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Ms. Carolita U. Kallaur
United States Department of Interior
Minerals Management Service
Washington, DC 20240

Dear Ms. Kallaur:

This constitutes the National Marine Fisheries Service's (NMFS) biological opinion (Opinion) based on our review of the Minerals Management Service's (MMS) proposed Gulf of Mexico Outer Continental Shelf Lease Sale 181 and its effects on loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), green *(Chelonia mydas)*, leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) sea turtles, the Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and the sperm whale (*Physeter macrocephalus*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973,
as amended. Your October 19, 2000, request for formal consultation was received on November 2, 2000. The NMFS consultation number for this action is F/SER/2000/01298; if you have any questions about this consultation please refer to this number.

This Opinion is based on information provided in the October 19, 2000, draft environmental impact statement received on November 2, 2000, for the proposed Gulf of Mexico Outer Continental Shelf Lease Sale 181. A complete administrative record of this consultation is on file here at the NMFS Southeast Regional Office.

We look forward to further cooperation with you on other MMS projects to ensure the conservation and recovery of our threatened and endangered marine species.

Sincerely,

Joseph E. Powers Ph.D.
Acting Regional Administrator

Enclosure

cc: F/PR3
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File: 1514-22.O.4a

**Endangered Species Act - Section 7 Consultation**

**Agency**: United States Department of the Interior Minerals Management Service

**Activity**: Gulf of Mexico Outer Continental Shelf Lease Sale 181 (F/SER/2000/01298)

**Consultation Conducted By**: National Marine Fisheries Service, Southeast Region

**Date Issued**: ___________________________

**Approved by**: ___________________________
Joseph E. Powers, Ph.D.
Acting Regional Administrator
Southeast Regional Office
National Marine Fisheries Service

This constitutes the National Marine Fisheries Services (NMFS) biological opinion (Opinion) based on our review of the Minerals Management Service's (MMS) proposed Gulf of Mexico Outer Continental Shelf Lease Sale 181 and its effects on loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), green *(Chelonia mydas)*, leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) sea turtles, the Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and the sperm whale (*Physeter macrocephalus*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended. Your October 19, 2000, request for formal consultation was received on November 2, 2000. The NMFS consultation number for this action is F/SER/2000/01298; if you have any questions about this consultation please refer to this number.

This Opinion is based on information provided in the October 19, 2000, draft environmental impact statement received on November 2, 2000, for the proposed Gulf of Mexico (GOM) Outer Continental Shelf (OCS) Lease Sale 181. A complete administrative record of this consultation is on file at NMFS' Southeast Regional Office.

***Consultation History***

Section 7 consultations between MMS and NMFS regarding the impact of the GOM OCS oil and gas lease sales have been conducted since 1979, when a biological opinion on the effects of lease sales on listed species in the Southeast Region was issued. The opinion and subsequent consultations on annual lease sales considered only the impacts of the lease sales themselves. A consultation was conducted in 1987 to consider the effects of other actions associated with and resulting from lease sales, including exploration, development and non-explosive decommissioning. The consultation concluded with a biological opinion issued on November 2, 1987, that found that OCS oil and gas activities had the potential to adversely affect listed marine species. The scarcity of basic information on listed species in the Gulf of Mexico, however, precluded a full assessment of the possible impacts, although they were thought to be minimal. No incidental take was authorized.

Formal consultations on lease sales conducted after 1987 have concluded that there was no new information to change the basis for the conclusions of the 1987 regional biological opinion; these consultations did, however, identify data needs regarding the distribution, abundance, and status of marine mammals and sea turtles in the Gulf of Mexico. In an effort to gather needed data MMS and NMFS have engaged in cooperative research since 1989, conducting aerial and vessel surveys to assess the distribution and abundance of cetaceans and sea turtles in the Gulf of Mexico. In May 1997, MMS asked NMFS to conduct a formal consultation, pursuant to Section 7(a)(2), on the GOM OCS Oil and Gas Lease Sales in the central planning area for lease sale 169, 172, 175, 178, and 182, which are planned for April 1998, 1999, 2000, 2001 and 2002, respectively. Consultation on the western GOM multi-year oil and gas lease sales, including sales 171, 174, 177, and 180, which are planned for August 1998, 1999, 2000, and 2001, respectively, was requested in September 1997. Draft environmental impact statements (DEIS) and an associated Oil Spill Risk Analysis were also submitted for NMFS review during this time period. These documents along with the new information gathered since 1989 led NMFS to issue a biological opinion dated January 1998 that determined these lease sales would lead to the incidental take of 25 sea turtles and one Gulf sturgeon and would not jeopardize the continued existance of any of these species.

To date there have been no formal consultations under section 7 of the ESA completed for lease sales in the eastern GOM planning zone; however, the development of Destin Dome Unit 56, which is in the eastern GOM planning zone, has been consulted on formally. This consultation looked at all of the aspects of the development of the area for natural gas and their effects on listed species. This consultation concluded in a biological opinion that determined that the development of Destin Dome Unit 56 for natural gas was not likely to jeopardize the continued exsistance of ESA protected species under NMFS purview.

MMS requested formal consultation under section 7 of the ESA for the proposed GOM OCS lease sale 181 in the eastern GOM planning zone with a letter and DEIS dated October 19, 2000. NMFS received this request on November 2, 2000 and considers it a complete initiation package. The biological opinion below is based, in part, on information contained in the DEIS received on November 2, 2000, for the proposed GOM OCS lease sale 181 and information gathered as part of NMFS=s formal consultation on the development of Destin Dome Unit 56.

## Biological Opinion

### I. Proposed Action

A complete description of the proposed actions can be found in the DEIS prepared by MMS and submitted to NMFS on October 19, 2000, for the proposed GOM OCS lease sale 181 in the eastern GOM planning area.

The GOM constitutes one of the world=s major oil and gas producing areas, and has proved a steady and reliable source of crude oil and natural gas for more than 50 years. MMS is the administrative agency that is responsible for the mineral leasing of submerged lands outside of state waters. The agency is also charged with the supervision of offshore operations after leases have been issued. Each year, MMS holds oil and gas lease sales for blocks within planning areas on the GOM OCS. Each sale offers for lease all the unleased blocks within the planning areas. Only a small percentage of the blocks are expected to be leased, and only a portion of those leased are likely to be drilled and to support production.

The proposed lease sale is scheduled for December 2001. This sale will offer for lease 1,033 blocks in the eastern GOM OCS planning area. The proposed lease area includes about 5.949 million acres located 15 to 200 miles offshore of Florida and Alabama in water depths ranging from 13 to 11,237 feet. The estimated amounts of resources projected to be developed as a result of this proposed sale range from 0.03 to 0.24 billion barrels of oil and .053 to 1.80 trillion cubic feet of natural gas.

MMS is responsible for regulating and monitoring all oil and gas operations in the Federal OCS; therefore, this consultation considers the impacts of all activities associated with exploration, development, and production of oil and gas as a result of this proposed sale. Abandonment and subsequent removal of oil and gas structures in the Gulf is also considered except for the removal of structures using explosives. Explosive rig removals have been considered under a separate consultation. The following overview, provided by the MMS= OCS Region, describes the regulations and programs implemented by MMS to ensure that operations resulting from the proposed lease sale are orderly, safe, and pollution-free. Specifically, these programs reduce the risk of oil spill occurrence and provide requirements that will mitigate impacts should an oil spill occur.

Proposed oil and gas operations must meet or exceed the safety standards set by MMS. Regulations for oil, gas, and sulphur lease operations on the OCS are specified in 30 CFR 250. Regulations for geological and geophysical exploration operations on the OCS are specified in 30 CFR 251.

To ensure OCS activities are conducted in a safe manner and to promote the prevention of oil spills and air pollution, MMS requires the use of the Best Available and Safest Technology (BAST), as required by the Outer Continental Shelf Lands Act. This includes requirements for state-of-the-art drilling technology, production safety systems, completion of oil and gas wells, oil-spill contingency plans, pollution-control equipment, and specifications for platform/structure designs.

MMS does a technical and safety review of all proposed platform designs and installation procedures. The operator must design, fabricate, install, use, inspect, and maintain all platforms and structures on the OCS to assure their structural integrity for the safe conduct of operations at specific locations. Production safety equipment used on the OCS must be designed, installed, used, maintained, and tested in a manner to assure the safety and protection of the human, marine, and coastal environments. All tubing installations open to hydrocarbon-bearing zones below the surface must be equipped with safety devices that will shut off the flow from the well in the event of an emergency, unless the well is incapable of flowing. All surface production facilities must be designed, installed, and maintained in a manner that provides for efficiency, safety of operations, and protection of the environment.

Notice to Lessees (NTL) issued by MMS requires operators to submit, for early technical and safety review by MMS, a Deepwater Operations Plan (DWOP) for all operations in deepwater and all projects using subsea technology. The DWOP requirement was established to address the different functional requirements of equipment in deepwater, particularly the safety system requirements associated with subsea development systems, and the complexities and unique types of fixed and floating production facilities. The DWOP allows MMS and industry to identify very early in the plan review process any potential issues specific to deep water operations.

Several regulations require a departure or alternative compliance approval to permit development operations to proceed in deepwater areas of the Gulf. For MMS to grant alternative compliance approvals, the operator must demonstrate an equivalent or improved degree of safety. A departure can be granted when necessary if the operator can demonstrate that an acceptable level of safety exists. The MMS safety, technical, and engineering review of departure requests can involve risk assessment and a review of hazards analyses.

MMS evaluates the design and fabrication of pipelines. Operators are required to periodically inspect pipeline routes using methods prescribed by the MMS for any indication of pipeline leakage. Monthly over-flights are conducted to inspect pipeline routes for leakage.

The Oil Pollution Act (OPA) of 1990 requires removal of spilled oil and establishes a national system for planning for and responding to oil-spill incidents. MMS responsibilities include spill prevention, oil-spill contingency plans, oil-spill containment and clean-up equipment, financial responsibility certification, and civil penalties. MMS regulations require that all owners and operators of oil handling, storage, or transportation facilities located seaward of the coastline submit an Oil-Spill Response Plan (OSRP) for approval before an owner/operator can use a facility. Owners or operators of offshore pipelines are required to submit a plan for any pipeline that carries oil, condensate that has been injected into the pipeline, or gas and naturally occurring condensate; pipelines carrying essentially dry gas do not require a plan. To continue operations, the facility must be operated in compliance with the approved plan. All MMS-approved OSRP's are required to be reviewed and updated every two years.

The Gulf of Mexico has received "Special Area" status under MARPOL, thereby prohibiting the disposal of all solid waste into the marine environment. Fixed and floating platforms, drilling rigs, manned production platforms, and support vessels operating under a Federal oil and gas lease are required to develop Waste Management Plans and to post placards reflecting discharge limitations and restrictions. MMS regulations explicitly prohibit the disposal of equipment, cables, chains, containers, or other materials into offshore waters. Portable equipment, spools or reels, drums, pallets, and other loose items weighing 18 kg or more must be marked in a durable manner with the owner's name prior to use or transport over offshore waters. Smaller objects must be stored in a marked container when not in use.

MMS established regulations at 30 CFR 250 to comply with the Clean Air Act. Regulated pollutants include carbon monoxide, particulates, sulphur dioxide, nitrogen oxides, hydrogen sulfide, and volatile organic compounds (as a precursor to ozone). These regulations allow the collection of information about potential sources of pollution for the purpose of determining whether the projected emissions of air pollutants from the facility may result in onshore ambient air concentrations above significance levels provided in the regulations and appropriate emission controls as deemed necessary to prevent accidents and air quality deterioration. MMS issued an NTL titled AHydrogen Sulfide ($H_2S$) Requirements≅ to provide guidance on sensor location, sensor calibration, respirator breathing time, measures for protection against sulfur dioxide, requirements for classifying an area for the presence of $H_2S$, requirements for flaring and venting of gas containing $H_2S$, and other issues pertaining to $H_2S$-related operations.

Under MMS operating regulations and lease agreements, all lessees must remove objects and obstructions upon termination of a lease. Lessees must ensure all objects related to their activities were removed following termination of their lease.

MMS conducts onsite inspections to assure compliance with lease terms, NTL's, and approved plans, and to ensure that safety and pollution-prevention requirements of regulations are met. These inspections involve items of safety and environmental concern. If an operator is found in violation of a safety or environmental requirement, a citation is issued requiring that it be fixed within 7 days.

The primary objective of initial inspections is to ensure proper installation of mobile units or structures and associated equipment. After operations begin, additional announced and unannounced inspections are conducted. Unannounced inspections are conducted to foster a climate of safe operations, to maintain an MMS presence, and to focus on operators with a poor performance record. They are also conducted after a critical safety feature has previously been found defective. Annual inspections are conducted on all platforms, but more frequent inspections may be conducted on rigs and platforms. On-board inspections involve the inspection of all safety systems of a production platform. MMS is cooperating with the U.S. Environmental Protection Agency (USEPA) in monitoring compliance with more restrictive water pollution controls, and MMS inspectors have assumed new duties in collecting water samples from offshore platforms and performing more visual inspections for discharged effluents.

Proper training of personnel is essential to ensure that offshore oil and gas operations are carried out in a manner that emphasizes operational safety and minimizes the risk of environmental damage. All operators must have trained personnel to operate oil-spill cleanup equipment or must retain a trained contractor(s) to operate the equipment for them. The Drilling Well-Control Training Program was instituted by MMS in 1979. In 1983, the Safety Device Training Program was established to ensure that personnel involved in installing, inspecting, testing, and maintaining safety devices are qualified.

**Action area**

The immediate action area for this sale will be the 1,033 blocks in the eastern GOM OCS planning area offered for lease. The proposed lease area includes about 5.949 million acres located 15 to 200 miles offshore of Florida and Alabama in water depths ranging from 13 to 11,237 feet (see map at attachment 1). Additionally, there will be numerous support facilities throughout the GOM that are also part of the action area (see map, attachment 2).

## II. Status of Listed Species and Critical Habitat

The following listed species under the jurisdiction of NMFS are known to occur in the GOM and may be affected by the proposed action:

*Endangered*

| | |
|---|---|
| Sperm Whale | *Physeter macrocephalus* |
| Green turtle[1] | *Chelonia mydas* |
| Leatherback turtle | *Dermochelys coriacea* |
| Hawksbill turtle | *Eretmochelys imbricata* |
| Kemp's ridley turtle | *Lepidochelys kempii* |

*Threatened*

| | |
|---|---|
| Loggerhead turtle | *Caretta caretta* |
| Gulf sturgeon | *Acipenser oxyrinchus desotoi* |

Endangered whales, including northern Atlantic right whales (*Eubalaena glacialis*) and humpback whales (*Megaptera novaeangliae*), have been observed occasionally in the GOM. The individuals observed have likely been inexperienced juveniles straying from the normal range of these stocks. Since NMFS does not believe that there are resident stocks of these species in the GOM, the potential for interaction between any of

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

the proposed project=s activities and northern Atlantic right whales or humpback whales is extremely low. Based on the above, NMFS has determined that these species are not likely to be adversely affected by the proposed action.

No critical habitat for listed species under the jurisdiction of NMFS has been designated in the GOM.

**Sperm Whale** ***(Physeter macrocephalus)***

*Listing Status*

Sperm whales have been protected from commercial harvest by the International Whaling Commission (IWC) since 1981, although the Japanese continued to harvest sperm whales in the North Pacific until 1988 (Reeves and Whitehead 1997). Sperm whales were listed as endangered under the ESA in 1973. They are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the Marine Mammal Protection Act of 1972. Critical habitat has not been designated for sperm whales.

*Species Description and General Information*

Sperm whales are the largest of the odontocetes (or toothed whales). Males reach a length of 18.3 m, with females reaching lengths of up to 12.2 m (Odell 1992). Sperm whales have huge, blunt, squarish heads comprising 25 to 35% of their total body length (Würsig *et al.* 2000). They are a uniform dark grey in color; the upper lips and lower jaw (except the ventral region) are white. There are often also light blotches on the undersurface of the body.

Sperm whales are distributed in all of the world=s oceans. For the purposes of management, the IWC defines four stocks: the North Pacific, the North Atlantic, the Northern Indian Ocean, and Southern Hemisphere. However, Dufault=s (1999) review of the current knowledge of sperm whales indicates no clear picture of the worldwide stock structure of sperm whales. In general, females and immature sperm whales appear to be restricted in range, whereas males are found over a wider range and appear to make occasional movements across and between ocean basins (Dufault 1999).

Females and juveniles form pods that are restricted mainly to tropical and temperate latitudes (between 50°N and 50°S) while the solitary adult males can be found at higher latitudes (between 75°N and 75°S) (Reeves and Whitehead, 1997). In the western North Atlantic they range from Greenland to the Gulf of Mexico and the Caribbean.

*Life History Information and Social Behavior*

Sperm whale populations are often organized into 2 types of groupings: breeding schools and bachelor schools. Older males are often solitary (Best 1979). Breeding schools consist of females of all ages and males up through the juvenile phase.
Female sperm whales attain sexual maturity at the mean age of 8 or 9 years and a length of about 9 m (Kasuya 1991, as cited in Perry *et al.* 1999, Würsig *et al.* 2000). The mature females ovulate April through August in the Northern Hemisphere. During this season one or more large mature bulls temporarily join each breeding school. A single calf is born at a length of about 4 meters, after a 15-16 month gestation period. Calves are nursed for 2 -3 years (in some cases, up to 13 years); the calving interval is estimated to be about 4 to 7 years (Kasuya 1991, Würsig *et al.* 2000).

Males have a prolonged puberty and attain sexual maturity at between age 12 and 20, and a body length of 12 m, but may require another 10 years to become large enough to successfully compete for breeding rights (Kasuya 1991, Würsig *et al.* 2000). Bachelor schools consist of maturing males who leave the breeding school and aggregate in loose groups of about 40 animals. As the males grow older they separate from the bachelor schools and remain solitary most of the year (Best 1979).

Sperm whales exhibit alloparental guarding of young at the surface (Whitehead 1996b), and alloparental nursing (Reeves and Whitehead 1997).

The age distribution of the sperm whale population is unknown, but they are believed to live at least 60 years (Rice 1978). Estimated annual mortality rates of sperm whales are thought to vary by age, but previous estimates of mortality rate for juveniles and adults are now considered unreliable (IWC 1980, as cited in Perry *et al.* 1999). Potential sources of natural mortality in sperm whales include killer whales and the papilloma virus (Lambertson *et al.* 1987).

*Abundance and Status in the Gulf of Mexico*

There has been speculation, based on a year-round occurrence of strandings, opportunistic sightings and whaling catches, that sperm whales in the Gulf of Mexico may constitute a distinct stock (Schmidley, 1981; Fritts 1983; and Hansen *et al.* 1995 as cited in Perry *et al.* 1999), and indeed, they are treated as such in NMFS= Marine Mammal Stock Assessment Report (Waring *et al.*, 2000). Seasonal aerial surveys have confirmed that sperm whales are present in the northern Gulf of Mexico in all seasons, but sightings are more common during summer (Mullin *et al.* 1991; Davis *et al.*, in prep.) and fall (Mullin *et al.* 1994).

Sperm whale sightings recorded from the National Oceanic and Atmospheric Administration (NOAA) vessel Oregon II from 1991 - 1997 are concentrated just beyond the 100 m depth contour in the northern Gulf of Mexico, east of the Mississippi River Delta. Recent studies conducted jointly by researchers from NMFS and Texas A&M indicate that these waters are an important area for Gulf sperm whales. In fact, researchers with Texas A & M believe that the area should be considered as critical habitat for sperm whales (R. Davis, pers. comm.), as it is the only known breeding and calving area in the Gulf, for what is believed to be an endemic population.

The Gulf of Mexico sperm whale stock is estimated at 530 sperm whales, calculated from an average of estimates from 1991-1994 surveys (Waring *et al.* 2000). The minimum population estimate ($N_{min}$), is 411 sperm whales (Waring *et al.* 2000). The estimate of $N_{min}$ is calculated as the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate (or the equivalent of the 20$^{th}$ percentile of the log-normal distributed abundance estimate as specified by NMFS (Anon. 1994). $N_{min}$ is a required component of the PBR (Potential Biological Removal level) calculation as required under the MMPA. The estimated PBR for the Gulf sperm whale stock is 0.8 sperm whales. PBR is an estimate of the number of animals which can be removed (in addition to natural mortality) annually from a marine mammal population or stock while maintaining that stock at OSP (optimum sustainable population level) or without causing the population or stock to slow its recovery to OSP by more than 10%. Stock size is considered to be low relative to OSP; there is no trend in population size discernable from estimates of abundance over time (Waring *et al.* 2000 and references within).

Sperm whales are the most abundant large cetacean in the Gulf of Mexico, and represent the most important Gulf cetacean in terms of collective biomass. These whales were once hunted in Gulf waters.

According to Würsig *et al.* (2000), sperm whales south of the Mississippi River Delta apparently concentrate their movements to stay in or near variable areas of upwelling, or cold-core rings. Presumably this is due to the greater productivity inherent in such areas, which would provide concentrated sources of forage species for these great whales. The continental margin in the north-central Gulf is only 20 km wide at its narrowest point, and the ocean floor descends quickly along the continental slope, reaching a depth of 1,000 m within 40 km of the coast. This unique area of the Gulf of Mexico brings deepwater organisms within the influence of coastal fisheries, contaminants, and other human impacts on the entire northern Gulf. Low salinity, nutrient-rich water occurs over the continental shelf and slope near the mouth of the Mississippi River. This creates a deepwater environment with locally enhanced primary and secondary productivity, and may explain the presence of sperm whales in the area (Davis *et al.* 1998).

*Diving Behavior*

Sperm whales are noted for their ability to make prolonged, deep dives, and are likely the deepest and longest diving mammal. Typical foraging dives last 40 minutes and descend to about 400m, followed by approximately 8 minutes of resting at the surface (Gordon 1987; Papastavrou *et al.* 1989). However, dives of over 2 hr and deeper than 3.3 km have been recorded (Clarke 1976; Watkins *et al.* 1985 and Watkins *et al.* 1993). Descent rates recorded from echo-sounders were approximately 1.7m/sec and nearly vertical (Goold and Jones 1995). There are no data on diurnal differences in dive depths in sperm whales. However, like most diving vertebrates for which there are data (e.g., rorqual whales, fur seals, chinstrap penguins), sperm whales probably make relatively shallow dives at night when deep scattering layer organisms move towards the surface.

*Habitat and Food Preferences*

Sperm whales generally occur in waters greater than 180 meters in depth. While they may be encountered almost anywhere on the high seas, their distribution shows a preference for continental margins, sea mounts, and areas of upwelling, where food is abundant (Leatherwood and Reeves 1983). Waring *et al.* (1993) suggests sperm whale distribution in the Atlantic is closely correlated with the Gulf Stream edge. Like swordfish, which feed on similar prey, sperm whales migrate to higher latitudes during summer months, when they are concentrated east and northeast of Cape Hatteras. Bull sperm whales migrate much farther poleward than the cows, calves, and young males. Because most of the breeding herds are confined almost exclusively to warmer waters, many of the larger mature males return in the winter to the lower latitudes to breed. It is not known whether Gulf sperm whales exhibit similar seasonal movement patterns. Their presence in the Gulf is year-round; although it is not known whether this holds true for males of reproductive age.

Deepwater is their typical habitat, but sperm whales also occur in coastal waters at times (Scott and Sadove, 1997). When found relatively close to shore, sperm whales are usually associated with sharp increases in bottom depth where upwelling occurs and biological production is high, implying the presence of a good food supply (Clarke, 1956).

Sperm whales feed primarily on medium to large-sized mesopelagic squids *Architeuthis* and *Moroteuthis*. They also take significant quantities of large demersal and mesopelagic sharks, skates, and bony fishes, especially mature males in higher latitudes (Clarke 1962, 1980). Postulated feeding/hunting methods include lying suspended and relatively motionless near the ocean floor and ambushing prey; attracting squid and other prey with bioluminescent mouths; or stunning prey with ultrasonic sounds (Würsig, 2000). Sperm whales occasionally drown after becoming entangled in deep-sea cables that wrap around their lower jaw, and odd objects (*e.g.*, stones, rubber boots, buckets, and boards) have been found in their stomachs, suggesting these animals may at times cruise the ocean floor with open mouths (Würsig *et al.* 2000, Rice 1989). As stomach contents reveal little evidence that lower jaw and teeth are used to grasp or chew prey, it has been speculated that sperm whales may ingest food with a sucking motion of the tongue or may hunt by using intensely focused and projected sound to stun prey (Norris and Mohl 1983, and Berzin 1971, as cited in Norris and Mohl 1983, Würsig *et al.* 2000).

*Vocalizations and Hearing*

Sperm whales produce loud broad-band clicks from about 0.1 to 20 kHz (Weilgart and Whitehead 1993, 1997; Goold and Jones 1995). These clicks have source levels estimated at 171 dB (Levenson 1974). Current evidence suggests that the disproportionately large head of the sperm whale is an adaptation to produce these vocalizations (Norris and Harvey 1972; Cranford 1992; but see Clarke 1979). This suggests that the production of these loud low frequency clicks is extremely important to the survival of individual sperm whales. The function of these vocalizations is relatively well-studied (Weilgart and Whitehead 1993, 1997; Goold and Jones 1995). Long series of monotonous, regularly spaced clicks are associated with feeding and are thought to be produced for echolocation. Distinctive, short, patterned series of clicks, called codas, are associated with social behavior and intragroup interactions. They are thought to be for intra-specific communication, perhaps to maintain social cohesion with the group (Weilgart and Whitehead 1993). Groups of closely related females and their offspring have group-specific dialects (Weilgart and Whitehead 1997).

Most odontocetes apparently use whistle vocalization as "signature calls" to convey information about the specific identity of the sender. Sperm whales may use clicks rather than whistles for echolocation as well as for signature calls, and unique stereotyped click sequence "codas" have been recorded from individual whales over periods lasting several hours (Mullins *et al.* 1988; Watkins and Schevill, 1977b; Adler-Fenchel, 1980; Watkins *et al.* 1985b). According to Weilgart and Whitehead (1988), sperm whale clicks may convey information about the age, sex, and reproductive status of the sender.

A recent study indicates that sperm whale clicks may have a wider dB range than previously believed. Clicks recorded off the coast of Norway in 1997 and 1998, an area thought to be utilized by adult foraging males, were measured for directionality and sound levels. The recorded sound levels for sperm whale clicks exceeded 220 dB. The results of these studies are 40 to 50 dB higher than the sound levels previously recognized for this species (Møhl *et al.* 2000). Sperm whale clicks range from <100 Hz to 30 kHz, with most energy at 2-4 kHz and 10-16 kHz. Clicks are repeated at rates of 1-90 per second (Backus and Schevill, 1966; Watkins and Schevill, 1977b; Watkins *et al.* 1985a).

The only data on the hearing range of sperm whales are evoked potentials from a stranded neonate (Carder and Ridgway 1990). These data suggest that neonatal sperm whales respond to sounds from 2.5-60 kHz. Sperm whales have been observed to frequently stop echolocating in the presence of underwater pulses made by echosounders and submarine sonar (Watkins and Schevill 1975; Watkins *et al.* 1985). They also stop vocalizing for brief periods when codas are being produced by other individuals, perhaps because they can hear better when not vocalizing themselves (Goold and Jones 1995). Sperm whales have moved out of areas after the start of air-gun seismic testing (Davis *et al.* 1995).

Because they spend large amounts of time at depth and use low frequency sound, sperm whales are likely to be vulnerable to any negative effects of low frequency sound in the ocean (Croll *et al.* 1999). Even though sperm whales are abundant on a world-wide scale (Reeves and Whitehead 1997), because their potential rate of reproduction is so low and because those found in the Gulf of Mexico are believed to be a small (Nmin = 411) resident stock, even small negative impacts of noise resulting from activities associated with the proposed action could cause population declines. Furthermore, because of their role as important predators of mesopelagic squid and fish, changes in their abundance could affect the distribution and abundance of other marine species.

*Impacts of Human Activity on the Species*

The sperm whale was listed as endangered under the ESA in 1973. The primary factor for the species= decline, that precipitated ESA listing, was commercial whaling. Sperm whales were hunted in America from the 17th century through the early 1900s, but the exact number of whales harvested in the commercial fishery is not known (Townsend 1935). The IWC estimates that nearly a quarter-million sperm whales were killed worldwide in whaling activities between 1800 and 1900 (IWC 1969). With the advent of modern whaling the larger rorqual whales were targeted. However, as their numbers decreased greater attention was paid to smaller rorquals and sperm whales. From 1910 to 1982 there were nearly 700,000 sperm whales killed worldwide from whaling activities (IWC Committee for Whaling Statistics 1959-1983). Since the ban on nearly all hunting of sperm whales, there has been little evidence that human-induced mortality or injury is significantly affecting the recovery of sperm whale stocks (Perry *et al.* 1999; Waring *et al.* 1997; Blaylock *et al.* 1995). NMFS believes there are insufficient data to determine population trends for this species (Waring *et al.* 1999).

Few instances of injury or mortality of sperm whales due to human impacts have been recorded in U.S. waters. Sperm whales typically inhabit waters further offshore than most U.S. commercial fisheries operate. Documented takes primarily involve offshore fisheries such as the offshore lobster pot fishery and pelagic driftnet and longline fisheries. Sperm whales have learned to depredate sablefish from longline gear in the Gulf of Alaska and toothfish from longline operations in the south Atlantic Ocean. No direct injury or mortality has been recorded during hauling operations, but lines have had to be cut when whales were caught on them (Ashford and Martin 1996). Sperm whales are also struck by ships; although no information is available on recent confirmed cases in U.S. waters. Due to the offshore distribution of this species, interactions that do occur are less likely to be reported than those involving right, humpback, and fin whales occurring in nearshore areas.

Because of their generally more offshore distribution and their benthic feeding habits, sperm whales are less subject to entanglement than are right or humpback whales. Sperm whales have been taken in the pelagic drift gillnet fishery for swordfish, and could likewise be taken in the shark drift gillnet fishery on occasions when they may occur more nearshore, although this likely does not occur often. Although no interaction between sperm whales and longlines have been recorded in the U.S. Atlantic, as noted above, such interactions have been documented elsewhere.

Preliminary data for 2000 indicate that of 10 sperm whales reported to the U.S. stranding network (9 dead and 1 injured) there was 1 possible fishery interaction, 1 ship strike (wounded with bleeding gash on side) and 8 animals for which no signs of entanglement or injury were sighted or reported. No sperm whales have stranded or been reported to the stranding network to date in 2001.

**Kemp=s Ridley Turtle (*Lepidochelys kempii*)**

Of the seven extant species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. The Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) (USFWS and NMFS 1992b) contains a description of the natural history, taxonomy, and distribution of the Kemp's ridley turtle. Kemp=s ridleys nest in daytime aggregations known as arribadas, primarily at Rancho Nuevo, a stretch of beach in Mexico. Most of the population of adult females nest in this single locality (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the early 1970s, the world population estimate of mature female Kemp's ridleys had been reduced to 2,500-5,000 individuals. The population declined further through the mid-1980s. Recent observations of increased nesting suggest that the decline in the ridley population has stopped and there is cautious optimism that the population is now increasing.

The nearshore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile Kemp's ridley and loggerhead sea turtles. Ogren (1988) suggests that the Gulf coast, from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern Gulf of Mexico. Stomach contents of Kemp's ridleys along the lower Texas coast consisted of a predominance of nearshore crabs and mollusks, as well as fish, shrimp and other foods considered to be shrimp fishery discards (Shaver 1991). Analyses of stomach contents from sea turtles stranded on upper Texas beaches apparently suggest similar nearshore foraging behavior (Plotkin pers. comm.).

Research being conducted by Texas A&M University has resulted in the intentional live-capture of hundreds of Kemp=s ridleys at Sabine Pass and the entrance to Galveston Bay. Between 1989 and 1993, 50 of the Kemp's ridleys captured were tracked (using satellite and radio telemetry) by biologists with the NMFS Galveston Laboratory. The tracking study was designed to characterize sea turtle habitat and to identify small and large scale migration patterns. Preliminary analysis of the data collected during these studies suggests that subadult Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud, NMFS Galveston Laboratory, pers. comm.).

In recent years, unprecedented numbers of Kemp's ridley carcasses have been reported from Texas and Louisiana beaches during periods of high levels of shrimping effort. NMFS established a team of population biologists, sea turtle scientists, and managers, known as the Turtle Expert Working Group (TEWG) to conduct a status assessment of sea turtle populations. Analyses conducted by the group have indicated that the Kemp=s ridley population is in the early stages of recovery; however, strandings in some years have increased at rates higher than the rate of increase in the Kemp=s population (TEWG 1998). While many of the stranded turtles observed in recent years in Texas and Louisiana are believed to have been incidentally taken in the shrimp fishery, other sources of mortality exist in these waters. These stranding events illustrate the vulnerability of Kemp's ridley and loggerhead turtles to the impacts of human activities in nearshore Gulf of Mexico waters.

The TEWG (1998) developed a population model to evaluate trends in the Kemp=s ridley population through the application of empirical data and life history parameter estimates chosen by the TEWG. Model results identified three trends in benthic immature Kemp=s ridleys. Benthic immatures are those turtles that are not yet reproductively mature but have recruited to feed in the nearshore benthic environment, where they are available to nearshore mortality sources that often result in strandings. Benthic immature ridleys are estimated to be 2-9 years of age and 20-60 cm in length. Increased production of hatchlings from the nesting beach beginning in 1966 resulted in an increase in benthic ridleys that leveled off in the late 1970s. A second period of increase followed by leveling occurred between 1978 and 1989 as hatchling production was further enhanced by the cooperative program between the U.S. Fish and Wildlife Service and Mexico=s Instituto Nacional de Pesca to increase the nest protection and relocation program in 1978. A third period of steady increase, which has not leveled off to date, has occurred since 1990 and appears to be due to the greatly increased hatchling production and an apparent increase in survival rates of immature turtles beginning in 1990, due in part to the introduction of turtle excluder devices (TEDs). Adult ridley numbers have now grown from a low of approximately 1,050 adults producing 702 nests in 1985, to greater than 3,000 adults producing 1,940 nests in 1995, to greater than 9,000 adults producing about 5,700 nests in 2000.

The TEWG (1998) was unable to estimate the total population size and current mortality rates for the Kemp=s ridley population. However, the TEWG listed a number of preliminary conclusions. The TEWG indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Over the period 1987 to 1995, the rate of increase in the annual number of nests accelerated in a trend that would continue with enhanced hatchling production and the use of TEDs. Nesting data indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and a low of 702 nests in 1985. Thus, the trajectory of adult abundance tracks trends in nest abundance from an estimate of 9,600 in 1966 to 1,050 in 1985. The TEWG estimated that in 1995 there were 3,000 adult ridleys. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6% to 28% from 1981 to 1989 and from 23% to 41% from 1990 to 1994. The population model in the TEWG projected that Kemp=s ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2020 if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. It determined that the data reviewed suggested that adult Kemp's ridley turtles were restricted somewhat to the Gulf of Mexico in shallow near shore waters, and benthic immature turtles of 20-60 cm straight line carapace length are found in nearshore coastal waters including estuaries of the Gulf of Mexico and the Atlantic.

The TEWG (1998) identified an average Kemp=s ridley population growth rate of 13% per year between 1991 and 1995. Total nest numbers have continued to increase. However, the 1996 and 1997 nest numbers reflected a slower rate of growth, while the increase in the 1998 nesting level was much higher, then decreased in 1999, and increased again strongly in 2000. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular internesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable.

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

***Loggerhead Turtle (Caretta caretta)***

Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans and are the most abundant species of sea turtle occurring in U.S. waters. Loggerhead sea turtles concentrate their nesting in the north and south temperate zones and subtropics, but generally avoid nesting in tropical areas of Central America, northern South America, and the Old World (Magnuson *et al.* 1990). The two largest known nesting aggregation of loggerhead sea turtles occurs on Masirah and Kuria Muria Islands in Oman and the aggregation of nesting loggerheads occurring in the southeast U.S. The loggerhead nesting aggregation on Masirah Island is estimated at a minimum of 30,000 nesting females each year. This is the only large nesting colony of loggerheads in Oman and is the largest known aggregation of this species in the world (Ross and Barwani 1982).

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the gulf coast of Florida. The Turtle Expert Working Group (1998, 2000) recognized at least 4 genetically distinct loggerhead nesting subpopulations in the western North Atlantic and southeastern U.S. and suggested that they be considered independent demographically, consistent with the definition of a distinct vertebrate population segment (59 FR 65884-65885, December 21, 1994; 61 FR 4722-4725 February 7, 1996) and of a management unit (NMFS SEFSC 2001, Part I). A 5th subpopulation was identified in NMFS SEFSC 2001. Although NMFS has not completed the administrative processes necessary to formally recognize populations or subpopulations of loggerhead sea turtles, these sea turtles are generally grouped by their nesting locations. This is also consistent with recovery criteria which are separated state by state. Based on the most recent reviews of the best scientific data on the population genetics of loggerhead sea turtles and analyses of their population trends (TEWG 1998, 2000; NMFS SEFSC 2001, Part I), NMFS treats these genetically distinct loggerhead turtle nesting aggregations as distinct subpopulations whose survival and recovery is critical to the survival and recovery of the species.

The subpopulations are divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida at about $29^o$ N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from $29^o$ N on the east coast to Sarasota on the west coast (approximately 83,400 nests in 1998); (3) a Florida panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida (approximately 1,200 nests in 1998); (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez 1990) (approximately 1,000 nests in 1998) (TEWG 2000, Table 11); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (approximately 200 nests per year) (NMFS SEFSC 2001, Part I).

The importance of maintaining these subpopulations in the wild is shown by the many examples of extirpated nesting assemblages in the world. Natal homing to the nesting beach provides the genetic barrier between these subpopulations, preventing recolonization with turtles from other nesting beaches. Recent fine-scale analysis of mtDNA work from Florida rookeries indicate that population separations begin to appear between nesting beaches separated by more than 100 km of coastline that does not host nesting (Francisco *et al.* 2000); and tagging studies are consistent with this result (Richardson 1982, Ehrhart 1979, LeBuff 1990, CMTTP). Nest site relocations greater than 100 km occur, but generally are rare ( Ehrhart 1979; LeBuff 1974, 1990; CMTTP; Bjorndal *et al.* 1983).
The loggerhead sea turtles in the action area are likely to represent differing proportions of these 5 Western North Atlantic subpopulations, as well as unidentified subpopulations from the eastern Atlantic. This Opinion considers these subpopulations for the analysis, with particular emphasis on the northern subpopulation of loggerhead sea turtles. The continental shelf areas of the U.S. Atlantic and Gulf of Mexico include foraging habitat for benthic animals. Although the northern subpopulation produces about 9% of the loggerhead nests, it comprises more of the loggerhead sea turtles found in foraging areas from the northeastern U.S. to Georgia. Between 24% and 46% of the loggerhead sea turtles in this area are from the northern subpopulation (NMFS SEFSC 2001; Bass *et al.* 1999, 1998; Norrgard, 1995; Rankin-Baransky, 1997; Sears 1994, Sears *et al.* 1995). In the Carolinas, the northern subpopulation is estimated to make up from 25% to 28% of the loggerheads (NMFS SEFSC 2001; Bass *et al.* 1999, 1998). About 10% of the loggerhead sea turtles in foraging areas off the Atlantic coast of central Florida are from the northern subpopulation (Witzell *et al.* in review). In the Gulf of Mexico, most of the loggerhead sea turtles in foraging areas are from the South Florida subpopulation, although the northern subpopulation may represent about 10% of the loggerhead sea turtles in the western gulf (Bass *et al.* 1999).

Loggerheads reported captured in the pelagic longline fishery in the open ocean are mostly pelagic juveniles, although the size range does overlap pelagic stages with small benthic juveniles. (NMFS SEFSC 2001). Recent studies have suggested that not all loggerhead sea turtles follow the model of circumnavigating the North Atlantic Gyre as pelagic immatures, followed by permanent settlement into benthic environments.

Some may not totally circumnavigate the north Atlantic. Some of these turtles may either remain in the pelagic habitat in the north Atlantic longer than hypothesized or they may move back and forth between pelagic and coastal habitats (Witzell in prep.). Laurent *et al.* (1998) proposed that between the strict oceanic pelagic stage and the benthic stages, immature turtles may live through an immature coastal stage in which they switch between pelagic and benthic foods and habitats. Also, some animals in the open ocean are probably adults, as they are known to make migrations between foraging grounds and nesting beaches across open ocean waters and benthic juveniles have been reported to migrate well offshore seasonally (Epperly *et al.* 1995, Shoop and Kenney 1992, Mullin and Hoggard 2000).

In the Mediterranean Sea, about 45 - 47% of the pelagic loggerheads are from the western Atlantic subpopulations, including 2% from the northern subpopulation, while the remainder originated from the Mediterranean nesting beaches (Laurent *et al.* 1998). In the vicinity of the Azores and Madeira Archipelagoes, about 17-19% of the pelagic loggerheads are from the northern subpopulation, about 71-72% are from the South Florida subpopulation, and about 10-11% are from the Yucatán subpopulation (Bolten *et al*. 1998). The turtles from the Azores samples were dipnetted from the ocean's surface and represent a mixture of pelagic animals. The SEFSC report notes that these animals are smaller than those taken on pelagic longlines; although, if there is no sorting in the pelagic environment based on natal origin then these smaller animals still represent the same genetic mix that might be found in the larger animals. Consequently, these results can be applied to animals caught by the U.S. longline fleet in the North Atlantic, *i.e*, 19% of turtles taken would be expected to be from the northern subpopulation.

Loggerhead sea turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years. However, as noted above, studies have suggested that some of these turtles may either remain in the pelagic habitat in the north Atlantic longer than hypothesized or they may move back and forth between pelagic and coastal habitats (Witzell in prep.). Turtles in this life history stage are called Apelagic immatures≅ and are best known from the eastern Atlantic near the Azores and Madeira and have been reported from the Mediterranean as well as the eastern Caribbean (Bjorndal *et al.* in press). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they recruit to coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico.

Benthic immature loggerheads, the life stage following the pelagic immature stage, have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico (R. Márquez-M., pers. comm.). Large benthic immature loggerheads (70-91 cm) represent a larger proportion of the strandings and in-water captures (Schroeder *et al.* 1998) along the south and western coasts of Florida as compared with the rest of the coast, which could indicate that the larger animals are either more abundant in these areas or just more abundant within the area relative to the smaller turtles. Benthic immature loggerheads foraging in northeastern U.S. waters are known to migrate southward in the fall as water temperatures cool (Epperly *et al.* 1995; Keinath 1993; Morreale and Standora 1999; Shoop and Kenney 1992), and migrate northward in spring. Past literature gave an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985; Frazer *et al.* 1994) and the benthic immature stage as lasting at least 10-25 years. However, NMFS SEFSC (2001) reviewed the literature and constructed growth curves from new data, estimating ages of maturity among the 4 models ranging from 20-38 years and benthic immature stage lengths from 14-32 years.

Adult loggerhead sea turtles have been reported throughout the range of this species in the U.S. and throughout the Caribbean Sea. As discussed in the beginning of this section, they nest primarily from North Carolina southward to Florida with additional nesting assemblages in the Florida Panhandle and on the Yucatán Peninsula. Non-nesting, adult female loggerheads are reported throughout the U.S. and Caribbean Sea; however, little is known about the distribution of adult males who are seasonally abundant near nesting beaches during the nesting season. Aerial surveys suggest that loggerheads (benthic immatures and adults) in U.S. waters are distributed in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

Based on the data available, it is difficult to estimate the size of the loggerhead sea turtle population in the U.S. or its territorial waters. There is, however, general agreement that the number of nesting females provides a useful index of the species= population size and stability at
this life stage. Nesting data collected on index nesting beaches in the U.S. from 1989-1998 represent the best data set available to index the population size of loggerhead sea turtles. However, an important caveat for population trends analysis based on nesting beach data is that this may reflect trends in adult nesting females but not reflect overall population growth rates. Given this caveat, between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,014 to 92,182 annually, with a mean of 73,751.

Since a female often lays multiple nests in any one season, the average adult female population of 44,970 was calculated using the equation [(nests/4.1) * 2.5]. These data provide an annual estimate of the number of nests laid per year while indirectly estimating both the number of females nesting in a particular year (based on an average of 4.1 nests per nesting female; Murphy and Hopkins (1984)) and of the number of adult females in the entire population (based on an average remigration interval of 2.5 years; Richardson *et al.*, 1978)). On average, 90.7% of these nests were of from the south Florida subpopulation, 8.5% were from the northern subpopulation, and 0.8% were from the Florida Panhandle nest sites. There is limited nesting throughout the Gulf of Mexico west of Florida, but it is not known to which subpopulation the turtles making these nests belong. The number of nests in the northern subpopulation from 1989 to 1998 was 4,370 to 7,887, with a 10-year mean of 6,247 nests. With each female producing an average of 4.1 nests in a nesting season, the average number of nesting females per year in the northern subpopulation was 1,524. Assuming an average remigration rate of 2.5 years, the total nesting and non-nesting adult female population is estimated as 3,810 adult females in the northern subpopulation (TEWG, 1998, 2000).

The status of this northern population based on number of loggerhead nests has been classified as stable or declining (TEWG 2000). Another consideration adding to the vulnerability of the northern subpopulation is that NMFS scientists estimate, using genetics data from Texas, South Carolina, and North Carolina in combination with juvenile sex ratios from those states, that the northern subpopulation produces 65% males, while the south Florida subpopulation is estimated to produce 80% females (NMFS SEFSC 2001, Part I).

The NMFS SEFSC report (2001) summarizes trend analyses for number of nests sampled from beaches for the northern subpopulation and the Florida subpopulation and concluded that from 1978-1990, the northern subpopulation has been stable at best and possibly declining (less than 5% per year). From 1990 to the present, the number of nests has been increasing at 2.8-2.9% annually; however, there are confidence intervals about these estimates that include no growth (0%). Over the same time frame, the Florida numbers are 5.3-5.4% per year over 1978-1990, and since 1990, 3.9-4.2%.

From a global perspective, the southeastern U.S. nesting aggregation is an important component of this species. It is second in size only to the nesting aggregations in the Arabian Sea off Oman and represents about 35 and 40 % of the nests of this species. The status of the Oman nesting beaches has not been evaluated recently, but they are located in a part of the world that is vulnerable to extremely disruptive events (*e.g.*, political upheavals, wars, and catastrophic oil spills). The resulting risk facing this nesting aggregation and these nesting beaches is cause for considerable concern (Meylan *et al.* 1995).

*Status and Trends*

The most recent work regarding status and trends of loggerhead sea turtles is NMFS SEFSC (2001), which is incorporated herein by reference.

There is general agreement that the number of nesting females provides a useful index of the species= population size and stability at this life stage, even though there are uncertainties in estimating the overall population size. Nesting data collected on index nesting beaches in the U.S. from 1989-1998 represent the best data set available to index the population size of loggerhead sea turtles. However, an important caveat for population trends analysis based on nesting beach data is that this may reflect trends in adult nesting females but not overall population growth rates. Adult nesting females often account for less than 1% of total population numbers (NMFS SEFSC 2001).

The recovery plan for this species (NMFS and USFWS 1991) states that southeastern U.S. loggerheads can be considered for delisting if, over a period of 25 years, adult female populations in Florida are increasing and there is a return to pre-listing annual nest numbers of 800 in North Carolina, 10,000 in South Carolina, and 2,000 in Georgia. This equates to approximately 3,100 nesting females per year at 4.1 nests per female per season and a total population of about 7,800 adult females, with a 2.5 year remigration rate. Earlier, this Opinion provided estimates of the size of the adult female northern subpopulation of loggerheads (comprising females nesting from Amelia Island, Volusia County, Florida northward), based on nesting data from 1989-1998, at 3,810 adult females. In other words, at this gross level of analysis, levels of nesting and population sizes in the northern subpopulation may be slightly less than half of the recovery plan goals. Per its stated recovery goal, the nesting Florida subpopulation is increasing.
The TEWG (1998, 2000) concluded that the nesting trend for the northern subpopulation of loggerheads is stable or declining. The meta-analysis described in NMFS SEFSC 2001 report, however, suggests that, after 1989, the nesting activity for the northern subpopulation was increasing 2.8 to 2.9% per year but there are confidence intervals around these estimates that include no growth (0%). (The south Florida subpopulation is increasing 3.9 to 4.2% per year.) However, NMFS SEFSC (2001) cautions that Ait is an unweighted analysis and does not consider the beaches= relative contribution to the total nesting activity of the subpopulation and must be interpreted with some caution.≅ For example, South Carolina accounts for over half the total northen subpopulation nesting, and decreases in South Carolina nesting strongly affected the conclusions of TEWG (1998, 2000). In the meta-analysis, however, only a single South Carolina beach was used; and, although it has annual nestings of around 1,000, the proportional change in nesting at that beach was given equal weight to proportional changes at beaches with around 10 nests per year. Furthermore, although the analysis was limited to data from beaches where the effort was believed to have been relatively constant over time, this assumption of consistent effort may not always be true.

Several published reports have discussed the problems facing long-lived species that delay sexual maturity (Crowder *et al.* 1994). In general, these reports concluded that animals that delay sexual maturity and reproduction must have high, annual survival as juveniles through adults to ensure that enough juveniles survive to reproductive maturity and then reproduce enough times to maintain stable population sizes. This general concept can be applied to sea turtles, as shown in several studies (Crouse *et al.* 1987, Crowder *et al.* 1994, Crouse 1999). However, this would mean it would be equally long periods of time before benefits from protection would also be seen; the long benthic juvenile stages (24 and 33 years in models) means a long time before these are translated into increasing numbers of nesting females on the beach. Heppell *et al.* (in press.) specifically showed that the growth of the loggerhead sea turtle population was particularly sensitive to changes in the annual survival of both juvenile and adult sea turtles and that the adverse effects of the pelagic longline fishery on loggerheads from the pelagic immature phase appeared critical to the survival and recovery of the species. Crouse (1999) concluded that relatively small changes in annual survival rates of both juvenile and adult loggerhead sea turtles will adversely affect large segments of the total loggerhead sea turtle population. NMFS SEFSC (2001) concludes that juvenile stages have the highest elasticity and maintaining or decreasing current sources of mortality in those stages will have the greatest impact on maintaining or increasing population growth rates.

*Threats from Natural Causes*

Loggerhead sea turtles face numerous threats from natural causes. The 5 known subpopulations of loggerhead sea turtles in the northwest Atlantic and southeast U.S. are subject to fluctuations in the number of young produced annually because of natural phenomena, such as hurricanes, as well as human-related activities. There is a significant overlap between hurricane seasons in the Caribbean Sea and northwest Atlantic Ocean (June to November) and the loggerhead sea turtle nesting season (March to November). Hurricanes can have potentially disastrous effects on the survival of eggs in sea turtle nests. In 1992, Hurricane Andrew affected turtle nests over a 90-mile length of coastal Florida. All of the eggs were destroyed by storm surges on beaches that were closest to the eye of this hurricane (Milton *et al.* 1992). On Fisher Island near Miami, Florida, 69 % of the eggs did not hatch after Hurricane Andrew, probably because they were drowned by the storm surge. Nests from the northern subpopulation were destroyed by hurricanes which made landfall in North Carolina in the mid to late 1990s. Sand accretion and rainfall that result from these storms can appreciably reduce hatchling success. These natural phenomena probably have significant, adverse effects on the size of specific year classes, particularly given the increasing frequency and intensity of hurricanes in the Caribbean Sea and northwest Atlantic Ocean.

*Threats from Human Activities*

Some anthropogenic mortality that contributed to loggerhead declines, prior to listing under the ESA in 1978, have been mitigated over the years. These and other undocumented factors may be responsible for potentially increasing trends in nesting females seen since 1990 that appear in the NMFS SEFSC (2001) meta analysis for the northern subpopulation of loggerheads. For example, direct takes of eggs and nesting females were prohibited and actions were taken in state waters to close fisheries for various reasons (*e.g.,* sturgeon fisheries using large mesh gillnets in S. C., Florida prohibition on entangling nets). A summary of recent stranding trends provided in NMFS SEFSC (2001) notes that from 1998-2000, strandings decreased in traditionally high stranding zones on the Atlantic coast but doubled to historic levels along the southern Florida Gulf Coast and in the Florida keys, possibly due to a persistent red tide.

A number of anthropogenic impacts were identified by NRC (1990) and NMFS & USFWS (1991) for loggerhead sea turtles, but baseline analysis is complicated by the fact that these impacts (other than drowning in bottom trawls) are largely unquantified. The known sources of impact were included in NMFS SEFSC (2001) Appendix 2. These fall into several categories that impact sea turtles both domestically and internationally: trawl fisheries, gillnet fisheries, hook and line fisheries, pelagic longline fisheries, pound nets, fish traps, lobster pots, whelk pots, long haul seines and channel nets, as well as non-fishery impacts such as power plants, marine pollution including marine debris, and direct harvest of eggs and adults in foreign countries, oil and gas exploration, development, and transportation, underwater explosions, dredging, offshore artificial lighting, marina and dock construction and operation; boat collisions, and poaching. On their nesting beaches in the U.S., loggerhead sea turtles are threatened with beach erosion, armoring, and renourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; exotic dune and beach vegetation; predation by species such as fire ants, raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), opossums (*Didelphus virginiana*); and poaching. Some of these threats are discussed in more detail below. A more thorough description of anthropogenic mortality sources is provided in the TEWG reports (1998, 2000) and in NMFS SEFSC (2001).

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 and probably cause fluctuations in sea turtle nesting success. Volusia County, Florida, for example, allows motor vehicles to drive on sea turtle nesting beaches (the County has filed suit against the USFWS to retain this right) and sea turtle nesting in Indian River, Martin, West Palm, and Broward counties of Florida can be affected by beach armoring, beach renourishment, beach cleaning, artificial lighting, predation, and poaching.

The survival of juvenile loggerhead sea turtles is threatened by a completely different set of threats from human activity once they migrate to the ocean. A proportion of the pelagic immature loggerhead sea turtles from the western Atlantic circumnavigate the North Atlantic over several years (Carr 1987, Bjorndal 1994). During that period, they are exposed to a series of longline fisheries. The U.S. is only 1 of 23 countries fishing in the Atlantic Ocean and Mediterranean Sea with pelagic longlines from 1990-1997 (Carocci and Majowski 1998). Most of the foreign high seas fisheries in the Atlantic are similar to the U.S. in number of fishing days and miles of line per day, with some exceptions, such as the Mediterranean fleet which fishes smaller vessels, once per night and close to shore (NMFS SEFSC 2001). In the North Atlantic, the U.S. fleet was roughly 4-8 times more efficient (proportion catch/proportion hooks) than the other fleets at catching swordfish and 2-3 times more efficient at catching tunas.

Loggerheads are primarily exposed to these fleets in the pelagic juvenile stage. According to observer records, an estimated 7,891 loggerhead sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992-1999, of which 66 were discarded dead ( NMFS SEFSC 2001). However, the U.S. fleet accounts for a small proportion (5-8%) of the hooks fished in the Atlantic Ocean compared to other nations, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People's Republic of China, Grenada, Canada, Belize, France, and Ireland (Carocci and Majkowski 1998). Reports of incidental takes of turtles are incomplete for many of these nations (see NMFS SEFSC 2001, Part II, Chapter 5, p. 162 for a complete description of take records). For example, bottom set lines in the coastal waters of Madeira, Portugal, are reported to take an estimated 500 pelagic immature loggerheads each year (Dellinger and Encarnacao 2000). Based on their proportional distribution, the capture of immature loggerhead sea turtles in longline fleets in the Azores and Madeira Archipelagoes and the Mediterranean Sea will have a significant, adverse effect on the annual survival rates of juvenile loggerhead sea turtles from the western Atlantic subpopulations. Considerably more loggerheads than leatherbacks are taken in the Mediterranean Sea. Another example is the Mexican fishery in the Gulf of Mexico which incidentally captures 5 turtles per 100 trips with mortality estimated at 1.6 turtles per 100 trips. Adding up the under-represented observed takes per country per year of 23 actively fishing countries likely results in an estimate of thousands of animals annually over different life stages.

In waters off the coastal U.S., the survival of juvenile loggerhead sea turtles is affected by a suite of fisheries in federal and state waters (see *Effects of the Action*, Section 4). Loggerhead turtles are captured, injured, or killed in shrimp fisheries off the Atlantic coast; along the southeastern Atlantic coast, loggerhead turtle populations were declining in the presence of shrimp fishing off the nesting beaches, before the required use of TEDs (Magnuson *et al.* 1990). Conversely, these nesting populations did not appear to be declining where nearshore shrimping effort is low or absent. The management of shrimp harvest in the Gulf of Mexico demonstrates the correlation between shrimp trawling and impacts to sea turtles. Waters out to 200 nm are closed to shrimp fishing off of Texas each year for approximately a 3-month period (mid-May through mid-July) to allow shrimp to migrate out of estuarine waters; sea turtle strandings decline substantially during this period (NMFS, STSSN unpublished data).

Loggerhead sea turtles are captured in fixed pound net gear in the Long Island Sound, in pound net gear and trawls in summer flounder and other finfish fisheries in the mid-Atlantic and Chesapeake Bay, in gillnet fisheries in the mid-Atlantic and elsewhere, in fisheries for monkfish and for spiny dogfish, and in northeast sink gillnet fisheries. Capture rates of sea turtles in the longline fishery are second only to those of the U.S. shrimp fishing fleet (Crouse 1999, Magnuson *et al.* 1990), although shrimping probably does not significantly impact immature, pelagic stage loggerheads.

Although loggerhead sea turtles are most vulnerable to pelagic longlines during their pelagic, immature life history stage, there is some evidence that benthic immatures may also be captured, injured, or killed by pelagic fisheries. Any loggerhead sea turtles that follow this developmental model of moving back and forth between pelagic and coastal habitats could be adversely affected by shark gillnets and shark bottom longlines set in coastal waters, in addition to pelagic longlines.

Virtually all of the pelagic immature loggerheads taken in the Portuguese longline fleet in the vicinity of the Azores and Madeira are from western North Atlantic nesting subpopulations (Bolten *et al.* 1994, 1998) and about half of those taken in both the eastern and western basins of the Mediterranean Sea are from the western North Atlantic subpopulations (Bowen *et al.* 1993; Laurent *et al.* 1998). Aguilar *et al.* (1995) estimated that the Spanish swordfish longline fleet, which is only one of the many fleets operating in the region, alone captures more than 20,000 juvenile loggerheads annually, killing an estimated 20-30%. Estimated bycatch of marine turtles by the U.S. Atlantic tuna and swordfish longline fisheries, based on observer data, was significantly greater than reported in logbooks through 1997 (Johnson *et al.* 1999; Witzell 1999), but was comparable by 1998 (Yeung 1999). Observer records indicate that an estimated 6,544 loggerheads were captured by the U.S. fleet between 1992-1998, of which an estimated 43 were dead (NMFS SEFSC 2001). Aguilar *et al.* (1995) reported that hooks were removed from only 171 of 1,098 loggerheads captured in the Spanish longline fishery, describing that removal was possible only when the hook was found in the mouth, the tongue or, in a few cases, externally (flippers, *etc.*); the presumption is that all others had ingested the hook.

From 1981-1990, 397 loggerhead sea turtles were incidentally captured in gill nets set by Italian fishermen in the central Mediterranean Sea; gill net mortality was reported to be 73.6%. An additional study estimated 16,000 loggerheads per year are captured by net with 30% mortality. Observers of the Spanish driftnet fishery in the western Mediterranean documented the incidental capture of 30 loggerheads from 1993-1994, of which one was dead; 236 loggerheads were estimated to have been caught in 1994. Six-hundred loggerheads are estimated to have been caught annually by gillnet in Nicaragua. Gillnets set for finfish and sharks in Belize are also suspected of catching sea turtles (see NMFS SEFSC 2001).

Bottom set lines in the coastal waters of Madeira, Portugal, are reported to take an estimated 500 pelagic immature loggerheads each year. Adult female loggerheads are taken by hand by the indigenous people inhabiting Boavista Island, Cape Verde, Western Africa. In Cuba, loggerheads are commercially harvested (see NMFS SEFSC 2001).

An additional source of mortality is ingestion of marine debris. A summary of marine debris impacts can be found in the TEWG reports (1998, 2000) and NMFS SEFSC (2001).

***Leatherback Turtle (Dermochelys coriacea*)**

The Recovery Plan for Leatherback Turtles (*Dermochelys coriacea*) contains a description of the natural history and taxonomy of this species (USFWS and NMFS 1992). Leatherbacks are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico (Ernst and Barbour 1972). Adult leatherbacks forage in temperate and subpolar regions from 71°N to 47°S latitude in all oceans and undergo extensive migrations to and from tropical nesting beaches between 90°N and 20°S. In the Atlantic Ocean, leatherbacks have been recorded as far north as Newfoundland and Labrador, Canada and Norway, and as far south as Uruguay and Argentina and South Africa (see NMFS SEFSC 2001).

Female leatherbacks nest from southeastern United States to southern Brazil in the western Atlantic and from Mauritania to Angola in the eastern Atlantic. The most significant nesting beaches in the Atlantic, and perhaps in the world, are in French Guiana and Suriname (see NMFS SEFSC 2001). When they leave the nesting beaches, leatherbacks move offshore but eventually utilize both coastal and pelagic waters. Leatherbacks are deep divers, with recorded dives to depths in excess of 1000 m (Eckert *et al.* 1989), but they may come into shallow waters if there is an abundance of jellyfish nearshore. Leary (1957) reported a large group of up to 100 leatherbacks just offshore of Port Aransas, Texas associated with a dense aggregation of *Stomolophus*. They also occur annually in places such as Cape Cod Bay and Narragansett Bay during certain times of the year, particularly during the fall. Shoop and Kenney (1992) summarized 3 years of survey effort from the eastern Atlantic out to the 2000 m isobath and reported leatherback turtles throughout the study area, both inside and outside the 2000 m isobath. A summer seasonal peak in sea turtle density was noted throughout the study area. Density estimates from a dedicated NMFS NEFSC aerial survey in July and August of 1995 and 1998 supported these results.

The leatherback is the largest living turtle and it ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS and USFWS 1995). Leatherback turtles feed primarily on cnidarians (medusae, siphonophores) and tunicates (salps, pyrosomas) and are often found in association with jellyfish.

Although leatherbacks are a long-lived species (> 30 years), they are somewhat faster to mature than loggerheads, with an estimated age at sexual maturity reported as about13-14 years for females, and an estimated minimum age at sexual maturity of 3-6 years, with 9 years reported as a likely minimum (Zug 1996) and 19 years as a likely maximum (NMFS SEFSC 2001). They nest frequently (up to 7 nests per year) during a nesting season and nest about every 2-3 years. During each nesting, they produce 100 eggs or more in each clutch and thus, can produce 700 eggs or more per nesting season (Schultz 1975).

*Genetics*

Genetic analyses of leatherbacks to date indicate that within the Atlantic basin significant genetic differences occur among St. Croix, U.S. Virgin Islands, and mainland Caribbean populations (Florida, Costa Rica, Suriname/French Guiana) and between Trinidad and the same mainland populations, (Dutton *et al.* 1999) leading to the conclusion that there are at least 3 separate subpopulations of leatherbacks in the Atlantic. Much of the genetic diversity is in the relatively small insular subpopulations.

Genetic analyses indicate that female leatherback turtles nesting in St.Croix/Puerto Rico and those nesting in Trinidad differ from each other and from turtles nesting in Florida, French Guiana/Suriname and along the South African Indian Ocean coast. Turtles nesting in Florida, French Guiana/Suriname and South Africa cannot be distinguished at this time with mtDNA. The largest known nesting aggregation of the leatherback turtles in the western North Atlantic Ocean occurs in French Guiana. This may be the largest nesting aggregation of leatherback turtles in the world (see NMFS SEFSC 2001).

The analysis of mitochondrial DNA (mtDNA) indicate that the loss of the nesting populations from the St. Croix region and Trinidad would essentially eliminate most of the detected mtDNA variation throughout the Atlantic (Dutton *et al.* 1999). To date, no studies have been published on the genetic make-up of pelagic or benthic foraging leatherbacks in the Atlantic. Compared to current knowledge regarding loggerhead populations, the genetic distinctness of leatherback populations is less clear and populations or subpopulations of leatherback sea turtles have not been formally recognized based on genetic studies. This Opinion, therefore, considers the status of the various nesting populations, as well as the Atlantic and worldwide populations.

The nesting aggregation in French Guiana has been declining at about 15% per year since 1987. From the period 1979-1986, the number of nests was increasing at about 15% annually. The number of nests in Florida and the U.S. Caribbean has been increasing at about 10.3% and 7.5%, respectively, per year since the early 1980=s but the magnitude of nesting is much smaller than that along the French Guiana coast (see NMFS SEFSC 2001).

*Status and Trends*

Initial estimates of the worldwide leatherback population were between 29,000 and 40,000 breeding females (Pritchard 1971), later refined to approximately 115,000 adult females globally (Pritchard 1982). An estimate of 34,500 females (26,200 - 42,900) was made by Spotila *et al.* (1996), along with a claim that the species as a whole was declining and local populations were in danger of extinction (NMFS SEFSC 2001). They attribute this to fishery related mortality but, at least historically, it was due primarily to intense exploitation of the eggs (Ross 1979). On some beaches in the Pacific, nearly 100% of the eggs laid have been harvested (Eckert 1996). Eckert (1996) and Spotila *et al.* (1996) record that adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries. The Pacific population is in a critical state of decline, now estimated to number less than 3,000 total adult and subadult animals (Spotila *et al.* 2000). The status of the Atlantic population is less clear. In 1996, it was reported to be stable, at best (Spotila 1996), but numbers in the Western Atlantic at that writing were reported to be on the order of 18,800 nesting females. According to Spotila (pers. comm.), the Western Atlantic population currently numbers about 15,000 nesting females, whereas current estimates for the Caribbean (4,000) and the Eastern Atlantic (*i.e.,* off Africa, numbering ~ 4,700) have remained consistent with numbers reported by Spotila *et al.* in 1996. Spotila *et al.* (2000) indicates that between 1989 and 1995, marked leatherback returns to the nesting beach at St. Croix averaged only 48.5%, but that the overall nesting population grew. This is in contrast to a Pacific nesting beach at Playa Grande, Costa Rica, where only 11.9% of turtles tagged in 1993-94 and 19.0% of turtles tagged in 1994-95 returned to nest over the next 5 years. Characterizations of the Pacific population suggest that is has a very low likelihood of survival and recovery in the wild under current conditions. However, NMFS SEFSC (2001) note that while all these authors have noted dramatic declines in Pacific nesting beaches, they have suggested apparently stable or increasing nesting populations in the Atlantic.

Nest counts are the only reliable population information available for leatherback turtles. Recent declines have been seen in the number of leatherbacks nesting worldwide (NMFS and USFWS 1995). Natural fluctuations such as an annual cycle or the fact that females may shift their nesting efforts in places like Suriname due to erosion at French Guiana, for example, complicate analysis of trends based on that data. Another important factor is that nesting trends reflect trends in adult females, a small proportion of the population, and may not be valid for the rest of the population (NMFS SEFSC 2001). The status of the leatherback population in the Atlantic is difficult to assess since major nesting beaches occur over broad areas within tropical waters outside the United States. Although leatherbacks occur in all U.S. Atlantic, Gulf, and Caribbean waters, it is estimated that about 250 females now visit nesting sites in the U.S. (*i.e.*, Florida, Puerto Rico and the U.S. Virgin Islands)(NMFS SEFSC 2001). The primary leatherback nesting beaches occur in French Guiana, Suriname, and Costa Rica in the western Atlantic, and in Mexico in the eastern Pacific. Although increased observer effort on some nesting beaches has resulted in increased reports of leatherback nesting, declines in nest abundance have been reported from the beaches of greatest nesting densities.

The major western Atlantic nesting area for leatherbacks is located in the Suriname-French Guiana trans-boundary region. Chevalier and Girondot (1998) report that combined nesting in the two countries has been declining since 1992. Nesting also occurs on Florida=s east coast. In 1998 the Florida Department of Environmental Protection reported 351 nests and 146 false crawls on the east coast of Florida. In the eastern Caribbean, nesting occurs primarily in the Dominican Republic, the Virgin Islands, and on islands near Puerto Rico. Sandy Point, on the western edge of St. Croix, Virgin Islands, has been designated by the U.S. Fish and Wildlife Service as critical habitat for nesting leatherback turtles.

The current status of nesting populations in French Guiana and Suriname is difficult to interpret because these beaches are so dynamic geologically. Schulze (1975) described a 10-year cycle of beach accretion and erosion in Guyana that could explain part of the cycle observed in nesting over the last 30 years. Chevalier *et al.* (in press) states that since the mid-1970s leatherback nesting has declined (1987-1992 mean = 40,950 nests and 1993-1998 mean = 18,100 nests). They state that there is very little shifting in nesting from French Guiana and Suriname to other Caribbean sites (there has only been 1 tag recapture elsewhere). Numbers are decreasing in Suriname, too. Chevalier *et al.* (in press) claims that there is no human-induced mortality on the beach in French Guiana, and natural mortality of adults should be low. There has been very low hatchling success on beaches used for the last 25 years.

Zug (1996) pointed out that the combination of the loss of long-lived adults in fishery-related mortality, and the lack of recruitment stemming from elimination of annual influxes of hatchlings because of intense egg harvesting, has caused the sharp decline in leatherback populations. The author stated that Athe relatively short maturation time of leatherbacks offers some hope for their survival if we can greatly reduce the harvest of their eggs and the accidental and intentional capture and killing of large juveniles and adults.≅

In summary, the conflicting information regarding the status of Atlantic leatherbacks makes it difficult to conclude whether or not the population is currently in decline. Numbers at some nesting sites are up, while at others they are down. Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1-11.5% increase), although it should be noted that there was also an increase in the survey area in Florida over time (NMFS SEFSC 2001). At one site (St. Croix), population growth has been documented despite large apparent mortality of nesting females; for data from 1979 on from St. Croix, the number of nests is estimated to be increasing at 7.5% per year ( NMFS SEFSC 2001). However, the largest leatherback rookery in the western North Atlantic remains along the northern coast of South America in French Guiana and Suriname. While Spotila *et al.* (1996) indicated that turtles may have been shifting their nesting from French Guiana to Suriname due to beach erosion, analyses show that the overall area trend in number of nests has been negative since 1987 at a rate of 15.0 - 17.3 % per year (NMFS SEFSC 2001, Appendix 1). If turtles are not nesting elsewhere, it appears that the Western Atlantic portion of the population is being subjected to mortality beyond sustainable levels, resulting in a continued decline in numbers of nesting females.

As noted above, there are many human-related sources of mortality for leatherbacks. Due to a combination of factors, including the continued harvest of eggs and adult turtles for meat in some Caribbean and Latin nations, the effects of ocean pollution, and natural disturbances such as hurricanes (which may destroy nesting beaches), it is clear that the endangered leatherback populations of the Atlantic require major conservation efforts to ensure their long-term survival and recovery in the wild.

The U.S. pelagic longline fishery, in combination with the foreign longline fleets and coastal fishery, could produce sufficient leatherback mortality to result in the decreases evident on South American nesting beaches. On the other hand, large removals of eggs alone could produce the same result and would be evidenced on the nesting beach quickly. In order to determine the impact of longline fleets, there needs to be an apportionment of turtles by nesting beach origin and the mortality rate needs to be quantified (NMFS SEFSC 2001, Part III, Chap. 7). Other clear concerns for South American nesting turtles are impacts on French Guiana and Suriname beaches. Even if the longline takes were eliminated, those declines would not likely reverse. On the other hand, if measures to reduce mortality occur in French Guiana and Suriname, that alone could be enough to reverse those declines.

*Effects from Human Activities*

Of the Atlantic turtle species, leatherback turtles seem to be the most susceptible to entanglement in fishing gear with lines, such as lobster gear lines and longline gear rather than swallowing hooks. They are also just as susceptible to trawl capture as the other species. This susceptibility may be the result of 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 the longline fishery.

Chevalier *et al.* (in press) indicates that threats to the population include fishing (longlines, drift nets, and trawling), pollution (plastic bags and chemicals), and boat propellers. Around 90% of the nests are laid within 25 km of the Maroni (also AMarowijne≅ or AMarouini≅) River estuary. Strandings in 1997, 1998, and 1999 in the estuary were 70, 60, and 100, which Chevalier *et al.* (in press) considers underestimates. They questioned the fishermen and actually observed a 1-km gillnet with 7 dead leatherbacks. This observation, coupled with the strandings, led the authors to conclude that there were large numbers captured incidentally in large-mesh nets. There are protected areas nearshore in French Guiana; offshore, driftnets are set. There are no such protected areas off Suriname, and fishing there occurs at the beach. Offshore nets soak overnight in Suriname; many boats fish overnight. According to Chevalier *et al.* (in press), the French Guiana government is establishing a working group to deal with accidental capture and to enforce the legislation. They will work towards the management of the fishery activity, collaborate with Suriname, study the accidental capture by the fishermen, satellite track turtles, and study strandings. The main problem appears to be the close proximity of the driftnet fishery to the nesting areas and shrimp trawling off beaches without TEDs. Tag return data emphasize the global nature of the leatherback and the link between these South American nesters and animals found in U.S. waters. For example, a nesting female tagged May 29, 1990, in French Guiana was later recovered and released alive from the York River. Another nester tagged in French Guiana on June 21, 1990, was later found dead in Palm Beach, Florida (STSSN database, unpubl.).

Swinkels and van Tienen (in press) state that from 1995-1999 there was a large increase in leatherback nesting in Suriname. There is a nature reserve in Suriname and one in adjacent French Guiana. There were increasing population trends observed on 3 beaches but poaching of the nests was 80%. Samsambo Beach in Suriname is a very dynamic beach, which has been newly created (by natural events) and now is a nesting beach. In 1999 there were > 4,000 nests, of which about 50% were poached. In 1995, very few were poached but Swinkels and Tienen indicate that since that time poaching has increased. The beach has naturally been renourished over this period. Swinkels and Tienen=s null hypothesis was that there had been a shift in nesting activity (from other nesting areas). The alternate hypothesis was that the new nesting represented new recruitment to the population.

Leatherbacks are exposed to pelagic fisheries throughout their life cycle. According to observer records, an estimated 6,363 leatherback sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992-1999, of which 88 were discarded dead (NMFS SEFSC 2001). Leatherbacks make up a significant portion of takes in the Gulf of Mexico and South Atlantic areas, but are more often released alive. However, the U.S. fleet accounts for a small portion (5-8%) of the hooks fished in the Atlantic Ocean compared to other nations, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People=s Republic of China, Grenada, Canada, Belize, France, and Ireland (Carocci and Majkowski 1998). Reports of incidental takes of turtles are incomplete for many of these nations (see NMFS SEFSC 2001, Part II, Chapter 5, p. 162 for a complete description of take records). Adding up the under-represented observed takes per country per year of 23 actively fishing countries would likely result in estimates of thousands of sea turtles annually over different life stages.

*1ngestion of Marine Debris*

Leatherback sea turtles may be more susceptible to marine debris ingestion than other species due to their pelagic existence and the tendency of floating debris to concentrate in convergence zones which adults and juveniles use for feeding areas and migratory routes (Lutcavage *et al.* 1997; Shoop and Kenney 1992). Investigations of the stomach contents of leatherback sea turtles revealed that a substantial percentage (44% of the 16 cases examined) contained plastic (Mrosovsky 1981). Along the coast of Peru, intestinal contents of 19 of 140 (13%) leatherback carcasses were found to contain plastic bags and film (Fritts 1982). The presence of plastic debris in the digestive tract suggests that leatherbacks might not be able to distinguish between prey items and plastic debris (Mrosovsky 1981). Balazs (1985) speculated that the object may resemble a food item by its shape, color, size or even movement as it drifts about, and induce a feeding response. Although necropsies conducted between 1980 and 1992 by the Sea Turtle Stranding and Salvage Network (STSSN) participants showed that leatherbacks were more likely to ingest marine debris in the southeastern U.S. than in the northeast, it was noted that leatherbacks also consume plastic bags in the northeastern U.S. (Witzell and Teas 1994). However, when data were included through 1999, the majority (72%) of leatherbacks that had ingested marine debris or fishing gear were found from Virginia through Maine. Of the 33 leatherbacks that were necropsied in New York, plastic bags were found in 10 animals (Sadove and Morreale 1990). (*In* NMFS SEFSC 2001, Part II).

*Entanglements*

Sea turtles entangled in fishing gear generally have a reduced ability to feed, dive, surface to breathe or perform any other behavior essential to survival (Balazs 1985). They may be more susceptible to boat strikes if forced to remain at the surface, and entangling lines can constrict blood flow resulting in necrosis *(Ibid.*). Leatherbacks seem more likely to become entangled in fishing gear than other species. Leatherback entanglement in longline fishing gear is discussed in NMFS SEFSC 2001, Part III, Chapter 7. The fish trap fishery, operating in Rhode Island from March through December, is known to capture sea turtles. Leatherbacks have been captured alive in large fish traps set off Newport - most are reported to be released alive (Anon. 1995). Of the approximately 20 live, entangled sea turtles reported by the NMFS Northeast Region Stranding Network, the majority were leatherback sea turtles entangled in pot gear in New England waters. The leatherbacks become entangled in the buoy line and/or ground line, possibly mistaking the buoys for cannonball jellyfish (Anon. 1995). Massachusetts, Rhode Island, Connecticut, and New York all have active lobster pot fisheries which can entangle leatherbacks (Anon. 1995). Entanglement in lobster pot lines was cited as the leading determinable cause of adult leatherback strandings in Cape Cod Bay, Massachusetts (Prescott 1988; R. Prescott pers. comm.). During the period 1977- 1987, 89% of the 57 stranded adult leatherbacks were the result of entanglement (Prescott 1988). Likewise, during the period 1990-1996, 58% of the 59 stranded adult leatherbacks showed signs of entanglement (R. Prescott, pers. comm.). Many of the stranded leatherbacks for which a direct cause of death could not be documented showed evidence of rope scars or wounds and abraded carapaces, implicating entanglement *(Ibid*.).

In the Southeast U.S. mid-Atlantic waters, the blue crab fishery is another potential source of leatherback entanglement. In North Carolina, two leatherback sea turtles were reported entangled in a crab pot buoy inside Hatteras Inlet (D. Fletcher, pers. comm.). A third leatherback was reported entangled in a crab pot buoy in Pamlico Sound off of Ocracoke. This turtle was disentangled and released alive; however, lacerations on the front flippers from the lines were evident (D. Fletcher, pers. comm.). Leatherbacks become entangled in Florida=s lobster pot and stone crab fisheries also, as documented on stranding forms.

Although not documented as the major cause of leatherback strandings in the U.S. Virgin Islands for the time period 1982 to1997 (1 of 5 leatherbacks stranded due to entanglement out of a total of 122 strandings) (Boulon 2000), leatherbacks have been observed with their flippers wrapped in the line of West Indian fish traps (R. Boulon, pers. comm.). STSSN leatherback strandings for 1980-1999 documented significantly more strandings as a result of entanglement in the northern states (Virginia to Maine; 62%) than southern (Florida=s east coast to North Carolina; 18%) or Gulf states (Florida=s west coast to Texas; 19%). The majority (67%) of these strandings were the result of being entangled in crab or lobster trap lines; additional sources of entanglement included entanglement in fishing line or nets or having a hook in the mouth or flipper (*In* NMFS SEFSC 2001, Part II.).

Leatherback sea turtles also are vulnerable to capture in gillnets. Gillnet fisheries operating in the nearshore waters of the mid-Atlantic states are likely to take leatherbacks since these fisheries and leatherbacks may co-occur; however, there is very little quantitative data on capture rate and mortality. According to the NMFS NEFSC Fisheries Observer Program, in 1994, 2 live and 2 dead leatherback sea turtles were reported incidentally captured in drift gillnets set in offshore waters from Maine to Florida (with 56% observer coverage); in 1995, 15 live and 12 dead leatherback sea turtles were reported (70% coverage); in 1996, 1 live leatherback was reported (54% coverage); in 1998, 3 live and 2 dead leatherbacks were reported (92% coverage). The NMFS NEFSC Fisheries Observer Program also had observers on the bottom coastal gillnet fishery which operates in the Mid-Atlantic, but no takes of leatherback sea turtles were observed from 1994-1998. Observer coverage of this fishery, however, ranged from <1% to 5%. In North Carolina, a leatherback was reported captured in a gillnet set in Pamlico Sound at the north end of Hatteras Island in the spring of 1990 (D. Fletcher, pers. comm.). It was released alive by the fishermen after much effort.

Five other leatherbacks were released alive from nets set in North Carolina during the spring months: one was from a net (unknown gear) set in the nearshore waters near the North Carolina/Virginia border (1985); two others had been caught in gillnets set off of Beaufort Inlet (1990); a fourth was caught in a gillnet set off of Hatteras Island (1993); and a fifth was caught in a sink net set in New River Inlet (1993) *(Ibid*.). In September of 1995, however, two dead leatherbacks were removed from a large (11-inch) monofilament shark gillnet set in the nearshore waters off of Cape Hatteras, North Carolina *(Ibid*.). Gillnets set in northwest Atlantic coastal waters are reported to routinely capture leatherback sea turtles (Goff and Lien 1988; Goff *et al.* 1994; Anon. 1996). Leatherbacks often 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). In the waters of coastal Nicaragua, gillnets targeting green and hawksbill turtles also incidentally catch leatherback turtles (Lagueux *et al.* 1998). An estimated 1,000 mature female leatherback sea turtles are caught annually off of Trinidad and Tobago with mortality estimated to be between 50-95% (Eckert and Lien 1999). Many of the turtles do not die as a result of drowning, but rather because the fishermen butcher them in order to get them out of their nets (*Ibid*.) (*In* NMFS SEFSC 2001, Part II).

The National Research Council Committee on Sea Turtle Conservation identified incidental capture in shrimp trawls as the major anthropogenic cause of sea turtle mortality (National Research Council 1990). Although federal regulations requiring TEDs in trawls were fully implemented in May 1991 and U.S. sea turtle strandings have declined since then (Crouse, Crowder, and Heppell *unpubl*. as cited by Crowder *et al.* 1995), trawls equipped with TEDs are still taking large immature and adult loggerhead and green sea turtles (Epperly and Teas 1999) and leatherbacks (Henwood and Stuntz 1987). As leatherbacks make their annual spring migration north, they are likely to encounter shrimp trawls working in the nearshore waters off the Atlantic coast. Although the Leatherback Contingency Plan was developed to protect migrating leatherbacks from being incidentally captured and killed in shrimp trawls, NMFS has also had to implement additional leatherback protections outside of the contingency plan, through emergency rules in response to high strandings of leatherbacks in Florida and Texas. Because of these high leatherback strandings occurring outside the leatherback conservation zone, the lack of aerial surveys conducted in the fall, the inability to conduct required replicate surveys due to weather, equipment or personnel constraints, and the possibility that a 2-week closure was insufficient to ensure that leatherbacks had vacated the area, NMFS published an Advanced Notice of Proposed Rulemaking in April 2000 (65 FR 17852-17854, April 5, 2000) indicating that NMFS was considering publishing a proposed rule to provide additional protection for leatherback turtles in the shrimp fishery. NMFS requested all shrimp trawlers to use TEDs modified to release leatherback sea turtles along the east coast of Florida to the Georgia/Florida border through the end of March 2000 (December 11, 2000 NR00-061). This request had the effect of protecting leatherbacks during the winter Florida shrimp season that tend to stay in this area until the start of the spring migration.

Turtle excluder devices are required in the mid-Atlantic winter trawl fishery for summer flounder in waters south of Cape Charles, Virginia; however, these small TEDs can not exclude leatherback sea turtles. Although not documented, it is suspected that this and other trawl fisheries may take turtles north of Cape Charles where TEDs are not required. In Rhode Island, leatherbacks are occasionally taken by trawlers targeting scup, fluke, and monkfish in state waters (Anon. 1995). It is likely that leatherbacks may be taken by trawlers operating off other mid-Atlantic states. Observers onboard shrimp trawlers operating in the northeastern region of Venezuela documented the capture of 48 sea turtles, of which 6 were leatherbacks, from 13,600 trawls (Marcano and Alio 2000). They estimated annual capture of all sea turtle species to be 1,370 with an associated mortality of 260 turtles, or about 19% (*In* NMFS SEFSC 2001, Part II).

*Poaching*

NMFS SEFSC (2001) notes that poaching is still occurring in the U.S. Virgin Islands, both juveniles and adults. Four of the five strandings in St. Croix were the result of poaching (Boulon 2000). A few cases of fishermen poaching leatherbacks have been reported from Puerto Rico, but most of the poaching is of eggs. In Ghana, nearly two thirds of the leatherback sea turtles that come up on the beach are killed by local fishermen.

***Green Turtles (Chelonia mydas)***

*Taxonomy, Genetic Stocks, and Distribution within the NMFS Southeast Region*

Linnaeus first described the green turtle as *Testudo mydas* in 1758 from a specimen taken at Ascension Island, and Brongniart first assigned the green turtle to the genus *Chelonia* in 1800. As new locations for the green turtle (*Chelonia mydas*) were studied, the species came to be known as one having a number of morphologically distinct assemblages worldwide (reviews are given by Hirth 1997, Pritchard and Trebbau 1984, and Groombridge and Luxmoore 1989).

Assemblages of green turtles are best known where they nest and the relatedness of these nesting assemblages is strongly influenced by the natal beach homing of females (assessment is from mitochondrial DNA analysis, Bowen *et al.* 1992, Allard *et al.* 1994). Examinations of nuclear DNA show that male-mediated gene flow between nesting assemblages is moderate but is limited by the distance between respective breeding sites (Karl *et al.* 1992). Thus, the overall relatedness of green turtle assemblages appears to follow lines of geographical separation of nesting beaches.

The greatest genetic differences between green turtle stocks occur between two ocean regions, the Atlantic-Mediterranean and the Indian-Pacific Oceans (from mitochondrial DNA analysis; Bowen *et al.* 1992). However, within each of these ocean regions there are many genetically distinct stocks. In the Western Atlantic, the most distinctive split is between eastern (Florida/Mexico and Costa Rica) and western (Aves Island and Suriname) stocks, although each of the four stocks can be genetically separated (Lahanas *et al.* 1994).

The complete nesting range of the green turtle within the NMFS Southeast Region includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina and at the U.S. Virgin Islands (USVI) and Puerto Rico (NMFS and USFWS 1991). Principal U.S. nesting areas for green turtles are in eastern Florida, predominantly Brevard through Broward Counties (Ehrhart and Witherington 1992). Regular green turtle nesting also occurs on St Croix, USVI, and on Vieques, Culebra, Mona, and the main island of Puerto Rico (Mackay and Rebholz 1996, C. Diez pers. com.).

Green turtle foraging areas in the region include any neritic waters having macroalgae or seagrasses near mainland coastlines, islands, reefs, or shelves, and any open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (Hirth 1997, NMFS and USFWS 1991). Principal benthic foraging areas in the region include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984, Hildebrand 1982, Shaver 1994), Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957, Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon System, Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward Counties (Wershoven and Wershoven 1992, Guseman and Ehrhart 1990). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs.

### *Status and Trends within the NMFS Southeast Region*

#### *Green Turtle Nesting Assemblages within the Southeast Region*

The vast majority of green turtle nesting within the Southeast Region occurs in Florida where green turtle nesting has been extensively and consistently surveyed during the period 1989-1999. In Florida during the 11-year period, green turtle abundance from nest counts ranges 109-1389 nesting females per year (Meylan *et al.* 1995 and Florida Marine Research Institute Statewide Nesting Database, unpublished data; estimates assume 4 nests per female per year, Johnson and Ehrhart 1994). High biennial variation and a predominant two-year re-migration interval (Witherington and Ehrhart 1989a, Johnson and Ehrhart 1994) warrant combining even and odd years into two-year cohorts. This gives an estimate of total nesting females that ranges 705-1509 during the period 1990-1999. It is important to note that because methodological limitations make the clutch frequency number (4 nests/female/year) an under-estimate (by as great as 50%), a more

conservative range for numbers of green turtles nesting in Florida is 470-1509 nesting females between 1990 and 1999.
In Florida during the period 1989-1999, numbers of green turtle nests by year show no trend ($n = 11$, $r^2 = 0.055$, $p = 0.49$). However, odd-even year cohorts of nests (as described and as justified above) did show a significant increase ($n = 5$, $r^2 = 0.72$, $p = 0.033$) during the period 1990-1999 (Florida Marine Research Institute, Index Nesting Beach Survey Database).

It is unclear how greatly green turtle nesting in the whole of Florida has been reduced from historical levels (Dodd 1981), although one account indicates that nesting in Florida=s Dry Tortugas may now be only a small fraction of what it once was (Audubon 1926). Total nest counts and trends at index beach sites during the past decade suggest that green turtles that nest within the Southeast Region are recovering and have only recently reached a level of approximately 1000 nesting females.

*Benthic Foraging Green Turtles within the Southeast Region*

There are no reliable estimates of the number of green turtles inhabiting foraging areas within the Southeast Region and it is likely that green turtles foraging in the region come from multiple genetic stocks. Maximum likelihood analyses of mitochondrial DNA haplotype frequencies (D Bagley and L Ehrhart, unpublished data) show that immature green turtles captured from three sites on the Atlantic Coast of Florida originated from at least five distinct nesting assemblages that are distributed throughout the Atlantic Ocean Basin. In these immature green turtles, the greatest proportion of haplotypes from known nesting assemblages (92-97%) came from either a Florida and Yucatan mixed stock or from a Tortuguero, Costa Rica stock.

Trends in numbers of foraging green turtles within the region are also uncertain because of a lack of data. However, there is one sampling area in the region with a large time series of constant turtle-capture effort that may represent trends for a limited area within the region. This sampling area is at an intake canal for a power plant on the Atlantic coast of Florida where 2578 green turtles have been captured during the period 1977-1999 (FPL 2000, M Bresette, unpublished data). At the power plant, the annual number of immature green turtle captures (minimum straight-line carapace length < 85 cm) has increased significantly during the 23 year period ($r^2 = 0.42$, $p < 0.001$).

Status of immature green turtles foraging in the Southeast Region might also be assessed from trends at nesting beaches where many of the turtles originated, principally, Florida, Yucatan, and Tortuguero. Trends at Florida beaches are presented above. Trends in green turtle nesting at Yucatan beaches can not be assessed because of irregularity in beach survey methods over time. Trends at Tortuguero (ca. 20,000-50,000 nests/year) show a significant increase in nesting during the period 1971-1996 (Bjorndal *et al.* 1999).

***Threats to green turtles within the NMFS Southeast Region***

*Threatened Destruction, Modification, or Curtailment of Habitat*

Significant threats on green turtle nesting beaches in the region include beach armoring, erosion control, artificial lighting, and disturbance. Armoring of beaches (seawalls, revetments, rip-rap, sandbags, sand fences) in Florida, meant to protect developed property, is increasing and has been shown to discourage nesting even when armoring structures do not completely block access to nesting habitat (Mosier 1998). Alternatives to beach armoring include beach nourishment (artificially replacing beach sand lost to erosion). Most beach nourishment activities in the region take place outside the nesting/hatching season and are not likely to directly destroy nests. However, poor quality beach fill on nourished beaches does affect the ability of turtles to nest (Crain *et al.* 1995, Raymond 1984) and may affect egg survivorship (Ackerman 1980).

Light pollution is an additional problem associated with human development on nesting beaches. Sea turtle hatchlings emerge from nests principally at night and become misdirected by artificial lighting, resulting in substantial mortality (Witherington 1997, 2000). In addition, adult green turtles are discouraged from nesting where artificial lighting is present (Witherington 1992). Other significant impacts on nesting beach habitat include egg mortality and disturbances to nesting females from foot, domestic animal, and vehicular traffic (Mann 1977, Witherington 1999). Barriers produced by exotic vegetation also reduce the suitability of nesting beaches (Davis and Whiting 1977). The severity of problems caused by coastal development and human access to the beach can be expected to increase with time.

Green turtles depend on shallow foraging grounds with sufficient benthic vegetation. Direct destruction of foraging areas due to dredging, boat anchorage, deposition of spoil, and siltation (Coston-Clements and Hoss 1983, Williams 1988) may have considerable effects on the distribution of foraging green turtles. Eutrophication, heavy metals, radioactive elements, and hydrocarbons all may reduce the extent, quality, and productivity of foraging grounds (Frazier 1980).

Pollution also threatens the pelagic habitat of young green turtles. The pelagic drift lines that young green turtles inhabit tend to collect floating debris such as plastics, oil, and tar (Carr 1987, Witham 1978). Contact with oil and the ingestion of plastics and tar are known to kill young sea turtles (Carr 1987). Older juvenile green turtles have also been found dead after ingesting seaborne plastics (Balazs 1985). A major threat from manmade debris is the entanglement of turtles in discarded monofilament fishing line and abandoned netting (Balazs 1985).

*Over-Utilization*

The principal cause of past declines and extirpations of green turtle assemblages has been the over-exploitation of green turtles as food and other products. The over-harvesting of individuals that are of high reproductive value (namely, large immatures and adults) has been implicated in the extirpation of nesting green turtles at Bermuda, Grand Cayman, Israel, Hong Kong, Mauritius, and Reunion (Groombridge and Luxmoore 1989, King 1982, National Research Council 1990). Adult and immature green turtles are utilized for meat, calipee (from which green turtle soup is made), leather, oil, and cosmetics, and are stuffed whole as curios. Green turtle eggs are prized as food and are eaten as aphrodisiacs (Parsons 1962).

Although intentional take of green turtles and their eggs is not extensive within the NMFS Southeast Region, green turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction. Adult green turtles and immatures are exploited heavily on foraging grounds off Nicaragua and to a lesser extent off Colombia, Mexico, Panama, Venezuela, and the Tortuguero nesting beach (Carr *et al.* 1978, Nietschmann 1982, Bass *et al.* 1998, Lagueux 1998).

*Disease and Predation*

The occurrence of green turtle fibropapillomatosis (GTFP) disease was originally reported in the 1930's, when it was thought to be rare (Smith and Coates 1938). Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994, acobson 1990, Jacobson *et al.* 1991). GTFP is characterized by cutaneous growths (fibropapillomas) as large as 25 cm and visceral fibromas in some afflicted turtles. The growths are commonly found in the eyes, occluding sight, are often entangled in debris, and are frequently infected secondarily. The mortality rate among green turtles with fibropapilloma disease is not known. Other significantly debilitating diseases are relatively rare in wild green turtles (see the review by Herbst and Jacobson 1995).

Predation on sea turtles by animals other than humans occurs principally during the egg and hatchling stage of development (Stancyk 1982). Mortality due to predation of early stages appears to be relatively high naturally, and the reproductive strategy of the animal is structured to compensate for this loss (Bjorndal 1980). Some additional predation pressures on nesting beaches have occurred due to the introduction of domesticated and feral animals (Stancyk 1982). Predation of hatchlings at sea may be high (Gyuris 1994, Stancyk 1982, Witherington and Salmon 1992); however, few data are available. Hatchling sea turtles on land and in the water that are attracted to artificial light sources may suffer increased predation proportional to the increased time spent on the beach and in the predator-rich near-shore zone (Witherington 2000).

*Other Threats Incidental to Human Activity*

Green turtles are often captured and drowned in nets set to catch fishes. Gill nets, trawl nets, pound nets (Crouse 1982, Hillestad *et al.* 1982, National Research Council 1990) and abandoned nets of many types (Balazs 1985, Ehrhart *et al.* 1990) are known to catch and kill sea turtles. Green turtles also are taken by hook and line fishing. Collisions with power boats and encounters with suction dredges have killed green turtles along the U.S. coast and may be common elsewhere where boating and dredging activities are frequent (Florida Marine Research Institute, Sea Turtle Stranding and Salvage Network Database).

*Threats from Natural Phenomena*

Natural disturbances such as hurricanes can cause significant destruction of nesting beaches. At Aves Island, Venezuela, the nesting area was severely eroded and all eggs present were destroyed by the passage of Hurricane David in 1979 (Pritchard 1980). Smaller storms are also known to cause considerable loss of sea turtle eggs on nesting beaches (Ross and Barwani 1982, Witherington 1986). This density-independent mortality may be relatively inconsequential for a large stable population but may significantly threaten a depleted one. The presence of human development, and particularly beach armoring, can magnify the damage to nesting beaches by storms.

Hypothermic stunning and mortality are known to affect hundreds of green turtles during regular episodes of cold weather (Witherington and Ehrhart 1989b). These episodes are especially common in the northern Indian River Lagoon System of Florida.

### ***Hawksbill Turtles (Eretmochelys imbricata)***

*Status and Trends*

The hawksbill turtle is listed as Endangered under the U.S. Endangered Species Act (1973), and is considered Critically Endangered by the International Union for the Conservation of Nature (IUCN) based on global population declines of over 80% during the last three generations (105 years) (Meylan and Donnelly, 1999). Only five regional nesting populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly, 1999). Most populations are declining, depleted, or remnants of larger aggregations. Although hawksbills are subject to the suite of threats that affect other marine turtles, the decline of the species is primarily attributed to centuries of exploitation for tortoiseshell, the beautifully patterned scales that cover the turtle=s shell (Parsons, 1972). Imports from 1970 to 1986 by Japan, the world=s principal market, represented the shell of more than 600,000 adult turtles (Milliken and Tokunaga, 1987). International trade in tortoiseshell is now prohibited among all signatories of the Convention on International Trade in Endangered Species, but some illegal trade continues, as does trade between non-signatories. Domestic trade in tortoiseshell, which is not subject to the Convention, is significant in many countries around the world.

In the Western Atlantic, the largest hawksbill nesting population occurs in the Yucatán Península of Mexico, where several thousand nests are recorded annually in the states of Campeche, Yucatán, and Quintana Roo (Garduño-Andrade *et al.*, 1999). Important but significantly smaller nesting aggregations are documented elsewhere in the region in Puerto Rico, the U.S. Virgin Islands, Antigua, Barbados, Costa Rica, Cuba, and Jamaica (Meylan, 1999a). Estimates of the annual number of nests for each of these areas are of the order of hundreds to a few thousand. Nesting within the southeastern U.S. and U.S. Caribbean is restricted to Puerto Rico (>650 nests/yr), the U.S. Virgin Islands (~400 nests/yr), and, rarely, Florida (0-4 nests/yr)(Eckert, 1995; Meylan, 1999a; Florida Statewide Nesting Beach Survey database). At the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out, populations appear to be increasing (Mona Island, Puerto Rico) or stable (Buck Island Reef National Monument, St. Croix, USVI) (Meylan, 1999a).

*Biology*

The hawksbill is a medium-sized sea turtle with adults in the Caribbean ranging in size from approximately 62.5 to 94.0 cm straight carapace length. The species occurs in all ocean basins although it is relatively rare in the Eastern Atlantic and Eastern Pacific, and absent from the Mediterranean Sea. Hawksbills are the most tropical of the marine turtles, ranging from approximately 30_N to 30_ S. They are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays and coastal lagoons. The diet is highly specialized and consists primarily of sponges (Meylan, 1988) although other food items, notably corallimorphs and zooanthids, have been documented to be important in some areas of the Caribbean (van Dam and Diez, 1997; Mayor *et al.*, 1998; Leon and Diez, 2000).

The life history of hawksbills consists of a pelagic stage that lasts from the time they leave the nesting beach as hatchlings until they are approximately 22 - 25 cm in straight carapace length (Meylan, 1988; Meylan, in prep.), followed by residency in developmental habitats (foraging areas where immatures reside and grow) in coastal waters. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and occasionally mangrove-fringed bays may be occupied. Hawksbills show fidelity to their foraging areas over periods of time as great as several years (van Dam and Diez, 1998).

Hawksbills may undertake developmental migrations (migrations as immatures) and reproductive migrations that involve travel over hundreds or thousands of kilometers (Meylan, 1999b). Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest. Movements of reproductive males are less well known, but are presumed to involve migrations to the nesting beach or to courtship stations along the migratory corridor. Females nest an average of 3-5 times per season with some geographic variation in this parameter (see references on pp. 204-205, Meylan and Donnelly, 1999; Richardson *et al.*, 1999). Clutch size is higher on average (up to 250 eggs) than that of green turtles (Hirth, 1980). Reproductive females may exhibit a high degree of fidelity to their nest sites. This, plus the tendency of hawksbills to nest at regular intervals within a season, make them vulnerable to capture on the nesting beach.

Genetic studies indicate that a natal homing mechanism predominates for reproductive females and that nesting populations should be treated as separate stocks (Bass *et al.*, 1996; Bass, 1999). Feeding grounds typically are occupied by turtles from multiple nesting populations (Bowen *et al.*, 1996; Bass, 1999).

Hawksbills are threatened by all the factors that threaten other marine turtles, including exploitation for meat, eggs, and the curio trade, loss or degradation of nesting and foraging habitats, increased human presence, nest depredation, oil pollution, incidental capture in fishing gear, ingestion of and entanglement in marine debris, and boat collisions (Lutcavage *et al.*, 1997; Meylan and Ehrenfeld, 2000). The relative importance of these factors varies geographically, and differentially affects the various life history stages. In the US, much of what we know about mortality factors affecting each species has been gathered by the Sea Turtle Stranding and Salvage Network.

*Distribution, Abundance, and Threats along the U.S. Gulf Coast (Texas to Florida Bay)*

Texas is the only state in the continental U.S. other than Florida where hawksbills occur on any regular basis. Nesting is extremely rare (one nest was recorded at Padre Island in 1998 [Mays and Shaver, 1998]) but pelagic-size individuals and small juveniles are not uncommon and are believed to be animals dispersing from nesting beaches in the Yucatán Peninsula of Mexico and farther south in the Caribbean (Amos, 1989). Hawksbills comprised 5.2% of all strandings recorded along the Texas coast from 1980-1994; nearly all hawksbill strandings occurred on ocean-facing beaches or in Gulf waters (Shaver, 1998). Amos (1989) reported that in contrast to strandings of other species, many of the strandings in Texas involved live animals less than 10 cm in carapace length. Strandings from 1972 B 1989 were concentrated at Port Aransas, Mustang Island, and near the headquarters of the Padre Island National Seashore (Amos, 1989). Live hawksbills are sometimes seen along the jetties at Aransas Pass Inlet. Other live sightings include a 24.7-cm juvenile captured in a net at Mansfield Channel in May 1991 (Shaver, 1994), and periodic sightings of immature animals in the Flower Gardens National Marine Sanctuary, particularly at Stetson Bank (E. Hickerson, pers. comm.).

Elsewhere along the northern Gulf of Mexico, live hawksbills are rarely recorded. A 75-cm hawksbill was reported captured in a purse seine two miles off Holly Beach, Louisiana (Rester and Condrey, 1996), but the photograph provided suggests that it was a misidentified loggerhead (Meylan, in prep.). There is also a report of a hawksbill captured in a gill net in Cameron Parish, Louisiana (Dundee and Rossman, 1989). Hawksbills are described as occasional visitors to the Alabama coast.

Along the Gulf coast of Florida, only one hawksbill nest has been reported. This was at Longboat Key, Manatee County, on 19 May 1980 (Meylan, in prep.). No voucher specimens or photographs exist for this record. All strandings of hawksbills on the Gulf coast of Florida have occurred along the southern half of the coast, south from Pasco County (Florida Sea Turtle Stranding and Salvage Network database). No hawksbills were reported among a sample of over 400 sea turtles cold-stunned in St. Joseph Bay (Gulf County) in January 2001 (Summers *et al.*, in press), nor have they been reported from in-water capture studies in the Cedar Keys area (Levy County). However, a museum specimen documents the occurrence of a 45.6 cm hawksbill at Yankeetown, also in Levy County. A 21.6 cm hawksbill was found alive but entrapped in the Crystal River nuclear power plant in November 2000 (Florida Sea Turtle Stranding and Salvage Network).

Most of the hawksbills that strand on Florida=s west coast are immature, but very few are pelagic-size, suggesting that pelagic-size turtles dispersing south out of the Gulf on the currents do so at some distance from the shore or else are not subject to much mortality (Meylan, in prep.). Pinellas County, including Tampa

Bay, has the largest share of west coast hawksbill strandings. It is likely that immature hawksbills utilize the various hard-bottom habitats off the west coast as developmental habitat (Meylan, in prep.).

A single hawksbill was captured in the Ten Thousand Islands (Collier County) as part of an in-water capture program (Witzell and Schmid, in press). Hawksbills appear to be rare in Florida Bay (Monroe County); only two immature hawksbills have been recorded during extensive in-water sampling there (B. Schroeder, pers. comm.).

Threats to hawksbills along the Gulf coast of the U.S. are marine pollution (especially oil), entanglement in marine debris, degradation of foraging habitats, and boat-related injuries.

*Distribution, Abundance, and Threats along the U.S. Atlantic Coast (Florida Keys to Virginia)*

The Atlantic coast of Florida is the only area in the United States where hawksbills nest on a regular basis, but four is the maximum number of nests documented in any year during 1979-2000 (Florida Statewide Nesting Beach Survey database). Nesting occurs as far north as Volusia County, FL, and south to the Florida Keys, including Boca Grande and the Marquesas. Soldier Key in Miami-Dade County has had more nests than any other location, and it is one of the few places in Florida that are mentioned in the historical literature as being a nesting site for hawksbills DeSola, 1935). There is also a report of a nest in the late 1970s at nearby Cape Florida. It is likely that some hawksbill nesting in Florida goes undocumented due to the great similarity of the tracks of hawksbills and loggerheads. All documented records of hawksbill nesting from 1979 to 2000 took place between May and December except for one April nest in the Marquesas (Florida Statewide Nesting Survey database).

Long-term trends in hawksbill nesting in Florida are unknown, although there are a few historical reports of nesting in south Florida and the Keys (True, 1884; Audubon, 1926; DeSola, 1935). DeSola (1931) stated that the Florida Keys were once the location of the finest fishery in the world for this species. However, there are no specific records to substantiate this claim. No trend in nesting in Florida is evident from 1979 to 2000; between 0 and 4 nests are recorded annually.

Hawksbill strandings occur along the entire Atlantic coast but the majority are south of Cape Canaveral, particularly in Palm Beach, Broward and Miami-Dade counties (Florida Sea Turtle Stranding and Salvage database). Most of the strandings in these counties are pelagic-size turtles. The abundance of hawksbills of this life history stage in southeast Florida may be linked to the close proximity of the Florida Current (Meylan, in prep.). These pelagic-stage hawksbills are presumably dispersing from nesting beaches in the Gulf and Caribbean. Strandings of pelagic-size hawksbills show a very high incidence of fouling with oil or tar, particularly in Palm Beach, Broward and Miami-Dade counties.

Live juvenile to adult hawksbills have been recorded all along Florida=s Atlantic coast, but nowhere in great numbers. They are not uncommon in the Florida Keys and on the reefs off Broward and Palm Beach counties. Twenty-four hawksbills have been removed from the intake canal at the Florida Power and Light St. Lucie Plant in Juno Beach (St. Lucie County) during 1978-2000 (M. Bresette, pers. comm.). The animals ranged in size from 34.0 B 83.4 cm straight carapace length and were captured in most months of the year. Immature hawksbills have been recorded on rare occasions in both the Indian River Lagoon (Indian River County) and Mosquito Lagoon (Brevard County). A 24.8 cm hawksbill was captured on the worm reefs 200 meters off the coast in Indian River County (L Ehrhart, pers. comm.).

Records of hawksbills north of Florida are relatively rare, although they exist as far north as Massachusetts. Pelagic-stage hawksbills dispersing from the Gulf of Mexico and southern Florida in the Gulfstream Current would be expected to occur offshore Georgia and the Carolinas. A pelagic-stage hawksbill was captured with a dipnet 37 nautical miles east of Sapelo Island, Georgia on 31 May 1994 (Parker, 1996). The turtle was floating at the surface in a dense mat of sargassum. An adult female hawksbill stranded on Cumberland Island in 1998, and a juvenile stranded on Jekyll Island the same year (Ruckdeschel *et al.*, 2000). There is a record of a hawksbill captured in a pound net off Savannah in 1931. A small number of hawksbills have been recorded from North Carolina, including a 30-cm individual captured in a summer flounder trawl (Epperly *et al.*, 1995a), another individual caught in a gill net behind Hatteras Island in Pamlico Sound (Epperly *et al.*, 1995b), and a third entrapped in a power plant in Southport, NC (S. Epperly, pers. comm.). Schwartz (1976) mentions four hawksbills recorded near Beaufort Inlet (2) and Morehead City (2) in the 1970s.

One confirmed record of a hawksbill exists for the lower Chesapeake Bay in Virginia (Keinath and Musick, 1991); another individual was stunned in Virginia by cold winter temperatures in December 2000 (Sea Turtle Stranding and Salvage Network database) .

The primary threats to hawksbills along the Atlantic coast of the United States are fouling with petroleum products, capture on hooks or entanglement in monofilament line or other marine debris, loss or degradation of feeding habitats, and boat-related injuries. Reefs in the Florida Keys are threatened by pollution, siltation, damage from anchors, shipgroundings, and other factors. Hawksbills are occasionally entrapped by the intake structure of power plants. The threat to hawksbills from disease is largely unknown. No substantiated records of Florida hawksbills with fibropapillomatosis exist, although several specimens that appeared to be hybrids between hawksbills and other species have had tumors (Meylan, in prep.).

*Distribution, Abundance, and Threats in the U.S. Caribbean*

The majority of hawksbills in U.S. waters occur in Puerto Rico and the U.S. Virgin Islands. Mona Island (Puerto Rico, 181 05= N, 67157 W) has 7.2 km of sandy beach that host the largest known hawksbill nesting aggregation in the Caribbean Basin, with over 500 nests recorded annually from 1998 B 2000 (Diez and van Dam, in press; Carlos Diez, pers. comm.). The island has been surveyed for marine turtle nesting activity for more than 20 years; surveys since 1994 show an increasing trend. Increases are attributed to nest protection efforts in Mona and fishing reduction in the Caribbean.

The coral reef habitat and cliffs around Mona Island and nearby Monito Island are an important feeding ground for all sizes of post-pelagic hawksbills. Genetic research has shown that this feeding population is not primarily composed of hawksbills that nest on Mona, but instead includes animals from at least six different nesting aggregations, particularly the U.S. Virgin Islands and the Yucatán Peninsula (Mexico) (Bowen *et al.*, 1996; Bass, 1999). Genetic data indicate that some hawksbills hatched at Mona utilize feeding grounds in waters of other countries, including Cuba and Mexico. Hawksbills in Mona waters appear to have limited home ranges and may be resident for several years (van Dam and Diez, 1998).

Mona Island is designated Critical Habitat for the hawksbill and it receives protection as a Natural Reserve under the administration of the Puerto Rico Department of Natural Resources and Environment. Limited poaching of eggs and females still occurs but the relative remoteness of the island from mainland Puerto Rico and the lack of any permanent inhabitants other than refuge staff confer considerable protection. Hog predation of nests requires continual maintence of fencing of nesting beaches. There is pressure on both nesting beaches and surrounding reef habitats from increased human presence, including visitors arriving via yachts. Although the island is currently a natural reserve, the threat of future development for tourism or other purpose always exists.

Hawksbill nesting occurs on mainland Puerto Rico at numerous sites, including Caja de Muertos, Humacao, Piñones, Fajardo, and Luquillo (Eckert, 1995; Carlos Diez, pers. comm.). None of these has been systematically surveyed over a significant period, but nesting levels appear to be low. Nesting also occurs at low density on Culebra Island and Vieques Island (Eckert, 1995). On Culebra, nesting is known to occur at Fanduca Beach, Jalovita Beach, Jalova Beach, Yellow Beach, Tamarindo Sur, Playa Brava, and Fossil Beach (USFWS Biological Opinion on naval excercises, July 27, 2000). An average of 2 B 7 nests were deposited annually on each of these beaches between 1991 and 1997. Historical literature suggests that nesting at Culebra and Vieques islands was once much more common (Wilcox, 1904). Hawksbills commonly occur in feeding habitats around Culebra.

Threats to hawksbills on mainland Puerto Rico, Culebra, and Vieques are numerous and include degradation of nesting and foraging habitats, poaching, entanglement, oil, ingestion of marine debris, boat-related injuries, incidental catch, nest depredation, increased human presence, and illegal trade in tortoiseshell and stuffed juvenile hawksbills.

The U.S. Virgin Islands is also an important hawksbill nesting site. Buck Island Reef National Monument off St. Croix has been surveyed for nesting activity since 1987. Between 1987 and 1999, between 73 and 135 hawksbill nests have been recorded annually (Meylan and Donnelly, 1999). The population, although small, is considered to be stationary. Females tagged while nesting on Buck Island have been found in Cuba and the Miskito Keys, Nicaragua (Meylan, 1999b). Nesting beaches on Buck Island experience large-scale beach erosion and accretion as a result of hurricanes, and nests may be lost to erosion or burial. Predation of nests by mongoose is a serious problem and requires intensive trapping. The hawksbills that reside in waters around Buck Island have been the subject of ecological studies since 1994. Buck Island Reef National Monument was expanded in size in 2001 from 880 to 18,000 acres (Z. Starr-Hillis, pers. comm.)

*Hawksbill nesting also occurs elsewhere on St. Croix, St. John and St. Thomas.*

During the 1994, 1995, and 1996 nesting seasons, 100, 78, and 84 hawksbill nests were recorded, respectively, at Sandy Point National Wildlife Refuge and the East End beaches (Jack=s Bay, Isaac=s Bay, and East End Bay) (Mackay and Rebholz, 1997).

Juvenile and adult hawksbills are common in the waters of the U.S. Virgin Islands. Immature hawksbills tagged at St. Thomas during long-term, in-water studies appeared to be resident for extended periods (Boulon, 1994). Tag returns were recorded from St. Lucia, the British Virgin Islands, Puerto Rico, St. Martin, and the Dominican Republic (Boulon, 1989; Meylan, 1999b).

Poaching of nesting females and eggs is still a problem in the U.S. Virgin Islands, as is vehicular driving, pollution (including sewage), boat-related injuries, degradation of nesting and foraging habitats, artificial lighting, entanglement, and illegal sale of stuffed juveniles and tortoiseshell (Eckert, 1995).

**Gulf sturgeon (*Acipenser oxyrinchus desotoi*)**

Detailed information regarding the life history, abundance, and distribution of Gulf sturgeon can be found in the Gulf Sturgeon Recovery/Management Plan (FWS and GSMFC 1995). Gulf sturgeon were listed as threatened in 1991, and are under the joint jurisdiction of the USFWS and NMFS. Historically, Gulf sturgeon occurred in most major rivers between the Mississippi and the Suwannee, and in marine waters from the Mississippi to Florida Bay. While little is known about the abundance of Gulf sturgeon through most of its range, estimates exist for the Suwannee and Apalachicola rivers. The USFWS (1990, 1991, 1992 in USFWS and GSMFC 1995) reported an average of 115 individuals larger than 45 cm total length over-summering in the Apalachicola River below Jim Woodruff Lock and Dam. For the Suwannee River, population size estimates ranging from 2,250 to 3,300 individuals have been made (Carr and Rago, unpublished data in USFWS and GSMFC 1995).

The Gulf sturgeon is a subspecies of the Atlantic sturgeon. It is an anadromous fish with a sub-cylindrical body imbedded with bony plates or scutes. The snout is greatly extended and blade-like with four fleshy chin barbels in front of the mouth which is protractile on the lower surface of the head. The upper lobe of the tail is longer than the lower lobe. Body color is light brown to dark brown and pale underneath. The species grows to a maximum length of about 8 feet and over 200 pounds in weight.

Populations in the Suwannee River and Apalachicola River have been fairly well studied over the past decade using ultrasonic and radio telemetry and conventional sampling gear. Subadult and adult fish begin migration into rivers from the Gulf of Mexico in early spring and continuing until early May (Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston *et al.* in press). In late September or October, subadult or adult sturgeon begin downstream migrations. Sturgeon apparently only feed during their stay in marine waters; food items are rarely found in the stomachs of specimens sampled from rivers. In the vicinity of the Suwannee River, the primary foods of juveniles are amphipods with isopods, annelids, dipterans, blue crab parts, lancelets, brachipods, and plant material (Huff 1975, Mason and Clugston 1993). Gulf sturgeon are long-lived, reaching an age of at least 28 years. Not surprisingly, the fish gain weight during their tenure in marine waters and subsequently lose weight during their stay in fresh water. Growth of fish aged 2 to 5 appears rapid (9.4 inches a year), but decreases to 3.1 inches a year between ages 6 to 8 (L.G. Jenkins, unpublished manuscript). Spawning of Gulf sturgeon is not well documented. However, a few larval sturgeon have been collected in early April and early May in the Apalachicola River (Wooley *et al.* 1982). Observations of ultrasonic tagged gravid females by S. Carr suggests that spawning takes place in the immediate vicinity of springs with primarily rocky substrates. Age at sexual maturity for females ranges from 8 to 17 years, and for males from 7 to 21 years (Huff 1975). Fecundity in Gulf sturgeon, based on three individuals, ranged from 274,680 to 475,000 eggs per female, or an average of 20,652 eggs a pound (Chapman *et al.* 1993).

The Gulf sturgeon is restricted to the Gulf of Mexico and its drainages, primarily from the Mississippi River to the Suwannee River, in Louisiana, Mississippi, Alabama, and Florida. The subspecies may also occur sporadically as far west as Texas, and in marine waters in Florida south to Florida Bay. Historic data indicate that populations have declined. Current population estimates are known only for the Apalachicola River and Suwannee River. The U.S. Fish and Wildlife Service has monitored the Apalachicola River population since 1979. Since 1984, the population size in this river has ranged from 96 to 131 fish, with a mean of 115 (USFWS 1990). In the Suwannee River, which appears to support the most viable population of the Gulf sturgeon, a 1986 mark and recapture study estimates the annual population of between 2,250 to 3,000 fish, averaging about 40 pounds in size (S. Carr, Caribbean Conservation Corporation, pers. comm.). Commercial landing records show that the only consistent fisheries for Gulf sturgeon occurred in West Florida, especially in the Apalachicola River, from around 1900 to the 1970s.

This fish is anadromous; immature and mature individuals participate in fresh water migrations. Adult fish spend 8 to 9 months each year in rivers and 3 to 4 of the coolest months in estuarine or Gulf waters. Young fish under 2 years of age apparently do not migrate out of rivers and estuaries. In the Suwannee River, adult sturgeon frequent areas near the mouths of springs and cool-water rivers during the summer months. Adult fish tend to congregate in deeper waters of rivers with moderate currents and sand and rocky bottoms. Seagrass beds with mud and sand substrates appear to be important marine habitats (Mason and Clugston 1993).

Directed and incidental take in fisheries and habitat loss have been identified as the major threats to the recovery of Gulf sturgeon.

## III. Species Likely to Be Affected

Of the above-listed species occurring in the GOM, NMFS believes that the five sea turtle species are vulnerable to injury and death from some of the activities associated with the proposed action. The effects of petroleum industry-associated noise on sea turtles are little understood, but it may cause disturbance if not physical harm. NMFS believes sperm whales may be vulnerable to adverse effects of acoustic harassment from seismic activities, construction and operation noise, or pollution resulting from activities associated with the proposed action. Injury or death from accidental vessel strikes, or ingestion of debris, are potential concerns as well.

Gulf sturgeon are easily sampled in rivers because they are in the lower reaches which are bordered (enclosed) by banks. The locations of Gulf sturgeon in the sea, however, are unknown because of the vast area where sampling would be required. However, there have been no reported catches of this species in Federal waters (USEPA 1993a), and their exposure to adverse effects associated with the proposed action would be primarily limited to onshore support activities occurring in inland waterways. If contacted, Gulf sturgeon may be adversely affected by crude oil spills resulting from oil and gas development activities.

## IV. Environmental Baseline

### Status of the Species Within the Action Area

#### *Factors Affecting Sea Turtles and Sperm Whales*

Below is a description of fisheries and other threats to sea turtles and whales in the Atlantic, Gulf of Mexico and Caribbean. These are categorized into federally-permitted activities (these would require section 7 consultations and include 14 federal fisheries, 1 Atlantic States Marine Fisheries Commission (SMFC) fishery, 4 power plants, numerous Section 10 permits for scientific research and incidental take, FWS-permitted activities on beaches (*e.g.*, beach nourishment, construction, sea turtle work), state- permitted activities (includes Section 10 permits), non-permitted activities which include state fisheries, boat strikes, poaching, beach and coastal lighting, marine debris, and foreign activities (fishing with longline, gillnet, set net, hook and line, trawls, harpoon/spear, and beach seines). Information/data available on loggerhead and leatherback sea turtle interactions relative to these activities is available in Appendix II of the NMFS SEFSC (2001) report.

*Federal Actions*

In recent years, NMFS has undertaken several ESA section 7 consultations to address the effects of vessel operations and gear associated with federally-permitted fisheries on threatened and endangered species in the action area. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on large whales and sea turtles. Similarly, recovery actions NMFS has undertaken under both the MMPA and the ESA are addressing the problem of the take of whales in the fishing and shipping industries. Estimates of incidental take of sea turtles for federal actions considered in previous Opinions are summarized briefly in the following pages and in NMFS (2001a). The following summary of anticipated incidental take of turtles includes only those federal actions which have undergone formal section 7 consultation.

*Vessel Operations*

Federal vessel operations in the action area which may interact with listed species include those associated with operations of the U.S. Navy (USN) and U.S. Coast Guard (USCG) - which maintain the largest federal vessel fleets, the Environmental Protection Agency (EPA), NOAA, and the U.S. Army Corps of Engineers (COE). NMFS has identified measures to minimize interactions with listed species during formal consultations with the USCG, USN, and COE, and is currently in early phases of consultation with the other federal agencies on their vessel operations. NMFS has also included restrictions on operations of contract or private vessels associated with COE dredging operations, which minimize and/or avoid interactions with listed whales and turtles.

With these measure in place, NMFS anticipated that no incidental take of listed whales, and only one or two sea turtles, would occur annually incidental to the USCG and USN vessel operations. Since the USN consultation only covered operations out of Mayport, Florida, and the USCG consultation did not cover operations in the Gulf of Mexico, NMFS has not yet been requested to consult on the effects of USN or USCG vessels interacting with large whales and sea turtles when they are operating in other areas within the action area of the HMS Pelagic Fishery. NMFS has not consulted on operations of vessels by other federal agencies within the action area (NOAA, EPA, COE) which are engaged in research and/or other activities, with the exception of Section 7 consultations completed for research permits.

Through the section 7 process, where applicable, NMFS has, and will continue to, recommend measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. For the purposes of this consultation, NMFS anticipates that vessels operated by these federal agencies will continue to operate in the action area with potential for some level of interaction with listed species. Based on information provided concerning those activities which have undergone section 7 consultation, most of these interactions are not expected to result in injury or harm. Those vessels operating in compliance with NMFS= recommendations are assumed to significantly avoid and/or minimize the potential for interactions with listed species. Refer to the Opinions for the USCG (NMFS 1995, 1996b, and 1998) and the USN (NMFS 1997a) for details on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures.

Therefore, while this may have been more of a source of mortality in previous years, very little impact is expected on either sea turtles or whales from the activities already covered under section 7 in the foreseeable future. Vessel operations outside federal consultation requirements are being addressed through other means that will be discussed later (*e.g.*, private vessel traffic and large whale take-reduction plans).

*Military Operations*

Military operations include vessel operations and ordnance detonation, that may also adversely affect listed species of whales and sea turtles. NMFS= 1997 Opinion on USN aerial bombing training in the ocean off the southeast U.S. coast, involving live ordnance (500 and 1,000-lb bombs), anticipated that up to 84 loggerhead, 12 leatherback, and 12 green or Kemp=s ridley sea turtles, in combination, may be injured or killed annually during testing activities (NMFS 1997a).

The USN has also proposed to conduct a one-time ship-shock test for the new SEA WOLF submarine off the Atlantic coast of Florida, using 5 submerged detonations of 10,000-lb explosive charges. If this program is implemented, the test is estimated to injure or kill 50 loggerhead, 6 leatherback, and 4 hawksbill, green, or Kemp=s ridley sea turtles, in combination (NMFS 1996b). The USN has also proposed to conduct a one-time ship-shock test in summer 2001 on the DDG-81 WINSTON CHURCHILL, using 4 submerged detonations of 10,000-lb explosive charges. NMFS has anticipated that this testing may lethally take up to 8 sea turtles, and take up to 228 sea turtles by acoustic harassment (NMFS 2000b).

*Dredging Activities*

Dredging associated with the construction and maintenance of federal navigation channels has also been identified as a source of mortality to sea turtles. Although listed whales may detect dredging activities, they are not likely to interact with the dredge operations. Sperm whales are unlikely to occur in areas of dredging. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle.

U.S. Navy northeast operations requiring dredging at the Dam Neck Naval Facility may take 10 loggerhead, 1 green and 1 Kemp's ridley. Along the Atlantic coast of the southeastern United States, NMFS estimates that annual, observed injury or mortality of sea turtles from hopper dredging associated with COE activities may reach 35 loggerheads, 7 greens, 7 Kemp=s ridleys, and 2 hawksbills (NMFS 1997b).

Along the north and west coasts of the Gulf of Mexico, COE channel maintenance dredging using a hopper dredge may injure or kill 30 loggerhead, 8 green, 14 Kemp=s ridley, and 2 hawksbill sea turtles annually (NMFS 1997c). For the eastern Gulf of Mexico, those numbers are 8 loggerhead, 5 leatherback, 5 green, 5 Kemp's ridley and 5 hawksbill sea turtles. In the Northeast Atlantic, COE dredging activities are expected to lethally take 29 leatherback, 2 leatherback, 7 green, and 6 Kemp's ridley sea turtles.

In most areas of the United States annual dredging to accommodate commercial shipping occurs in the nearshore approaches of the major ports. Dredging may pose a threat to some whale species due to increased vessel traffic, but such traffic is likely to be fairly nearshore (even the Aoffshore≅ borrow areas) in comparison to the distribution of sperm whales. Dredge vessels move back and forth between dredging and dumping sites; although, these vessels in general are relatively slow moving. Under ESA section 7 consultations conducted on various dredging activities, various measures to mitigate this concern have been implemented, including the posting of dedicated whale observers in high whale-use areas and seasons. Additionally, dredging may result in increased vessel traffic as deepening and/or widening of ports or channels attract more and larger vessels to use these areas. Dredging is responsible for the injury and mortality of sea turtles and various Opinions conducted on these activities contain numerous mitigation methods.

COE and Minerals Management Service (MMS) rig removal activities also adversely affect sea turtles. For the COE activities, an incidental take (by injury or mortality) of 1 documented Kemp's ridley, green, hawksbill, leatherback, or loggerhead turtle is anticipated under a rig removal consultation for the New Orleans District (NMFS 1998b). MMS= OCS oil and gas exploration, development, production, and abandonment activities are anticipated to result in annual incidental take (by injury or mortality) of 30 sea turtles, including no more than 5 Kemp's ridley, green, hawksbill, or leatherback turtles and no more than 10 loggerhead turtles. The potential for injury or mortality of sperm whales is not anticipated as a result of rig removal activities consulted upon to date, but there is concern that removal of deepwater platforms, if not properly mitigated, could potentially harm these animals. While not likely to cause serious injury or harm to sperm whales, noise associated with shallow water rig removal activities may contribute to background levels of overall noise pollution which could contribute to disturbance of sperm whales. The effects of seismic activities associated with oil and gas exploration in the Gulf has been considered relatively benign to date. However, this is inconsistent with scientific research and also regulations governing such activities in other areas (i.e., Alaska and California). Researchers have expressed concern that such activities my harm sperm whales by temporarily excluding them from areas that are important biologically or by contributing to chronic stress, or by interfering with intraspecific communication (Norris, 1998, 1999).

*Domestic Federal Fishery Operations*

Fishing operations using a variety of gear are known to interact with threatened and endangered species in the action area. Efforts to reduce the adverse effects of commercial fisheries are addressed through both the MMPA take reduction planning process and the ESA section 7 process. Longline, gillnet, set net, hook and line, trawls, harpoon/spear, pot gear, pound nets, fish traps and beach seines have been documented interacting with either whales or sea turtles or both. Since the federal fisheries are managed by NMFS, NMFS= Office of Sustainable Fisheries is required to complete section 7 consultations on decision to approve FMPs which may affect listed species. Following completion of formal section 7 consultations, NMFS= Office of Protected Resources has issued biological opinions for the following fisheries: American Lobster, Monkfish, Dogfish, Northeast Multispecies, Tilefish, Bluefish, Squid/Mackerel/Butterfish, Surf Clam/Ocean Quahog, and Summer Flounder/Scup/ Black Sea Bass, Weakfish, Herring, and Sargassum fisheries in the action area. These consultations are summarized below; for more detailed information, refer to the respective Opinions.

The *Northeast Multispecies Sink Gillnet Fishery* is one of the other major fisheries in the action area of this consultation that is known to entangle whales and sea turtles. This fishery has historically occurred from the periphery of the Gulf of Maine to Rhode Island in water to 60 fathoms. In recent years, more of the effort in this fishery has occurred in offshore waters and into the Mid-Atlantic. Participation in this fishery declined from 399 to 341 permit holders in 1993, and is expected to continue to decline as further groundfish conservation measures are implemented. The fishery operates throughout the year with peaks in the spring and from October through February. Data indicate that gear used in this fishery has seriously injured right whales, humpback whales, fin whales, and loggerhead, leatherback and Kemp's ridley sea turtles. Waring *et al.* (1997) reports that 17 serious injuries or mortalities of humpback whales from 1991 to 1996 were fishery interactions (not necessarily multispecies gear). Most implicated some kind of monofilament similar to that used in the multispecies fishery. Incidental lethal take levels of turtles anticipated in this fishery are 10 loggerhead, 4 leatherback, 4 green, and 2 Kemp's ridley. It is often difficult to assess gear found on stranded animals or observed at sea and assign it to a specific fishery. Only a fraction of the takes are observed, and the catch rate represented by the majority of takes, which are reported opportunistically, *i.e.*, not as part of a random sampling program, is unknown. Consequently, the total level of interaction cannot be determined through extrapolation. Based on new information regarding the status of right whales and sea turtle interactions, NMFS reinitiated consultation on the Multispecies FMP on May 4, 2000. The new Opinion will evaluate the effects of this fishery on listed species and provide new estimates of incidental take.

The *American Lobster Pot Fishery* is the largest fixed gear fishery in the action area. This fishery is known to take endangered whales and sea turtles. In 1998, NMFS reinitiated formal consultation on the federally regulated lobster fishery to consider potential effects of the transfer of management authority from the MSA to the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA), the implementation of new lobster management actions under the ACFCMA, and recent takes of endangered whales in the fishery. The previous formal consultation on the fishery under the MSA (Opinion issued December 13, 1996) had reached a jeopardy conclusion for the northern right whale. As a result of the Reasonable and Prudent Alternative

(RPA) included with the 1996 Opinion, an emergency regulation under the MMPA (Emergency Interim Final Rule, 62 FR 16108) was published implementing restrictions on the use of lobster pot gear in the federal portion of the Cape Cod Bay right whale critical habitat and in the Great South Channel right whale critical habitat during periods of expected peak right whale abundance.

The proposed ACFCMA plan contains measures to limit the number of lobster traps that can be deployed during the first two years of the plan, and further trap reduction measures may be chosen as default effort reduction measures during subsequent plan years. The reduction in the number of traps fished is expected to result in a reduction of entanglement risk. The interaction between the lobster trap fishery and endangered whales is addressed in the Atlantic Large Whale Take Reduction Plan (ALWTRP) implemented via an interim final rule November 15, 1997, followed by a final rule issued February 16,1999. The ALWTRP incorporated the RPA issued with the 1996 Opinion and implemented additional restrictions. Because of the greater protection provided by the ALWTRP, NMFS substituted the ALWTRP for the RPA issued with the 1996 Opinion and has concluded that the lobster fishery in the context of the ALWTRP is likely to adversely affect but is not likely to jeopardize the northern right whale. As with the multispecies Opinion noted above, the level of incidental take anticipated for this fishery was incorporated within the July 5, 1989, Opinion on the Issuing of Exemptions for Commercial Fishing Operations under Section 114 of the MMPA, as detailed above (NMFS 1989). Due to new information on the status of right whales and sea turtle interactions, NMFS reinitiated consultation on this fishery on June 22, 2000. The new Opinion will evaluate the effects of this fishery on listed species and provide new estimates of incidental take. The existing opinion anticipates lethal take of 10 loggerhead and 4 leatherback sea turtles.

The *Monkfish Fishery Management Plan* was prepared by the New England and Mid-Atlantic Fishery Management Councils. This fishery uses several gear types which may entangle protected species, and takes of shortnose sturgeon and sea turtles have been recorded from monkfish trips. The monkfish gillnet sector is included in either the northeast sink gillnet or mid-Atlantic coastal gillnet fisheries and is therefore regulated by the ALWTRP and the Harbor Porpoise Take Reduction Plan. NMFS completed a formal consultation on the Monkfish FMP on December 21, 1998, which concluded that the fishery, with modification under the take reduction plans, is not likely to jeopardize listed species or adversely modify critical habitat. The incidental take statement (ITS) provided under this Opinion anticipates up to 6 incidental takes of loggerhead turtles (no more than 3 lethal), 1 lethal or non-lethal take of a green sea turtle, 1 lethal or non-lethal take of a Kemp=s ridley, and 1 lethal or non-lethal take of a leatherback. However, based on the potential involvement of this fishery in the recent pulse of sea turtle strandings in North Carolina, noted elsewhere in this Opinion, as well as new information on the status of right whales and sea turtle interactions, NMFS reinitiated consultation on the Monkfish FMP on May 4, 2000. The new Opinion will evaluate the effects of this fishery on listed species and provide new estimates of incidental take.

The *Spiny Dogfish Fishery* is similar to the monkfish fishery, but uses somewhat smaller mesh gear. The most recent Opinion prepared for the FMP for this fishery anticipated 6 takes (no more than 3 lethal) of loggerheads, and 1 take (lethal or non-lethal) each for Kemp=s ridley, leatherback and green sea turtles. Due to new information on the status of right whales and sea turtle interactions, NMFS also reinitiated consultation on the Spiny Dogfish FMP on May 4, 2000. The new Opinion will evaluate the effects of this fishery on listed species and provide new estimates of incidental take.

NMFS recently completed consultation on a new FMP for the *Tilefish fishery* on March 13, 2001. Tilefish are primarily taken by bottom longline gear; although, bottom trawl gear is also utilized. Although sperm whales have been documented in bottom longline gear in fishing areas outside the action area, NMFS does not anticipate any listed whales will be taken in this fishery. Based on information from fisheries using similar gears in the action area, NMFS anticipated that up to 6 loggerheads and 1 leatherback sea turtle may be incidentally captured in bottom longline or trawl gears associated with the tilefish fishery on an annual basis.

The *Bluefish Fishery* operates in the action area using a combination of gillnets (48%), otter trawls (19%), fish pound nets (7%), hand and troll lines (6%), and haul seines (3%). Based on observations of incidental take of listed species in other fisheries using similar gear types, NMFS anticipated in its July 2, 1999, Opinion that up 6 loggerhead and 6 Kemp=s ridley sea turtles may be taken on an annual basis in the bluefish fishery.

The *Squid/Mackerel/Butterfish Fishery* uses primarily midwater and bottom trawl gear, although pelagic drift gillnet, pelagic longline/hook-and-line/hand line, purse seine, pot, trap, dredge, pound nets, and bandit gears are all approved for use under the FMP. NMFS= April 28, 1999, Opinion anticipated that up to 6 loggerheads, 2 greens or Kemp=s ridleys, and 1 leatherback sea turtle could be incidentally captured in the squid/mackerel/butterfish fishery.

The *Summer Flounder, Scup and Black Sea Bass Fisheries* are known to interact with sea turtles. While not documented, the gear-types used in this fishery could also entangle endangered whales, particularly humpback whales. Significant measures have been developed to reduce the take of sea turtles in summer flounder trawls, and trawls that meet the definition of a summer flounder trawl (which would include fisheries for other species such as scup and black sea bass), by requiring TEDs in nets in the area of greatest bycatch off the North Carolina and southern Virginia coast. NMFS is considering a more geographically inclusive regulation to require TEDs in trawl fisheries that overlap with sea turtle distribution to reduce the impact from this fishery. Developmental work is also ongoing for a TED that will work in the flynets used in the weakfish fishery. These fisheries are subject to the requirements of the ALWTRP for gillnets and lobster pots in the Mid-Atlantic. The anticipated observed annual take rates for turtles in this multispecies fishery is 15 loggerheads and 3 leatherbacks, hawksbills, greens, or Kemp=s ridleys, in combination annually (NMFS 1997a).

The *Southeast U.S. Shrimp Fishery* is known to incidentally take high numbers of sea turtles. Henwood and Stuntz (1987) reported that the mortality rate for trawl-caught turtles ranged between 21% and 38%, although Magnuson *et al.* (1990) suggested Henwood and Stuntz=s estimates were very conservative and likely an underestimate of the true mortality rate. Since 1990, shrimp trawlers in the southeastern U.S. are required to use TEDs, which optimally reduce a trawler=s capture rate by 97%. Even so, NMFS estimated that 4,100 turtles may be taken, lethally or non-lethally, annually by shrimp trawlers operating legally under the sea turtle conservation measures, including 650 leatherbacks too big to be released through TEDs, 1,700 turtles taken in try nets, and 1,750 turtles (representing a 3% capture rate) that fail to escape through the TED (NMFS, 1998d), including large loggerheads. A detailed summary of the U.S. shrimp trawl fishery and the Mid-Atlantic winter trawl fishery impacts can be found in the TEWG reports (1998, 2000).

A large proportion of stranded loggerheads and a small proportion of stranded green turtles appear too large to fit through the required minimum-sized TED openings in the shrimp trawl fishery and thus it is unlikely that current TEDs have achieved 97% reduction in capture of large turtles, such as loggerheads, greens, and leatherbacks. The relatively large proportion of stranded loggerhead turtles with dimensions greater than the required minimum TED height opening is cause for concern in light of the need to reduce mortality on the northern subpopulation of loggerheads (TEWG 1998). Strandings of loggerhead turtles with body depths greater than the currently required minimum TED height opening has ranged between 33% and 47% of the total measured strandings since 1986. In the 3 years preceding September 1999, nearly 1,300 stranded loggerhead turtles were deeper bodied than the currently required TED height opening. The problem is acute off the nesting beaches of the eastern Gulf of Mexico and the Atlantic seaboard (Epperly and Teas 1999). It is also noteworthy that, on average, the number of turtle carcasses stranded on ocean-facing beaches may represent, at best, based on evidence obtained via a 3-dimensional oceanographic model (Werner *et al.* 1999), approximately 20% of the total number of available carcasses at sea (*i.e.*, of turtles dying at sea). Only those turtles killed very close to the shore may be most likely to strand (*in* NMFS SEFSC 2001, Part I). NMFS has recently reinitiated consultation on the *Southeast U.S. Shrimp Fishery* to consider a new TED regulation proposed April 5, 2000, to increase the size of openings and reduce mortalities of captured sea turtles.

The *Atlantic Herring Fishery* operating in the northeastern U.S. was issued a biological opinion that anticipated 6 loggerhead takes, of which no more than 3 would be lethal, and 6 lethal takes of Kemp's ridleys.

An Opinion on the *NMFS/ASMFC Interjurisdictional FMP for Weakfish* was conducted in June 1997. Weakfish are caught in the summer flounder fishery and are also fished with flynets. Analyses of the NMFS= observer data showed 36 incidental captures of sea turtles for trawl and gillnet vessels operating south of Cape May, New Jersey from April 1994 through December 1996. Of those turtles taken, 28 loggerheads were taken in trawls that also caught weakfish, and resulted in 2 deaths. Most of the sea turtle takes occurred in late fall. In all cases, weakfish landings were second in poundage behind Atlantic croaker and summer flounder (NEFSC, unpub. data). The Opinion on the federal portion of the fishery anticipates 20 lethal takes of loggerheads and 2 lethal takes of Kemp's ridleys.

In the *Sargassum Fishery*, NMFS has also anticipated that juvenile sea turtles will be taken. In its June 21, 1999, Opinion, NMFS anticipated that up to 30 neonate/immature loggerhead and no more than 1 neonate/pelagic immature leatherback, hawksbill, green, and Kemp=s ridley sea turtles will be taken on an annual basis during the harvest of *sargassum*.

*Other Federal Actions*

*Power Plants* impact sea turtles entering coastal or inshore areas by entrainment in the cooling-water systems. At the St. Lucie nuclear power plant at Hutchinson Island, Florida, large numbers of green and loggerhead turtles have been captured in the seawater intake canal in the past several years. Annual capture levels from 1994-1997 have ranged from almost 200 to almost 700 green turtles and from about 150 to over 350 loggerheads. Almost all of the turtles are caught and released alive; NMFS estimates the survival rate at 98.5% or greater (see NMFS 1997e).

An Opinion completed in January 2000 estimates that the operations at the Brunswick Steam Electric Plant in Brunswick, North Carolina, may take 50 sea turtles in any combination annually, that are released alive. NMFS also estimated the total lethal take of turtles at this plant may reach 6 loggerhead, 2 Kemp=s ridley, or 3 green turtles annually.

An Opinion completed in June 1999 on the operations at the Crystal River Energy Complex in Crystal River, Florida, estimated the level of take of sea turtles in the plant=s intake canal may reach 55 sea turtles with an estimated 50 being released alive biennially. Opinions were also issued for the Oyster Creek and Salem and Hope Nuclear generating stations that anticipated 40 loggerhead takes (8 lethal), 7 Kemp's ridleys (3 lethal) and 8 greens (2 lethal).

It is important to note that the large majority of captures in power plant facilities on the U.S. east coast do not result in serious injury or mortality since most of the plants have implemented procedures specifically to release turtles unharmed.

*Other federally permitted activities* affecting loggerhead and leatherback sea turtles are detailed in NMFS SEFSC, 2001, Appendix II and include a number of research activities, the large majority of which are not lethal. Very little data was available from US FWS on various activities they permit based on their sea turtle jurisdiction on beaches. However, as they are also monitoring activities like beach renourishment through Section 7 consultation, it would be expected that the impacts of such activities would be minimal.

***State or Private Actions***

*Private and Commercial Vessels*

Private and commercial vessels operate in the action area of this consultation and also have the potential to interact with whales and sea turtles. For example, shipping traffic in Massachusetts Bay is estimated at 1,200 ship crossings per year with an average of 3 per day. More than 280 commercial fishing vessels fish on Stellwagen Bank in the Gulf of Maine, and sportfishing contributes more than 20 vessels per day from May to September. In Massachusetts Bay alone, about 20 whale watch companies representing 40-50 boats conduct several thousand trips from April to September, with the majority of effort in the summer season. More than 280 commercial vessels fish on Stellwagen Bank. Sportfishing contributes more than 20 vessels per day from May to September. In addition, an unknown number of private recreational boaters frequent Massachusetts and Cape Cod Bays. Similar traffic and more exists for many other ports, some larger, within the scope of this consultation which overlap with whale high-use areas. The invention and popularization of new technology resulting in high speed catamarans for ferry services and whale watch vessels operating in congested coastal areas contribute to the potential for impacts from privately-operated vessels.

Various initiatives have been planned or undertaken to expand or establish high-speed watercraft service in the northwest Atlantic, including one service between Bar Harbor, Maine, and Nova Scotia with a vessel operating at higher speeds than established watercraft service. The Bar HarborBNova Scotia high speed ferry conducted its first season of operations in 1998. The operations of these vessels and other high-speed craft may adversely affect threatened and endangered whales and sea turtles, as discussed previously with private and commercial vessel traffic in the Action Area. NMFS and other member agencies of the Northeast Implementation Team for the Recovery of the Northern Right Whale will continue to monitor the development of the high speed vessel industry and its potential threats to listed species and critical habitat. Recent whale strikes resulting from interaction with whale watch boats and recreational vessels have also been recorded.

Wiley *et al.* (1995) showed that in the mid-Atlantic area (between Chesapeake Bay, Virginia, and Cape Hatteras, North Carolina), of the stranded humpback whales for which the cause of death was determinable, 30% of the mortalities were attributed to vessel strikes and 25% had injuries consistent with entanglement in fishing gear. This indicates that vessel interactions are having an impact upon whale populations along this portion of the coast. Most such interactions are apparently coastal, and not likely of great concern for sperm whales, which apparently are ship struck only rarely. It is not currently known what degree of mixing exists, if any, between Atlantic and Gulf sperm whales.

The ports of Jacksonville and Port Everglades, Florida; Baltimore, Maryland; Wilmington, Delaware; Philadelphia, Pennsylvania; New York, New York; and Boston, Massachusetts support some of the country=s strongest maritime economies. Commercial shipping traffic in Massachusetts Bay is estimated at 1,200 ship crossings per year with an average of 3 per day. About 17 million tons of waterborne cargo pass through the

Port of Jacksonville, Florida which receives about 1,600 vessels each year moving between the U.S. and South America, Europe, and the Caribbean. About 4.8 million tons (short tons) pass through the Port of Wilmington, Delaware which receives about 400 vessels each year. About 56 million tons of waterborne cargo passed through the Port of New York in 1998. About 1.3 million tons of general cargo, 1.5 million tons of bulk cargo, and 12.8 million tons of bulk fuel cargo pass through the Port of Boston, Massachusetts, which receives more than 62 ship calls, 350 container vessels, and 1,700 bulk cargo vessels each year. In addition, about 60 cruise vessels sail from the Port of Boston each year (Note: data derived from the internet websites of each of the named ports).

In southeastern waters, shipping channels associated with Jacksonville and Port Canaveral, Florida, bisect the area that contains the most concentrated whale sightings within right whale critical habitat. These channels and their approaches serve commercial shipping ports and two military bases. All of these channels require periodic maintenance dredging by the COE (and at times, more extensive dredging is conducted to support port expansion or to allow for larger military vessels). These commercial ports are growing, with the port of Jacksonville, one of the busiest ports on the east coast, undergoing major expansion along with several other east coast ports vying for designation as Amegaports≅ to attract Panamanian ex-vessel traffic. Expansion of these ports requires section 7 consultations.

It is not currently possible to quantify the numbers of whales or especially sea turtles injured or killed as a result of vessel collisions, but some stranding data indicate that this may be a significant source of mortality for sea turtles (Plotkin and Amos 1990, Shaver 1998).

In addition to commercial traffic and recreational pursuits, private vessels participate in high-speed marine events concentrated in the southeastern United States that are a particular threat to sea turtles, and occasionally to marine mammals as well. The magnitude of these marine events is not currently known. NMFS and the USCG are in early consultation on these events, but a thorough analysis has not been completed. The Sea Turtle Stranding and Salvage Network (STSSN) also reports many records of vessel interaction (propeller injury) with sea turtles off coastal states such as New Jersey and Florida, where there are high levels of vessel traffic.

Ship strikes have been identified as a significant source of mortality to the Western Atlantic stock of right whales (Kraus 1990) and are also known to impact all other endangered whales. Specifically, commercial and private vessels may affect humpback, fin, sperm, and right whales. Small vessel traffic also kills or injures threatened and endangered sea turtles in the action area. NMFS expects this commercial traffic into and out of these ports to continue into the foreseeable future. The best scientific and commercial data available provide no specific information on what risk this level of commercial traffic poses to endangered whales in the action area, but NMFS would expect this level of commercial traffic to pose a risk of ship strikes that would continue to kill or seriously injure whales in numbers similar to those observed between 1994 and 1999 (1 dead blue whale, 1 dead sei whale, 2 dead fin whales, and at least 6 dead right whales).

*State Fishery Operations*

Several coastal state fisheries are known to incidentally take listed species, but information on these fisheries is sparse (NMFS 2001a). Although few of these state regulated fisheries are currently authorized to incidentally take listed species, several state agencies have approached NMFS to discuss applications for a section 10(a)(1)(B) incidental take permit. Since NMFS= issuance of a section 10(a)(1)(B) permit will require formal consultation under section 7 of the ESA, the effects of these activities will be considered in future section 7 consultations. Although the past and current effects of these fisheries on listed species is currently not determinable, NMFS believes that ongoing state fishing activities may be responsible for seasonally high levels of observed strandings of sea turtles on both the Atlantic and Gulf coasts. Most of the state data is based on extremely low observer coverage or sea turtles were not part of data collection; thus, this data provides insight into gear interactions that could occur but is not indicative of the magnitude of the overall problem. The following state by state summary is based on research summarized in NMFS SEFSC (2001) and only records sea turtles.

NOTE: It is important to recognize that these estimates are based on varied levels of observer effort (some extremely low), differences in observer program priorities, varying levels of information provided to NMFS by the states, and varying levels of sophistication in data collection and database management techniques. Therefore, these values do not provide a reliable estimate of the magnitude of take and are considered significant underestimates of actual take.

*Massachusetts* fisheries include: bottom trawl fishery (1 observed loggerhead take), lobster pot fishery (85 stranded leatherbacks linked to this fishery), pound net (weir) fishery (no data), pound net (1 observed leatherback), gill net (1 observed loggerhead), non-shrimp trawl (1 green), fish trap (1 loggerhead), hook and line (1 loggerhead).

*Rhode Island fisheries* include: bottom trawl ("occasional" loggerhead), gill nets (no data), large fish traps (no data), lobster pots (no data), pound nets (2 observed leatherbacks), non-shrimp trawl (1 leatherback observed).

*Connecticut fisheries*: no data on listed species bycatch available, but bottom trawl, gill net, and lobster pot fisheries operate in state waters.

*New York*: fisheries consist of bottom trawl, pound nets, gillnets, fish trap, non-shrimp trawl, lobster pot and set nets. Of these, the pound net fishery has taken 144 loggerheads, 43 Kemp's ridleys and 52 green turtles, all unharmed. The rest of the fisheries combined only show observed interactions of 1-2 turtles each from any number of species.

*New Jersey*: has a list of fisheries similar to NY, no data was available for the bottom trawl or gill net fisheries, pound net captures were observed for 16 loggerheads.

*Delaware:* no data were available on the horseshoe crab fishery, gillnet fishery or fish traps for sea turtle take, but 9 loggerheads and 3 greens were observed in non-shrimp trawls, 12 loggerheads in hook and line fisheries in Delaware Bay, and 2 in driftnets.

*Maryland*: no data were available for bottom trawl, gillnet, pound net, or hook and line fisheries operating in the state, but pound nets had 4 observed greens and non-shrimp trawls had 1 observed loggerhead.

*Virginia*: the pound net fishery had 82 observed loggerhead takes (1 dead) and 6 green (0 dead), hook and line, non-shrimp trawl and gill net fisheries records show 1-2 observations of loggerhead takes. According to NMFS records for the Marine Mammal Exemption Program, which governed marine mammal/fishery interactions prior to the 1994 amendments to the MMPA, interactions between humpback whales and menhaden purse seines have occurred in the past. It is not known whether injury or mortality resulted nor where the interactions occurred.

*North Carolina*: the pound net fishery has been observed for years and has probably some of the most complete data; a total of 2898 loggerheads were estimated to have been caught (156 observed), 0 were dead, 531 estimated ridleys, and 221 estimated greens. Hook and line fishery observed takes are 70 loggerheads, 1 leatherback, 3 Kemp's ridleys, 22 greens, 0 dead; seine and long haul seine net observations included 15 loggerheads, 1 Kemp's ridley; the next highest fisheries are the shrimp trawl (22 loggerheads, 2 dead; 2 Kemp's ridleys and 5 greens); and non-shrimp trawls which also had observations of loggerheads (53, 6 dead). No data on sea turtle takes were available on beach seine fisheries, stop net fishery, purse seine fishery, fish traps, eel pots, shrimp pots; although, observed takes of humpback whales have been recorded by NEFSC in the beach seine fishery. Crab pot fisheries and pelagic longline had a few observations of sea turtle takes. Gillnet fisheries in North Carolina are diverse and extensive, and include a large recreational component in addition to the commercial component. One humpback whale mortality was documented in a sink gillnet targeting spot and croaker.

*South Carolina* has relatively few fisheries: gillnet, whelk trawling, hook and line and shrimp trawl. Few data are available regarding interactions between listed species and these fisheries. The gillnet fishery includes a small shad fishery which is phasing out, and a recreational component. A few loggerheads were observed taken in both the gillnet and trawl fisheries.

*Georgia* also has relatively few fisheries: shrimp bait fishery, whelk fishery, blue crab fishery, shrimp trawl, hook and line, with a few loggerhead and green turtle observed takes.

*Florida* has a long list of state fisheries including: hook and line, fish trap, try net, shrimp trawl, non-shrimp trawl, gillnet, longline, cast net, and set net. These fisheries have observations of relatively few turtles, the majority loggerheads, with the exception of the hook and line fisheries which have 7 loggerheads (1 dead), 30 greens and 4 Kemp's ridleys in the Atlantic and 1 green, and 7 loggerheads (1 dead), 1 green and 20 Kemp's ridleys in the Gulf. The set net fishery had the next largest number of observations, 12 green turtles, recorded as alive.

*Alabama* has shrimp trawl incidental captures, but relatively little data are available.

*Mississippi* and *Louisiana* have shrimp and non-shrimp trawl fisheries, and gillnets; most recorded takes are of Kemp's ridleys (12) in shrimp trawls in Louisiana.

*Texas* supports hook and line, gillnet, cast net, seine net, set net, trotline, shrimp trawl, non-shrimp trawl, and try net fisheries. The largest recorded takes are Kemp's ridleys, 387 (91 dead) in the hook and line fishery.

The most obvious conclusion from the above list of sea turtle and whale interaction reports is the paucity of data available on interactions and also the significant potential for impacts on listed species from state fisheries. This is particularly true for whales, which may carry gear long distances before they are documented as entangled, making it difficult to determine where the interaction occurred. To address these data gaps, several state agencies have initiated observer programs to collect information on interactions between listed species and certain gear types. Other states have pro-actively closed nearshore waters to gear-types known to have high encounter rates with listed species. Depending on the fishery in question, many state permit holders also hold federal permits; therefore, existing section 7 consultations on federal fisheries may address some of the state fishery impacts. Impacts of state fisheries on endangered whales are being addressed, as appropriate, through the MMPA take reduction development process. For example, the ALWTRP addresses the mid-Atlantic coastal gillnet fishery, which is largely prosecuted in state waters. NMFS is also actively participating in a cooperative effort with ASMFC to standardize and/or implement programs to collect information on level of effort and bycatch in state fisheries. When this information becomes available, it can be used to refine take reduction plan measures in state waters. With regard to whale entanglements, vessel identification is occasionally recovered from gear removed from entangled animals. With this information, it is possible to determine whether the gear was deployed by a federal or state permit holder and whether the vessel was fishing in federal or state waters.

In addition to the lack of data, other trends emerge from these summaries; certain gear types may have high levels of sea turtle takes, but very low rates of serious injury or mortality. For example, the pound net and hook and line takes rarely result in death, but trawls and gillnets frequently do. Leatherbacks seem to be susceptible to a more restricted list of fisheries, while the hard shelled turtles, particularly loggerheads, seem to appear in data on almost all of the state fisheries.

In 1998, East Coast states from Maine through North Carolina began implementing regulations pursuant to the Year 1 requirements of *Amendment 3 to the Atlantic States Marine Fisheries Commission=s Coastal Fishery Management Plan for American Lobster* (ASMFC 1997). The proposed federal ACFCMA plan is designed to be complementary to the ASMFC plan, and the two plans are similar in structure. Regulations will be geared toward reducing lobster fishing effort by 2005 to reverse the overfished status of the resource. States in the 6 coastal areas must implement regulations according to a compliance schedule established in Amendment 3. Effort reduction measures will be similar to those proposed in the federal ACFCMA plan. Several states have implemented trap caps for 1998. Further trap limits, which the compliance schedule requires for Area 1 and the Outer Cape Lobster Management Area in 1999, will generate some localized risk reduction for protected species in those areas. If all states elect to implement a significant trap reduction program, the overall entanglement risk would be substantially reduced. Vessels fishing in state waters will be required to comply with MMPA take reduction plan regulations designed to reduce entanglement risk to whales.

Early in 1997, the *Commonwealth of Massachusetts* implemented restrictions on lobster pot gear in the state water portion of the Cape Cod Bay critical habitat during the January 1 - May 15 period to reduce the impact of the fishery on right whales. The regulations were revised prior to the 1998 season. State regulations impact state permit holders who also hold federal permits, although effects would be similar to those resulting from federal regulations during the January 1 - May 15 period. Massachusetts has also implemented winter/spring gillnet restrictions similar to those in the ALWTRP and the MSA for the purpose of right whale and/or harbor porpoise conservation. Lobster pots are fished in areas outside of Massachusetts where sea turtles and the depleted stock of bottlenose dolphin are present. Entanglement has been documented for both species.

The North Carolina Observer program documented 33 flynet trips from November through April of 1991-1994 and recorded no turtles caught in 218 hours of trawl effort. However, a NMFS-observed vessel fished for summer flounder for 27 tows with an otter trawl equipped with a TED and then fished for weakfish and Atlantic croaker with a flynet that was not equipped with a TED. They caught 1 loggerhead in 27 TED-equipped tows and 7 loggerheads in 9 flynet tows without TEDs. In addition, the same vessel using the flynet on a previous trip took 12 loggerheads in 11 out of 13 observed tows targeting Atlantic croaker. A slight potential exists for interaction between this fishery and humpback whales, particularly in the mid-Atlantic, but no documentation of such interactions is available.

Other bottom trawl fisheries that are suspect for the incidental capture of sea turtles are the horseshoe crab fishery in Delaware (Spotila *et al.* 1998) and the whelk trawl fishery in South Carolina (S. Murphy, pers. comm. to J. Braun-Mcneill, November 27, 2000) and Georgia (M. Dodd, pers. comm. to J. Braun-McNeill, December 21, 2000). In South Carolina, the whelk trawling season opens in late winter and early spring when offshore bottom waters are > 551F. One criterion for closure of this fishery is water temperature: whelk trawling closes for the season and does not reopen throughout the state until 6 days after water temperatures first reach 641F in the Fort Johnson boat slip. Based on the South Carolina Department of Natural Resources Office of Fisheries Management data, approximately 6 days will usually lapse before water temperatures reach 681F, the temperature at which sea turtles move into state waters (D. Cupka, pers. comm.). From 1996-1997, observers onboard whelk trawlers in Georgia reported a total of 3 Kemp's ridleys, 2 greens and 2 loggerhead sea turtles captured in 28 tows for a catch per unit effort (CPUE) of 0.3097 turtles/100ft net hour. As of December 2000, TEDS are required in Georgia state waters when trawling for whelk (*Ibid*.). A loggerhead was reported captured in a Florida try net (W. Teas, pers. comm.).

A detailed summary of the gillnet fisheries currently operating along the mid- and southeast U.S. Atlantic coastline, that are known to incidentally capture loggerheads, can be found in the TEWG reports (1998, 2000). Although all or most nearshore gillnetting in state waters of South Carolina, Georgia, Florida, Louisiana, and Texas is prohibited by state regulations, gillnetting in other states= waters and in federal waters does occur. Of particular concern are the nearshore and inshore gillnet fisheries of the mid-Atlantic operating in Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina state waters and/or federal waters. Incidental captures in these gillnet fisheries (both lethal and non-lethal) of loggerhead, leatherback, green and Kemp's ridley sea turtles have been reported (W. Teas, pers. comm., J. Braun-McNeill pers. comm.). In addition, illegal gillnet incidental captures have been reported in South Carolina, Florida, Louisiana and Texas (NMFS 2001a).

Georgia and South Carolina prohibit gillnets for all but the shad fishery. This fishery was observed in South Carolina for one season by the NMFS SEFSC (McFee *et al.* 1996). No takes of protected species were observed. Florida banned all but very small nets in state waters, as has the state of Texas. Louisiana, Mississippi and Alabama have also placed restrictions on gillnet fisheries within state waters such that very little commercial gillnetting takes place in southeast waters, with the exception of North Carolina. Most pot fisheries in the southeast are prosecuted only in areas not likely to be frequented by whales, but in areas frequented by sea turtles.

Gillnetting activities in North Carolina associated with the southern flounder fishery have recently been implicated in large numbers of sea turtle mortalities. NMFS closed part of Pamlico Sound to the setting of gillnets targeting southern flounder in fall 1999 after the strandings of relatively large numbers of loggerhead and Kemp=s ridley sea turtles on inshore beaches. NMFS also closed the waters north of Cape Hatteras to 38E N., including the mouth of the Chesapeake Bay, to large (> 6 inch stretched) mesh gillnets for 30 days in mid-May 2000 due to the large numbers of loggerhead strandings in North Carolina, and will continue to implement such proactive measures as necessary. A large proportion of these stranded loggerheads was assumed to be from the northern subpopulation. This assumption is partly supported by analyses conducted by Bass *et al.* (1999) on genetic samples collected from sea turtles stranding on U.S. Atlantic and Gulf of Mexico shores. The northern subpopulation accounted for 25-28% of the animals that stranded off the Carolinas, and 46% of the animals sampled that stranded in the northernmost area sampled, Virginia (TEWG 2000). Most recently, on October 27, 2000, the North Carolina Division of Marine Fisheries (NCDMF) closed waters in the southeastern portion of the Pamlico Sound as a result of elevated takes by the commercial large-mesh flounder gillnet fishery. The NCDMF and NMFS had just agreed on details of a section 10 permit of the ESA for the southern flounder fishery just prior to the closure. The fishery was closed when anticipated incidental take levels were met for green sea turtles. The NCDMF estimated that there were 50 loggerheads captured at the time of closure and that 44 of those had been drowned (NMFS 2001a).

Pulses of elevated sea turtle strandings occur with regularity in the Mid-Atlantic area, particularly along North Carolina through southern Virginia in the late fall/early spring, coincident with sea turtle migrations. For example, in the end of April through early May, 2000, approximately 300 turtles, mostly loggerheads, stranded north of Oregon Inlet, North Carolina. Gillnets were found with four of the carcasses. These strandings are likely caused by state fisheries as well as Federal fisheries, although not any one fishery has been identified as the major cause. Fishing effort data indicate that fisheries targeting monkfish, dogfish, and bluefish were operating in the area of the strandings. Strandings in this area represent at best, 7-13% of the actual nearshore mortality (Epperly *et al.* 1996). Studies by Bass *et al.* (1998), Norrgard (1995) and Rankin-Baransky (1997) indicate that the percentage of northern loggerheads in this area is highly over-represented in the strandings when compared to the ~ 9% representation from this subpopulation in the overall U.S. sea turtle nesting populations. Specifically, the genetic composition of sea turtles in this area is 25-54% from the northern subpopulation, 46 - 64% from the South Florida subpopulation, and 3-16% from the Yucatan subpopulation. The cumulative removal of these turtles on an annual basis would severely impact the recovery of this species.

Pound nets are a passive, stationary gear that are known to incidentally capture loggerhead sea turtles in Massachusetts (R. Prescott pers. comm.), Rhode Island, New Jersey, Maryland (W. Teas pers. comm.), New York (Morreale and Standora 1998), Virginia (Bellmund *et al.* 1987) and North Carolina (Epperly *et al.* 2000). Although pound nets are not a significant source of mortality for loggerheads in New York (Morreale and Standora 1998) and North Carolina (Epperly *et al.* 2000), they have been implicated in the stranding deaths of loggerheads in the Chesapeake Bay from mid-May through early June (Bellmund *et al.* 1987). The turtles were reported entangled in the large mesh (>8 inches) pound net leads (NMFS 2001a).

Incidental captures of loggerheads in fish traps set in Massachusetts, Rhode Island, New York, and Florida have been reported (W. Teas, pers. comm.). Although no incidental captures have been documented from fish traps set in North Carolina and Delaware (Anon 1995), they are another potential anthropogenic impact to loggerheads and other sea turtles. Lobster pot fisheries are prosecuted in Massachusetts (Prescott 1988), Rhode Island (Anon 1995), Connecticut (Anon 1995) and New York (S. Sadove, pers. comm.). Although they are more likely to entangle leatherback sea turtles, lobster pots set in New York are also known to entangle loggerhead sea turtles *(Ibid.*). No incidental capture data exist for the other states. Long haul seines and channel nets in North Carolina are known to incidentally capture loggerhead and other sea turtles in the sounds and other inshore waters(J. Braun-McNeill, pers. comm.). No lethal takes have been reported (*In* NMFS 2001a).

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 turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001). A detailed summary of the known impacts of hook and line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998, 2000).

***International Factors***

*International Fisheries*

Less is known about *sperm whales* than humpbacks and right whales. The sperm whales occupying the eastern U.S. Atlantic EEZ likely represent only a fraction of the total stock and their offshore distribution is thought to be commonly associated with the Gulf Stream edge and other features. Impacts in international waters in the north are probably affecting different social groupings than seen off the northeast U.S. and include more social groups of females and calves/juveniles. Whaling records include catches near West Greenland, the Azores, Madeira, Spain, Morocco, Norway, the British Isles, and the Faroes. Because of their offshore distribution, sperm whales are less likely to be impacted overall by human activities (Waring *et al.* 2000). However, in 1993, longline gear was found on a dead sperm whale, wound tightly about its jaw. This whale was found floating about 20 miles off Mt. Desert Rock; the gear=s country of origin is unknown. A sperm whale entangled in net was documented 130 nmi off northwest Bermuda.

Sperm whales are impacted by fisheries and ship traffic in international waters, but the magnitude is currently unquantifiable. Information is so sparse on this species that it is difficult to speculate, but given their distribution, impacts from international sources are likely similar to U.S. impacts.

For sea turtle species in the Atlantic, Gulf of Mexico and Caribbean, international activities, particularly fisheries, are significant factors impacting populations. The U.S. and 26 other nations participate in longline fishing throughout the western North Atlantic Ocean and the relative proportion of total hooks fished by the U.S. fleet is small compared to foreign fleets. As with U.S. fleets, sea turtles are bycatch (NMFS SEFSC 2001). Takes of pelagic juvenile loggerheads in U.S. and international longline fisheries as a whole are large and the mortality rate is unknown but NMFS SEFSC (2001) concludes that it could alter population trends. Some information is available on international gillnet fisheries. Incidental capture in gillnets in the central Mediterranean Sea (set by Italian fishermen) took 397 loggerheads between 1981-1990, with as high as a 73.6% mortality rate. Another study estimated 16,000 loggerheads per year with a 30% mortality. The Spanish driftnet fishery in the western Mediterranean documented 236 loggerheads between 1993-1994, one dead. Green and hawksbill turtles are actually targeted in Nicaragua, but an estimated 600 loggerheads are also caught each year. They also take leatherbacks, and an estimated 1000 mature female leatherbacks are caught annually off Trinidad and Tobago with a 50 - 95% mortality rate. Gillnets set for finfish and sharks in Belize catch sea turtles, and of 500-800 turtles sold annually in Belize, 30% may be loggerheads. Additional information on the impacts of international fisheries is found in NMFS SEFSC (2001). NMFS estimates that thousands of sea turtles of all species are incidentally caught and a proportion of them killed incidentally or intentionally annually by international activities. The impact of international fisheries is a significant factor in the baseline inhibiting sea turtle recovery.

*Other International Factors*

For sea turtles, substantial impacts of human activities are still evident on nesting populations of all species in areas outside of U.S. control. This includes poaching of eggs from nests and using the turtles themselves for food or shell products as well as beach development problems.

*Other Factors Influencing the Environmental Baseline*

*Marine Pollution*

A number of activities that may indirectly affect listed species in the action area of this consultation include discharges from wastewater systems, dredging, ocean dumping and disposal, aquaculture, recreational fishing, and anthropogenic marine debris. The impacts from these activities are difficult to measure. Where possible, however, conservation actions are being implemented to monitor or study impacts from these sources. For example, extensive monitoring is being required for a major discharge in Massachusetts Bay (Massachusetts Water Resources Authority) in order to detect any changes in habitat parameters associated with this discharge. Close coordination is occurring through the section 7 process on both dredging and disposal sites to develop monitoring programs and ensure that vessel operators do not contribute to vessel-related impacts.

Sources of pollutants in Atlantic and Gulf coastal regions include atmospheric loading of pollutants such as PCBs, storm water runoff from coastal towns, cities and villages, runoff into rivers emptying into the bays, groundwater and other discharges, and river input and runoff. 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 effects on larger embayments is unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo *et al.* 1986), the impacts of many other anthropogenic toxins have not been investigated.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities and industries into the Gulf of Mexico. The coastal waters of the Gulf of Mexico have more sites with high contaminant concentrations than other areas of the coastal United States, due to the large number of waste discharge point sources. Although these contaminant concentrations do not likely affect the more pelagic waters of the action area, the species of turtles analyzed in this Opinion travel between nearshore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

An extensive review of environmental contaminants in turtles has been conducted by Meyers-Schöne and Walton (1994); however, most information relates to freshwater species. High concentrations of chlorobiphenyls and organochlorine pesticides in the eggs of the freshwater snapping turtle, *Chelydra serpentina*, have been correlated with population effects such as decreased hatching success, increased hatchling deformities and disorientation (Bishop *et al.* 1991, 1994).

Very little is known about baseline levels and physiological effects of environmental contaminants on marine turtle populations (Witkowski and Frazier 1982, Bishop *et al.* 1991). There are a few isolated studies on organic contaminants and trace metal accumulation in green and leatherback sea turtles (Davenport and Wrench 1990, Aguirre *et al.* 1994). Mckenzie *et al.* (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in marine turtle tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles. It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with turtle size were observed in green turtles, most likely attributable to a change in diet with age. Sakai *et al.* (1995) found the presence of metal residues occurring in loggerhead turtle organs and eggs. More recently, Storelli *et al.* (1998) analyzed tissues from 12 loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals and porpoises by Law *et al.* (1991). Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

The effects of pollution on offshore species such as sperm whales is not well understood. Sea turtles nest primarily in the southeastern United States, and early life stages and breeding individuals of these species are likely to be impacted by pollution in these areas, as well as in the Northeast. Necropsies of hatchlings and juveniles show that young turtles commonly consume plastics and tar balls (STSSN stranding data base).

Oil spills from tankers transporting foreign oil, as well as the illegal discharge of oil and tar from vessels discharging bilge water will continue to affect water quality in the Gulf of Mexico. Cumulatively, these sources and natural oil seepage contribute most of the oil discharged into the Gulf of Mexico. Studies of floating tar sampled during the 1970s, when bilge discharge was still legal, concluded that up to 60% of the pelagic tars sampled did not originate from the northern Gulf of Mexico coast. Necropsies of hatchlings and juveniles show that young turtles commonly consume tar balls (STSSN stranding data base).

An additional source of mortality that has not been adequately assessed is the ingestion and long-term effects of *anthropogenic marine debris* by pelagic turtles. Preliminary indications are that approximately 15% of pelagic post-hatchling loggerheads from Florida beaches have ingested plastics and approximately 46% have ingested tar within the first few weeks of pelagic foraging (n=168) (Witherington 1994, in review). Plastic and rubber latex debris is regularly found in the stomachs of necropsied stranded sea turtles. Of 1,710 turtles necropsied between 1980 and 1992, 11.5% had ingested debris, including plastic pieces and balloons: a greater proportion of loggerheads were affected than were Kemp=s ridleys, and in both species the percentage impacted by digested debris was highest in the Gulf of Mexico (Witzell and Teas 1994).

Marine debris will likely persist in the action area in spite of MARPOL prohibitions. In Texas and Florida, approximately half of the stranded turtles examined have ingested marine debris (Plotkin and Amos 1990; Bolten and Bjorndal 1991). Of 43 dead stranded green turtles examined by Bjorndal *et al.* (1994), 24 had ingested some sort of debris. Although fewer individuals are affected, entanglement in marine debris may contribute more frequently to the death of sea turtles. A summary of marine debris impacts can be found in the TEWG reports (1998, 2000).

*Natural Biotoxins*

Geraci *et al.* (1989) identified bioaccumulation of the neurotoxin responsible for paralytic shellfish poisoning (saxitoxin) in mackerel consumed by humpback whales as the possible cause of mortality of 14 humpbacks which stranded between November of 1987 and January of 1988. No saxitoxin was identified in plankton or shellfish sampled in Massachusetts waters at the time of the mortality. The authors suggest the neurotoxin could have been transported by mackerel obtaining the toxin from planktonic sources in the Gulf of St. Lawrence, the spawning ground for mackerel. While a similar multiple mortality of large whales has not been observed, the authors suggest individual mortalities caused by the biotoxin would go unnoticed. The reason for the multiple mortalities in the winter of 1987 and 1988 has not been explained, although they may have been related to a shift in the normal diet of humpbacks due to the lack of sand lance in the bays the previous summer.

*Disease*

An unknown disease is posing a new threat to loggerhead sea turtles. Between the period of September 2000 to January 2001, 45 debilitated and 95 dead loggerhead turtles have been found in south Florida between Indian River and Charlotte Counties, elevating stranding data for this period to more than 3 times the previous 10-year average for this area (Foley, pers. comm., 2000). These numbers may represent only 10 to 20 % of the turtles that have been affected by this disease because many dead or dying turtles never wash ashore. Starting in March, adult female loggerheads that nest in south Florida but reside elsewhere will be migrating to south Florida in anticipation of the nesting season. If the agent responsible for debilitating these turtles remains in Florida over the next several months, the scope of this die off may increase substantially. In addition, if the agent is infectious, these females could spread the disease throughout the range of the adult loggerhead population. Symptoms of the unknown disease include extreme lethargy and pneumonia. Of those found alive, even with extensive care, many of them have died and none have fully recovered. The cause of the disease has yet to be determined but potential causes include bacteria, virus, or exposure to some toxin.

*Research and Enhancement*

Both FWS and NMFS have issued several section 10(a)(1)(A) permits authorizing the take of listed whales and turtles in the action area for research and enhancement purposes (see Appendix II, SEFSC 2001). For turtles, these permits include activities such as capture, tagging, relocation, collection of blood samples, movement and treatment of injured turtles, behavioral studies, transport and possession of live turtles, and captive display. Although the conduct of these activities will disturb or harass several sea turtles, the effects of these activities on sea turtles are anticipated to be largely beneficial and no serious injury or mortalities are anticipated. Permits for research and enhancement of whales include activities such as photo-identification, tagging, biopsy, behavioral studies, and studies of blubber thickness. As with sea turtles, research and enhancement activities may disturb or harass whales, but no serious or long-term impacts are anticipated.

*Nesting Beach Impacts*

Beachfront development, lighting and beach erosion control all are ongoing activities along the Gulf and Atlantic coasts. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, more and more coastal counties are adopting more stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting. Some of these measures are being drafted in response to ongoing lawsuits brought against the counties by concerned citizens who charged the counties with failing to uphold the ESA by allowing unregulated beach lighting which resulted in takes of hatchlings.

*Conservation and Recovery Activities*

A number of activities are in progress that ameliorate some of the potential threat (impact) from the aforementioned activities. Education and outreach are considered one of the primary tools to reduce the threat of impact from private and commercial vessels. The USCG has provided education to mariners on whale protection measures and uses their programs such as radio broadcasts and notice to mariner publications to alert the public to potential whale concentration areas. The USCG is also participating in international activities (discussed below) to decrease the potential for commercial ships to strike a whale. In addition, outreach efforts for fishermen under the ALWTRP are increasing awareness and fostering a conservation ethic among fishermen that is expected, in the long term, to help reduce the overall probability of adverse impacts in the environmental baseline from these commercial fishing activities.

Numerous recovery activities are being implemented to decrease the level of impacts from private and commercial vessels in the action area. These include the early warning system (EWS), other activities recommended by the Northeast Recovery Plan Implementation Team for the Right and Humpback Whale Recovery Plans and Southeast Recovery Plan Implementation Team for the Right Whale Recovery Plan, and NMFS regulations.

*The Northeast and Southeast Early Warning Systems*

Due to concern over potential collisions between right whales and hopper dredges operating in designated critical habitat for right whales in southeast waters, monitoring requirements were placed on the COE and resulted, in the 1980s, in the first regular aerial survey flights for right whales in waters off the Southeast United States. These surveys evolved over the years and, since late 1993/early 1994, have been officially sponsored by NMFS, the USCG, USN, and COE, and became known as early warning systems (EWS). The surveys were designed as daily reconnaissance flights to detect the presence of whales in and around a number of busy southeast shipping ports, USN vessel and submarine bases, and COE dredging sites, in order to alert vessels of the whales= presence and prevent potential whale/vessel collisions. The EWS, with the assistance of the USN and USCG, has evolved a sophisticated communication network which alerts not only dredges and military vessels in the area, but provides broadcasts to mariners via NAVTEX, NOAA Weather Radio, and other means, and even contacts vessels directly via radio when urgently necessary to prevent imminent collision.

Using the SEUS aircraft survey program as a model, efforts were initiated in 1996 to develop a similar program in the Cape Cod Bay and the Great South Channel in late winter and early spring. The program is a cooperative effort by NMFS, the USCG, Massachusetts Division of Fisheries, the Massachusetts Environmental Trust, the Center for Coastal Studies, the USN and MASSPORT (the Boston port authority). As a result of recommendations by the ALWTRT, a similar EWS, known as the ASighting Advisory System,≅ was established in the Northeast in late 1996. NMFS has the ability under the ESA to impose emergency regulations which may be used to protect unusual congregations of right whales. Through a fax-on-demand system, fishermen can obtain sighting reports and, in some cases, can make necessary adjustments in fishing practices to decrease the potential for entanglements. The Commonwealth of Massachusetts was a key collaborator in the 1996-1997 effort and expanded the effort during the 1997-1998 season. The USCG has played a key role in this effort, providing both air and sea support. The State of Maine and the Canada Department of Fisheries and Oceans have expressed interest in conducting this type of EWS along their coastal waters. It is expected that other potential sources of sightings such as the USN may contribute to this effort. The NMFS Maine ALWTRP Coordinator is also working with local aquaria to collect whale sightings from fishing vessels in the Gulf of Maine. All this cooperation will increase the chance of success of this program in diverting potential impacts in the environmental baseline. As concern over right whale numbers has increased, aerial surveillance has been extended to areas further offshore, where this system may also be of potential benefit to sperm whales.

*The Northeast and Southeast Whale Recovery Implementation Teams*

In order to address the known impacts to right and humpback whales described in the Recovery Plan, NMFS established the Northeast and Southeast Recovery Plan Implementation Teams (NEIT and SEIT). The Recovery Plans describe steps to reduce human impacts to levels that will allow the two species to recover and rank the various recovery actions in order of importance. The Implementation Teams provide advice to the various federal and state agencies or private entities on achieving these national goals within their respective regions. The teams both agreed to focus primarily on habitat and vessel related issues and rely on the take reduction plan process under the MMPA for reducing takes in commercial fisheries.

As part of NEIT activities, a Ship Strike Workshop was held in December, 1996, to inform the shipping community of their need to participate in efforts to reduce the impacts of commercial vessel traffic on right whales. The workshop summarized current research efforts using new shipboard and moored technologies as deterrents, and a report was given on ship design studies currently being conducted by the New England Aquarium and Massachusetts Institute of Technology. This workshop increased awareness among the shipping community and has further contributed to reducing the threat of ship strikes of right whales. In addition, a Cape Cod Canal Tide Chart that included information on critical habitat areas and the need for close watch during peak right whale activity was distributed widely to professional mariners and ships passing through the canal. A radio warning was transmitted by Canal traffic managers to vessels transiting the Canal during peak Northern right whale activity periods. Follow-up meetings were held with New England Port Authority and pilots to notify commercial ship traffic to keep a close watch during peak right whale movement periods. At the request of the SEIT, the NEIT ship strike subcommittee expanded to include the Southeast. Additional ship strike meetings have been held with industry in the Southeast, mid-Atlantic, and Northeast and progress is being made to develop a vessel management strategy to greatly reduce potential whale/vessel interactions. In addition to its ship strike prevention activities, the SEIT established a GIS subcommittee and is progressing with work to analyze right whale sightings, vessel traffic information, and pertinent environmental data in order to better understand right whale distribution patterns in southeast waters and ultimately prevent human interactions with these whales.

*The Whale Disentanglement Network*

The Center for Coastal studies (CCS), under NMFS authorization, has responded to numerous calls to disentangle various whales entrapped in gear since 1984, and has developed considerable expertise in whale disentanglement. NMFS has supported this effort financially since 1995. The ALWTRP identifies whale disentanglement as an important component of the take reduction plan. As a result, NMFS greatly increased funding for this network, purchasing equipment caches to be located at strategic spots along the Atlantic coastline, supporting training for fishermen and biologists, purchasing telemetry equipment, *etc.* This has resulted in a greatly expanded capacity for disentanglement along the entire Atlantic seaboard, including offshore areas. Memoranda of Understanding (MOUs) developed with the U.S. Coast Guard ensure their participation and assistance in the disentanglement effort. As a result, NMFS believes that many whales which may otherwise have succumbed to complications from entangling gear, are being set free to survive the ordeal.

*Reducing Potential for Vessel Related Impacts*

As part of recovery actions aimed at reducing vessel related impacts, NMFS published a proposed rule in August 1996 restricting vessel approach to right whales (61 FR 41116) to distances outside of 500 yards in order to minimize human-induced disturbance. The Recovery Plan for the Northern Right Whale identified disturbance as one of the principal human-related factors impeding right whale recovery (NMFS 1991b). Following public comment, NMFS published an interim final rule in February 1997 codifying the regulations. With certain exceptions, the rules prohibit both boats and aircraft from approaching any right whale closer than 500 yards. The regulations are consistent with the Commonwealth of Massachusetts= approach to regulations for right whales. These are expected to reduce the potential for vessel collisions inherent in the environmental baseline.

In April 1998, the USCG submitted, on behalf of the United States, a proposal to the International Maritime Organization (IMO) requesting approval of a mandatory ship reporting system in two areas off the east coast of the United States. The USCG worked closely with NMFS and other agencies on technical aspects of the proposal. The proposal was submitted to the IMO=s Subcommittee on Safety and Navigation for consideration and submission to the Marine Safety Committee at IMO and approved in December 1998. The system will require all vessels over 300 tons to report to a shore-based station, thereby prompting a return message which provides precautionary measures to be taken to reduce the likelihood of a ship strike and locations of recent right whale sightings. The reporting system was initially implemented on July 1, 1999. The USCG and NOAA are playing important roles in helping to implement the system.

*Measures to Reduce Impacts from Sound Sources*

NMFS and the U.S. Navy have been working cooperatively to establish a policy for monitoring and managing *Acoustic Impacts from Anthropogenic Sound Sources* in the marine environment. Acoustic impacts can include temporary or permanent injury, habitat exclusion, habituation, and disruption of other normal behavior patterns. It is expected that the policy on managing anthropogenic sound in the oceans will provide guidance for programs such as the use of acoustic deterrent devices in reducing marine mammal-fishery interactions and review of federal activities and permits for research involving acoustic activities. The Office of Naval Research hosted a meeting in March 1997 to develop scientific and technical background for use in policy formulation. NMFS hosted a workshop in September 1998 to gather technical information which will support development of new acoustic criteria.

*Measures to Reduce Impacts of Aquaculture and Recreational Fishing*

*Aquaculture* is currently not concentrated in whale high-use areas, but some projects have begun in Cape Cod Bay Critical Habitat and in other inshore areas off the Massachusetts and New Hampshire coast. Acknowledging that the potential for impacts is currently unknown, NMFS is coordinating research to measure habitat related changes in Cape Cod Bay and is ensuring through the section 7 process that these facilities do not contribute to the entanglement potential in the baseline. Many applicants have agreed to alter the design of their facilities to minimize or eliminate the use of lines to the surface that may entangle whales and/or sea turtles.

*Recreational fishery interactions*: Loggerheads, greens, and Kemp=s ridleys are known to bite a baited hook, frequently ingesting the hook. Hooked turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties. Necropsies have revealed hooks internally which often were the cause of death. An investigation of injuries and mortalities related to fish hook ingestion is underway at the NMFS Laboratory, Galveston, Texas, and NMFS currently is exploring adding questions about encounters with sea turtles to intercept interviews of recreational fishermen conducted by the Texas Parks and Wildlife Department and under the auspices of the Marine Recreational Fishery Statistics Surveys conducted throughout the Gulf of Mexico and along the Atlantic Coast. NMFS is also considering questioning recreational fishermen aboard headboats throughout the southeast U.S. Atlantic and the Gulf of Mexico to quantify their encounters with sea turtles (TEWG 2000). A detailed summary of the impact of hook and line incidental captures on loggerhead sea turtles can be found in the TEWG reports (1998, 2000).

*Measures to Reduce Incidental Takes of Sea Turtles in Commercial Fisheries*

NMFS implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial fisheries. In particular, NMFS has required the use of TEDs in southeast U.S. shrimp trawls since 1989 and in summer flounder trawls in the mid-Atlantic area (south of Cape Charles, Virginia) since 1992. It has been estimated that TEDs exclude 97% of the turtles caught in such trawls. These regulations have been refined over the years to ensure that TED effectiveness is maximized through proper placement and installation, configuration (*e.g.*, width of bar spacing), floatation, and more widespread use. Analyses by Epperly and Teas (1999) indicate that the minimum requirements for the escape opening dimensions are too small, and that as much as 47% of the loggerheads stranding annually along the Atlantic seaboard and Gulf of Mexico were too large to fit through existing openings. On April 5, 2000, NMFS published an Advance Notice of Proposed Rulemaking to require larger escape openings (65 FR 17852). It is expected that the new TED requirements incorporating larger escape openings, when implemented, presumably no later than the fall of 2001, will have a significant effect on reducing shrimp trawl mortality of large, sexually mature loggerhead sea turtle and will contribute to the eventual recovery of the southeastern U.S. loggerhead population (North Carolina - 800 nests/season; South Carolina - 10,000 nests/season; Georgia - 2,000 nests/season).

In 1993 (with a final rule implemented 1995), NMFS established a Leatherback Conservation Zone to restrict shrimp trawl activities off the coast of Cape Canaveral, Florida, to the North Carolina/Virginia border. This provides for short-term closures when high concentrations of normally pelagically distributed leatherbacks are recorded in more coastal waters where the shrimp fleet operates. This measure is necessary because, due to their size, adult leatherbacks are larger than the escape openings of most NMFS-approved TEDs. This rule was originally established because of coastal concentrations of leatherbacks which sometimes appear during their spring northward migration, but the rule was also recently implemented in the fall of 1999 off the coast of northern Florida due to unseasonable concentrations there. Leatherback TEDs were also required off the coast of Texas in the spring of 2000 due to unusual numbers of leatherback strandings.

NMFS is also working to develop a TED which can be effectively used in a type of trawl known as a flynet, which is sometimes used in the mid-Atlantic and northeast fisheries to target sciaenids and bluefish. Limited observer data indicate that takes can be quite high in this fishery. A prototype design has been developed, but testing under commercial conditions is still necessary.

The *Massachusetts Environmental Trust and Massachusetts Division of Marine Fisheries* have funded several projects to investigate fixed fishing gear and potential modifications to reduce the risk of entanglement to whales. These projects are an important complement to the NMFS research effort and have yielded valuable information on the entanglement problem. The Trust has also funded research on right whales in the Cape Cod Bay critical habitat area.

NMFS closed part of Pamlico Sound to the setting of gillnets targeting southern flounder in fall 1999 after the strandings of relatively large numbers of loggerhead and Kemp=s ridley sea turtles on inshore beaches. This is a state-regulated fishery. NMFS also closed the waters north of Cape Hatteras to 38E N., including the mouth of the Chesapeake Bay, to large (> 6 inch stretched) mesh gillnets for 30 days in mid-May 2000 due to the large numbers of loggerhead strandings in North Carolina, and will continue to implement such proactive measures as necessary. A large proportion of these stranded loggerheads was assumed to be from the northern subpopulation. This assumption is partly supported by analyses conducted by Bass *et al.* (1999) on genetic samples collected from sea turtles stranding on U.S. Atlantic and Gulf of Mexico shores. The northern subpopulation accounted for 25-28% of the animals that stranded off the Carolinas, and 46% of the animals sampled that stranded in the northernmost area sampled, Virginia (TEWG 2000). Most recently, on October 27, 2000, the North Carolina Division of Marine Fisheries (NCDMF) closed waters in the southeastern portion of the Pamlico Sound as a result of elevated takes by the commercial large-mesh flounder gillnet fishery. The NCDMF and NMFS had just agreed on details of a section 10 permit of the ESA for the founder fishery just prior to the closure. The fishery was closed when anticipated incidental take levels were met for green sea turtles. The NCDMF estimated that there were 50 loggerheads captured at the time of closure and that 44 of those had been drowned (NMFS SEFSC 2001, Part 1).

In addition, NMFS has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. In addition to making this information widely available to all fishermen, in July and August 2001 NMFS conducted a series of workshops with longline fishermen to discuss bycatch issues, including protected species, and to educate them regarding handling and release guidelines. Meetings were conducted in Silver Spring, MD; Fairhaven, MA; Gloucester, MA, Islandia, NY; Barnegat Light, NJ; Manteo, NC; and Cape Canaveral, FL. NMFS intends to continue these outreach efforts and hopes to reach all fishermen participating in the pelagic longline fishery over the next 1 to 2 years.

*Sea Turtle Stranding and Salvage Network Activities*

There is an extensive network of sea turtle stranding and salvage network (STSSN) participants along the Atlantic and Gulf of Mexico that not only collects data on dead sea turtles, but also rescues and rehabilitates any live stranded turtles. In most states, the STSSN is coordinated by state wildlife agency staff, although some state stranding coordinators are associated with academic institutions. Data collected by the STSSN are used to monitor stranding levels and compare them with fishing activity in order to determine whether additional restrictions on fishing activities are needed. These data are also used to monitor incidence of disease, study toxicology and contaminants, and conduct genetic studies to determine population structure. All of the states that participate in the STSSN are collecting tissue for and/or conducting genetic and ageing studies to better understand the population dynamics of the small subpopulation of northern nesting loggerheads. These states also tag turtles when live ones are encountered (either via the stranding network through incidental takes or in-water studies). Tagging studies help provide an understanding of sea turtle movements, longevity, reproductive patterns, *etc.*

*Gulf Sturgeon*

Habitat destruction and degradation, exacerbated by potential over-exploitation of the species, are primarily responsible for the sturgeon's decline. Dams have prevented access to historic sturgeon migration routes and spawning areas (Wooley and Crateau 1985). Dredging and other navigation maintenance, possibly including lowering of river elevations and elimination of deep holes and altered rock substrates, may have adversely affected Gulf sturgeon habitats (Wooley and Crateau 1985). A decrease in groundwater flows has reduced cool water habitats, which are thought to be warm water refugia for sturgeon (S. Carr, personal communication); recent droughts in the Apalachicola River system have aggravated the loss of cool water refugia. Increased groundwater withdrawal for irrigation in southwest Georgia may result in a 30 percent reduction of discharge to streams (Hayes *et al.* 1983). Contaminants, both agricultural and industrial, may also be a factor in their decline. Organochlorines have been documented in Gulf sturgeon at levels that may cause reproductive failure, reduced survival of young, or physiological alterations in other fish (White *et al.* 1983). To compound these anthropogenic impacts, the life history of the Gulf sturgeon complicates recovery efforts. Breeding populations take years to establish because of their advanced age at sexual maturity. In addition, Gulf sturgeon appear to be homestream spawners with little, if any, natural repopulation from migrants from other rivers.

Incidental catch of Gulf sturgeon in other fisheries has been documented. There have been incidental captures of Gulf sturgeon recorded by Wooley and Crateau (1985) and Swift *et. al.* (1977). They specifically recorded captures in the shrimp and gillnet fisheries in the Apalachicola Bay. Similar incidental catches have been reported in Mobile Bay, Tampa Bay, and Charlotte Harbor. Louisiana Department of Wildlife and Fisheries (LDWF) reported 177 Gulf Sturgeon were incidentally captured by commercial fishermen in southeast Louisiana during 1992.

The concerted efforts of numerous public and private organizations has resulted in a fairly substantial body of information necessary for the management and protection of the Gulf sturgeon. Commercial harvest of this species has been eliminated by Louisiana, Mississippi, Alabama, and Florida. Gulf sturgeon have been experimentally reared for life history studies and possible reintroduction into the wild. Primary recovery goals are to prevent further reductions in existing wild populations, establish population levels that would allow delisting of the species by river systems, and to establish, following delisting, self-sustaining populations that could withstand directed fishing pressure within each river system. Other goals are to continue to characterize, protect, and restore essential habitats, evaluate population levels rangewide, refine life history studies, and reduce or eliminate incidental mortality.

***In summary***, NMFS believes that there are several factors adversely affecting Gulf Sturgeon within the action area which will continue to combine to slow their recovery. NMFS believes the above beneficial actions, when viewed in light of the adverse effects discussed above, will help all breeding populations of Gulf sturgeon species found in the action area to stabilize or increase. NMFS assumes the following activities will continue at current levels within the action area:

- Lack of access to spawning areas due to dams;
- decreasing of surface water and ground water flows due to human activities;
- the continued introduction of contaminants into Gulf sturgeon habitat; and
- continued incidental capture by commercial and recreational fisheries.

## V. Effects of the Action

Despite the many regulations implemented to reduce the likelihood of environmental impacts of OCS oil and gas development activities, these activities may have numerous direct and indirect effects on listed and protected species in the Gulf of Mexico. These effects are described in detail in the draft environmental impact statements prepared by MMS for this proposed action.
The projects or results of actions undertaken as part of the proposed action that may have adverse impacts on listed species are:

- noise from exploration, construction, and production activities;
- well, pipeline, and platform construction;
- vessel traffic;
- brightly-lit platforms;
- OCS-related trash and debris; and
- contaminants.

### *Noise*

Oil and gas exploration, development and production activities contribute numerous sources of additional noise into Gulf of Mexico waters. These increases in noise are expected to affect sea turtles and sperm whales, but should not affect Gulf sturgeon.

*General Information on Effects of Noise*

Although the sperm whale inner ear resembles that of most dolphins and is tailored for ultrasonic (>20 kHz) reception, there are indications that the sperm whale may have hearing capability at low frequencies (Carder and Ridgway, 1990), and the species is known to be sensitive to changes in its acoustic environment

(Watkins and Schevill, 1975; Watkins *et al.* 1985a, 1985b). Sperm whales have been found to react to sounds at frequencies below 28 kHz, including 3.5 kHz submarine sonar signals (Watkins *et al.* 1993). Based on inner ear anatomy Ketten (1994) noted that the predicted functional lower limit of hearing for sperm whale should be near 100 Hz.

Bowles *et al.* (1994) noted in the Heard Island project (designed to test the concept of monitoring temperatures across ocean basins via measurement of the transmission speed of low frequency sounds) that sperm whales at some times (but not all) ceased calling in association with broad band pulsed sounds at received levels only 10-15 dB above ambient. Watkins and Schevill (1975) showed several years ago that sperm whales generally cease emitting their characteristic pulsed sounds when exposed to a short sequence of noise pulses from acoustic pingers emitting ~1 pulse/second at 6-13 kHz at relatively low source levels (~110 - 130 dB re 1 ΦPa -m). However, according to Watkins (1977) and Backus and Schevill (1966), sperm whales generally did not cease calling or otherwise react to continual pulsing from echosounders at 12 kHz. Carder and Ridgway (1990) report that evoked potentials measured in a sperm whale calf demonstrated peak auditory capacity in the 5 - 20 kHz range, while Watkins *et al.* (1985 & 1993) and Papastavrou *et al.* (1989) assert that higher frequency pulses (30 - 60 kHz) lead to no obvious reaction by sperm whales.

Watkins *et al.* (1985 & 1993) also reported that sperm whales in the eastern Caribbean became silent, interrupted their activities and moved away from strong pulses from submarine sonar. In contrast, Richardson *et al.* (1995) cite a personal communication with J. Gordon (1994) indicating that sperm whales in the Mediterranean continued calling when exposed to frequent and strong military sonar signals, but also report that whalers rarely used sonar to follow these whales due to their tendency to scatter upon hearing the sound. Adverse reactions to vessel activity have also been recorded (e.g. Gaskin 1972, Gambell 1968, Lockyer 1977, Whitehead 1990, Reeves 1992, Gordon *et al.* 1992).

The available information on the effects of various man-made sounds on sperm whales is not consistent. Although the studies described above consistently suggest that sperm whales can detect man-made sound pulses, these studies report a wide range of reactions to those sounds. In addition, a recent study of the effects of detonator discharges by Madsen and Møhl (2000) did not report any observations of sperm whales reacting to sounds from detonators while on the surface or submerged. Specifically, these researchers did not observe a cessation of clicking by sperm whales exposed to explosions at received levels of 180 dB re 1 μ Pa (any cessation of clicking might be evidence that sperm whales have been disturbed; for example, this behavioral change would be considered level B harassment under the Marine Mammal Protection Act [2]).

Two studies on sperm whale vocal responses to loud, low frequency sound are being conducted in the Azores and Gulf of Mexico that should help explain these differing responses. Given the potential significance of areas adjacent to the proposed action area to Gulf sperm whales, NMFS will review results from these studies to determine if they reveal any new information which would suggest that any effects may occur in a manner or to an extent not considered in this Opinion, requiring reinitiation of formal consultation. Based on

2 The ESA does not define harassment and NMFS has not defined this term, pursuant to the ESA, through regulation. However, the Marine Mammal Protection Act of 1972, as amended, defines harassment as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild or has the potential to injure a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [16 U.S.C. 1362(18)(A)]. The latter portion of this definition (that is A...causing disruption of behavioral patterns including...migration, breathing, nursing, breeding, feeding, or sheltering≅) is almost identical to the U.S. Fish and Wildlife Service=s regulatory definition of Aharass≅. For this Opinion, we will define harassment as injury to an individual animal or population of animals resulting from a human action that disrupts one or more behavioral patterns that are essential to an individual animal=s life history or to the animal=s contribution to a population, or both. We are particularly concerned about injuries that may manifest themselves as an animal that fails to feed successfully, breed successfully (which can result from a feeding failure), or complete its life history because of changes in its behavioral patterns. In the latter two of these examples, the injury to an individual animal could be injurious to a population because the individual=s breeding success will have been reduced.

the best scientific information currently available, NMFS believes that any behavioral responses causing adverse effects to sperm whales due to noise associated with development and operation will be short-term, temporary, and unlikely to result in biological effects which would appreciably reduce the reproduction, numbers, or distribution of sperm whales in the wild. However, these behavioral responses, although expected to be minor, may result in harassment of individual sperm whales in or within detection range of the proposed action.

Evaluation and prediction of human-made noise impacts on marine mammals is difficult. This situation is partially a reflection of limited research on the subject (Green *et al.* 1994) as well as the complications introduced by the natural variability in animal behavioral responses. It is also a result of the fact that estimating acoustic environmental impact on animals requires interpretation and integration of results from many disciplines including, but not necessarily limited to, the study of how sound waves interact with the environment (physical acoustics), how animals hear sounds with their ears (anatomy and physiology) and how animals use sounds for such things as communicating, navigating and finding food (bioacoustics, psychoacoustics and behavioral ecology). One of the most obvious behavioral responses to industrial noise is to avoid the area by swimming away from or detouring around the noise source. Bowheads (which apparently are far more sensitive to noise than are sperm whales) have been observed avoiding, detouring around or moving away from a number of different types of industrial noise sources, including seismic survey and drilling operations at ranges of up to 15 miles (24 km) from the industrial activity (Llungblad *et al.* 1985, 1988, LGL & Greeneridge 1987, Hall *et al.* 1994, Richardson 1998). Obvious responses to the approach of active seismic vessels at ranges of 3.1 to 6.2 miles (5 - 10 km) were observed by Llungblad *et al.* (1985) during four experimental tests. These tests were not conducted under controlled conditions (i.e., other noise sources were operating at the time), and approaches at greater ranges were not conducted, so results can not be used to determine the range at which the whales first begin to respond to seismic activity.

For bowheads, at least, effects from significant noise disturbance apparently continue even after the disturbance has subsided. It takes at least two weeks before the normal bowhead whale migration route is reestablished, following a significant disturbance (B. Rexford in USACE 1996). Noise from sources in the ice leads during spring migration is apparently especially disturbing (Worl 1980), indicating that the degree to which an activity my disturb a whale may have a strong context-related component.

Bone-conducted hearing appears to be a reception mechanism for at least some sea turtle species, with the skull and shell acting as receiving structures (Lenhardt *et al.* 1983). Captive loggerhead and Kemp's ridley turtles exposed to brief, audio-frequency vibrations initially showed startle responses of slight head retraction and limb extension (Lenhardt *et al.* 1983). Sound-induced swimming has been observed for captive loggerheads (O'Hara and Wilcox 1990; Moein *et al.* 1993, Lenhardt 1994); some loggerheads exposed to low-frequency sounds responded by swimming towards the surface at the onset of the sound, presumably to lessen the effects of the transmissions (Lenhardt 1994). An anecdotal observation of a free-ranging leatherback's response to the sound of a boat motor suggests that leatherbacks may be sensitive to low-frequency sounds, but the response could have been to mid- or high-frequency components of the sound (Advanced Research Projects Agency 1995). Based on the above, NMFS believes it is reasonable to assume that sea turtles will detect noise associated with these activities and experience some temporary, adverse effects. NMFS also believes that of any these biological effects will be minor, and not likely to appreciably reduce the reproduction, numbers, or distribution of sea turtles in the wild.

*Seismic Activities*

Seismic surveys in OCS waters involve towed arrays of airguns generating sound pulses to obtain information for site evaluation for drilling rigs, platform design and placement, or to assess potential hydrocarbon reservoirs to optimally locate exploration and development wells. Generally, a sleeve-type air gun array releases compressed air into the water, producing an air-filled cavity that expands violently, contracts, and re-expands, creating an acoustical energy pulse that penetrates the seafloor. The airguns are towed 5-10 meters below the surface of the water and release the compressed air regularly every several seconds followed by 5-15 second silent periods. Twelve to 70 airguns may be towed to study deep water structures. The peak levels of sound pulses produced by the airgun arrays are well above ambient and vessel sound levels, but short pulses limit the total energy released. The sound from the seismic sources is directed downward; however, some horizontal propagation that can be detected many kilometers away will occur (Malme *et al.* 1983 in Richardson *et al.* 1995).

Studies of seismic exploration using on-bottom cable (or OBC) technologies in the Beaufort Sea, AK, showed detectable sounds from these seismic activities at distances of over 67 km. Sound transmission varies with temperature, basin configuration, bottom topography, etc. and thus these studies do not tell us over what distances such sounds would be perceptible in the Gulf of Mexico, but they do indicate that such sounds can carry over long distances. Sounds emitted from these OBC seismic operations measured from 210 - 255 dB re 1 Φ Pa at the source.

Seismic exploration signals were encountered frequently during GulfCet cruises to determine marine mammal distribution and abundance in the Gulf. Most signals were of a relatively standard form, with the main energy of the pulse between 100-900 Hz, with one or two echoes, typically below 100 Hz. On a number of occasions, we enountered other signals broadcast from seismic survey vessels. This included a loud seismic shock centered at 2.5 kHz, with little energy below 1 kHz. This first pulse has the same frequency content of a sperm whale. Reportedly, higher frequency systems centered between 25-45 kHz are now in use.

Richardson *et al.* (1995) hypothesized that marine mammals would have to be well within 100 m of an airgun array to be susceptible to immediate hearing damage. Generally, they concluded that most seismic operations were unlikely to cause permanent injury to marine mammals because seismic exploration is transitory, marine mammals appear to tolerate strong calls from themselves and their social groups, and some baleen whales have shown avoidance behavior that would remove them from the area of harm.

During surveys conducted to find and tag sperm whales in the Gulf of Mexico, sperm whales sighted over a few days in a particular area began to leave when seismic activities occurred (Stafford and Mate 1993), suggesting that sperm whales may be harassed by seismic surveys, but would possibly remove themselves from harmful exposure to airgun pulses. NMFS agrees that the best available information suggests that, while the effects of the noise produced by seismic surveys is believed to be sublethal, sea turtles and marine mammals, including listed sperm whales, may have short-term startle or avoidance responses. Additionally, if exposure to such noise is prolonged, sperm whales could be temporarily displaced from areas of biological importance to them. The action area encompasses the area of greatest sperm whale concentrations in the Gulf. Recent studies sponsored by MMS and conducted jointly by researchers from NMFS, and academic institutions, have indicated that this area should be considered as critical habitat for sperm whales (R. Davis, pers. comm.), as it is the only known breeding and calving area in the Gulf, for what is believed to be an endemic population. Therefore, disturbance from oil exploration, development , and subsequent rig removal activities could deter sperm whales from using preferred habitat for important reproductive and other biological functions. Sounds associated with these oil production-related activities could also disturb sperm whales by interfering with their interspecific communications by drowning out or Amasking≅ communication signals.

*Auditory Masking*

Significant auditory interference, or masking, only occurs for frequencies similar to those of the masking noise. The maximum radius of influence of an introduced sound on marine mammals is the distance from the source at which the noise can barely be heard. This range is determined by either the hearing sensitivity of the animal, and/or the background noise level (Richardson *et al.* 1995). For example, communication signals in beluga are subject to masking by low frequency noises of icebreakers (Erbe 2000).

Masking for sperm whales could affect communication between individuals, ability to receive information from their environment, or echolocation effectiveness. Sperm whale clicks can range to below 100 Hz, but most of the energy is concentrated at 2-4 kHz and 10-16 kHz, within the range of seismic activities recorded in the Gulf.

*Disturbance*

Disturbance can change behavior patterns in several species of whales. Studies of baleen whales, including the bowhead (*Balaena mysticetus*) and gray whales (*Eschrichtius robustus*), clearly document a pattern of short-term, behavioral disturbance in response to a variety of actual and simulated vessel activity and noise (Richardson *et. al*. 1985; Malme *et. al*. 1983). Studies of bowhead whales revealed that these whales oriented themselves in relation to a vessel when the engine was on, and a significant avoidance response was invoked simply by turning the engine on, even at a distance of approximately 3,000 ft (900 m). Studies of humpback whales on their summering grounds, as summarized by Baker and Herman (1989) and on their wintering grounds, as summarized by Bauer (1986), found similar patterns of disturbance in response to vessel activity.

Behavioral disruption has the potential to affect important behavioral patterns that are essential to an individual animals= life history or to the animal=s contribution to a population, or both. Impacts of this sort include behavioral manifestations which cause failure of feeding, reproduction, or another life history element due to changes in its behavioral patterns. Adoption of habitual coping behaviors may prove successful in adapting to the disturbance if the adoption fits the normal range of behavior for the individual.

As with other marine mammals, odontocetes exhibit disturbance reactions such as cessation of resting, feeding, or social interactions and/or changes in surfacing, respiration, or diving cycles, and avoidance behavior in response to certain frequencies and intensities of sound. For example, odontocetes have been observed both approaching and avoiding noisy sources, but are also relatively unresponsive to noise at low frequency (Awbrey *et al.* 1983). Sperm whales, however, may react to sounds at low frequencies because they can hear at low frequencies, and have been known to react to received levels of 100 dB at 3.5 kHz generated by submarine sonar (Watkins *et al.* 1993).

In the wild most sea turtles spend only 3-6 % of their time at the surface and would therefore most likely experience a reduced exposure to noise impacts from overflights (MMS 1999). Likewise, sperm whales are deep divers and generally spend minimal time at the surface. The extent to which turtles and sperm whales may have already responded to existing background levels of noise and disturbance from marine activities in the Gulf is unknown. It is also not known whether turtles or sperm whales exposed to recurring vessel noise disturbance will be stressed or otherwise affected in a negative but indiscernible way; however, any effects are expected to be sublethal. Based on existing information, although helicopter noise may be detectable by turtles and sperm whales, NMFS expects any behavioral responses to be minor, temporary in nature, and unlikely to result in a biological effect which would directly affect turtles or sperm whales. However, such activities may contribute to overall disturbance of sperm whales and contribute to their movement away from this biologically important area.

*Habituation and Sensitization*

In addition to disturbance, habituation and sensitization also are important when discussing the potential reactions of whales to a noise stimulus. Habituation refers to the condition in which repeated experiences with a stimulus that has no important consequence for the animal leads to a gradual decrease in response. Sensitization refers to the situation in which the animal shows an increased behavioral response over time, to a stimulus associated with something that has an important consequence for the animal. Richardson *et al.* (1990) provided an example of bowheads becoming habituated to the noises from dredging and drilling operations. Conversely, Richardson *et al.* (1995) cited Walker (1949) as reporting that the responses of gray whale mother and calf pairs to a hovering helicopter seemed to increase the more the helicopter herded the mother and calf pairs into shallow water.

There have been relatively few studies of habituation in marine mammals. In toothed whales, one apparent example of habituation is the tolerance by white whales of the many boats that occur in certain estuaries versus the extreme sensitivity of this species to the first icebreaker approach of the year in a remote area of the high Arctic. Also, in certain areas, wild dolphins have become unusually tolerant of humans, and may even actively approach them (Lockyer 1978, Conner and Smolker 1985, Shane *et al.* 1986).

In general, there is a tendency for the level of response to human-made noises to scale with the level of variability and unpredictability in the sound source. Animals may show little to no response to a noise source with a relatively constant intensity level and constant frequency spectrum (e.g. a humming generator, operational drilling platform) but will react to a noise source that is rapidly changing in intensity or in frequency content (e.g. an exploration drilling platform, ice breaking activity). Of course, when whales are presented with very loud noises they will likely react regardless of whether they are intermittent or continuous.

*Drilling and Oil Platform Activities*

The noises from operating platforms and drillships could produce sounds at intensities and frequencies that could be heard by turtles and sperm whales. There is some evidence suggesting that turtles may be able to hear low-frequency sounds, which is where most industrial noise energy is concentrated. Sea turtle hearing sensitivity is not well studied. A few preliminary investigations using adult green, loggerhead, and Kemp's ridley turtles suggest that they are most sensitive to low-frequency sounds (Ridgway *et al.* 1969, Lenhardt *et al.* 1983). It has been suggested that sea turtles use acoustic signals from their environment as guideposts during migration and as a cue to identify their natal beaches (Lenhardt *et al.* 1983). Based on conclusions of Lenhardt *et al.* (1983) and O'Hara and Wilcox (1990), low-frequency sound transmissions could potentially cause increased surfacing behavior and deterrence from the area near the sound source. The potential for increased surfacing behavior could place turtles at greater risk of vessel collisions and potentially greater vulnerability to natural predators.

The potential direct and indirect impacts of sound on sperm whales includes physical auditory effects (temporary threshold shift), behavioral disruption, displacement from important habitat, and adverse impacts on the food chain. Based on the above information, NMFS believes that the low frequency noise created by drilling activities may also be detected by sperm whales and some harassment resulting in biological effects is possible. Because of the biological importance of the action area to Gulf sperm whales, any short- or long-term effects which appreciably reduce their reproduction, numbers, or distribution in the action area would be biologically significant to this apparently resident population.

*Noise and Disturbance Associated with Vessel and Helicopter Traffic*

Noise from increased vessel and helicopter traffic may also affect sea turtles and sperm whales. An earlier MMS EIS, cited in the Marine Mammal Commission=s 1998 Annual Report to Congress, indicated that at the time there were an average of three or four seismic surveys conducted in the northern Gulf every day, more than 100 exploration and development wells were drilled every year, and more than 1,000 boat trips and 2,000 helicopter trips were then being made in the northern Gulf every day. MMS indicates that, over the next 40 years, they anticipate up to about 800 additional wells to be drilled (plus up to 1,265 Aworkovers and other well activities≅), only 6 -21 production structures installed and later removed (via explosives), 1-3 blowouts, and up to 51,000 vessel trips (1,275 per year) and 710,000 helicopter trips (about 49 per day) in association with the proposed action.

MMS reported that transportation corridors for sea going vessels would be through areas where loggerhead turtles have been sighted (these vessels would transit at a speed from about 8-12 knots or less during actual construction on-site). Helicopter activity will also increase as a result of the proposed action. Since noise from service-vessel traffic and helicopter overflights may elicit a startle reaction from sea turtles and sperm whales there is the possibility of short-term disruption of movement patterns and behavior. Sounds from approaching aircraft are detected in air far longer than in water. For example, an approaching Bell 214ST helicopter became audible in air over four minutes before passing overhead, while it was detected underwater for only 38 seconds at 3 m depth and 11 seconds at 18 m (Greene 1985).

***Other Proposed Activities which May Impact Listed Species***

*Construction Activities.*

Structure installation and pipeline placement can cause localized water quality degradation because of disturbed sediments which can impact wetlands, seagrass beds and live-bottom sea turtle habitats; however, these impacts are expected to be temporary. The temporary loss of seagrass and high-salinity marsh would affect sea turtles indirectly by temporarily reducing the availability of forage species that rely on these sensitive habitats. Because of the temporary nature of these disturbances little or no long-term damage is expected to the physical integrity, species diversity, or biological productivity of live-bottom marine turtle habitat, sea grasses, and wetlands as a result of the proposed action. Noises associated with structure installation and pipeline placement activities are likely to be detected by turtles and sperm whales, and these species may temporarily avoid swimming through noisy areas, especially if the noises are highly variable and unpredictable. However, there are no studies of the response of sea turtles or sperm whales to these types of construction activities. Since these disturbances would be temporary and the biological effects likely to be minor, NMFS believes that it is reasonable to assume that any behavioral responses which may result from the detection of noises associated with structure installation and pipeline placement activities are not likely to result in a biological effect which would adversely affect sea turtles, Gulf sturgeon or sperm whales.

*Vessel Strikes*

Increased ship traffic could increase the probability of collisions between ships and sperm whales or turtles, resulting in injury or death to some animals. During 1996, there were 76,241 vessel trips recorded for the

Panama City to New Orleans portion of the Gulf Intercoastal Waterway (GIWW), and 60,543 vessel trips originating or ending in the harbors of Pensacola, Mobile, and Pascagoula (U.S. Dept. of the Army, COE 1996). The increase in vessel traffic caused by the proposed action is expected to be small compared to the total vessel activity in the area. These vessels would transit at a speed of from about 8-12 knots or much less during actual exploration or construction. During transit there are lookouts to avoid collision with any large floating marine debris, either living or inert. Although sperm whales are only rarely known to be struck by vessels, and their large size should make them easily detectable by an onboard observer, other large whales such as humpback and right whales (which generally are not present in the Gulf) have been struck by non-OCS vessels outside the proposed action area. Given the existing level of OCS-related vessel traffic in the Gulf, the absence of any reported collisions with sperm whales in the Gulf, the rapid and powerful swimming capabilities of this species, their habit of spending little time at the surface, and the expectation that an onboard observer would spot a sperm whale and avoid a collision, NMFS believes it is unlikely that sperm whales will be struck by an OCS-related vessel.

As stated above, increased ship traffic could increase the probability of collisions between ships and sea turtles. Although there have been thousands of vessel trips that have been made in support of offshore operations during the past 40 years of OCS oil and gas operations, there have been no observations or reports of OCS-related vessels having struck sea turtles. Collisions with small and/or submerging turtles may go undetected, even with an observer onboard, and especially in adverse weather. The likelihood that one of the support or supply vessels associated with the proposed action traveling at 8-12 knots would observe or detect an accidental collision with a relatively small turtle is probably highly variable and heavily influenced by local sea conditions.

Experience and observations during marine research on boats and ships that travel much faster than those that will support the proposed action show that floating turtles do successfully dive and avoid injury on approach by motorized vessels (Gitschlag, personal communication, 2000). However, vessel-related injuries do occur and were noted in 13% of stranded turtles examined from strandings in the GOM and on the Atlantic Coast during 1993 (Teas 1994), but this figure includes those that may have been struck by boats post-mortem. In Florida, where coastal boating is popular, the frequency of boat injuries between 1991 and 1993 was 18% of strandings (Lutcavage *et al.* 1997). Based on the above, NMFS believes that the proposed increase in ship traffic is not likely to result in a ship strike of a sperm whale; however, due to their smaller size, it is reasonable to assume that one turtle may be accidentally injured or killed by collision with a project related vessel over the projected 30-years of operations resulting from the proposed lease sale.

*Brightly-lit Platforms*

Brightly-lit, offshore drilling platforms present a potential danger to sea turtle hatchlings (Owens 1983). Hatchlings are known to be attracted to light (Raymond 1984, Witherington and Martin 1996, Witherington 1997) and could be expected to orient toward lighted offshore platforms if they are close to shore (Chan and Liew 1988). If this occurs, hatchling predation would increase dramatically since large birds and predacious fish also congregate around the platforms (Owens 1983, Witherington and Martin 1996). Hatchlings may rely less on light cues offshore (Salmon and Wyneken, 1990); however, it is not known whether lights on platforms located further offshore attract them. Furthermore, attraction to offshore locations would be less problematic than attraction to landside locations, as the issue is to ensure that hatchlings head to sea rather than remaining onshore where they are subject to a variety of mortality sources including auto traffic and starvation. While some adverse effects may occur, NMFS believes it is unlikely that they will appreciably reduce the reproduction, numbers, or distribution of sea turtles in the wild.

*OCS-related Trash and Debris*

Sea turtles and sperm whales can become entangled in or ingest debris produced by operations associated with the proposed action. Leatherback turtles that mistake plastics for jellyfish may be more vulnerable to internal blockage from plastics than other sea turtle species; however, all turtles are vulnerable to debris ingestion. Small amounts of debris can kill a sea turtle; however, the predictability of such mortality may be low (Bjorndal *et. al.* 1994). A given piece of debris could pass through the gut of a turtle many times without becoming lodged in the gut, but during one transit, the debris could become oriented in such a way as to block the gut and result in the death of the turtle (Bjorndal *et. al.* 1994). Bjorndal *et. al.* (1994) also point out that small amounts of debris could have significant effects on the demography of sea turtles through the absorption of toxins. They cite a study by Lutz (1990) that demonstrated that small pieces of latex and plastic sheeting can be retained in the digestive tract of normally feeding turtles for up to 4 months, and the latex appeared to have deteriorated during that time. This long retention time may also allow for the absorption of plasticizers.

Numerous studies conducted on sea turtle ingestion of marine debris indicate that plastic is ingested at higher rates than other marine debris (Stanley *et. al.* 1988, Plotkin and Amos 1988, 1990, Balazs 1985, and Bjorndal *et. al.* 1994). In controlled experiments with green and loggerhead sea turtles, Lutz (1987) demonstrated that in most instances the ingestion of plastic appeared to occur coincidentally with general feeding and may be accidental or the result of indiscriminate selection, but on several occasions he observed both greens and loggerheads actively seeking out and swallowing plastic sheets. Plotkin and Amos (1990) necropsied 111 turtles stranded on the south Texas coast and found that 60 (54.1%) had ingested some type of debris. Of the 111 turtles necropsied 88 were loggerheads, 15 were green, and 8 were hawksbill. Of these, 46 (52.3%) loggerheads, 7 (46.7%) greens, and 7 (87.5%) hawksbills ingested debris. They also cited personal communications with Donna Shaver (Texas STSSN coordinator) who necropsied 104 Kemp=s ridleys stranded in the same area and found 31 (29.8%) of them had ingested some sort of marine debris. Plotkin and Amos (1990) also analyzed the type of debris ingested and found that of the 111 turtles necropsied 39 (35.1%) ingested plastic bag pieces, 15 (13.5%) had ingested hard plastic pieces, 10 (9.0%) had ingested plastic line or rope, and 8 (7.2%) had ingested plastic beads or pellets. Coe *et. al.* (1996) identified records that showed stranded individuals of each of the five species of sea turtles found in the GOM had ingested plastic bags and plastic sheeting. They also identified records that showed a loggerhead sea turtle had ingested a plastic bottle and another had ingested a plastic champagne cork. Some of the other records identified by Coe *et. al.* (1996) recorded such things as an iron bolt and a milk carton as having been ingested by sea turtles. One of the loggerhead turtles examined during a study by Stanley *et. al.* (1988) had ingested an aluminum can.

Sperm whales are known to ingest foreign objects, and it has been speculated that they may at times feed near the ocean bottom with open mouth, ingesting many of the items they encounter (Würsig *et al.* 2000). Laist (1996) summarized literature citing incidents of marine debris in cetaceans, and lists various types of fisheries gear, ropes, mylar balloons, cups, and newspapers as having been found in digestive tracts of stranded sperm whales. NMFS Southeast Regional stranding records include a juvenile sperm whale which stranded off Hatteras, NC in 1999. Its esophagus and stomach chambers were blocked with unidentified plastic, rope, plastic bags, and a small inflatable raft. It has been postulated that sperm whales, swimming at depths in virtual darkness, may employ Aactive random tactile searching, perhaps with the jaw lowered≅, as one feeding method used, and which may explain ingestion of debris as well as a possible explanation of why sperm whales sometimes become entangled in deepsea cables (Rice, 1989).

A study by the EPA (1990) indicated that at that time the offshore oil and gas industry's role as a source of marine debris was relatively small. Less than 1.1% of all marine debris in U.S. waters could be directly attributable to the offshore oil and gas industry. Waste materials made of paper, plastic, wood, glass, and metal are associated with both the proposed action and the OCS Program in the GOM. Most of the waste is associated with galley and offshore food service operations and with operational supplies such as shipping pallets, containers used for drilling muds and chemical additives (sacks, drums, and buckets), and protective coverings used on mud sacks and drilling pipes (shrink wrap and pipe-thread protectors). Some personal items, such as hard hats and personal flotation devices, are accidentally lost overboard from time to time.

Generally, galley, operational, and household wastes are collected and stored on the lower deck near the loading dock in large receptacles resembling dumpsters. These large containers are generally covered with netting to avoid loss and are returned to shore by service vessels for disposal in approved landfills. MMS regulations, USEPA's NPDES permit conditions, the USCG's regulations implementing MARPOL 73/78, Annex V (Marine Plastic Pollution Research and Control Act), and the Shore Protection Act prohibit the disposal of any trash and debris into the marine environment, call for the development of waste management plans, and require precautions that would prevent careless loss of solid waste or debris in storage or during transport. Victual matter or organic food waste are allowed to be ground up into small pieces and disposed of overboard from structures located more than 20 km from shore.

Information provided by industry gives some indication of the amount of trash historically generated during the drilling of an average offshore well. A typical well drilled to about 4,300 m might require 9,300 mud sacks, 100 pails, 250 pallets, 225 shrink-wrap applications, and two 55-gallon drums. Drilling operations require the most supplies, equipment, and personnel and therefore, generate more solid waste than production operations.

Over the last several years oil and gas companies have employed waste reduction and improved waste-handling practices to reduce the amount of trash offshore which could potentially be lost into the marine environment. Improved waste management practices (such as substituting paper cups and reusable ceramic cups and dishes for those made of styrofoam), recycling offshore waste, and transporting and storing supplies and materials in bulk containers, when feasible, are commonplace. These practices have resulted in a marked decline in accidental loss of trash and debris throughout GOM offshore oil and gas operations (MMS 1999).

Over the 30-year life of the proposed action the only debris expected to be released accidentally as a result of the proposed action include occasional accidental loss of personal items such as hardhats and flotation devices, especially during the drilling and construction phase. These materials are not expected to be ingested by sperm whales and sea turtles, or otherwise result in any adverse effects to these species. Based on the above information and the waste management practices being employed by oil companies, NMFS believes that the amount of marine debris generated as a result of the proposed action is likely to be insignificant and is not likely to result in injury or death of sperm whales or sea turtles.

*Oil Spills*

Oil spills associated with the proposed action may result in adverse effects to listed species and the other living marine resources in the Gulf of Mexico. As discussed above, MMS is responsible for implementing programs to minimize this threat. MMS has established requirements that operators use the ABest Available and Safest Technology≅ (BAST) for drilling and production of wells, as well as in the development of oil spill contingency plans and in the design of pollution-control equipment. Safety devices are required to shut off well flow during emergencies. Regular pipeline inspections are required, as well as monthly over-flights, to inspect for pipeline leakage. Oil Spill Response Plans must be approved by MMS before a facility can be used, and operators must comply with approved plans to continue operating facilities. These Plans are reviewed and updated, incorporating the BAST, every two years. Air quality control regulations have also been implemented to monitor emissions to detect potential sources of pollution to ensure that they do not result in violations of the allowed onshore ambient concentrations. MMS conducts regular onsite visits, including unannounced inspections of offshore platforms. Operators are required to fix violations within 7 days. Additionally, MMS requires operators to have trained personnel or contractors available to handle oil-spill cleanup equipment.

Despite the implementation of programs to minimize the possibility of oil spills, some accidental discharges continue to occur at all stages of exploration, development and production. However, the volume of crude oil spilled from pipelines and platforms in the OCS between 1980 and 1999 (71,500 barrels) was significantly lower than that observed between 1964 and 1979 (416,000 barrels), suggesting that many of MMS= programs to reduce oil spills have been fairly effective. Since 1980, the ratio of the amount of oil spilled to oil produced in the OCS is 1 to 10,000. If that ratio continues to apply to the deepwater operations associated with Lease Sale 181, about 2,400 barrels of oil may be expected to be spilled if MMS= high estimate of oil production (0.24 billon barrels) is reached. Historically, most spills, by number, involve less than 1 barrel of oil (94% from 1980 to 1999), but 79% of the total volume of oil spilled are from spills of over 1,000 barrels, even though such spills account for only 0.05% of the total number of spills. MMS has estimated that the mean chance of occurrence of a major spill involving more than 1,000 barrels as a result of Lease Sale 181 is 37%, if the high estimate of oil production is used. For this analysis, NMFS is assuming that up to 2,400 barrels of lease-sale 181 production may be released over a 30-year period, including at least one large spill.

The severity of the effects of an oil spill on listed species is obviously related to the location of the spill, the type of oil, the level of contact with the oil that the whales, turtles or fish have, and the life stage of the animal encountering the oil. Direct contact with oil can result in irritation and damage to skin and soft tissues of whales and dolphins, and similar effects to sea turtles and Gulf sturgeon. Dolphins exposed to petroleum products exhibited reduced food intake, modifications in respiration and gas metabolism, and depressed nervous functions (Lukina *et al*. 1996 as cited in MMS 1997). Inhalation of toxic vapors released by fresh crude oil spills and other volatile distillates may irritate respiratory membranes, congest lungs and cause pneumonia. Hydrocarbons absorbed in the blood stream may accumulate in the brain and liver and result in neurological disorders. Trained dolphins could detect, and appeared to avoid, dark oil slicks. However, bottlenose dolphins did not consistently avoid entering slick oil during the Mega Borg oil spill (Smultea and Würsig, 1991, 1995 as cited in MMS 1997).

The DEIS prepared for the proposed action (MMS 2000) recounts numerous studies of the effects of oil on sea turtles. Eggs, hatchlings and juvenile turtles are the most vulnerable to mortalities associated with oil spills. Fresh oil was found to be toxic to sea turtle nests, particularly during the last quarter of the incubation period (Fritts and McGehee 1982 in MMS 2000). Based on direct observations, all of the major systems in sea turtles are adversely affected by short exposure to weathered oil (Vargo *et al.*, 1986, Lutz and Lutcavage, 1989). The long-term effects and the effects of chronic exposure are unknown. Oil adheres to the body surface of sea turtles, and has been observed on eyes, nares, mouth and upper esophagus. Feeding along convergence lines could prolong sea turtles= contact with oil (Witherington, 1994). Chronically ingested oil may accumulate in organs. Entrapment in tar and oil slicks may occur. Blood chemistry studies on sea turtles after oiling revealed decreases in hematocrit and hemoglobin concentrations (Lutcavage *et al.* 1995). This reduction in critical components of the oxygen transport system and associated high white blood cell counts suggests that sea turtles are significantly stressed by exposure to oil.

A loggerhead sea turtle was sighted surfacing repeatedly in an oil slick in the Gulf of Mexico for over an hour. In 1993, eggs, hatchlings and juvenile sea turtle mortalities occurred after a freighter hit two barges transporting fuel from Mississippi and Louisiana to Tampa, Florida. Strandings of oiled turtles or turtles associated with tar are reported regularly to the Sea Turtle Stranding and Salvage Network database, particularly from south Florida and along Padre Island, Texas.

Gulf sturgeon may attempt to avoid oil spills. While early life stages are sensitive to the toxic effects of hydrocarbons, it may take several months of exposure to high levels of hydrocarbons for adult fish to exhibit toxicological compounds suggesting biological harm. Generally, only acute exposure would be expected in association with individual spill events.

Chronic exposure of listed and protected whales, marine mammals, sea turtles and Gulf sturgeon to the components of oil spills may result in contamination or reduction of prey. Additionally, physiological stress on these animals might result in reduced fitness and vulnerability to disease and parasites. However, annually, few deaths are likely due to the low likelihood that many listed or protected species may occur in the small areas contacted by oil spills, and dispersion and loss of oil is likely to be rapid if a spill occurs. Coastal oil-spill contingency plans should reduce the impact of spills, although some spill clean-up activities may affect sea turtles. (Note: Oil spill response and clean-up is Federally managed by multi-agency Regional Response Teams, not MMS; therefore, oil spill response is not considered part of MMS= proposed action.) Protection efforts generally attempt to prevent contact of oil on sensitive areas such as nesting beaches where turtles are particularly vulnerable.

Based on the above information, NMFS believes that oil spills as a consequence of the proposed action will have adverse impacts on sperm whales, sea turtles and Gulf sturgeon. The effects on sperm whales are expected to be sublethal as are the majority of effects on sea turtles and Gulf sturgeon. Because of the probability of releases and some large spills, however, NMFS does believe that the degree of oiling experienced by a few individual turtles and sturgeon may, rarely, be acute and significant. NMFS therefore believes that, over the projected 30-year lifetime of the proposed action, up to two sea turtles (in any combination of the five species found in the GOM) and one Gulf sturgeon may be killed as a result of an oil spill resulting from activities associated with the proposed action. Although populations of some of these species are small, the loss of this small number of individuals is not likely to appreciably reduce the species= ability to survive and recover in the wild through reduction in their numbers. NMFS is unable to estimate the number of individuals that may experience sublethal effects. For adult, female sea turtles and sturgeon, the reproductive periodicity and the number of eggs produced during a breeding season are thought to be influenced by the animals= nutritional condition and general fitness, so impacts to an individual adult female=s overall reproductive success are theoretically possible. Although there is great uncertainty about the nature and extent of sublethal effects from contact with spilled oil, NMFS does not expect those effects to rise to the level where there would be a detectable effect on any population=s reproduction. Sublethal effects are also likely as a result of bioaccumulation of oil-based toxins up the food chain; however, such effects are currently not quantifiable.

*Additional contaminants*

Water quality degradation occurs in the nearfield of platforms from operational discharges including drilling fluids and waste discharges. As platforms move into deeper waters, multiple wells will be associated with each structure and the resultant cumulative amount of contaminants allowed in discharges will be larger. Dilution into deeper waters should result in a sufficient reduction in contaminant concentration to avoid immediate adverse effects to water-column organisms. However, the resulting introduction of contaminants into the Gulf of Mexico may affect sea turtles, marine mammals including listed sperm whales, and Gulf sturgeon through biomagnification in the food chain or a reduction in available prey. Chronic sublethal effects could cause declines in the health of listed species, or lowered reproductive fitness.

MMS has used modeling techniques to estimate cumulative onshore impacts from OCS sources located in the Central Planning Area of the Gulf. The results indicate that the significance level for nitrogen dioxide ($NO_2$) established by MMS is exceeded along a portion of the Louisiana coastline. By MMS regulations, Abest available control technology≅ is required and is being implemented, to bring $NO_2$ levels down to within the legal limits.

Tissues from dead stranded bottlenose dolphins and sea turtles have contained high levels of organochlorides and heavy metals. The contribution of OCS related activities to these contaminants relative to other known sources such as the Mississippi River is not known but is thought to be low. Therefore NMFS believes that contaminants associated with the proposed action are not likely to adversely affect listed species to a degree that would lead to mortalities.

*MMS Marine Protected Species Workshop and Expert Panel Recommendations*

On June 15 - 16, 1999, MMS convened a Marine Protected Species Workshop which featured a panel of experts who discussed various concerns in relation to MMS activities in the Gulf of Mexico, and made a series of recommendations to MMS in relation to those concerns. These recommendations and concerns are outlined in a draft Discussion Summary which was prepared for review and comment by Panel members. Several are summarized below (for a more complete listing, refer to MMS for the panel summary). A number of such recommendations (including some not listed here) are currently being carried out under the MMS-funded joint sperm whale research project (see summary outlined in the section below).

<u>General Issues</u>:

1) There is a need to consider differential habitat utilization by species, life history stage, and by sex in distribution models for sea turtles. The expert panel came up with a list of priorities for sea turtle studies. It was noted that determining the distribution of post-hatchling and early life history stages in the Gulf is of considerable importance, since some MMS - related activities may be seriously impacting these young turtles. Previous aerial surveys have been flown too high to see the smaller turtles. Industry=s involvement could be helpful, particularly for using helicopters to do the surveys. Ship surveys can work for sea turtles, if designed properly. Information on sea turtle abundance throughout their distribution is needed.

2) Conduct studies to determine if there are discrete populations or stocks of sperm whales (and other cetacean species).

3) Support the Southeast Marine Mammal Stranding Network and analysis of collected data. Stranding network data could be utilized to assess effects of human activities; determine if there is ear bone damage from sound; create baseline information on disease; assist with stock determination studies; and analyze tissues for contaminants to help determine if there is a link to immune system suppression. However, there is also a need to realize the biases inherent in using stranding data, including that fewer deepwater animals reach the shoreline.

4) A sea turtle meeting, to focus on methodology, should be conducted. An initial meeting could be hosted jointly by NMFS and MMS, and would bring together sea turtle biologists and technology experts. Possibly using transponders on young turtles was discussed. Such tags could be activated with an acoustic signal from the research vessel. Using high frequency sonar to locate turtles was also discussed, though concern was raised about cetaceans being able to hear this sound.

5) Noise as a potential harmful effect to the marine environment, and in particular, cetaceans, was noted as a topic of great scientific concern. Several workshop participants voiced particular concern over the impact of noise on the animals= environment, notably that changes in ambient noise would increase over time in levels and frequencies, not only raising the level of sound, but changing the dominant frequencies and masking communication signals of cetaceans.

6) Concern was expressed that as a result of a progression of activities into deeper water, there will be an increase in the number of cetacean species and individual animals affected by MMS activities. Deepwater cetaceans are more naive or behaviorally sensitive, since they occur in areas with no previous exposure to exploration and development activities. Deepwater cetaceans have a different ear than shallow water cetaceans; deepwater cetaceans are more sensitive to low frequency sounds, while shallow water cetaceans are more sensitive to relatively high frequency sounds. Cetacean stock discreteness also becomes a greater issue. Sea turtle post-hatchling and early pelagic life history stages occur in deep water, and little is known about sea turtles during this stage of life or the possible impacts from exploration and development activities.

7) Placement of platforms in deeper water could create Ahabitat≅ which may or may not be beneficial. For example, Dr. Bob Hoffman (Marine Mammal Commission) noted that about 15 years ago, when there was some exploratory drilling off New Jersey, bright lights on the drilling platform attracted squid, which in turn attracted sperm whales that fed on these squid. This could in turn increase the potential for interactions between sperm whales and MMS-related activities, habituate them to humans or anthropogenic noise, etc. Examination of sperm whale distribution and behavior prior to structure placement would provide information relative to assessing potential impacts afterwards.

8) Participants emphasized that it was critical to study offshore areas before exploration and development occur. It is important to have data and observations (abundance, distribution and behavior) beforehand as baseline information, so that the question of whether human activities are impacting the animals can be better addressed later. Some important basic ecological questions need to be answered. A particularly important goal is to attempt to relate prey distribution and abundance to estimated carrying capacity of these habitats to be able to

compare them to other large ocean areas of similar scale. This information is important in understanding whether human activities are affecting the abundance of animals.

9) Emphasis also needs to be placed on conducting surveys to obtain additional distribution and abundance information for the southern and offshore waters of the Gulf, as the animals do not recognize political boundaries and some probably move throughout the entire Gulf. Offshore surveys should be conducted and stranding information obtained of the southern Gulf in cooperation with colleagues in Mexico and Cuba. The MMS and other Federal agencies would provide expertise, assistance, and possibly funding. Platforms-of-opportunity will most likely be very beneficial to studies in the southern Gulf since very little baseline information has been collected from there.

10) As oil and gas exploration and development activities move into the eastern Gulf, the risk of impacting discrete populations and/or stocks of protected species increases. Post-hatchling movements of sea turtles is also of concern. Work has been done in the Atlantic to follow hatchlings to the pelagic zone; similar work needs to be conducted in the Gulf.

11) Noise producing activities were flagged as a primary concern, particularly seismic surveys and operating platforms. Concern was raised because of the amount of noise-producing activity that occurs in the Gulf, creating changes in ambient noise, and also regarding the level of duplication of seismic survey effort. The following specific questions and concerns were highlighted:

    1. Has seismic profiling affected the distribution, abundance, or productivity of a species or stocks?

    2. Have some or all species become accustomed to seismic profiling and other noise producing activities? How are they affected by such activities?

    3. Do attractions to certain areas override the aversive effects of noise but cause stress that may increase susceptibility to disease, parasites, or predation? and

    4. Will extension of activities to deeper waters and the Eastern Planning Area have potentially significant effects on biologically important behavior and affect distribution, abundance, or productivity?

12) The expert panel discussed a number of possible study approaches. A strong recommendation was made for a study (experiment) to be conducted to determine the types and levels of seismic survey and other anthropogenic sounds that sperm whales are routinely exposed to in different areas and different times of the year, and whether their distribution, movements, vocalization patterns or other behavior changes are in response to the sound. It is expensive to look at a

population response to air guns, so it was suggested to dedicate dollars to examination of responses of individuals in certain key species (e.g., sperm whale).

The null hypothesis would be: sperm whales in the northern Gulf have become accustomed and do not (no longer) respond in any detectable way to sounds associated with offshore oil and gas exploration and development. This study would be treated as a controlled experiment and include sound playback. Look at two populations, one where activity is occurring, another where it hasn't and compare information. Predict the received sound level and verify this by using satellite-linked tags and/or recoverable satellite-linked tags and/or data loggers that could be put on a representative subset of sperm whales. Received sound level, the animal's vocalizations, and its heart rate could be recorded. Additionally, 3-D orientation sensors could be part of the tag. This tag would help in detecting subtle responses, and the responses could be interpreted in terms of biological significance. A valid response model would be needed, to predict impacts. It would need to be recognized that there is individual variability in response, and that tolerant animals might have ear damage. Having a companion effort like visual monitoring was also recommended.

13) It should be determined whether offshore oil and gas exploration and development by itself or in combination with other activities has caused or is likely to cause changes in ambient noise (levels and characteristics)that make it more difficult for cetaceans to carry out vital communications or other functions.

14) A Gulf of Mexico acoustic database should be developed and ambient noise levels in representative areas should be monitored. There should be consultation and cooperation with, for example, the Navy, NMFS, and the seismic industry to obtain available data, design, and seek cooperative funding to carry out a long-term program to detect changes and monitor trends in ambient noise levels in the Gulf.

15) Long-term studies on Gulf protected species are needed. Behaviors like diving and foraging need to be characterized in an area-specific fashion before seismic activities will take place.

16) A case can be made that seismic profiling may be disrupting behavior of some species. Modeling can be used to help assess possible behavioral significance of observed effects.

17) The Office of Naval Research is considering support of a proposal to start looking at auditory systems of sea turtles. Hearing may play an important role in alteration of their behaviors, and such research should be supported.

18) Sea turtle behavior patterns around platforms should be studied using information collected by tags. This could be a small-scale study, which would be relatively inexpensive and could help identify problems that could help with adapting structure removal techniques. Using high-

frequency sonar to locate sea turtles and marine mammals in the vicinity of platforms was suggested as a possible technique.

19) It was noted that, from studies in Alaska and elsewhere, it seems reasonable to assume that the distibutions, behavior, and/or productivity of at least some species of marine mammals in the northern Gulf have been and will be affected by seismic surveys or other exploration and development activities. If there is a reasonable likelihood that taking is occurring or will occur, industry should comply with the MMPA by obtaining incidental take authorization, and by initiating monitoring programs in accordance with section 101(a)(5)(A)of the Act.

20) It was recommended that four cruises per year would be needed for low enough coefficients of variation for fine-scale detection of changes in cetacean abundance. Right now, only drastic changes in abundance estimates would be detectable under the current survey/sampling scheme.

21) It was pointed out that there is a lack of uniform regulations nationwide for seismic surveys, and that it seems inappropriate to have a very different regulatory environment on the West Coast and Alaska compared to the Gulf. For example, in a recent EIS on potential oil and gas activities for the Canadian Georges Bank, concern was indicated regarding the effect of seismic surveys (the pressure effect was of greatest concern) on fish larvae. MMS and NMFS should strive for greater consistency across regions in how these activities are reviewed, analyzed, and regulated.

22) It was stressed that masking, as a noise impact, is important. Seismic signals have been discussed at length, but they are high intensity over a very short period of time compared to vessel traffic, which is a different signal and may have more of a long-term impact than any other signal. Ambient noise change is also an important item requiring further study.

Contaminants:

23) The presence, levels, sources, and effects of environmental contaminants from all sources should be examined, and a survey should be conducted to determine the contribution of exploration and development activities to total contaminant load. The types and levels of contaminants present in different species and age/sex groups of marine mammals in different parts of the Gulf should be determined, particularly the northern Gulf of Mexico, using stranded animals. MMS should consult with NMFS and EPA to determine data currently available and, as needed, provide funding to determine and monitor the presence, levels, sources, and effects of environmental contaminants from all sources. If potentially harmful types or levels of contaminants are found, a monitoring program should be established. Collective or collaborative action by NMFS, EPA, MMS, and related state agencies, was suggested. A survey should also be conducted to determine the contributions of oil and gas exploration and development activities to the total load.

24) The role of contaminants and other anthropogenic stressors in precipitating harmful algal blooms and disease outbreaks requires further study. The effects of persistent ocean contaminants on

marine mammals was the subject of a recent Marine Mammal Commission workshop (O'Shea *et al.*, 1999). The MMS should consult with NOS and EPA to determine how MMS programs can contribute to answering questions regarding the role of contaminants and other stressors in harmful algal blooms and diseases. Other needs include the development of ways of quantifying indicators of the health and disease levels of animals, so links between contaminants and diseases can be determined. Health assessment information was collected simultaneously with tissue sampling for contaminants for Matagorda Bay, TX dolphins a few years ago, but the contaminant analysis still has not been completed.

*Joint Research Project on Gulf Sperm Whales*

Much of what is currently known regarding the abundance and distribution of marine mammals and sea turtles in the Gulf of Mexico has evolved out of a series of surveys (GulfCet and GulfCet II) and ancillary studies conducted by researchers with NMFS and Texas A&M, and funded by MMS. A collaborative effort between NMFS, MMS, The Office of Naval Research, and researchers from private academic institutions was initiated last summer to answer several basic questions regarding sperm whales in the Gulf of Mexico, and the potential effects of oil and gas related activities on their abundance, distribution, and behavior.

A variety of techniques are being employed to study numerous aspects of the biology of these great whales, including photo-ID, traditional visual shipboard surveys, biopsies and subsequent DNA and contaminants studies, acoustic arrays (to determine whether more whales may be detected acoustically than visually), behavioral observations, collection of fecal samples for diet analyses, and tagging. The tagging studies are of particular interest, as they are using cutting edge technology wherein an acoustic data logger is affixed to a whale via suction cups. Data which can be recorded include sounds from both the whale and ambient noise, depth and acceleration of the dive, and the pitch and roll of the animal while wearing the tag. These tags worked well during last year=s pilot study; the hope is to use them this summer to measure sounds that sperm whales are exposed to, as well as their subsequent responses. Behavioral data are collected simultaneously, to provide context for interpretation of the recorded sounds. These studies should begin to address many of the issues raised by the MMS industry panel workshop convened in 1999.

## VI. Cumulative Effects

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area considered in this biological opinion. 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. Within the action area, major future changes are not anticipated in ongoing human activities described in the environmental baseline. The present, major human uses of the action area -- commercial fishing and oil and gas exploration and extraction -- are expected to continue at the present levels of intensity in the near future as are their associated risks of injury or mortality to sea turtles and sperm whales posed by accidental oil spills, vessel collisions, marine debris, chemical discharges, and man-made noises. As discussed in Section IV; however, sperm whales and sea turtles migrate throughout the GOM and may be affected during their life cycles by nonfederal activities outside the action area.

Beachfront development, lighting and beach erosion control all are ongoing activities along the Gulf coast. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, more and more coastal counties are adopting more stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting. Some of these measures are being drafted in response to ongoing law suits brought against the counties by concerned citizens who charged the counties with failing to uphold the Endangered Species Act by allowing unregulated beach lighting which resulted in takes of hatchlings.

State-regulated commercial and recreational fishing activities in the GOM waters currently result in the take of threatened and endangered species. Other recreational activities such as whale watch cruises have also resulted in the incidental take of endangered whales, although there are no known whale watch activities in the Gulf of Mexico other than nearshore operations targeting dolphins. It is expected that states will continue to license/permit large vessel and thrill-craft operations which do not fall under the purview of a Federal agency and will issue regulations that will affect fishery activities. NMFS will continue to work with states to develop ESA Section 6 agreements and Section 10 permits to enhance programs to quantify and mitigate these takes. Any increase in recreational vessel activity in inshore and offshore waters of the GOM will likely increase the risk of turtles and sperm whales taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles, including Kemp=s ridleys. Future cooperation between NMFS and the states on these issues should help decrease take of sea turtles and whales caused by recreational activities.

## VII. Conclusion

After reviewing the current status of endangered sperm whale, the green, leatherback, hawksbill, and Kemp=s ridley sea turtles and the threatened loggerhead sea turtle and the Gulf sturgeon in the GOM, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is NMFS= biological opinion that the implementation of the proposed action, as described in the Proposed Action section of this Opinion, is not likely to jeopardize the continued existence of endangered sperm whale, the green, leatherback, hawksbill, and Kemp=s ridley sea turtles, or the threatened loggerhead sea turtle or the Gulf sturgeon. No critical habitat has been designated for these species in the GOM; therefore, none will be affected.

## VIII. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, 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 carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary and must be undertaken by MMS so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. MMS has a continuing duty to regulate the activity covered by this incidental take statement. If MMS fails to assume and implement the terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, MMS must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement.

### Amount or Extent of Anticipated Take

Based on stranding records, incidental captures during recreational and commercial fishing vessels, scientific surveys, and historical data, sperm whales, Gulf sturgeon, and five species of sea turtles are known to occur in GOM waters in and around the action area. Current available information on the relationship between these species and OCS oil and gas activities indicates that sea turtles may be killed or injured by vessel strikes that may happen as a result of the proposed action.

Pursuant to section 7(b)(4) of the ESA, NMFS anticipates an incidental take (by injury or mortality) of up to **one** documented sea turtle, either a loggerhead, Kemp=s ridley, green, leatherback, or hawksbill turtle as a result of a vessel strike over the 30-year life of the proposed action. This level of take is anticipated for the exploration and production of oil and gas that may result from the GOM OCS oil and gas lease sale 181. If the actual incidental take meets or exceeds this level, MMS must immediately request reinitiation of formal consultation. NMFS Southeast Region will cooperate with MMS in the review of the incident.

NMFS believes that an unspecified number of sea turtles will experience sublethal effects as the result of exposure to spilled oil, resulting from the proposed action. NMFS believes that up to two sea turtles of any of the five species present in the action area and up to one Gulf sturgeon will be killed as a result of exposure to spilled oil. However, NMFS is not including an incidental take statement for the incidental take of listed species due to oil exposure. Incidental take, as defined at 50 CFR 402.02, refers only to takings that result from an *otherwise lawful* activity. The Clean Water Act (33 USC 1251 *et seq.*) as amended by the Oil Pollution Act of 1990 (33 USC 2701 *et seq.*) prohibits discharges of harmful quantities of oil, as defined at 40 CFR 110.3, into waters of the United States. Therefore, even though this biological opinion has considered the effects on listed species by oil spills that may result from the proposed action, those takings that would result from an unlawful activity (*i.e.,* oil spills) are not specified in this incidental take statement and have no protective coverage under section 7(o)(2) of the ESA.

NMFS believes an unspecified number of sperm whales within the action area will be adversely affected by noise from construction and drilling activities and increased vessel traffic. These effects are expected to be sublethal. The extent to which sperm whales will detect and exhibit a behavioral response will be determined by a variety of factors. However, NMFS is not including an incidental take statement for the incidental take of whale species due to acoustic harassment at this time because the take of marine mammals has not been authorized under section 101(a)(5) of the Marine Mammal Protection Act (MMPA) and/or its 1994 amendments. Following issuance of such regulations or authorizations, NMFS may amend this Opinion to include incidental take of sperm whales.

**Effect of the Take**

NMFS has determined that the level of anticipated take is not likely to appreciably reduce the survival or recovery of Kemp=s ridley, green, loggerhead, leatherback, or hawksbill sea turtles, the Gulf sturgeon, or sperm whales in the wild, by reducing their reproduction, numbers, or distribution. In particular, NMFS determined that it does not expect activities associated with the proposed action, when added to ongoing activities affecting these species in the action area and cumulative effects, to affect sperm whales, Gulf sturgeon or sea turtles in a way that reduces the number of animals born in a particular year; the reproductive success of these species; or the survival of young that will recruit into the adult, breeding populations. However, not enough information is currently available to fully evaluate the cumulative effects of all the factors affecting these species. This is particularly true regarding the potential disturbance that the noise resulting from the proposed activities may cause to sperm whales. Results of ongoing and planned studies to determine the actual effects of various man-made noises to sperm whales are expected to become available during the early years of the proposed action. NMFS will review these results and determine if they represent new information revealing effects which may affect sperm whales in a manner or to an extent nor considered in this Opinion.

**Reasonable and Prudent Measures**

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize the potential for incidental take of Gulf sturgeon, sperm whales, or Kemp=s ridley, green, loggerhead, leatherback, and hawksbill sea turtles:

1) MMS shall minimize the amount of debris left in the water as a result of the proposed action to the greatest extent practicable.

2) MMS shall monitor all vessel traffic associated with the proposed action for impacts to sea turtles or sperm whales.

**Terms and Conditions**

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

1. MMS must condition permits issued to oil companies to require collection and removal of flotsam resulting from exploration and production resulting from the proposed action.

2. MMS shall condition permits issued to oil companies requiring them to post signs in prominent places on all vessels and platforms used as a result of the proposed action detailing the reasons (legal and ecological) why release of debris must be eliminated.

3. MMS shall develop, in conjunction with NMFS, a program to train observers to be used during vessel operations supporting the proposed action. These observers will be used to help to avoid and monitor take of listed species and marine mammals during vessel operations. This program will also develop methods by which observers can report sightings of sea turtles and large whales and any takes of sea turtles or cetaceans resulting from vessel operations.

4. MMS shall complete an annual report to be submitted to NMFS' Southeast Regional Office Assistant Regional Administrator, F/SER3 by January 30 of each year. This report will enumerate the number, amount, location, and types of toxic spills resulting from the proposed action for the previous calender year (Jan 1-Dec 31), the number of vessel operations resulting from the proposed action, with the observer reports for the previous calender year, platform removal operation observer reports, and takes of NMFS protected species resulting from the proposed action for the previous calender year.

5. Any injured or dead sea turtle resulting from the proposed action will be collected if possible and the Florida Sea Turtle Salvage and Stranding Network (FL STSSN) coordinator will be contacted as soon as possible (1-800-241-4653; ID no. 274-4867) to obtain the carcass of the turtles. If the turtle can not be collected, the FL STSSN coordinator still must be notified as soon as possible and given the last known location of the turtle. MMS shall send a report detailing the take to NMFS' Assistant Regional Administrator for Protected Resources, Southeast Regional Office, within 14 days of the incident (F/SER3, 9721 Executive Center Drive, North, St. Peterburg, Florida 33702). This report must contain: the cause of the take, location, species, and final disposition of the turtle.

6. Any injured or dead marine mammal (including unauthorized takes of listed sperm whales) resulting from the proposed action will be collected if possible and the Southeast Regional Stranding Coordinator will be contacted as soon as possible (emergency pager: 1-305-862-2850) to organize a necropsy. MMS shall send a report detailing the take to NMFS' Assistant Regional Administrator for Protected Resources, Southeast Regional Office, within 14 days of the incident (F/SER3, 9721 Executive Center Drive, North, St. Peterburg, Florida 33702). This report must contain: the cause of the take, location, species, and final disposition of the carcass. Collection and analysis of samples from stranded non-listed marine mammals which may die as a result of activities associated with the proposed action will help biologists better evaluate potential impacts to listed sperm whales.

7. Any dead Gulf sturgeon resulting from the proposed action will be collected if possible and frozen. MMS will contact the sturgeon coordinator for the Florida Marine Research Institute at (727) 896-8626 for disposition of the carcass. MMS shall send a report detailing the take to NMFS' Assistant Regional Administrator for Protected Resources, Southeast Regional Office, within 14 days of the incident (F/SER3, 9721 Executive Center Drive, North, St. Peterburg, Florida 33702). This report must contain: the cause of the take, location, and final disposition of the sturgeon.

NMFS believes that no more than one documented Gulf sturgeon and three documented sea turtles of the five species found in the action area, in combination, may be taken by injury or mortality for the 30-year length of the proposed action (including the two turtles which may be taken as a result of oil-spill activities and are not authorized herein). The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. MMS must immediately request initiation of formal consultation, provide an explanation of the causes of the taking, and review with NMFS the need for possible modification of the reasonable and prudent measures.

## IX. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. MMS should continue its support of research to determine effects of OCS related noise on sperm whales, and to elucidate the question of sperm whale stock structure and distribution patterns in the GOM (i.e., are MMS activities impacting an endemic stock?). This includes studies currently or soon to be in progress such as acoustic studies, photo-ID, biopsies, morphometrics, behavioral studies, acoustic tagging, and visual and acoustic line-transect abundance estimation. MMS should also support satellite tracking studies to gain insight into the ranging patterns of these whales and help determine the degree of movement (if any) outside of Gulf waters. Studies should be conducted in all seasons to examine any seasonal patterns in mating, calving, or feeding to determine whether it is important to avoid disturbance in particular areas during certain times of year.

2. MMS should continue to analyze tar samples collected from stranded sea turtles and marine mammals, as well as beaches and driftlines, to determine the source of the tar. Additionally, research on neonatal turtle habitat in the GOM, which may include driftlines where tarballs accumulate, should be conducted.

3. MMS should continue to conduct surveys of the GOM to determine the distribution and relative abundance of sea turtles and cetaceans (relative to OCS oil and gas activities).

4. MMS should conduct or support studies to elucidate Gulf sturgeon use of marine waters through its Environmental Studies Program. While significant progress has been made in telemetry studies on Gulf sturgeon in rivers, bays, and estuaries, studies of Gulf sturgeon distribution, movements, and habitat in the marine environment are still needed. Information from these types of studies would help fill data gaps and enable a more thorough evaluation of potential impacts of oil and gas activities on the Gulf sturgeon.

5. As described above, on June 15 - 16, 1999, MMS hosted a Marine Protected Species Workshop in New Orleans, LA. At this workshop, an expert panel provided several recommendations regarding future research needs to investigate concerns regarding the effects of oil and gas exploration, development, and associated activities on marine mammals. Some of

these recommendations, such as the collaborative Gulf sperm whale project, are currently being implemented, at least in part. MMS, in concert with appropriate agencies and with assistance in funding by industry where possible, should expand upon current efforts in supporting work to carry out the recommendations of the panel.

6. MMS should encourage permit holders to use current knowledge of sperm whale distribution patterns to avoid these whales as much as possible. In this regard, recall that sperm whale sightings in the project area were more frequent in summer and fall, and were associated with the presence of cold-core rings.

7. MMS should require that permit holders maintain helicopter traffic over the proposed action area at altitudes above 1,000 feet as practicable, to avoid disturbance to whales and sea turtles.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

## X. Reinitiation of Consultation

This concludes formal consultation on the actions outlined in MMS= letter dated October 19, 2000. 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 taking specified in the incidental take statement is met or exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, MMS must immediately request reinitiation of formal consultation.

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