UNITED STATES DEPARTMENT OF COMMERCE
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NATIONAL MARINE FISHERIES SERVICE
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DEC 1 5 2014

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SER-2014-14835

Mr. Bruce W. Hagedorn
Acting Chief, Eglin Natural Resources
Department of the Air Force, 96th Test Wing
501 De Leon Street, Suite 101
Eglin Air Force Base, Florida 32542-5133

Ref.: USAF, Eglin Air Force Base Maritime Strike Operations Tactics Development and Evaluation, Eglin Gulf Test and Training Range, Gulf of Mexico

Dear Mr. Hagedorn:

This is the National Marine Fisheries Service's (NMFS) Biological Opinion issued in accordance with Section 7 of the Endangered Species Act (ESA) of 1973. The Department of the Air Force proposes to conduct maritime strike operations within the Eglin Gulf Test and Training Range located in the Gulf of Mexico. These strike operations will continue the development of tactics, techniques, and procedures for Air Force aircraft to counter small maneuvering maritime targets.

The Biological Opinion analyzes the project's effects on 4 species of sea turtles. The Biological Opinion is based on project-specific information provided by the Air Force and their consultants, as well as NMFS's review of published literature. It is our Opinion that the action, as proposed, may adversely affect 4 species of sea turtles (loggerhead, Kemp's ridley, green, and leatherback). A previous Section 7 consultation conducted by NMFS on a very similar maritime strike operation in the same area of the Eglin Gulf Test and Training Range (W-151A) concluded that the project may affect, but is not likely to adversely affect, hawksbill sea turtles, smalltooth sawfish, Gulf sturgeon, sperm whales, and Gulf sturgeon critical habitat. Those conclusions are included by reference here (See SER-2012-9587, signed May 6, 2013).

We look forward to further cooperation with you on other Department of the Air Force projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Dr. Dave Rydene, Consultation Biologist, at (727) 824-5379, or by email at David.Rydene@noaa.gov.

Sincerely,

Miles M. Croom

for Roy E. Crabtree, Ph.D.
Regional Administrator

Enc.: 1. Biological Opinion
2. *PCTS Access and Additional Considerations for ESA Section 7 Consultations* (Revised June 11, 2013)

File: 1514-22.S

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: Department of the Air Force, Eglin Air Force Base

Activity: Maritime Strike Operations in the Eglin Gulf Test and Training Range, Florida

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida

Consultation Number SER-2014-14835

Approved by: Miles M. Croom

for Roy E. Crabtree, Ph.D., Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: DEC 15 2014

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Background

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species; Section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any such action. NMFS and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA: if the subject species is cited in 50 CFR 222.23(a) or 227.4 the federal agency shall contact NMFS, otherwise the federal agency shall contact USFWS (50 CFR 402.01).

Formal consultation is required when a federal action agency determines that a proposed action "may affect" listed species or designated critical habitat. Consultation is concluded after NMFS issues a Biological Opinion ("Opinion") that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The Opinion states the amount or extent of incidental take of the listed species that may occur, develops measures (i.e., reasonable and prudent measures) to reduce the effect of take, and recommends conservation measures to further conserve the species. Notably, no incidental destruction or adverse modification of critical habitat can be authorized, and thus there are no reasonable and prudent measures, only reasonable and prudent alternatives that must avoid destruction and adverse modification.

This document represents NMFS's Opinion based on our review of impacts associated with proposed maritime strike operations to be conducted in the Eglin Gulf Test and Training Range (EGTTR), offshore of Florida. The Department of the Air Force is both the applicant and action agency for this particular project. We based this Opinion on project information provided by the Eglin Natural Resources Section (NRS) and other sources of information including published literature and summary reports provided by the Eglin NRS.

1 CONSULTATION HISTORY

NMFS received a request from the Eglin Air Force Base (EAFB) on August 5, 2014, for ESA Section 7 consultation on the project. This original request contained a Biological Assessment (BA) that analyzed impacts to 4 species of sea turtles. Subsequently, the Air Force provided a letter dated September 18, 2014, revising the proposed action and BA. The Air Force determined that the project may affect, and is likely to adversely affect 4 species of sea turtles (loggerhead, Kemp's ridley, green, and leatherback). NMFS initiated formal consultation on September 18, 2014.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

The U.S. Air Force (USAF) proposes to conduct maritime strike missions in the Gulf of Mexico involving the use of multiple types of live munitions (Table 1) against small boat targets in the EGTTR. Ordnance will be delivered by multiple types of aircraft, and targets will include stationary, towed, and remotely-controlled boats. At least 2 ordnance delivery aircraft will participate in each live weapon release mission. Ordnance detonations will occur approximately 20 feet (ft) above the water's surface, at the surface, or approximately 10 ft below the surface. In total, the USAF will deploy 47 live bombs/missiles, 100 rockets, and 6,000 live gunnery rounds. The USAF will conduct 1 mission per day over a period of few weeks in February-March 2015 with missions firmly scheduled to begin February 6, 2015. Missions will only occur on weekdays and during daytime hours. The USAF will request that the Coast Guard release a *Notice to Mariners* approximately a week prior to the missions, informing boaters of the closure of a safety zone. A human safety zone will be established around the area prior to each live mission, and will be enforced by a large number of safety boats (approximately 20-25). The size of this zone will vary, depending upon the particular munition used in a given test event. A composite safety footprint was developed, which incorporates all munitions being deployed and averages them out. The composite safety footprint consists of an approximately 19-mile-diameter circle (9.5-mile-wide radius from the detonation point). Non-participating vessels (such as recreational and commercial fishing vessels) will be excluded from entering the safety footprint while it is active, which is expected to be up to 4 hours per mission on test days.

In addition to the human safety zone, the USAF will also establish a marine species protection zone based on the distance to which energy- and pressure-related impact zones could extend based on the various types of ordnance to be used. At least 2 trained marine species observers will be aboard each of 2-6 of the safety boats (depending on the size of the area to be surveyed) and will survey the species protection zone beginning at sunrise (or at least 1.5 hours prior to weapon deployment) up until 30 minutes prior to each live weapon deployment. At 30 minutes before weapon deployment, observers are required to retreat to the edge of the human safety zone. Observers will continue to scan for protected species from the periphery of the human safety zone during active weapon testing. Crews of the other safety boats will also opportunistically scan for protected species, though this will not be their primary task. The USAF will also use an instrumentation barge anchored approximately 600 ft from target boats as a base of operations to collect data, remotely control the target boats, and observe for protected species. Live video feeds from this barge will be viewed by a trained marine species observer (located in the Eglin Central Control Facility) before and during test activities.

Post-detonation monitoring surveys will commence once the mission area is declared safe. Vessels will move into the survey area from outside the human safety zone and monitor for at least 30 minutes, concentrating on the area down-current of the mission site. The protected species survey vessels will document any sea turtles that were killed or injured as a result of the mission and, if practicable, recover and examine any dead animals. The species, number, location, and behavior of any animals observed will be documented and reported to Eglin NRS. No known take of sea turtles occurred during similar maritime strike exercises conducted by EAFB in 2013.

Table 1. Types, amounts, and detonation locations of munitions proposed for use

Type of Munition	Total # of Live Munitions	Detonation Type	Warhead – explosive	Net Explosive Weight per Munition
GBU-10 or GBU-24	2	Surface	MK-84 - Tritonal	945 lbs
GBU-12 or GBU-54	6	Surface	MK-82 - Tritonal	192 lbs
AGM-65 (Maverick)	6	Surface	WDU-24/B penetrating blast-fragmentation	86 lbs
CBU-105 (WCMD)	4	Airburst	10 BLU-108 sub-munitions each containing 4 projectiles, parachute, rocket motor and altimeter	83 lbs
GBU-38 (Laser Small Diameter Bomb)	4	Surface	AFX-757 (Insensitive munition)	37 lbs
AGM-114 (Hellfire)	15	Subsurface (10 msec delay)	High Explosive Anti-Tank (HEAT) tandem anti-armor metal augmented	20 lbs
AGM-175 (Griffin)	10	Surface	Blast fragmentation	13 lbs
2.75 Rockets	100	Surface	Comp B-4 HEI	Up to 12 lbs
PGU-12 HEI 30 mm	1,000	Surface	30 x 173 mm caliber with aluminized RDX explosive. Designed for GAU-8/A Gun	0.1 lbs
7.62 mm/.50 Cal	5,000	Surface	N/A	N/A

AGL = above ground level; AGM = air-to-ground missile; CBU = Cluster Bomb Unit; GBU = Guided Bomb Unit; JDAM = Joint Direct Attack Munition; LJDAM = Laser Joint Direct Attack Munition; mm = millimeters; lbs = pounds; PGU = Projectile Gun Unit; HEI = high explosive incendiary

2.2 Action Area

The EGTTR comprises 102,000 square nautical miles of Gulf of Mexico surface waters, beginning 3 nautical miles from shore. The training range is subdivided into blocks consisting of Warning Areas, and all activities under this project will take place in Warning Area W-151A. Specifically, the strike missions will be conducted in the northern inshore portion of the Warning Area, approximately 17 miles offshore of Santa Rosa Island (Figure 1). Water depth in the mission area is approximately 115 ft. The action area will include the portion of Warning Area W-151A where the munitions testing will occur as well as the waters between the Warning Area and EAFB where boats will transit.

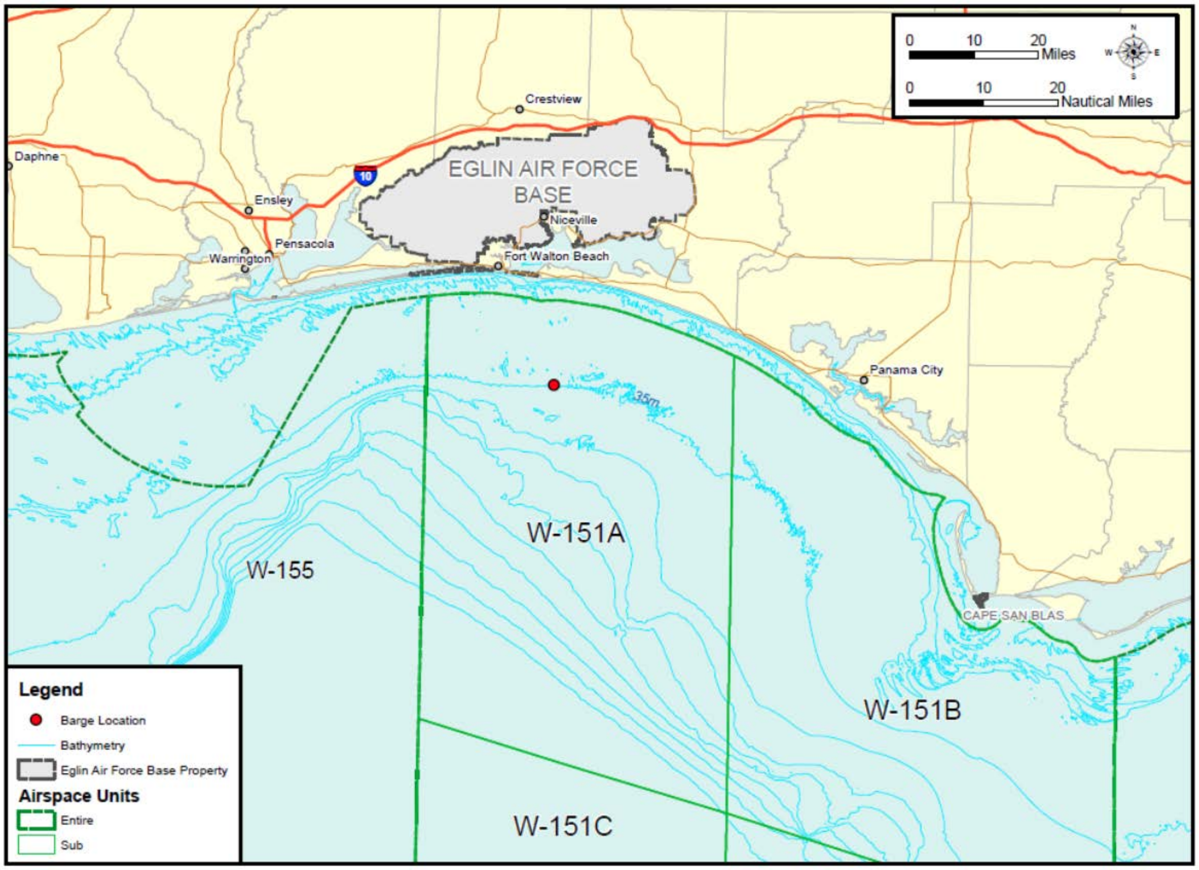

Figure 1. Map of the EAFB Warning Areas, including W-151A. The red point indicates the approximate position of the strike missions.

3 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

The following endangered (E) and threatened (T) sea turtle and fish species, and designated critical habitat under the jurisdiction of NMFS, may occur in or near the action area:

Common Name	Scientific Name	ESA Listed Status
Sea Turtles		
Loggerhead sea turtle	*Caretta caretta*[1]	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Green sea turtle	*Chelonia mydas*[2]	E/T
Fish		
Gulf sturgeon	*Acipenser oxyrinchus*	T

[1] Northwest Atlantic Ocean (NWA) distinct population segment (DPS). On September 16, 2011, NMFS and USFWS issued a final rule changing the listing of loggerhead sea turtles from a single, threatened species to nine DPSs listed as either threatened or endangered. The NWA DPS was listed as threatened.
[2] Green turtles are listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are listed as endangered.

Common Name	Scientific Name	ESA Listed Status
	desotoi	
Smalltooth sawfish	*Pristis pectinata*[3]	E
Whales		
Sperm whale	*Physeter macrocephalus*	E
Critical Habitat		
Gulf sturgeon Unit 11		

3.1 Analysis of Species and Critical Habitats Not Likely to be Adversely Affected

There are 5 species of sea turtles (green, hawksbill, Kemp's ridley, leatherback, and loggerhead) which may be found in or near the action area. Yet, according to the NOAA Sea Turtle Stranding and Salvage Network (http://www.sefsc.noaa.gov/species/turtles/strandings.htm) hawksbill sea turtle strandings in the action area during the 10-year period of 2003-2012 were rare, with only 5 reported strandings over the 10-year period. By comparison, 543 loggerhead, 345 green, 320 Kemp's ridley, and 30 leatherback sea turtles stranded in the area during the same 10-year period. Due to the rarity of hawksbills in the action area NMFS believes any effects to this species are discountable.

Smalltooth sawfish, Gulf sturgeon, and sperm whales also use portions of the Gulf of Mexico and may be found in or near the action area; however, each of these species is unlikely to be found in the area of the munitions testing (approximately 17 miles offshore of Santa Rosa Island). Smalltooth sawfish are rare to the northern Gulf coast as their population is generally restricted to the southern half of peninsular Florida (NMFS 2000). Gulf sturgeon use the nearshore waters of the northern Gulf coast including bays, estuaries, and barrier island passes (NMFS 2009a), but are unlikely to occur on the outer continental shelf where munitions will be tested. Conversely, sperm whales are found in the Gulf of Mexico but are more typically associated with the deeper waters off the continental slope (Baumgartner et al. 2001). Therefore, any effects to these species are discountable.

Unit 11 of Gulf sturgeon critical habitat is located within the action area, but is unlikely to be affected by the proposed action. Unit 11 extends from the high tide line out 1 mile from shore. Since the munitions testing will occur approximately 17 miles offshore, critical habitat will not be affected by the tests. Vessels associated with the training, though, will have to pass through critical habitat en route to the testing area. Boats traveling through the critical habitat unit are not expected to cause any adverse effects to the essential features of Gulf sturgeon critical habitat (abundant prey items, water quality, sediment quality, and safe, unobstructed migratory pathways). Boats will operate in marked channels or waters sufficiently deep enough to avoid contact with the bottom so there will be no effect to Gulf sturgeon prey that live within the sediments or sediment quality. Similarly, vessel traffic associated with the project will have no effect on migratory pathways. While vessels could affect water quality in the area, NMFS believes any effects will be insignificant, as any pollution of the water from outboard motors will be minute in relation to the large volume of water in the Gulf.

[3] U.S. distinct population segment

Similarly, loggerhead sea turtle nearshore reproductive critical habitat is located within the action area, but is unlikely to be affected by the proposed action. Loggerhead nearshore reproductive habitat describes nearshore waters adjacent to nesting beaches that are used by hatchlings to egress to the open-water environment as well as by nesting females to transit between beach and open water. This includes nearshore waters from beach shorelines out to 1.6 kilometers (km) (0.86 nautical mile) offshore. Munitions testing will occur outside of this critical habitat zone and associated boat traffic traversing the zone is not expected to cause any adverse effects to loggerhead nearshore reproductive critical habitat. Loggerhead sea turtle *Sargassum* critical habitat in the geographic region around EAFB is well offshore of the project area and will not be affected by the project.

In summary, NMFS concludes that hawksbill sea turtles, smalltooth sawfish, Gulf sturgeon, sperm whales, Gulf sturgeon critical habitat, and loggerhead sea turtle nearshore reproductive critical habitat may be affected, but are not likely to be adversely affected by the proposed action covered in this Opinion. Loggerhead sea turtle *Sargassum* critical habitat will not be affected. These species and any associated critical habitat will not be discussed further.

3.2 Species Likely to be Adversely Affected

Green, Kemp's ridley, leatherback, and loggerhead sea turtles are all likely to be adversely affected by the proposed action. These sea turtles are all highly migratory, travel widely throughout the Gulf and South Atlantic, and are known to occur in the test area. The remaining sections of this Opinion will focus solely on these species.

The following subsections are synopses of the best available information on the status of the species that are likely to be adversely affected by one or more components of the proposed action, including information on the distribution, population structure, life history, abundance, population trends, and threats to each species. The biology and ecology of these species as well as their status and trends inform the effects analysis for this Opinion. Additional background information on the status of sea turtle species can be found in a number of published documents, including: recovery plans for the Atlantic green sea turtle (NMFS and USFWS 1991), Kemp's ridley sea turtle (NMFS and USFWS 1992b), leatherback sea turtle (NMFS and USFWS 1992a), and loggerhead sea turtle (NMFS and USFWS 2008); Pacific sea turtle recovery plans (NMFS and USFWS 1998a; NMFS and USFWS 1998b; NMFS and USFWS 1998c; NMFS and USFWS 1998b); and sea turtle status reviews, stock assessments, and biological reports (Conant et al. 2009b; NMFS-SEFSC 2001; NMFS-SEFSC 2009a; NMFS and USFWS 1995; NMFS and USFWS 2007a; NMFS and USFWS 2007b; NMFS and USFWS 2007c; NMFS and USFWS 2007d; NMFS and USFWS 2007e; TEWG 1998; TEWG 2000a; TEWG 2007; TEWG 2009).

3.2.1 Loggerhead Sea Turtle – NW Atlantic Distinct Population Segment (DPS)

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. NMFS and USFWS published a Final Rule designating 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule established several DPSs: (1) Northwest Atlantic Ocean (threatened), (2) Northeast Atlantic Ocean (endangered), (3) South Atlantic Ocean (threatened), (4) Mediterranean Sea (endangered), (5) North Pacific Ocean (endangered), (6) South Pacific Ocean (endangered), (7) North Indian Ocean (endangered), (8) Southeast Indo-Pacific Ocean (endangered), and (9) Southwest Indian Ocean (threatened). The Northwest Atlantic (NWA) DPS is the only one that occurs within the action area and therefore is the only one considered in this Opinion.

Species Description and Distribution

Loggerheads are large sea turtles. Adults in the southeast United States average about 3 ft (92 centimeters [cm]) long, measured as a straight carapace length (SCL), and weigh approximately 255 pounds (lb) (116 kilograms [kg]) (Ehrhart and Yoder 1978). Adult and subadult loggerhead sea turtles typically have a light yellow plastron and a reddish brown carapace covered by non-overlapping scutes that meet along seam lines. They typically have 11 or 12 pairs of marginal scutes, 5 pairs of costals, 5 vertebrals, and a nuchal (precentral) scute that is in contact with the first pair of costal scutes (Dodd 1988).

The loggerhead sea turtle inhabits continental shelf and estuarine environments throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). Habitat uses within these areas vary by life stage. Juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Subadult and adult loggerheads are primarily found in coastal waters and eat benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

The majority of loggerhead nesting occurs at the western rims of the Atlantic and Indian Oceans concentrated in the north and south temperate zones and subtropics (NRC 1990b). In the western north Atlantic, loggerhead nesting is concentrated along the coasts of the United States from southern Virginia to Alabama. Additional nesting beaches are found along the northern and western Gulf of Mexico, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison 1997; Addison and Morford 1996), off the southwestern coast of Cuba (Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

Non-nesting, adult female loggerheads are reported throughout the U.S. Atlantic, Gulf of Mexico, and Caribbean Sea. Little is known about the distribution of adult males who are seasonally abundant near nesting beaches. Aerial surveys suggest that loggerheads as a whole are distributed in U.S. waters as follows: 54% in the southeast, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

Within the NWA DPS, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf Coast of Florida. Previous Section 7 analyses have recognized at least 5 western Atlantic subpopulations, divided geographically as follows: (1) a Northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29ºN; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast of the state to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez M 1990; TEWG 2000b); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS-SEFSC 2001).

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula. It also concluded that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the recovery plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are as follows: (1) the Northern Recovery Unit (Florida/Georgia border north through southern Virginia), (2) the Peninsular Florida Recovery Unit (Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (islands located west of Key West, Florida), (4) the Northern Gulf of Mexico Recovery Unit (Franklin County, Florida, through Texas), and (5) the Greater Caribbean Recovery Unit (Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008). The recovery plan concluded that all recovery units are essential to the recovery of the species. Although the recovery plan was written prior to the listing of the NWA DPS, the recovery units for what was then termed the Northwest Atlantic population apply to the NWA DPS.

Life History Information

The Northwest Atlantic Loggerhead Recovery Team defined the following 8 life stages for the loggerhead life cycle, which include the ecosystems those stages generally use: (1) egg (terrestrial zone), (2) hatchling stage (terrestrial zone), (3) hatchling swim frenzy and transitional stage (neritic zone[4]), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008). Loggerhead hatchlings are 1.5-2 inches (in) long and weigh about 0.7 ounces (20 grams [g]). As post-hatchlings, loggerheads hatched on U.S. beaches enter the "oceanic juvenile" life stage, migrating offshore and becoming associated with *Sargassum* habitats, driftlines, and other convergence zones (Carr 1986; Conant et al. 2009a; Witherington 2002a). Oceanic juveniles grow at rates of 1-2 in (2.9-5.4 cm) per year (Bjorndal et al. 2003; Snover 2002) over a period as long as 7-12 years (Bolten et al. 1998) before moving to more coastal habitats. Studies have suggested that not all loggerhead sea turtles follow the model of circumnavigating the North Atlantic Gyre as pelagic juveniles, which is then followed by permanent settlement into benthic environments (Bolten and Witherington 2003; Laurent et al. 1998). These studies suggest some turtles may either remain in the oceanic habitat in the North Atlantic longer than hypothesized, or

[4] Neritic refers to the nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 meters.

they move back and forth between oceanic and coastal habitats interchangeably (Witzell 2002). Stranding records indicate that when immature loggerheads reach 15-24 in (40-60 cm) SCL, they begin to reside in coastal inshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico (Witzell 2002).

After departing the oceanic zone, neritic juvenile loggerheads in the Northwest Atlantic inhabit continental shelf waters from Cape Cod Bay, Massachusetts, south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Estuarine waters of the United States, including areas such as Long Island Sound, Chesapeake Bay, the Pamlico and Core Sounds, the Mosquito and Indian River Lagoons, Biscayne Bay, Florida Bay, and numerous embayments fringing the Gulf of Mexico, comprise important inshore habitat. Along the Atlantic and Gulf of Mexico shoreline, essentially all shelf waters are inhabited by loggerheads (Conant et al. 2009a).

Like juveniles, non-nesting adult loggerheads also use the neritic zone. However, these adult loggerheads do not use the relatively enclosed shallow-water estuarine habitats with limited ocean access as frequently as juveniles. Areas such as Pamlico Sound, North Carolina, and the Indian River Lagoon, Florida, are regularly used by juveniles but not by adult loggerheads. Adult loggerheads do tend to use estuarine areas with more open ocean access, such as the Chesapeake Bay in the U.S. mid-Atlantic. Shallow-water habitats with large expanses of open ocean access, such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads (Conant et al. 2009a).

Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Seasonal use of mid-Atlantic shelf waters, especially offshore New Jersey, Delaware, and Virginia during summer months, and offshore shelf waters, such as Onslow Bay (off the North Carolina coast), during winter months has also been documented (Hawkes et al. 2007; Georgia Department of Natural Resources, unpublished data; South Carolina Department of Natural Resources, unpublished data). Satellite telemetry has identified the shelf waters along the west Florida coast, The Bahamas, Cuba, and the Yucatán Peninsula as important resident areas for adult female loggerheads that nest in Florida (Foley et al. 2008; Girard et al. 2009; Hart et al. 2012). The southern edge of the Grand Bahama Bank is important habitat for loggerheads nesting on the Cay Sal Bank in The Bahamas, but nesting females are also resident in the bights of Eleuthera, Long Island, and Ragged Islands. They also reside in Florida Bay in the United States, and the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture in Cuban waters of 5 adult female loggerheads originally flipper-tagged in Quintana Roo, Mexico, indicating that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics

A number of stock assessments and similar reviews (Conant et al. 2009a; Heppell et al. 2003a; NMFS-SEFSC 2001; NMFS-SEFSC 2009a; NMFS and USFWS 2008; TEWG 1998; TEWG 2000b; TEWG 2009) have examined the stock status of loggerheads in the Atlantic Ocean, but none have been able to develop a reliable estimate of absolute population size.

Numbers of nests and nesting females can vary widely from year to year. Nesting beach surveys, though, can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of female loggerhead sea turtles, as long as such studies are sufficiently long and effort and methods are standardized (e.g., NMFS and USFWS 2008). NMFS and USFWS (2008) concluded that the lack of change in 2 important demographic parameters of loggerheads, remigration interval and clutch frequency, indicate that time series on numbers of nests can provide reliable information on trends in the female population.

Peninsular Florida Recovery Unit

The Peninsular Florida Recovery Unit (PFRU) is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989-2007 showed an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 2012 was 98,601 nests (FWRI nesting database).

In addition to the total nest count estimates, the Florida Fish and Wildlife Research Institute (FWRI) uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years. This provides a better tool for understanding the nesting trends (Figure 2). FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2012) (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/). Over that time period, 3 distinct trends were identified. From 1989-1998 there was a 23% increase that was then followed by a sharp decline over the subsequent decade. Large increases in loggerhead nesting occurred since then. FWRI examined the trend from the 1998 nesting high through 2012 and found the decade-long post-1998 decline had reversed and there was no longer a demonstrable trend. Looking at the data from 1989 through 2012, FWRI concluded that there was an overall positive change in the nest counts.

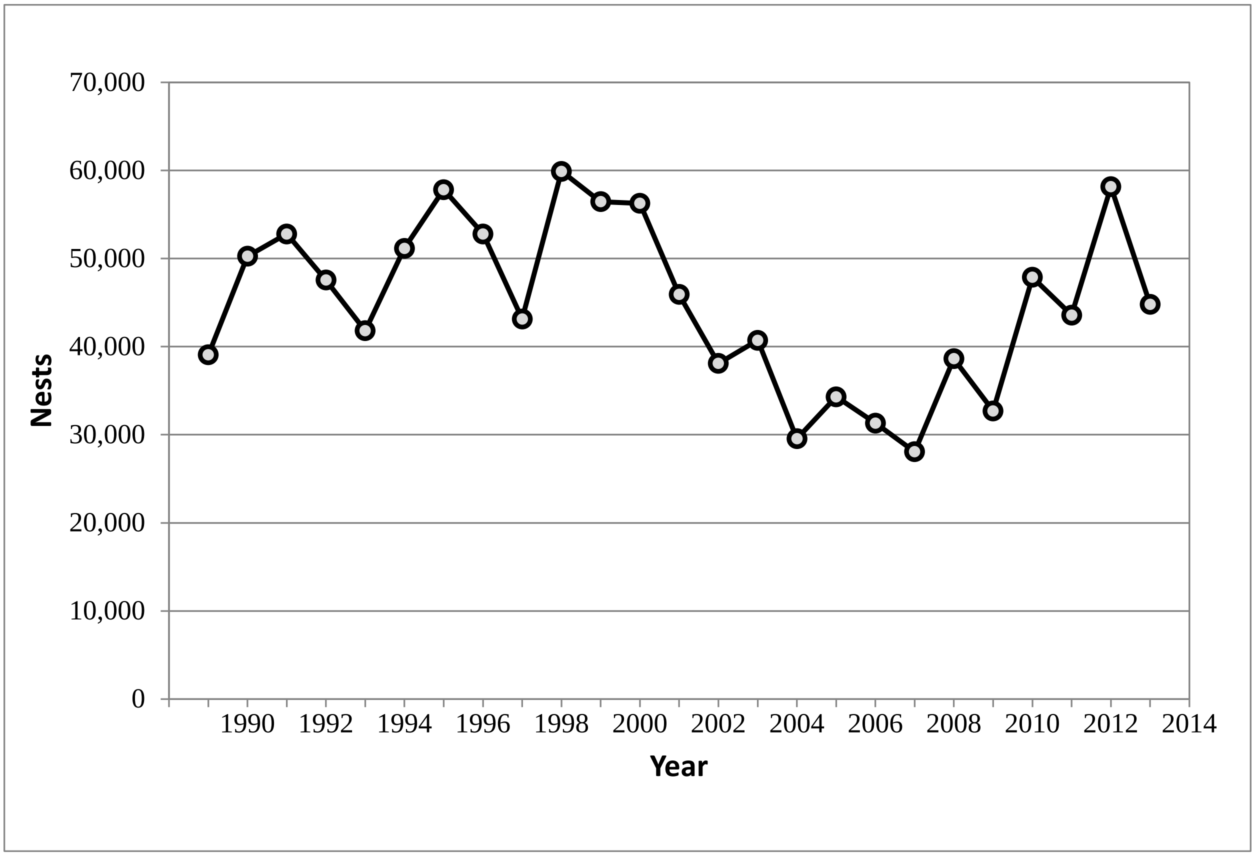

Figure 2. Loggerhead sea turtle nesting at Florida index beaches since 1989

Northern Recovery Unit

Annual nest totals from beaches within the Northern Recovery Unit (NRU) averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (Georgia Department of Natural Resources [GADNR] unpublished data, North Carolina Wildlife Resources Commission [NCWRC] unpublished data, South Carolina Department of Natural Resources [SCDNR] unpublished data), and represent approximately 1,272 nesting females per year, assuming 4.1 nests per female (Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3% annually from 1989-2008. Nest totals from aerial surveys conducted by SCDNR showed a 1.9% annual decline in nesting in South Carolina from 1980-2008. Overall, there is strong statistical data to suggest the NRU had experienced a long-term decline over that period of time.

Data since that analysis (Table 2) are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, http://www.georgiawildlife.com/node/3139). South Carolina and North Carolina nesting have also begun to show a shift away from the declining trend of the past.

Table 2. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets)

Nests Recorded	2008	2009	2010	2011	2012	2013
Georgia	1,649	998	1,760	1,992	2,241	2,289
South Carolina	4,500	2,182	3,141	4,015	4,615	5,193
North Carolina	841	302	856	950	1,074	1,260
Total	6,990	3,472	5,757	6,957	7,930	8,742

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009-2012, with 2012 showing the highest index nesting total since the start of the program (Figure 3).

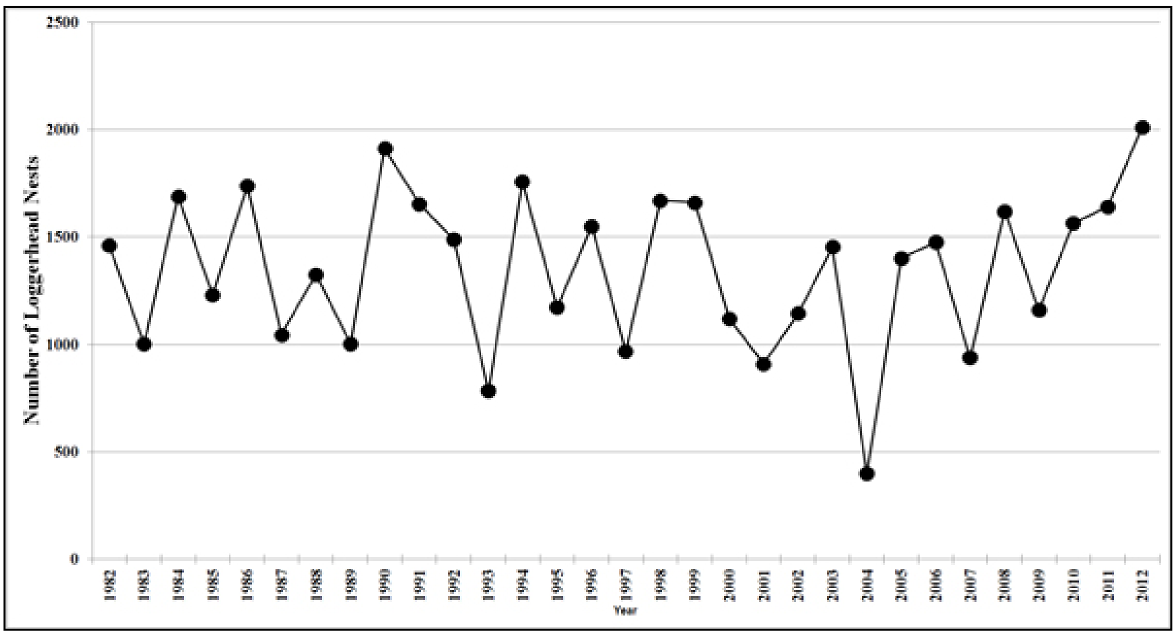

Figure 3. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website, http://www.dnr.sc.gov/seaturtle/nest.htm)

<u>Other NW Atlantic DPS Recovery Units</u>

The remaining 3 recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU)—are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004, although the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually. Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. Nesting survey effort has been inconsistent among the GCRU nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

In-water Trends

Nesting data are the best current indicator of sea turtle population trends; yet, in-water data also provide some insight. Such research suggests the abundance of neritic juvenile loggerheads is steady or increasing. Although Ehrhart et al. (2007) found no significant regression-line trend in a long-term dataset, researchers have observed notable increases in catch per unit effort (CPUE) (Arendt et al. 2009; Ehrhart et al. 2007; Epperly et al. 2007). Researchers believe that this increase in CPUE is likely linked to an increase in juvenile abundance, although it is unclear whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence. Bjorndal et al. (2005), cited in NMFS and USFWS (2008), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest oceanic/neritic juveniles (historically referred to as small benthic juveniles), which could indicate a relatively large number of individuals around the same age may mature in the near future (TEWG 2009). In-water studies throughout the eastern United States, however, indicate a substantial decrease in the abundance of the smallest oceanic/neritic juvenile loggerheads- a pattern corroborated by stranding data (TEWG 2009).

Population Estimate

The NMFS Southeast Fishery Science Center developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (NMFS-SEFSC 2009a). The model uses the range of published information for the various parameters including mortality by stage, stage duration (years in a stage), and fecundity parameters such as eggs per nest, nests per nesting female, hatchling emergence success, sex ratio, and remigration interval. Resulting trajectories of model runs for each individual recovery unit, and the western North Atlantic population as a whole, were found to be very similar. The model run estimates, from the adult female population size for the western North Atlantic (from the 2004-2008 time frame), suggest the adult female population size approximately 20,000 to 40,000 individuals, with a low likelihood of being up to 70,000 (NMFS-SEFSC 2009a). A less robust estimate for total benthic females in the western North Atlantic was also obtained, yielding approximately 30,000-300,000 individuals, up to less than 1 million (NMFS-SEFSC 2009a). A preliminary regional abundance survey of loggerheads within the northwestern Atlantic continental shelf for positively identified loggerhead in all strata estimated about 588,000 loggerheads (interquartile range of 382,000-817,000). When correcting for unidentified turtles in proportion to the ratio of identified turtles, the estimate increased to about 801,000 loggerheads (interquartile range of 521,000-1,111,000) (NMFS-NEFSC 2011).

Threats (Specific to Loggerhead Sea Turtles)
The threats faced by loggerhead sea turtles are well-summarized in the general discussion of threats in Section 4.2. Yet the impact of fishery interactions is a point of further emphasis for this species. The joint NMFS and USFWS Loggerhead Biological Review Team determined that the greatest threats to the NWA DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009a).

Regarding the impacts of pollution, loggerheads may be particularly affected by organochlorine contaminants; they have the highest organochlorine concentrations in sampled tissues (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Storelli et al. (2008) analyzed tissues from stranded loggerhead sea turtles and found that 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 (Law et al. 1991).

Specific information regarding potential climate change impacts on loggerheads is discussed in Section 4.2.

3.2.2 Green Sea Turtle

The green sea turtle was listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered.

Species Description and Distribution
The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) and a straight carapace length of greater than 3.3 ft (1 meter [m]). Green sea turtles have a smooth carapace with 4 pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes. They typically have a black dorsal surface and a white ventral surface, although the carapace of green sea turtles in the Atlantic Ocean has been known to change in color from solid black to a variety of shades of grey, green, or brown and black in starburst or irregular patterns (Lagueux 2001).

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth and USFWS 1997). The 2 largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica, and Raine Island, on the Pacific coast of Australia along the Great Barrier Reef.

Differences in mitochondrial DNA properties of green sea turtles from different nesting regions indicate there are genetic subpopulations (Bowen et al. 1992; Fitzsimmons et al. 2006). Despite the genetic differences, sea turtles from separate nesting origins are commonly found mixed together on foraging grounds throughout the species' range. Such mixing occurs at extremely low levels in Hawaiian foraging areas, perhaps making this central Pacific population the most isolated of all green sea turtle populations occurring worldwide (Dutton et al. 2008).

In U.S. Atlantic and Gulf of Mexico waters, green sea turtles are distributed throughout inshore and nearshore waters from Texas to Massachusetts. Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984; Hildebrand 1982; Shaver 1994), the 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 in Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward Counties (Guseman and Ehrhart 1992; Wershoven and Wershoven 1992). The summer developmental habitat for green sea turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997). Additional important foraging areas in the western Atlantic include the Culebra Archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito ("Miskito") Coast of Nicaragua, the Caribbean coast of Panama, scattered areas along Colombia and Brazil (Hirth 1971), and the northwestern coast of the Yucatán Peninsula.

The complete nesting range of green sea turtles within the southeastern United States includes sandy beaches between Texas and North Carolina, as well as the U.S. Virgin Islands and Puerto Rico (Dow et al. 2007; NMFS and USFWS 1991). Still, the vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard south through Broward counties. For more information on green sea turtle nesting in other ocean basins, refer to the 1991 publication, *Recovery Plan for the Atlantic Green Turtle* (NMFS and USFWS 1991) or the 2007 publication, *Green Sea Turtle 5-Year Status Review* (NMFS and USFWS 2007a).

*Life History Informati*on

Green sea turtles reproduce sexually, and mating occurs in the waters off nesting beaches. Mature females return to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982; Frazer and Ehrhart 1985) every 2-4 years while males are known to reproduce every year (Balazs 1983). In the southeastern United States, females generally nest between June and September, and peak nesting occurs in June and July (Witherington and Ehrhart 1989). During the nesting season, females nest at approximately 2-week intervals, laying an average of 3-4 clutches (Johnson and Ehrhart 1996). Clutch size often varies among subpopulations, but mean clutch size is approximately 110-115 eggs. In Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989). Eggs incubate for approximately 2 months before hatching. Hatchling green sea turtles are approximately 2 in (5 cm) in length and weigh approximately 0.9 ounces (25 g). Survivorship at any particular nesting site is greatly influenced by the level of anthropogenic stressors, with the more pristine and less disturbed nesting sites (e.g., along the Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua [Campbell and Lagueux 2005; Chaloupka and Limpus 2005).

After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007b). Green sea turtles exhibit particularly slow growth rates of about 0.4-2 in (1-5 cm) per year (Green 1993; McDonald-Dutton and Dutton 1998), which may be attributed to their largely herbivorous, low-net energy diet (Bjorndal 1982). At approximately 8-10 in (20-25 cm) carapace length, juveniles leave the pelagic environment and enter nearshore developmental habitats such as protected lagoons and open coastal areas rich in sea grass and marine algae. Growth studies using skeletochronology indicate that green sea turtles in the western Atlantic shift from the oceanic phase to nearshore developmental habitats after approximately 5-6 years (Bresette et al. 2006; Zug and Glor 1998). Within the developmental habitats, juveniles begin the switch to a more herbivorous diet, and by adulthood feed almost exclusively on seagrasses and algae (Rebel 1974), although some populations are known to also feed heavily on invertebrates (Carballo et al. 2002). Green sea turtles mature slowly, requiring 20-50 years to reach sexual maturity (Chaloupka and Musick 1997; Hirth and USFWS 1997).

While in coastal habitats, green sea turtles exhibit site fidelity to specific foraging and nesting grounds, and it is clear they are capable of “homing in” on these sites if displaced (McMichael et al. 2003). Reproductive migrations of Florida green sea turtles have been identified through flipper tagging and/or satellite telemetry. Based on these studies, the majority of adult female Florida green sea turtles are believed to reside in nearshore foraging areas throughout the Florida Keys and in the waters southwest of Cape Sable, with some post-nesting turtles also residing in Bahamian waters as well (NMFS and USFWS 2007b).

Status and Population Dynamics

Population estimates for marine turtles do not exist because of the difficulty in sampling turtles over their geographic ranges and within their marine environments. Nonetheless, researchers have used nesting data to study trends in reproducing sea turtles over time. A summary of nesting trends is provided in the most recent 5-year status review for the species (NMFS and USFWS 2007b) organized by ocean region (i.e., Western Atlantic Ocean, Central Atlantic Ocean, Eastern Atlantic Ocean, Mediterranean Sea, Western Indian Ocean, Northern Indian Ocean, Eastern Indian Ocean, Southeast Asia, Western Pacific Ocean, Central Pacific Ocean, and Eastern Pacific Ocean). It shows trends at 23 of the 46 nesting sites: 10 appeared to be increasing, 9 appeared to be stable, and 4 appeared to be decreasing. With respect to regional trends, the Pacific, the Western Atlantic, and the Central Atlantic regions appeared to show more positive trends (i.e., more nesting sites increasing than decreasing) while the Southeast Asia, the Eastern Indian Ocean, and possibly the Mediterranean Sea regions appeared to show more negative trends (i.e., more nesting sites decreasing than increasing). These regional determinations should be viewed with caution, because trend data was only available for about half of the total nesting concentration sites examined in the review and site specific data availability appeared to vary across all regions.

The Western Atlantic region (i.e., the focus of this Opinion) was one of the best performing in terms of abundance in the entire review, as there were no sites that appeared to decrease. The 5-year status review for the species reviewed the trend in nest count data for each identified 8 geographic areas considered to be primary sites for green sea turtle nesting in the Atlantic/Caribbean (NMFS and USFWS 2007a): (1) Yucatán Peninsula, Mexico; (2) Tortuguero, Costa Rica; (3) Aves Island, Venezuela; (4) Galibi Reserve, Suriname; (5) Isla Trindade, Brazil; (6) Ascension Island, United Kingdom; (7) Bioko Island, Equatorial Guinea; and (8) Bijagos Achipelago, Guinea-Bissau. Nesting at all of these sites was considered to be stable or increasing with the exception of Bioko Island and the Bijagos Archipelago where the lack of sufficient data precluded a meaningful trend assessment for either (NMFS and USFWS 2007a). Seminoff (2004) likewise reviewed green sea turtle nesting data for 8 sites in the western, eastern, and central Atlantic, including all of the above with the exception that nesting in Florida was reviewed in place of Isla Trindade, Brazil. Seminoff (2004) concluded that all sites in the central and western Atlantic showed increased nesting, with the exception of nesting at Aves Island, Venezuela, while both sites in the eastern Atlantic demonstrated decreased nesting. These sites are not inclusive of all green sea turtle nesting in the Atlantic; however, other sites are not believed to support nesting levels high enough that would change the overall status of the species in the Atlantic (NMFS and USFWS 2007a). More information about site-specific trends for the other major ocean regions can be found in the most recent 5-year status review for the species (see NMFS and USFWS 2007a).

By far, the largest known nesting assemblage in the western Atlantic region occurs at Tortuguero, Costa Rica. According to monitoring data on nest counts, as well as documented emergences (both nesting and non-nesting events), there appears to be an increasing trend in this nesting assemblage since monitoring began in the early 1970s. For instance, from 1971-1975 there were approximately 41,250 average annual emergences documented and this number increased to an average of 72,200 emergences from 1992-1996 (Bjorndal et al. 1999). Troëng and Rankin (2005) collected nest counts from 1999-2003 and also reported increasing trends in the population consistent with the earlier studies, with nest count data suggesting 17,402-37,290 nesting females per year (NMFS and USFWS 2007a). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica, population's growing at 4.9% annually.

In the continental United States, green sea turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida where an estimated 200-1,100 females nest each year (Meylan et al. 1994; Weishampel et al. 2003). Occasional nesting has also been documented along the Gulf Coast of Florida (Meylan et al. 1995). More recently, green sea turtle nesting has occurred in North Carolina on Bald Head Island, just east of the mouth of the Cape Fear River, on Onslow Island, and on Cape Hatteras National Seashore. In 2010, a total of 18 nests were found in North Carolina, 6 nests in South Carolina, and 6 nests in Georgia (nesting databases maintained on www.seaturtle.org).

In Florida, index beaches were established to standardize data collection methods and effort on key nesting beaches. Since establishment of the index beaches in 1989, the pattern of green sea turtle nesting has generally shown biennial peaks in abundance with a positive trend during the 10 years of regular monitoring (Figure 4). According to data collected from Florida's index nesting beach survey from 1989-2012, green sea turtle nest counts across Florida have increased approximately ten-fold from a low of 267 in the early 1990s to a high of 25,553 in 2013. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in both 2010 and 2011, a decrease in 2012, and another increase in 2013 (Figure 4). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more has resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9%.

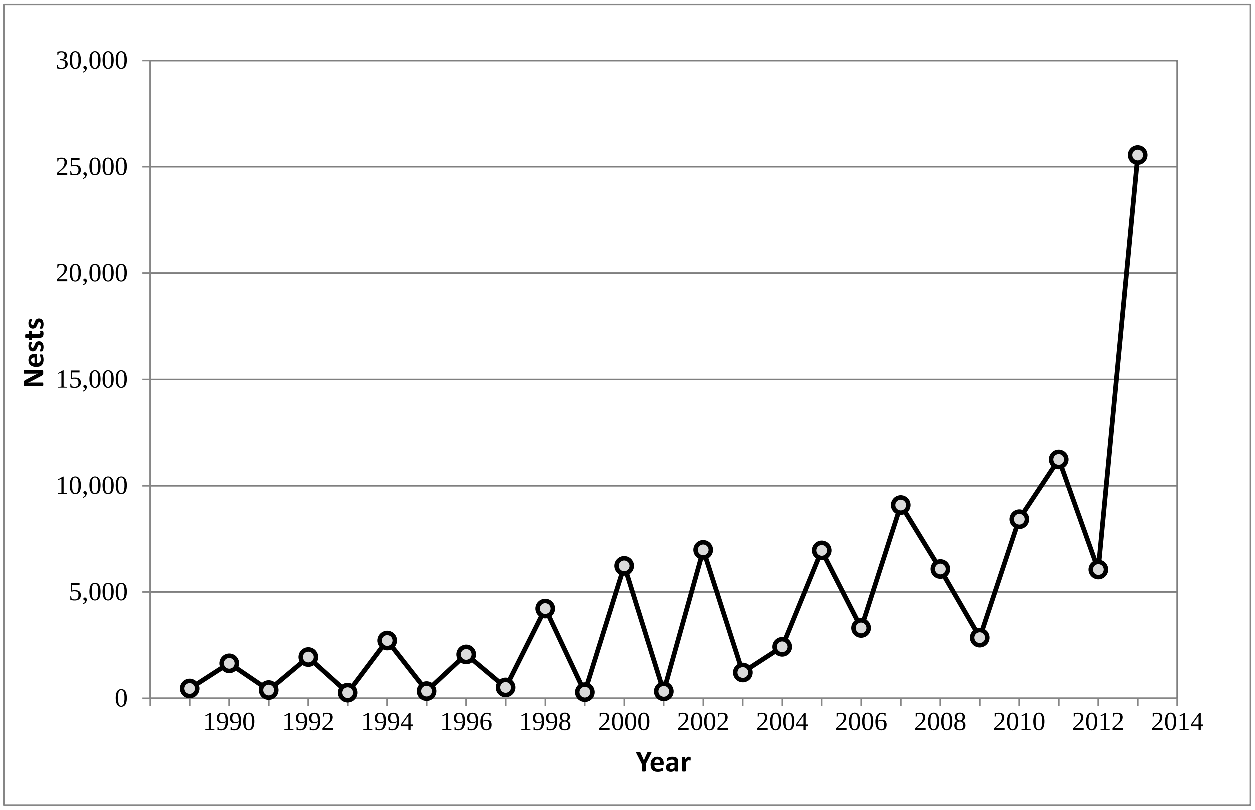

Figure 4. Green sea turtle nesting at Florida index beaches since 1989

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 4.2.

In addition to general threats, green sea turtles are susceptible to natural mortality from fibropapillomatosis (FP) disease. FP results in the growth of tumors on soft external tissues (flippers, neck, tail, etc.), the carapace, the eyes, the mouth, and internal organs (gastrointestinal tract, heart, lungs, etc.) of turtles (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). These tumors range in size from 0.04 in (0.1 cm) to greater than 11.81 in (30 cm) in diameter and may affect swimming, vision, feeding, and organ function (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). Presently, scientists are unsure of the exact mechanism causing this disease, though it is believed to be related to both an infectious agent, such as a virus (Herbst et al. 1995), and environmental conditions (e.g., habitat degradation, pollution, low wave energy, and shallow water (Foley et al. 2005). Presently, FP is cosmopolitan, but it has been found to affect large numbers of animals in specific areas, including Hawaii and Florida (Herbst 1994; Jacobson 1990; Jacobson et al. 1991).

Cold-stunning is another natural threat to green sea turtles. Although it is not considered a major source of mortality in most cases, as temperatures fall below 46.4°-50°F (8°-10°C) turtles may lose their ability to swim and dive, often floating to the surface. The rate of cooling that precipitates cold-stunning appears to be the primary threat, rather than the water temperature itself (Milton and Lutz 2003). Sea turtles that overwinter in inshore waters are most susceptible to cold-stunning because temperature changes are most rapid in shallow water (Witherington and Ehrhart 1989). During January 2010, an unusually large cold-stunning event in the southeastern United States resulted in around 4,600 sea turtles, mostly greens, found cold-stunned, with hundreds found dead or dying. A large cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1,650 green sea turtles found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding, while approximately 1,030 turtles were rehabilitated and released. Additionally, during this same time frame, approximately 340 green sea turtles were found cold-stunned in Mexico, though approximately 300 of those were subsequently rehabilitated and released.

3.2.3 Leatherback Sea Turtle

The leatherback sea turtle was listed as endangered throughout its entire range on June 2, 1970, (35 FR 8491) under the Endangered Species Conservation Act of 1969.

Species Description and Distribution
The leatherback is the largest sea turtle in the world, with a curved carapace length (CCL) often exceeding 5 ft (150 cm) and front flippers that can span almost 9 ft (270 cm) (NMFS and USFWS 1998b). Mature males and females can reach lengths of over 6 ft (2 m) and weigh close to 2,000 lb (900 kg). The leatherback does not have a bony shell. Instead, its shell is approximately 1.5 in (4 cm) thick and consists of a leathery, oil-saturated connective tissue overlaying loosely interlocking dermal bones. The ridged shell and large flippers help the leatherback during its long-distance trips in search of food.

Unlike other sea turtles, leatherbacks have several unique traits that enable them to live in cold water. For example, leatherbacks have a countercurrent circulatory system (Greer et al. 1973),[5] a thick layer of insulating fat (Davenport et al. 1990; Goff and Lien 1988), gigantothermy

[5] Countercurrent circulation is a highly efficient means of minimizing heat loss through the skin's surface because heat is recycled. For example, a countercurrent circulation system often has an artery containing warm blood from the heart surrounded by a bundle of veins containing cool blood from the body’s surface. As the warm blood flows away from the heart, it passes much of its heat to the colder blood returning to the heart via the veins. This conserves heat by recirculating it back to the body’s core.

(Paladino et al. 1990),[6] and they can increase their body temperature through increased metabolic activity (Bostrom and Jones 2007; Southwood et al. 2005). These adaptations allow leatherbacks to be comfortable in a wide range of temperatures, which helps them to travel further than any other sea turtle species (NMFS and USFWS 1995). For example, a leatherback may swim more than 6,000 miles (10,000 km) in a single year (Benson et al. 2007a; Benson et al. 2011; Eckert 2006b; Eckert et al. 2006). They search for food between latitudes 71°N and 47°S, in all oceans, and travel extensively to and from their tropical nesting beaches. In the Atlantic Ocean, leatherbacks have been recorded as far north as Newfoundland, Canada, and Norway, and as far south as Uruguay, Argentina, and South Africa (NMFS-SEFSC 2001).

While leatherbacks will look for food in coastal waters, they appear to prefer the open ocean at all life stages (Heppell et al. 2003b). Leatherbacks have pointed tooth-like cusps and sharp-edged jaws that are adapted for a diet of soft-bodied prey such as jellyfish and salps. A leatherback's mouth and throat also have backward-pointing spines that help retain jelly-like prey. Leatherbacks' favorite prey (e.g., medusae, siphonophores, and salps) occur commonly in temperate and northern or sub-arctic latitudes and likely have a strong influence on leatherback distribution in these areas (Plotkin 1995). Leatherbacks are known to be deep divers, with recorded depths in excess of a half-mile (Eckert et al. 1989), but they may also come into shallow waters to locate prey items.

Genetic analyses using microsatellite markers along with mitochondrial DNA and tagging data indicate there are 7 groups or breeding populations in the Atlantic Ocean: Florida, Northern Caribbean, Western Caribbean, Southern Caribbean/Guianas, West Africa, South Africa, and Brazil (TEWG 2007). General differences in migration patterns and foraging grounds may occur between the seven nesting assemblages, although data to support this is limited in most cases.

Life History Information

The leatherback life cycle is broken into several stages: (1) egg/hatchling, (2) post-hatchling, (3) juvenile, (4) subadult, and (5) adult. Leatherbacks are a long-lived species that delay age of maturity, have low and variable survival in the egg and juvenile stages, and have relatively high and constant annual survival in the subadult and adult life stages (Chaloupka 2002; Crouse 1999; Heppell et al. 1999; Heppell et al. 2003b; Spotila et al. 1996b; Spotila et al. 2000). While a robust estimate of the leatherback sea turtle's life span does not exist, the current best estimate for the maximum age is 43 (Avens et al. 2009). It is still unclear when leatherbacks first become sexually mature. Using skeletochronological data, Avens et al. (2009) estimated that leatherbacks in the western North Atlantic may not reach maturity until 29 years of age, which is longer than earlier estimates of 2-3 years by Pritchard and Trebbau (1984); of 3-6 years by Rhodin (1985); of 13-14 years for females by Zug and Parham (1996); and 12-14 years for leatherbacks nesting in the U.S. Virgin Islands by Dutton et al. (2005). A more recent study that examined leatherback growth rates estimated an age at maturity of 16.1 years (Jones et al. 2011).

The average size of reproductively active females in the Atlantic is generally 5-5.5 ft (150-162 cm) CCL (Benson et al. 2007a; Hirth et al. 1993; Starbird and Suarez 1994). Still, females as

[6] "Gigantothermy" refers to a condition when an animal has relatively high volume compared to its surface area, and as a result, it loses less heat.

small as 3.5-4 ft (105-125 cm) CCL have been observed nesting at various sites (Stewart et al. 2007).

Female leatherbacks typically nest on sandy, tropical beaches at intervals of 2-4 years (Garcia M. and Sarti 2000; McDonald and Dutton 1996; Spotila et al. 2000). Unlike other sea turtle species, female leatherbacks do not always nest at the same beach year after year; some females may even nest at different beaches during the same year (Dutton et al. 2005; Eckert et al. 1989; Keinath and Musick 1993; Steyermark et al. 1996). Individual female leatherbacks have been observed with fertility spans as long as 25 years (Hughes 1996). Females usually lay up to 10 nests during the 3-6 month nesting season (March through July in the United States), typically 8-12 days apart, with 100 eggs or more per nest (Eckert et al. 2012; Eckert et al. 1989; Maharaj 2004; Matos 1986 ; Stewart and Johnson 2006; Tucker 1988). Yet, up to approximately 30% of the eggs may be infertile (Eckert et al. 1989; Maharaj 2004; Matos ; MTN 1984; Stewart and Johnson 2006; Tucker 1988). The number of leatherback hatchlings that make it out of the nest on to the beach (i.e., emergent success) is approximately 50% worldwide (Eckert et al. 2012), which is lower than the greater than 80% reported for other sea turtle species (Miller 1997). In the United States, the emergent success is higher at 54%-72% (Eckert and Eckert 1990; Stewart and Johnson 2006; Tucker 1988). Thus the number of hatchlings in a given year may be less than the total number of eggs produced in a season. Eggs hatch after 60-65 days, and the hatchlings have white striping along the ridges of their backs and on the edges of the flippers. Leatherback hatchlings weigh approximately 1.5-2 ounces (40-50 g), and are approximately 2-3 in (51-76 mm) in length, with fore flippers as long as their bodies. Hatchlings grow rapidly with reported growth rates for leatherbacks from 2.5-27.6 in (6-70 cm) in length, estimated at 12.6 in (32 cm) per year (Jones et al. 2011).

In the Atlantic, the sex ratio appears to be skewed toward females. The Turtle Expert Working Group (TEWG) reports that nearshore and onshore strandings data from the U.S. Atlantic and Gulf of Mexico coasts indicate that 60% of strandings were females (TEWG 2007). Those data also show that the proportion of females among adults (57%) and juveniles (61%) was also skewed toward females in these areas (TEWG 2007). James et al. (2007) collected size and sex data from large subadult and adult leatherbacks off Nova Scotia and also concluded a bias toward females at a rate of 1.86:1.

The survival and mortality rates for leatherbacks are difficult to estimate and vary by location. For example, the annual mortality rate for leatherbacks that nested at Playa Grande, Costa Rica, was estimated to be 34.6% in 1993-1994 and 34.0% in 1994-1995 (Spotila et al. 2000). In contrast, leatherbacks nesting in French Guiana and St. Croix had estimated annual survival rates of 91% (Rivalan et al. 2005) and 89% (Dutton et al. 2005), respectively. For the St. Croix population, the average annual juvenile survival rate was estimated to be approximately 63% and the total survival rate from hatchling to first year of reproduction for a female was estimated to be between 0.4% and 2% (assuming age at first reproduction is between 9-13 years (Eguchi et al. 2006). Spotila et al. (1996a) estimated first-year survival rates for leatherbacks at 6.25%.

Migratory routes of leatherbacks are not entirely known; however, recent information from satellite tags have documented long travels between nesting beaches and foraging areas in the Atlantic and Pacific Ocean basins (Benson et al. 2007a; Benson et al. 2011; Eckert 2006a; Eckert et al. 2006; Ferraroli et al. 2004; Hays et al. 2004; James et al. 2005). Leatherbacks nesting in Central America and Mexico travel thousands of miles through tropical and temperate waters of the South Pacific (Eckert and Sarti 1997; Shillinger et al. 2008). Data from satellite tagged leatherbacks suggest that they may be traveling in search of seasonal aggregations of jellyfish (Benson et al. 2007b; Bowlby et al. 1994; Graham 2009; Shenker 1984; Starbird et al. 1993; Suchman and Brodeur 2005).

Status and Population Dynamics

The status of the Atlantic leatherback population has been less clear than the Pacific population, which has shown dramatic declines at many nesting sites (Santidrián-Tomillo et al. 2007; Sarti Martínez et al. 2007; Spotila et al. 2000). This uncertainty has been a result of inconsistent beach and aerial surveys, cycles of erosion, and reformation of nesting beaches in the Guianas (representing the largest nesting area). Leatherbacks also show a lesser degree of nest-site fidelity than occurs with the hardshell sea turtle species. Coordinated efforts of data collection and analyses by the leatherback TEWG have helped to clarify the understanding of the Atlantic population status (TEWG 2007).

The Southern Caribbean/Guianas stock is the largest known Atlantic leatherback nesting aggregation (TEWG 2007). This area includes the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela, with most of the nesting occurring in the Guianas and Trinidad. The Southern Caribbean/Guianas stock of leatherbacks was designated after genetics studies indicated that animals from the Guianas (and possibly Trinidad) should be viewed as a single population. Using nesting females as a proxy for population, the TEWG (2007) determined that the Southern Caribbean/Guianas stock had demonstrated a long-term, positive population growth rate. TEWG observed positive growth within major nesting areas for the stock, including Trinidad, Guyana, and the combined beaches of Suriname and French Guiana (TEWG 2007). More specifically, Wallace et al. (2013) report an estimated three-generation abundance change of +3%, +20,800%, +1,778%, and +6% in Trinidad, Guyana, Suriname, and French Guiana, respectively.

Researchers believe the cyclical pattern of beach erosion and then reformation has affected leatherback nesting patterns in the Guianas. For example, between 1979 and 1986, the number of leatherback nests in French Guiana had increased by about 15% annually (NMFS-SEFSC 2001). This increase was then followed by a nesting decline of about 15% annually. This decline corresponded with the erosion of beaches in French Guiana and increased nesting in Suriname. This pattern suggests that the declines observed since 1987 might actually be a part of a nesting cycle that coincides with cyclic beach erosion in Guiana (Schultz 1975). Researchers think that the cycle of erosion and reformation of beaches may have changed where leatherbacks nest throughout this region. The idea of shifting nesting beach locations was supported by increased nesting in Suriname,[7] while the number of nests was declining at beaches in Guiana (Hilterman et al. 2003). Though this information suggested the long-term trend for the overall Suriname and French Guiana population was increasing.

[7] Leatherback nesting in Suriname increased by more than 10,000 nests per year since 1999 with a peak of 30,000 nests in 2001.

The Western Caribbean stock includes nesting beaches from Honduras to Colombia. Across the Western Caribbean, nesting is most prevalent in Costa Rica, Panama, and the Gulf of Uraba in Colombia (Duque et al. 2000). The Caribbean coastline of Costa Rica and extending through Chiriquí Beach, Panama, represents the fourth largest known leatherback rookery in the world (Troëng et al. 2004). Examination of data from index nesting beaches in Tortuguero, Gandoca, and Pacuaré in Costa Rica indicate that the nesting population likely was not growing over the 1995-2005 time series (TEWG 2007). Other modeling of the nesting data for Tortuguero indicates a possible 67.8% decline between 1995 and 2006 (Troëng et al. 2007). Wallace et al. (2013) report an estimated three-generation abundance change of -72%, -24%, and +6% for Tortuguero, Gandoca, and Pacuare, respectively.

Nesting data for the Northern Caribbean stock is available from Puerto Rico, St. Croix (U.S. Virgin Islands), and the British Virgin Islands (Tortola). In Puerto Rico, the primary nesting beaches are at Fajardo and on the island of Culebra. Nesting between 1978 and 2005 has ranged between 469-882 nests, and the population has been growing since 1978, with an overall annual growth rate of 1.1% (TEWG 2007). Wallace et al. (2013) report an estimated three-generation abundance change of -4% and +5,583% at Culebra and Fajardo, respectively. At the primary nesting beach on St. Croix, the Sandy Point National Wildlife Refuge, nesting has varied from a few hundred nests to a high of 1,008 in 2001, and the average annual growth rate has been approximately 1.1% from 1986-2004 (TEWG 2007). From 2006-2010, Wallace et al. (2013) report an annual growth rate of +7.5% in St. Croix and a three-generation abundance change of +1,058%. Nesting in Tortola is limited, but has been increasing from 0-6 nests per year in the late 1980s to 35-65 per year in the 2000s, with an annual growth rate of approximately 1.2% between 1994 and 2004 (TEWG 2007).

The Florida nesting stock nests primarily along the east coast of Florida. This stock is of growing importance, with total nests between 800-900 per year in the 2000s following nesting totals fewer than 100 nests per year in the 1980s (Florida Fish and Wildlife Conservation Commission, unpublished data). Using data from the index nesting beach surveys, the TEWG (TEWG 2007) estimated a significant annual nesting growth rate of 1.17% between 1989 and 2005. FWC Index Nesting Beach Survey Data indicates biennial peaks in nesting abundance beginning in 2007 (Figure 5 and Table 3). A similar pattern was also observed statewide (Table 3). This up-and-down pattern is thought to be a result of the cyclical nature of leatherback nesting, similar to the biennial cycle of green turtle nesting. Overall, the trend shows growth on Florida’s east coast beaches. Wallace et al. (2013) report an annual growth rate of 9.7% and a three-generation abundance change of +1,863%.

Table 3. Number of leatherback sea turtle nests in Florida

Nests Recorded	2007	2008	2009	2010	2011
Index Nesting Beaches	517	265	615	552	625
Statewide	1,442	728	1,747	1,334	1,652

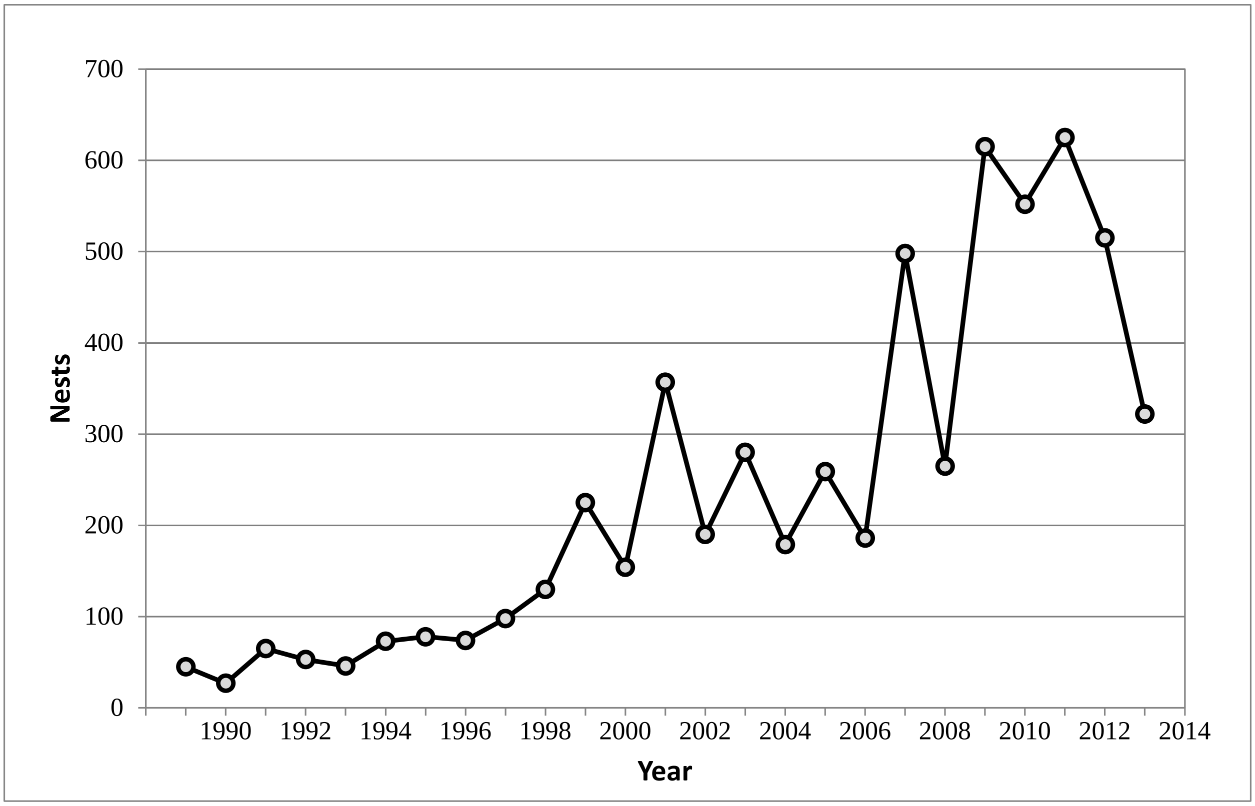

Figure 5. Leatherback sea turtle nesting at Florida index beaches since 1989

The West African nesting stock of leatherbacks is large and important, but it is a mostly unstudied aggregation. Nesting occurs in various countries along Africa's Atlantic coast, but much of the nesting is undocumented and the data are inconsistent. Gabon has a very large amount of leatherback nesting, with at least 30,000 nests laid along its coast in a single season (Fretey et al. 2007). Fretey et al. (2007) provide detailed information about other known nesting beaches and survey efforts along the Atlantic African coast. Because of the lack of consistent effort and minimal available data, trend analyses were not possible for this stock (TEWG 2007).

Two other small but growing stocks nest on the beaches of Brazil and South Africa. Based on the data available, TEWG (2007) determined that between 1988 and 2003, there was a positive annual average growth rate between 1.07 and 1.08% for the Brazilian stock. TEWG (2007) estimated an annual average growth rate between 1.04 and 1.06% for the South African stock.

Because the available nesting information is inconsistent, it is difficult to estimate the total population size for Atlantic leatherbacks. Spotila et al. (1996b) characterized the entire Western Atlantic population as stable at best and estimated a population of 18,800 nesting females. Spotila et al. (1996b) further estimated that the adult female leatherback population for the entire Atlantic basin, including all nesting beaches in the Americas, the Caribbean, and West Africa, was about 27,600 (considering both nesting and interesting females), with an estimated range of 20,082-35,133. This is consistent with the estimate of 34,000-95,000 total adults (20,000-56,000 adult females; 10,000-21,000 nesting females) determined by the TEWG (2007). The TEWG (2007) also determined that at of the time of their publication, leatherback sea turtle populations in the Atlantic were all stable or increasing with the exception of the Western Caribbean and

West Africa populations. The latest review by NMFS and USFWS (2013) suggests the leatherback nesting population is stable in most nesting regions of the Atlantic Ocean.

Threats

Leatherbacks face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 4.2; the remainder of this section will expand on a few of the aforementioned threats and how they may specifically impact leatherback sea turtles.

Of all sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear, especially gillnet and pot/trap lines. This may be because of their body type (large size, long pectoral flippers, and lack of a hard shell), their attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, their method of locomotion, and/or perhaps their attraction to the lightsticks used to attract target species in longline fisheries. From 1990-2000, 92 entangled leatherbacks were reported from New York through Maine and many other stranded individuals exhibited evidence of prior entanglement (Dwyer et al. 2002). Zug and Parham (1996) point out that a combination of the loss of long-lived adults in fishery-related mortalities and a lack of recruitment from intense egg harvesting in some areas has caused a sharp decline in leatherback sea turtle populations and represents a significant threat to survival and recovery of the species worldwide.

Leatherback sea turtles may also be more susceptible to marine debris ingestion than other sea turtle species due to their predominantly pelagic existence and the tendency of floating debris to concentrate in convergence zones that adults and juveniles use for feeding and migratory purposes (Lutcavage et al. 1997a; Shoop and Kenney 1992b). The stomach contents of leatherback sea turtles revealed that a substantial percentage (33.8% or 138 of 408 cases examined) contained some form of plastic debris (Mrosovsky et al. 2009). Blocking of the gut by plastic to an extent that could have caused death was evident in 8.7% of all leatherbacks that ingested plastic (Mrosovsky et al. 2009). Mrosovsky et al. (2009) also note that in a number of cases, the ingestion of plastic may not cause death outright, but could cause the animal to absorb fewer nutrients from food, eat less in general, etc.– factors which could cause other adverse effects. The presence of plastic in the digestive tract suggests that leatherbacks might not be able to distinguish between prey items and forms of debris such a plastic bags (Mrosovsky et al. 2009). Balazs (1985) speculated that the plastic object might resemble a food item by its shape, color, size, or even movement as it drifts about, and therefore induce a feeding response in leatherbacks.

As discussed in Section 4.2, global climate change can be expected to have various impacts on all sea turtles, including leatherbacks. Global climate change is likely to also influence the distribution and abundance of jellyfish, the primary prey item of leatherbacks (NMFS and USFWS 2007d). Several studies have shown leatherback distribution is influenced by jellyfish abundance (e.g., Houghton et al. 2006; Witt et al. 2007; Witt et al. 2006); however, more studies need to be done to monitor how changes to prey items affect distribution and foraging success of leatherbacks so population-level effects can be determined.

3.2.4 Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970, under the Endangered Species Conservation Act of 1969, a precursor to the ESA. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Groombridge 1982; TEWG 2000b; Zwinenberg 1977).

Species Description and Distribution
The Kemp's ridley sea turtle is the smallest of all sea turtles. Adults generally weigh less than 100 lb (45 kg) and have a carapace length of around 2.1 ft (65 cm). Adult Kemp's ridley shells are almost as wide as they are long. Coloration changes significantly during development from the grey-black dorsum and plastron of hatchlings, a grey-black dorsum with a yellowish-white plastron as post-pelagic juveniles, and then to the lighter grey-olive carapace and cream-white or yellowish plastron of adults. There are 2 pairs of prefrontal scales on the head, 5 vertebral scutes, usually 5 pairs of costal scutes, and generally 12 pairs of marginal scutes on the carapace. In each bridge adjoining the plastron to the carapace, there are 4 scutes, each of which is perforated by a pore.

Kemp's ridley habitat largely consists of sandy and muddy areas in shallow, nearshore waters less than 120 ft (37 m) deep, although they can also be found in deeper offshore waters. These areas support the primary prey species of the Kemp's ridley sea turtle, which consist of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The primary range of Kemp's ridley sea turtles is within the Gulf of Mexico basin, though they also occur in coastal and offshore waters of the U.S. Atlantic Ocean. Juvenile Kemp's ridley sea turtles, possibly carried by oceanic currents, have been recorded as far north as Nova Scotia. Historic records indicate a nesting range from Mustang Island, Texas, in the north to Veracruz, Mexico, in the south. Kemp's ridley sea turtles have recently been nesting along the Atlantic coast of the United States, with nests recorded from beaches in Florida, Georgia, and the Carolinas. In 2012, the first Kemp's ridley sea turtle nest was recorded in Virginia. The Kemp's ridley nesting population is exponentially increasing, which may indicate a similar increase in the population as a whole (NMFS et al. 2011).

Life History Information
Kemp's ridley sea turtles share a general life history pattern similar to other sea turtles. Females lay their eggs on coastal beaches where the eggs incubate in sandy nests. After 45-58 days of embryonic development, the hatchlings emerge and swim offshore into deeper, ocean water where they feed and grow until returning at a larger size. Hatchlings generally range from 1.65-1.89 in (42-48 mm) straight carapace length (SCL), 1.26-1.73 in (32-44 mm) in width, and 0.3-0.4 lb (15-20 g) in weight. Their return to nearshore coastal habitats typically occurs around 2 years of age (Ogren 1989), although the time spent in the oceanic zone may vary from 1-4 years or perhaps more (TEWG 2000). Juvenile Kemp's ridley sea turtles use these nearshore coastal habitats from April through November, but move towards more suitable overwintering habitat in

deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops.

The average rates of growth may vary by location, but generally fall within 2.2-2.9 ± 2.4 in per year (5.5-7.5 ± 6.2 cm/year) (Schmid and Barichivich 2006; Schmid and Woodhead 2000). Age to sexual maturity ranges greatly from 5-16 years, though NMFS et al. (2011) determined the best estimate of age to maturity for Kemp’s ridley sea turtles was 12 years. It is unlikely that most adults grow very much after maturity. While some sea turtles nest annually, the weighted mean remigration rate for Kemp’s ridley sea turtles is approximately 2 years. Nesting generally occurs from April to July and females lay approximately 2.5 nests per season with each nest containing approximately 100 eggs (Márquez M 1994).

Population Dynamics

Of the 7 species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the beaches of Rancho Nuevo, Mexico (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 mid-1980s, however, nesting numbers from Rancho Nuevo and adjacent Mexican beaches were below 1,000 with a low of 702 nests in 1985. Yet, nesting steadily increased through the 1990s, and then accelerated during the first decade of the twenty-first century (Figure 6), which indicates the species is recovering. It is worth noting that when the Bi-National Kemp’s Ridley Sea Turtle Population Restoration Project was initiated in 1978, only Rancho Nuevo nests were recorded. In 1988, nesting data from southern beaches at Playa Dos and Barra del Tordo were added. In 1989, data from the northern beaches of Barra Ostionales and Tepehuajes were added, and most recently in 1996, data from La Pesca and Altamira beaches were recorded. Currently, nesting at Rancho Nuevo accounts for just over 81% of all recorded Kemp’s ridley nests in Mexico. Following a significant, unexplained 1-year decline in 2010, Kemp’s ridley nests in Mexico reached a record high of 21,797 in 2012 (Gladys Porter Zoo nesting database 2013). In 2013, there was a second significant decline, with only 16,385 nests recorded. A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 42 in 2004, to a record high of 209 nests in 2012 (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm).

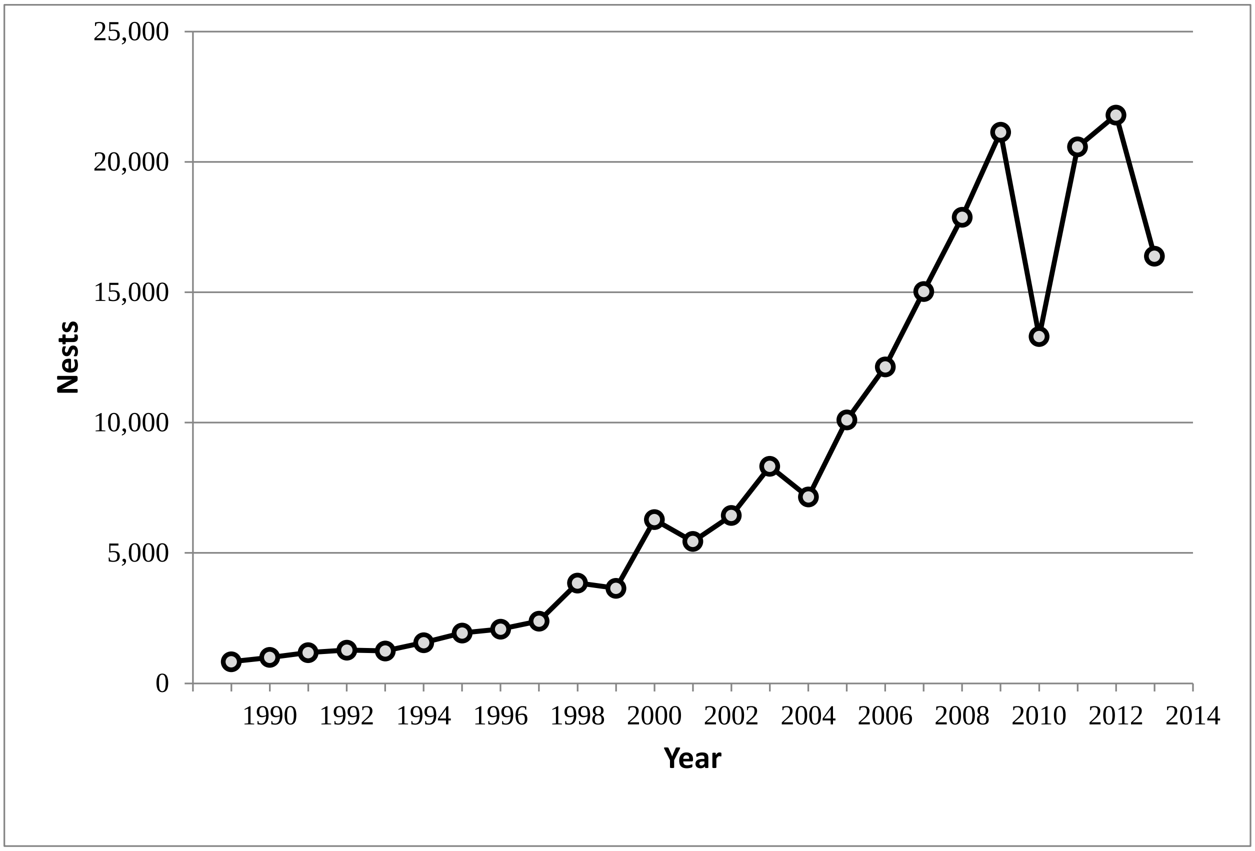

Figure 6. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2013)

Heppell et al. (2005) predicted in a population model that the population is expected to increase at least 12-16% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2015. NMFS et al. (2011) produced an updated model that predicted the population to increase 19% per year and attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesters on the beach, based on an average 2.5 nests/nesting female. While counts did not reach 25,000 nests by 2012, it is clear that the population is steadily increasing. The recent increases in Kemp's ridley sea turtle nesting seen in the last 2 decades is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of Turtle Excluder Devices (TEDs) (a specialized device that allows a captured sea turtle to escape when caught in a fisherman's net), reduced trawling effort in Mexico and the United States, and possibly other changes in vital rates (TEWG 1998; TEWG 2000b). While these results are encouraging, the species' limited range as well as low global abundance makes it particularly vulnerable to new sources of mortality as well as demographic and environmental randomness, all of which are often difficult to predict with any certainty.

Threats

Kemp's ridley sea turtles face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 4.2; the remainder of this section will expand on a few of the aforementioned threats and how they may specifically impact Kemp's ridley sea turtles.

As Kemp's ridley sea turtles continue to recover and nesting arribadas[8] are increasingly established, bacterial and fungal pathogens in nests are also likely to increase. Bacterial and fungal pathogen impacts have been well documented in the large arribadas of the olive ridley at Nancite in Costa Rica (Mo 1988). In some years, and on some sections of the beach, the hatching success can be as low as 5% (Mo 1988). As the Kemp's ridley nest density at Rancho Nuevo and adjacent beaches continues to increase, appropriate monitoring of emergence success will be necessary to determine if there are any density-dependent effects.

Over the past 3 years, NMFS has documented (via the Sea Turtle Stranding and Salvage Network data, http://www.sefsc.noaa.gov/species/turtles/strandings.htm) elevated sea turtle strandings in the Northern Gulf of Mexico, particularly throughout the Mississippi Sound area. In the first 3 weeks of June 2010, over 120 sea turtle strandings were reported from Mississippi and Alabama waters, none of which exhibited any signs of external oiling to indicate effects associated with the Deepwater Horizon (DWH) oil spill event. A total of 644 sea turtle strandings were reported in 2010 from Louisiana, Mississippi, and Alabama waters, 561 (87%) of which were Kemp's ridley sea turtles. During March through May of 2011, 267 sea turtle strandings were reported from Mississippi and Alabama waters alone. A total of 525 sea turtle strandings were reported in 2011 from Louisiana, Mississippi, and Alabama waters, with the majority (455) occurring from March through July, 390 (86%) of which were Kemp's ridley sea turtles. During 2012, a total of 428 sea turtles were reported from Louisiana, Mississippi, and Alabama waters, though the data is incomplete. Of these reported strandings, 301 (70%) were Kemp's ridley sea turtles. These stranding numbers are significantly greater than reported in past years; Louisiana, Mississippi, and Alabama waters reported 42 and 73 sea turtle strandings for 2008 and 2009, respectively. It should be noted that stranding coverage has increased considerably due to the DWH oil spill event.

Nonetheless, considering that strandings typically represent only a small fraction of actual mortality, these stranding events potentially represent a serious impact to the recovery and survival of the local sea turtle populations. While a definitive cause for these strandings has not been identified, necropsy results indicate a significant number of stranded turtles from these events likely perished due to forced submergence, which is commonly associated with fishery interactions (B. Stacy, NMFS, pers. comm. to M. Barnette, NMFS, March 2012). Yet, available information indicates fishery effort was extremely limited during the stranding events. The fact that in both 2010 and 2011 approximately 85% of all Louisiana, Mississippi, and Alabama stranded sea turtles were Kemp's ridleys is notable; however, this could simply be a function of the species' preference for shallow, inshore waters coupled with increased population abundance as reflected in recent Kemp's ridley nesting increases.

In response to these strandings, and due to speculation that fishery interactions may be the cause, fishery observer effort was shifted to evaluate the inshore skimmer trawl fishery during the

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[8] Arribada is the Spanish word for "arrival" and is the term used for massive synchronized nesting within the genus *Lepidochelys.*

summer of 2012. During May-July of that year, observers reported 24 sea turtle interactions in the skimmer trawl fishery, all but one of which were identified as Kemp's ridleys (1 sea turtle was an unidentified hardshell turtle). Encountered sea turtles were all very small, juvenile specimens ranging from 7.6-19.0 in (19.4-48.3 cm) curved carapace length (CCL), and all sea turtles were released alive. The small average size of encountered Kemp's ridleys introduces a potential conservation issue, as over 50% of these reported sea turtles could potentially pass through the maximum 4-inch bar spacing of TEDs currently required in the shrimp fishery. Due to this issue, a proposed 2012 rule to require TEDs in the skimmer trawl fishery (77 FR 27411) was not implemented. Based on anecdotal information, these interactions were a relatively new issue for the inshore skimmer trawl fishery. Given the nesting trends and habitat utilization of Kemp's ridley sea turtles, it is likely that fishery interactions in the Northern Gulf of Mexico may continue to be an issue of concern for the species, and one that may potentially slow the rate of recovery for Kemp's ridley sea turtles.

4 ENVIRONMENTAL BASELINE

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of green, Kemp's ridley, leatherback, and loggerhead turtles within the action area. The environmental baseline is a "snapshot" of the action area at a specified point in time and includes state, tribal, local, and private actions already affecting the critical habitat that will occur contemporaneously with the consultation in progress. Unrelated federal actions affecting the species and its critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are federal and other actions within the action area that may benefit the species and its critical habitat.

4.1 Status of Species in the Action Area

Sea Turtles

The four species of sea turtles that occur in the action area are all highly migratory. Therefore, the status of these species (or DPS where applicable) of sea turtles in the action area, as well as the threats to these species, are best reflected in their range-wide statuses and supported by the species accounts in Section 3 (Status of Species).

4.2 Factors Affecting Sea Turtles in the Action Area

As stated in Section 2.2 (Action Area), the action area includes the waters between Eglin Air Force Base and Warning Area W-151A, as well as the portion of Warning Area W-151A where the munitions testing will occur. The following analysis examines the impacts of past and on-going actions that may affect these species' environment specifically within this defined action area. The environmental baseline for this Opinion includes the effects of several activities affecting the survival and recovery of ESA-listed sea turtle species in the action area. The activities that shape the environmental baseline in the action area of this consultation are federal fisheries, effects of vessel operations, additional military activities, dredging, and marine pollution.

4.2.1 Federal Actions

NMFS has undertaken a number of Section 7 consultations to address the effects of federally-permitted fisheries and other federal actions on threatened and endangered sea turtle species, and when appropriate, has authorized the incidental taking of these species. Each of those consultations sought to minimize the adverse effects of the action on sea turtles. The summary below of federal actions and the effects these actions have had on sea turtles includes only those federal actions in the action areas which have already concluded or are currently undergoing formal Section 7 consultation.

Climate Change

There is a large and growing body of literature on past, present, and future impacts of global climate change, exacerbated and accelerated by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA's climate information portal provides basic background information on these and other measured or anticipated effects (see http://www.climate.gov).

Climate change impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty; however significant impacts to the hatchling sex ratios of loggerhead turtles may result (NMFS and USFWS 2007c). In marine turtles, sex is determined by temperature in the middle third of incubation with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007c). Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80% female offspring for loggerheads nesting near Southport, North Carolina. The same increase in air temperatures at nesting beaches in Cape Canaveral, Florida, would result in close to 100% female offspring. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most clutches, leading to death (Hawkes et al. 2007). Warmer sea surface temperatures have been correlated with an earlier onset of loggerhead nesting in the spring (Hawkes et al. 2007; Weishampel et al. 2004), as well as short inter-nesting intervals (Hays et al. 2002) and shorter nesting season (Pike et al. 2006).

The effects from increased temperatures may be exacerbated on developed nesting beaches where shoreline armoring and construction have denuded vegetation. Erosion control structures could potentially result in the permanent loss of nesting beach habitat or deter nesting females (NRC 1990a). These impacts will be exacerbated by sea level rise. If females nest on the seaward side of the erosion control structures, nests may be exposed to repeated tidal overwash (NMFS and USFWS 2007c). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish, etc., which could ultimately affect the primary foraging areas of sea turtles.

Fisheries

Threatened and endangered sea turtles are adversely affected by fishing gears used throughout the continental shelf of the action area. Gillnet, pelagic and bottom longline, other types of hook-and-line gear, trawl, and pot fisheries have all been documented as interacting with sea turtles.

For all fisheries for which there is a Fishery Management Plan (FMP), impacts have been evaluated under Section 7. Formal Section 7 consultations have been conducted on the following fisheries, occurring at least in part within the action area, found likely to adversely affect threatened and endangered sea turtles: Southeastern shrimp trawl fisheries, reef fish, and coastal migratory pelagic resources fisheries. Anticipated take levels associated with these and other fisheries in the Gulf of Mexico are presented in Appendix 1; the take levels reflect the impact on sea turtles and other listed species of each activity anticipated from the date of the incidental take statement (ITS) forward in time.

Southeastern Shrimp Trawl Fisheries

Various types of gear are used to capture shrimp including otter trawls, wing nets (butterfly nets), skimmer trawls, pusherhead trawls (chopstick rigs), stationary butterfly nets, beam trawls, roller-frame trawls, cast nets, channel nets, haul seines, traps, and dip nets. The otter trawl, with various modifications, is the dominant gear used in offshore waters and essentially the sole gear used in the federal fisheries. Authorized gear types listed for the Gulf of Mexico FMP are trawl, butterfly net, skimmer, and cast net for commercial use and trawl only for the recreational use.

Shrimp trawling is believed to have had the greatest adverse effect on sea turtles in the action area in the past. By the late 1970s, there was evidence thousands of sea turtles were being killed annually in the Southeast (Henwood and Stuntz 1987). In 1990, the National Research Council (NRC) concluded the Southeast shrimp trawl fishery affected more sea turtles than all other activities combined and was the most significant man-made source of sea turtle mortality in the U.S. waters, in part due to the high reproductive value of turtles taken in this fishery (NRC 1990a). The level of annual mortality described in NRC (1990a) is believed to have continued until 1992-1994, when U.S. law required all shrimp trawlers in the Atlantic and Gulf of Mexico to use TEDs, which allowed some turtles to escape nets before drowning (NMFS 2002b). Despite the apparent success of TEDs for some species of sea turtles (e.g., Kemp’s ridleys), it was later discovered that TEDs were not adequately protecting all species and size classes of sea turtles. Analyses by Epperly and Teas (2002) indicated that the minimum requirements for the escape opening dimension in TEDs in use at that time were too small for some sea turtles and that as many as 47% of the loggerheads stranding annually along the Atlantic and Gulf of Mexico were too large to fit the existing openings. In February 2003, NMFS implemented revisions to the TED regulations addressing that problem (68 FR 8456, February 21, 2003). The revised TED regulations were expected to reduce shrimp trawl related mortality by 94% for loggerheads and 97% for leatherbacks.

NMFS has completed several consultations on Southeastern shrimp fisheries including regulations governing the use of TEDs. The most recent Opinion, titled "*Reinitiation of Endangered Species Act (ESA) Section 7 Consultation on the Continued Implementation of the Sea Turtle Conservation Regulations, as Proposed to Be Amended, and the Continued Authorization of the Southeast U.S. Shrimp Fisheries in Federal Waters under the Magnuson-Stevens Act,*" was completed May 8, 2012. This Opinion was the culmination of several requests for reinitiation of consultation on different shrimp fisheries and listed species as the various triggers for reinitiation were met. With each reinitiation request and determination made, the scope of the proposed action and the species subject to reinitiation of Section 7 consultation were expanded. The scope of the action and species subject to reinitiation of Section 7 consultation were also expanded as triggered by a proposed change to the sea turtle conservation regulations and the listing of the 2 DPS of Atlantic sturgeon. This new Opinion now covers NMFS's Section 7 consultation responsibilities on both its implementation of sea turtle conservation regulations under the ESA as proposed to be amended, and its authorization of federal shrimp trawling under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for all listed species. This Opinion supersedes all previous determinations and Opinions on southeastern shrimp trawl fisheries. The Opinion concluded that operation of the fishery would not jeopardize the continued existence of any sea turtle species. Since the completion of this Opinion, NMFS has reinitiated consultation due to the withdrawal of the proposed rule to require TEDs in the skimmer trawl fishery.

Gulf of Mexico Reef Fish Fishery
The Gulf of Mexico reef fish fishery uses 2 basic types of gear: spear or powerhead, and hook-and-line gear. Hook-and-line gear used in the fishery includes both commercial bottom longline and commercial and recreational vertical line (e.g., handline, bandit gear, rod-and-reel).

Prior to 2008, the reef fish fishery was believed to have a relatively moderate level of sea turtle bycatch attributed to the hook-and-line component of the fishery (i.e., approximately 107 captures and 41 mortalities annually, all species combined, for the entire fishery) (NMFS 2005c) In 2008, Southeast Fisheries Science Center (SEFSC) observer programs and subsequent analyses indicated that the overall amount and extent of incidental take for sea turtles specified in the incidental take statement of the 2005 Opinion on the reef fish fishery had been severely exceeded by the bottom longline component of the fishery (approximately 974 captures and at least 325 mortalities estimated for the period July 2006-2007).

In response, NMFS published an emergency rule prohibiting the use of bottom longline gear in the reef fish fishery shoreward of a line approximating the 50-fathom depth contour in the eastern Gulf of Mexico, essentially closing the bottom longline sector of the reef fish fishery in the eastern Gulf of Mexico for 6 months pending the implementation of a long-term management strategy. The Gulf of Mexico Fishery Management Council (GMFMC) developed a long-term management strategy via a new amendment (Amendment 31 to the Reef Fish FMP). The amendment included a prohibition on the use of bottom longline gear in the Gulf of Mexico reef fish fishery shoreward of a line approximating the 35-fathom contour east of Cape San Blas, Florida, from June through August; a reduction in the number of bottom longline vessels operating in the fishery via an endorsement program and a restriction on the total number of hooks that may be possessed onboard each Gulf of Mexico reef fish bottom longline vessel to 1,000, only 750 of which may be rigged for fishing. Amendment 31 was implemented on May 26, 2010.

On October 13, 2009, The NMFS Southeast Regional Office completed an Opinion that analyzed the expected effects of the continued operation of the Gulf of Mexico reef fish fishery under the changes proposed in Amendment 31 (NMFS-SEFSC 2009b). The Opinion concluded that sea turtle takes would be substantially reduced compared to the fishery as it was previously prosecuted, and that operation of the fishery would not jeopardize the continued existence of any sea turtle species. In August 2011, consultation was reinitiated to address the DWH oil release event and potential changes to the environmental baseline. Reinitiation of consultation was not related to any material change in the fishery itself, violations of any terms and conditions of the 2009 Opinion, or an exceedance of the incidental take statement. The resulting September 11, 2011 Opinion concluded the continued operation of the Gulf reef fish fishery is not likely to jeopardize the continued existence of any listed sea turtles.

Coastal Migratory Pelagic Resources Fisheries
In 2007, NMFS completed a Section 7 consultation on the continued authorization of the coastal migratory pelagic resources fishery in the Gulf of Mexico and South Atlantic (NMFS 2007b). Commercial fishermen target king and Spanish mackerel with hook-and-line (i.e., handline, rod-and-reel, and bandit), gillnet, and cast net gears. Recreational fishers use only rod-and-reel. Trolling is the most common hook-and-line fishing technique used by both commercial and recreational fishers. A winter troll fishery operates along the east and south Gulf coast. Although “run-around” gillnets accounted for the majority of the king mackerel catch from the late 1950s through 1982, in 1986, and in 1993, handline gear has been the predominant gear used in the commercial king mackerel fishery since 1993 (NMFS 2007b). The gillnet fishery for king mackerel is restricted to the use of run-around gillnets in Gulf to Monroe and Collier Counties in January. Run-around gillnets are still the primary gear used to harvest Spanish mackerel, but the fishery is relatively small because Spanish mackerel are typically more concentrated in state waters where gillnet gear is prohibited. The 2007 Opinion concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected only by the gillnet component of the fishery. The continued authorization of the fishery was not expected to jeopardize the continued existence of any of these species and an ITS was provided.

Federal Vessel Activity and Military Operations
Watercraft are the greatest contributors to overall noise in the sea and have the potential to interact with sea turtles though direct impacts or propellers. Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Vessels operating at high speeds have the potential to strike sea turtles. Potential sources of adverse effects from federal vessel operations in the action area include operations of the U.S. Department of Defense (DoD), Bureau of Ocean Energy Management (BOEM), Bureau of Safety and Environmental Enforcement (BSEE), Federal

Energy Regulatory Commission (FERC), United States Coast Guard (USCG), NOAA, and USACE.

Military

Formal consultations on overall U.S. Navy (USN) activities in the southeastern United States have been completed, including: U.S. Navy Atlantic Fleet sonar training activities (AFAST) (January 20, 2011); Navy AFAST LOA 2012-2014: U.S. Navy active sonar training along the Atlantic Coast and Gulf of Mexico (December 19, 2011); and activities in the Gulf of Mexico Range Complex from November 2010 to November 2015 (March 17 2011). These Opinions concluded that although there is a potential from some USN activities to affect sea turtles, those effects were not expected to impact any species on a population level. Therefore, the activities were determined to be not likely to jeopardize the continued existence of any ESA-listed sea turtle species.

Military testing and training may also affect listed species of sea turtles. The air space over the Gulf of Mexico is used extensively by the DoD for conducting various air-to-air and air-to-surface operations. Nine military warning areas and five water test areas are located within the Gulf of Mexico. The western Gulf has 4 warning areas that are used for military operations. The areas total approximately 21 million acres (ac) or 58% of the area. In addition, 6 blocks in the Western Gulf are used by the Navy for mine warfare testing and training. The Central Gulf has 5 designated military warning areas that are used for military operations. These areas total approximately 11.3 million ac. Portions of the Eglin Water Test Areas (EWTA) comprise an additional 0.5 million ac in the Central Planning Area (CPA). The total 11.8 million ac is about 25% of the area of the CPA.

A consultation evaluating the impacts from USAF search-and-rescue training operations in the Gulf of Mexico was completed in 1999 (NMFS 1999). NMFS more recently completed 4 consultations on Eglin Air Force Base testing and training activities in the Gulf of Mexico. These consultations concluded that the incidental take of sea turtles is likely to occur. These Opinions have issued incidental take for these actions: EGTTR (NMFS 2004b), the Precision Strike Weapons Tests (NMFS 2005b), the Santa Rosa Island Mission Utilization Plan (NMFS 2005d) and Naval Explosive Ordnance Disposal School (NMFS 2004a). These consultations determined the training operations would adversely affect sea turtles, but would not jeopardize their continued existence.

Offshore Energy

NMFS has also conducted Section 7 consultations related to energy projects in the Gulf of Mexico (Mineral Management Service [MMS], FERC, and the Maritime Administration) to implement conservation measures for vessel operations. Through the Section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. At the present time, however, they present the potential for some level of interaction.

Dredging

Marine dredging vessels are common within U.S. coastal waters. Although the underwater noises from dredge vessels are typically continuous in duration (for periods of days or weeks at a time) and strongest at low frequencies, they are not believed to have any long-term effect on sea turtles. The construction and maintenance of federal navigation channels and dredging in sand mining sites ("borrow areas"), however, have been identified as sources of sea turtle mortality. Hopper dredges in the dredging mode are capable of moving relatively quickly compared to sea turtle swimming speeds and can thus overtake, entrain, and kill sea turtles as the suction draghead(s) of the advancing dredge overtakes resting or swimming turtles. Entrained sea turtles rarely survive. In 2003, NMFS completed a Regional Opinion on the impacts of USACE's hopper-dredging operations in the Gulf of Mexico (NMFS 2007c). In the Gulf of Mexico Regional Biological Opinion (GRBO), NMFS determined that (1) Gulf of Mexico hopper dredging would adversely affect Gulf sturgeon and 4 sea turtle species (i.e., green, hawksbill, Kemp's ridley, and loggerheads), but it would not jeopardize their continued existence and (2) dredging in the Gulf of Mexico would not adversely affect leatherback sea turtles, smalltooth sawfish, or ESA-listed large whales. An ITS for those species adversely affected was issued.

The above-listed Regional Opinion considers maintenance dredging and sand mining operations. Numerous other "free-standing" Opinions have been produced that analyzed hopper dredging projects that did not fall (partially or entirely) under the scope of actions contemplated by this Regional Opinion. Examples include: the dredging of Ship Shoal in the Gulf of Mexico Central Planning Area for coastal restoration projects (Opinion issued to MMS, now BOEM, in 2005 [NMFS 2005a]), East Pass dredging, Destin, Florida (to USACE in 2009 [NMFS 2009a]), and dredging of City of Mexico Beach canal inlet (to USACE in 2012 [NMFS 2012]). Each of the above free-standing Opinions had its own ITS and determined that hopper dredging during the proposed actions would not jeopardize the continued existence of any species of sea turtles or other listed species, or destroy or adversely modify critical habitat of any listed species.

Oil and Gas Exploration and Extraction
Although oil and gas exploration, production, and development do not occur within the action area, oil and gas activities may indirectly impact protected sea turtles located there. Oil spills and marine debris from nearby oil and gas activities could affect protected turtles within the action area. Many Section 7 consultations have been completed on MMS (now BOEM) oil and gas lease activities. Opinions issued on July 11, 2002 (NMFS 2002c), November 29, 2002 (NMFS 2002a), August 30, 2003 (Lease Sales 189 and 197, [NMFS 2003]), and June 29, 2007 (2007-2012 Five-Year Lease Plan, [NMFS 2007a]), have concluded that sea turtle takes may result from vessel strikes, marine debris, and oil spills.

NMFS's June 29, 2007, Opinion issued to MMS concluded that the 5-year leasing program for oil and gas development in the coastal and the Western Planning Areas of the Gulf of Mexico and its associated actions were not likely to jeopardize the continued existence of threatened or endangered species or destroy or adversely modify designated critical habitat. NMFS estimated the number of listed species that could potentially experience adverse effects as the result of exposure to an oil spill over the lifetime of the action. However, as discussed below, on April 20, 2010, a massive oil well explosion, and then subsequent release of oil at British Petroleum's Deepwater Horizon (DWH) deepwater drilling rig over the MC252 ("Macondo") well occurred. Given the effects of the spill, on July 30, 2010, BOEM requested reinitiation of interagency consultation under Section 7 of the ESA on the June 29, 2007, Opinion on the Five-Year Outer

Continental Shelf Oil and Gas Leasing Program (2007-2012) in the Central and Western Planning Areas of the Gulf of Mexico.

NMFS has begun synthesizing data from the DWH spill, and it is clear that BOEM underestimated the size, frequency, and impacts associated with a catastrophic spill under the 2007-2012 lease/sale program. The size and duration of the DWH oil spill were greater than anticipated, and the effects on listed species have exceeded NMFS's projections. NMFS has not yet issued an Opinion concluding the reinitiated consultation.

The DWH Oil Spill and Recent Increase in Sea Turtle Strandings in the Northern Gulf
On April 20, 2010, while working on an exploratory well approximately 50 miles offshore of Louisiana, the semi-submersible drilling rig DWH experienced an explosion and fire. The rig subsequently sank and oil and natural gas began leaking into the Gulf of Mexico. Oil flowed for 86 days, until finally being capped on July 15, 2010. Millions of barrels of oil were released into the Gulf. Additionally, approximately 1.84 million gallons of chemical dispersant was applied both subsurface and on the surface to attempt to break down the oil. There is no question that the unprecedented DWH spill and associated response activities (e.g., skimming, burning, and application of dispersants) have resulted in adverse effects on listed sea turtles.

At this time, the total effects of the oil spill on species found throughout the Gulf of Mexico, including sea turtles, are not known. Potential DWH-related impacts to all sea turtle species include direct oiling or contact with dispersants from surface and subsurface oil and dispersants, inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, loss of foraging resources which could lead to compromised growth and/or reproductive potential, harm to foraging, resting and/or nesting habitats, and disruption of nesting turtles and nests. There is currently an ongoing investigation and analysis being conducted under the Oil Pollution Act (33 U.S.C. 2701 et seq.) to assess natural resource damages and to develop and implement a plan for the restoration, rehabilitation, replacement or acquisition of the equivalent of the injured natural resources. The final outcome of that investigation may not be known for many months to years from the time of this Opinion. Consequently, other than some emergency restoration efforts, most restoration efforts that occur pursuant to the Oil Pollution Act have yet to be determined and implemented, and so the ultimate restoration impacts on the species are unknowable at this time.

During the response phase to the DWH oil spill (April 26–October 20, 2010) a total of 1,146 sea turtles were recovered, either as strandings (dead or debilitated generally onshore or nearshore) or were collected offshore during sea turtle search and rescue operations (Table 4). Subsequent to the response phase a few sea turtles with visible evidence of oiling have been recovered as strandings. The available data on sea turtle strandings and response collections during the time of the spill are expected to represent a fraction (currently unknown) of the actual losses to the species, as most individuals likely were not recovered. The number of strandings does not provide insights into potential sublethal impacts that could reduce long-term survival or fecundity of individuals affected. It does provide, however, some insight into the potential relative scope of the impact among the sea turtle species in the area.

Table 4. Sea Turtles Recovered in the DWH Spill Response Area (April 26 – October 20, 2010).

Turtle Species	Alive	Dead	Total
Green turtle (*Chelonia mydas*)	172	29	201
Hawksbill turtle (*Eretmochelys imbricata*)	16	0	16
Kemp's ridley turtle (*Lepidochelys kempii*)	328	481	809
Loggerhead turtle (*Caretta caretta*)	21	67	88
Unknown turtle species	0	32	32
Total	537	609	1146

http://www.nmfs.noaa.gov/pr/health/oilspill/turtles.htm

Another period of high stranding levels occurred in 2011, similar to that in 2010. Investigations, including necropsies, were undertaken by NMFS to attempt to determine the cause of those strandings. Based on the findings, the 2 primary considerations for the cause of death of the turtles that were necropsied are forced submergence or acute toxicosis. With regard to acute toxicosis, sea turtle tissue samples were tested for biotoxins of concern in the northern Gulf of Mexico. Environmental information did not indicate a harmful algal bloom or threat to marine animal health was present in the area. With regard to forced submergence, the only known plausible cause of forced submergence that could explain this event is incidental capture in fishing gear. NMFS has assembled information regarding fisheries operating in the area during and just prior to these strandings. While there is some indication that lack of compliance with existing TED regulations and the operations of other trawl fisheries that do not require TEDs may have occurred in the area at the time of the strandings, direct evidence that those events caused the unusual level of strandings is not available. More information on the stranding event, including number of strandings, locations, and species affected, can be found at http://www.nmfs.noaa.gov/pr/species/turtles/gulfofmexico.htm.

In addition to effects on subadult and adult sea turtles, the 2010 May through September sea turtle nesting season in the northern Gulf may also have been adversely affected by the DWH oil spill. Setting booms to protect beaches, cleanup activities, lights, people, and equipment all may have had unintended effects, such as preventing females from reaching nesting beaches and thereby reducing nesting in the northern Gulf. The spill could have also affected the emergence success of hatchlings from nests along the Gulf coast. In an attempt to reduce the loss of the 2010 northern Gulf cohort, many of nests were relocated to the east coast of Florida to reduce the risk to hatchlings. The survivorship and future nesting success of individuals from one nesting beach being transported to and released at another nesting beach is unknown.

ESA Research Permits

Sea turtles are the focus of research activities authorized by Section 10 permits under the ESA. Authorized activities range from photographing, weighing, and tagging sea turtles incidentally taken in fisheries, to blood sampling, tissue sampling (biopsy), and performing laparoscopy on intentionally captured sea turtles. The number of authorized takes varies widely depending on the research and species involved, but may involve the taking of hundreds of sea turtles annually. Most takes authorized under these permits are expected to be (and are) nonlethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations. In addition, since issuance of the permit is a federal activity, issuance of the permit by NMFS must also be reviewed for compliance with Section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species or adverse modification of its critical habitat.

4.2.2 State or Private Actions

A number of activities that may indirectly affect protected species within the action area include discharges from wastewater systems, dredging, ocean pumping and disposal, and state fisheries. The impacts from these activities are difficult to measure. Where possible, conservation actions through the ESA Section 7 process, ESA Section 10 permitting, and state permitting programs are being implemented to monitor or study impacts from these sources.

State Fisheries
Various fishing methods used in state commercial and recreational fisheries, including gillnets, fly nets, trawling, pot fisheries, pound nets, and vertical line are all known to incidentally take sea turtles, but information on these fisheries is sparse (NMFS-SEFSC 2001). Most of the state data are based on extremely low observer coverage, or sea turtles were not part of data collection; thus, these data provide insight into gear interactions that could occur but are not indicative of the magnitude of the overall problem.

Stone Crab Fishery
The commercial component of the fishery is traps; recreational fishers use traps or wade/dive for stone crabs. Of the gears used, only commercial traps are expected to result in adverse effects on ESA-listed species. The number of commercial traps actually in the water is very difficult to estimate, and the number of traps used recreationally is unquantifiable with any degree of accuracy. NMFS completed a Section 7 consultation on the Gulf of Mexico Stone Crab FMP on September 28, 2009 (NMFS 2009b) and determined the continued authorization of the fishery would not adversely affect ESA-listed marine mammals, Gulf sturgeon, or adversely affect critical habitat. It did conclude the action was likely to adversely affect sea turtles and smalltooth sawfish, but would not jeopardize their continued existence; an ITS was issued for takes in the commercial trap sector of the fishery. On October 28, 2011, NMFS repealed the federal FMP for this fishery, and the fishery is now managed exclusively by the state of Florida.

Recreational Boat Traffic
Data show that vessel traffic is one cause of sea turtle mortality (Lutcavage et al. 1997a), Sea Turtle Stranding Database). Stranding data for the U.S. Gulf of Mexico show that vessel-related injuries are noted in stranded sea turtles. Data indicate that live- and dead-stranded sea turtles showing signs of vessel-related injuries continue in a high percentage of stranded sea turtles in coastal regions of the southeastern United States.

4.2.3 Marine Pollution and Environmental Contamination

Sources of pollutants along the action area include atmospheric loading of pollutants such as PCBs, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean (e.g., Mississippi River into the Gulf of Mexico), and groundwater and other discharges. 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 are 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, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise and boat traffic can degrade marine habitats used by sea turtles (Colburn et al. 1996). The development of marinas and docks in inshore waters can negatively impact nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not likely affect the more pelagic waters, the species of turtles analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

The Gulf of Mexico is an area of high-density offshore oil extraction with chronic, low-level spills and occasional massive spills (such as the recent DWH oil spill, Ixtoc I oil well blowout and fire in the Bay of Campeche in 1979, and the explosion and destruction of a loaded supertanker, the Mega Borg, near Galveston in 1990). Oil spills can impact wildlife directly through 3 primary pathways: ingestion– when animals swallow oil particles directly or consume prey items that have been exposed to oil, absorption– when animals come into direct contact with oil, and inhalation– when animals breath volatile organics released from oil or from "dispersants" applied by response teams in an effort to increase the rate of degradation of the oil in seawater. Several aspects of sea turtle biology and behavior place them at particular risk, including the lack of avoidance behavior, indiscriminate feeding in convergence zones, and large pre-dive inhalations (Milton et al. 2003). When large quantities of oil enter a body of water, chronic effects such as cancer and direct mortality of wildlife becomes more likely (Lutcavage et al. 1997a). Oil spills in the vicinity of nesting beaches just prior to or during the nesting season could place nesting females, incubating egg clutches, and hatchlings at significant risk (Fritts et al. 1982; Lutcavage et al. 1997a; Witherington 1999). Continuous low-level exposure to oil in the form of tar balls, slicks, or elevated background concentrations also challenge animals facing other natural and anthropogenic stresses. Types of trauma can include skin irritation, altering of the immune system, reproductive or developmental damage, and liver disease (Keller et al. 2004; Keller et al. 2006). Chronic exposure may not be lethal by itself, but it may impair a turtle's overall fitness so that it is less able to withstand other stressors (Milton et al. 2003).

The earlier life stages of living marine resources are usually at greater risk from an oil spill than adults. This is especially true for hatchlings, since they spend a greater portion of their time at the sea surface than adults; thus, their risk of exposure to floating oil slicks is increased (Lutcavage et al. 1995). One of the reasons might be the simple effects of scale: for example, a given amount of oil may overwhelm a smaller immature organism relative to the larger adult. The metabolic machinery an animal uses to detoxify or cleanse itself of a contaminant may not be fully developed in younger life stages. Also, in early life stages, animals may contain proportionally higher concentrations of lipids, to which many contaminants such as petroleum hydrocarbons bind. Most reports of oiled hatchlings originate from convergence zones, ocean areas where currents meet to form collections of contaminants. These zones aggregate oil slicks where surface currents collide before pushing down and around, and represents a virtually closed system where a smaller weaker sea turtle can easily become trapped (Carr 1987; Witherington 2002b). Lutz and Lutcavage (1989) reported that hatchlings have been found apparently starved to death, their beaks and esophagi blocked with tarballs.

Frazier (1980) suggested that olfactory impairment from chemical contamination could represent a substantial indirect effect in sea turtles, since a keen sense of smell apparently plays an important role in navigation and orientation. A related problem is the possibility that an oil spill impacting nesting beaches may affect the locational imprinting of hatchlings, and thus impair their ability to return to their natal beaches to breed and nest (Milton et al. 2003). Whether hatchlings, juveniles, or adults, tar balls in a turtle's gut are likely to have a variety of effects – starvation from gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (such as local necrosis or ulceration), interference with fat metabolism, and buoyancy problems caused by the buildup of fermentation gases (floating prevents turtles from feeding and increases their vulnerability to predators and boats), among others. Also, trapped oil can kill the seagrass beds that turtles feed upon.

Unfortunately, little is known about the effects of dispersants on sea turtles, and such impacts are difficult to predict in the absence of direct testing. While inhaling petroleum vapors can irritate turtles' lungs, dispersants can interfere with lung function through their surfactant (detergent) effect. Dispersant components absorbed through the lungs or gut may affect multiple organ systems, interfering with digestion, respiration, and excretion.

Nutrient loading from land-based sources, such as coastal communities and agricultural operations, are known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. An example is the large area of the Louisiana continental shelf with seasonally-depleted oxygen levels (< 2 mg/Liter) caused by eutrophication from both point and non-point sources. Most aquatic species cannot survive at such low oxygen levels and these areas are known as "dead zones." The oxygen depletion, referred to as hypoxia, begins in late spring, reaches a maximum in mid-summer, and disappears in the fall. Since 1993, the average extent of mid-summer, bottom-water hypoxia in the northern Gulf of Mexico has been approximately 16,000 km^2, approximately twice the average size measured between 1985 and 1992. The hypoxic zone attained a maximum measured extent in 2002, when it was about 22,000 km^2 which is larger than the state of Massachusetts (USGS 2005). The hypoxic zone has impacts on the animals found there, including sea turtles, and the ecosystem-level impacts continue to be investigated.

4.2.4 Conservation and Recovery Actions Shaping the Environmental Baseline

Outreach and Education, Sea Turtle Entanglements, and Rehabilitation
NMFS and cooperating states (including Florida) have established an extensive network of sea turtle stranding participants along the Atlantic and Gulf of Mexico coasts that not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles.

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

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

5 EFFECTS OF THE ACTION ON SEA TURTLES

In this section of the Opinion, we assess the effects of the proposed action on the 4 species of sea turtles identified in Section 3 (green, Kemp's ridley, leatherback, and loggerhead) as likely to be adversely affected. Potential routes of effects of the proposed action on these species include contact with expendables (ordnance), ordnance detonation, noise disturbance, vessel interactions, and the release of marine debris.

5.1 Vessel interactions

A number of boats (20-25) will be involved with the proposed munitions testing, which could lead to interactions with sea turtles. Vessel traffic, particularly high-speed boats such as enforcement/patrol crafts, can strike sea turtles leading to injury or death; therefore, sea turtles may be affected by the project. Still, NMFS believes the risk of vessel strike impacts to listed turtles resulting from the proposed action is low. The operation of 20-25 boats in an area approximately 283 square miles in size will not increase typical boat traffic in the area and will not lead to a higher risk of interactions between turtles and vessels. Munitions testing will occur in a variety of sea states up to wave heights of 4 ft, but vessel operators are expected to adjust their speed and vigilance based on conditions. Fair weather patterns and calm sea states will allow boaters to observe and avoid any protected species in their paths. Conversely, increased sea states will generally compel vessel operators to decrease speed, which would reduce the risk of an interaction. NMFS believes sea turtles may be affected, but are not likely to be adversely affected, by vessel strike as the risk of any effect is discountable.

5.2 Contact with expendables

Direct physical contact with expendables or shrapnel can result in physical harm to protected species. Direct physical impacts could result from bombs, gunnery ammunition, and shrapnel from live missiles impacting with animals at or near the surface of the water. Gunnery rounds will comprise the majority of all ordnance in this training (see Table 1). Some ordnance contains high explosives (bombs and missiles), but these are analyzed separately in this document (Section 5.4) so all projectiles in this section are considered inert. NMFS believes it is unlikely that sea turtles will be directly impacted by ordnance or shrapnel because (1) the zone of influence (zone where turtles could be exposed to noise or pressure influences) will be surveyed by trained marine species observers prior to each mission, (2) the area in which impacts from falling debris would occur is very small (meters across) and can be monitored for species presence through the video cameras aboard the instrument barge, and (3) the density of marine turtles in the test area is relatively low (Table 5). Therefore, NMFS believes any effects will be discountable.

5.3 Marine debris

Munitions testing will be conducted on vessel targets, which may result in fragments from both munitions and targets being dispersed into the water. These fragments could remain on the surface, enter the water column, or settle to the bottom. Surface debris will be collected by USAF personnel to the extent practicable, but no efforts will be made to collect debris below the surface. Marine debris can be ingested by sea turtles and cause gastrointestinal blockages or damage to internal organs. Sea turtles, especially leatherbacks, may be more susceptible to marine debris ingestion than other species due to the tendency of floating debris to concentrate in convergence zones which adults and juveniles use for feeding areas and migratory routes (Lutcavage et al. 1997b; Shoop and Kenney 1992a). Floating plastics such as plastic bags are known to be ingested by turtles thus causing injury or death (Mrosovsky et al. 2009). Debris can also result in entrapment or entanglement of sea turtles, though this is more commonly associated with derelict fishing gears. NMFS believes the proposed action may affect, but is not likely to adversely affect, turtles through the release of marine debris because (1) the amount of debris will be minimal (relative to other sources of debris and the amount of water in the Gulf) and (2) surface debris will be collected and removed from the water. Therefore, any effects will be insignificant.

Table 5. Adjusted sea turtle densities in the action area as derived from published literature

Species	Adjusted Density (animals/km^2)
Loggerhead sea turtle[1]	2.36
Kemp's ridley sea turtle[1]	1.904
Leatherback sea turtle[1]	0.601
Green sea turtle[2]	0.170

[1] Garrison, 2008; adjusted for observer and availability bias by author
[2] Epperly et al., 2002; not adjusted for sighting or availability bias by the authors, but adjusted by Eglin AFB for this take analysis

5.4 Ordnance detonation and noise

The detonation of ordnances during the proposed action will result in noise and pressure waves in the water column that can affect marine turtles. Effects can include injury, death, or harassment (behavioral changes). How and to what degree sea turtles are affected depends on the source of the sound/pressure wave, the proximity of sea turtles to the source, and the number of disturbances over time. Animals in close proximity to detonations could be injured or killed as a result of tissue destruction caused by very intense pressure waves. Damage to tissue is most likely to occur where substantial impedance differences occur (e.g., across air/tissue interfaces in the middle ear, sinuses, lungs, and intestines).

Noise from mission activities may elicit a startle reaction from sea turtles and produce temporary, sublethal stress (NRC 1990b). Startle reactions may result in increased surfacing, rapid swimming, or diving reactions to an acoustic stimulus (Lendhardt 1994; McCauley et al. 2000). The ambient noise in habitats near mission activities may affect habitat quality such that important biological behaviors may be disrupted (e.g., feeding, mating, and resting), and mission areas may be avoided due to the noise generated. The magnitude of those effects may depend on several factors including the frequency, periodicity, duration, and intensity of the sounds, and the behavior of the animals during the exposure. (Lenhardt et al. 1983) suggested that sea turtles use acoustic signals from their environment as guideposts during migration and as a cue to identify their natal beaches. Although there is some evidence that environmental sound may have a functional role in sea turtle behavior, relatively few studies have investigated the functional role of hearing in these species' life history and behavior. There is no information regarding the consequences that these disturbances may have on sea turtles in the long term, but short-term disruption of normal behaviors and temporary abandonment of habitat is likely in response to some noises produced by munitions testing.

While studies have addressed the effects of sound and pressure waves on marine mammals, far less is known about how these effects impact marine turtles. The ear structure of sea turtles (both an aerial and aquatic receptor, Lenhardt et al. (1996) is different from that of cetaceans, and differences in the effects from detonation energy on marine mammals and marine reptiles may be expected. Marine turtles are sensitive to low frequencies, with an effective hearing range between 100 and 1000 Hz (Bartol et al. 1999; Ketten and Bartol 2006; Lendhardt 1994; Moein et al. 1994; Ridgeway et al. 1969). In-water hearing thresholds at frequencies ranging from 100-1000 Hz are 160 to 200 dB re 1µPa (Lendhardt 1994). McCauley et al. (2000) have shown that green and loggerhead turtles noticeably change swimming patterns at sound levels of 166 dB re 1µPa and behavior patterns at 175 dB re 1µPa. Due the general lack of information regarding thresholds for sea turtles, NMFS typically relies upon the thresholds for marine mammals when conducting noise analyses for sea turtles.

The USAF conducted an analysis to determine the effects of ordnance detonation on marine turtles by incorporating 3 sources of information: (1) zone of influence (ZOI), (2) density of sea turtles in the ZOI, and (3) the number of detonations (Table 1). They defined the ZOI as "the area of ocean in which sea turtles could potentially be exposed to various noise or pressure thresholds associated with exploding ordnances." Turtles in the ZOI may be affected through mortality, injury, or harassment (temporary threshold shifts), each of which is defined by different criteria. To determine the threshold for mortality of sea turtles, the USAF used criteria established by Goertner (1982) for the onset of severe lung injury to marine mammals (30.5 psi-ms). This criterion is dependent on animal mass, so to be conservative the USAF based this threshold on the mass of a dolphin calf. For nonlethal injury, the USAF based the threshold on the onset of slight lung injury associated with a positive impulse level (indexed to 13 psi-ms) from (Goertner 1982). The final threshold, non-injurious harassment, was defined as "a temporary, recoverable loss of hearing sensitivity at a particular frequency or frequency range. This threshold is defined by 2 criteria: (1) an energy flux density of 182 dB re 1 μPa^2/sec, and (2) a peak pressure of 23 psi. The USAF calculated the ZOI for behavioral effects using both criteria and then used the more conservative value (182 dB re 1 μPa^2/sec) to estimate the impacts to sea turtles for this project.

The USAF estimated sea turtle densities in the area based on past scientific literature (Table 5). While these studies only account for larger turtles that could be effectively observed, NMFS doesn't expect post-hatchlings or pelagic juveniles to be in the action area. These age classes of sea turtles generally use oceanic gyres and tidal fronts that are located farther offshore (B. Witherington, FWC pers. comm., to A. Brame, NMFS, April 4, 2013). Further, NMFS does not expect post-hatchlings to be transiting through the action area as the hatching of sea turtles in this area occurs later in summer. Loggerhead, Kemp's ridley, and leatherback sea turtle densities were estimated from a habitat modeling project conducted within portions of the Eglin Test Training Range (Garrison 2008). This model incorporated aerial survey data and environmental data to predict densities in different portions of the test range and during different months of the year. The USAF used the model to calculate the density of loggerhead, Kemp's ridley, and leatherback sea turtles in the months of February and March when the munitions testing is scheduled. Densities were provided based upon one-year (2007) and 5-year monthly averages for SST and chlorophyll. The 5-year average is considered preferable and is used in this document. Since the Maritime Weapon Systems Evaluation program test activities could occur any time during February or March, the density estimate associated with the highest monthly 5-year average was used for this analysis, which in this case was in February.

The model developed by Garrison (2008) was not successful in predicting green sea turtle density. Therefore, the USAF used offshore aerial survey data collected by Epperly et al. (2002) to estimate green turtle density for the purposes of this project. This data did not account for sighting or availability bias and may likely represent an underestimation of the true density of green sea turtles in the area. To account for this the USAF adjusted densities provided by Epperly et al. based on a 90% dive profile, thereby providing a more likely estimate of their true density in the area.

Table 6 shows the calculated distances from the detonation point to which the impact thresholds will extend. The USAF used these distances to calculate the ZOIs, which they in turn used (along with the density estimates and the number of detonations) to calculate the number of turtles that could potentially be impacted by the project (Table 7). The potential effects do not consider the mitigation efforts the USAF proposed as part of the project.

Estimates of the distances to impact thresholds and take estimates for the AGM-114 missile detonating 10 ft below the water's surface were based on a munition (GBU-38) with a larger Net Explosive Weight (NEW) detonating 10 ft below the surface. This is considered a highly conservative approach as the AGM-114 has a NEW of 20 lbs, while the GBU-38 has a NEW of 189 lbs.

Table 6. Distances (radii) to which pressure waves and sound could propagate from the detonation of each proposed ordnance. Values were calculated using the threshold criteria outlined above and reported in meters.

Munition	Detonation Scenario	Mortality	Physiological	Behavioral	
		30.5 psi-msec	13 psi-msec	182 dB EFD*	23 psi
GBU-10 or GBU-24	Surface	202	362	932	**1280**
GBU-12 or GBU-54	Surface	114	243	687	**752**
AGM-65 (Maverick)	Surface	84	187	**605**	575
GBU-38 (LSDB)	Surface	84	187	**605**	575
CBU-105	Airburst	0	0	0	0
AGM-114 (Hellfire)	Subsurface	278	529	**1,126**	749
AGM-175 (Griffin)	Surface	46	105	**413**	353
2.75 Rockets	Surface	46	105	**413**	353
PGU-13 HEI 30 mm	Surface	0	7	31	**60**
7.62 mm/0.50 cal	Surface	0	0	0	0

Based on the above analysis conducted by the USAF and verified by NMFS, we believe that 2 loggerhead, 2 Kemp's ridley, 1 leatherback, and 1 green sea turtle may be lethally taken, while up to 96 loggerhead, 77 Kemp's ridley, 30 leatherback, and 78 green sea turtles may be nonlethally taken (by injury or behavioral impacts). The risk of damage from ordnance testing can be reduced when observations indicate that there are no sea turtles within the impact area. The USAF will monitor the area for sea turtles prior to strike missions to reduce the potential for impacts (see Section 2.1).

Table 7. The estimated number of sea turtles that may potentially be affected by the proposed project.

Species	Number of Impacts, Mortality	Number of Impacts, Physiological	Number of Impacts, Behavioral
Loggerhead sea turtle	1.426	3.421	92.100
Kemp's ridley sea turtle	1.150	2.760	74.305
Leatherback sea turtle	0.512	1.184	28.510
Green sea turtle	0.103	0.246	6.634
TOTAL	**3.191**	**7.611**	**201.549**

6 CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating their Biological Opinions (50 CFR 402.14). Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion.

Within the action area, major future changes are not anticipated in the ongoing human activities described in the environmental baseline. The present, major human uses of the action area such as commercial fishing, recreational boating and fishing, and the transport of mineral resources and other waterborne commerce throughout the Gulf of Mexico are expected to continue at the present levels of intensity in the near future as are their associated risks of injury or mortality to listed species posed by incidental capture by fishers, accidental oil spills, vessel collisions, marine debris, chemical discharges, and man-made noise.

The fisheries described as occurring within the action area (see Section 4, Environmental Baseline) are expected to continue as described into the foreseeable future, concurrent with the proposed action. Numerous fisheries in state waters of the Gulf of Mexico regions have also been known to adversely affect sea turtles. The past and present impacts of these activates have been discussed in the Environmental Baseline section of this Opinion. NMFS is not aware of any proposed or anticipated changes in these fisheries (except perhaps the southeastern shrimp fisheries) that would substantially change the impacts each fishery has on sea turtles covered by this Opinion.

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. 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. In 2010, there was a massive oil well release in the Gulf of Mexico at British Petroleum's DWH well. Official estimates are that million barrels of oil were released into the Gulf. At this time the assessment of total direct impact to sea turtles has not been determined. Additionally, the long-term impacts as a result of habitat impacts, prey loss, and subsurface oil particles and oil components broken down through physical, chemical, and biological processes are not known.

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 many sites with high contaminant concentrations due to the large number of waste discharge point sources. A variety of diseases occurs in marine turtles from different pathogens, harmful algal blooms, and increased contaminant loads. Diseases in turtles appear to occur more frequently in turtles that reside in poorly circulating, nearshore waters close to large human populations. The listed species analyzed in this Opinion may be exposed to these contaminants, accumulate them (directly or indirectly), and be at an increased risk of disease and mortality during their life cycles.

The level of authorized incidental take in the Gulf of Mexico is expected to continue to increase in the future. Increased pressures from coastal development, pollution, noise, recreational and commercial fisheries, marine transportation, and mineral resource exploration and development is expected to result in increased risks to listed species and the ecosystems on which they depend. Although some unavoidable take is anticipated from future actions, harm avoidance measures are expected to reduce or eliminate many of the takes that may be associated with these actions.

7 JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of any ESA-listed sea turtles. In Section 5, we outlined how the proposed action would affect these species at the individual level and the extent of those effects in terms of the number of associated interactions, captures, and mortalities of each species to the extent possible with the best available data. Now we assess each of these species' response to this impact, in terms of overall population effects, and whether those effects of the proposed action, in the context of the status of the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), will jeopardize their continued existence.

"To jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Thus, in making this conclusion for each species, we typically first look at whether there will be a reduction in the reproduction, numbers, or distribution. Then, if there is a reduction in one or more of these elements, we explore whether it will cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

The NMFS and USFWS's *ESA Section 7 Handbook* (USFWS and NMFS 1998) defines *survival* and *recovery*, as they apply to the ESA's jeopardy standard. *Survival* means "the species' persistence… beyond the conditions leading to its endangerment, with sufficient resilience to allow recovery from endangerment." Survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. *Recovery* means "improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the Act." Recovery is the process by which species' ecosystems are restored and/or threats to the species are removed so self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities.

NMFS believes that the effects of the proposed action (the lethal take of 2 loggerhead, 2 Kemp's ridley, 1 leatherback, and 1 green sea turtle and the nonlethal take [by injury or behavioral impacts] of up to 96 loggerhead, 77 Kemp's ridley, 30 leatherback, and 78 green sea turtles by pressure waves associated with the action) are not likely to appreciably reduce either the survival or recovery of these species in the wild. NMFS does not expect the activities associated with the proposed action, when added to ongoing activities affecting these species in the action area and the cumulative effects (Section 6.0), to affect sea turtles in a way that reduces the number of animals born in a particular year (i.e., a specific age-class), the reproductive success of adult sea turtles, or the number of hatchlings that annually recruit into the adult breeding population.

Sea turtles may be taken by the proposed action. The proposed action is not expected to affect foraging habitat, nesting beaches, or introduce any large amounts of substances or debris that may adversely affect sea turtles. The lethal take of 2 loggerhead, 2 Kemp's ridley, 1 leatherback, and 1 green sea turtle is expected to reduce numbers, but these individuals are expected to be replaced by recruitment from younger-age classes and new individuals into the population from nesting beaches. Although a few individuals may be removed each year, the population is believed to be large enough to maintain a viable reproductive population. All life stages are important to the survival and recovery of the species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. For example, the take of male juveniles may affect survivorship and recruitment rates into the reproductive population in any given year, and yet not significantly reduce the reproductive potential of the population. By contrast, the death of mature breeding females can have an immediate effect on the reproductive rate of the species. Sublethal effects on adult females may also reduce reproduction by hindering foraging success, as sufficient energy reserves are probably necessary for producing multiple clutches of eggs in a breeding year. Different age classes may be subject to relative rates of mortality, resilience, and overall effects of population dynamics.

In the absence of information on absolute numbers and sex ratio of the various age classes, it is difficult to predict the anticipated annual mortality of different age classes from the proposed action. However, the relatively low numbers of takes (the lethal take of 2 loggerhead, 2 Kemp's ridley, 1 leatherback, and 1 green sea turtle and the nonlethal take of up to 96 loggerhead, 77 Kemp's ridley, 30 leatherback, and 78 green sea turtles) are not expected to appreciably reduce the numbers found in any given age class, and not all of the expected takes will affect reproduction or recruitment into the population. Because of the expected low number of interactions with the species under consideration, we believe that the effects of the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival and recovery of loggerhead, leatherback, Kemp's ridley, or green sea turtles in the wild.

8 CONCLUSION

After reviewing the current status of each species, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is NMFS's Biological Opinion that the proposed munitions testing may adversely affect sea turtles, but is not likely to jeopardize the continued existence of these species in the wild.

9 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or 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 Reasonable and Prudent Measures (RPMs) and terms and conditions of the ITS. Take that occurs while not in compliance with the requirements of the proposed action does not constitute authorized incidental take because it is not incidental to an otherwise lawful activity. Accordingly, such take is not covered by the ITS and constitutes unlawful take.

This Opinion establishes an ITS with RPMs and terms and conditions for incidental take coverage for sea turtle takes throughout the action area during the proposed munitions testing. If new information indicates effects are greater than those anticipated in Section 5.4 (the basis for our jeopardy analysis in Section 7), consultation must be reinitiated.

9.1 Anticipated Amount or Extent of Incidental Take

NMFS has determined that there is an expected impact to sea turtles in the action area as a result of the pressure waves and noise associated with detonating munitions from test mission activities. The proposed harm avoidance measures (pre- and post-site monitoring) will help reduce the numbers of sea turtle takes during missions; however, the available information still indicates that sea turtles may be harassed, injured, or killed as a result of pressure waves from exploding ordnance associated with the proposed action. Therefore, pursuant to Section 7(b)(4) of the ESA, NMFS anticipates the incidental take of turtles as shown in Table 8. If the actual incidental take exceeds this level at any time during the proposed project, the USAF must immediately reinitiate formal consultation.

9.2 Effect of the Take

NMFS has determined the level of anticipated take associated with the proposed action and exempted from ESA Section 9 take prohibitions in this ITS is not likely to jeopardize the continued existence of green, Kemp's ridley, leatherback, or loggerhead (NWA DPS) sea turtles.

Table 8. Anticipated take associated with the proposed project

Species	Lethal Take	Nonlethal Take
Loggerhead sea turtle	2	96
Kemp's ridley sea turtle	2	77
Leatherback sea turtle	1	30
Green sea turtle	1	78

9.3 Reasonable and Prudent Measures

NMFS believes the following RPMs are necessary and appropriate to minimize impacts of incidental take of Kemp's ridley, green, loggerhead, and leatherback sea turtles:

1. The USAF shall avoid areas of *Sargassum* when conducting training missions as sea turtles, especially juveniles, are known to use these habitats.

2. The USAF shall implement monitoring and reporting measures to validate the effectiveness of the measures to reduce impacts to sea turtles resulting from the training missions in the EGTTR.

9.4 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the USAF 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 nondiscretionary.

1. In conducting pre-mission surveys the USAF shall identify and avoid areas containing *Sargassum*.

2. The USAF shall submit a report to NMFS Southeast Regional Office containing the following information:

    a. The date, time, and description of each mission activity.

    b. The coordinates and water depth of each mission location.

    c. The time pre-mission clearance of the area began and ended, and identification (to species level if possible) and number of any protected species sighted.

    d. Any incidental takes of protected species and their condition at time of sighting/collection. Incidental takes should be immediately reported to NMFS by transmitting take reports to takereport.nmfsser@noaa.gov and referencing the present Biological Opinion by date, title, and Public Consultation Tracking System number. Any takes should also be reported to the Sea Turtle Stranding and Salvage Network state coordinator, Dr. Alan Foley (904) 696-5904, and the Florida Fish and Wildlife Conservation Commission Wildlife Alert Hotline: 1-888-404-FFWCC.

3. The USAF shall provide endangered species training and certification to train crew members.

10 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 to help implement recovery plans or to develop information. NMFS believes the U.S. Department of the Air Force should implement the following conservation recommendations:

1. EAFB should conduct a study of noise and pressure wave propagation for small explosive charges at and just beneath the surface of the water (e.g., live munitions and gunnery rounds). Measurements should be taken that can be used to predict effects to marine life (eggs and larvae, fish, sea turtles, and cetaceans). EAFB should take measurements to characterize pressure, frequency, and sound levels at various distances and depths from the target areas (real or simulated) to document the propagation of pressure waves and sound from project activities, and to develop appropriate parameters to predict effects to marine life.

2. EAFB should develop an observer training program in coordination with NOAA Fisheries to assist pilots and vessel operators with methods to survey, observe, and identify protected species to avoid harm to species protected under the ESA and the Marine Mammal Protection Act during routine missions in the EGTTR.

NMFS requests to be notified if the conservation measures are implemented. This will assist us in evaluating future project effects on sea turtles in the northern Gulf of Mexico.

11 REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed munitions testing described and coordinated by the USAF. 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 exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the 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.

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13 APPENDIX 1: ANTICIPATED INCIDENTAL TAKE OF ESA-LISTED SPECIES IN NMFS-AUTHORIZED FEDERAL FISHERIES IN THE SOUTHEAST REGION

Table A.1. Fishery Incidental Take Authorized in the Southeast Region

Fishery	ITS Authorization Period	Listed Species					
		Loggerhead	**Leatherback**	**Kemp's Ridley**	**Green**	**Hawksbill**	**Smalltooth Sawfish**
Coastal Migratory Pelagics	3-Year	33- All lethal	2 lethal takes for Leatherbacks, Hawksbill, and Kemp's ridley- both lethal takes		14- All lethal	See leatherback entry	2 Nonlethal takes
Gulf of Mexico Reef Fish	3-Year	1,044- No more than 572 lethal	11- All lethal	108- No more than 41 lethal	116- No more than 75 lethal	9- No more than 8 lethal	8 Nonlethal takes
HMS-Pelagic Longline	3-Year	1,905- No more than 339 lethal	1,764- No more than 252 lethal	105- No more than 18 lethal for these species in combination			None
HMS-Shark	3-Year	679- No more than 346 lethal	74- No more than 47 lethal	2- No more than 1 lethal	2- No more than 1 lethal	2- No more than 1 lethal	51- No more than 1 lethal take
Gulf of Mexico and South Atlantic Spiny Lobster	3-Year	3-Lethal or nonlethal take	1 –Lethal or nonlethal take for leatherbacks, hawksbill, and Kemp's ridley		3 Lethal or nonlethal takes	1 –Lethal or nonlethal take for leatherbacks, hawksbill, and Kemp's ridley	2 Nonlethal takes