UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
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SER-2013-11301

SEP 23 2013

Mr. William G. Bailey
Chief, Planning Division
Department of the Army
Savannah District, Corps of Engineers
100 W. Oglethorpe Avenue
Savannah, Georgia 31401-3640

Ref.: Amendment of the November 2011, Savannah Harbor Expansion Project Biological Opinion, Savannah, Georgia

Dear Mr. Bailey:

Enclosed is the National Marine Fisheries Service's (NMFS's) amendment to the biological opinion (opinion) for the U.S. Army Corps of Engineers (USACE) proposed Savannah Harbor Expansion Project in Chatham County, Georgia. The following amendment to the opinion analyzes the project effects on green sea turtles *(Chelonia mydas)* and leatherback sea turtles (*Dermochelys coriacea*), in accordance with Section 7 of the Endangered Species Act (ESA) of 1973.

This opinion is based on information provided in your e-mail dated April 18, 2013, information from the 2012-2013 Brunswick Harbor bed leveler evaluation, as well as information from previous NMFS consultations conducted on the use of hopper dredging methods. It is our opinion that the action, as proposed, is likely to adversely affect green sea turtles and leatherback sea turtles, but is not likely to jeopardize their continued existence.

We look forward to further cooperation with you on other projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Kay Davy, consultation biologist, by e-mail at Kay.Davy@noaa.gov or (727) 415-9271.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

File: 1514-22.F.3

Endangered Species Act – Section 7 Consultation
Amended Biological Opinion

Action Agency:	U.S. Army Corps of Engineers (USACE), Savannah District
Activity:	Amendment of the biological opinion for the deepening of the Savannah Harbor Federal Navigational Channel in association with the Savannah Harbor Expansion Project (new NMFS Consultation No. SER-2013-11301)
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida
Approved By:	Roy E. Crabtree, Ph.D., Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	9/23/13

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List of Frequently Used Acronyms

cms	centimeters
CPUE	Catch Per Unit Effort
DPS	Distinct Population Segment
DWH	Deepwater Horizon
EPA	Environmental Protection Agency
ERDC	Engineering Research and Development Center
ESA	Endangered Species Act of 1973
FMP	Fishery Management Plan
FR	Federal Register
FWC	Florida Fish and Wildlife Commission
HMS	Highly Migratory Species
ITS	Incidental Take Statement
kt	knot
NMFS	National Marine Fisheries Service
NRC	National Research Council
NWA	Northwest Atlantic
ODMDS	Ocean Dredged Material Disposal Site
PCB	Polychlorinated biphenyl
PIT	Passive Integrated Transponder
PRD	Protected Resources Division
RBO	Regional Biological Opinion
RPA	Reasonable and Prudent Alternatives
SAD	South Atlantic Division
SEFSC	Southeast Fisheries Science Center
SER	Southeast Regional Office
SHEP	Savannah Harbor Expansion Project
STSSN	Sea Turtle Stranding and Salvage Network
TED	Turtle Excluder Device
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USN	United States Navy

Introduction

This document represents NMFS's amended biological opinion for the Savannah Harbor Expansion Project (SHEP) based on our review of recent dredging-related activities that resulted in impacts to green sea turtles and leatherback sea turtles. The original SHEP biological opinion was issued in November 2011, but did not include an analysis of potential impact to these species. Prior to 2012, encounters with green sea turtles and leatherback sea turtles during dredging operations off Georgia had not been documented. With the recent documentation of impacts to these species off Georgia while conducting a bed leveler evaluation, the Savannah District contacted NMFS requesting reinitiation of the SHEP opinion. This amended opinion analyzes project effects only on green sea turtles and leatherback sea turtles and provides an ITS for both species. Information used in the preparation of this amended opinion was provided by the Savannah District following their bed leveler evaluation conducted in Brunswick Harbor during 2012-2013. During the evaluation, green and leatherback sea turtles were captured while closed-net trawling was being conducted behind the operating bed leveler.

AMENDMENT TO NOVEMBER 4, 2011, SHEP BIOLOGICAL OPINION
(to include green sea turtles and leatherback sea turtles)

1 Consultation History

March 18, 2013: NMFS is notified that one green sea turtle and one leatherback sea turtle have been captured and released alive during the Savannah District's bed leveler evaluation conducted in Brunswick Harbor. The turtles were caught by the closed-net trawler while following behind the bed leveler as a part of the evaluation. In addition, a dead leatherback that was presumably killed by a ship strike was also collected by the trawler during the evaluation. We were also informed that a lethal take of a green sea turtle occurred in Brunswick Harbor during February 2012 and another occurred in Savannah Harbor during March 2012.

April 18, 2013: NMFS receives a request from the Savannah District to re-initiate Section 7 consultation for the SHEP (NMFS Consultation No. F/SER/2010/05579). The Savannah District requested green sea turtle take be added to the Incidental Take Statement included in SHEP's opinion and the removal of Condition "e" in the *Sea Turtle and Smalltooth Sawfish Construction Conditions* from Appendix D of the opinion.

April 19, 2013: Formal consultation is initiated.

May 21, 2013: NMFS receives a request from the Savannah District to also add leatherback sea turtle take to the Incidental Take Statement included in SHEP's opinion.

2 Description of the Proposed Action and Action Area

Please refer to the original opinion for a detailed description of the proposed action and action area.

3 Species and Critical Habitat Occurring in the Action Area

3.1 Species

The following table lists the endangered (E) and threatened (T) species and Distinct Population Segments (DPSs) proposed under the jurisdiction of NMFS that may occur in the action area:

Common Name	Scientific Name	Status
Sea Turtles		
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Loggerhead sea turtle (Northwest Atlantic Ocean DPS)[1]	*Caretta caretta*	T
Green sea turtle	*Chelonia mydas*	E/T[2]
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Fish		
Shortnose sturgeon	*Acipenser brevirostrum*	E
Atlantic sturgeon (South Atlantic DPS)	*Acipenser oxyrinchus oxyrinchus*	E
Whales		
North Atlantic right whale	*Eubalaena glacialis*	E
Humpback whale	*Megaptera novaeangliae*	E

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3.2 Critical Habitat

There is currently no designated critical habitat in the action area. NMFS has recently initiated a proposal to designate critical habitat for the loggerhead NWA DPS, as critical habitat was deemed not determinable at the time of the listing.

3.3 Species Not Likely to be Adversely Affected

In the original opinion, we determined that the proposed action is not likely to adversely affect green sea turtles, hawksbill sea turtles, leatherback sea turtles, North Atlantic right whales, and humpback whales, and these species were excluded from further analysis and consideration in the opinion.

[1] NMFS and USFWS issued a final rule designating nine DPSs for loggerhead sea turtles (76 FR 58,868, September 22, 2011; effective October 24, 2011). The Northwest Atlantic DPS (NWA DPS) is the only loggerhead DPS that occurs in the action area

[2] Green turtles are listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are listed as endangered.

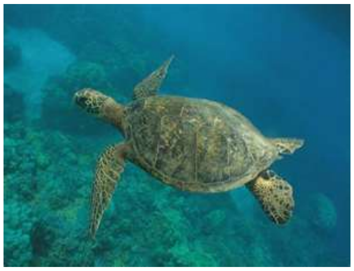
3.4 Species Likely to be Adversely Affected

This opinion has now been amended to include an analysis of green sea turtles and leatherback sea turtles. The subsections focus primarily on the Atlantic Ocean populations of these species since these are the populations that may be directly affected by the proposed action. As sea turtles are highly migratory, potentially affected species in the action area may make migrations into other areas of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. The following subsections are synopses of the best available information on the life history, distribution, population trends, and current status of these species.

Please refer to the original opinion for a detailed description of the other species addressed by the opinion.

3.4.1 Status of Green Sea Turtles

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. Critical habitat for the green sea turtle was designated on September 2, 1998, for the waters surrounding Isla Culebra, Puerto Rico, and its associated keys. No critical habitat exists in the action area for this consultation.



Green sea turtle

Species Description, Distribution, and Population Structure
Green sea turtles have a smooth carapace with four 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, brown and black in starburst or irregular patterns (Lagueux 2001).

Green sea turtles are distributed circumglobally, mainly in waters between the northern and southern 20°C isotherms (Hirth 1971) and nesting occurs in more than 80 countries worldwide (Hirth and USFWS 1997). The two largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica, and Raine Island, on the Great Barrier Reef in Australia. The complete nesting range of green sea turtles within the southeastern United States includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina as well as the USVI and Puerto Rico (NMFS and USFWS 1991a, Dow et al. 2007). However, the vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Meylan et al. 1995, Johnson and Ehrhart 1994). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard through Broward counties. For more information on green sea turtle nesting in other ocean basins, refer to the 1991 Recovery Plan for the Atlantic Green Turtle (NMFS and USFWS 1991a) or the 2007 Green Sea Turtle 5-Year Status Review (NMFS and USFWS 2007b).

In U.S. Atlantic and Gulf of Mexico waters, green sea turtles are found in 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 (Wershoven and Wershoven 1992, Guseman and Ehrhart 1992). The summer developmental habitat for green 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 Coast of Nicaragua, the Caribbean coast of Panama, scattered areas along Colombia and Brazil (Hirth 1971), and the northwestern coast of the Yucatán Peninsula.

Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs (Hays et al. 2001) and, like loggerheads, are known to migrate from northern areas in the summer back to warmer waters of the south in the fall and winter to avoid seasonally cold seawater temperatures. In terms of genetic structure, regional subpopulations show distinctive mitochondrial DNA properties for each nesting rookery (Bowen et al. 1992, Fitzsimmons et al. 2006). Despite the genetic differences, green sea turtles from separate nesting origins are commonly found mixed together on foraging grounds throughout the species' range. However, such mixing occurs at extremely low levels in Hawaiian foraging areas, perhaps making this central Pacific population the most isolated of all green turtle populations occurring worldwide (Dutton et al. 2008).

Life History Information

Green sea turtles exhibit particularly slow growth rates [about 1-5 cms per year (Green 1993, McDonald-Dutton and Dutton 1998)] and also have one of the longest ages to maturity of any sea turtle species [i.e., 20-50 years (Chaloupka and Musick 1997, Hirth and USFWS 1997)]. The slow growth rates are believed to be a consequence of their largely herbivorous, low-net energy diet (Bjorndal 1982). Upon reaching sexual maturity, females begin returning to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982, Frazer and Ehrhart 1985) and are capable of migrating significant distances (hundreds to thousands of kilometers) between foraging and nesting areas. While females lay eggs every 2-4 years, males reproduce every year (Balazs 1983).

Green sea turtle mating occurs in the waters off nesting beaches. 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 two-week intervals, laying an average of 3-4 nests (Johnson and Ehrhart 1996). The number of eggs per nest varies among subpopulations, but the average nest size is around 110-115 eggs. In

Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989), which will incubate for approximately 2 months before hatching. Survivorship at any particular nesting site is greatly influenced by the level of human-caused stressors. More pristine and less disturbed nesting sites (e.g., Great Barrier Reef in Australia) show 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 period they feed close to the surface on a variety of marine algae and other life associated with drift lines and other debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007b). However, at approximately 20- to 25-cm carapace length, juveniles leave pelagic habitats and enter benthic foraging habitats. Growth studies using skeletochronology indicate that green sea turtles in the Western Atlantic shift from the oceanic phase to nearshore development habitats (protected lagoons and open coastal areas rich in sea grass and marine algae) after approximately 5-6 years (Zug and Glor 1998, Bresette et al. 2006). As adults, they feed almost exclusively on sea grasses and algae in shallow bays, lagoons, and reefs (Rebel and Ingle 1974) although some populations are known to also feed heavily on invertebrates (Carballo et al. 2002). 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). Based on flipper tagging and/or satellite telemetry studies, the majority of adult female Florida green sea turtles are believed to reside in nearshore foraging areas throughout the Florida Keys from Key Largo to the Dry Tortugas and in the waters southwest of Cape Sable, Florida, with some post-nesting turtles also residing in Bahamian waters as well (NMFS and USFWS 2007b).

Abundance and Trends

A summary of nesting trends is provided in the most recent 5-year status review for the species (NMFS and USFWS 2007a) in which the authors collected and organized abundance data from 46 individual nesting concentrations 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). The authors were able to determine trends at 26 of the 46 nesting sites and found that 12 appeared to be increasing, 10 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, 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 since trend data was only available for about half of the total nesting concentration sites examined in the review and that site specific data availability appeared to vary across all regions.

The western Atlantic region (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 be decreasing. The 5-year status review for the species identified eight geographic areas considered to be primary sites for green sea turtle nesting in the Atlantic/Caribbean and reviewed the trend in nest count data for each (NMFS and USFWS 2007b). These sites include (1) Yucatán Peninsula, Mexico; (2) Tortuguero, Costa Rica; (3) Aves Island, Venezuela; (4) Galibi Reserve, Suriname; (5) Isla

Trindade, Brazil; (6) Ascension Island, United Kingdom; (7) Bioko Island, Equatorial Guinea; and (8) Bijagos Archipelago, 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 site (NMFS and USFWS 2007a). Seminoff (2004) likewise reviewed green sea turtle nesting data for eight 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 emergences documented per year and this number increased to an average of 72,200 emergences documented per year 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 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 growing at 4.9 percent annually. The number of females nesting per year on beaches in the Yucatán, Aves Island, Galibi Reserve, and Isla Trindade number in the hundreds to low thousands, depending on the site (NMFS and USFWS 2007a). 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 as well as the beaches on the Florida Panhandle (Meylan et al. 1995). More recently, green sea turtle nesting occurred on Bald Head Island, North Carolina; just east of the mouth of the Cape Fear River; on Onslow Island; and 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). Increased nesting has also been observed along the Atlantic coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997).

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 up until recently, the pattern of green turtle nesting has shown biennial peaks in abundance with a generally positive trend during the ten years of regular monitoring. According to data collected from Florida's index nesting beach survey from 1989-2011, green turtle nest counts across Florida have increased approximately tenfold from a low of 267 in the early 1990s to a high of 10,701 in 2011. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008 and dropped under 3,000 in 2009, at first causing some concern, but 2010 saw an increase back to 8,426 nests on the index nesting beaches and then the high of 10,701was measured in 2011 (FWC Index Nesting Beach Survey Database). Modeling by Chaloupka and Balazs (2007) 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 percent.

There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas of the southeastern United States, where they come to forage. Ehrhart et al. (2007) have documented a significant increase in in-water abundance of green turtles in the Indian River Lagoon area. It is likely that immature green sea turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green sea turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero.

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of green sea turtles 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. There are also significant and ongoing threats to green sea turtles from human-related causes in the United States. Similar to that described in more detail previously for loggerhead sea turtles, these threats include global climate change, beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, interactions with fishing gear, and oils spills. For all sea turtle species, the potential impacts of the DWH release are described in the Environmental Baseline section of this document.

Fibropapillomatosis disease is an increasing threat to green sea turtles. Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994, Jacobson 1990, Jacobson et al. 1991). As noted previously in Section 3.2.4, all sea turtles are susceptible to cold stunning; however, for unknown reasons, green sea turtles appear to be the most susceptible sea turtle species. 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 turtles being found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding and approximately 1,030 were rehabilitated and released. Additionally, during this same time frame, approximately 340 green turtles were found cold-stunned in Mexico, with approximately 300 of those reported as being subsequently released.

All of the DWH-related impacts mentioned for loggerhead sea turtles (e.g., direct oiling, inhalation of volatile compounds, etc.; see Section 3.2.4) are likely to have also affected green sea turtles. During the response phase to the DWH oil spill (April 26 – October 20, 2010) a total of 201 (172 alive and 29 dead) green 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. The mortality number of green sea turtles is lower than that for loggerheads despite loggerheads having far fewer total strandings, but this is because the majority of green sea turtles came from the offshore rescue (pelagic stage), of which almost all survived after rescue, whereas a greater proportion of the loggerhead recoveries were nearshore neritic stage individuals found dead. While green sea turtles regularly use the northern Gulf of Mexico, they have a widespread distribution throughout the entire Gulf of Mexico, Caribbean, and Atlantic. As described above, nesting is relatively rare on the northern coast of the Gulf of Mexico. Therefore, green sea turtles likely suffered adverse impacts from the DWH spill, a relatively small proportion of the population is expected to have been exposed to and directly impacted by the spill.

3.4.2 Status of Leatherback Sea Turtles

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. Critical habitat was designated in 1979 in coastal waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands. Designation of critical habitat in the Pacific Ocean occurred on January 26, 2012 (77 FR 4170). This designation includes approximately 16,910 square miles (43,798 square km) stretching along the California coast from Point Arena to Point Arguello east of the 3,000-meter depth contour; and 25,004 square miles (64,760 square km) stretching from Cape Flattery, Washington, to Cape Blanco, Oregon, east of the 2,000-meter depth contour.

Leatherback sea turtle

Species Description, Distribution, and Population Structure

The leatherback is the largest sea turtle in the world. Mature males and females can reach lengths of over 2 m (6 ft) and weigh close to 900 kg (2000 lbs). The leatherback is the only sea turtle that lacks a hard, bony shell. A leatherback's carapace is approximately 4 cm thick and consists of a leathery, oil-saturated connective tissue overlaying loosely interlocking dermal bones. The ridged carapace and large flippers are characteristics that make the leatherback uniquely equipped for long-distance foraging migrations. Leatherbacks lack the crushing chewing plates characteristic of sea turtles that feed on hard-bodied prey (Pritchard 1971). Instead, they have pointed toothlike cusps and sharp-edged jaws that are adapted for a diet of soft-bodied pelagic (open ocean) prey, such as jellyfish and salps. A leatherback's mouth and throat also have backward-pointing spines that help retain gelatinous prey.

The leatherback sea turtle ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS and USFWS 1995). They forage in temperate and subpolar regions between latitudes 71°N and 47°S in all oceans and undergo extensive migrations 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). Female leatherbacks nest from the southeastern United States to southern Brazil in the western Atlantic and from Mauritania to Angola in the eastern Atlantic. The most significant nesting beaches in the Atlantic, and perhaps in the world, are located in French Guiana and Suriname (NMFS SEFSC 2001).

Previous genetic analyses of leatherbacks using only mitochondrial DNA (mtDNA) suggested that within the Atlantic basin there were at least three genetically distinct nesting populations: the St. Croix nesting population (USVI), the mainland nesting Caribbean population (Florida, Costa Rica, Suriname/French Guiana), and the Trinidad nesting population (Dutton et al. 1998). Further genetic analyses using microsatellite markers along with the mtDNA data and tagging data has resulted in Atlantic Ocean leatherbacks now being divided into seven groups or breeding populations: 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

Leatherbacks are believed to be a relatively long-lived sea turtle species. 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). Past estimates showed that they reached sexual maturity faster than most other sea turtle species as Rhodin (1985) reported maturity for leatherbacks occurring at 3-6 years of age while Zug and Parham (1996) reported maturity occurring at 13-14 years of age. More recent research using sophisticated methods of analyzing leatherback ossicles has cast doubt on the previously accepted age to maturity figures, with leatherbacks in the western North Atlantic possibly not reaching sexual maturity until as late as 29 years of age (Avens and Goshe 2007). Female leatherbacks lay up to 10 nests during the nesting season (March through July in the United States) at 2-3 year intervals. They produce 100 eggs or more in each nest and, thus, can produce 700 eggs or more per nesting season (Schultz 1975). However, up to approximately 30 percent of the eggs may be infertile. Thus, the actual proportion of eggs that can result in hatchlings is less than this seasonal estimate. After 60-65 days, leatherback hatchlings with white striping along the ridges of their backs and on the margins of the flippers emerge from the nest. Leatherback hatchlings are approximately 50-77 cm in length, with fore flippers as long as their bodies, and weigh approximately 40-50 g. Although leatherbacks forage in coastal waters, they appear to remain primarily pelagic through all life stages (Heppell et al. 2003). Eckert (1999) found that leatherback juveniles remain in waters warmer than 26ºC until they exceed 100 cm in length. The location and abundance of prey, including medusae, siphonophores, and salps, in temperate and boreal latitudes likely has 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 may also come into shallow waters to locate prey items.

Abundance and Trends

The status of the Atlantic leatherback population has been less clear than the Pacific population, which has shown dramatic declines at many nesting sites (Spotila et al. 2000, Santidrian Tomillo et al. 2007, Sarti Martinez et al. 2007). 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), a lesser degree of nest-site fidelity than occurs with the hardshell sea turtle species, and inconsistencies in the availability and analyses of data. However, coordinated efforts at data collection and analyses by the Leatherback Turtle Expert Working Group 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 the vast majority of the nesting occurring in the Guianas and Trinidad. Past analyses had shown that the nesting aggregation in French Guiana had been declining at about 15 percent per year since 1987 (NMFS SEFSC 2001). However, from 1979-1986, the number of nests was increasing at about 15 percent annually, which could mean that the observed decline could be part of a nesting cycle that coincides with the erosion cycle of Guiana beaches described by Schultz (1975). It is thought that the cycle of erosion and reformation of beaches has resulted in shifting nesting beaches throughout this region. This was supported by the increased nesting seen in Suriname, where leatherback nest numbers had shown large increases concurrent with declines elsewhere (with more than 10,000 nests per year since 1999 and a peak of 30,000 nests in 2001), and the long-term trend for the overall Suriname and French Guiana population was thought to possibly show an increase (Girondot 2002 in Hilterman and Goverse 2003). In the past, many sea turtle scientists have agreed that the Guianas (and some would include Trinidad) should be viewed as one population and that a synoptic evaluation of nesting at all beaches in the region is necessary to develop a true picture of population status (Reichart et al. 2001). Genetics studies have added support to this notion and have resulted in the designation of the Southern Caribbean/Guianas stock. Using both Bayesian modeling and regression analyses, the TEWG (2007) determined that the Southern Caribbean/Guianas stock had demonstrated a long-term, positive population growth rate (using nesting females as a proxy for population). This positive growth was seen within major nesting areas for the stock, including Trinidad, Guyana, and the combined beaches of Suriname and French Guiana (TEWG 2007).

The Western Caribbean stock includes nesting beaches from Honduras to Colombia. Within that range, nesting is most prevalent in Costa Rica, Panama, and the Gulf of Uraba in Colombia (Duque et al. 2000). The Caribbean coast 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 three index nesting beaches in the region (Tortuguero, Gandoca, and Pacuaré in Costa Rica) using various Bayesian and regression analyses indicated that the nesting population likely was not growing over the 1995-2005 time series of available data (TEWG 2007). Other modeling of the nesting data for Tortuguero indicates a possible 67.8 percent decline between 1995 and 2006 (Troëng et al. 2007).

Nesting data for the Northern Caribbean stock is available from Puerto Rico, St. Croix (USVI), 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 percent (TEWG 2007). At the primary nesting beach on St. Croix, the Sandy Point National Wildlife Refuge, nesting has fluctuated from a few hundred nests to a high of 1,008 in 2001, and the average annual growth rate has been approximately 1.1 percent from 1986-2004 (TEWG 2007). 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 percent 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 percent between 1989 and 2005. In 2007, a record 517 leatherback nests were observed on the index beaches in Florida, followed by 265 nests in 2008, a record 615 nests in 2009, a slight decline to 552 nests in 2010, and then a new record of 625 nests in 2011 (FWC Index Nesting Beach Survey Database). 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, but overall the trend shows rapid growth on Florida's east coast beaches.

The West African nesting stock of leatherbacks is a large, important, but 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. However, it is known that Gabon has a very large amount of leatherback nesting, with at least 30,000 nests laid along its coast in one season (Fretey et al. 2007). Fretey et al. (2007) also 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 nesting stocks utilize the beaches of Brazil and South Africa. For the Brazilian stock, the TEWG (2007) analyzed the available data and determined that between 1988 and 2003 there was a positive annual average growth rate of 1.07 percent using regression analyses and 1.08 percent using Bayesian modeling. The South African stock has an annual average growth rate of 1.06 based on regression modeling and 1.04 percent using the Bayesian approach (TEWG 2007).

Estimates of total population size for Atlantic leatherbacks are difficult to ascertain due to the inconsistent nature of the available nesting data. In 1996, the entire Western Atlantic population was characterized as stable at best (Spotila et al. 1996), with numbers of nesting females reported to be on the order of 18,800. A subsequent analysis by Spotila. (Spotila et al. 2000) indicated that by 2000, the Western Atlantic nesting levels had decreased to about 15,000 females. Spotila et al. (Spotila et al. 1996) estimated that the leatherback population for the entire Atlantic basin, including all nesting beaches in the Americas, the Caribbean, and West Africa, totaled approximately 27,600 adult females (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 (TEWG 2007).

Threats

Anthropogenic impacts to the leatherback population are similar to those facing other sea turtle species including interactions with fishery gear, marine pollution, destruction of foraging habitat, and threats to nesting beaches (see loggerhead status and trends section for more information on these threats). Of all the extant sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear, especially gillnet and pot/trap lines used in various fisheries around the world. This susceptibility may be the result 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). For many years, the TEDs required in many U.S. fisheries were less effective at excluding the larger leatherback sea turtles compared to the smaller, hard-shelled turtle species. However, modifications to the design of TEDs have been required since 2003 that are expected to have reduced the amount of leatherback deaths that result from net capture. 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. 1997, Shoop and Kenney 1992).

Investigations of the stomach contents of leatherback sea turtles revealed that a substantial percentage (44 percent of the 16 cases examined) contained some form of plastic debris (Mrosovsky 1981). 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 object might resemble a food item by its shape, color, size or even movement as it drifts about, and induce a feeding response in leatherbacks. Just as with other sea turtles, nesting and foraging leatherback sea turtles are subjected to the effects from past and present oil spills occurring in the Gulf of Mexico and other regions (see loggerhead sea turtle status section for more information). At the time of this consultation, no confirmed deaths of leatherbacks have been recorded in the vicinity of the DWH spill site, although this does not mean that no mortality has occurred. In addition to direct contact, ingestion of oil-contaminated prey items represents a particular threat to leatherbacks emanating from the DWH spill in the Gulf of Mexico and this may continue to be a threat to recovery in the years ahead.

As discussed in more detail in the loggerhead section of the original SHEP opinion, 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. 2006, Witt et al. 2007); however, more studies need to be done to monitor how changes to prey items affect distribution and foraging success of leatherbacks so that population-level effects can be determined.

4 Environmental Baseline

By regulation, environmental baselines for opinions include the past and present impacts of all state, federal, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02).

This section contains a description of the effects of past and ongoing human factors leading to the current status of the species, their habitat, and ecosystem within the action area. The environmental baseline is a snapshot of the factors affecting the species and includes state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. Unrelated future federal actions affecting the same species that have completed consultation are also part of the environmental baseline, as are implemented and ongoing federal and other actions within the action area that may benefit listed species. The purpose of describing the environmental baseline in this manner is to provide context for the effects of the proposed action on the listed species.

4.1 Status and Distribution of Sea Turtles in the Action Area

The green and leatherback sea turtles that occur in the action area are highly migratory, as are all sea turtle species worldwide. NMFS believes that no individual members of any sea turtle species are likely to be year-round residents of the action area. Individual animals will make migrations into nearshore waters as well as other areas of the North Atlantic Ocean, including the Gulf of Mexico and the Caribbean Sea. Therefore, the status of the green and leatherback sea turtles in the Atlantic (see Section 3) most accurately reflects the species' status within the action area.

4.1.1 Factors Affecting Sea Turtles in the Action Area

The proposed project is located off Georgia, within the Savannah Harbor Entrance Channel. The following analysis examines actions that may affect these species' environment specifically within the defined action area.

Please refer to the original opinion for a detailed description of the action area.

4.1.1.1 Federal Actions

In recent years, NMFS has undertaken several ESA 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 impacts of the action on sea turtles. Similarly, NMFS has undertaken recovery actions under the ESA to address sea turtle takes in the fishing and shipping industries and other activities such as USACE dredging operations. The summaries below address anticipated sources of incidental take of sea turtles and includes only those federal actions in or near the action area that have already concluded or are currently undergoing formal Section 7 consultation.

Federal Vessel Activity and Operations

Potential sources of adverse effects from federal vessel operations in the action area include operations of the USN and USCG, the EPA, NOAA, and the USACE. NMFS has conducted formal consultations with the USCG, the USN, and NOAA on their 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. Refer to the biological opinions for the USCG (NMFS 1995) and the USN (NMFS 1996, 1997a) for details on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures.

Dredging

The construction and maintenance of federal navigation channels and sand mining sites ("borrow areas") has been identified as a source 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 of the advancing dredge overtakes the resting or swimming turtle. Entrained sea turtles rarely survive. NMFS completed a regional biological opinion on the impacts of USACE's South Atlantic coast hopper-dredging operations in 1997 for dredging in the USACE's South Atlantic Division (NMFS 1997b). The regional biological opinion on South Atlantic hopper dredging (SARBO) of navigational channels and borrow areas determined that dredging there would not adversely affect leatherback sea turtles. The opinion did determine hopper dredging in the South Atlantic Division (i.e., coastal states of North Carolina through Key West, Florida, would adversely affect four sea turtle species (i.e., green, hawksbill, Kemp's ridley, and loggerheads) but would not jeopardize their continued existence. An ITS for those species was issued. Reinitiation of the SARBO will address leatherback (and other species) take by relocation trawlers used to minimize sea turtle take by hopper dredges (R. Hendren, NMFS, pers. comm. to K. Davy, NMFS, July 2013).

ESA Permits

Regulations developed under the ESA allow for the issuance of permits allowing take of certain ESA-listed species for the purposes of scientific research under Section 10(a)(1)(a) of the ESA. In addition, Section 6 of the ESA allows NMFS to enter into cooperative agreements with states to assist in recovery actions of listed species. Prior to issuance of these permits, the proposal must be reviewed for compliance with Section 7 of the ESA.

Sea turtles are the focus of research activities authorized by Section 10 permits under the ESA. As of January 2012, there were 26 active scientific research permits directed toward sea turtles that are applicable to the action area of this biological opinion. 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 nonlethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the species). In addition, since issuance of the permit is a federal activity, issuance of the permit by NMFS must also undergo an ESA Section 7 analysis to ensure the issuance of the permit does not result in jeopardy to the species.

4.1.1.2 Federally-Managed Fisheries Effects on Sea Turtles

Threatened and endangered sea turtles are adversely affected by several types of fishing gears used throughout the action area. Gillnet, longline, other types of hook-and-line gear, trawl gear, and pot fisheries have all been documented as interacting with sea turtles. Available information suggests sea turtles can be captured in any of these gear types when the operation of the gear overlaps with the distribution of sea turtles. For all fisheries for which there is an FMP or for which any federal action is taken to manage that fishery, 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: Atlantic shark, coastal migratory pelagic, dolphin/wahoo, South Atlantic snapper-grouper, and Southeast shrimp trawl. An ITS has been issued for the take of sea turtles in each of these fisheries.

HMS Atlantic Shark Fisheries
These fisheries include commercial shark bottom longline and gillnet fisheries and recreational shark fisheries under the FMP for Atlantic Tunas, Swordfish, and Sharks (HMS FMP). NMFS has consulted formally twice on effects of HMS shark fisheries on sea turtles (i.e., NMFS 2003b and NMFS 2008). Both bottom longline and gillnet are known to adversely affect sea turtles.

The most recent ESA Section 7 consultation was completed on May 20, 2008, on the continued operation of those fisheries and Amendment 2 to the Consolidated HMS FMP (NMFS 2008). The consultation concluded the proposed action was not likely to jeopardize the continued existence of sea turtles. An ITS was provided authorizing two takes (one of which could be lethal) of each species for green, hawksbill, and Kemp’s ridley every three years. The opinion also authorized the take of 74 (47 of which could be lethal) leatherback and 679 (346 of which could be lethal) loggerhead sea turtles.

Coastal Migratory Pelagics Fishery
NMFS recently completed a Section 7 consultation on the continued authorization of the coastal migratory pelagics fishery in the South Atlantic (NMFS 2007). Gillnets are the primary gear type used by commercial fishermen in the South Atlantic region, while the recreational sector uses hook-and-line gear. The hook-and-line effort is primarily trolling. The biological opinion for this fishery concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by operation of the fishery. However, the proposed action was not expected to jeopardize the continued existence of any of these species and an ITS was provided.

Dolphin/Wahoo Fishery
The South Atlantic FMP for the dolphin/wahoo fishery was approved in December 2003. The stated purpose of the Dolphin and Wahoo FMP is to adopt precautionary management strategies to maintain the current harvest level and historical allocations of dolphin (90 percent recreational) and ensure no new fisheries develop. NMFS conducted a formal Section 7 consultation to consider the effects on sea turtles of authorizing fishing under the FMP (NMFS 2003a). The August 27, 2003, opinion concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by the longline component of the fishery, but it was not expected to jeopardize their continued existence. An ITS for sea turtles was provided with the opinion.

South Atlantic Snapper-Grouper Fishery
A Section 7 consultation on the South Atlantic snapper-grouper fishery (NMFS 2006) was completed by NMFS. The fishery uses spear and powerheads, black sea bass pot, and hook-and-line gear. Hook-and-line gear used in the fishery includes commercial bottom longline gear and commercial and recreational vertical line gear (e.g., handline, bandit gear, and rod-and-reel). The consultation found only hook-and-line gear likely to adversely affect, green, hawksbill, Kemp's ridley leatherback, and loggerhead sea turtles. The consultation concluded the proposed action was not likely to jeopardize the continued existence of any of these species, and an ITS was provided.

Southeastern Shrimp Trawl Fisheries
Southeast shrimp fisheries operating off Georgia target primarily brown and white shrimp in nearshore waters through the state-regulated territorial seas and in federal waters of the EEZ. As sea turtles rest, forage, or swim on or near the bottom, they are captured by shrimp trawls pulled along the bottom. In 1990, the National Research Council (NRC) concluded that the Southeast shrimp trawl fisheries affected more sea turtles than all other activities combined and was the most significant anthropogenic 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 1990).

On May 9, 2012, NMFS completed an opinion which analyzed the continued implementation of the sea turtle conservation regulations and the continued authorization of the Southeast U.S. shrimp fisheries in federal waters under the Magnuson-Stevens Act (NMFS 2012). The opinion also considered a proposed amendment to the sea turtle conservation regulations that would withdraw the alternative tow time restriction at 50 CFR 223.206(d)(2)(ii)(A)(*3*) for skimmer trawls, pusher-head trawls, and wing nets (butterfly trawls) and instead require all of these vessels to use turtle excluder devices (TEDs). The opinion concluded that the proposed action would not jeopardize the continued existence of any sea turtle species. An ITS was provided that used trawl effort and capture rates as proxies for sea turtle take levels. The biological opinion requires NMFS to minimize the impacts of incidental takes through monitoring of shrimp effort and regulatory compliance levels, conducting TED training and outreach, and continuing to research the effects of shrimp trawling on listed species. Consultation for this fishery has recently been reinitiated.

4.1.1.3 State or Private Actions

Maritime Industry

Private and commercial vessels, including fishing vessels, operating in the action area of this consultation also have the potential to interact with ESA-listed species. The effects of fishing vessels, recreational vessels, or other types of commercial vessels on listed species may involve disturbance or injury/mortality due to collisions or entanglement in anchor lines. Commercial traffic and recreational pursuits can also adversely affect sea turtles through propeller and boat strikes. The Sea Turtle Stranding and Salvage Network (STSSN) includes many records of vessel interaction (propeller injury) with sea turtles where there are high levels of vessel traffic. The extent of the problem is difficult to assess because of not knowing whether the majority of sea turtles are struck pre- or post-mortem. It is important to note that minor vessel collisions may not kill an animal directly, but may weaken or otherwise affect it so it is more likely to become vulnerable to effects such as entanglements. NMFS and the USCG have completed several formal consultations on individual marine events that may affect sea turtles.

Coastal Development

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

State Fisheries

Commercial state fisheries are located in the nearshore habitat areas that comprise the action area. Recreational fishing from private vessels also occurs in the area. Observations of state recreational fisheries have shown that loggerhead sea turtles are known to bite baited hooks and frequently ingest the hooks. Hooked turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001). Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

In August of 2007, NMFS issued a regulation (72 FR 43176, August 3, 2007) to require any fishing vessels subject to the jurisdiction of the United States to take observers upon NMFS's request. The purpose of this measure is to learn more about sea turtle interactions with fishing operations, to evaluate existing measures to reduce sea turtle takes, and to determine whether additional measures to address prohibited sea turtle takes may be necessary.

4.1.1.4 Other Potential Sources of Impacts in the Environmental Baseline

Marine Pollution
The development of marinas and docks in inshore waters can negatively impact nearshore habitats. 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 nearshore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

Fuel oil spills could affect animals directly or indirectly through the food chain. Fuel spills involving fishing vessels are common events. However, these spills typically involve small amounts of material. Larger oil spills may result from accidents, although these events would be rare. No direct adverse effects on listed species resulting from fishing vessel fuel spills have been documented.

Nutrient loading from land-based sources, such as coastal communities and agricultural operations stimulate plankton blooms in closed or semi-closed estuarine systems
There are studies on organic contaminants and trace metal accumulation in green and leatherback sea turtles (Aguirre et al. 1994, Caurant et al. 1999, Corsolini et al. 2000). Mckenzie et al. (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in sea turtles tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with sea turtle size were observed in green turtles, most likely attributable to a change in diet with age. Sakai et al. (1995) documented the presence of metal residues occurring in loggerhead sea turtle organs and eggs. Storelli et al. (1998) analyzed tissues from 12 loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals, and porpoises (Law et al. 1991). No information on detrimental threshold concentrations is available and little is known about the consequences of exposure of organochlorine compounds to sea turtles. Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

Acoustic Impacts
Acoustic impacts can include temporary or permanent injury, habitat exclusion, habituation, and disruption of other normal behavior patterns. NMFS and the U.S. Navy are working cooperatively to assess military acoustic impacts (e.g., mid-range sonar) along the east coast of the United States (i.e., primarily North Carolina through Florida). Although focused on marine mammals, sea turtles may benefit from increased research on acoustics and reduction in noise levels.

Climate Change

Climate change at normal rates (thousands of years) was not historically a problem for sea turtles species since they have shown unusual persistence over a scale of millions of years. However, there is a 90 percent probability that warming of Earth's atmosphere since 1750 is due to human activities resulting in atmospheric increases in carbon dioxide, methane, and nitrous oxide (IPCC 2007). All reptiles including sea turtles have a tremendous dependence on their thermal environment for regulating physiological processes and for driving behavioral adaptations (Spotila et al. 1996). In the case of sea turtles, where many other habitat modifications are documented (beach development, loss of foraging habitat, etc.), the prospects for accentuated synergistic impacts on survival of the species may be even more important in the long-term. Atmospheric warming creates habitat alteration which may change sex ratios, reproductive periodicity, marine habitats, or prey resources such as crabs and other invertebrates. It may increase hurricane activity leading to an increase in debris in nearshore and offshore waters, resulting in increase in entanglement, ingestion, or drowning. Atmospheric warming may change convergence zones, currents and other oceanographic features that are relevant to various sea turtles' life stages.

4.1.1.5 Conservation and Recovery Actions Benefiting Sea Turtles

NMFS and cooperating states have established an extensive network of STSSN 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. Outreach programs have been established and data on sea turtle interactions with recreational fisheries has been collected through the Marine Recreational Fishery Statistical Survey (MRFSS)/Marine Recreational Information Program.

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.

Outreach and Education, Sea Turtle Entanglement, and Rehabilitation

There is an extensive network of STSSN participants along the Atlantic coast who not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles.

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)].

Other Actions
A revised recovery plan for the loggerhead sea turtle was issued January 16, 2009 (NMFS and USFWS 2008). A binational recovery plan for the Kemp's ridley sea turtle was completed in September 2011 (NMFS et al. 2011). Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising these plans based upon the latest and best available information.

Five-year status reviews were completed for green, Kemp's ridley, leatherback, and hawksbill sea turtles in 2007 (NMFS and USFWS 2007b, NMFS and USFWS 2007e, NMFS and USFWS 2007c, NMFS and USFWS 2007d); NMFS has reinitiated 5-year status reviews for these species. The most recent status review for loggerhead sea turtles was completed in 2009 (Conant et al. 2009). These reviews were conducted to comply with the ESA mandate for periodic status evaluation of listed species to ensure that their threatened or endangered listing status remains accurate. Each review determined that no delisting or reclassification of a species status (i.e., threatened or endangered) was warranted at this time. However, further review of species data for the green, hawksbill, and leatherback sea turtles was recommended, to evaluate whether DPSs should be established for these species. The Services published a final rule on September 22, 2011, listing loggerhead sea turtles as nine separate DPSs.

5 Effects of the Action

This section of the opinion has been amended to include our assessment of the effects of the proposed action on green sea turtles and leatherback sea turtles. The analysis in this section forms the foundation for our jeopardy analysis in Section 7.0. A jeopardy determination is reached if we would reasonably expect the proposed action to cause reductions in numbers, reproduction, or distribution that would appreciably reduce listed species' likelihood of surviving and recovering in the wild.

5.1 Dredging

The potential for adverse effects of dredging operations on sea turtles has been previously assessed by NMFS (NMFS 1991, 1995, 1997a, 1997b, 2003b) in the various versions of the SARBO and the 2003 (revised in 2005 and 2007) Gulf of Mexico Regional Biological Opinion (GRBO). Additionally, the USACE prepared a comprehensive analysis of data from Gulf and Atlantic hopper dredging projects to identify factors affecting sea turtle take rates (Dickerson et al. 2007). Furthermore, the USACE maintains an online Sea Turtle Data Warehouse (USACE 2013) with historical records of dredging projects and turtle interactions. These are the primary sources, discussed further below, for our analysis of dredging effects on sea turtles.

Mechanical (Clamshell/Bucket Dredges) and/or Cutterhead Dredging
The project may affect sea turtles by injury or death as a result of interactions with equipment or materials used during dredging; however, NMFS believes the chance of injury or death from interactions with clamshell/bucket and/or hydraulic cutterhead dredging equipment is discountable as these species are highly mobile and are likely to avoid the areas during construction. NMFS has received very few reported sea turtle takes associated with these dredging methods. In the South Atlantic region only one sea turtle has been taken by a clamshell

dredge in over more than 20 year. Due to the infrequency of interactions with these gear types, NMFS believes that the likelihood of sea turtles being taken by a hydraulic cutterhead or a clamshell dredge is discountable.

Hopper Dredging

Hopper dredging was implicated in the mortality of South Atlantic endangered and threatened sea turtles as early as the late 1970s and in NMFS's opinions issued in 1979, 1980, and others leading to the RBO issued in 1991. This determination was repeated in the 1995 and 1997 SARBOs (NMFS 1995, 1997a, 1997b) and the 1995 and 2003 GRBOs. The measures established in consecutive RBOs (NMFS 1991, 1995, 1997a) to avoid and minimize sea turtle interactions during hopper dredging operations permitted by the USACE in the southeastern United States are included in this project, with the exception of modifications to dredge timing (i.e., "dredging window") and conditions of/requirements for capture-type relocation trawling.

To date, use of hopper dredges in USACE activities in northeast Florida and Georgia has been limited under the 1997 RBO to operating between December 1 through April 15, except in emergency situations, due to the presumption that the potential for lethal and injurious take of sea turtles by hopper dredges would be lower during winter periods of lower seasonal abundance. However, recent data analysis of hopper dredging projects from 1995-2008 by the USACE indicates that documented sea turtle take rates in projects from Georgia and the east coast of Florida are lower (on both a turtles-taken-per-project basis and turtles-taken-per-day basis) during May through November (when hopper dredging is discouraged) than during December through April, which is the NMFS-recommended dredging window. Turtles are typically more abundant during the warm summer months but may not spend large amounts of time on or in the bottom sediments and may need to surface more often to breathe due to increased activity. Turtles resting on or in bottom sediments are more vulnerable to dredge entrainment than turtles swimming in the water column above the draghead. Although increased numbers of sea turtles are known to be encountered between June and September (peak nesting season), they may be less vulnerable to entrainment because of their biological requirements (e.g., reproductive activities, reduced feeding, increased metabolism), mandating them to spend more time in the upper water column, where they are not vulnerable to suction draghead entrainment. Given this evidence and rationale, hopper dredging conducted during December 1 through March 31 may result in more takes than during the summer dredging.

Savannah Harbor Entrance Channel

Based on the results of the 2012 maintenance dredging of Savannah and Brunswick harbors and the 2013 Brunswick Harbor bed leveler evaluation (USACE 2013a), green sea turtles and leatherback sea turtles may be taken by hopper dredging/relocation operations of this project. We anticipate yearly incidental take, by injury or mortality, will consist of one green sea turtle being observed (and counted) by onboard protected species observers as lethally taken during the proposed hopper dredging in the Savannah Harbor Entrance Channel. This estimate is based on the use of only hopper dredges for the entire project and represents mortality *detected* by onboard observers.

The NMFS-approved onboard observers monitor dredged material inflow and overflow screening baskets on many hopper dredging projects, and observers will be required to monitor the proposed action. Dredged material screening, however, is only partially effective, and observed takes likely provide only partial estimates of total sea turtle mortality. NMFS believes that some turtles killed by hopper dredges go undetected because body parts are forced through the sampling screens by water pressure and are buried in the dredged material, or animals are crushed or killed but their bodies or body parts are not entrained by the suction and so the takes may go unnoticed. The only mortalities that are noticed and documented are those where body parts float, are large enough to be caught in the screens, and can be identified as sea turtle parts. Body parts that are forced through the 4-inch (or greater) inflow screens of the suction dragheads by the suction-pump pressure and that do not float are very unlikely to be observed, since they will sink to the bottom of the hopper and not be detected by the overflow screening. Unobserved takes are not documented, thus, observed takes may under-represent actual lethal takes. It is not known how many turtles are killed but unobserved. Because of this, in the GRBO (NMFS 2003b), in making its jeopardy analysis, NMFS estimated that up to one out of two impacted turtles may go undetected (i.e., that observed take constituted only about 50 percent of total take). That estimate was based on region-wide (overall Gulf of Mexico) hopper dredging projects including navigation channel dredging and sand borrow area dredging for beach renourishment projects, year-round, including seasonal windows when no observers are required, times when 100 percent coverage is required, and times when only 50 percent observer coverage is required (i.e., at sand borrow sites). The proposed December 1 through March 31 dredging of the Savannah Harbor Entrance Channel will include 100 percent observer coverage for the duration of work, which is estimated to last three years. Since the 100 percent observer coverage that will be required for the proposed dredging action is twice as intensive (and theoretically, twice as effective) as the 50 percent observer coverage requirement of the 2003 GRBO, NMFS believes that a significantly greater number of turtles will be detected with 100 percent observer coverage than with just 50 percent observer coverage (i.e., one of two turtles), but that a significant number of turtle parts will still pass through the screens undetected. In NMFS's January 7, 2009, Mayport Ship Channel hopper dredging biological opinion to the U.S. Navy, under similar circumstances to the proposed action (i.e., it also required 100 percent observer coverage year-round), NMFS estimated that approximately 66 percent (two out of three entrained turtles or turtle parts) would be observed/documented by shipboard protected species observers. More recently, NMFS's biological opinion to the USACE's Galveston District on the Freeport Harbor Navigation Channel widening and deepening project (also with 100 percent observer coverage) again anticipated that approximately 66 percent of entrained turtles would be detected. Now, similarly, NMFS estimates that observers on the proposed project will detect approximately two of every three turtles entrained. This estimate is based on the use of 100 percent observer coverage, the best available empirical evidence, years of hopper dredging experience and observer reports, and the commonality of the 100 percent observer requirement with previous dredging consultations under similar conditions. This opinion estimates that observers will detect and record approximately 66.6 percent of total mortality (i.e., two of every three turtles killed by the dredge will be detected, observed, and tallied by onboard observers), resulting in an additional estimated two green sea turtles taken, but not detected, for a total of five green sea turtles lethally taken by the dredge over the course of the three years of project dredging.

As with previous NMFS biological opinions on hopper dredging, our subsequent jeopardy analysis is necessarily based on our knowledge (in this case, our best estimate) of the total number of turtles that will be lethally taken, which includes those that are killed but not observed. Our best estimate of turtles lethally taken will be the sum of the observed and unobserved takes, i.e., those observed and documented by onboard protected species observers, plus those unobserved, undocumented lethal takes (because the turtles/turtle parts were either not entrained, or were entrained but were not seen/counted by onboard protected species observers).

Our Incidental Take Statement (ITS), is based on observed takes, not only because observed mortality gives us an estimate of unobserved mortality, but because observed, documented take numbers serve as triggers for some of the reasonable and prudent measures, and for potential reinitiation of consultation if actual observed takes exceed the anticipated/authorized number of observed takes. Furthermore, our ITS level of anticipated/authorized lethal takes assumes ongoing sea turtle relocation trawling, since it is an integral and important part of the proposed action. Without the implementation of relocation trawling, mortalities resulting from hopper dredge activities could be higher.

A very few turtles (over the years, a fraction of a percent) survive entrainment in hopper dredges, usually smaller juveniles that are sucked through the pumps without being dismembered or badly injured. Often they will appear uninjured only to die days later of unknown internal injuries, while in rehabilitation. Experience has shown that the vast majority of hopper-dredge impacted turtles are immediately crushed or dismembered by the violent forces they are subjected to during entrainment. Therefore, we are conservatively predicting that all takes by hopper dredges will be lethal.

5.2 Modified Bed-Leveling Activities

Bed-leveling is often associated with hopper dredging (and other types of dredging) operations, and may be utilized in this project. Bed-leveling "dredges" do not use suction; they redistribute sediments, rather than removing them. Plows, I-beams, or other seabed-leveling mechanical dredging devices are often used for cleanup operations, i.e., to lower high spots left in channel bottoms and dredged material deposition areas by hopper dredges or other type dredges. Leveling devices typically weigh about 30 to 50 tons, are fixed with cables to a derrick mounted on a barge pushed or pulled by a tugboat at about one to two knots. Some evidence indicates that bed leveling devices may be responsible for occasional sea turtle mortalities (NMFS 2003). Sea turtles may be crushed as the leveling device passes over a turtle which fails to move or is not pushed out of the way by the sediment "wave" generated by and pushed ahead of the device. Sea turtles in Georgia waters may have been crushed and killed in 2003 by bed-leveling which commenced after the hopper dredge finished its work associated with the Brunswick Harbor Entrance Channel dredging. The local sea turtle stranding network reported documented stranded crushed sea turtles in the area where the bed-leveler dredge was working, within days after the dredge was in the area. Brunswick Harbor is also one of the sites where sea turtles captured by relocation trawlers sometimes show evidence of brumating (over-wintering) in the muddy channel bottom, which could explain why, if sea turtles were in fact crushed by bed-leveler type dredges (there is no proof, but it is the most likely explanation), they failed to react quickly enough to avoid the bed-leveler. Bed-leveler use at other dredging operations has not resulted in observed or documented sea turtle mortalities; therefore, the best available evidence points to occasional potential interactions to brumating sea turtles at Brunswick. All things considered, the use of bed-levelers is probably preferable (less likely to result in sea turtle interactions) to the use of hopper dredges for cleanup operations, since turtles foraging, resting, or brumating on irregular bottoms are probably more likely to be entrained by suction dragheads than crushed by bed-levelers, because (1) sea turtle deflector dragheads are less effective on uneven bottoms; (2) hopper dredges move considerably faster than bed-leveler “dredges;” and (3) bed-levelers do not use suction.

The project proposes to authorize their use only in the Bar Channel. Furthermore, their use would be restricted to the leveling of high spots in the channel or placement area, where the use of a hopper dredge for such work would be expected to result in equal or greater take of endangered species. Proposed modifications (i.e., integrated deflector configurations) to traditional bed-levelers are expected to reduce their unknown (but thought to be discountable) potential to impact non-brumating sea turtles. NMFS believes it is unlikely that turtles may be adversely affected by potential bed-leveling activities during “high-spot cleanup” during the proposed action. However, if injurious or lethal bed-leveler interactions appear to have occurred, based on reports of stranded turtles, they shall be immediately reported to NMFS. Any such takes shall not be counted against the total lethal takes allowed by the Incidental Take Statement of this opinion. In addition, unobserved takes have already been accounted for in our total take estimates (see RPMs, Term and Condition No. 6), as discussed in the preceding section (5.1.1).

5.3 Relocation Trawling

The function and purpose of capture relocation trawling is to capture sea turtles that may be in the dredge’s path. By reducing the sea turtle density immediately in front of the dredge’s suction dragheads, the potential for draghead-turtle interactions is reduced. The relocation trawler typically pulls two standard (60-foot headrope) shrimp trawl nets, as close as safely possible in front of the advancing hopper dredge. The trawler also continues sweeping the area to be dredged (channels or borrow areas) even while the hopper dredge is not actively dredging, e.g., when it is enroute to the Ocean Dredged Material Disposal Site (ODMDS) or pumpout station. Relocation trawling has been successful at temporarily displacing Kemp’s ridley, loggerhead, leatherback, and green sea turtles from channels in the Atlantic Ocean and Gulf of Mexico during periods when hopper dredging was imminent or ongoing (Dickerson et al. 2007). Historically, NMFS has required relocation trawling be used to reduce potential turtle take by the dredge, by capturing the turtle in a modified shrimp net, bringing it onboard the trawler, and transporting it approximately 3-5 miles from the dredging where it is released into the ocean. Dickerson et al. (2007) analyzed historical data for USACE dredging projects in the Atlantic Ocean and Gulf of Mexico and concluded that relocation trawling is effective at reducing the rate of sea turtle entrainment by hopper dredges. Dickerson et al. (2007) also found that the effectiveness of relocation trawling was increased when the trawling was initiated at the beginning or early in the project and by the intensity of trawling effort (i.e., more time trawling per hour). Dickerson et al. (2007) noted that when a relocation trawler is used – whether or not turtles are actually captured – the incidence of lethal sea turtle take by hopper dredges decreases. Dickerson concluded that the action of the trawl gear on the bottom results in stimulating turtles off the bottom and into the water column, where they are no longer likely to be impacted by the suction draghead of a hopper dredge. The effects of relocation trawling on sea turtles will be further discussed below.

Effects of Recapturing of Sea Turtles during Relocation Trawling

Some sea turtles captured during relocation trawling operations return to the dredge site and subsequently are recaptured. For example, sea turtle relocation studies by Standora et al. (1993) at Canaveral Channel, Florida, relocated 34 turtles to six release sites of varying distances north and south of the channel. Ten turtles returned from southern release sites, and seven from northern sites, suggesting that there was no significant difference between directions. The observed return times from the southern release sites suggested a direct correlation between relocation distance and likelihood of return or length of return time to the channel. No correlation was observed between the northern release sites and the time or likelihood of return. The study found that relocation of turtles to the site 70 km (43 miles) south of the channel would result in a return time of over 30 days.

Over a 7-day period in February 2002, REMSA, a private company contracted to conduct relocation trawling, captured, tagged, and relocated 69 turtles (55 loggerheads and 14 greens) from Canaveral Channel, Florida, with no recaptures; turtles were relocated a minimum of three to four miles away (T. Bargo, REMSA, pers. comm. to E. Hawk, NMFS, June 2, 2003). Twenty-four hour per day relocation trawling conducted by REMSA at Aransas Pass Entrance Channel (Corpus Christi Ship Channel) from April 15, 2003, to July 7, 2003, resulted in the relocation of 71 turtles (56 loggerheads, 15 Kemp's ridleys, and one leatherback) between 1.5 and 5 miles from the dredge site, with three recaptures, all loggerheads (T. Bargo, REMSA, pers. comm. to E. Hawk, NMFS, July 24, 2003). One turtle released on June 14, 2003, approximately 1.5 miles from the dredge site, was recaptured four days later at the dredge site; another turtle captured June 9, 2003, and released about three miles from the dredge site was recaptured nine days later at the dredge site. Subsequent releases occurred five miles away. Of these 68 subsequent capture/releases, one turtle released on June 22, 2003, was recaptured 13 days later (REMSA Final Report, Sea Turtle Relocation Trawling, Aransas Pass, Texas, April-July 2003) at the dredge site. Post DWH oil spill, over 15 days of dredging and associated turtle relocation trawling conducted between July 9 and 23, 2010, for the construction of 35 miles of oil-barrier sand-berms at Hewes Point, Chandeleur Islands, Louisiana, resulted in 194 sea turtle trawl-captures and relocations (185 loggerheads, eight Kemp's ridleys, and one green), with 11 turtles recaptured (all loggerheads) at the sand borrow site after being relocated at least three miles away from the dredge site (L. Brown, USACE, pers. comm. via e-mail to E. Hawk, NMFS, February 22, 2011). Table 10 below compares the various recapture rates for relocation trawling.

More recently, from April 11-June 11, 2011, at the Longboat Key beach nourishment project, 23 sea turtles were captured and relocated (20 loggerheads, two Kemp's, and one green). One, a large, sexually-mature male loggerhead, was captured at the borrow site (and relocated) three times, released each time at least three to five miles away from the capture site, each time in a different compass direction from the borrow site. After the last recapture, the turtle was released with a satellite transmitter attached (E. Hawk, NMFS, pers. comm. June 13, 2011).

Table 1. Comparison of Recapture Rates for Relocation Trawling

Number of Turtles Released/Relocated	Relocation Distance from dredge site	Number of Turtles Recaptured	Recapture Timing	Citation
34	43 miles (Southern release site)	10	> 30 days	Standora et al. (1993)
69	Minimum 3-4 miles	0	N/A	T. Bargo, REMSA, pers. comm. to E. Hawk, NMFS, June 2, 2003
71	1.5-5 miles	3	4-13 days	REMSA Final Report, Sea Turtle Relocation Trawling, Aransas Pass, Texas, April-July 2003
194	Minimum 3 miles	11	15 days	L. Brown, USACE, pers. comm. via e-mail to E. Hawk, NMFS, February 22, 2011

Effects of Trawl Capture on Sea Turtles

The capture and handling of sea turtles can result in raised levels of stressor hormones, and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research trawls for turtles, these physiological effects are expected to dissipate within a day (Stabenau and Vietti 1999). During the course of 1,600 days of relocation trawling at Wilmington, North Carolina; Kings Bay and Savannah, Georgia; Pensacola, Florida; and Texas channels (Sabine Pass, Galveston, Freeport, Matagorda Pass, and Corpus Christi), Coastwise Consulting, Inc. successfully captured, tagged, and released over 770 loggerhead, Kemp's ridley, green, and hawksbill, and leatherback sea turtles (C. Slay, Coastwise Consulting, pers. comm. via e-mail to E. Hawk, NMFS, January 25, 2007). Only one turtle mortality was documented, a leatherback. It was attributed to illegal artificial reef material deployed within a designated borrow area. The trawl net that captured the leatherback got entangled on the reef material and the trawler was unable to haul its nets timely (within 42 minutes, as required by the GRBO). The turtle drowned before the net was able to be freed and brought to the surface. On the Atlantic coast, REMSA also successfully tagged and relocated over 140 turtles in the last several years, most notably, 69 turtles (55 loggerheads and 14 greens) in a 7-day period at Canaveral Channel in October 2002, with no significant injuries. Other sea turtle relocation contractors (R. Metzger in 2001; C. Oravetz in 2002) have also successfully and non-injuriously trawl-captured and released sea turtles out of the path of oncoming hopper dredges. In 2003 in the Gulf of Mexico, REMSA captured, tagged, and relocated 71 turtles at Aransas Pass, Texas, with no apparent long-term ill effects to the turtles. Three injured turtles captured were transported to University of Texas Marine Science Institute rehabilitation facilities for treatment (two had old, non-trawl related injuries or wounds; the third turtle may have sustained an injury to its flipper, apparently from the door chain of the trawl, during capture). Three of the 71 captures were recaptures and were released around 1.5, 3, and 5 miles, respectively, from the dredge site; none exhibited any evidence their capture, tag, release, and subsequent recapture, was in any way detrimental (T.

Bargo, REMSA, pers. comm. to E. Hawk, NMFS, June 2, 2003. Given that sea turtle recaptures are relatively infrequent, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects from recapture are not expected.

Relocation Trawl Tow-Time Effects on Sea Turtles

The Gulf and South Atlantic Fisheries Development Foundation's August 31, 1998, "Alternatives to TEDs: Final Report" study presents data on 641 South Atlantic shallow trawl tows (only one tow was in water over 27.4 m), all conducted under restricted tow times (55 minutes during April through October and 75 minutes from November through March), and 584 Gulf of Mexico nearshore trawl tows conducted under the same tow-time restrictions of 55 and 75 minutes. Offshore effort in the Gulf of Mexico consisted of 581 non-time restricted tows, which averaged 7.8 hours per tow.

All totaled, 323 turtle observations were documented: 293 in the nearshore (time-restricted) South Atlantic efforts, and 30 in the Gulf efforts (24 in nearshore time-restricted tows and six in offshore time-unrestricted tows). Of the 293 South Atlantic turtles (219 loggerhead, 68 Kemp's ridley, five green, and one leatherback), only 274 were used in the analyses (201 loggerhead, 67 Kemp's ridley, five green, and one leatherback) because 12 escaped from the nets after being seen and seven were caught in try nets. Of the 274 South Atlantic turtles captured using restricted tow times, only five loggerheads and one Kemp's ridley died because of the interaction, a 2.2 percent fatality rate (six divided by 274).

For the Gulf efforts, 30 turtle observations/interactions (24 nearshore and six offshore) were recorded but just 26 turtles were included in the study's CPUE analysis (21 in nearshore and five in offshore), since some may have been previously dead (i.e., non-trawl-related). These 26 captures (eight loggerhead, 16 Kemp's ridley, and two green) resulted in three mortalities (one loggerhead nearshore, one loggerhead, and one green offshore). The nearshore restricted tow-time mortality rate was one of 21 nearshore captures, or 4.8 percent; the offshore non-restricted tow-time mortality rate was two of five offshore captures, or 40 percent. The latter figure is unsurprising, given the long, unrestricted tow times.

For purposes of our analysis on effects of relocation trawling, we excluded all the offshore tows and mortalities because they occurred under prolonged, non-restricted tow times which are not comparable to time-restricted relocation trawling methods. This leaves 1,225 time-restricted tows (584 in the nearshore Gulf of Mexico + 641 in the nearshore South Atlantic), resulting in 295 trawl-captured turtles (274 [South Atlantic nearshore]+ 21 [Gulf of Mexico nearshore]) resulting in seven mortalities (six in the South Atlantic and one in the Gulf of Mexico), i.e., 2.4 percent of the interactions (295 divided by 7) resulted in death. However, it must be remembered that the USACE-authorized relocation trawling tow time limit for conservation trawling in association with hopper dredging is much more conservative (in terms of allowable tow times) than the above study which used 55- and 75-minute allowable tow times. Those trawl tow times greatly exceed currently allowed trawl tow times. The USACE hopper dredging/relocation trawling protocol established by the USACE's South Atlantic Division limits allowable tow times to 30 minutes or less, which results in significantly lower sea turtle mortalities than 2.4 percent, as discussed below.

Sea Turtle Mortalities by Relocation Trawling

Since 1991, the USACE has documented more than 75 hopper-dredging projects in the South Atlantic and Gulf of Mexico where a trawler was used as part of the project, consisting of thousands of individual tows of relocation trawling nets. In addition, the USACE has also conducted or permitted abundance assessments and/or project-specific relocation trawling of sea turtles in navigation channels and sand borrow areas in the Southeast and Gulf of Mexico using commercial shrimp vessels equipped with otter trawls (Sea Turtle Data Warehouse; D. Dickerson 2007). On eight occasions a turtle has been lethally or injuriously taken by a relocation trawler (six in the Gulf of Mexico and two in the South Atlantic) over the same 20-year period (USACE Sea Turtle Warehouse; pers. comm.. T. Jordan, USACE, to E. Hawk, NMFS, May 23, 2011). Some of these incidents are described below.

Rarely, properly conducted relocation trawling can result in accidental sea turtle deaths, as the following examples illustrate. Henwood noted that trawl-captured loggerhead sea turtles died on several occasions during handling on deck during winter trawling in Canaveral Channel in the early 1980s, after short (approximately 30 minutes) tow times. However, Henwood (T. Henwood, NMFS SEFSC, pers. comm. to E. Hawk, NMFS, December 6, 2002) also noted that a significant number of the loggerheads captured at Canaveral during winter months appeared to be physically stressed and in “bad shape” compared to loggerheads captured in the summer months from the same site that appeared much healthier and robust.

In November 2002, during relocation trawling conducted in York Spit, Virginia, a Kemp’s ridley sea turtle was likely struck by one of the heavy trawl doors or it may have been struck and killed by another vessel shortly before trawl net capture. The hopper dredge was not working in the area at the time. Additionally, during relocation trawling conducted off Destin, Florida, on December 2, 2006, a leatherback turtle was captured and killed. However, this mortality by drowning occurred after the trawler encountered and entangled its trawl net on a large section of uncharted bottom debris, and was unable to retrieve it from the bottom for several hours (Dickerson et al. 2007). Over 15 days of dredging and associated turtle relocation trawling conducted between July 9 and 23, 2010, for the construction of 35 miles of oil-barrier sand-berms at Hewes Point, Chandeleur Islands, Louisiana, 194 sea turtles were trawl-captured, with three mortalities in 584 thirty-minute tows, or a 1.5 percent mortality rate (R. Crabtree, NMFS, letter to USACE, dated January 14, 2011). NMFS considers that this rate is unusually high, given the last two decades of relocation trawling experience. The reason for the unusually high level of relocation trawler turtle mortalities associated with the berm project is unknown. At Mayport Channel dredging in April 2011, a green turtle was drowned when it entangled in an improperly designed non-capture trawl net (non-capture trawl nets have typical tow times of 3-4 hours, since they are not designed to capture turtles).

Trawl Tow Time Limits

The National Research Council (NRC) report “Decline of the Sea Turtles: Causes and Prevention” (NRC 1990) suggested that limiting tow durations to 40 minutes in summer and 60 minutes in winter would yield sea turtle survival rates that approximate those required for the approval of new TED designs, i.e., 97 percent. The NRC report also concluded that mortality of turtles caught in shrimp trawls increases markedly for tow times greater than 60 minutes.

Current NMFS TED regulations allow, under very specific circumstances, for shrimpers with no mechanical-advantage trawl retrieval devices on board, to be exempt from TED requirements if they limit tow times to 55 minutes during April through October and 75 minutes from November through March. The presumption is that these tow time limits will result in turtle survivability comparable to having TEDs installed.

Current NMFS SER opinions typically limit tow times for relocation trawling to 42 minutes or less, measured from the time the trawl doors enter the water when setting the net to the time the trawl doors exit the water during haulback ("doors in – doors out"). This approximates 30 minutes of bottom-trawling time. As previously stated, the USACE limits authorized relocation trawling time in association with hopper dredging and its limit is at least as conservative (in terms of allowable tow times) as NMFS's; the USACE's current hopper dredging/relocation trawling protocol limits capture-trawling relocation tow times to 30 minutes or less, doors in to doors out. Overall, the significantly reduced tow times used by relocation trawling contractors, compared to those used during the 1998 studies on the effects of unrestricted, 55-minute, and 75-minute tow times, leads NMFS to conclude that current relocation trawling mortalities occur (and will continue to occur) at a much lower rate than 2.4 percent. Relocation trawling data bears this out strikingly: from October 2006, to July 2013, USACE dredging projects relocated 1,359 turtles in the Gulf of Mexico and South Atlantic. There were eight documented mortalities during those relocation events, or 0.6 percent overall (USACE Sea Turtle Data Warehouse, queried July 2013).

Total Impact of Relocation Trawling on Sea Turtles

NMFS believes that properly conducted and supervised relocation trawling (i.e., observing NMFS-recommended trawl speed and tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result in adverse effects (i.e., injury or death) to sea turtles. As discussed above, NMFS estimates that, overall, sea turtle trawling and relocation efforts will result in considerably less than 0.5 percent mortality of captured turtles, with any mortalities that do occur being primarily due to the turtles being previously stressed or diseased or struck by trawl doors or suffering accidents on deck during codend retrieval and handling. On the other hand, hopper dredge entrainments invariably result in injury, and are almost always fatal.

Even though relocation trawling involves the take (via capture, collection, and relocation) of sea turtles, it has constituted a legitimate RPM in past NMFS biological opinions on hopper dredging because it reduces the level of almost certain mortality of sea turtles by hopper dredges, and it allows the sea turtles captured non-injuriously by trawl to be relocated out of the path of the dredges. Without relocation trawling, the number of sea turtles mortalities resulting from hopper dredging would likely be significantly greater than the estimated number discussed above and specified in the ITS. The Consultation Handbook (for Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act, U.S. Fish and Wildlife Service and National Marine Fisheries Service, March 1998) expressly authorizes such directed take as an RPM at pages 4-54. Therefore, NMFS will in this section evaluate the expected number of sea turtles collected or captured during required relocation trawling, so that these numbers can be included in the evaluation of whether the proposed action will jeopardize the continued existence of the species.

The number of sea turtles collected or captured by trawlers in association with hopper dredging projects varies considerably by project area, amount of effort, and time of year. Additionally, sea turtle distribution can be very patchy, resulting in significant differences in number of turtle captures by relocation trawler, and in some areas, one species may dominate the captures. For example, Canaveral, Florida, is known for its abundance of green turtles; Calcasieu, Louisiana, for its almost exclusive capture of Kemp's ridleys; Brunswick, Georgia, and Mississippi-River Gulf Outlet, Louisiana, captures are predominantly loggerheads (E. Hawk, NMFS, pers. comm., June 13, 2011).

Since October 2011, of the 1,216 turtle captures by relocation trawler, the majority (1,145) occurred in the Gulf of Mexico, while 71 occurred in the South Atlantic (USACE Sea Turtle Data Warehouse, June 14, 2011 data). Dickerson et al. (2007) evaluated the effectiveness of relocation trawling for reducing incidental take of sea turtles by analyzing incidental take recorded in endangered species observer reports, relocation trawling reports, and hopper dredging project reports from 1995 through 2006. From 1995 through 2006, 319 hopper dredging projects throughout the Gulf of Mexico (n = 128) and Atlantic Ocean (n = 191) used endangered species monitoring and a total of 358 dredging-related sea turtle takes were reported (Regions: Gulf =147 sea turtles; Atlantic = 211 sea turtles). During the 70 projects with relocation trawling efforts, 1,239 sea turtles were relocated (Regions: Gulf=844; Atlantic=395). Loggerhead is the predominant species for both dredge take and relocation trawling take of sea turtles. Kemp's ridleys rank second. Green turtles have been captured in trawls only during December through March in the Gulf of Mexico. Although two hawksbills and six leatherbacks were relocated during 1995-2006, neither of these species has ever been killed by a dredge. However, during the Destin-Ft. Walton Beach, Florida, beach nourishment project in December 2006, one leatherback was drowned accidentally.

Based on these data, Dickerson et al. (2007) calculated the average CPUE for dredging projects within the South Atlantic as 1.19 sea turtles per project. This does not account for the volume of sediment dredged during each project. Dickerson et al. (2007) then compared the CPUE of takes per dredge day between dredging periods with and without relocation trawling to evaluate the effectiveness of relocation efforts for reducing incidental take of sea turtles. For projects utilizing relocation trawling, the lowest overall CPUE (0.0222 takes/dredge day) was seen when relocation began at the onset of dredging and continued throughout the entire dredging project. The next lowest take rates were found for projects that either initiated relocation trawling prior to the start of dredging (0.0667 takes/dredge day) or early in the first third of the dredging project (0.0642 takes/dredge day) and continued relocation throughout the remaining dredging project. Smallest reductions in take rates were seen when relocation trawling was initiated either late (during second third) (0.1070 takes/dredge day) or very late (during last third) (0.1808 takes/dredge day) in the dredging project (Dickerson et al. 2007). Table 11 below summarizes the varying CPUE of takes per dredge in relation to when relocation trawling is initiated during a dredge project.

Table 2. CPUE of takes per dredge day in relation to when relocation trawling is initiated during a dredge project.

CPUE of takes per dredge day	Initiation of Relocation Trawling
0.0222 takes/dredge day	at onset of dredging and continued throughout the entire dredging project
0.0667 takes/dredge day	Prior to the start of dredging and continued throughout the entire dredging project
0.0642 takes/dredge day	early in the first third of the dredging project and continued throughout the entire dredging project
0.1070 takes/dredge day	during second third of dredging project
0.1808 takes/dredge day	during last third of dredging project

Dickerson et al. (2007) concluded that relocation trawling is an effective management option for reducing incidental take of sea turtles during hopper dredging in some locations, provided aggressive trawling effort is initiated either at the onset of dredging or early in the project. It is reasonable to assume that, for the proposed action analyzed in this opinion, in the absence of relocation trawling the number of sea turtle mortalities would increase, but predicting a precise number would be problematic due to the fact that the USACE has not been consistent in using relocation trawling as a standard practice for the maintenance dredging of the Savannah Harbor Entrance Channel. The number of sea turtles captured by relocation trawlers does not directly translate into potential mortalities by hopper dredges in the absence of relocation trawling, due to the differences in footprint between the two gear types. The spread of a relocation trawler's net is much greater than the width of a hopper dredge's dragheads; therefore, the trawler will encounter a significantly greater number of sea turtles.

Estimating the Number of Relocation Trawler Takes during Project Dredging
Non-injurious takes may be expected with the implementation of relocation trawling. Review of the only relocation data available for the Savannah Harbor where a take occurred, indicates that 159 tows conducted over seven days (March 28-April 4, 2006) resulted in the take of one Kemp's ridley sea turtle. From this, we estimate that during the 121 days of the December 1 to March 31 hopper dredging window (which is the only time period "window" when hopper dredging is normally allowed by the USACE, in accordance with the USACE South Atlantic Division's hopper dredging protocol, and is the time frame proposed by the USACE for hopper dredging for the currently proposed action), relocation trawling may result in the non-lethal take of up to 17 turtles (of non-specific genera) each year (121 divided by 7 = 17.3). The relocation trawling may result in sea turtle capture, but this type of take is not expected to be injurious of lethal due to the short duration of the tow times (15 to 30 minutes per tow; not more than 42 minutes) and required safe-handling procedures. It cannot be ruled out that injury or mortality could occur, but such events are rare. As previously explained, based on past experience, NMFS estimates that, overall, sea turtle trawling and relocation efforts will result in considerably less than 0.5 percent mortality of captured turtles, primarily due to their being previously stressed or diseased, or if struck by trawl doors, or from accidents occurring during handling in the water and on deck. Since 2006, mortality associated with relocation trawling in the Gulf of Mexico and South Atlantic has averaged 0.6 percent.

Flipper Tagging
Flipper tagging of captured turtles is not expected to have any detrimental effects on captured animals. Tagging prior to release will help NMFS learn more about the habits and identity of trawl-captured animals after they are released, and if they are recaptured they will enable improvements in relocation trawling design to further reduce the effect of the hopper dredging activities. External and internal flipper tagging with Inconel and Passive Integrated Transponder (PIT) tags is not considered a dangerous procedure by the sea turtle research community, is routinely done by thousands of volunteers in the United States and abroad, and can be safely accomplished with minimal training. NMFS knows of no instance where flipper tagging has resulted in mortality or serious injury to a trawl-captured sea turtle. Such an occurrence would be extremely unlikely because the technique of applying a flipper tag is minimally traumatic and relatively non-invasive; in addition, these tags are attached using sterile techniques. Important growth, life history, and migratory behavior data may be obtained from turtles captured and subsequently relocated. Therefore, these turtles should not be released without tagging (and prior scanning for pre-existing tags).

Genetic Sampling
Analysis of genetic samples may provide information on sea turtle populations such as life history, nesting beach identification, and distribution/stock overlap. This may ultimately lead to enhanced sea turtle protection measures. Tissue sampling is performed to determine the genetic origins of captured sea turtles, and learn more about turtle nesting beach/population origins. This is important information because some populations, e.g., the northern subpopulation of loggerheads nesting in the Southeast Region (i.e., the proposed endangered Northwest Atlantic loggerhead DPS), may be declining. For all tissue sample collections, a sterile 4- to 6-mm punch sampler is used. Researchers who examined turtles caught two to three weeks after sample collection noted that the sample collection site was almost completely healed. NMFS does not expect that the collection of a tissue sample from each captured turtle will cause any additional stress or discomfort to the turtle beyond that experienced during capture, collection of measurements, and tagging. Tissue sampling procedures are specified in the Terms and Conditions of this opinion.

Dredged Material Disposal
NMFS believes the proposed dredged material (approximately 13.3 million cubic yards) disposal activities over the three-year life of the project are not likely to adversely affect sea turtles. Sea turtles may be attracted to ODMDS's to forage on the bycatch that may be occasionally found in the dredged material being dumped. As such, turtles could be potentially impacted by the sediments being discharged overhead. However, NMFS does not expect an injury from, nor has ever received a report of an injury to a sea turtle resulting from, burial in, or impacts from, hopper-dredge-released sediments, neither from inshore or offshore disposal sites, anywhere the USACE conducts dredged material disposal operations. Sea turtles are highly mobile and apparently are able to avoid a descending sediment plume discharged at the surface by a hopper dredge opening its hopper doors, or pumping its sediment load over the side. Even if temporarily enveloped in a sediment plume, NMFS believes the possibility of injury, or burial of normal, healthy sea turtles by dredged material (i.e., sand and silt) disposal, is discountable or its effects insignificant. NMFS believes that foraging habitat for sea turtles is not likely a limiting factor in the action area, and thus the loss of potential sand bottom foraging habitat adjacent to, or on the

surface of, the disposal areas (compared to remaining foraging habitat) from burial by dredged material sediments will have insignificant effects on sea turtles. The risk of injury to sea turtles from collisions with dredge-related vessels is also considered discountable, considering the species' mobility and the slow speed of the hopper dredge vessels and associated barges and scows.

6 Cumulative Effects

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

Within the action area, major future changes are not anticipated in ongoing human activities described in the environmental baseline. The present human uses of the action area, such as commercial shipping, boating, and fishing, are expected to continue at the present levels of intensity in the near future as are their associated risks of injury or mortality to sea turtles posed by incidental capture by fishermen, vessel collisions, marine debris, chemical discharges, and man-made noises.

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

NMFS presumes that any additional increases in recreational vessel activity in inshore and offshore waters of the Atlantic Ocean will likely increase the risk of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles. Future cooperation between NMFS and the states on these issues should help decrease take of sea turtles caused by recreational activities. NMFS will continue to work with coastal states to expand ESA Section 6 agreements and develop Section 10 permits to enhance programs to quantify and mitigate these takes.

7 Jeopardy Analyses

The analyses conducted in the previous sections of this opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of affected ESA-listed sea turtles. In Section 5, we outlined how the proposed action can affect sea turtles and the extent of those effects in terms of estimates of the numbers of each species expected to be killed. Now we turn to an assessment of each species' response to this impact, in terms of overall population effects from the estimated take, and whether those effects of the proposed action, when considered in the context of the status of the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), will jeopardize the continued existence of the affected species.

It is the responsibility of the action agency to "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species…" (ESA Section 7(a)(2)). Action agencies must consult with and seek assistance from the Services to meet this responsibility. The Services must ultimately determine in a biological opinion whether the action jeopardizes listed species. "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 determination, NMFS must look at whether the action directly or indirectly reduces the reproduction, numbers, or distribution of a listed species. Then, if there is a reduction in one or more of these elements, we evaluate whether it would be expected to cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

In the following section we evaluate the responses of green sea turtles and leatherback sea turtles to the effects of the action. Please refer to the original opinion for detailed information on the jeopardy analyses of the other species.

7.1 Effect of the Action on Green Sea Turtles' Likelihood of Survival and Recovery in the Wild

NMFS believes the proposed action may result in three lethal green sea turtle takes over the course of the project. In addition, based on the trawling results from the Brunswick Harbor bed-leveler evaluation, NMFS believes there will also be three nonlethal takes (of the total 17 nonlethal takes) associated with relocation trawling during the three years of the project. The potential nonlethal take of three green sea turtles is not expected to have any measurable impact on the reproduction, numbers, or distribution of these species. The individuals are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. Since the takes may occur anywhere in the action area and would be released within the general area where caught, no change in the distribution of green sea turtles is anticipated.

The potential lethal take of three green sea turtles over the duration of the project would reduce the number of green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Lethal interactions would also result in a potential reduction in future reproduction, assuming some individuals would be females and would have survived otherwise to reproduce. For example, an adult green sea turtle can lay 1-7 clutches (usually 2-3) of eggs every 2 - 4 years, with 110-115 eggs/nest of which a small percentage is expected to survive to sexual maturity. The anticipated lethal interactions are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of green sea turtles is expected from these takes.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. The 5-year status review for green sea turtles states that of the seven green sea turtle nesting concentrations in the Atlantic Basin for which abundance trend information is available, all were either stable or increasing (NMFS and USFWS 2007a). That review also states that the annual nesting female population in the Atlantic basin ranges from 29,243-50,539 individuals; green sea turtle nesting patterns also show a biennial peaks in abundance, with a generally positive trend during the last ten years of regular monitoring. An average of 5,039 green turtle nests were laid annually in Florida between 2001 and 2006 with a low of 581 in 2001 and a high of 9,644 in 2005 (NMFS and USFWS 2007a). Data from the index nesting beaches program in Florida substantiate the dramatic increase in nesting. Nesting increased from 2007-2011. An average of 11,004 green sea turtle nests were laid annually in Florida during the period with a low of 4,462 in 2009 and a high of 15,352 in 2011 (FWRI 2012). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica, population growing at 4.9 percent annually.

In the absence of any total population estimates for green sea turtles nesting trends are the best proxy we have for estimating population changes. The 5-year status review estimated between 29,000 and 50,000 adult females existed in the Atlantic basin at the time of its writing in 2007 (NMFS and USFWS 2007a). Since the nesting has increased every year since 2007, and the initial estimate only included adult females, we believe the population is likely much larger than that estimate and increasing. Additionally, of the 26 green sea turtle rookeries for which trend information is available, 12 show an increasing trend, 10 show a stable trend, four show a decreasing trend. This is significant because regardless of the size of these rookeries, each contributes to species' genetic diversity and since only few show evidence of decline, we believe the species is maintaining genetic heterogeneity. We also believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the abundance trend information for green sea turtles is clearly increasing, we believe the lethal take of three green sea turtles during the project dredging will not have any measurable effect on that trend. Therefore, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the green sea turtle in the wild.

The Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) lists the following relevant recovery objectives over a period of 25 continuous years:

Objective: *The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years:*

- Green sea turtle nesting in Florida between 2001-2006 was documented as follows: 2001 – 581 nests, 2002 – 9,201 nests, 2003 – 2,622, 2004 – 3,577 nests, 2005 – 9,644 nests, 2006 – 4,970 nests. This averages 5,039 nests annually over those six years (2001-2006) (NMFS and USFWS 2007a). Subsequent nesting has shown even higher average numbers (i.e., 2007 – 12,751 nests, 2008 – 9,228, 2009 – 4,462, 2010 – 13,225 nests, 2011 – 15,352 (FWRI 2012)) thus this recovery criterion continues to be met.

Objective: A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

- There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds have increased.

The potential lethal take of three green sea turtles during the course of the project will result in a reduction in numbers when takes occur but it is unlikely to have any detectable influence on the trends noted above. Nonlethal takes of sea turtles would not affect the adult female nesting population or number of nests per nesting season. Additionally, our estimate of future take is based on our belief that the same level of take occurred in the past. Even so, we have still seen positive trends in the status of this species. Thus, the proposed action does not oppose the recovery objectives above and will not result in an appreciable reduction in the likelihood of green sea turtles' recovery in the wild.

Conclusion

The lethal or nonlethal take of green sea turtles associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the green sea turtle in the wild.

7.2 Effect of the Action on Leatherback Sea Turtles' Likelihood of Survival and Recovery in the Wild

The proposed action may result in 3 nonlethal leatherback sea turtle takes associated with relocation trawling over the three years of project dredging. The nonlethal take of three leatherback sea turtles during the project is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals are expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated. Since these takes may occur anywhere in the action area and would be released within the general area where caught, no change in the distribution of leatherback sea turtles is anticipated.

We do not anticipate the proposed action will have any detectable impact on the population overall, and the action will not cause the population to lose genetic diversity, or the capacity to successfully reproduce. Therefore, we do not believe the proposed action will cause an appreciable reduction in the likelihood of survival.

The Atlantic recovery plan for the U.S. population of the leatherback sea turtles (NMFS and USFWS 1992b) does not include any recovery actions that are directly related to the proposed action of this opinion. Thus, we believe the proposed action will not impede the progress of the recovery plan.

Conclusion

The nonlethal take of leatherback sea turtles associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the leatherback sea turtle in the wild.

8 Conclusion

We analyzed the best available data, the status of the species, environmental baseline, effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of green sea turtles and leatherback sea turtles.

Sea Turtles

The proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species. Therefore, it is our opinion that the Savannah Harbor Expansion Project is not likely to jeopardize the continued existence of green sea turtles and leatherback sea turtles.

9 Incidental Take Statement (ITS)

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 the RPMs and terms and conditions of the ITS.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under Section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is expected or has been authorized under Section 101(a)(5) of the MMPA, no statement on incidental take of endangered whales is provided, and no take is authorized. Nevertheless, the USACE must immediately notify (within 24 hours, if communication is possible) NMFS's Office of Protected Resources should a take of a listed marine mammal occur.

9.1 Anticipated Incidental Take

Table 3. Anticipated Future Take Over 3 Years for All Turtle Species Addressed by the SHEP Opinion

Sea Turtles	Non-Lethal Take	Lethal Take	Total Estimated Take
Loggerhead	25	16	41
Green	3	3	6
Leatherback	3		3
Kemp's ridley	20	11	31
Total	51	30	81

9.2 Effect of the Take

Sea Turtles
NMFS has determined the anticipated level of incidental take specified in Section 9.1 is not likely to jeopardize the continued existence of green sea turtles or leatherback sea turtles.

9.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental take on listed species, which results from an agency action otherwise found to comply with Section 7(a)(2) of the ESA. It also states the RPMs necessary to minimize the impacts of take and the terms and conditions to implement those measures, must be provided and must be followed to minimize those impacts. Only incidental taking by the federal agency that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are specified as required, by 50 CFR 402.01(i)(1)(ii) and (iv), to document the incidental take by the proposed action and to minimize the impact of that take on ESA-listed species. These measures and terms and conditions are non-discretionary, and must be implemented by the USACE in order for the protection of Section 7(o)(2) to apply. The USACE has a continuing duty to regulate the activity covered by this incidental take statement. If the USACE fails to adhere to the terms and conditions through enforceable terms, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse.

NMFS has determined that the following RPMs are necessary and appropriate to minimize impacts of the incidental take of sea turtles during the proposed action. The RPMs have not been modified from the original opinion. They are included in the amended opinion to address the additional species (i.e., green sea turtles and leatherback sea turtles).

The RPMs that NMFS believes are necessary to minimize the impacts of the proposed hopper dredging have been discussed with the USACE in the past and are standard operating procedures, and include the use of intake and overflow screening, use of sea turtle deflector dragheads, observer and reporting requirements, and relocation trawling. The following RPMs and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. Experience has shown that injuries sustained by sea turtles entrained in the hopper dredge dragheads are usually fatal. Current opinions for hopper dredging (e.g., the 2003 GRBO) require observer monitoring requirements, deflector dragheads, and conditions and guidelines for relocation trawling, which NMFS believes are necessary to minimize effects of these removals on listed sea turtle species that occur in the action area.

1. Take Reporting: Observer Requirements and Dredged Material Screening

NMFS-approved observers monitor dredged material inflow and overflow screening baskets on many projects; however, screening is only partially effective; and observed, documented takes provide only partial estimates of total sea turtle mortality. NMFS believes that some listed species taken by hopper dredges go undetected because body parts are forced through the sampling screens by the water pressure and are buried in the dredged material, or animals are crushed or killed but not entrained by the suction and so the takes may go unnoticed. The only mortalities that are documented are those where body parts either float, are large enough to be caught in the screens, and/or can be identified as from sea turtle species. However, this opinion estimates that with 4-inch inflow screening in place, and 24-hour, 100-percent observer coverage, observers will probably detect and record 66.6 percent of turtle mortality. Additionally, coordination with local sea turtle stranding networks can be a valuable adjunct monitoring method; not to directly monitor takes, but to help ensure that unanticipated impacts to sea turtles are not occurring.

2. Deflector Dragheads

V-shaped, sea turtle deflector dragheads prevent an unquantifiable yet significant number of sea turtles from being entrained and killed in hopper dredges each year. Without them, turtle takes during hopper dredging operations would unquestionably be higher. Draghead tests conducted in May-June 1993 by the USACE's Waterways Experimental Station (WES), now known as the Engineering Research and Development Center (ERDC), in clear water conditions on the sea floor off Fort Pierce, Florida, with 300 mock turtles placed in rows, showed convincingly that the newly-developed WES deflector draghead "performed exceedingly well at deflecting the mock turtles." Thirty-seven of 39 mock turtles encountered were deflected, two turtles were not deflected, and none were damaged. Also, "the deflector draghead provided better production rates than the unmodified California draghead, and the deflector draghead was easier to operate and maneuver than the unmodified California flat-front draghead." The V-shape reduced forces encountered by the draghead and resulted in smoother operation. V-shaped deflecting dragheads are now a widely accepted conservation tool, the dredging industry is familiar with them and their operation, and they are used by all USACE Districts conducting hopper dredge operations where turtles may be present.

3. Relocation Trawling

Relocation trawling has proved to be a useful conservation tool in most dredging projects where it has been implemented. In some areas, its use may be unnecessary and expensive, especially in some areas and some times of the year. In the Jacksonville District, sea turtles have been relocated out of the path of hopper dredges operating in Tampa Bay and Charlotte Harbor or their entrance channels. In February 2002 during the Jacksonville District's Canaveral Channel emergency hopper dredging project for the Navy, two trawlers working around the clock captured and relocated 69 loggerhead and green turtles in seven days, and no turtles were entrained by the hopper dredge. In the Wilmington District's Bogue Banks Project in North Carolina, two trawlers successfully relocated five turtles in 15 days between March 13 and 27, 2003; one turtle was taken by the dredge. In 2003, Aransas Pass relocation trawling associated with hopper dredging resulted in 71 turtles captured and released (with three recaptures) in three months of dredging and relocation trawling. Five turtles were killed by the dredge. No turtles were killed after relocation trawling was increased from 12 to 24 hours per day (T. Bargo, pers. comm. to E. Hawk, NMFS, October 27, 2003). In 2006, trawling associated with the dredging of the Houston-Galveston Navigation Channels resulted in seven loggerheads relocated in 60 days of trawling (USACE Sea Turtle Data Warehouse; http://el.erdc.usace.army.mil/seaturtles/index.cfm). In Fiscal Year 2007, relocation trawling activities in USACE channel projects in the Gulf of Mexico resulted in the capture and relocation of 67 green, 42 Kemp's ridley, and 68 loggerhead sea turtles; in the South Atlantic, 18 loggerhead and 17 Kemp's ridley sea turtles were relocated (Ibid).

This opinion authorizes the use of turtle relocation trawling. NMFS believes the use of relocation trawling should be required during the proposed hopper dredging associated with this project. NMFS expects the effect of any turtle relocation trawling would be non-lethal and non-injurious.

9.4 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the USACE 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. Observers (RPM 1): The USACE shall arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges throughout the proposed project.

2. Screening (RPM 1): 100 percent inflow screening of dredged material is required and 100 percent overflow screening is recommended. If conditions prevent 100 percent inflow screening, inflow screening may be reduced gradually, as further detailed in the following paragraph, but 100 percent overflow screening is then required.

   a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the Savannah District, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased, for example, to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Other variations in screening size are allowed, with prior written approval by NMFS. Clogging should be significantly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case effective 100 percent overflow 4-inch screening is mandatory. The USACE shall notify NMFS beforehand if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved.

   b. Need for Flexible, Graduated Screens: NMFS believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

3. Dredging Pumps: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

4. Sea Turtle Deflecting Draghead (RPM 2): A state-of-the-art rigid deflector draghead must be used on all hopper dredges at all times. Alternate draghead designs shall not be used unless prior, written approval is given by NMFS.

5. Dredge Take Reporting and Final Report: Observer reports of incidental take by hopper dredges must be faxed to NMFS's Southeast Regional Office (phone: 727/824-5312, fax: 727/824-5309), and reported by electronic mail to: (**takereport.nmfsser@noaa.gov**) by onboard NMFS-approved protected species observers, the dredging company, or the USACE within 24 hours of any sea turtle or other listed species take observed. This biological opinion shall be referenced by title, date, and PCTS consultation number (SER-2013-11301)

   A final report summarizing the results of the hopper dredging and any documented sea turtle or other listed species takes must be submitted to NMFS within 30 working days of completion of the dredging project. Reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken, screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the Savannah District deems relevant.

6. Sea Turtle Strandings (RPM 1): The Savannah District Project Manager or designated representative shall notify the STSSN state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

   Information on any such strandings shall be reported in writing within 30 days of project end to NMFS's Southeast Regional Office. Because the deaths of these turtles have already been accounted for in NMFS's jeopardy analysis, the strandings will not be counted against the USACE's take limit.

7. Reporting - Strandings: The USACE shall provide NMFS's Southeast Regional Office with a report detailing incidents, with photographs when available, of stranded sea turtles that bear indications of draghead impingement or entrainment and/or bed-leveler interactions.

8. Relocation Trawling (RPM 3)(if applicable): The use of relocation trawling is required during all proposed hopper dredging during December 1 through March 31. Relocation trawling is recommended, but not required, outside of that period.

9. Relocation Trawling Report (RPM 3)(if applicable): The USACE shall provide NMFS's Southeast Regional Office with an end-of-project report within 30 days of completion of each year's relocation trawling. This report may be incorporated into the final report summarizing the results of the hopper dredging project.

10. Additional Relocation Trawler Requirements (RPM 3) (if applicable): Any capture-type or sweep-type relocation trawling conducted or contracted by the USACE to temporarily reduce or assess the abundance of these listed species during a hopper dredging project in order to reduce the possibility of lethal hopper dredge interactions, is subject to the following conditions as listed below. In the event that trawling does result in the capture of a sea turtle, the USACE or its contractors may employ a separate chase boat to relocate the turtle to a site no less than three miles from the capture site.

    a. Handling: Sea turtles recovered by observers on modified relocation trawlers (e.g., turtles incidentally captured in modified trawl gear, injured turtles recovered on the surface, etc.) shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix B).

    b. Captured Sea Turtle Holding Conditions: Sea turtles may be held up to 24 hours for the collection of important scientific measurements, prior to their release. Captured sea turtles shall be kept moist, and shaded whenever possible, until they are released.

    c. Scientific Measurements and Data Collection: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observer's log. Only NMFS-approved protected species observers or observer candidates in training under the direct supervision of a NMFS-approved protected species observer shall conduct the tagging/measuring/weighing/tissue sampling operations. External mounting of satellite tags, radio transmitters, data loggers, crittercams, etc. may be done under the authority of this opinion by NMFS-approved, trained personnel, after approval from NMFS SER PRD (see Terms and Condition #10.g., Other Sampling Procedures).

NMFS-approved protected species observers may conduct more invasive scientific procedures (e.g., bloodletting, laparoscopies, external tumor removals, anal and gastric lavages, etc.) and partake in or assist in “piggy back” research projects but only if the observer holds a valid federal sea turtle research permit (and any required state permits) authorizing the activities, or the observer is acting as the duly-designated agent of the permit holder, and has first notified NMFS’s Southeast Regional Office, Protected Resources Division.

d. Injuries: Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility. Minor skin abrasions resulting from trawl capture are considered non-injurious. The USACE shall ensure that logistical arrangements and support to accomplish this are pre-planned and ready, and is responsible for ensuring that dredge vessel personnel comply with this requirement. The USACE shall bear the financial cost of sea turtle transport, treatment, rehabilitation, and release.

e. Flipper Tagging: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida’s Archie Carr Center for Sea Turtle Research. This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

f. PIT-Tag Scanning: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler to PIT-tag captured sea turtles. PIT tagging of sea turtles is not required to be done if the NMFS-approved protected species observer does not have prior training or experience in said activity; however, if the observer has received prior training in PIT tagging procedures and is comfortable with the procedure, then the observer shall PIT tag the animal prior to release (in addition to the standard external tagging):

Sea turtle PIT tagging must then be performed in accordance with the protocol detailed at NMFS’s Southeast Fisheries Science Center’s Web page: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEFSC’s “Fisheries Observers” Web page);

Unless otherwise approved in advance by NMFS SER PRD, PIT tags used must be sterile, individually-wrapped tags to prevent disease transmission. PIT tags should be 125-kHz, glass-encapsulated tags–the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400-kHz tag), then insert one in the other shoulder.

g. Other Sampling Procedures: All other tagging and external or internal sampling procedures (e.g., bloodletting, laparoscopies, external tumor removals, anal and gastric lavages, mounting of satellite or sonic transmitters, or similar tracking equipment, etc.) performed on live sea turtles are not permitted under this opinion unless the observer holds a valid sea turtle research permit authorizing the activity, either as the permit holder or a designated agent of the permit holder, or unless the observer (or person performing the procedure, in the case of piggy-back research by the USACE or other federal or state government agency or university personnel) receives prior, written approval by NMFS SER after a thorough review by PRD of their credentials, experience, and training in the proposed procedures.

h. PIT-Tag Scanning and Data Submission Requirements: All sea turtles captured by relocation trawling or dredges shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show they have been previously PIT tagged shall nevertheless be externally flipper tagged. Sea turtle data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All sea turtle data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov. Sea turtle external flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

i. Handling Fibropapillomatose Turtles: NMFS-approved protected species observers are not required to handle viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, observers must maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions.

11. <u>Requirement and Authority to Conduct Tissue Sampling for Genetic and Contaminants Analyses</u>: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler or hopper dredge to tissue-sample live- or dead-captured sea turtles without the need for an ESA Section 10 permit.

All live or dead sea turtles captured by relocation trawling and hopper dredging (for both USACE-conducted and USACE-permitted activities) shall be tissue-sampled prior to release. Sampling shall continue uninterrupted until such time as NMFS determines and notifies the USACE in writing.

Sea turtle tissue samples shall be taken in accordance with NMFS's SEFSC procedures for sea turtle genetic analyses, and, as specified, for contaminants (e.g., heavy metals) analyses. Protocols for tissue sampling to be utilized in contaminants analyses are currently being developed by Dr. Dena Dickerson, ERDC. The USACE shall ensure that tissue samples taken during the dredging project are collected and stored properly and mailed every three months until completion of the dredging project to: NOAA, National

Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149.

12. Training - Personnel on Hopper Dredges: The USACE must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of the hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, USACE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

13. Dredge Lighting: All lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nm of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

14. Best Management Practices: The USACE will be required to conduct activities in compliance with NMFS's March 23, 2006, *Sea Turtle and Smalltooth Sawfish Construction Conditions* (Appendix D), except that Condition "e" shall not apply to the hopper dredging operations as it is impracticable to require a hopper dredge to stop all forward movement whenever a sea turtle is sited closer than 50 feet on the surface.

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 or critical habitat to help implement recovery plans or to develop information.

Pursuant to Section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the USACE in contributing to the conservation of sea turtles by further reducing or eliminating adverse impacts that result from dredging.

1. Draghead Modifications and Bed-Leveling Studies: The USACE should supplement other efforts to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time

dragheads are off the bottom. NMFS is ready to assist the USACE in conducting studies to evaluate bed-leveling devices and their potential for interaction with sea turtles, and develop modifications if needed.

2. Draghead Evaluation Studies and Protocol: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NMFS should be consulted regarding the development of a protocol for draghead evaluation tests. NMFS recommends that USACE coordinate with ERDC, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle takes.

3. Continuous Improvements in Monitoring and Detecting Takes: The USACE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle mortality.

4. Overflow Screening: The USACE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NMFS considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

5. Preferential Consideration for Horizontal Overflow Screening: The USACE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

6. Section 10 Research Permits, Relocation Trawling, Piggy-Back Research, and 50 CFR Part 223 Authority to Conduct Research on Salvaged, Dead Specimens: NMFS recommends that USACE ERDC apply to NMFS for an ESA Section 10 research permit to conduct endangered species research on species incidentally captured during traditional relocation trawling. NMFS SER shall assist the USACE with the permit application process.

7. NMFS also encourages the USACE to cooperate with NMFS's scientists, other federal agencies' scientists, and university scientists holding appropriate research permits to

make fuller use of turtles taken or captured by hopper dredges and relocation trawlers pursuant to the authority conferred by this opinion. NMFS encourages "piggy-back" research projects by duly-permitted or authorized individuals or their authorized designees.

Important research can be conducted without a Section 10 permit on salvaged dead specimens. Under current federal regulations (see 50 CFR 223.206 (b): Exception for injured, dead, or stranded [threatened sea turtle] specimens), "Agents…of a Federal land or water management agency may…salvage a dead specimen which may be useful for scientific study." Similar regulations at 50 CFR 222.310 provide "salvaging" authority for endangered sea turtles.

8. Draghead Improvements - Water Ports: NMFS recommends that the USACE require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the USACE for dredging projects be eventually outfitted with water ports located in the top of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom by the dredge operator with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

   NMFS supports and recommends the implementation of proposals by ERDC and USACE personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: (1) An adjustable visor; (2) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and (3) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

9. Economic Incentives for No Turtle Takes: The USACE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or X number of cubic yards of material moved, or hours of dredging performed, without taking turtles. This may encourage dredging companies to research and develop "turtle friendly" dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms; etc.

10. Sodium Vapor Lights on Offshore Equipment: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low-pressure sodium vapor lights or other light

sources proven to have low attraction to sea turtles are highly recommended for lights that cannot be eliminated.

11 Reinitiation of Consultation

This concludes formal consultation on the proposed deepening of the Savannah Harbor federal navigational channel. This amendment to the original biological opinion was in response to new information that revealed potential effects of the action to listed species not previously considered in the original opinion.

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 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. In instances where the amount or extent of take is exceeded, USACE must immediately request reinitiation of formal consultation.

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