that would be attracted to these areas for feeding. However, at present there is no information to clearly indicate any of these are influencing ESA-listed species interactions in American lobster trap/pot gear.

Based on the best currently available information, cetacean and sea turtle interactions with American lobster gear are likely at times when, and in areas where, cetacean and sea turtle distribution overlaps with operation of the fishery.

6.2 Anticipated Effects of the Proposed Action

NMFS has identified that the proposed action is likely to adversely affect ESA-listed cetaceans and sea turtles when the animals come into physical contact with American lobster fishing gear. Such contact can result in injuries, including severe injuries and death. No other direct effects to cetaceans or sea turtles are expected as a result of the proposed action. No indirect effects to cetaceans or sea turtles are expected as a result of the proposed action. In this section of the Opinion, NMFS will determine, given the currently available information, the anticipated number of cetaceans and sea turtles (by species) that will be affected by the continued operation of the American lobster fishery over the next ten years.

The analyses in this section are based upon the best available commercial and scientific data on sea turtle and cetacean biology and the effects of the proposed action. Data pertaining to the American lobster fishery, relative to interactions with sea turtles and cetaceans are limited, so we are often forced to make assumptions to overcome the limits in our knowledge. Much of the information used to estimate interaction levels for this fishery was generated from past data, which was collected when fishing effort was likely higher than it will be in at least the near future. Fishing effort in the near future will likely remain at reduced levels allowing lobster stocks to grow. However, future levels of reduced fishing effort were not taken into considerations in this Opinion and we assumed that fishing will occur at historic levels; this results in a worst case scenario for listed species (i.e., we are assuming that more fishing effort may occur in the future than may actually occur). However it allows us to be conservative in predictions about effects on listed species.

6.2.1 Anticipated Cetacean Interactions in American Lobster Gear

No method has yet been identified for predicting the level of overall or species-specific cetacean bycatch in the American lobster fishery. Some whale mortalities may never be observed, thus the actual counts of numbers of documented mortalities are likely to be a subset of the actual number of entanglement related mortalities that occur. Additionally, assignment of a specific fishery to an observed entanglement is rarely possible because even in those rare cases where gear is retrieved, identification remains problematic because the same gear (*e.g.,* lines and webbing) is used in multiple fisheries.

It should be noted that the analysis of entanglement events used in this Opinion differs in an important way from the reporting in the NOAA Stock Assessment Reports for Marine Mammals. Specifically, gear analyses were the criteria used to categorize entanglement events to U.S., Canadian, or undefined origin in this Opinion; in contrast, the NOAA Stock Assessment Reports for Marine Mammals initially use the location the animal was first sighted to categorize the events to "U.S. waters" or "Canadian waters," then re-assign any events when/if gear analyses provide a confirmed country of origin for the involved gear. The location where an entangled whale is first sighted may be quite a distance from the original location of entanglement.

The objective of NOAA Stock Assessment Reports for Marine Mammals is to report status of marine mammal populations. The objective of this Opinion is to assess potential impacts to ESA-listed species due to the proposed action, which in this case is the continuation of the American lobster fishery. Thus, for the purposes of this Opinion, NMFS has chosen to exclude entanglement events that have been attributed to gear used in Canadian fisheries and in turn, we focus on entanglement events that are of undetermined origin or confirmed U.S. origin since these events are directly attributed to U.S. fisheries or cannot be ruled out as resulting from U.S. fisheries. By including gear of "unknown" origin, which may in fact be foreign gear, we are taking a more conservative approach than we would be if we excluded all gear that could not be identified as U.S. origin. This conservative approach is meant to comply with direction from the U.S. Congress to provide the "benefit of the doubt" to threatened and endangered species [House of Representatives Conference Report No.697, 96th Congress, Second Session, 12 (1979)].

We are using the conservative approach in this Opinion of assuming all gear of unknown origin is U.S. gear, although it is unlikely that all of these entanglements involve U.S. gear. Proportioning the origin of unknown entanglements between Canada and the U.S. may be analyzed more fully in the near future. One approach being taken into consideration is using the percentage of individual right whale sightings in Canadian waters from the New England Aquarium U.S. and Canadian sighting database. For example (numbers are for illustrative purposes only),

2005 - 275 individuals sighted; 150 in Canadian waters = 54.5% in Canadian waters
2006 - 300 individuals sighted; 120 in Canadian waters = 40.0% in Canadian waters
2007 - 330 individuals sighted; 100 in Canadian waters = 30.3% in Canadian waters
2008 - 350 individuals sighted; [illegible] in Canadian waters = 51.4% in Canadian waters
2009 - 290 individuals sighted; 16[illegible] in Canadian waters = 55.1% in Canadian waters

This results in an average of [illegible].3% of right whales sighted in Canadian waters. In the absence of data to the contrary, we assume that entanglements are just as likely to happen in Canadian waters as U.S. waters. This percentage would then be attributed to the entanglements of unknown origin for the time period of 2005 to 2009. Therefore, using this method, 12 of the 24 right whale entanglements between 2005 and 2009 (NMFS NERO 2012), in gear from an unknown origin, would be assumed to involve U.S. fishing gear. This method may more accurately reflect the number of right whales becoming entangled in U.S. fishing gear, which is the subject of this consultation.

The example provided above may provide an option for calculating the entanglement origin for right whales; however, other species of large whales do not receive such extensive survey efforts; thus, the sample size may be too small for this method to be suitable for other species. NMFS is currently in the process of developing criteria to more accurately attribute unknown gear involved in entanglements to humpback, fin, and sei whales.

Although only 20% of the lobster effort is located in federal waters (i.e., the EEZ), typically offshore lobster trap gear poses a greater risk of serious injury or mortality to ESA-listed large whales since these events are more difficult to respond to decreasing the chance of a disentanglement attempt. Since the majority of lobster fishing effort is concentrated in the northeastern waters when right, humpback, fin, and sei whales are present, risk of gear interactions increases during the summer and fall for these species.

North Atlantic right whales

From 2005 to 2009, the average reported mortality or serious injury to right whales in U.S. waters due to fishery entanglement was 0.8 (Waring *et al.* 2011). Documented entanglements most likely underestimate the extent of the entanglement problem since not all entanglements are likely to be observed. Consequently, the total level of interaction between fisheries and right whales is unknown. However, studies have estimated that more than 60% of right whales exhibit scars consistent with fishery interactions. Broad based gear modifications developed under the ALWTRP are expected to reduce the number and severity of right whale entanglements.

Between 2005 and 2009, 26 entangled right whales were reported. Of these 26, one case was identified as gear from the lobster fishery; this entanglement did not result in a serious injury or mortality. In this time period, approximately 15% of all the reported right whale entanglements resulted in serious injury or mortality (NMFS NERO 2012). Of the entanglements that resulted in serious injury or mortality, two had unknown gear, one had unknown gillnet gear, and one had pot/trap gear not from the lobster fishery.

Entanglements of right whales in pot/trap gear continue to occur despite the measures implemented by the ALWTRP. The ALWTRP has recently added new measures affecting trap/pot gear in the Northeast U.S. While the measures of the ALWTRP are expected to reduce the lethal effect of trap/pot gear on right whales, the lobster fishery has the potential to seriously injure or kill zero to three right whales per year. The American lobster fishery continues to pose a risk of entanglement for North Atlantic right whales.

Humpback whales

Humpback whale entanglements in lobster gear have been documented. Between 2005 and 2009, 81 humpback whale entanglements were documented. Six of those entanglements were in gear identified as coming from the American lobster fishery, averaging 1.2 per year (NMFS NERO 2012). From 2005 to 2009, there was one documented humpback serious injury as a result of entanglement in lobster gear. However, 13 of the humpback entanglements from 2005-2009 were in undocumented gear types have resulted in serious injury or mortality. Because serious injuries or mortalities of humpbacks in lobster gear have occurred in the past, we expect that the American lobster fishery has the potential to seriously injure or kill zero to five humpback whales per year.

Fin whales

Fin whales are vulnerable to entanglement in lobster trap gear while foraging and migrating in areas where gear is present. Entanglements of fin whales have been documented but are considered to occur at an insignificant level approaching zero mortality and serious injury rate.

From 2005-2009, no fin whales were documented entangled in pot/trap gear set by the American lobster fishery. However, in that time period there were 12 events where the gear was not identified or recovered and it is possible that some of that gear originated from the lobster fishery (NMFS NERO 2012).

Although some entangled whales may be freed of gear (either by their own actions or with the assistance of the disentanglement network), given the limited survey coverage in the action area, the limited observer coverage in the fishery, that gear is not continuously tended, and the logistical difficulties of disentanglement efforts in offshore areas, and the known serious injury or mortality of other whales resulting from lobster gear, we assume that in the future fin whales may be entangled in lobster gear and that zero to three entanglements may result in serious injury or mortality per year.

Sei whales

From 2005 to 2009, there have been three documented cases of sei whales entangled with unidentified gear; no entanglements have occurred in gear that was identified as lobster gear. While interactions with sei whales are possible, this species does not frequent inshore waters and therefore is not likely to encounter lobster gear. Based on documented entanglements, the average annual rate of sei whale entanglements is approximately 0.6. No sei whale mortalities have been reported as a result of entanglement in lobster fishing gear (NMFS NERO 2012), although it is possible. Documentation suggests zero to two serious injury and mortalities due to entanglement of sei whales may occur per year.

6.2.2 Anticipated Sea Turtle Interactions in American Lobster Gear

The following sections describe the data used, the processes, and the results of NMFS' analyses for estimating the number or amount of sea turtle interactions by the federal American lobster fishery. When calculating the sea turtle interaction rate, we used STDN vertical line stranding and entanglement records documented during 2002 through 2010 in state and federal waters. We believe this approach is reasonable for a number of reasons. The species of sea turtles that occur in the action area are all highly migratory and found in both state and federal waters. Trap construction requirements are very similar in the state and federal fisheries, and effort throughout the season is similar. The vast majority of both state and federal fishing effort occurs in the depth range (0-36 meters, 0-120 feet) where sea turtles are known to occur most frequently; thus neither fishery is known to have a disproportionate rate of sea turtle entanglements based on the distributions of sea turtles and lobster fishery effort.

The formation of the STDN in 2002 has increased the detail and accuracy of sea turtle entanglement data. As previously stated, entanglement data may be skewed to show more entanglements in coastal waters that are highly utilized by recreational boaters and therefore have a greater likelihood of being observed. Recreational boaters provide the majority of the entanglement reports. For the purposes of this Opinion, the estimate of sea turtle interactions by the lobster fishery is calculated using confirmed and probable events reported to the STDN between the years 2002 and 2010. Any of the estimates that produced fractional numbers were rounded up to complete the final estimates.

We use the best available sea turtle entanglement data to estimate the total number of sea turtle interactions by the American lobster fishery. An annual average of sea turtle interactions was calculated based on the number of reliable entanglement reports in the time period. A percentage of unidentified gear was assumed to come from a specific fishery based on percentages of identified gear that was obtained. The American lobster fishery occurs in state and federal waters by vessels with state and/or federal permits. Of the total effort in state and federal waters, approximately 20% of the American lobster fishery operates their gear in federal waters. Approximately 40% of lobster traps fished (in both state and Federal waters combined) is by vessels holding a federal permit. For the purposes of this Opinion, the federal portion of the lobster fishery is defined by those vessels with federal permits, regardless of whether the vessel is fishing in state or federal waters. (NMFS NERO 2010; American Lobster Stock Assessment Review Team 2009). Therefore, NMFS calculated interactions in the Federal portion of the lobster fishery by multiplying the total number of estimated interactions by 40%; this assumes that interactions in state vs. federal fisheries is proportional to the distribution of total amount of lobster traps fished (i.e., 40% federal, 60% state or recreational).

Leatherback Sea Turtle Interactions
Lobster is sparsely distributed in much of the southern extent of the action area. Reported landings from Delaware southward are typically less than 0.1% of total landings. Since 2004, federal trap tags ordered from NJ vessels represent less than 5% of the total federal trap tags ordered. No trap tags have been purchased for vessels from DE, MD, VA, and NC since 2004. Delaware through North Carolina have been granted *de minimus* status under the ASMFCs Interstate Fishery Management Plan (ISFMP). This means that there is minimal presence of either lobster or lobster-related activities in these coastal economies. Additionally, between 2002 and 2010, there were no reports of leatherback entanglements in lobster trap/pot gear south of NY. Whelk pot gear is the dominant vertical line gear in waters south of NJ and has been identified as the cause of entanglement in the majority of cases in that area. For the aforementioned reasons, the geographic scope of leatherback entanglement data used to estimate interactions in this Opinion will be confined to waters from ME through NY.

There were 97 confirmed or probable vertical line entanglement reports of leatherbacks from ME to NY during 2002-2010. The number of documented leatherback entanglements from ME to NY averaged 10.77 annually from 2002-2010. For the purposes of this Opinion, unconfirmed reports will not be considered. Fourty-three leatherback events involved lobster gear, 22 events involved gear identified to be from a different source other than the lobster fishery, and 32 events the gear could not be assigned to a specific fishery. From the total of 65 events involving a verified gear, 66% came from the lobster fishery.

For this Opinion, the percentage of all identified gear that proved to be lobster gear (66%) will be applied to the unverified gear total to determine the number that will be assumed to also be lobster gear. Therefore, 21 (66%) of the 32 entanglement events with unverified gear will be assumed to have involved lobster trap/pot gear, resulting in a total of 64 entangled leatherbacks in lobster gear from 2002-2010. Given that the opportunistic STDN data are considered biased towards state waters and entanglements are considered to occur at the same rate in the federal and state fishery, the observed state fishery entanglement rate will be applied to the federal portion of the fishery. As previously stated, two of the 43 lobster gear entanglements were confirmed to involve gear from vessels holding federal permits. In seven of the entanglements, it was unverified if the gear came from a state, federal, or recreational fishery. The conservative approach is to assume leatherback entanglements in unknown lobster gear involved state permitted lobster gear; thus, 41 of the 43 (95%) lobster gear entanglements were confirmed to involve gear from vessels that are permitted to operate in the state fishery but not the federal fishery. Therefore, of the 64 entanglements, 60.8 are estimated to have involved state permitted lobster gear, which represents an annual average of 6.75 entanglements in state lobster gear from 2002-2010. If the rate of entanglements observed through opportunistic STSSN reports (considered to cover the entirety of the lobster fishery in state waters, or 60% of the total lobster fishery) was the same in the federal portion (40% of lobster fishery), then we would expect the average of 6.75 entanglements in state gear to be indicitave of a total average of 11.25 leatherback entanglements in the entire fishery. This means that we would expect an average of 4.5 entanglements of leatherbacks to occur annually in the federal portion of the fishery.

The actual number of entangled leatherbacks per year may be larger; however, the actual number of entanglements cannot be extrapolated from the existing data. Since approximately 40% of the lobster fishery involves federally permitted vessels, the Federal lobster fishery is assumed to have been responsible for at least 4.5 leatherback entanglements annually. We expect an average of five leatherback turtle entanglements in the federal lobster fishery to be observed annually. Due to the relatively low amount of reports of entanglements, which impedes our ability to evaluate the rate of serious injury/mortality, and the fact that fewer entanglements in the EEZ may be able to be responded to in a timely manner, which would translate into a lower chance of a successful disentanglement and/or more time for the animal to suffer injuries from the gear, we assume that these entanglements could all result in serious injury or mortality.

Stranding and sighting records suggest that both adult and immature leatherback sea turtles occur within the action area where the American lobster fishery operates (NMFS and USFWS 1992, NMFS SEFSC 2001). Tracking of tagged leatherbacks also demonstrates the movement of sexually mature leatherbacks over U.S. continental shelf waters (James *et al.* 2005a; 2005b). Immature and sexually mature leatherback sea turtles are known to be captured in lobster gear. Between 2002 and 2010 leatherbacks entangled in lobster gear ranged from 106-183 cm curved carapace length (CCL) (STSSN 2012). TEWG (2007) states subadults as 100-145 cm and adults as >145 cm CCL. Therefore, either immature or sexually mature leatherback sea turtles could be entangled and killed in lobster pot gear since both age classes occur in areas where the lobster fishery operates.

Loggerhead Sea Turtle Interactions

The five life stages recognized for loggerhead sea turtles are: (1) Hatchling, size 4 cm curved carapace length (CCL); (2) Post-hatching, size range of 4-6 cm CCL; (3) Oceanic juvenile, size range of 8.5-64 cm CCL; (4) Neritic juvenile, size range 46-87 cm CCL; (5) Adult, neritic or oceanic, male size > 83 cm CCL, female size > 87 cm CCL (NMFS and USFWS 2008).

There is insufficient data of loggerhead sea turtles observed entangled in American lobster gear to determine estimated sizes of future entanglements. Based on observer measurements and known distribution ranges of loggerhead sea turtles captured in the other fisheries, NMFS expects that both neritic immature and sexually mature loggerhead sea turtles may be captured in lobster trap gear as a result of the continued operation of the American lobster fishery.

As previously stated, documentation of loggerhead sea turtle interaction with lobster trap/pot gear is limited. From 2002-2010, there was only one documented case of a loggerhead entangled in vertical line gear in the area from ME to NY. This event was classified as probable and the gear on the animal was not identified to a particular fishery. During this same time period there were nine confirmed reports of loggerheads entangled in vertical line gear south of NY, eight in VA and one in NJ. Seven of these entanglements involved fishing gear that identified to a particular fishery; all seven were in VA, and five involved whelk pot gear and two involved blue crab pot/trap gear. Despite the lack of reported interactions of loggerheads with lobster gear, the possibility exists that interactions will occur. We realize that more turtles might be entangled than are actually reported, therefore, we anticipate one loggerhead sea turtle interaction will be observed annually in the American lobster fishery. For loggerhead sea turtle interactions in lobster gear, the low occurrence of these observations does not allow valid determinations on the anticipated levels of lethal interactions for these events; therefore, we assume that this interaction could be lethal or non-lethal.

6.3 Summary of Anticipated Interactions of Cetaceans and Sea Turtles

Based on NMFS' large whale entanglement data for the years 2005-2009 (Table 6), the annual mean rates of fin whale and sei whale entanglements resulting in serious injury or mortality (SI/M) have been 0.8 and 0.6, respectively. The type of gear was unidentified in 100% of the fin and sei whale entanglement events. Entanglements resulting in serious injury and/or mortality to fin and sei whales caused by the American lobster fishery operation are considered to occur rarely and at an insignificant level.

The most recent SAR has the annual mean rate of SI/M from fishery gear entanglements listed as 0.8 and 3.4, respectively, for right and humpback whales in U.S. waters for 2005-2009 (Waring et al. 2011). During that time period, one humpback whale entangled in lobster gear resulted in a serious injury. Between 2000 and 2009, the range of entanglements resulting in SI/M as a result of U.S. fishing gear was zero to three for North Atlantic right whales, zero to three for fin whales, zero to five for humback whales, and zero to two for sei whales (NMFS NERO 2012).

The American lobster fishery does pose a risk of serious injury and mortality to right and humpback whales as a result of entanglement in pot/trap gear. The continued implementation and development of ALWTRP measures, along with an overall reduction in American lobster fishery effort provide cause to anticipate the number of right and humpback whale entanglements in trap/pot gear should decline or, at least, not increase.

The American lobster fishery is likely to have the greatest effect on sea turtles from May through November in Mid-Atlantic waters and waters of the GOM. As a result of the continued operation of the American lobster fishery over the next ten years, NMFS anticipates the observed interaction of up to one loggerhead sea turtle annually and five leatherback sea turtles annually. Interactions of leatherback and loggerhead sea turtles could be lethal or non-lethal.

7.0 CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this 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. For that reason, future effects of other federal fisheries are not considered in this section of the document; all federal fisheries that may affect listed species are the subject of formal section 7 consutlations. Effects of ongoing federal activities, including other fisheries, are considered in the *Environmental Baseline* and *Status of the Species sections* of this Opinion and are also factored into the *Integration and Synthesis of Effects* section below.

Sources of human-induced mortality, injury, and/or harassment of cetaceans and sea turtles in the action area that are reasonably certain to occur in the future include interactions in state-regulated fishing activities, vessel collisions, ingestion of plastic debris, pollution, global climate change, coastal development, and catastrophic events. While the combination of these activities may affect populations of ESA-listed cetaceans and sea turtles, preventing or slowing a species' recovery, the magnitude of these effects is currently unknown.

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

Right and humpback whale entanglements in gear set in state waters also occur. Entanglements in state lobster pot/traps and in croaker sink gillnet gear have been reported (Waring *et al.* 2007; Glass *et al.* 2008). Actions have been taken to reduce the risk of entanglement to large whales, although more information is needed to assess the effectiveness of these actions. State water fisheries continue to pose a risk of entanglement to large whales to a level that cannot be quantified.

Vessel Interactions – NMFS' STSSN data indicate that vessel interactions are responsible for a large number of sea turtles strandings within the action area each year. Such collisions are reasonably certain to continue into the future. Collisions with boats can stun or kill sea turtles, and many stranded turtles have obvious propeller or collision marks (Dwyer *et al.* 2003). However, it is not always clear whether the collision occurred pre- or post-mortem. NMFS believes that sea turtle vessel interactions will continue. An estimate of the number of sea turtles that will likely be killed by vessels is not available from data at this time.

Collisions of ESA-listed right, humpback, fin and sei whales with large vessels are known to occur, and are a source of serious injury and mortality for these species. As described in section 4.4.7, NMFS has implemented a ship strike reduction program to reduce the number of right whale strikes by large vessels. The program consists of both regulatory and non-regulatory components, such as requiring vessels to reduce speed in certain areas at certain times when right whales are likely to be present. The program is not specific to areas or times when other species of large whales are likely to be present in the vicinity of large ports of shipping lanes. The program does not require reduced speeds in all areas where right whales may occur. Although these measures are designed to reduce interactions of ESA-listed whales as a result of vessel strikes, the risk of interaction has not been fully removed since interactions may still occur at times when large whales and vessels occupy the same areas.

Pollution and Contaminants – Human activities in the action area causing pollution are reasonably certain to continue, as are impacts from them on cetaceans and sea turtles. However, the level of impacts cannot be projected. Marine debris (*e.g.*, discarded fishing line or lines from boats) can entangle turtles in the water and drown them. Turtles commonly ingest plastic or mistake debris for food. Chemical contaminants may also have an effect on sea turtle reproduction and survival. Excessive turbidity due to coastal development and/or construction sites could influence sea turtle foraging ability. As mentioned previously, turtles are not very sensitive to changes in water quality or increased suspended sediments, but if these alterations make habitat less suitable for turtles and hinder their capability to forage, eventually they would leave or tend to avoid these areas (Ruben and Morreale 1999).

Contaminant studies have confirmed that right whales are exposed to and accumulate contaminants. Antifouling agents and flame retardants that have been proven to disrupt reproductive patterns and have been found in other marine animals, which raises new concerns about their effects on right whales (Kraus *et al.* 2007). Recent data also support a hypothesis that chromium, an industrial pollutant, may be a concern for the health of the North Atlantic right whales and that inhalation may be an important exposure route (Wise *et al.* 2008). The impacts of biotoxins on marine mammals are also poorly understood, yet data is showing that marine algal toxins may play significant roles in mass mortalities of these animals (Rolland *et al.* 2007). Although there are no published data concerning the effects of biotoxins on right whales, researchers have discovered that right whales are being exposed to measurable quantities of paralytic shellfish poisoning (PSP) toxins and domoic acid via trophic transfer through the copepods upon which they feed (Durbin *et al.* 2002; Rolland *et al.* 2007; Leandro *et al.* 2009). Other large whales are likely similarly affected. Between November 1987 and January 1988, at least 14 humpback whales died after consuming Atlantic mackerel containing a dinoflagellate saxitoxin (Geraci *et al.* 1989; Waring *et al.* 2009). In July 2003, dead humpback whales tested positive for low levels of domoic acid (Waring *et al.* 2009). However, domoic acid poisoning could not be confirmed as the cause of death (Waring *et al.* 2009).

Noise pollution has been raised primarily as a concern for marine mammals but may be a concern for other marine organisms, including sea turtles. The potential effects of noise pollution on marine mammals and sea turtles range from minor behavioral disturbance to injury and death. The noise level in the ocean is thought to be increasing at a substantial rate due to increases in shipping, seismic exploration, offshore drilling, and sonar used by military and research vessels (NMFS 2007b). Because under some conditions low frequency sound travels very well through water, few oceans are free of human noise. While there is no hard evidence of a whale population being adversely impacted by noise, scientists think it is possible that masking, the covering up of one sound by another, could interfere with marine mammals' ability to feed and to communicate for mating (NMFS 2007b). Masking is a major concern about shipping, but only a few species of marine mammals have been observed to demonstrate behavioral changes to low level sounds. Concerns about noise in the action area are primarily related to increasing commercial shipping and recreational vessels.

Global climate change is likely to negatively affect sea turtles and large whales. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. The effects on ESA-listed species are unknown at this time. There are multiple hypothesized effects to sea turtles and cetaceans, including changing the range and distribution of ESA-listed species as well as their prey distribution and/or abundance due to water temperature changes. Ocean acidification may also negatively affect marine life, particularly organisms with calcium carbonate shells which serve as important prey items for many species. Global climate change may also affect reproductive behavior in sea turtles, including earlier onset of nesting, shorter internesting intervals, and a decrease in the length of nesting season. Additionally, air temperature may affect the sex ratio of sea turtle offspring. Water temperature affects the distribution of cetaceans, and global climate change may alter their range. Ocean acidification may have an adverse impact on the prey for baleen whales which may result in serious consequences for the marine food web. A decline in reproductive fitness as a result of global climate change could have profound effects on the abundance and distribution of sea turtles and cetaceans in the Atlantic.

Coastal development – Along the Mid-Atlantic and Southeast coastline, beachfront development, lighting, and beach erosion potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. Coastal counties are presently adopting stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting. Some of these measures were drafted in response to lawsuits brought against the counties by concerned citizens who charged the counties with failing to uphold the ESA by allowing unregulated beach lighting that results in negative effects to hatchlings.

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.

8.0 INTEGRATION AND SYNTHESIS OF EFFECTS

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

In the NMFS/U.S. Fish and Wildlife Section 7 Handbook, *Survival* is defined as:

> For determination of jeopardy/adverse modification: the species' persistence as listed or as a recovery unit, beyond the conditions leading to its endangerment, with sufficient resilience to allow for the potential recovery from endangerment. Said another way, survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a species with a sufficient population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter.

Recovery is defined as:

> Improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the Act.

8.1 Integration and Synthesis of Effects on Cetaceans and Sea Turtles

This Opinion has identified in Section 6 (*Effects of the Action*) that the proposed action--continued operation of the fishery under the American Lobster FMP may directly affect right, humpback, fin, and sei whales as a result of entanglement in pot/trap gear fished in the American lobster fishery. No other direct or indirect effects to ESA-listed cetaceans are expected as a result of the activity. This Opinion has also identified that the proposed action may directly affect loggerhead and leatherback sea turtles as a result of interaction with lobster trap gear used in the American lobster fishery. No other direct or indirect effects to ESA-listed sea turtles are expected as a result of this activity. The following discussion in Sections 8.1.1 through 8.1.5 below provide NMFS' determinations of whether there is a reasonable expectation that right, humpback, fin, and sei whales as well as loggerhead and leatherback sea turtles will experience reductions in reproduction, numbers, or distribution in response to these effects, and whether any reductions in the reproduction, numbers, or distribution of these species can be expected to appreciably reduce the species' likelihood of surviving and recovering in the wild. It is important to consider that the assessments in sections 8.1.1 through 8.1.5 are based on historical data and do not fully account for the trend in reduction of effort in the American lobster fishery and other fisheries. Thus, the assessments in these sections could be considered worst case expectations as the relatively recent reductions in commercial fisheries effort could result in decreased opportunities for entanglements of ESA-listed species.

8.1.1 North Atlantic Right Whale

As described in the Status of Species section of this Opinion, for 2005-2009, the average reported mortality and serious injury to right whales due to fishery entanglement was 0.8 whales per year (U.S. waters, 0.8; Canadian waters, 0.0) (Waring *et al.* 2011). In the majority of cases, an entanglement report does not contain the necessary information to assign the event to a particular fishery. From 2005-2009, lobster gear of U.S. or undocumented origin was not recorded in any SI/M entanglement events with right whales (Table 6). Although there are no documented cases of SI/M to right whales from lobster gear in 2005-2009, SI/M has previously been documented for right whales as a result of entanglement in lobster gear. Based on the serious injury and mortality data for the past ten years, we expect to see a range of zero to three right whales seriously injured or killed per year as a result of entanglement in U.S. fishing gear.

For the purposes of this assessment, we are assuming that on a five year average, zero to three right whales are seriously injured or killed as a result of U.S. fisheries. Under the worst case scenario, we could have five years in a row where three serious injuries or mortalities were observed, resulting in an average of three per year. Therefore, we expect the five year average to range from zero to three. Because serious injury or mortality could result from the lobster fishery, this Opinion assumes that serious injury or mortality could and would occur as a result of the lobster fishery.

PBR for the western Atlantic stock of North Atlantic right whale stock is 0.8 whales (Waring *et al.* 2011). As indicated above, while the annual average rate of documented SI/M events for right whales attributable to lobster gear is less than PBR ($0 < 0.8$), the overall annual rate of documented serious injury/mortality events with all U.S. commercial fishing gear for right whales is 0.8, which meets the PBR value of 0.8. The term "potential biological removal level" means the maximum number of animals, not including natural mortalities that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. It is important to note that optimum sustainable population is a population level that is significantly higher than survival and recovery. The 2011 SAR indicates that the level of serious injuries or mortalities of North Atlantic right whales attributable to U.S. commercial fisheries meets the level necessary to allow for growth to the optimum sustainable population level. However, what we must consider in this Opinion is whether the continued operation of the lobster fishery over the next ten years will result in interactions with right whales that will result in serious injuries or mortalities that are likely to appreciably reduce the survival and recovery of North Atlantic right whales. If so, then we would have to determine if that appreciable reduction in survival and recovery for the western Atlantic stock resulted in an appreciable reduction in survival and recovery for North Atlantic right whales.

As described in the Status of Species section of this Opinion, the latest final stock assessment report indicates that the population of North Atlantic right whales has grown at a rate of 2.4% between 1990 and 2007 (Waring *et al.* 2011). In order to assess the impact of fisheries mortality on the North Atlantic right whale population, NMFS NEFSC developed a population viability analysis (PVA) to examine the influence of anthropogenic mortality reduction on survival and recovery for the species (Pace, unpublished). The PVA included simulation models that re-sampled from observed calving records and a set of survival rates estimated from re-sightings histories of cataloged individuals collected over a 28 year period, and used these to assess the influence that simple and per capita reductions in anthropogenic mortality might have on population trajectories. Status quo simulations project forward assuming conditions are similar to those experienced from 1997 to 2006 – *i.e.*, without any reductions in mortality from entanglements or ship strikes, continuing the observed population trends experienced over the past 28 year period into the future. Basically, the PVA evaluated how the populations would fare without entanglement mortalities compared to the status quo (*i.e.*, with entanglement mortalities). The PVA evaluated several scenarios, including removing the mortality of one right whale (random life stage and sex) per year and one adult female per year. The PVA also evaluated the removal of right whale mortality on a per capita basis (meaning that as the population went up or down, the mortality reduction would go up or down relative to the population size). The three per capita scenarios evaluated the effect of the removal of the mortality of one animal (random life stage and sex), one adult female, and three animals (random life stage and sex).

The entire PVA is attached as an appendix to this Opinion, but some of the relevant results are summarized as follows:

- Median overall growth rates for the simulated populations ranged from 1.3% for status quo conditions to 2.1% for reductions in mortality equivalent to three animals per year.
- Status quo projections suggest a very low likelihood of extinction. No extinctions or quasi-extinctions were observed in the 1,000 projections (over a 100 year period).

- Only 2 of 1000 projections (with status quo simulation over a 100 year period) ended the 100 year period with a smaller total population size than they started with (345), and those were just marginally smaller.
- The status quo showed an 8.6% probability of achieving a 2.0% growth rate over the next 35 years. With one less mortality per year, that probability went up to 14.7%; with one less adult female mortality per year, the probability improved to 24.6%.

Effects of Serious Injury or Mortality from Fisheries Entanglement on Survival and Recovery

The modeling done by Pace (unpublished) indicates that under the status quo (i.e., no changes in mortality rate) there is a very low likelihood of the North Atlantic right whale going extinct or reaching a quasi-extinction level (a population of only 50 adult females, see explanation below). None of the model projections actually predicted extinction or quasi-extinction. Agreed upon criteria for quasi-extinction, *i.e.*, population numbers, structure and trends, for North Atlantic right whales have not yet been developed; however, quasi-extinction is commonly considered to be a threshold population size below which the population would be critically endangered or effectively extinct. For large vertebrates, a variety of numerical values have been considered for this threshold (*e.g.*, from 20 to 500). The PVA conducted by Pace (unpublished) used a quasi-extinction level of 50 adult female right whales. The rationale for this level follows: (1) there is general consensus in the conservation genetics community that large vertebrate populations cannot fall below 50 breeding animals and still maintain genetic integrity (Shaffer 1981; Franklin 1980), and (2) the International Union for Conservation of Nature (IUCN)(Reilly *et al.* 2008) considers this to be one of the two threshold numerical values for a "critically endangered" population category (IUCN 2008). IUCN uses 250 mature animals as an alternative threshold value for "critically endangered" populations when there is evidence of a population decline. Given the population increase currently observed for the species (2.4% increase from 1990-2007 (Waring *et al.* 2011), or 1.3% (Pace, unpublished) based on the parameters and time series in his model), it is reasonable to use 50 rather than 250 as the threshold value for quasi-extinction. As described above, using 50 adult females as the quasi-extinction threshold, Pace (unpublished) observed zero simulations out of 1000 getting to quasi-extinction for North Atlantic right whales over the next 100 years, both including and excluding the serious injuries and mortalities assumed to be occurring due to entanglements in U.S. fishing gear.

This model assumes that conditions experienced in the future will be similar to conditions experienced in the past. Over the last 30 years there have been periods of very low calving rates. Recent information indicates that the periods of low calving rates may be associated with periods of lower availability of copepods in suitable densities for feeding. We are limited in our ability to influence and manage copepod density, and if copepod densities were to decrease (perhaps due to climate change, pollution, or other factors), this could negatively affect the ability of the population to successfully reproduce.

While the mortality of zero to three right whales per year will reduce the number of right whales in the population compared to the number that would have been present absent the proposed action, as evidenced by the results of the PVA, it is not likely that this reduction in numbers will appreciably change the status of this population or its increasing trend. As described above, none of the 1,000 runs of the status quo projections in the PVA, which assumes future levels of serious injury and mortality due to U.S. fishing gear are similar to past levels or predict extinction. In addition, only two of the 1,000 status quo projections ended the 100 year period with a smaller total population size than the starting population size.

Reproductive potential of North Atlantic right whales is not expected to be affected in any other way other than through a reduction in numbers of individuals. The mortality of zero to three right whales per year would have the effect of reducing the amount of potential reproduction of right whales as the right whales killed would have no potential for future reproduction. However, future reproductive value was considered in the PVA, and, as evidenced by the results of the PVA, a reduction in the current mortality level by one animal per year, even a mature female, does not change the future trajectory of this species. Even considering the potential loss of future mature whales that would be produced by the individuals that would be killed as a result of the proposed action, any effect to future year classes is anticipated to be very small and would not change the increasing trend of this population. Additionally, the proposed action will not affect habitat in any way that will reduce mating or rearing success. The proposed action is not likely to reduce distribution because the action will not prevent right whales from accessing any habitats used seasonally for migrating, foraging, mating or rearing.

While generally speaking, the loss of a small number of individuals from a subpopulation or species can have an appreciable effect on the numbers, reproduction and distribution of the species, this is likely to occur only when there are very few individuals in a population, the individuals occur in a very limited geographic range, or the species has extremely low levels of genetic diversity. The results of the PVA indicate that this is not the case for right whales and the loss of individuals as a result of entanglement in fishing gear, at a rate similar to what has occurred in the past, is not likely to appreciably reduce the likelihood of survival of this species (*i.e.*, it will not increase the risk of extinction faced by this species).

In certain instances, an action that does not appreciably reduce the likelihood of a species' survival might affect its likelihood of recovery or the rate at which recovery is expected to occur. As explained above, we have determined that the proposed action will not appreciably reduce the likelihood that North Atlantic right whales will survive in the wild. Here, we consider the potential for the action to reduce the likelihood of recovery. As noted above, recovery is defined as the improvement in status such that listing is no longer appropriate. Section 4(a)(1) of the ESA requires listing of a species if it is in danger of extinction throughout all or a significant portion of its range (i.e., "endangered"), or likely to become in danger of extinction throughout all or a significant portion of its range in the foreseeable future (i.e., "threatened") because of any of the following five listing factors: (1) the present or threatened destruction, modification, or curtailment of its habitat or range, (2) overutilization for commercial, recreational, scientific, or educational purposes, (3) disease or predation, (4) the inadequacy of existing regulatory mechanisms, (5) other natural or manmade factors affecting its continued existence.

The proposed action is not expected to modify, curtail, or destroy the range of the species since it will result in the annual mortality of zero to three individuals and the PVA indicates that this loss will not cause an appreciable change in the increasing trend of this population and therefore it will not affect the overall distribution of right whales. The proposed action will not utilize right whales for recreational, scientific or commercial purposes or affect the adequacy of existing regulatory mechanisms to protect this species. The loss of these individuals will not change the status or trend of the species, which is increasing and would not result in an appreciable reduction in the likelihood of improvement in the status of right whales throughout their range. The effects of the proposed action will not hasten the extinction timeline or otherwise increase the danger of extinction. Below, we consider effects of the action on the downlisting criteria identified for right whales in the most recent recovery plan.

The goal of the 2005 revised Recovery Plan for North Atlantic Right Whale is to recover North Atlantic right whales to a level sufficient to warrant their removal from the List of Endangered and Threatened Wildlife and Plants under the ESA. The intermediate goal is to reclassify the species from endangered to threatened. The revised Recovery Plan states that North Atlantic right whales may be considered for *reclassifying to threatened* when all of the following have been met: 1) the population ecology (range, distribution, age structure, and gender ratios, etc.) and vital rates (age-specific survival, age-specific reproduction, and lifetime reproductive success) of right whales are indicative of an increasing population; 2) the population has increased for a period of 35 years at an average rate of increase equal to or greater than 2% per year; 3) none of the known threats to North Atlantic right whales (summarized in the five listing factors) are known to limit the population's growth rate; and 4) given current and projected threats and environmental conditions, the right whale population has no more than a 1% chance of quasi-extinction in 100 years.

The revised Recovery Plan for North Atlantic Right Whales states that the most significant need for North Atlantic right whale recovery is to reduce or eliminate deaths and injuries from anthropogenic activities, namely shipping and commercial fishing operations. As described in this Opinion, there are numerous management and regulatory initiatives implemented and underway to meet this need. Several significant management measures have been implemented recently, and their effects would not yet be expected to be seen in the population in terms of an increased population growth rate. Two of the more significant measures designed to reduce the risk from these anthropogenic activities are the implementation of the ALWTRP measures in 2009 (*e.g.*, broad based gear modifications requiring the use of sinking groundlines for gillnet and pot/trap gear) and the Ship Strike Reduction Program, including the 2008 regulations requiring large ships to reduce speeds to 10 knots in areas where right whales feed and reproduce, as well as along migratory routes. Any positive impacts on right whales from these measures would not be observed for some time in the population, and were not assumed in the model developed by Pace (unpublished), nor are they included in the latest stock assessment report (Waring *et al*. 2011). Another significant event that has taken place over the last decade is the reduction in fishing capacity and effort in U.S. Atlantic fisheries. For example, effort in the Northeast multispecies fisheries as a result of Amendment 16 is expected to be reduced by nearly 75% when compared to fishing effort and capacity in the early 1990s (NEFMC 2009). While some fishing effort may increase in the future as fisheries stocks respond to management measures to rebuild them, there are measures in place that will prevent overcapacity from redeveloping (*i.e.*, nearly all U.S. Atlantic commercial fisheries are closed/limited access).

Furthermore, as fish stocks increase, another possible outcome will be increased catches/landings with constant or even reduced fishing effort.

As stated previously, the most recent groundline regulations under the ALWTRP and the ship strike measures have not been in place long enough for there to be an opportunity to detect and evaluate their effect on the population of North Atlantic right whales. Similarly, the projections produced by the PVA conducted by Pace (unpublished), because it uses conditions experienced during the December 1, 1979- November 30, 2005 time period to project forward, do not reflect the effects of these most recent actions.

The threshold of achieving a 2.0% growth rate over a 35 year period is a downlisting and not a recovery threshold. Downlisting criteria identify conditions which when reached indicate that the population is no longer endangered (at risk of extinction) and is more properly classified as threatened (likely to become endangered). The PVA projects a 1.3% population growth and under all scenarios modeled by Pace (unpublished), the North Atlantic right whale is not likely (<50% probability) to move from an endangered status to a threatened status. When one looks at the actual observed growth rate in the population (2.4%), however, the population is increasing at a rate targeted for downlisting (if maintained for 35 years) as identified in the species' recovery plan. It is important to note that the median growth rates (including under the status quo) in Pace (unpublished) are based on model simulations, while the population growth rate of 2.4% in Waring *et al*. (2011) is an observed growth rate in the population. The modeling uses a longer timeframe which incorporates years of poorer calving rates which results in more pessimistic forward projections. Decisions regarding downlisting or delisting would be made on the basis of observed growth rates rather than model projections. As stated previously, the downlisting criterion is a 2% growth rate over 35 years. The observed mean growth rate of 2.4% over a 17 year period (1990 – 2007) indicates that if the status quo continues and this growth rate is maintained, the downlisting criteria will be met. The population appears to be on the correct trajectory to meet the downlisting criteria if the status quo can be maintained. Any improvements in the status quo would increase the population growth and increase the rate of recovery or decrease the time period to recovery.

An additional downlisting criteria states that the right whale population should have no more than a 1% chance of quasi-extinction in 100 years. As stated previously, none of the 1,000 runs of the PVA status quo projections resulted in a prediction of quasi-extinction in 100 years. Therefore, the population currently appears to be meeting this downlisting criteria.

Based on this analysis, the effects of the proposed action will not reduce the likelihood that the status of the species can improve to the point where it is recovered and could be delisted. Therefore, the proposed action will not appreciably reduce the likelihood that right whales can be brought to the point at which they are no longer listed as endangered or threatened.

Another important factor to consider is that both the observed and modeled population growth rates for the status quo do not take into account any benefits to the species as a result of recently implemented regulations to reduce the risk of entanglement from groundlines under the ALWTRP, nor do they consider the benefits from the ship speed regulations. These actions have been implemented, but have not been in place long enough for their full beneficial effect to be realized in the population. It is anticipated that it would take at least five years after implementation to be able to detect any changes in the population as a result of these management measures. The vertical line strategy that is being developed under the ALWTRP, when implemented, would also benefit the population. While the details of the vertical line strategy are still being developed in consultation with the ALWTRT, there is a commitment by NMFS to its implementation within a given time schedule (as described in Section 4.4.5.1). Additionally, fishing effort in the American lobster fishery is expected to be reduced as a result of lobster trap effort control and trap transferability measures approved by the Atlantic States Marine Fisheries Commission and in evaluation by the NMFS (NMFS 2010i).

As described above and as indicated in Pace (unpublished), North Atlantic right whales have a very low risk (zero model projections) of going extinct or reaching quasi extinction over the next 100 years under status quo conditions, including the serious injuries and mortalities caused by U.S. fishing gear. The actual population is increasing at a rate targeted for downlisting (if maintained for 35 years) as identified in the species' recovery plan. The species has persisted and is projected to do so into the future. The projected and observed mean population growth for the past 17 years provides evidence that the species has sufficient resilience to allow for recovery from endangerment. It is important to consider that the action being considered in this Opinion is not new, it is ongoing and the right whale population has been increasing while the lobster fishery has continued to occur and continued to impact right whales. No changes to the fishery are being proposed that would increase the potential for interactions between the fishery and right whales.

Based on the analysis described above, the serious injury or mortality of zero to three right whales per year as a result of fisheries entanglement in U.S. gear over the next ten years is not likely to reduce appreciably the likelihood of both survival and recovery of North Atlantic right whales.

8.1.2 Humpback Whale

As established above, the use of pot/trap gear for the proposed activity is expected to result in the entanglement of humpback whales. An annual average of 0.2 SI/M events of humpbacks in lobster gear has been documented for the period 2005-2009 (NMFS NERO 2012). During that same time period, the average documented SI/M events for humpbacks in all entangling gear were 2.8 annually (NMFS NERO 2012). It should be noted that this database includes a large number of entanglements with undocumented gear types, which may include non-fishery related gear like anchoring systems and mooring gear. Another accounting of serious injury/mortality events for humpback whales from 2005-2009 indicates the annual rate of documented occurrences with all commercial fishing gear types in U.S. waters has been 3.4 (Waring *et al.* 2011). This annual rate as calculated over a five year period has remained relatively stable, with the 2010 assessment being 2.8 (covering 2004-2008), the 2009 assessment being 2.4 (covering 2003-2007), the 2008 assessment being 2.6 (covering 2002-2006) and the 2007 assessment being 2.4 (covering 2001-2005). Levels of interactions with whales prior to 2006 were calculated through a different method, as described in Waring (2009), and therefore are not directly comparable to post-2006 estimates.

Based on the serious injury and mortality data for the past 10 years, we expect to see a range of zero to five humpback whales seriously injured or killed each year as a result of U.S. fishing gear. Because serious injury or mortality could result from the lobster fishery, this Opinion assumes that serious injury or mortality could and would occur as a result of the lobster fishery.

Potential biological removal (PBR) for the Gulf of Maine humpback whale stock is 1.1 whales (Waring *et al.* 2011) which has been consistent in the 2007-2011 stock assessment reports. As indicated above, while the annual average rate of documented serious injury/mortality events for humpback whales attributable to lobster gear is less than PBR (0.2 < 1.1), the overall annual rate of documented serious injury/mortality events with all U.S. commercial fishing gear for humpback whales is 3.4, which exceeds the PBR value of 1.1. The term "potential biological removal level" means the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. It is important to note that optimum sustainable population is a population level that is significantly higher than survival and recovery. The 2011 SAR indicates that the level of serious injuries or mortalities of Gulf of Maine humpback whales attributable to U.S. commercial fisheries is higher than the level necessary to allow for growth to the optimum sustainable population level. However, what we must consider in this Opinion is whether the continued operation of the lobster fishery over the next ten years will result in interactions with humpback whales that will result in serious injuries or mortalities that are likely to appreciably reduce the survival and recovery of the Gulf of Maine stock of humpback whales. If so, then we would have to determine if that appreciable reduction in survival and recovery for the Gulf of Maine stock resulted in an appreciable reduction in survival and recovery for humpback whales, which as previously noted, are listed as a single global species that is endangered throughout its range.

According to the latest final stock assessment report, the best abundance estimate for Gulf of Maine humpback whales was 847 animals, and the minimum population estimate is 549 animals. The Gulf of Maine feeding population is estimated to be increasing at a rate of 6.5% for the period 1979-1991 (Barlow and Clapham, 1997). However, using data from 1992 through 2000, the population showed a lower growth rate of 0-4% (Clapham *et al.* 2003). A more precise estimate was not possible with available data; the lower estimate assumed a calf survival rate of 0.51 and the higher estimate was based on a calf survival rate of 0.875. The authors hypothesized that the apparent decline in growth rate during this later period could have resulted from a shift in humpback whale distribution to areas less sampled, a reduction in adult female survival, increased interbirth intervals or high mortality of first-year whales (such as off the Mid-Atlantic coast (Barco *et al.* 2002; Clapham *et al.* 2003). They considered reduced calf survival to be the most likely explanation and noted an apparent improvement after 1996. A subsequent study confirmed both low average reproductive rates and calf survival during much of that period (Robbins, 2007). The average estimated calf survival rate for the period 2000-2005 (0.664, 95% CI: 0.517-0.784) fell between the values assumed by Clapham *et al*. (2003), and did not include neonatal mortality prior to arrival on the feeding ground (Robbins 2007). Regardless of the cause of lower calf survival between 1992 and 1995, Clapham *et al*. (2003) conclude that calf survival appears to have returned to near-previous levels beginning in 1996 and that it is likely that population growth is now comparable to that observed between 1979 and 1991 (6.5%). Given all of the available data, the 2011 stock assessment concludes that the Gulf of Maine humpback whale stock is steadily increasing in size. It is important to consider that the action being considered in this Opinion is not new, it is ongoing, and the Gulf of Maine humpback stock population has been increasing while the lobster fishery has continued to occur and continued to impact this stock. No changes to the fishery are being proposed that would increase the potential for interactions between the fishery and humpback whales.

The 2011 stock assessment concludes that the North Atlantic population of humpback whales overall had an estimated average population increase of 3.1% over the time period 1979-1993 (Waring *et al*. 2011; Stevich *et al*. 2003). Given that U.S. commercial fishery interactions are not currently threatening the survival of the Gulf of Maine stock of humpback whales, it is logical to conclude that they are not threatening the survival of the overall stock of North Atlantic humpback whales, particularly in light of the increasing population trend.

The 2011 stock assessment concludes that human impacts (vessel collisions and entanglements) may be slowing recovery of humpback whale populations. In this Opinion, we must consider whether impacts associated with fishing authorized under the American Lobster FMP are likely to result in an appreciable reduction in the likelihood of recovery of humpback whales.

The goal of the 1991 Recovery Plan for the Humpback Whale (Plan) is to assist humpback whale populations to grow and to reoccupy areas where they were historically found. The long-term numerical goal of the Plan is to increase humpback whale populations to at least 60% of the number of existing before commercial exploitation or of current environmental carrying capacity. With those levels undetermined, an intermediate goal was specified as a "doubling of extant populations within the next 20 years."

The 1991 Plan used the 1986 population estimate for the Gulf of Maine feeding aggregation of humpback whales, which was 240 (95% CI = 147 to 333) (NMFS 1991b). The most recent best estimate of abundance for Gulf of Maine humpback whales is 847 animals (CV =0.55). The current minimum population estimate is 549 animals (Waring *et al.* 2011). Based on these numbers, it does appear that the Gulf of Maine stock of humpback whales has more than doubled in the 20 years since the 1991 plan was published.

The Recovery Plan for Humpback Whales set out four major objectives to proceed on a path toward recovery. One of the four objectives specifically addresses fishery interactions by identifying the need to, "identify and reduce human-related mortality, injury, and disturbance," to humpback whales. As described in this Opinion, there are numerous management and regulatory initiatives implemented and underway to meet this need. Several significant management measures have been implemented recently, and their effects would not yet be expected to be seen in the population in terms of an increased population growth rate. Two of the more significant measures designed to reduce the risk from these anthropogenic activities are the implementation of the ALWTRP measures in 2009 (*e.g.*, broad based gear modifications requiring the use of sinking groundlines for gillnet and pot/trap gear) and the Ship Strike Reduction Program, including the 2008 regulations requiring large ships to reduce speeds to 10 knots in areas where right whales feed and reproduce, as well as along migratory routes. Any positive impacts on humpback whales from these measures would not be observed for some time in the population, and do not appear in the latest stock assessment report. The vertical line strategy developed under the ALWTRP, when implemented, will also benefit the population. While the details of the vertical line strategy are still being developed in consultation with the ALWTRT, there is a commitment to its implementation within a given time schedule.

As part of a large-scale assessment called More of North Atlantic Humpbacks (MoNAH) project, extensive sampling was conducted on humpbacks in the Gulf of Maine/Scotian Shelf region and the primary wintering ground on Silver Bank during 2004-2005. These data are being analyzed along with additional data from the U.S. Mid-Atlantic to estimate abundance and refine knowledge of population structure. This work is intended to update the YONAH population estimate and is being used in an ongoing status review under the ESA.

Another, significant event that has taken place over the last decade is the reduction in fishing capacity and effort in U.S. Atlantic fisheries. For example, effort in the Northeast multispecies fisheries as a result of Amendment 16 is expected to be reduced by nearly 75% when compared to fishing effort and capacity in the early 1990's (NEFMC 2009). Fishing effort in the American lobster fishery is expected to be reduced as a result of lobster trap effort control and trap transferability measures approved by the Atlantic States Marine Fisheries Commission and in evaluation by the NMFS (NMFS 2010i). While some fishing effort may increase in the future as fisheries stocks respond to management measures to rebuild them, there are measures in place that will prevent overcapacity from redeveloping (*i.e.*, nearly all U.S. Atlantic commercial fisheries are closed/limited access). Furthermore, as fish stocks increase, another possible outcome will be increased catches/landings with constant or even reduced fishing effort.

Specific downlisting criteria for humpback whales have not been developed. However, the estimated increases in the Gulf of Maine stock and the North Atlantic populations of humpback whales indicate that these populations are recovering despite continued interactions with commercial fisheries inside the U.S. EEZ. Additionally, there are indications of increasing abundance for the eastern and central North Pacific stocks (Waring *et al.* 2011) which are not impacted by the action under consideration in this Opinion.

The rate of humpback entanglements in fishing gear continues to be of concern to resource managers. The relatively new broad based gear modifications of the ALWTRP are expected to reduce the risk of SI/M due to humpback whale entanglement. The most recent data indicates the humpback whale population is steadily increasing despite the anthropogenic and cumulative effects previously discussed in this Opinion. While zero to five interactions of humpback whales per year resulting in serious injury or mortality may occur under the continued authorization of the American Lobster FMP over the next ten years, the interaction level is not expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of this species.

8.1.3 Fin and Sei Whales

Serious injury and mortality entanglements of fin and sei whales have been documented but occur at a level below PBR for both species (Waring *et al.* 2011). This indicates that the level of serious injuries or mortalities of fin and sei whales attributable to U.S. commercial fisheries still allows these stocks to maintain population levels and growth rates needed to reach or maintain their optimum sustainable population. Additionally, effort in the American lobster fishery is expected to be reduced, broad based gear modifications of the ALWTRP have been implemented. While interactions with fin and sei whales may occur under the continued authorization of the American Lobster FMP over the next ten years, the interaction level is not expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of these species.

8.1.4 NWA DPS Loggerhead Sea Turtle

The *Northwest Atlantic DPS of loggerhead sea turtles* is listed as "threatened" under the ESA. It takes decades for loggerhead sea turtles to reach maturity. Once they have reached maturity, females typically lay multiple clutches of eggs within a season, but do not typically lay eggs every season (NMFS and USFWS 2008). There are many natural and anthropogenic factors affecting the survival of loggerheads prior to their reaching maturity as well as for those adults who have reached maturity. As described in the Status of the Species/Environmental Baseline and Cumulative Effects sections above, loggerhead sea turtles in the action area continue to be affected by multiple anthropogenic impacts including bycatch in commercial and recreational fisheries, habitat alteration, dredging, power plant intakes and other factors that result in mortality of individuals at all life stages. Negative impacts causing death of various age classes occur both on land and in the water. Many actions have been taken to address known negative impacts to loggerhead sea turtles. However, many remain unaddressed, have not been sufficiently addressed, or have been addressed in some manner but whose success cannot be quantified.

The SEFSC (2009) estimated the number of adult females in the NWA DPS at 30,000, and if a 1:1 adult sex ratio is assumed, the result is 60,000 adults in this DPS. Based on the reviews of nesting data, as well as information on population abundance and trends, NMFS and USFWS determined in the September 2011 listing rule that the NWA DPS should be listed as threatened. They found that an endangered status for the NWA DPS was not warranted given the large size of the nesting population, the overall nesting population remains widespread, the trend for the nesting population appears to be stabilizing, and substantial conservation efforts are underway to address threats.

It is unclear whether nesting beach trends, in-water abundance trends, or some combination of both, best represents the actual status of loggerhead sea turtle populations in the Atlantic. Estimates of the total loggerhead population in the Atlantic are not currently available. However, as part of the Atlantic Marine Assessment Program for Protected Species (AMAPPS), aerial line transect sightings surveys and turtle telemetry studies were conducted along the Atlantic Coast in the summer of 2010. The calculated preliminary regional abundance estimate is about 588,000 loggerheads along the U.S. Atlantic coast, with an inter-quartile range of 382,000-817,000 (NMFS NEFSC 2011). The estimate increases to approximately 801,000 (inter-quartile range of 521,000-1,111,000) when based on known loggerheads and a portion of unidentified turtle sightings. Also, a recent loggerhead population estimate prepared by Richards *et al.* (2011) using data from 2001-2010 states that the loggerhead adult female population in the western North Atlantic is 38,334 individuals (SD =2,287). They estimated adult female subpopulation sizes to range from a minimum of 258 females for the Dry Tortugas RU to a maximum of 45,048 females for the Peninsular Florida RU. Although there is much uncertainty in these population estimates, they provide some context for evaluating the size of the likely population of loggerheads in the Atlantic.

As described above, the use of pot/trap gear in the American lobster fishery is expected to adversely affect loggerhead sea turtles as a result of entanglement in gear. This Opinion has identified in Section 6.2.2 that the proposed activity, continued operation of the fishery under the American Lobster FMP, will directly affect loggerhead sea turtles by entangling up to one loggerhead sea turtle annually in pot/trap gear. As a result of being entangled in the fishing gear, one loggerhead sea turtle annually is expected to die or sustain serious injuries leading to death or failure to reproduce. The trap gear fixed on benthic habitat as a result of the fishing activities will have an insignificant effect on loggerhead sea turtles prey or habitat, as discussed in Section 4.1.1. No other direct or indirect effects to loggerhead sea turtles are expected as a result of the proposed action.

The lethal removal of up to one loggerhead sea turtle annually from the action area would be expected to reduce the number of loggerhead sea turtles from the recovery unit of which they originated as compared to the number of loggerheads that would have been present in the absence of the proposed action (assuming all other variables remained the same). However, this does not necessarily mean that these recovery units will experience reductions in reproduction, numbers or distribution in response to these effects to the extent that survival and recovery would be appreciably reduced. The final revised recovery plan for loggerheads compiled the most recent information on mean number of loggerhead nests and the approximated counts of nesting females per year for four of the five identified recovery units (i.e., nesting groups). They are: (1) for the NRU, a mean of 5,215 loggerhead nests per year with approximately 1,272 females nesting per year; (2) for the PFRU, a mean of 64,513 nests per year with approximately 15,735 females nesting per year; (3) for the DTRU, a mean of 246 nests per year with approximately 60 females nesting per year; and (4) for the NGMRU, a mean of 906 nests per year with approximately 221 females nesting per year. For the GCRU, the only estimate available for the number of loggerhead nests per year is from Quintana Roo, Yucatán, Mexico, where a range of 903-2,331 nests per year was estimated from 1987-2001 (NMFS and USFWS 2007a). There are no annual nest estimates available for the Yucatán since 2001 or for any other regions in the GCRU, nor are there any estimates of the number of nesting females per year for any nesting assemblage in this recovery unit.

It is likely that the loggerhead sea turtles entangled in lobster gear originate from several of the recovery units. Limited information is available on the genetic makeup of sea turtles in the mid-Atlantic. Cohorts from each of the five western Atlantic subpopulations are expected to occur in the action area. Genetic analysis of samples collected from immature loggerhead sea turtles captured in pound nets in the Pamlico-Albemarle Estuarine Complex in North Carolina from September-December of 1995-1997 indicated that cohorts from all five western Atlantic subpopulations were present (Bass et al. 2004). In a separate study, genetic analysis of samples collected from loggerhead sea turtles from Massachusetts to Florida found that all five western Atlantic loggerhead subpopulations were represented (Bowen et al. 2004). Bass et al. (2004) found that 80 percent of the juveniles and sub-adults utilizing the foraging habitat originated from the south Florida nesting population, 12 percent from the northern subpopulation, 6 percent from the Yucatan subpopulation, and 2 percent from other rookeries. The previously defined loggerhead subpopulations do not share the exact delineations of the recovery units identified in the 2008 recovery plan. However, the PFRU encompasses both the south Florida and Florida panhandle subpopulations, the NRU is roughly equivalent to the northern nesting group, the Dry Tortugas subpopulation is equivalent to the DTRU, and the Yucatan subpopulation is included in the GCRU.

Based on the genetic analysis presented in Bass et al. (2004) and the small number of loggerheads from the DTRU or the NGMRU likely to occur in the action area it is extremely unlikely that the loggerhead likely to be killed due to interactions with lobster gear will originate from either of these recovery units. The majority, at least 80% of the loggerheads entangled, are likely to have originated from the PFRU, with the remainder from the NRU and GCRU. As explained above, only one loggerhead mortality is expected to result annually from the continued operation of the lobster fishery over the next ten years. As it is impossible to predict whether this turtle will be from the PFRU, the NRU or the GCRU, NMFS considers below the effects of the annual mortality of one loggerhead from any of the these three recovery units.

As noted above, the most recent population estimates indicate that there are approximately 15,735 females nesting annually in the PFRU and approximately 1,272 females nesting per year in the NRU. For the GCRU, the only estimate available for the number of loggerhead nests per year is from Quintana Roo, Yucatán, Mexico, where a range of 903-2,331 nests per year was estimated from 1987-2001 (NMFS and USFWS 2007a). There are no annual nest estimates available for the Yucatán since 2001 or for any other regions in the GCRU, nor are there any estimates of the number of nesting females per year for any nesting assemblage in this recovery unit; however, the 2008 recovery plan indicates that the Yucatan nesting aggregation has at least 1,000 nesting females annually. As the numbers outlined here are only for nesting females, the total number of loggerhead sea turtles in each recovery unit is likely significantly higher. The loss of one loggerhead represents an extremely small percentage of the number of sea turtles in the PFRU. Even if the total population was limited to 15,735 loggerheads, the loss of one individual would represent approximately 0.006% of the population. Similarly, the loss of one loggerhead from the NRU represents an extremely small percentage of the recovery unit. Even if the total population was limited to 1,272 sea turtles, the loss of one individual would represent approximately 0.08% of the population. The loss of one loggerhead from the GCRU, which is expected to support at least 1,000 nesting females, represents less than 0.1% of the population. The loss of such a small percentage of the individuals from any of these recovery units represents an even smaller percentage of the species as a whole. Assuming that the loggerhead interaction in the fishery is female, and assuming that the interaction is of an adult to assume a worst case scenario as far as reproductive value to the population, the loggerhead mortality as a result of the American lobster fishery would result in the removal of less than 0.01 percent of the adult female loggerhead population in the Western Atlantic (1 out of 38,334, using the estimated adult female population from Richards *et al.* 2011). As such, it is unlikely that the death of one loggerhead sea turtle will have a detectable effect on the numbers and population trends of loggerheads in these recovery units or the number of loggerheads in the population as a whole. Additionally, this action is not likely to reduce distribution of loggerheads because the action will only result in temporary delays for foraging and migrating loggerheads and will not impede any loggerheads from accessing suitable foraging grounds and or disrupt other migratory behaviors.

In general, while the loss of a small number of individuals from a subpopulation or species may have an appreciable reduction on the numbers, reproduction and distribution of the species, this is likely to occur only when there are very few individuals in a population, the individuals occur in a very limited geographic range or the species has extremely low levels of genetic diversity. This situation is not likely in the case of loggerhead sea turtles because: the species is widely geographically distributed, it is not known to have low levels of genetic diversity, and there are several thousand individuals in the population.

Based on the information provided above, the death of no more than one loggerhead sea turtle as a result of the continued operation of the lobster fishery over the next ten years will not appreciably reduce the likelihood of survival (i.e., it will not decrease the likelihood that the species will continue to persist into the future with sufficient resilience to allow for the potential recovery from endangerment). The action will not affect loggerheads in a way that prevents the species from having a sufficient population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring and it will not result in effects to the environment which would prevent loggerheads from completing their entire life cycle, including reproduction, sustenance, and shelter. This is the case because, annually,: (1) the death of one loggerhead represents an extremely small percentage of the species as a whole; (2) the loss of this loggerhead will not change the status or trends of any nesting aggregation, recovery unit or the species as a whole; (3) the loss of one loggerhead is not likely to have an effect on the levels of genetic heterogeneity in the population; (3) the loss of one loggerhead is likely to have an undetectable effect on reproductive output of any nesting aggregation or the species as a whole; and, (4) the action will have no effect on the distribution of loggerheads in the action area or throughout its range; and, (6) the action will have no effect on the ability of loggerheads to shelter and only an insignificant effect on individual foraging loggerheads.

In certain instances an action may not appreciably reduce the likelihood of a species survival (persistence) but may affect its likelihood of recovery or the rate at which recovery is expected to occur. As explained above, NMFS has determined that the proposed action will not appreciably reduce the likelihood that loggerheads will survive in the wild. Here, NMFS considers the potential for the action to reduce the likelihood of recovery. As noted above, recovery is defined as the improvement in status such that listing is no longer appropriate.

Section 4(a)(1) of the ESA requires listing of a species if it is in danger of extinction throughout all or a significant portion of its range (*i.e*., "endangered"), or likely to become in danger of extinction throughout all or a significant portion of its range in the foreseeable future (i.e., "threatened") because of any of the following five listing factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range, (2) overutilization for commercial, recreational, scientific, or educational purposes, (3) disease or predation, (4) the inadequacy of existing regulatory mechanisms, (5) other natural or manmade factors affecting its continued existence.

The proposed action will not appreciably reduce the likelihood of survival of the loggerhead sea turtle species. Also, it is not expected to modify, curtail or destroy the range of the species since it will result in an extremely small reduction in the number of loggerheads in any geographic area and since it will not affect the overall distribution of loggerheads. The proposed action will not utilize loggerheads for recreational, scientific or commercial purposes, affect the adequacy of existing regulatory mechanisms to protect any of these species of sea turtles, or affect their continued existence. As explained above, the proposed action is likely to result in the mortality of up to 1 loggerhead annually; however, as explained above, the loss of this individual over this time period is not expected to affect the persistence of loggerhead sea turtles. In summary, the effects of the proposed action will not hasten the extinction timeline or otherwise increase the danger of extinction; further, the action will not prevent the species from growing in a way that leads to recovery and the action will not change the rate at which recovery can occur. This is the case because while the action may result in a small reduction in the number of loggerheads and a small reduction in the amount of potential reproduction due to the loss of one individual, these effects will be undetectable over the long-term and the action is not expected to have long term impacts on the future growth of the population or its potential for recovery. Therefore, based on the analysis presented above, the proposed action will not appreciably reduce the likelihood that loggerhead sea turtles can be brought to the point at which they are no longer listed as endangered or threatened.

Despite the threats faced by individual loggerhead sea turtles inside and outside of the action area, the proposed action will not increase the vulnerability of individual sea turtles to these additional threats and exposure to ongoing threats will not increase susceptibility to effects related to the proposed action. While NMFS is not able to predict with precision how climate change will continue to impact loggerhead sea turtles in the action area or how the species will adapt to climate-change related environmental impacts, no additional effects related to climate change to loggerhead sea turtles in the action area are anticipated over the life of the proposed action. NMFS has considered the effects of the proposed action in light of cumulative effects explained above, including climate change, and has concluded that even in light of the ongoing impacts of these activities and conditions, the conclusions reached above do not change.

Based on the analysis presented herein, the proposed action, resulting in the mortality of no more than one loggerhead per year over the next ten years, is not likely to appreciably reduce the survival and recovery of the NWA DPS of loggerhead sea turtles.

8.1.5 Leatherback Sea Turtle

Leatherback sea turtles are known to become entangled in lobster trap gear. Between 2002 and 2010 there have been 43 confirmed interactions between leatherbacks and lobster gear. Additionally, during the period 1980-2000 there were 119 reported leatherback sea turtles entangled in lobster trap gear from Maine to New York.

Leatherback sea turtles will continue to be captured, entangled, or hooked by fisheries other than the federal lobster fishery considered in this Opinion. An unknown number of turtles may also be injured or killed from non-fishery related effects such as direct harvest, vessel collisions, or ingestion of debris. Adverse effects to sea turtle habitat, including loss of nesting sites or degradation of nesting or foraging areas, are also expected to continue.

Interactions of leatherback sea turtles in the American lobster fishery are reasonably likely to occur given: (1) that the distribution of leatherbacks overlaps with operation of American lobster fishery, and (2) interactions of leatherback sea turtles lobster trap gear have been observed. Based on STDN data, the capture of leatherback sea turtles in pot gear operating within the action area, including lobster gear, would be an expected event. However, given the lack of observer coverage in the American lobster fishery as well as other fisheries in the action area, it is likely that some interactions have occurred but were not observed or reported. Based on previous estimates and the current leatherback sea turtle entanglement data, NMFS anticipates five leatherback sea turtles interactions per year in federal waters as a result of the continued operation of the American Lobster FMP over the next ten years.

The lethal removal of five leatherback sea turtles annually, whether male or female or immature or mature, would be expected to reduce the number of Atlantic leatherback sea turtles as compared to the number of leatherback sea turtles in the Atlantic that would have been present in the absence of the proposed action assuming all other variables remained the same. The loss of five female leatherback sea turtles annually, would be expected to reduce the reproduction of Atlantic leatherback sea turtles as compared to the reproductive output of leatherback sea turtles in the Atlantic in the absence of the proposed action. The lethal removal of five leatherback sea turtles annually from the Atlantic as a result of the continued operation of the American lobster fishery over the next ten years will not appreciably reduce the likelihood of survival for the species for the following reasons. Unlike leatherbacks in the Pacific, the nesting trend (in terms of number of nests laid) for leatherbacks in the Atlantic is stable or increasing for nearly all Atlantic leatherback nesting sites. The TEWG (2007) report identified seven leatherback populations or groups of populations in the Atlantic: Florida, North Caribbean, Western Caribbean, Southern Caribbean, West Africa, South Africa, and Brazil. The Leatherback TEWG concluded that there was an increasing or stable trend in nesting for all of these with the exception of the Western Caribbean and West Africa. For example, the Florida Statewide Nesting Beach Survey Program has documented an increase in leatherback nesting numbers in that state from 98 in 1988 to between 800 and 900 nests in the early 2000s (NMFS and USFWS 2007b). In 2001, the number of nests for Suriname and French Guiana, the largest known nesting areas for leatherbacks worldwide, was 60,000 (Hilterman and Goverse 2004).

This is one of the highest numbers observed for this region in 35 years (Hilterman and Goverse 2004). A stable trend in nesting suggests that leatherbacks are able to maintain current levels of nesting as well as current numbers of adult females despite the activities described in the *Environmental Baseline*, *Cumulative Effects*, and the *Status of the Species* sections (for those activities that occur outside of the action area of this Opinion). An increasing trend in nesting suggests that the combined impact to Atlantic leatherbacks from these on-going activities is less than what has occurred in the past. The result of which is that more female leatherbacks are maturing and subsequently nesting, and/or are surviving to an older age and producing more nests across their lifetime.

As described in the *Status of the Species* and *Environmental Baseline* sections, action has been taken to reduce anthropogenic effects to Atlantic leatherbacks. These include regulatory measures to reduce the number and severity of leatherback interactions with the two leading known causes of leatherback fishing mortality in the Atlantic: the U.S. Atlantic longline fisheries (measures first implemented in 2000 and subsequently revised) and the U.S. South Atlantic and Gulf of Mexico shrimp fisheries (measures implemented in 2002). Reducing the number of leatherback sea turtles injured and killed as a result of these activities is expected to increase the number of Atlantic leatherbacks, and increase leatherback reproduction in the Atlantic. Since the regulatory measures are relatively recent, it is unlikely that current nesting trends reflect the benefit of these actions to Atlantic leatherbacks. Therefore, the current nesting trends for Atlantic leatherbacks are likely to improve as a result of regulatory action taken for the U.S. Atlantic longline fisheries and the U.S. South Atlantic and Gulf of Mexico shrimp fisheries. There are no new known sources of injury or mortality for leatherback sea turtles in the Atlantic.

Based on the information provided above, the loss of five leatherback sea turtles annually in the Atlantic as a result of the continued operation of the American lobster fishery over the next ten years will not appreciably reduce the likelihood of survival for leatherbacks in the Atlantic given the increased and stable nesting trend at the Atlantic nesting sites, and given measures that reduce the number of Atlantic leatherback sea turtles injured and killed in the Atlantic (which should result in increases to the numbers of leatherbacks in the Atlantic that would otherwise have not occurred in the absence of those regulatory measures). The American lobster fishery has no effects on leatherback sea turtles that occur outside of the Atlantic. Therefore, since the continued operation of the American lobster fishery over the next ten years will not appreciably reduce the likelihood of survival for leatherbacks in the Atlantic, the proposed action will not appreciably reduce the likelihood of survival of the species.

The five-year status review for the species reviewed the recovery criteria provided with the 1992 recovery plan for leatherbacks in the Atlantic, and the progress made in meeting each objective (NMFS and USFWS 2007b). These are: (1) the adult female population increases over the next 25 years as evidenced by a statistically significant trend in the number of nests at Culebra (Puerto Rico), St. Croix (U.S. Virgin Islands), and along the East Coast of Florida; (2) nesting habitat encompassing at least 75% of nesting activity in Puerto Rico, U.S. Virgin Islands, and Florida is in public ownership; and (3) all priority one tasks have been implemented (address a multitude of measures in areas of nesting habitat protection, scientific studies, marine debris, oil and gas exploration, amongst others) (NMFS and USFWS 1992). As described in this Opinion, the continued operation of the American lobster fishery over the next ten years is expected to kill up to five leatherback sea turtles annually. No other effects to leatherbacks are expected as a result of the proposed action. The continued operation of the fishery will not affect ownership of nesting habitat, nor will it affect the protection of nesting beaches and the marine environment or compromise the ability of researchers to conduct scientific studies. Therefore, the continued operation of the American lobster fishery over the next ten years within the constraints of the FMP will have no effect on recovery criteria #2 and #3.

The lethal interaction of up to five leatherback sea turtles with lobster gear annually, as a result of the proposed action is expected to reduce the number of leatherbacks in the Atlantic compared to the number that would have been present in the absence of the proposed action, and will, similarly, reduce leatherback reproduction in the Atlantic as a result of the capture and killing if the leatherbacks are females. These conclusions are relevant to recovery criteria #1 of the 1992 recovery plan for leatherbacks in the Atlantic. As described in the five-year status review, the number of nests counted in Puerto Rico increased from 9 in 1978 to a minimum of 469-882 nests recorded each year from 2000 to 2005. Based on the nesting numbers, the annual female population growth rate was positive for the 28-year time period from 1978 to 2005. In St. Croix, U.S. Virgin Islands, leatherback nesting increased from a low of 143 in 1990 to a high of 1,008 in 2001. Based on the nesting numbers, the annual female population growth rate was positive for the 19-year time period from 1986 to 2004. In Florida, nests have increased from 98 nests in 1989 to 800-900 nests per season in the early 2000s (NMFS and USFWS 2007b). Based on the nesting numbers, the annual female population growth rate was positive for the 18-year time period from 1989-2006 (NMFS and USFWS 2007b). The annual loss of up to five leatherback sea turtles, together with an increase in nesting, is not expected to affect the positive growth rate in the female population of leatherback sea turtles nesting in Puerto Rico, St. Croix, and Florida. Therefore, the continued operation of the American lobster fishery over the next ten years within the constraints of the current American Lobster FMP will not appreciably reduce the likelihood of recovery for leatherback sea turtles in the Atlantic. Since the American lobster fishery has no effects on leatherback sea turtles that occur outside of the Atlantic, its continued operation will not appreciably reduce the likelihood of survival and recovery for the species.

9.0 CONCLUSION

After reviewing the current status of right, humpback, fin, and sei whales as well as loggerhead and leatherback sea turtles, the environmental baseline and cumulative effects in the action area, the effects of the continued operation of the American Lobster FMP over the next ten years, in compliance with the requirements of the ALWTRP, it is NMFS' biological opinion that the proposed activity is likely to adversely affect, but not jeopardize the continued existence of these species.

10.0 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).

When a proposed NMFS action is found to be consistent with section 7(a)(2) of the ESA, section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of incidental taking, if any. It also states that reasonable and prudent measures necessary to minimize impacts of any incidental take be provided along with implementing terms and conditions. The measures described below are non-discretionary and must therefore be undertaken in order for the exemption in section 7(o)(2) to apply. Failure to implement the terms and conditions through enforceable measures, may result in a lapse of the protective coverage section of 7(o)(2).

Anticipated Amount or Extent of Incidental Take

Based on data from STDN, estimates of sea turtle take in trap/pot gear used in the American lobster fishery, and the distribution and abundance of turtles in the action area, NMFS anticipates that the continued implementation of the American Lobster FMP, may result in the taking of sea turtles in federal waters as follows:

- for loggerhead sea turtles, NMFS anticipates the annual lethal or non-lethal take of up to one individual in American lobster pot/trap gear;

- for leatherback sea turtles, NMFS anticipates the annual lethal or non-lethal take of up to five individuals in American lobster pot/trap gear.

NMFS is not including an incidental take authorization for right, humpback, fin, and sei whales at this time because the incidental take of ESA-listed whales has not been authorized under section 101(a)(5) of the MMPA. Following the issuance of such authorizations, NMFS may amend this Opinion to include an incidental take allowance for these species, as appropriate. NMFS recognizes that further efforts among stakeholders are necessary to reduce interactions between authorized federal fisheries and right, humpback, fin, and sei whales in order to achieve the MMPA's goal of insignificant levels of incidental mortality and serious injury of marine mammals approaching a zero mortality and serious injury rate, taking into consideration the economics of the fishing industry, the availability of existing technology, and existing State or regional fishery management plans. NMFS continues to work toward this zero mortality goal of the MMPA through the means identified in the pertinent subsections of section 4.4 above, including continued development and implementation of the ALWTRP with the collaboration of the ALWTRT. Although NMFS has concluded that the American lobster fishery is not likely to jeopardize the continued survival or recovery of right, humpback, fin, and sei whales for purposes of ESA Section 7, the need for further efforts among stakeholders to reduce whale/fishery interactions and achieve the zero mortality goal of the MMPA is not diminished by this no-jeopardy conclusion.

Anticipated Impact of Incidental Take

NMFS has concluded that the continued operation of the American lobster fishery may adversely affect but is not likely to jeopardize loggerhead and leatherback sea turtles. Nevertheless, NMFS must take action to minimize these takes. The following Reasonable and Prudent Measures (RPMs) have been identified as ways to minimize sea turtle interactions with the American lobster fishery now and to generate the information necessary in the future to continue to minimize incidental takes. These measures are non-discretionary and must be implemented by NMFS.

Reasonable and Prudent Measures

NMFS has determined that the following RPMs are necessary or appropriate to minimize impacts of the incidental take of sea turtles in the American lobster fishery:

1. NMFS must seek to ensure that any sea turtles incidentally taken in American lobster fishing gear are handled in such a way as to minimize stress to the animal and increase its survival rate.

2. NMFS must seek to ensure that monitoring and reporting of any sea turtles encountered in American lobster fishing gear: (1) detects any adverse effects such as injury or mortality; (2) assesses the realized level of incidental take in comparison with the anticipated incidental take documented in this Opinion; (3) detects whether the anticipated level of take has occurred or been exceeded; and (4) collects data from individual encounters.

3. NMFS must continue to investigate and implement, within a reasonable time frame following sound research, gear modifications for gear used in the American lobster fishery to reduce incidental takes of sea turtles and/or the severity of the interactions that occur.

4. NMFS must continue to review available data to determine whether there are areas or conditions within the action area where sea turtle interactions with fishing gear used in the American lobster fishery are more likely to occur.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, and regulations issued pursuant to section 4(d), NMFS must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

1. To comply with RPM #1 above, NMFS must distribute information to federal American lobster permit holders specifying handling or resuscitation requirements fishermen must undertake for any sea turtles taken. At a minimum, handling and resuscitation requirements listed in 50 CFR 223.206(d)(1) must be implemented. NMFS must also

distribute the NER STDN Disentanglement Guidelines to federal American lobster permit holders. Use of the sea turtle handling and release protocols described in Epperly *et al*. (2004) and NMFS SEFSC (2008) should also be considered. Implementation of these requirements must continue to occur when updates to methods become available.

2. To also comply with RPM #1 above, NMFS must develop and distribute training materials for commercial fishermen in the use of any sea turtle release equipment and/or sea turtle handling protocols and guidelines implemented. Such training materials would be able to be brought on board fishing vessels and accessed upon incidental capture (*e.g.* CD that could be used in on-board computer, placard, etc.).

3. To comply with RPM #2 above, NMFS must continue to use entanglement reports, observer reports, and any other information available to it, to monitor the incidental take of sea turtles in the federal American lobster fishery. Along with the NER STDN Disentanglement Guidelines, NMFS must also distribute the sea turtle entanglement reporting requirements to permit holders that use trap/pot gear.

4. To also comply with RPM #2 above, NMFS must require that disentanglement responders collect detailed information on the gear involved in entanglements, and submit all information on the gear to NMFS. NMFS must evaluate the gear information regarding entanglements, and produce an annual report on the entanglements that were reported in the previous year.

5. To also comply with RPM #2 above, NMFS must continue to implement sea turtle serious injury criteria for fisheries in the NE Region in order to better assess and evaluate injuries sustained by sea turtles in fishing gear, and their potential impact on sea turtle populations.

6. Bycatch estimates must be combined with quantitative stock assessments to provide improved understanding of how listed species are adversely affected by estimated bycatch levels. Thus, to also comply with RPM #2 above, NMFS must improve its quantitative stock assessment of incidentally caught species. A sufficient quantitative stock assessment includes, but is not limited to, an integrative modeling framework for quantitative stock assessment and the necessary fishery independent data needed to support such assessments. Progress towards this goal must be reported annually.

7. To comply with RPM #3 above, NMFS must continue to investigate modifications of trap/pot gear and its effects on sea turtles through research and development, as resources allow. Within a reasonable amount of time following completion of an experimental gear trial from or by any source, NMFS must review all data collected from the experimental gear trials, determine the next appropriate course of action (*e.g.,* expanded gear testing, further gear modification, rulemaking to require the gear modification), and initiate action based on the determination.

8. To comply with RPM #4 above, NMFS must continue to review all data available on the observed/documented take of sea turtles in trap/pot fisheries and other suitable information (*i.e.,* data on observed sea turtle interactions for other fisheries, vertical line density information, sea turtle distribution information, or fishery surveys in the area where the lobster fishery operates) to assess whether there is sufficient information to undertake any additional analysis to attempt to identify correlations with environmental conditions or other drivers of incidental take within some or all of the action area. If such additional analysis is deemed appropriate, within a reasonable amount of time after completing the review, NMFS will take appropriate action to reduce sea turtle interactions and/or their impacts.

Monitoring

NMFS must continue to monitor levels of sea turtle bycatch in the American lobster fishery. Entanglement reports have been used as the principal means to estimate sea turtle bycatch in the American lobster fishery and to monitor incidental take levels. NMFS will continue to use entanglement reports to monitor sea turtle bycatch in commercial trap/pot gear that catches American lobster as a target species. NMFS should also continue to support NEFOP's development of a video monitoring pilot project to evaluate its utility for various fishing gear types including trap/pot. If video monitoring proves to be a feasible supplement to observer coverage, the utility of video in identifying sea turtle bycatch events should be investigated. In the future, video could potentially be used to evaluate compliance with VTR requirements for incidentally taken sea turtles.

For the purposes of monitoring this ITS, NMFS will continue to use STDN data as the primary means of collecting incidental take information. NMFS will re-estimate takes annually in the American lobster fishery using all available and up to date STDN entanglement data. Using these data, NMFS will determine if the annual incidental take level in this Opinion has been met or exceeded.

Large Whale Monitoring

NMFS will continue to monitor levels of large whale entanglement in the American lobster fishery. Serious injury determinations and stock assessment reports have been used as the principal means to estimate the large whale entanglement rate in the American lobster fishery and to monitor SI/M levels. NMFS has recently developed a monitoring strategy for the ALWTRP and will produce an annual report stating the most up-to-date SI/M five year rolling average. To provide the most up-to-date rolling average possible, the five year average will consist of the most recently available year's data from the annual SI/M report averaged with the previous 4 years of data obtained from the U.S. Atlantic and Gulf of Mexico Marine Mammal SAR. Analyzing the data in this way will reduce the two year lag associated with using SAR estimates alone by one year.

For the purposes of monitoring large whale SI/M, NMFS will use the serious injury determination reports, SARs, and the ALWTRP monitoring reports to collect entanglement information. NMFS will re-examine SI/M annually in the American lobster fishery. Using these data, NMFS will determine if the annual SI/M is significantly different than what was evaluated in this Opinion.

11.0 CONSERVATION RECOMMENDATIONS

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

1. NMFS should continue to collect and analyze biological samples from sea turtles incidentally taken in fishing gear targeting lobster to determine the nesting origin of sea turtles taken in the lobster fishery in order to better assess the effects of the fishery on nesting groups and recovery units and address those effects accordingly. NMFS should review its policies/protocols for the processing of genetics samples to determine what can be done to improve the efficiency and speed for obtaining results of genetic samples taken from all incidentally taken sea turtles.

2. NMFS should establish a protocol for bringing to shore any sea turtle incidentally taken in American lobster fishing gear that is fresh dead, that dies on the vessel shortly after the gear is retrieved, or dies following attempts at resuscitation in accordance with the regulations. Such protocol should include the steps to be taken to ensure that the carcass can be safely and properly stored on the vessel and properly transferred to appropriate personnel for examination. The protocol should also identify the purpose for examining the carcass and the samples to be collected. Port samplers and observers should also be trained in the protocols for notification of the appropriate personnel in the event that a vessel comes into port with a sea turtle carcass.

3. NMFS should work with states to promote the permitting of activities (*e.g.*, state permitted fisheries, state agency in-water surveys) that are known to incidentally take ESA-listed species.

4. NMFS should support studies on seasonal ESA-listed species distribution and abundance in the action area, behavioral studies to improve our understanding of ESA-listed species interactions with fishing gear, and foraging studies including prey abundance/distribution studies (which may influence distribution), as well as studies and analysis necessary to develop population estimates for sea turtles.

5. NMFS should continue to monitor and evaluate the effectiveness of the ALWTRP, particularly the impacts of the broad based gear requirements implemented in 2008 and

2009, as well as the implementation of the vertical line strategy. As part of the monitoring plan for the ALWTRP, NMFS' goal should be to detect a change in the frequency of entanglements and/or serious injuries and mortalities associated with entanglements. Metrics to consider in detecting this change could include: observed time lapses between detected large whale entanglements, known large whale serious injuries and mortalities due to entanglement, and analysis of whale scarring data.

6. NMFS should continue to undertake and support aerial surveys, passive acoustic monitoring, and the Sighting Advisory System.

7. NMFS should continue to develop and implement measures to reduce the risk of ship strikes of large whales.

8. NMFS should continue to undertake and support disentanglement activities, in coordination with the states, other members of the disentanglement and stranding network, and with Canada.

9. NMFS should continue to cooperate with the Canadian government to compare research findings and facilitate implementation in both countries of the most promising risk-reduction practices for large whales and sea turtles.

12.0 REINITIATING CONSULTATION

This concludes formal consultation on the continued operation of the American lobster fishery as it operates under the American Lobster FMP. 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, NERO must immediately request reinitiation of formal consultation.

In addition, re-initiation will be required if NMFS determines that in any given calendar year following the release of this biological opinion one or more of the following has occurred as a result of U.S. federal fisheries and in gear used or possibly used under this FMP: (1) more than three mortalities or serious injuries of North Atlantic right whales; or (2) more than five mortalities or serious injuries of humpback whales; or (3) more than three mortalities or serious injuries of fin whales; and/or (4) more than two mortalities or serious injuries of sei whales.

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