NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7
BIOLOGICAL OPINION

Title: Biological Opinion on the Issuance of Permit No. 20455 to Randall Wells for Research on Bottlenose and Atlantic Spotted Dolphins

Consultation Conducted By: Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Action Agency: Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service

Publisher: Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Approved:

for Donna S. Wieting
Director, Office of Protected Resources

Date: MAY 26 2017

Consultation Tracking number: FPR-2016-9183

Digital Object Identifier (DOI): doi:10.7289/V5319SZV

This page left blank intentionally

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

1 INTRODUCTION

The Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.) establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat they depend on. Section 7(a)(2) of the ESA requires Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with the National Marine Fisheries Service (NMFS) for threatened or endangered species (ESA-listed), or designated critical habitat that may be affected by the action that are under NMFS jurisdiction (50 C.F.R. §402.14(a)). If a Federal action agency determines that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS concur with that determination for species under NMFS jurisdiction, consultation concludes informally (50 C.F.R. §402.14(b)).

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS provides a biological opinion stating whether the Federal agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. If NMFS determines that the action is likely to jeopardize ESA-listed species or destroy or adversely modify critical habitat, NMFS provides a reasonable and prudent alternative that allows the action to proceed in compliance with section 7(a)(2) of the ESA. If an incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts and terms and conditions to implement the reasonable and prudent measures.

The action agency for this consultation is NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter the Permits Division). The Permits Division proposes to issue a scientific research permit (Appendix A) pursuant to section 104 of the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 USC 1361 et seq.) to Randall Wells, Ph.D., Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota, Florida 34236. The purpose of the proposed permit is to allow an exception to the moratoria on takes established under the MMPA in order to allow the applicant to conduct scientific research on bottlenose (*Tursiops truncatus*) and Atlantic spotted dolphins (*Stenella frontalis*). While the proposed research is not directed at ESA-listed species, some aspects of the research may affect ESA-listed turtles and fishes.

Under the ESA take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." Harm is defined by regulation (50 C.F.R. §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." NMFS does not have a regulatory definition of "harass." We rely on our interim guidance, which interprets harass as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (NMFSPD 02-110-19).

This consultation, biological opinion, and incidental take statement, were completed in accordance with section 7(a)(2) of the statute (16 U.S.C. 1536 (a)(2)), associated implementing regulations (50 C.F.R. §§401-16), and agency policy and guidance was conducted by NMFS Office of Protected Resources Endangered Species Act Interagency Cooperation Division (hereafter referred to as "we"). This biological opinion and incidental take statement were prepared by NMFS Office of Protected Resources Endangered Species Act Interagency Cooperation Division in accordance with section 7(b) of the ESA and implementing regulations at 50 C.F.R. §402.

This document represents NMFS biological opinion on the effects of the proposed issuance of Permit No. 20455 on green (*Chelonia mydas*, North Atlantic Distinct Population Segment (DPS)), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*, Northwest Atlantic DPS), and olive ridley turtles (*Lepidochelys olivacea*), and smalltooth sawfish (*Pristis pectinate*, U.S. DPS), and Gulf sturgeon (*Acipenser oxyrinchus desotoi*). A complete record of this consultation is on file at NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

Dr. Wells has been conducting research on dolphins since the 1970s through the Sarasota Dolphin Research Program (https://www.sarasotadolphin.org/). His research focuses specifically on dolphins (primarily bottlenose dolphins, but more recently Atlantic spotted dolphins), and does not involved directed take of any ESA-listed species. As such, we have not previously consulted on a research permit for Dr. Wells. However, a recent consultation on a research permit for NMFS Marine Mammal Health and Stranding Response Program (MMHSRP) made it apparent that incidental take of ESA-listed turtles and fishes may result from seine net captures of dolphins (NMFS 2016a), which Dr. Wells has done and proposes to do under the permit renewal being considered here (Permit No. 20455). Consequently, in processing Dr. Wells' application for Permit No. 20455, the Permits Division reconsidered possible effects to ESA-listed turtles and fishes from Dr. Wells' research and requested our assistance in doing so. While processing Dr. Wells' application, the Permits Division informed us that between 1984 and 2016, two sea turtles were observed encircled or entangled in capture nets during Dr. Wells' dolphin seine net captures. These two turtles were released unharmed and no incident reports were filed nor required at that time. However, given this history, and the recent incidental capture of two ESA-listed turtles during MMHSRP seine net captures, the Permits Division requested formal consultation on the issuance of Permit No. 20455 in order to evaluate effects to non-target ESA-listed turtles and fishes.

1.2 Consultation History

This biological opinion is based on information provided in the applicant's permit application (NMFS 2016d), annual reports from Dr. Wells' previous permits (NMFS 2011b; NMFS 2016e), correspondence and discussions with the Permits Division and the applicant, previous biological opinions on similar research activities (NMFS 2016a; NMFS 2017b; NMFS 2017c), and the best scientific and commercial data available from the literature. Our communication with the Permits Division regarding this consultation is summarized as follows:

- On August 4, 2016, the Permits Division requested technical assistance regarding the issuance Permit No. 20455, and on August 17, 2016, we met with the Permits Division to discuss the proposed permit and research.
- On November 14, 2016, the Permits Division sent us a memorandum requesting formal consultation on the issuance of Permit No. 20455.
- On November 22, 2016, we met with the Permits Division to discuss the initiation package and requested clarification and additional information from the applicant, which was received on December 1, 2016.
- On January 12, 2017, we sent the Permits Division a memorandum informing them that the application was sufficient to initiate formal consultation as of December 1, 2016.

2 The Assessment Framework

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species; or adversely modify or destroy their designated critical habitat.

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of an ESA-listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 C.F.R. §402.02).

"Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of an ESA-listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 C.F.R. §402.02).

An ESA section 7 assessment involves the following steps:

Description of the Proposed Action (Section 3), *Interrelated and Interdependent Actions* (Section 4), and *Action Area* (Section 5)*:* We describe the proposed action, identify any interrelated and interdependent actions, and describe the action area with the spatial extent of those stressors.

Status of Endangered Species Act Protected Resources (Section 6): We identify the ESA-listed species and designated critical habitat that are likely to co-occur with those stressors in space and time and evaluate the status of those species and habitat.

Environmental Baseline (Section 7): We describe the environmental baseline in the action area including: past and present impacts of Federal, state, or private actions and other human activities in the action area; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, impacts of state or private actions that are contemporaneous with the consultation in process.

Effects of the Action (Section 8): We identify the number, age (or life stage), and gender of ESA-listed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. We also consider whether the action "may affect" designated critical habitat. This is our exposure analysis. We evaluate the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure. We also consider how the action may affect designated critical habitat. This is our response analyses. We assess the consequences of these responses of individuals that are likely to be exposed to the populations those individuals represent, and the species those populations comprise. This is our risk analysis. The adverse modification analysis considers the impacts of the proposed action on the essential habitat features and conservation value of designated critical habitat.

Cumulative Effects (Section 9): Cumulative effects are the effects to ESA-listed species and designated critical habitat of future state or private activities that are reasonably certain to occur within the action area 50 C.F.R. §402.02. Effects from future Federal actions that are unrelated to the proposed action are not considered because they require separate ESA section 7 compliance.

Integration and Synthesis (Section 10): In this section, we integrate the analyses in the biological opinion to summarize the consequences to ESA-listed species and designated critical habitat under NMFS' jurisdiction.

Conclusion (Section 11); With full consideration of the status of the species and the designated critical habitat, we consider the effects of the action within the action area on populations or subpopulations and on essential habitat features when added to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

- Reduce appreciably the likelihood of survival and recovery of ESA-listed species in the wild by reducing its numbers, reproduction, or distribution, and state our conclusion as to whether the action is likely to jeopardize the continued existence of such species; or
- Appreciably diminish the value of designated critical habitat for the conservation of an ESA-listed species, and state our conclusion as to whether the action is likely to destroy or adversely modify designated critical habitat.

If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat, then we must identify reasonable and prudent alternative(s) to the action, if any, or indicate that to the best of our knowledge there are no reasonable and prudent alternatives. See 50 C.F.R. §402.14.

In addition, we include an incidental take statement (Section 12) that specifies the impact of the take, reasonable and prudent measures to minimize the impact of the take, and terms and conditions to implement the reasonable and prudent measures. ESA section 7 (b)(4); 50 C.F.R. §402.14 (i). We also provide discretionary conservation recommendations (Section 13) that may be implemented by action agency. 50 C.F.R. §402.14 (j). Finally, we identify the circumstances in which reinitiation of consultation is required (Section 14). 50 C.F.R. §402.16.

To comply with our obligation to use the best scientific and commercial data available, we collected information identified through searches of *google scholar*, *web of science*, literature cited sections of peer reviewed articles, species listing documentation, and reports published by government and private entities. This biological opinion is based on our review and analysis of various information sources, including:

- Information submitted by the Permits Division and the applicant
- Government reports (including NMFS' biological opinions)
- National Oceanic and Atmospheric Administration (NOAA) technical memos
- Peer-reviewed scientific literature

These resources were used to identify information relevant to the potential stressors and responses of ESA-listed species and designated critical habitat under NMFS' jurisdiction that may be affected by the proposed action to draw conclusions on risks the action may pose to the continued existence of these species and the value of designated critical habitat for the conservation of ESA-listed species.

3 Description of the Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies. The proposed action for this consultation is the Permits Division's issuance of a scientific research permit pursuant to the MMPA to Dr. Wells. The research permit would allow an exception to the moratoria on takes established under MMPA in order to allow Dr. Wells to conduct scientific research on bottlenose and Atlantic spotted dolphins. The purpose of the research is to study of the health, biology, behavior, population structure and dynamics, and life history patterns of free-ranging bottlenose dolphins, and collect baseline data on Atlantic spotted dolphin ranging patterns, dive patterns, and health.

3.1 Proposed Activities

Permit No. 20455 would authorize Dr. Wells to take bottlenose and Atlantic spotted dolphins during a variety of research activities including photographic identification surveys, behavioral observations, biopsy sampling, tagging, acoustic playbacks, and capture and release in order to collect samples and physiological and health data. All of these activities are specifically directed at either bottlenose or Atlantic spotted dolphins, and most would have no effect on ESA-listed species. However, as noted above in Section 1.1, seine net captures of dolphins may result in incidental capture and/or entanglement of ESA-listed turtles and fishes. As such, below we focus on this aspect of the proposed research, but also describe general vessel operations and in-water acoustic playback studies since they may also affect ESA-listed turtles and fishes within the action area.

3.1.1 Vessel Operations

The Permits Division proposes to authorize Dr. Wells to conduct research on dolphins from small research vessels. These vessels provide a platform for conducting a variety of research activities including photography and observation, biopsy sampling, tagging, acoustic playbacks, and hoop and seine net captures.

On a typical day, a team of three to six researchers would leave the research base in Sarasota Bay, Florida at around 9:00 AM to search for dolphins in a small (approximately six to seven meters in length), outboard-powered vessel equipped with an observation tower. The vessel would follow a predetermined route selected to meet the day’s objectives, taking into consideration winds and tides. During transit, the vessel would cruise at speeds between 15 and 20 knots (minimum planing speed) and the crew would constantly search for dolphins. Once a dolphin or group of dolphins is sighted, the vessel would slow to match the dolphin(s) speed and begin collecting photographic, observational, and a variety of other data depending on the day’s research focus. If a candidate for tagging is present, researchers may also attempt to remotely tag a dolphin with one of several types of tags. Once data collection and/or tagging is complete, the vessel would continue along the predetermined route to continue searching for dolphins. On occasion, researchers may also stay with a dolphin or group of dolphins to conduct focal follow observations, during which researchers would track animals and record behavioral observations for 30 minutes, up to several hours. If researchers intend to capture dolphins that day, after the initial dolphin sighting and data collection, addition vessels would be used to capture dolphins, as further detailed below. A typical day would consists of up to 20 sightings of dolphins and/or dolphin groups, with researchers returning to the research base at around 5:00 PM.

3.1.2 Seine Net Captures

The Permits Division proposed to authorize Dr. Wells to capture up to 50 bottlenose dolphins annually using seine nets. The purpose of these captures is to allow researchers to conduct health assessments, collect a variety of biological samples, attach tags, and conduct various experiments. These captures also provided training opportunities for rescue teams to practice and perfect methods for emergency response related activities for other marine mammals, including ESA-listed species. While Dr. Wells would also be authorized to capture these 50 bottlenose dolphins with hoop nets instead of seine nets if the animals are in deep water, and would be authorized to capture Atlantic spotted dolphins with hoop nets, we do describe hoop net captures in detail here since they are directed at a specific individual dolphin and would not affect ESA-listed fishes or turtles (NMFS 2016a).

Dr. Wells proposes to use the same seine net capture method his research group has successfully used in Sarasota Bay and elsewhere since the 1970s (Asper 1975; Loughlin et al. 2010). This method typically involves eight to 12 small vessels (a net vessel, a veterinary examination vessel, a sample processing vessel, and several crew vessels), and a field research team of 55 to 90 people depending on the number of projects being performed. Small groups of dolphins (ideally four or less, on average two) would be approached by selected vessels carrying the staff most experienced in dolphin identification. If a group of dolphins contains individuals that researchers aim to capture, and does not include individuals they wish to avoid, then the group would be followed until it is in waters that facilitate safe and effective capture (preferably, waters outside of boating channels, less than 1.5 meters deep, where currents are minimal). At this point, dolphins would be encircled with a 600-meter long by four-meter deep seine net, deployed at high speed from an eight meter long commercial fishing vessel by a commercial fisherman with extensive dolphin capture-release experience (Asper 1975). A small (five to seven meter long) outboard-powered vessel may be used to help contain the dolphins by making small, high-speed circles where the net has not yet been laid, creating an acoustic barrier until the net circle is complete.

Once the corral is complete, crew boats would be deployed around the net to correct net overlays and respond to any entangled animals. In some cases, the corral and dolphins would be briefly towed to a nearby location if conditions were more favorable there (e.g., shallower). When the corral is in its final location, dolphin handlers would be deployed around the outside of the corral to respond to any animals that may become entangled in the net. Two crew members with at least 10 to 40 years of experience with dolphin capture-release would direct these activities, while the remaining researchers prepare for sampling and data collection and begin isolating individual dolphins. If necessary, isolation would be accomplished by pinching the net corral into several smaller corrals, but typically handlers would be able to put their arms around the selected individual as it bobs in place or swims slowly around the restricted enclosure. If any dolphins become entangled in the net, handlers would respond immediately and restrain the animals. Once a dolphin is restrained, a blood sample would be taken and the animal would be examined for pregnancy with ultrasound. Following this, the dolphin would be brought aboard the veterinary examination vessel using a sling for further processing. Once all dolphins are restrained, any unneeded net would be retrieved onto the net boat as soon as possible to minimize the possibility of incidental entanglement of non-target animals. Until the net is fully onboard the boat, the net float line would be monitored for entanglements by a dedicated observer team.

While aboard the veterinary examination vessel, dolphins would be subject to a variety of research activities including body measurements, photography, acoustic recordings, auditory evoked potential testing, collection of breath, fecal, urine, milk, gastric, and additional blood samples, anesthesia for blubber biopsying and tooth extraction, ultrasound examination, freeze-branding and/or other markings, oral exams, dental and thoracic x-rays, and tag attachment. Upon completion of the on-deck protocols, the animal would be returned to the water. Other research activities may be performed in water, either before or after on-deck protocols, including acoustic playback experiments, administration of isotopes for field metabolic rate research, and attachment of tags. The total time from when the net is deployed to the release of the last animal would vary with the situation and the numbers of dolphins caught, but would average three hours (range from 36 minutes to 4.6 hours). During most of this time (all except 20 to 40 minutes after deployment) the seine net would not be in the water. However, on occasion (on average less than five times per year) a small (10 to 20 meter diameter) net corral near the processing boat may be created and remain in place for up to approximately three hours. In such cases, multiple researchers would be standing in the water around the perimeter to monitor the net for target and non-target species.

3.1.3 Acoustic Playbacks

The Permits Division proposed to authorize Dr. Wells to conduct acoustic playback experiments in order to study dolphin vocalization and communication. Playbacks may take place while animals are aboard the veterinary examination vessel, while swimming in the corral net (before or after examination), or while free-swimming. Here we describe the playbacks that would occur in water, as those conducted aboard the veterinary examination vessel would have no effect on ESA-listed turtles and fishes.

Dr. Wells proposes to present natural and synthetic dolphins vocalizations to target individuals, at sources levels and frequencies similar to those of natural dolphin whistles (five to 20 kilohertz, and 160 dB re 1 µPa at 1 meter). During these playbacks, a speaker would placed at a depth of approximately one meter and the acoustic stimuli would be played for several seconds up to 13 minutes depending on the particular study design. The distance to the target dolphin(s) would vary, but would likely be between two and 10 meters, at which the estimated received level would be between 140 and 154 dB re 1 µPa. Researchers would make every effort to ensure that dolphins that are not subjects for the playback are farther away than the subject. The received level for these animals, which would be greater than 10 meters away, would be no more than 140 dB re 1 µPa. In addition to data that would be collected by tags if playbacks are conducted on previously tagged animals, researchers would observe, videotape, and record acoustic responses of dolphins using towed hydrophone arrays or stationary sound recording devices.

4 Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on that action for their justification. *Interdependent* actions are those that do not have independent utility apart from the action under consideration. For this consultation, we consider all vessel transit associated with research activities as interdependent. Thus, we evaluate the effects of this vessel transit on ESA-list species and so include all waters traversed during such transits as part of the action area.

5 ACTION AREA

Action area means all areas affected directly, or indirectly, by the Federal action, and not just the immediate area involved in the action (50 C.F.R. 402.02). The action area for Permit No. 20455 can be seen below in Figure 1. It includes waters off the west coast of Florida, including coastal waters and the U.S. Exlusive Economic Zone. Seine net captures would occur in shallow (typically less than three meters), coastal waters, primarily in Sarasota Bay, Florida but on occasion, elsewhere off the west coast of Florida. Research would occur anytime throughout the year.

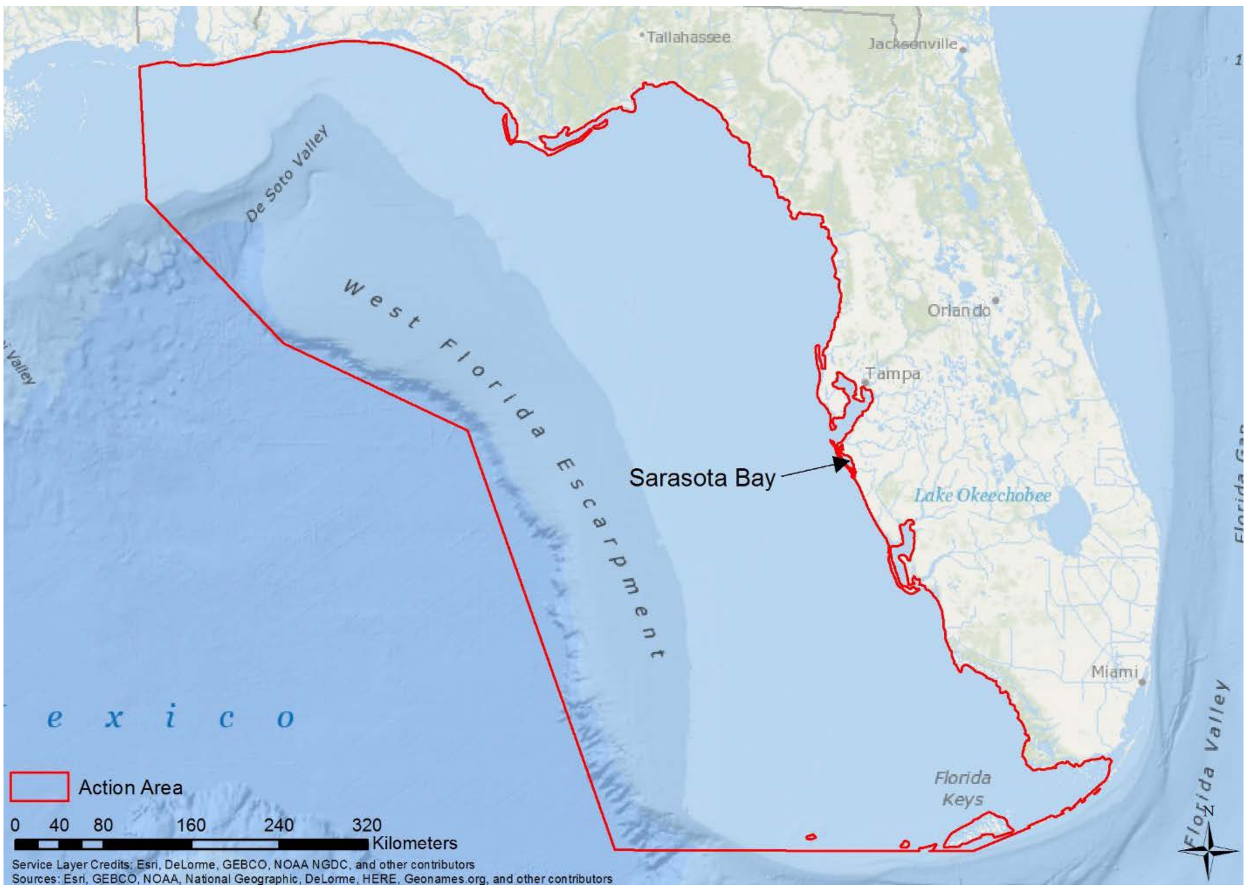

Figure 1: Action Area for Permit No. 20455 off the west coast of Florida.

6 STATUS OF ENDANGERED SPECIES ACT PROTECTED RESOURCES

This section identifies the ESA-listed species that potentially occur within the action area (Figure 1) that may be affected by the issuance of Permit No. 20455. It then summarizes the biology and ecology of those species that are likely to be adversely affected by the proposed action, and details what is known about their life histories in the action area. The species potentially occurring within the action area are ESA-listed in Table 1, along with their regulatory status.

Table 1: Threatened and endangered species that may be affected by the Permits Division's proposed action of the issuance of research Permit No. 20455.

Species	ESA Status	Critical Habitat	Recovery Plan
Turtles			
Green Turtle, (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693	63 FR 28359
Hawksbill Turtle (*Eretmochelys imbricata)*	E – 35 FR 8491	63 FR 46693	57 FR 38818
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	-- --	75 FR 12496
Leatherback Turtle (*Dermochelys coriacea*)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170	63 FR 28359
Loggerhead Turtle, (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39856	63 FR 28359 74 FR 2995
Olive Ridley Turtle (*Lepidochelys olivacea*) all other areas	T – 43 FR 32800	-- --	-- --
Fishes			
Gulf sturgeon (*Acipenser oxyrinchus desotoi*)	T – 56 FR 49653	68 FR 13370	09/1995
Smalltooth Sawfish (*Pristis pectinata*) – U.S. portion of range DPS	E – 68 FR 15674	74 FR 45353	74 FR 3566

During consultation we examined the status of each species that would be affected by the proposed action. The status is determined by the level of risk that the ESA-listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 C.F.R. 402.02. More detailed information on the status and trends of these ESA-listed species, and their biology and ecology can be found in the listing regulations and critical habitat designations published in the Federal Register, status reviews, recovery plans, and on NMFS Web site: http://www.nmfs.noaa.gov/pr/species/esa/listed.htm.

Below we describe the status of the species that are likely to be adversely affected by the proposed action. When available, we also describe that status of the species specifically within the action area.

6.1 Green Turtle (North Atlantic Distinct Population Segment)

The green turtle is globally distributed and commonly inhabits nearshore and inshore waters. The North Atlantic DPS green turtle is found in the North Atlantic Ocean and Gulf of Mexico (Figure 2).

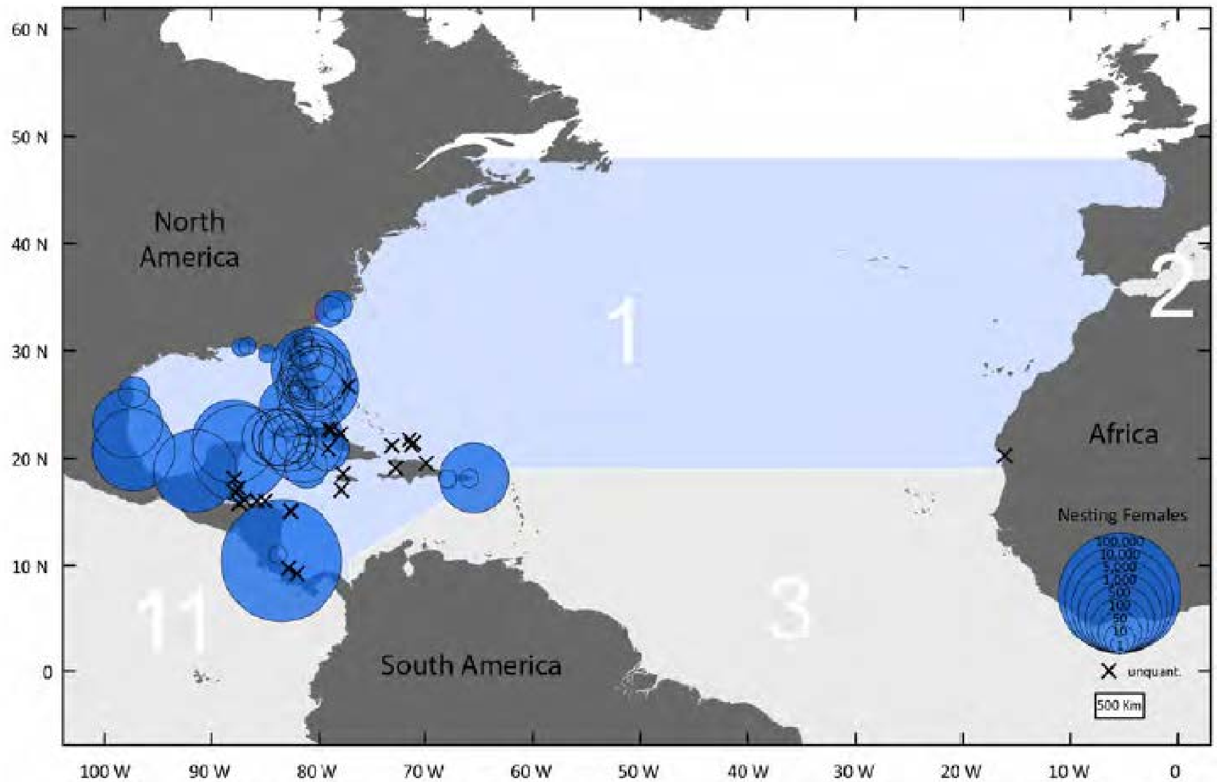

Figure 2. Geographic range of the North Atlantic distinct population segment green turtle, with location and abundance of nesting females. From Seminoff et al. (2015).

The green turtle is the largest of the hardshell marine turtles, growing to a weight of 350 pounds (159 kilograms) and a straight carapace length of greater than 3.3 feet (one meter) (Figure 3). The species was listed under the ESA on July 28, 1978. At this time, the species was separated into two listing designations: endangered for breeding populations in Florida and the Pacific coast of Mexico and threatened in all other areas throughout its range. On April 6, 2016, NMFS listed eleven DPSs of green sea turtles as threatened or endangered under the ESA (81 FR 20057) (Table 2). The North Atlantic DPS is listed as threatened.

Figure 3: Green turtle. Photo: Mark Sullivan, National Oceanic and Atmospheric Administration.

Table 2: North Atlantic distinct population segment green turtle information bar provides species Latin name, common name and current Federal Register notice of listing status, designated critical habitat, Distinct Population Segment, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Chelonia mydas	Green Turtle	North Atlantic	Threatened	2015	81 FR 20057	1991	63 FR 46693

We used information available in the 2007 five-year review (USFWS 2007) and 2015 status review (Seminoff et al. 2015) to summarize the life history, population dynamics and status of the species, as follows.

6.1.1 Life history

Age at first reproduction for females green turtles is 20 to 40 years. Green turtles lay an average of three nests per season with an average of one hundred eggs per nest. The remigration interval (i.e., return to natal beaches) is two to five years. Nesting occurs primarily on beaches with intact dune structure, native vegetation and appropriate incubation temperatures during summer months. Sex determination is temperature dependent, with warmer incubation producing more females. After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. Adult turtles exhibit site fidelity and migrate hundreds to thousands of kilometers from nesting beaches to foraging areas. Green turtles spend the majority of their lives in coastal foraging grounds, which include open coastlines and protected bays and lagoons. Adult green turtles feed primarily on seagrasses and algae, although they also eat jellyfish, sponges and other invertebrate prey.

6.1.2 Population dynamics

The following is a discussion of the species' population and its variance over time. This section includes: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the North Atlantic DPS green turtle.

Worldwide, nesting data at 464 sites indicate that 563,826 to 564,464 females nest each year (Seminoff et al. 2015). Compared to other DPSs, the North Atlantic DPS exhibits the highest nester abundance, with approximately 167,424 females at seventy-three nesting sites (Figure 2). The largest nesting site in the North Atlantic DPS is in Tortuguero, Costa Rica, which hosts seventy-nine percent of nesting females for the DPS (Seminoff et al. 2015).

For the North Atlantic DPS, available data indicate an increasing trend in nesting. There are no reliable estimates of population growth rate for the DPS as a whole, but estimates have been developed at a localized level. Modeling by Chaloupka et al. (2008) using data sets of 25 years or more show the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9 percent, and the Tortuguero, Costa Rica, population growing at 4.9 percent.

The North Atlantic DPS has a globally unique haplotype, which was a factor in defining the discreteness of the population for the DPS. Evidence from mitochondrial DNA studies indicates that there are at least four independent nesting subpopulations in Florida, Cuba, Mexico and Costa Rica (Seminoff et al. 2015). More recent genetic analysis indicates that designating a new western Gulf of Mexico management unit might be appropriate (Shamblin et al. 2016).

The green turtle has a circumglobal distribution, occurring throughout nearshore tropical, subtropical and, to a lesser extent, temperate waters. Green turtles from the North Atlantic DPS range from the boundary of South and Central America (7.5 degrees north, 77 degrees west) in the south, throughout the Caribbean, the Gulf of Mexico, and the U.S. Atlantic coast to New Brunswick, Canada (48 degrees north, 77 degrees west) in the north. The range of the DPS then extends due east along latitudes 48 degrees north and 19 degrees north to the western coasts of Europe and Africa (Figure 2). Nesting occurs primarily in Costa Rica, Mexico, Florida and Cuba.

6.1.3 Status

Historically, green turtles in the North Atlantic DPS were hunted for food, which was the principle cause of the population's decline. Apparent increases in nester abundance for the North

Atlantic DPS in recent years are encouraging but must be viewed cautiously, as the datasets represent a fraction of a green sea turtle generation, up to fifty years. While the threats of pollution, habitat loss through coastal development, beachfront lighting, and fisheries bycatch continue, the North Atlantic DPS appears to be somewhat resilient to future perturbations.

Status of Species within the Action Area

Four regions support nesting concentrations of particular interest in the North Atlantic DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo); United States (Florida), and Cuba. Seminoff et al. (2015) identified 73 nesting sites within the North Atlantic DPS, although some represent numerous individual beaches. Tortuguero, Costa Rica is the most important nesting concentration for green turtles in the North Atlantic DPS. In 2010, the estimated number of nesters was 30,052 to 64,396 (Seminoff et al. 2015). In the United States, green turtles nest primarily along the central and southeast coast of Florida where an estimated 8,426 females nest annually.

6.1.4 Critical Habitat

On September 2, 1998, NMFS designated critical habitat for green turtles (63 FR 46694), which include coastal waters surrounding Culebra Island, Puerto Rico (Figure 4). Seagrass beds surrounding Culebra provide important foraging resources for juvenile, subadult and adult green turtles. Additionally, coral reefs surrounding the island provide resting shelter and protection from predators. This area provides important developmental habitat for the species. Activities that may affect the critical habitat include beach renourishment, dredge and fill activities, coastal construction, and freshwater discharge. Due to its location, this critical habitat would be accessible by individuals of the North Atlantic DPS.

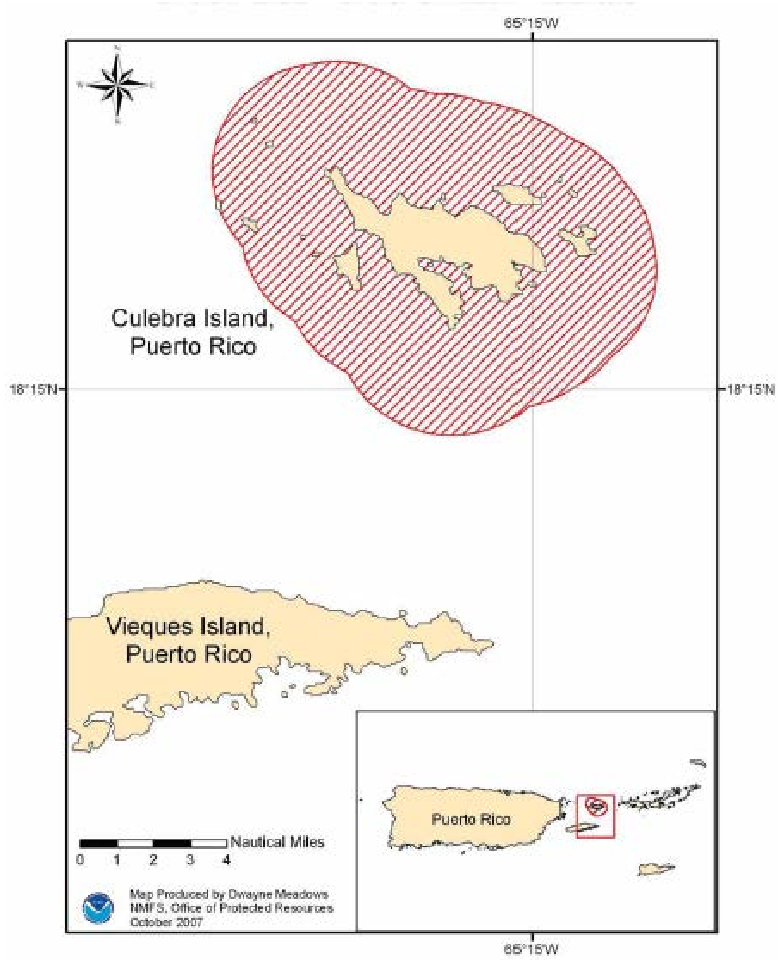

Figure 4: Map of green turtle designated critical habitat in Culebra Island, Puerto Rico.

6.1.5 Recovery Goals

See the 1998 and 1991 recovery plans for the Pacific, East Pacific and Atlantic populations of green turtles for complete down-listing/delisting criteria for recovery goals for the species. Broadly, recovery plan goals emphasize the need to protect and manage nesting and marine habitat, protect and manage populations on nesting beaches and in the marine environment, increase public education, and promote international cooperation on sea turtle conservation topics.

6.2 Hawksbill Turtle

The hawksbill turtle has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical oceans (Figure 5).

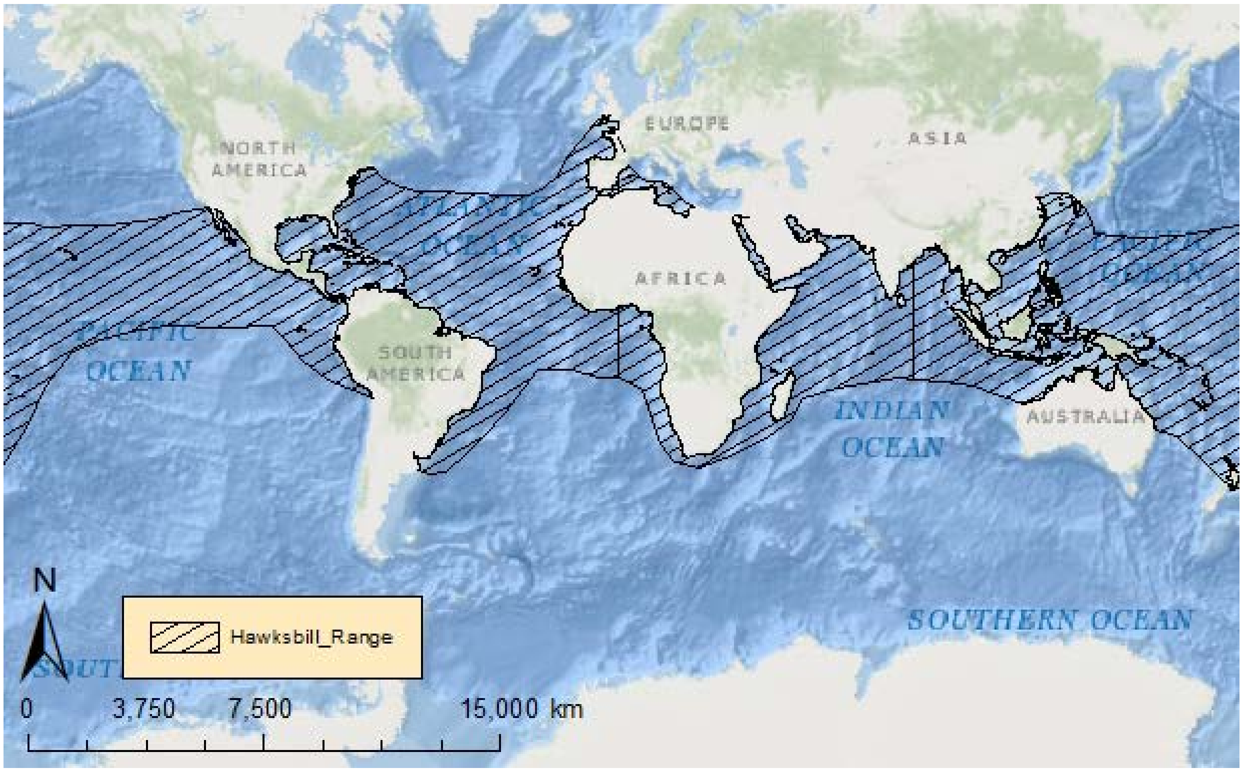

Figure 5. Map identifying the range of the hawksbill turtle.

The hawksbill turtle has a sharp, curved, beak-like mouth and a “tortoiseshell” pattern on its carapace, with radiating streaks of brown, black, and amber (Figure 6). The species was first listed under the Endangered Species Conservation Act and listed as endangered under the ESA since 1973 (Table 3).

Figure 6: Hawksbill turtle. Photo: John Chevalier

Table 3: Hawksbill turtle information bar provides species Latin name, common name and current Federal Register notifications for notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Eretmochelys imbricata	Hawksbill turtle	N/A	Endangered	2013	35 FR 8491	1991	63 FR 46693 Atlantic

We used information available in the five-year reviews (NMFS 2013b; NMFS and USFWS 2007a) to summarize the life history, population dynamics and status of the species, as follows.

6.2.1 Life History

Hawksbill turtles reach sexual maturity at 20 to 40 years of age. Females return to their natal beaches every two to five years to nest and nest an average of three to five times per season. Clutch sizes are large and can be up to 250 eggs. Sex determination is temperature dependent, with warmer incubation producing more females. Hatchlings migrate to, and remain in, pelagic habitats until they reach approximately 22 to 25 centimeters in straight carapace length. As juveniles, they take up residency in coastal waters to forage and grow. As adults, hawksbills use their sharp beak-like mouths to feed on sponges and corals. Hawksbill turtles are highly migratory and use a wide range of habitats during their lifetimes (Musick and Limpus 1997; Plotkin 2003). Satellite tagged turtles have shown significant variation in movement and migration patterns. Distance traveled between nesting and foraging locations ranges from a few hundred to a few thousand kilometers (Horrocks et al. 2001; Miller et al. 1998).

6.2.2 Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the hawksbill sea turtle.

Surveys at 88 nesting sites worldwide indicate that 22,004 to 29,035 females nest annually (NMFS 2013b). In general, hawksbills are doing better in the Atlantic and Indian Ocean than in the Pacific Ocean, where despite greater overall abundance, a greater proportion of the nesting sites are declining.

From 1980 to 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased 15 percent annually (Heppell et al. 2005); however, due to recent declines in nest counts, decreased survival at other life stages, and updated population modeling, this rate is not expected to continue (NMFS 2013b).

Populations are distinguished generally by ocean basin and more specifically by nesting location. Our understanding of population structure is relatively poor. Genetic analysis of hawksbill turtles foraging off the Cape Verde Islands identified three closely-related haplotypes in a large majority of individuals sampled that did not match those of any known nesting population in the western Atlantic, where the vast majority of nesting has been documented (McClellan et al. 2010; Monzon-Arguello et al. 2010). Hawksbills in the Caribbean seem to have dispersed into separate populations (rookeries) after a bottleneck roughly 100,000 to 300,000 years ago (Leroux et al. 2012).

The hawksbill has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic, Indian, and Pacific Oceans. In their oceanic phase, juvenile hawksbills can be found in *Sargassum* mats; post-oceanic hawksbills may occupy a range of habitats that include coral reefs or other hard-bottom habitats, sea grass, algal beds, mangrove bays and creeks (Bjorndal and Bolten 2010; Musick and Limpus 1997).

6.2.3 Status

Long-term data on the hawksbill turtle indicate that 63 sites have declined over the past 20 to one 100 years (historic trends are unknown for the remaining 25 sites). Recently, 28 sites (68 percent) have experienced nesting declines, 10 have experienced increases, three have remained stable, and 47 have unknown trends. The greatest threats to hawksbill turtles are overharvesting of turtles and eggs, degradation of nesting habitat, and fisheries interactions. Adult hawksbills are harvested for their meat and carapace, which is sold as tortoiseshell. Eggs are taken at high levels, especially in southeast Asia where collection approaches 100 percent in some areas. In addition, lights on or adjacent to nesting beaches are often fatal to emerging hatchlings and alters the behavior of nesting adults. The species' resilience to additional perturbation is low.

Status of Species within the Action Area

In the Atlantic, hawksbill population increase has been greater in the Insular Caribbean than along the Western Caribbean Mainland or the eastern Atlantic (including Sao Tomé and Equatorial Guinea). Nesting populations of Puerto Rico appeared to be in decline until the early 1990's, but have universally increased during the survey periods. Mona Island now hosts 199 to 332 nesting females annually, and the other sites combined host 51 to 85 nesting females annually (NMFS and USFWS 2007a). The U.S. Virgin Islands have a long history of tortoiseshell trade (Schmidt 1916). At Buck Island Reef National Monument, protection has been in force since 1988, and during that time, hawksbill nesting has increased by 143 percent to 56 nesting females annually, with apparent spill over to beaches on adjacent St. Croix. However, St. John populations did not increase, perhaps due to the proximity of the legal turtle harvest in the British Virgin Islands.

6.2.4 Critical Habitat

On September 2, 1998, NMFS established critical habitat for hawksbill turtles around Mona and Monito Islands, Puerto Rico (Figure 7). Aspects of these areas that are important for hawksbill turtle survival and recovery include important natal development habitat, refuge from predation, shelter between foraging periods, and food for hawksbill turtle prey.

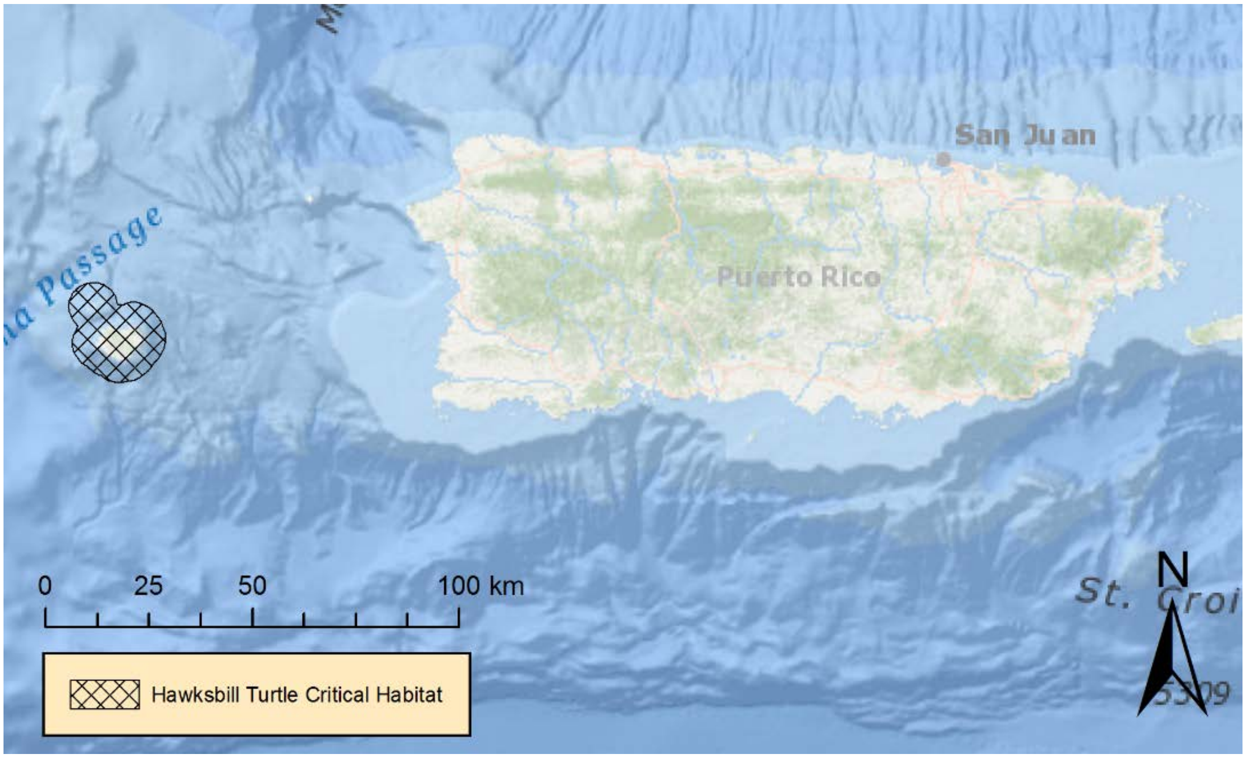

Figure 7. Map depicting hawksbill sea turtle critical habitat.

6.2.5 Recovery Goals

See the 1992 and 1998 Recovery Plans for the U.S. Caribbean, Atlantic and Gulf of Mexico and U.S. Pacific populations of hawksbill turtles, respectively, for complete down listing/delisting criteria for each of their respective recovery goals. The following items were the top recovery actions identified to support in the Recovery Plans:

1. Identify important nesting beaches.
2. Ensure long-term protection and management of important nesting beaches.
3. Protect and manage nesting habitat; prevent the degradation of nesting habitat caused by seawalls, revetments, sand bags, other erosion-control measures, jetties and breakwaters.
4. Identify important marine habitats; protect and manage populations in marine habitat.
5. Protect and manage marine habitat; prevent the degradation or destruction of important [marine] habitats caused by upland and coastal erosion.
6. Prevent the degradation of reef habitat caused by sewage and other pollutants.
7. Monitor nesting activity on important nesting beaches with standardized index surveys.
8. Evaluate nest success and implement appropriate nest-protection on important nesting beaches.
9. Ensure that law-enforcement activities prevent the illegal exploitation and harassment of sea turtles and increase law-enforcement efforts to reduce illegal exploitation.
10. Determine nesting beach origins for juveniles and subadult populations.

6.3 Kemp's Ridley Turtle

The Kemp's ridley turtle is considered the most endangered sea turtle internationally (Groombridge 1982; Zwinenberg 1977). Its range extends from the Gulf of Mexico to the Atlantic coast, with nesting beaches limited to a few sites in Mexico and Texas (Figure 8).

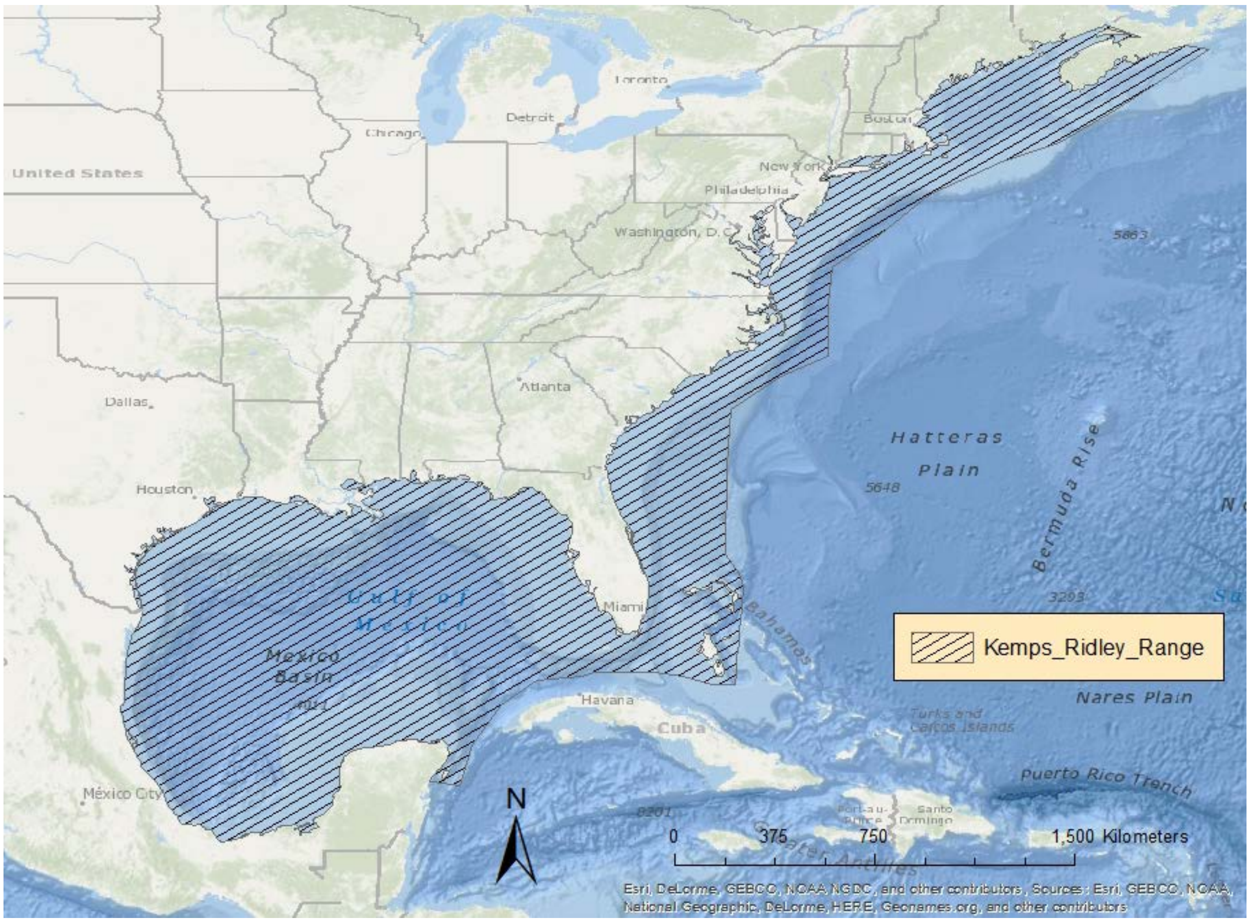

Figure 8. Map identifying the range of the Kemp's ridley turtle.

Kemp's ridley turtles the smallest of all sea turtle species, with a nearly circular top shell and a pale yellowish bottom shell (Figure 9). The species was first listed under the Endangered Species Conservation Act and listed as endangered under the ESA since 1973 (Table 4).

Figure 9: Kemp's ridley turtle. Photo: National Oceanic and Atmospheric Administration.

Table 4. Kemp's ridley turtle information bar provides species Latin name, common name and current Federal Register notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Lepidochelys kempii	Kemp's ridley turtle	None Designated	Endangered range wide	2015	35 FR 18319	75 FR 12496 U.S. Caribbean, Atlantic, and Gulf of Mexico (draft) U.S. Caribbean, Atlantic, and Gulf of Mexico	None Designated

We used information available in the revised recovery plan (NMFS 2011a) and the five-year review (NMFS 2015) to summarize the life history, population dynamics and status of the species, as follows.

6.3.1 Life History

Females mature at 12 years of age. The average remigration is two years. Nesting occurs from April to July in large arribadas, primarily at Rancho Nuevo, Mexico. Females lay an average of 2.5 clutches per season. The annual average clutch size is 97 to 100 eggs per nest. The nesting location may be particularly important because hatchlings can more easily migrate to foraging grounds in deeper oceanic waters, where they remain for approximately two years before returning to nearshore coastal habitats. Juvenile Kemp’s ridley turtles use these nearshore coastal habitats from April through November, but move towards more suitable overwintering habitat in deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops. Adult habitat largely consists of sandy and muddy areas in shallow, nearshore waters less than 120 feet (37 meters) deep, although they can also be found in deeper offshore waters. As adults, Kemp’s ridleys forage on swimming crabs, fish, jellyfish, mollusks, and tunicates (NMFS 2011a).

6.3.2 Population Dynamics

The following is a discussion of the species’ population and its variance over time. This section includes: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Kemp’s ridley turtle.

Of the sea turtles species in the world, the Kemp's ridley has declined to the lowest population level. Nesting aggregations at a single location (Rancho Nuevo, Mexico) were estimated at 40,000 females in 1947. By the mid-1980s, the population had declined to an estimated 300 nesting females. In 2014, there were an estimated 10,987 nests and 519,000 hatchlings released from three primary nesting beaches in Mexico (NMFS 2015). The number of nests in Padre Island, Texas has increased over the past two decades, with one nest observed in 1985, four in 1995, fifty in 2005, 197 in 2009, and 119 in 2014 (NMFS 2015).

From 1980 to 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased 15 percent annually (Heppell et al. 2005); however, due to recent declines in nest counts, decreased survival at other life stages, and updated population modeling, this rate is not expected to continue (NMFS 2015).

Genetic variability in Kemp’s ridley turtles is considered to be high, as measured by heterozygosis at microsatellite loci (NMFS 2011a). Additional analysis of the mitochondrial DNA taken from samples of Kemp’s ridley turtles at Padre Island, Texas, showed six distinct haplotypes, with one found at both Padre Island and Rancho Nuevo (Dutton et al. 2006).

The Kemp's ridley turtle occurs from the Gulf of Mexico and along the Atlantic coast of the United States (TEWG 2000). Kemp’s ridley turtles have occasionally been found in the Mediterranean Sea, which may be due to migration expansion or increased hatchling production (Tomas and Raga 2008). The vast majority of individuals stem from breeding beaches at Rancho Nuevo on the Gulf of Mexico coast of Mexico. During spring and summer, juvenile Kemp’s ridleys occur in the shallow coastal waters of the northern Gulf of Mexico from south Texas to north Florida. In the fall, most Kemp's ridleys migrate to deeper or more southern, warmer waters and remain there through the winter (Schmid 1998). As adults, many turtles remain in the Gulf of Mexico, with only occasional occurrence in the Atlantic Ocean (NMFS et al. 2010).

6.3.3 Status

The Kemp's ridley was listed as endangered in response to a severe population decline, primarily the result of egg collection. In 1973, legal ordinances prohibited the harvest of sea turtles from May to August, and in 1990, the harvest of all sea turtles was prohibited by presidential decree. In 2002, Rancho Nuevo was declared a Sanctuary. A successful head-start program has resulted in the reestablishment of nesting at Texan beaches. While fisheries bycatch remains a threat, the use of turtle excluder devices mitigates take. Fishery interactions and strandings, possibly due to forced submergence, appear to be the main threats to the species. It is clear that the species is steadily increasing; however, the species' limited range and low global abundance make it vulnerable to new sources of mortality as well as demographic and environmental randomness, all of which are often difficult to predict with any certainty. Therefore, its resilience to future perturbation is low.

Status of Species within the Action Area

During the mid-20th century, the Kemp's ridley was abundant in the Gulf of Mexico. Historic information indicates that tens of thousands of Kemp's ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). From 1978 through the 1980s, arribadas were 200 turtles or less, and by 1985, the total number of nests at Rancho Nuevo had dropped to approximately 740 for the entire nesting season, which was a projection of roughly 234 turtles (TEWG 2000; USFWS and NMFS 1992). Beginning in the 1990s, an increasing number of beaches in Mexico were being monitored for nesting, and the total number of nests on all beaches in Tamaulipas and Veracruz in 2002 was over 6,000; the rate of increase from 1985 ranged from 14 to 16 percent (Heppell et al. 2005; TEWG 2000; USFWS 2002). In 2006, approximately 7,866 nests were laid at Rancho Nuevo with the total number of nests for all the beaches in Mexico estimated at about 12,000 nests, which amounted to about 4,000 nesting females based on three nests per female per season (Rostal 2007; Rostal et al. 1997; USFWS 2006). Considering remigration rates, the population included approximately 7,000 to 8,000 adult female turtles at that time (Márquez et al. 1989; Rostal 2007; TEWG 2000). The 2007 nesting season included an arribada of over 4,000 turtles over a three-day period at Rancho Nuevo (NMFS and USFWS 2007b). The increased recruitment of new adults is illustrated in the proportion of first time nesters, which has increased from six percent in 1981 to 41 percent in 1994. NMFS (2015) identified noticeable drops in the number of nests in Texas and Mexico in 2010, 2013, and 2014.

6.3.4 Critical Habitat

No critical habitat has been designated for Kemp's ridley turtles.

6.3.5 Recovery Goals

See the 2011 Final Bi-National (United States and Mexico) Revised Recovery Plan for Kemp's ridley turtles for complete down listing/delisting criteria for each of their respective recovery goals. The following items were identified as priorities to recover Kemp's ridely turtles:

1. Protect and manage nesting and marine habitats.
2. Protect and manage populations on the nesting beaches and in the marine environment.
3. Maintain a stranding network.
4. Manage captive stocks.
5. Sustain education and partnership programs.
6. Maintain, promote awareness of and expand United States and Mexican laws.
7. Implement international agreements.
8. Enforce laws.

6.4 Leatherback Turtle

The leatherback turtle is unique among sea turtles for its large size, wide distribution (due to thermoregulatory systems and behavior), and lack of a hard, bony carapace. It ranges from tropical to subpolar latitudes, worldwide (Figure 10).

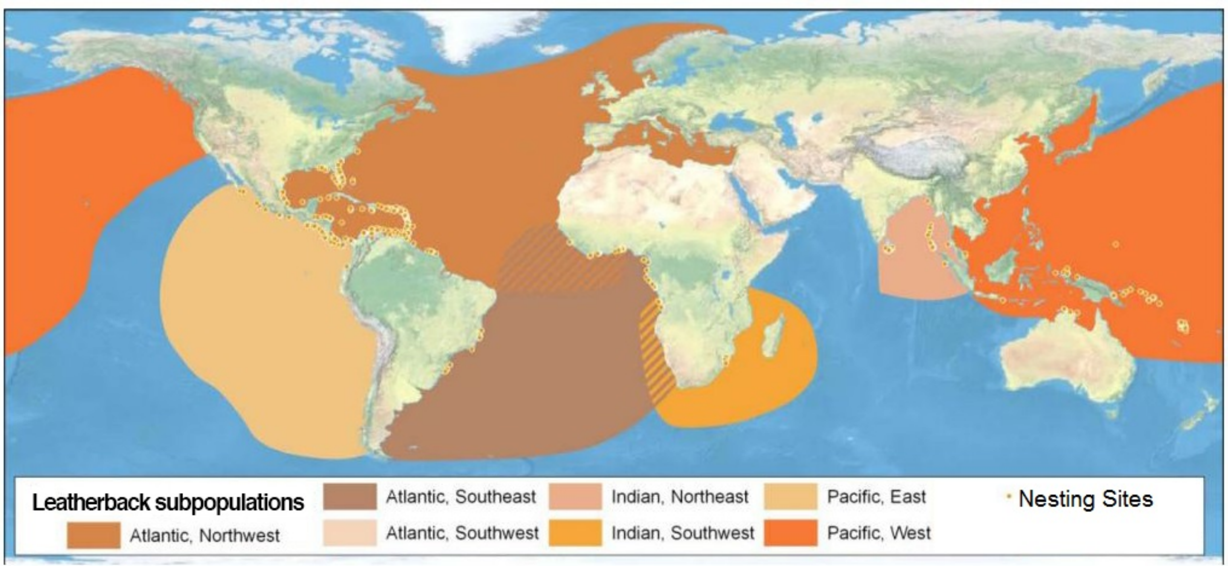

Figure 10: Map identifying the range of the leatherback turtle. Adapted from Wallace et al. (2007).

Leatherbacks are the largest living turtle, reaching lengths of six feet long, and weighing up to one ton. Leatherback sea turtles have a distinct black leathery skin covering their carapace with pinkish white skin on their belly (Figure 11). The species was first listed under the Endangered Species Conservation Act and listed as endangered under the ESA since 1973 (Table 5).

Figure 11: Leatherback turtle. Photo: R.Tapilatu

Table 5. Leatherback turtle information bar provides species Latin name, common name and current Federal Register notifications for notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Dermochelys coriacea	Leatherback turtle	N/A	Endangered range wide	2013	35 FR 8491	63 FR 28359 Pacific U.S. Caribbean, Atlantic and Gulf of Mexico	44 FR 17710 and 77 FR 4170

We used information available in the five-year review (NMFS 2013c) and the critical habitat designation to summarize the life history, population dynamics and status of the species, as follows.

6.4.1 Life History

Age at maturity has been difficult to ascertain, with estimates ranging from five to 29 years (Avens et al. 2009; Spotila et al. 1996). Females lay up to seven clutches per season, with more than 65 eggs per clutch and eggs weighing greater than 80 grams (Reina et al. 2002; Wallace et al. 2007). The number of leatherback hatchlings that make it out of the nest on to the beach (i.e., emergent success) is approximately 50 percent worldwide (Eckert et al. 2012). Females nest every one to seven years. Natal homing, at least within an ocean basin, results in reproductive isolation between five broad geographic regions: eastern and western Pacific, eastern and western Atlantic, and Indian Ocean. Leatherback turtles migrate long, transoceanic distances between their tropical nesting beaches and the highly productive temperate waters where they forage, primarily on jellyfish and tunicates. These gelatinous prey are relatively nutrient-poor, such that leatherbacks must consume large quantities to support their body weight. Leatherbacks weigh about 33 percent more on their foraging grounds than at nesting, indicating that they probably catabolize fat reserves to fuel migration and subsequent reproduction (James et al. 2005; Wallace et al. 2006). Leatherback turtles must meet an energy threshold before returning to nesting beaches. Therefore, their remigration intervals (the time between nesting) are dependent upon foraging success and duration (Hays 2000; Price et al. 2004).

6.4.2 Population Dynamics

The following is a discussion of the species’ population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the leatherback turtle.

Leatherbacks are globally distributed, with nesting beaches in the Pacific, Atlantic, and Indian oceans. Detailed population structure is unknown, but is likely dependent upon nesting beach location. Based on estimates calculated from nest count data, there are between 34,000 and 94,000 adult leatherbacks in the North Atlantic (TEWG 2007). In contrast, leatherback populations in the Pacific are much lower. Overall, Pacific populations have declined from an estimated 81,000 individuals to less than 3,000 total adults and subadults (Spotila et al. 2000). Population abundance in the Indian Ocean is difficult to assess due to lack of data and inconsistent reporting. Available data from southern Mozambique show that approximately ten females nest per year from 1994 to 2004, and about 296 nests per year counted in South Africa (NMFS 2013c).

Population growth rates for leatherback turtles vary by ocean basin. Counts of leatherbacks at nesting beaches in the western Pacific indicate that the subpopulation has been declining at a rate of almost six percent per year since 1984 (Tapilatu et al. 2013). Leatherback subpopulations in the Atlantic Ocean, however, are showing signs of improvement. Nesting females in South Africa are increasing at an annual rate of four to 5.6 percent, and from nine to 13 percent in Florida and the U.S. Virgin Islands (TEWG 2007), believed to be a result of conservation efforts.

Analyses of mitochondrial DNA from leatherback turtles indicates a low level of genetic diversity, pointing to possible difficulties in the future if current population declines continue (Dutton et al. 1999). Further analysis of samples taken from individuals from rookeries in the Atlantic and Indian oceans suggest that each of the rookeries represent demographically independent populations (NMFS 2013c).

Leatherback turtles are distributed in oceans throughout the world (Figure 10). Leatherbacks occur throughout marine waters, from nearshore habitats to oceanic environments (Shoop and Kenney 1992). Movements are largely dependent upon reproductive and feeding cycles and the oceanographic features that concentrate prey, such as frontal systems, eddy features, current boundaries, and coastal retention areas (Benson et al. 2011).

6.4.3 Status

The leatherback turtle is an endangered species whose once large nesting populations have experienced steep declines in recent decades. The primary threats to leatherback turtles include fisheries bycatch, harvest of nesting females and their eggs. Because of these threats, once large rookeries are now functionally extinct, and there have been range-wide reductions in population abundance. Other threats include loss of nesting habitat due to development, tourism, and sand extraction. Lights on or adjacent to nesting beaches alter nesting adult behavior and are often fatal to emerging hatchlings as they are drawn to light sources and away from the sea. Plastic ingestion is common in leatherbacks and can block gastrointestinal tracts leading to death. Climate change may alter sex ratios (as temperature determines hatchling sex), range (through expansion of foraging habitat), and habitat (through the loss of nesting beaches, because of sea-level rise. The species' resilience to additional perturbation is low.

Status of Species within the Action Area

North Atlantic leatherbacks likely number 34,000 to 94,000 individuals, with females numbering 18,800 and the eastern Atlantic segment numbering 4,700 (TEWG 2007). Trends and numbers include only nesting females and are not a complete demographic or geographic cross-section. In 1996, the entire western Atlantic population was characterized as stable at best (Spotila et al. 1996), with roughly 18,800 nesting females. A subsequent analysis indicated that by 2000, the western Atlantic nesting population had decreased to about 15,000 nesting females (NMFS 2005). Spotila et al. (1996) estimated that the entire Atlantic basin, including all nesting beaches in the Americas, the Caribbean, and West Africa, totaled approximately 27,600 nesting females, with an estimated range of 20,082 to 35,133. This is consistent with other estimates of 34,000 to 95,000 total adults (20,000 to 56,000 adult females; 10,000 to 21,000 nesting females) (TEWG 2007).

In the Caribbean, Atlantic and Gulf of Mexico, leatherback populations are generally increasing. In the United States, the Atlantic coast of Florida is one of the main nesting areas in the continental United States. Data from this area reveals a general upward trend, though with some fluctuation. Florida index nesting beach data from 1989 to 2014 indicate that number of nests at core index nesting beach ranged from 27 to 641 in 2014. In the U.S. Caribbean, nesting in Puerto Rico, St. Croix, and the U.S. Virgin Islands continues to increase as well, with some shift in the nesting between these two islands.

6.4.4 Critical Habitat

On March 23, 1979, leatherback critical habitat was identified adjacent to Sandy Point, St. Croix, Virgin Islands from the 183 meter isobath to mean high tide level between 17 degrees 42 minutes 12 seconds north and 65 degrees 50 minutes 00 seconds west (Figure 12). This habitat is essential for nesting, which has been increasingly threatened since 1979, when tourism increased significantly, bringing nesting habitat and people into close and frequent proximity. The designated critical habitat is within the Sandy Point National Wildlife Refuge. Leatherback nesting increased at an annual rate of thirteen percent from 1994 to 2001; this rate has slowed according to nesting data from 2001 to 2010 (NMFS 2013c).

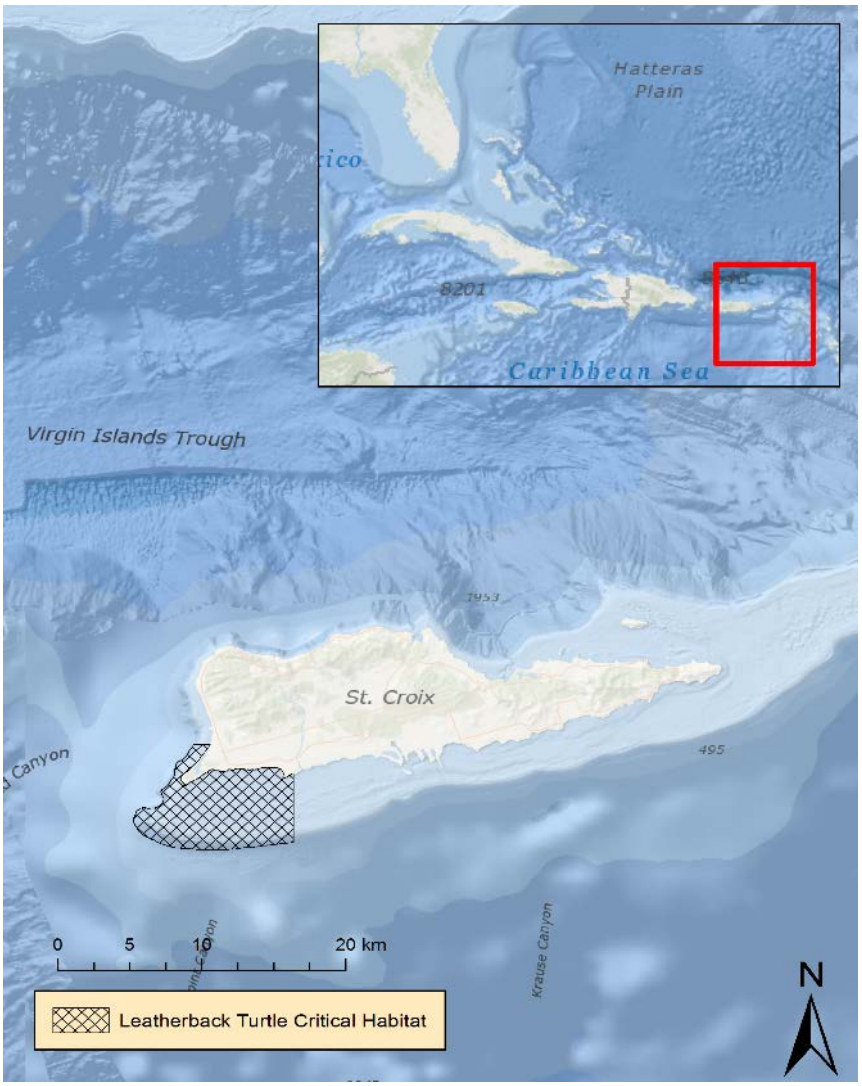

Figure 12: Map depicting leatherback turtle designated critical habitat in the United States Virgin Islands.

On January 20, 2012, NMFS issued a final rule to designate additional critical habitat for the leatherback turtle (50 CFR 226). This designation includes approximately 43,798 square kilometers stretching along the California coast from Point Arena to Point Arguello east of the 3000 meter depth contour; and 64,760 square kilometers stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 meters depth contour (Figure 13). The designated areas comprise approximately 108,558 square kilometers of marine habitat and include waters from the ocean surface down to a maximum depth of 80 meters. They were designated specifically because of the occurrence of prey species, primarily *scyphomedusae* of the order *Semaeostomeae* (i.e., jellyfish), of sufficient condition, distribution, diversity, abundance and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks.

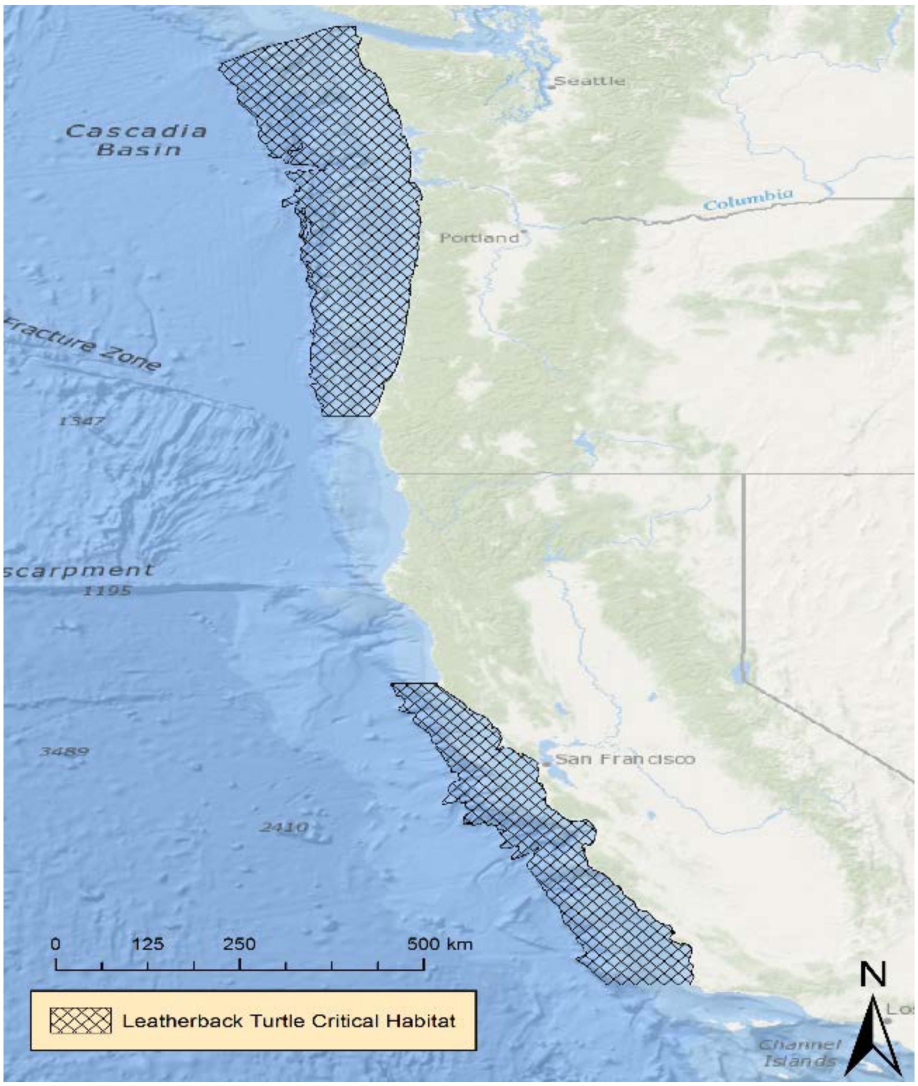

Figure 13: Map depicting leatherback turtle designated critical habitat along the United States Pacific Coast.

6.4.5 Recovery Goals

See the 1998 and 1991 Recovery Plans for the U.S. Pacific and U.S. Caribbean, Gulf of Mexico and Atlantic leatherback sea turtles for complete down listing/delisting criteria for each of their respective recovery goals. The following items are the top five recovery actions identified to support in the Leatherback Five Year Action Plan:

1. Reduce fisheries interactions.
2. Improve nesting beach protection and increase reproductive output.
3. International cooperation.
4. Monitoring and research.
5. Public engagement.

6.5 Loggerhead Turtle (Northwest Atlantic Distinct Population Segment)

Loggerhead turtles have a circumglobal distribution and are found in the temperate and tropical regions of the Indian, Pacific and Atlantic Oceans. Northwest Atlantic Ocean DPS loggerheads are found along eastern North America, Central America, and northern South America (Figure 14).

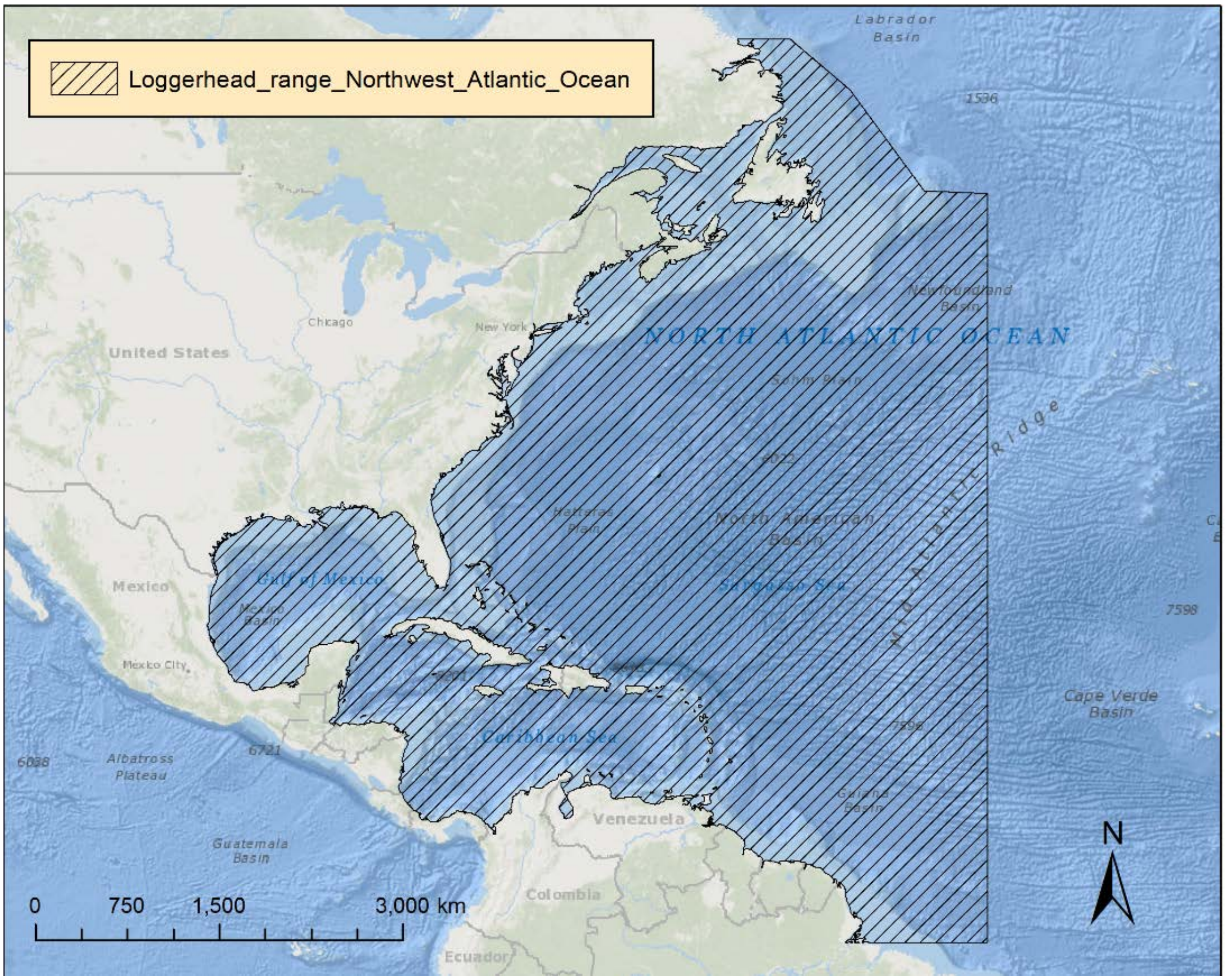

Figure 14. Map identifying the range of the Northwest Atlantic Ocean distinct population segment loggerhead turtle.

The loggerhead turtle is distinguished from other turtles by its reddish-brown carapace, large head and powerful jaws (Figure 15). The species was first listed as threatened under the Endangered Species Act in 1978. On September 22, 2011, NMFS designated nine DPSs of loggerhead turtles, with the Northwest Atlantic Ocean DPS listed as threatened (Table 6).

Figure 15: Loggerhead sea turtle. Photo: National Oceanic and Atmospheric Administration.

Table 6. Northwest Atlantic Ocean distinct population segment loggerhead turtle information bar provides species Latin name, common name and current Federal Register notice of listing status, designated critical habitat, Distinct Population Segment, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Caretta caretta	Loggerhead turtle	Northwest Atlantic Ocean	Threatened	2009	76 FR 58868	2009	79 FR 39855

We used information available in the 2009 status review (Conant et al. 2009) and the final listing rule to summarize the life history, population dynamics and status of the species, as follows.

6.5.1 Life History

Mean age at first reproduction for female loggerhead sea turtles is 30 years. Females lay an average of three clutches per season. The annual average clutch size is 112 eggs per nest. The average remigration interval is 2.7 years. Nesting occurs on beaches, where warm, humid sand temperatures incubate the eggs. Temperature determines the sex of the turtle during the middle of the incubation period. Turtles spend the post-hatchling stage in pelagic waters. The juvenile stage is spent first in the oceanic zone and later in the neritic zone (i.e., coastal waters). Coastal waters provide important foraging habitat, inter-nesting habitat, and migratory habitat for adult loggerheads.

6.5.2 Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Northwest Atlantic Ocean DPS loggerhead turtle.

There is general agreement that the number of nesting females provides a useful index of the species' population size and stability at this life stage, even though there are doubts about the ability to estimate the overall population size. Adult nesting females often account for less than one percent of total population numbers (Bjorndal et al. 2005).

Using a stage/age demographic model, the adult female population size of the Northwest Atlantic Ocean DPS is estimated at 20,000 to 40,000 females, and 53,000 to 92,000 nests annually (NMFS-SEFSC 2009). The Northwest Atlantic Ocean DPS is further categorized into five recovery units corresponding to nesting beaches. These are Northern Recovery Unit, Peninsular Florida Recovery Unit, Dry Tortugas Recovery Unit, Northern Gulf of Mexico Recovery Unit, and the Greater Caribbean Recovery Unit. The Northern Recovery Unit, from North Carolina to northeastern Florida, and is the second largest nesting aggregation in the DPS, with an average of 5,215 nests from 1989 to 2008, and approximately 1,272 nesting females (NMFS and USFWS 2008b). The Peninsular Florida Recovery Unit hosts more than 10,000 females nesting annually, which constitutes 87 percent of all nesting effort in the DPS (Ehrhart et al. 2003). The Greater Caribbean Recovery Unit encompasses nesting subpopulations in Mexico to French Guiana, the Bahamas, and the Lesser and Greater Antilles. The majority of nesting for this recovery unit occurs on the Yucatán peninsula, in Quintana Roo, Mexico, with 903 to 2,331 nests annually (Zurita et al. 2003). Other significant nesting sites are found throughout the Caribbean, and including Cuba, with approximately 250 to 300 nests annually (Ehrhart et al. 2003), and over 100 nests annually in Cay Sal in the Bahamas (NMFS and USFWS 2008b). The Dry Tortugas Recovery Unit includes all islands west of Key West, Florida. The only available data for the nesting subpopulation on Key West comes from a census conducted from 1995 to 2004 (excluding 2002), which provided a mean of 246 nests per year, or about 60 nesting females (NMFS and USFWS 2007c). The Northern Gulf of Mexico Recovery Unit has between 100 to 999 nesting females annually, and a mean of 910 nests per year.

The population growth rate for all four of the recovery units for the Northwest Atlantic DPS that have available data (Peninsular Florida, Northern, Northern Gulf of Mexico, and Greater Caribbean) indicate negative growth rates (Conant et al. 2009). Nest counts taken at index beaches in Peninsular Florida show a significant decline in loggerhead nesting from 1989 to 2006, most likely attributed to mortality of oceanic-stage loggerheads caused by fisheries bycatch (Witherington et al. 2009). Loggerhead nesting on the Archie Carr National Wildlife Refuge (representing individuals of the Peninsular Florida subpopulation) has fluctuated over the past few decades. There was an average of 9,300 nests throughout the 1980s, with the number of nests increasing into the 1990s until it reached an all-time high in 1998, with 17,629 nests. From that point, the number of loggerhead nests at the refuge have declined steeply to a low of 6,405 in 2007, increasing again to 15,539, still a lower number of nests than in 1998 (Bagley et al. 2013). For the Northern recovery unit, nest counts at loggerhead nesting beaches in North Carolina, South Carolina and Georgia declined at 1.9 percent annually from 1983 to 2005 (NMFS and USFWS 2007c). The nesting subpopulation in the Florida panhandle has exhibited a significant declining trend from 1995 to 2005 (Conant et al. 2009; NMFS and USFWS 2007c). Recent model estimates predict an overall population decline of 17 percent for the St. Joseph Peninsula, Florida subpopulation of the Northern Gulf of Mexico recovery unit (Lamont et al. 2014).

Genetic analysis of nesting subpopulations support the delineation of the previously mentioned five recovery units (Conant et al. 2009). A more recent analysis using expanded mitochondrial DNA sequences revealed that rookeries from the Gulf and Atlantic coasts of Florida are genetically distinct, and that rookeries from Mexico's Caribbean coast express high haplotype diversity (Shamblin et al. 2014). Furthermore, the results suggest that the Northwest Atlantic Ocean DPS should be considered as 10 management units: (1) South Carolina and Georgia, (2) central eastern Florida, (3) southeastern Florida, (4) Cay Sal, Bahamas, (5) Dry Tortugas, Florida, (6) southwestern Cuba, (7) Quintana Roo, Mexico, (8) southwestern Florida, (9) central western Florida, and (10) northwestern Florida (Shamblin et al. 2012).

Loggerhead hatchlings from the western Atlantic disperse widely, most likely using the Gulf Stream to drift throughout the Atlantic Ocean. Mitochondrial DNA evidence demonstrates that juvenile loggerheads from southern Florida nesting beaches comprise the vast majority (71 to 88 percent) of individuals found in foraging grounds throughout the western and eastern Atlantic: Nicaragua, Panama, Azores and Madiera, Canary Islands and Adalusia, Gulf of Mexico and Brazil (Masuda 2010).

6.5.3 Status

Due to declines in nest counts at index beaches in the United States and Mexico, and continued mortality of juveniles and adults from fishery bycatch, the Northwest Atlantic Ocean DPS is at risk and likely to decline in the foreseeable future (Conant et al. 2009).

Status of Species within the Action Area

The Peninsular Florida, Dry Tortugas, and Northern Gulf of Mexico Recovery Units may be found within the action area. Of these, the Peninsular Florida Recovery Unit is the largest, and may be critical to the survival of the species in the Atlantic given its large size, which is likely second only to the Oman nesting aggregation (NMFS and USFWS 1991). The Dry Tortugas and Northern Gulf of Mexico Recovery Units are magnitudes of order smaller. A near-complete statewide nest census in Florida (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed a mean of 64,513 loggerhead nests per year, representing approximately

15,735 nesting females annually (NMFS and USFWS 2008a). The Florida statewide estimated total for 2010 was 73,702 (FFWCC 2016). The 2010 index nesting number is the largest since 2000.

Population trend data are only available for the Peninsular Florida and Northern Gulf of Mexico Recovery Units, both of which appear to be in decline (Conant et al. 2009). The Peninsular Florida recovery unit increased at about 5.3 percent per year from 1978 to 1990, and was initially increasing at 3.9 to 4.2 percent after 1990. An analysis of nesting data from 1989 to 2005, a period of more consistent and accurate surveys than in previous years, showed a detectable trend and, more recently (1998 to 2005), analysis revealed evidence of a declining trend of approximately 22.3 percent (FFWCC 2006; FFWCC 2007; Witherington et al. 2009). Nesting data from the Archie Carr Refuge (one of the most important nesting locations in southeast Florida) over the last six years shows nests declined from approximately 17,629 in 1998 to 7,599 in 2004, also suggesting a decrease in recovery unit size. Loggerhead nesting is thought to consist of just 60 nesting females in the Caribbean and Gulf of Mexico. The nesting subpopulation in the Florida panhandle has exhibited a significant declining trend from 1995 to 2005 (Conant et al. 2009; NMFS and USFWS 2007c). Recent model estimates predict an overall population decline of 17 percent for the St. Joseph Peninsula, Florida subpopulation of the Northern Gulf of Mexico recovery unit (Lamont et al. 2014)

6.5.4 Critical Habitat

On July 10, 2014, NMFS and the U.S. Fish and Wildlife Service designated critical habitat for the Northwest Atlantic Ocean DPS loggerhead turtles along the U.S. Atlantic and Gulf of Mexico coasts from North Carolina to Mississippi (79 FR 39856) (Figure 16). These areas contain one or a combination of nearshore reproductive habitat, winter area, breeding areas, and migratory corridors. The critical habitat is categorized into 38 occupied marine areas and 685 miles of nesting beaches. The physical and biological features (formerly primary constituent elements) identified for the different habitat types include waters adjacent to high density nesting beaches, waters with minimal obstructions and manmade structures, high densities of reproductive males and females, appropriate passage conditions for migration, conditions that support sargassum habitat, available prey, and sufficient water depth and proximity to currents to ensure offshore transport of post-hatchlings.

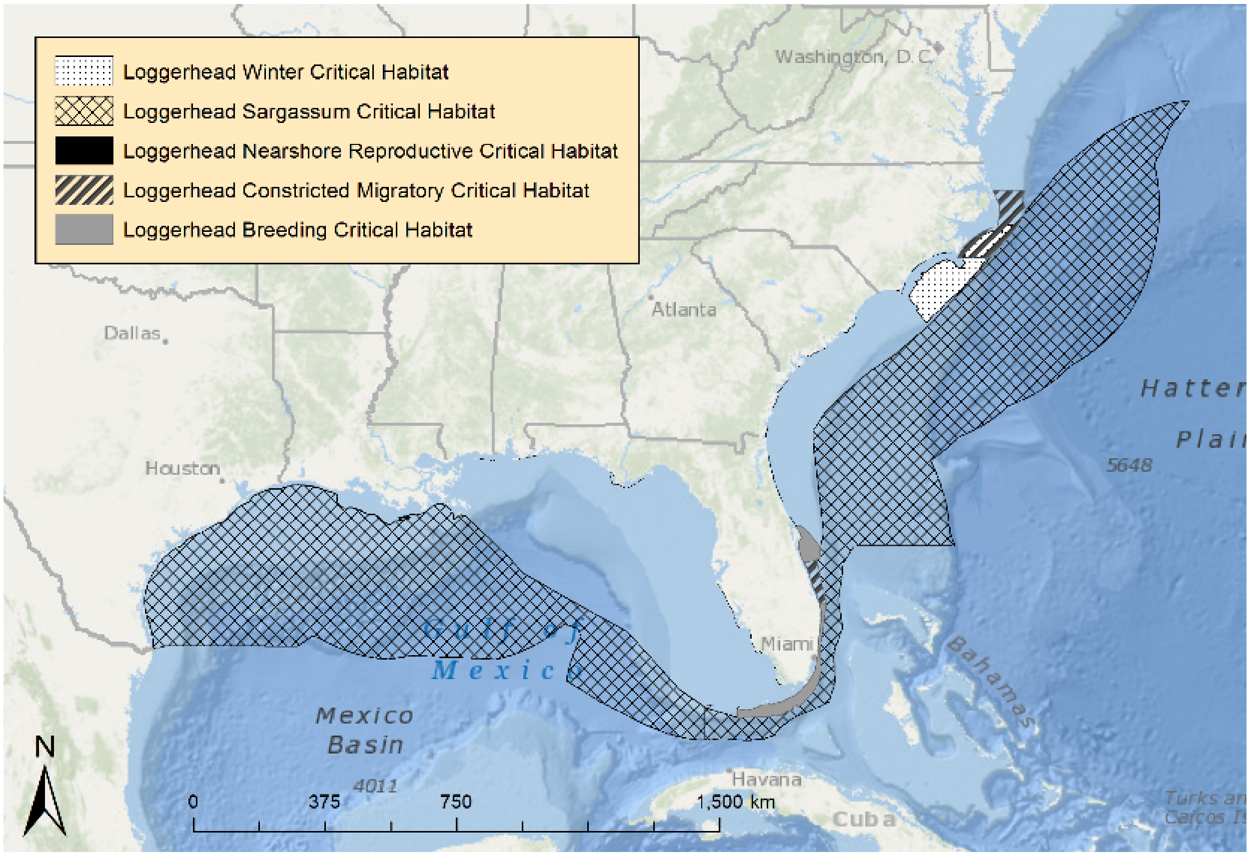

Figure 16: Map identifying designated critical habitat for the Northwest Atlantic Ocean distinct population segment loggerhead turtle.

6.5.5 Recovery Goals

See the 2009 final recovery plan for the Northwest Atlantic Ocean DPS of loggerheads for complete down listing/delisting criteria for each of the following recovery objectives.

1. Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females.
2. Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes.
3. Manage sufficient nesting beach habitat to ensure successful nesting.
4. Manage sufficient feeding, migratory and internesting marine habitats to ensure successful growth and reproduction.
5. Eliminate legal harvest.
6. Implement scientifically based nest management plans.
7. Minimize nest predation.
8. Recognize and respond to mass/unusual mortality or disease events appropriately.
9. Develop and implement local, state, Federal and international legislation to ensure long-term protection of loggerheads and their terrestrial and marine habitats.
10. Minimize bycatch in domestic and international commercial and artisanal fisheries.

11. Minimize trophic changes from fishery harvest and habitat alteration.
12. Minimize marine debris ingestion and entanglement.
13. Minimize vessel strike mortality.

6.6 Olive Ridley Turtle (All other areas)

The olive ridley turtle is a small, mainly pelagic, sea turtle with a circumtropical distribution (Figure 5).

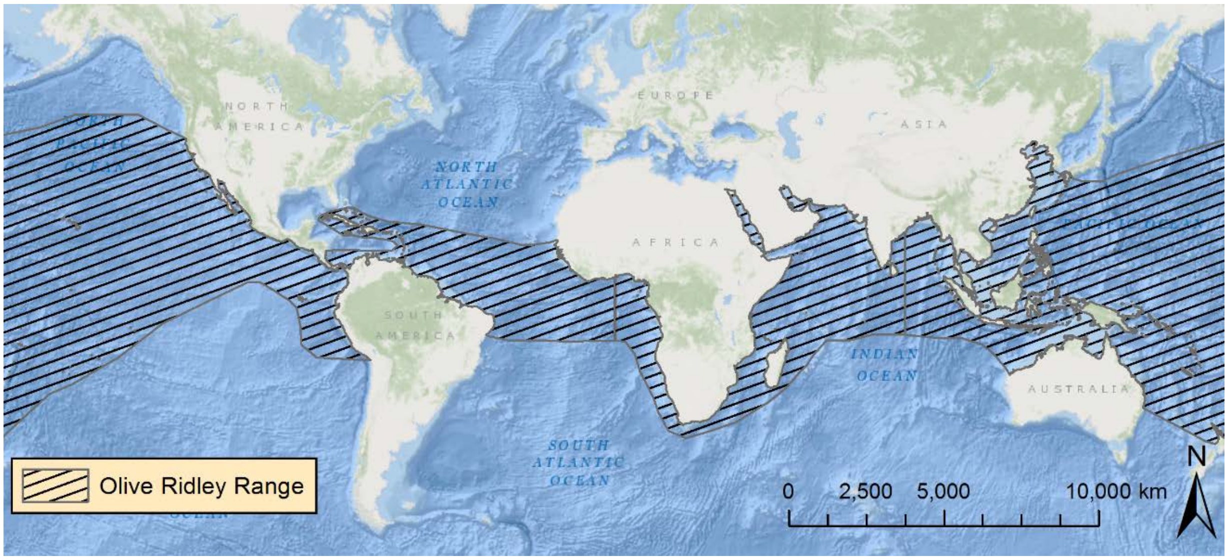

Figure 17. Map identifying the range of the olive ridley turtle.

Olive ridley turtles are olive or grayish-green in color, with a heart-shaped carapace (Figure 18). The species was listed under the ESA on July 28, 1978. The species was separated into two listing designations: endangered for breeding populations on the Pacific coast of Mexico, and threatened wherever found except where listed as endangered (i.e., in all other areas throughout its range) (Table 7).

Figure 18: Olive ridley turtle. Photo: Reuven Walder.

Table 7. Olive ridley turtle all other populations information bar provides species Latin name, common name and current Federal Register notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Lepidochelys olivacea	Olive ridley turtle	All other populations	Threatened	2014	43 FR 32800	N/A	None Designated

We used information available in the five-year review (NMFS and USFWS 2014) to summarize the life history, population dynamics and status of the threatened olive ridley turtle, as follows.

6.6.1 Life History

Olive ridley females mature at 10 to 18 years of age. They lay an average of two clutches per season (three to six months in duration). The annual average clutch size is 100 to 110 eggs per nest. Olive ridleys commonly nest in successive years. Females nest in solitary or in arribadas, large aggregations coming ashore at the same time and location. As adults, olive ridleys forage on crustaceans, fish, mollusks, and tunicates, primarily in pelagic habitats.

6.6.2 Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the endangered range-wide population of the olive ridley turtle.

Olive ridley turtles are thought to be the most abundant species of turtle, and can be found in the Atlantic, Indian and Pacific Oceans. There is no global estimate of olive ridley abundance, and we rely on nest counts and nesting females to estimate abundance in each of the ocean basins, described below.

In the western Atlantic, two arribada nesting beaches occur in Suriname and French Guiana. The Cayenne Peninsula in French Guiana hosts about 2,000 nests annually, while the Galibi Nature Reserve in Suriname had 335 nests in 1995. Solitary nesting also occurs elsewhere in Suriname, Guyana and French Guiana, although no abundance estimates are available. In Sergipe, Brazil, solitary nesting amounted to about 2,600 nests in 2002 and 2003.

In the eastern Atlantic, there are no arribada nesting beaches, but solitary nesting occurs in several countries along the western coast of Africa, from Gambia to Angola. For many countries, there are no abundance estimates available. For beaches with data available (Angola, the Republic of Congo, the Democratic Republic of Congo, Equatorial Guinea and Guinea Bissau), nest counts are low, with most monitoring taking place for only a few years. The most abundant nesting beaches are Orango National Park in Guinea Bissau, which had between 170 and 620 nests from 1992 to 1994; and the Republic of Congo, which had between 300 and 600 nests annually from 2003 to 2010 (NMFS and USFWS 2014).

In the Indian Ocean, three arribada nesting beaches are found in India, amounting to 150,000 to 200,000 nesting females annually. Solitary nesting also occurs elsewhere in the region, in eastern Africa, Oman, India, Pakistan, and other southeast Asian countries; for many, there are no estimates available. The largest recorded solitary nesting beach is in Myanmar, when in 1999, 700 nests were counted (NMFS and USFWS 2014).

There are no known arribada nesting beaches in the western Pacific; however, some solitary nesting occurs in Australia, Brunei, Malaysia, Indonesia and Vietnam. Data are lacking for many sites. Terengganu, Malaysia had 10 nests in 1998 and 1999. Alas Purwo, Indonesia, had 230 nests annually from 1993 to 1998.

In the eastern Pacific (excluding breeding populations in Mexico), there are arribada nesting beaches in Nicaragua, Costa Rica and Panama. La Flor, Nicaragua had 521,440 effective nesting females in 2008 and 2009; Chacocente, Nicaragua had 27,947 nesting females over the same period (Gago et al. 2012). Two other arribada nesting beaches are in Nicaragua, Masachapa and Pochomil, but there are no abundance estimates available. Costa Rica hosts two major arribada nesting beaches; Ostional has between 3,564 and 476,550 turtles per arribada, and Nancite has between 256 and 41,149 turtles per arribada. Panama has one arribada nesting beach, with 8,768 turtles annually. There are also several solitary nesting beaches in the eastern Pacific (excluding breeding populations in Mexico); however no abundance estimates are available for beaches in El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Columbia and Ecuador. On Hawaii Beach in Guatemala, 1,004 females were recorded in 2005 (NMFS and USFWS 2014).

Population growth rate and trend information for the threatened population of olive ridely sea turtles is difficult to discern, owing to its range over a large geographic area, and a lack of consistent monitoring data in all nesting areas. Below, we present any known population trend information for olive ridley sea turtles by ocean basin (NMFS and USFWS 2014).

Nesting at arribada beaches in French Guiana appears to be increasing, while in Suriname, nesting has declined by more than ninety percent since 1968. Solitary nesting also occurs elsewhere in Suriname, Guyana and French Guiana; no trend data are available. Solitary nesting in Brazil appears to be increasing, with 100 nests recorded in 1989 to 1990, to 2,606 in 2002 to 2003.

In the eastern Atlantic, trend data is not available for most solitary nesting beaches. Nest counts in the Republic of Congo decreased from 600 nests in 2003 and 2004 to less than 300 in 2009 and 2010.

The three arribada nesting beaches in India—Gahirmatha, Rushikulya, and Devi River—are considered stable over three generations. There is no trend data available for several solitary nesting beaches in the Indian Ocean. However, even for the few beaches with short-term monitoring, the nest counts are believed to represent a decline from earlier years.

There are no arribaba nesting beaches in the western Pacific. Data are lacking or inconsistent for many solitary nesting beaches in the western Pacific, so it is not possible to assess population trends for these sites. Nest counts at Alas Purwo, Indonesia, appear to be increasing, the nest count at Terengganu, Malaysia, is thought to be a decline from previous years.

Population trends at Nicaraguan arribaba nesting beaches are unknown or stable (La Flor). Ostional, Costa Rica arribada nesting beach is increasing, while trends Nancite, Costa Rica, and Isla Cañas, Panama, nesting beaches are declining. For most solitary nesting beaches in the eastern Pacific, population trends are unknown, except for Hawaii Beach, Guatemala, which is decreasing.

Genetic studies have identified four main lineages of olive ridleys: east India, Indo-Western Pacific, Atlantic, and the eastern Pacific. In the eastern Pacific, rookeries on the Pacific coasts of Costa Rica and Mexico were not genetically distinct, and fine-scale population structure was not found when solitary and arribada nesting beaches were examined. There was no population subdivision among olive ridleys along the east India coastline. Low levels of genetic diversity among Atlantic French New Guinea and eastern Pacific Baja California nesting sites are attributed to a population collapse caused by past overharvest (NMFS and USFWS 2014).

Globally, olive ridley sea turtles can be found in tropical and subtropical waters in the Atlantic, Pacific and Indian Oceans (Figure 5). Major nesting arribada beaches are found in Nicaragua, Costa Rica, Panama, India and Suriname.

6.6.3 Status

It is likely that solitary nesting locations once hosted large arribadas; since the 1960s, populations have experienced declines in abundance of 50 to 80 percent. Many populations continue to decline. Olive ridley turtles continue to be harvested as eggs and adults, legally in some areas, and illegally in others. Incidental capture in fisheries is also a major threat. The olive ridley turtle is the most abundant sea turtle in the world; however, several populations are declining as a result of continued harvest and fisheries bycatch. The large population size of the range-wide population, however, allows some resilience to future perturbation.

Status of Species within the Action Area

In the Western Atlantic Ocean (Surinam, French Guiana, and Guyana), there has, since 1967, been an 80 percent reduction in certain nesting populations (USFWS 2002).

6.6.4 Critical Habitat

No critical habitat has been designated for the range-wide, threatened population of olive ridley turtles.

6.6.5 Recovery Goals

There has not been a Recovery Plan prepared specifically for the range-wide, threatened population of olive ridley turtles. The 1998 Recovery Plan was prepared for olive ridleys found in the U.S. Pacific. Olive ridley turtles found in the Pacific could originate from the Pacific Coast of Mexico or from another nesting population. As such, the recovery goals in the 1998 Recovery Plan for the U.S Pacific olive ridley turtle can apply to both listed populations. See the 1998 Recovery Plan for the U.S. Pacific olive ridley turtles for complete down listing/delisting criteria for their recovery goals. The following items were the recovery criteria identified to consider delisting:

1. All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
2. Foraging populations are statistically significantly increasing at several key foraging grounds within each stock region.
3. All females estimated to nest annually at source beaches are either stable or increasing for over ten years.
4. Management plan based on maintaining sustained populations for turtles is in effect.
5. International agreements in place to protect shared stocks.

6.7 Gulf Sturgeon

The Gulf sturgeon subspecies of Atlantic sturgeon (*A. oxyrinchus*) is a large anadromous fish that resides completely within the Gulf of Mexico (Figure 19).

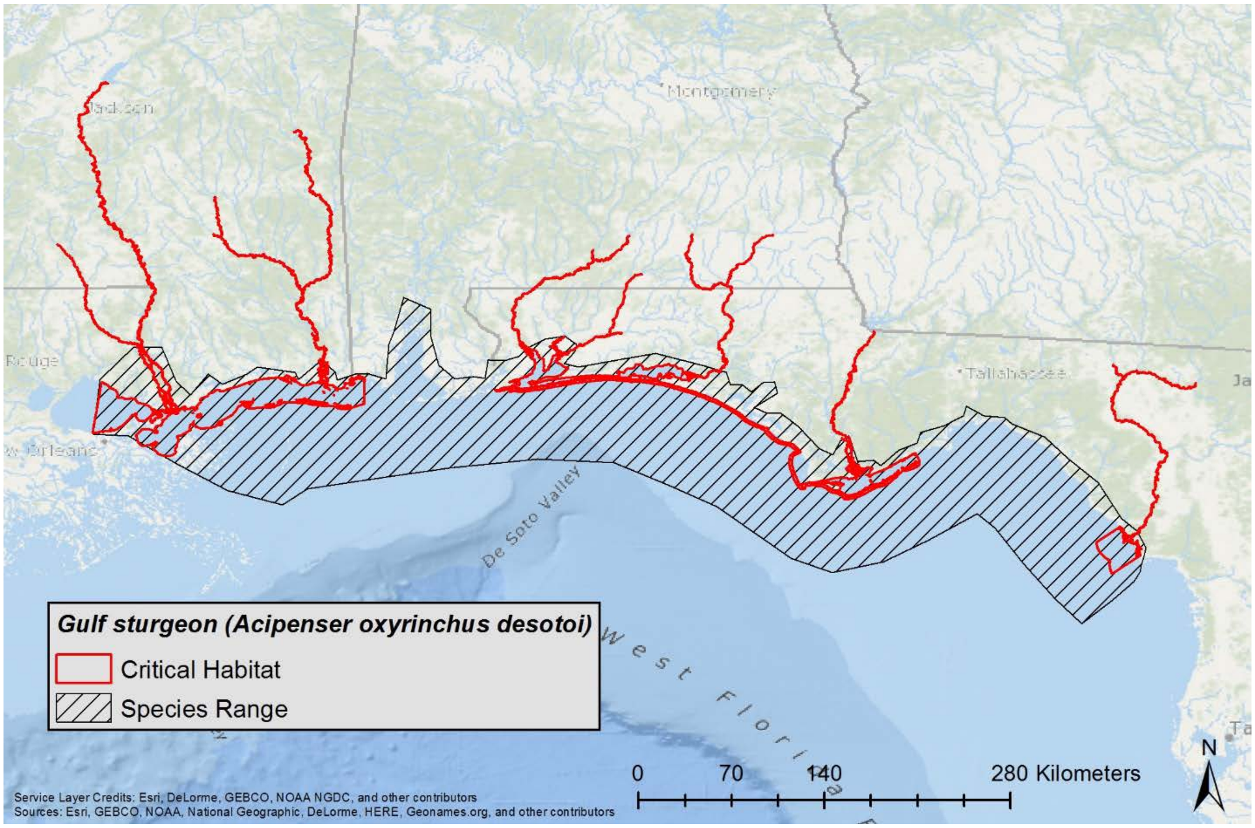

Figure 19: Map representing the range and designated critical habitat for Gulf Sturgeon.

Gulf sturgeon are nearly cylindrical fish with an extended snout, vertical mouth, five rows of scutes (bony plates surrounding the body), four chin barbels (slender, whisker-like feelers extending from the head used for touch and taste), and a heterocercal (upper lobe is longer than lower) caudal fin (Figure 20). Adults range from six to eight feet in length and weigh up to 200 pounds; females grow larger than males (USFWS 2009).

Figure 20: Gulf sturgeon: Photo: National Oceanic and Atmospheric Administration.

Gulf sturgeon were listed as threatened effective October 30, 1991 (56 CFR 49653, September 30, 1991), after their stocks were greatly reduced or extirpated throughout much of their historic range by overfishing, dam construction, and habitat degradation (Table 8). NMFS and the U.S. Fish and Wildlife Service jointly manage Gulf sturgeon. In riverine habitats, the U.S. Fish and Wildlife Service is responsible for all consultations regarding Gulf sturgeon and critical habitat. In estuarine habitats, responsibility is divided based on the action agency involved. The U.S. Fish and Wildlife Service consults with the Department of Transportation, the Environmental Protection Agency, the U.S. Coast Guard, and the Federal Emergency Management Agency; NMFS consults with the Department of Defense, U.S. Army Corps of Engineers, the Bureau of Ocean Energy Management, and any other federal agencies not specifically mentioned at 50 CFR 226.214. In marine areas, NMFS is responsible for all consultations regarding Gulf sturgeon and critical habitat. In 2009, NMFS and the U.S. Fish and Wildlife Service conducted a five-year review and found Gulf sturgeon continued to meet the definition of a threatened species (USFWS and NMFS 2009).

Table 8: Gulf sturgeon information bar provides species Latin name, common name and current Federal Register notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Acipenser oxyrinchus desotoi	Gulf Sturgeon	Subspecies of Atlantic sturgeon	Threatened	2009	56 FR 49653	1995	68 FR 13370

6.7.1 Life History

Gulf sturgeon are long-lived, with some individuals reaching at least 42 years in age (Huff 1975). Age at sexual maturity ranges from eight to 17 years for females and seven to 21 years for males (Huff 1975). Chapman and Carr (1995) estimated that mature female Gulf sturgeon that weigh between 64 and 112 pounds (29 to 51 kilograms) produce an average of 400,000 eggs. Spawning intervals range from one to five years for males, while females require longer intervals ranging from three to five years (Fox et al. 2000; Huff 1975).

Gulf sturgeon move from the Gulf of Mexico into coastal rivers in early spring (i.e., March through May). Fox et al. (2000) found water temperatures at time of river entry differed significantly by reproductive stage and sex. Individuals entered the river system when water temperatures ranged anywhere between 11.2 and 27.1 degrees Celsius. Spawning occurs in the upper reaches of rivers in the spring when water temperature is around 15 to 20 degrees Celsius. While Sulak and Clugston (1999) suggest that sturgeon spawning activity is related to moon phase, other researchers have found little evidence of spawning associated with lunar cycles (Fox et al. 2000; Slack et al. 1999). Fertilization is external; females deposit their eggs on the river bottom and males fertilize them. Gulf sturgeon eggs are demersal, adhesive, and vary in color from gray to brown to black (Huff 1975; Vladykov and Greely 1963). Parauka et al. (1991) reported that hatching time for artificially spawned Gulf sturgeon ranged from 85.5 hours at 18.4 degrees Celsius to 54.4 hours at about 23 degrees Celsius. Published research on the life history of younger Gulf sturgeon is limited. After hatching, young-of-year individuals generally disperse downstream of spawning sites, though some may travel upstream as well (Clugston et al. 1995; Sulak and Clugston 1999), and move into estuarine feeding areas for the winter months.

Tagging studies confirm that Gulf sturgeon exhibit a high degree of river fidelity (Carr 1983). Of 4,100 fish tagged, 21 percent (860 of 4,100 fish) were later recaptured in the river of their initial collection, eight fish (0.2 percent) moved between river systems, and the remaining fish (78.8 percent) have not yet been recaptured (USFWS and GSMFC 1995). There is no information documenting the presence of spawning adults in non-natal rivers. However, there is some evidence of movements by both male and female Gulf sturgeon (n = 22) from natal rivers into non-natal rivers (Carr et al. 1996; Craft et al. 2001; Fox et al. 2002; Ross et al. 2001; Wooley and Crateau 1985).

After spawning, Gulf sturgeon move downstream to areas referred to as "summer resting" or "holding" areas. Adults and subadults are not distributed uniformly throughout the river, but instead show a preference for these discrete holding areas usually located in the lower and middle river reaches (Hightower et al. 2002). While it was suggested these holding areas were sought for cooler water temperatures (Carr et al. 1996; Chapman and Carr 1995), Hightower et al. (2002) found that water temperatures in holding areas where Gulf sturgeon were repeatedly found in the Choctawhatchee River were similar to temperatures where sturgeon were only occasionally found elsewhere in the river.

In the fall, movement from the rivers into the estuaries and associated bays begins in September (at water temperatures around 23 degrees Celsius) and continues through November (Foster and Clugston 1997; Huff 1975; Wooley and Crateau 1985). Because the adult and large subadult sturgeon have spent at least six months fasting or foraging sparingly on detritus in the rivers, it is presumed they immediately begin foraging (Mason and Clugston 1993). Telemetry data indicate Gulf sturgeon are found in high concentrations near the mouths of their natal rivers with individual fish traveling relatively quickly between foraging areas where they spend an extended period of time (Edwards et al. 2007; Edwards et al. 2003).

Most subadult and adult Gulf sturgeon spend the cool winter months (October/November through March/April) in bays, estuaries, and nearshore environments in the Gulf of Mexico (Clugston et al. 1995; Fox et al. 2002; Odenkirk 1989). Tagged fish have been located in well-oxygenated shallow water (less than seven meters) areas that support burrowing macro invertebrates (Craft et al. 2001; Fox and Hightower 1998; Fox et al. 2002; Parauka et al. 2001; Rogillio et al. 2007; Ross et al. 2001; Ross et al. 2009). These areas may include shallow shoals five to seven feet (1.5 to 2.1 meters), deep holes near passes (Craft et al. 2001), unvegetated sand habitats such as sandbars, and intertidal and subtidal energy zones (Abele and Kim 1986; Menzel 1971; Ross et al. 2009). Subadult and adult Gulf sturgeon overwintering in Choctawhatchee Bay (Florida) were generally found to occupy the sandy shoreline habitat at depths of four to six feet (two to three meters) (Fox et al. 2002; Parauka et al. 2001). These shifting, predominantly sandy, areas support a variety of potential prey items including estuarine crustaceans, small bivalve mollusks, ghost shrimp, small crabs, various polychaete worms, and lancelets (Abele and Kim 1986; Menzel 1971; Williams et al. 1989). Preference for sandy habitat is supported by studies in other areas that have correlated Gulf sturgeon presence to sandy substrate (Fox et al. 2002).

Gulf sturgeon are described as opportunistic and indiscriminate benthivores that change their diets and foraging areas during different life stages. Their guts generally contain benthic marine invertebrates including amphiopods, lancelets, polychaetes, gastropods, shrimp, isopods, mollusks, and crustaceans (Carr et al. 1996; Fox et al. 2002; Huff 1975; Mason and Clugston 1993). Generally, Gulf sturgeon prey are burrowing species that feed on detritus and/or suspended particles, and inhabit sandy substrate. In the river, young-of-year sturgeon eat aquatic invertebrates and detritus (Mason and Clugston 1993; Sulak and Clugston 1999) and juveniles forage throughout the river on aquatic insects (e.g., mayflies and caddisflies), worms (oligochaete), and bivalves (Huff 1975; Mason and Clugston 1993). Adults forage sparingly in freshwater and depend almost entirely on estuarine and marine prey for their growth (Gu et al. 2001). Both adult and subadult Gulf sturgeon are known to lose up to 30 percent of their total body weight while in fresh water, and subsequently compensate the loss during winter feeding in marine areas (Carr 1983; Clugston et al. 1995; Heise et al. 1999; Morrow et al. 1998; Sulak and Clugston 1999; Wooley and Crateau 1985).

6.7.2 Population Dynamics

The following is a discussion of the species' population and its variance over time. This section is broken down into: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Gulf sturgeon.

Abundance of Gulf sturgeon is measured at the riverine scale. Currently, seven rivers are known to support reproducing populations of Gulf sturgeon: the Pearl, Pascagoula, Escambia, Yellow, Choctawhatchee, Apalachicola, and Suwannee rivers. The number of individuals within each riverine population is variable across their range, but generally over the last decade (USFWS and NMFS 2009) populations in the eastern part of the range (Suwannee, Apalachicola Choctawhatchee) appear to be relatively stable in number or have a slightly increasing population trend. In the western portion of the range, populations in the Pearl and Pascagoula Rivers have never been nearly as abundant as those to the east, and their current status, post-hurricanes Katrina and Rita, is unknown as comprehensive surveys have not occurred.

Both acute and episodic events are known to impact individual populations of Gulf sturgeon that in turn, affect overall population numbers. For example, on August 9, 2011, an overflow of "black liquor" (an extremely alkaline waste byproduct of the paper industry) was accidentally released by a paper mill into the Pearl River near Bogalusa, Louisiana, that may have affected the status and abundance of the Pearl River population. While paper mills regularly use acid to balance the black liquor's pH before releasing the material, as permitted by the Louisiana Department of Environmental Quality, this material released was not treated. The untreated waste byproduct created a low oxygen ("hypoxic") environment lethal to aquatic life. These hypoxic conditions moved downstream of the release site killing fish and mussels in the Pearl River over several days. Within a week after the spill, the dissolved oxygen concentrations returned to normal in all areas of the Pearl River tested by Louisiana Department of Wildlife and Fisheries. The investigation of fish mortality began on August 13, 2011, several days after the spill occurred. Twenty-eight Gulf sturgeon carcasses (38 to 168 centimeters total length) were collected in the Pearl River after the spill (Sanzenbach 2011a; Sanzenbach 2011b) and anecdotal information suggests many other Gulf sturgeon carcasses were not collected. The smaller fish collected represent young-of-year and indicate spawning is likely occurring in the Pearl River. The spill occurred during the time when Gulf sturgeon were still occupying the freshwater habitat. Because the materials moved downriver after the spill, the entire Pearl River population of Gulf sturgeon was likely impacted.

Gene flow is low in Gulf sturgeon stocks, with each stock exchanging less than one mature female per generation (Waldman and Wirgin 1998). Genetic studies confirm that Gulf sturgeon exhibit river-specific fidelity. Stabile et al. (1996) analyzed tissue taken from Gulf sturgeon in eight drainages along the Gulf of Mexico for genetic diversity and noted significant differences among Gulf sturgeon stocks, which suggests region-specific affinities and likely river-specific fidelity. Five regional or river-specific stocks (from west to east) have been identified: (1) Lake Pontchartrain and Pearl River, (2) Pascagoula River, (3) Escambia and Yellow Rivers, (4) Choctawhatchee River, and (5) Apalachicola, Ochlockonee, and Suwannee Rivers (Stabile et al. 1996).

Gulf sturgeon are found in river systems from Louisiana to Florida, in nearshore bays and estuaries, and in the Gulf of Mexico.

6.7.3 Status

The decline in the abundance of Gulf sturgeon has been attributed to targeted fisheries in the late 19th and early 20th centuries, habitat loss associated with dams and sills, habitat degradation associated with dredging, de-snagging, and contamination by pesticides, heavy metals, and other industrial contaminants, and certain life history characteristics (e.g. slow growth and late maturation) (56 FR 49653). Effects of climate change (warmer water, sea level rise and higher salinity levels) could lead to accelerated changes in habitats utilized by Gulf sturgeon. The rate that climate change and corollary impacts are occurring may outpace the ability of the Gulf sturgeon to adapt given its limited geographic distribution and low dispersal rate. In general, Gulf sturgeon populations in the eastern portion of the range appear to be stable or slightly increasing, while populations in the western portion are associated with lower abundances and higher uncertainty (USFWS 2009).

Status Within the Action Area

Within the action area abundance estimates are available for the Escambia, Yellow, Choctawhatchee, Apalachicola, and Suwannee rivers: in 2006, there were an estimated 451 individuals in the Escambia River; in the fall of 2003, there were an estimated 911 individuals in the Yellow River; in 2008, there were an estimated 3,314 individuals in the Apalachicola River; and in 2007, there were an estimated 14,000 individuals in the Suwannee River. Trend data indicate that the Escambia River population may be decreasing, while the Yellow, Choctawhatchee, Apalachicola, and Suwannee River populations all appear to be either stable or increasing. Despite several stable/increasing populations, recovery of depleted populations is an inherently slow process for a late-maturing species such as Gulf sturgeon. Their late age at maturity provides more opportunities for individuals to be removed from the population before reproducing. While a long life span also allows multiple opportunities to contribute to future generations, this is hampered within the species' range by habitat alteration, pollution, and bycatch.

6.7.4 Critical Habitat

In 2003, NMFS and the U.S. Fish and Wildlife jointly designated Gulf sturgeon critical habitat in 14 geographic units encompassing 2,783 river kilometers as well as 6,042 square kilometers of estuarine and marine habitat (Figure 19). The physical and biological features (previously called primary constituent elements) necessary for the conservation of Gulf sturgeon found in these areas include: (1) abundant food items within riverine, estuarine, and marine habitats; (2) riverine spawning sites with suitable substrates; (3) riverine aggregation areas (resting, holding, staging areas); (4) suitable flow regime; (5) suitable water quality; (6) suitable sediment quality; and (7) safe and unobstructed migratory pathways.

6.7.5 Recovery Plan

In 1995, a recovery/ management plan was published for the Gulf Sturgeon. In addition, all United States. fisheries for the Gulf sturgeon have been closed. The following are priority-one recovery tasks:

1. Develop and implement standardized population sampling and monitoring techniques.
2. Develop and implement regulatory framework to eliminate introductions of nonindigenous stock or other sturgeon species.
3. Reduce or eliminate incidental mortality.
4. Restore the benefits of natural riverine habitats.
5. Utilize existing authorities to protect habitat and where inadequate, recommend new laws and regulations.

6.8 Smalltooth Sawfish (United States Distinct Population Segment)

The smalltooth sawfish is a tropical marine and estuarine elasmobranch. Within the United States, smalltooth sawfish have been captured in estuarine and coastal waters from New York southward through Texas, although peninsular Florida has historically been the region of the United States with the largest number of recorded captures (NMFS 2010c) (Figure 21).

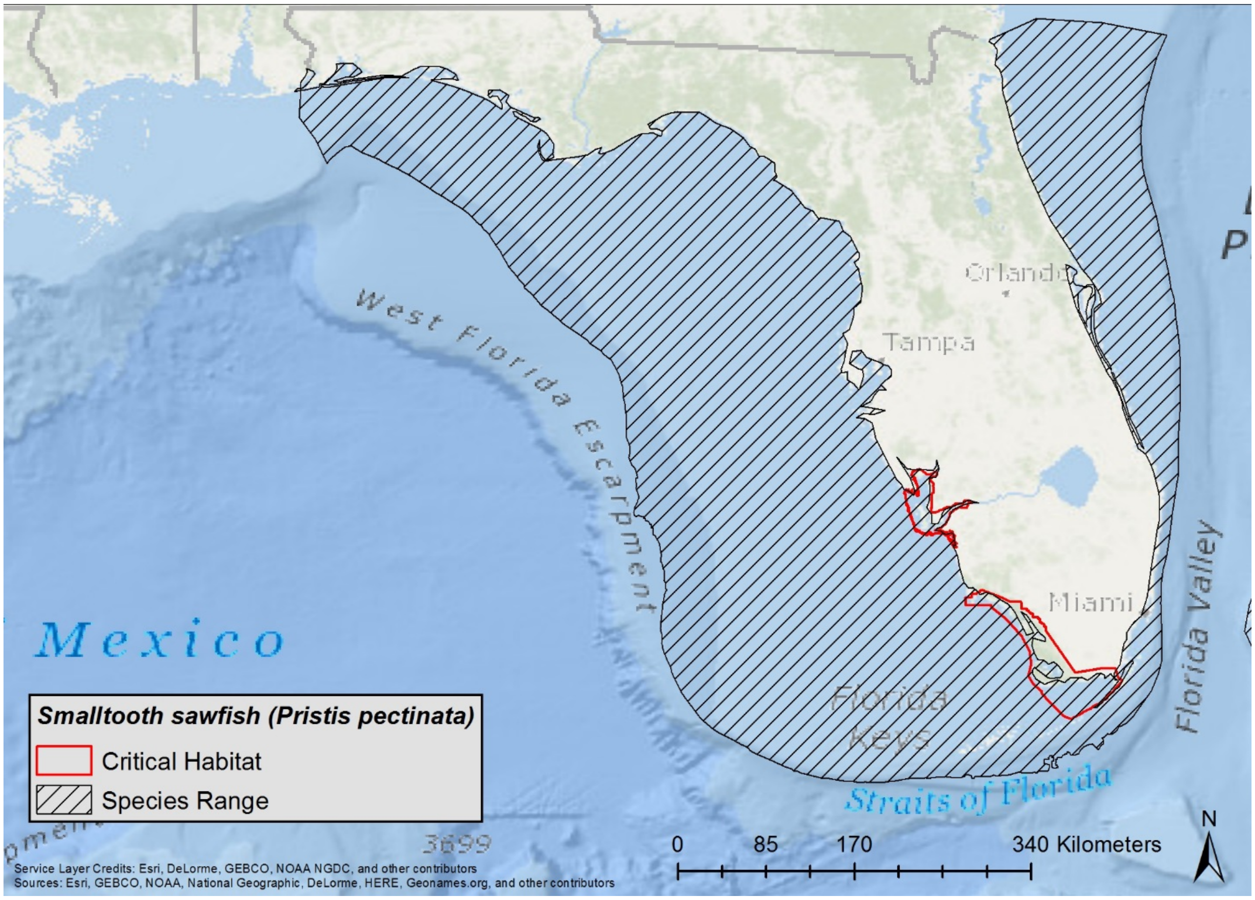

Figure 21: Map depicting the range and designated critical habitat for the United States Distinct Population Segment of Smalltooth Sawfish.

Although they are rays, sawfish physically resemble sharks, with only the trunk and especially the head ventrally flattened. Smalltooth sawfish are characterized by their “saw,” a long, narrow, flattened rostral blade with a series of transverse teeth along either edge (Figure 22). The U.S. Distinct Population Segment of smalltooth sawfish was listed as endangered under the ESA effective May 1, 2003 (Table 9).

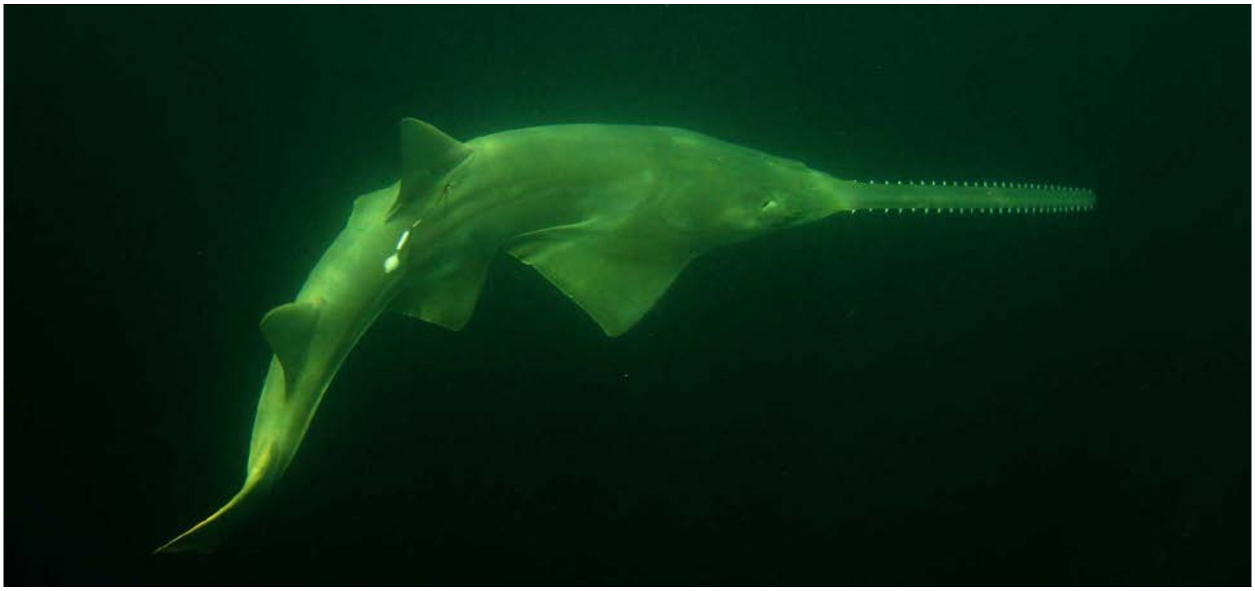

Figure 22: Smalltooth sawfish. Photo: R. Dean, Grubbs.

Table 9: Smalltooth sawfish United States population distinct population segment information bar provides species Latin name, common name and current Federal Register notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Pristis pectinata	Smalltooth Sawfish	United States Population	Endangered	2009	68 FR 15674	2009	74 FR 45353

6.8.1 Life History

Smalltooth sawfish size at sexual maturity has been reported as 360 centimeters total length by Simpfendorfer (2005). Carlson and Simpfendorfer (2015) estimated that sexual maturity for females occurs between seven and 11 years of age. As in all elasmobranchs, smalltooth sawfish are viviparous; fertilization is internal. The gestation period for smalltooth sawfish is estimated at five months based on data from the largetooth sawfish (Thorson 1976). Females move into shallow estuarine and nearshore nursery areas to give birth to live young between November and July, with peak parturition occurring between April and May (Poulakis et al. 2011). Litter sizes range between 10 and 20 individuals (Bigalow and Schroeder 1953; Carlson and Simpfendorfer 2015; Simpfendorfer 2005).

Neonate smalltooth sawfish are born measuring 67 to 81 centimeters in total length and spend the majority of their time in the shallow nearshore edges of sand and mud banks (Poulakis et al. 2011; Simpfendorfer et al. 2010). Once individuals reach 100 to 140 centimeters total length, they begin to expand their foraging range. Capture data suggests smalltooth sawfish in this size class may move throughout rivers and estuaries within a salinity range of 18 and 30 practical salinity units. Individuals in this size class also appear to have the highest affinity to mangrove habitat (Simpfendorfer et al. 2011). Juvenile sawfish spend the first two to three years of their lives in the shallow waters provided in the lower reaches of rivers, estuaries, and coastal bays (Simpfendorfer et al. 2008; Simpfendorfer et al. 2011). As smalltooth sawfish approach 250 centimeters total length they become less sensitive to salinity changes and begin to move out of the protected shallow-water embayments and into the shorelines of barrier islands (Poulakis et al. 2011). Adult sawfish typically occur in more open-water, marine habitats (Poulakis and Seitz 2004)

6.8.2 Population Dynamics

The following is a discussion of the species' population and its variance over time. This section is broken down into: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the smalltooth sawfish.

The abundance of smalltooth sawfish in U.S. waters has decreased dramatically over the past century. Efforts are currently underway to provide better estimates of smalltooth sawfish abundance (NMFS 2014). Current estimates are based on encounter data, genetic sampling, and geographic extent. Carlson and Simpfendorfer (2015) used encounter densities to estimate the female population size to be 600. Chapman et al. (2011) analyzed genetic data from tissue samples (fin clips) to estimate the effective genetic population size as 250 to 350 adults (95 percent confidence intervals 142 to 955). Simpfendorfer (2002) estimated that the U.S. population may number less than five percent of historic levels based on the contraction of the species' range.

The abundance of juveniles encountered in recent studies (Poulakis et al. 2014; Seitz and Poulakis 2002; Simpfendorfer and Wiley 2004) suggests that the smalltooth sawfish population remains reproductively viable. The overall abundance appears to be stable (Wiley and Simpfendorfer 2010). Data analyzed from the Everglades portion of the smalltooth sawfish range suggests that the population growth rate for that region may be around five percent per year (Carlson and Osborne 2012; Carlson et al. 2007). Intrinsic rates of growth for smalltooth sawfish have been estimated at 1.08 to 1.14 per year and 1.237 to 1.150 per year by Simpfendorfer (2000) and Carlson and Simpfendorfer (2015) respectively. However, these intrinsic rates are uncertain due to the lack of long-term abundance data.

Chapman et al. (2011) investigated the genetic diversity within the smalltooth sawfish population. The study reported that the remnant population exhibits high genetic diversity (allelic richness, alleles per locus, heterozygosity) and that inbreeding is rare. The study also suggested that the protected population will likely retain greater than 90 percent of its current genetic diversity over the next century.

Recent capture and encounter data suggests that the current distribution is focused primarily to south and southwest Florida from Charlotte Harbor through the Dry Tortugas (Poulakis and Seitz 2004; Seitz and Poulakis 2002). Water temperatures (no lower than 16 to 18 degrees Celsius) and the availability of appropriate coastal habitat (shallow, euryhaline waters and red mangroves) are the major environmental constraints limiting the distribution of smalltooth sawfish (Bigalow and Schroeder 1953).

6.8.3 Status

The decline in the abundance of smalltooth sawfish has been attributed to fishing (primarily commercial and recreational bycatch), habitat modification (including changes to freshwater flow regimes as a result of climate change), and life history characteristics (i.e. slow-growing, relatively late-maturing, and long-lived species (NMFS 2009b; Simpfendorfer et al. 2011)). These factors continue to threaten the smalltooth sawfish population.

Status Within the Action Area

Recent records indicate there is a resident reproducing population of smalltooth sawfish in south and southwest Florida from Charlotte Harbor through the Dry Tortugas, which is also the last U.S. stronghold for the species (Poulakis and Seitz 2004; Seitz and Poulakis 2002; Simpfendorfer and Wiley 2004). While the overall abundance appears to be stable, low intrinsic rates of population increase suggest that the species is particularly vulnerable to rapid population declines (NMFS 2010a).

6.8.4 Critical Habitat

Critical habitat for smalltooth sawfish was designated in 2009 (74 FR 45353) and includes two major units: Charlotte Harbor (221,459 acres) and Ten Thousand Islands/Everglades (619,013 acres) (Figure 21). These two units include essential sawfish nursery areas. The locations of nursery areas were determined by analyzing juvenile smalltooth sawfish encounter data in the context of shark nursery criteria (Heupel et al. 2007; Norton et al. 2012). Within the nursery areas, two features were identified as essential to the conservation of the species: red mangroves (*Rhizophora mangle*), and euryhaline habitats with water depths greater than or equal to 0.9 meters (74 FR 45353). The Charlotte Harbor unit includes areas which are moderate to highly developed (Cape Coral, Fort Myers) and includes a highly altered, flow-managed system (Caloosahatchee River). In contrast, the Ten Thousand Island/Everglades unit contains relatively undeveloped, pristine smalltooth sawfish habitat (Poulakis et al. 2014; Poulakis et al. 2011).

6.8.5 Recovery Goals

The 2009 Smalltooth Sawfish Recovery Plan contains complete downlisting/delisting criteria for each of the three following recovery goals (NMFS 2009b).

1. Minimize human interactions and associated injury and mortality.
2. Protect and/or restore smalltooth sawfish habitats.

3. Ensure smalltooth sawfish abundance increases substantially and the species reoccupies areas from which it had been previously extirpated.

7 ENVIRONMENTAL BASELINE

The "environmental baseline" includes the past and present impacts of all Federal, state, 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 which are contemporaneous with the consultation in process (50 C.F.R. §402.02). In this section, we discuss the environmental baseline within the action area as it applies to species that are likely to be adversely affected by the proposed action.

7.1 Climate Change

There is no question that our climate is changing. The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, show a warming of approximately 0.85 degrees Celsius over the period 1880 to 2012 (IPCC 2014). Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850 (IPCC 2014). Burning fossil fuels has increased atmospheric carbon dioxide concentrations by 35 percent with respect to pre-industrial levels, with consequent climatic disruptions that include a higher rate of global warming than occurred at the last global-scale state shift (the last glacial-interglacial transition, approximately 12,000 years ago) (Barnosky et al. 2012). Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90 percent of the energy accumulated between 1971 and 2010 (IPCC 2014). It is virtually certain that the upper ocean (zero to 700 meters) warmed from 1971 to 2010 and it likely warmed between the 1870s and 1971 (IPCC 2014). On a global scale, ocean warming is largest near the surface, and the upper 75 meters warmed by 0.11 degrees Celsius per decade over the period 1971 to 2010 (IPCC 2014). There is high confidence, based on substantial evidence, that observed changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. Higher carbon dioxide concentrations have also caused the ocean rapidly to become more acidic, evident as a decrease in pH by 0.05 in the past two decades (Doney 2010).

This climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine ecosystems in the near future. It is most likely to have the most pronounced effects on species whose populations are already in tenuous positions (Isaac 2009). As such, we expect the extinction risk of ESA-listed species to rise with global warming. Primary effects of climate change on individual species include habitat loss or alteration, distribution changes, altered and/or reduced distribution and abundance of prey, changes in the abundance of competitors and/or predators, shifts in the timing of seasonal activities of species, and geographic isolation or extirpation of populations that are unable to adapt. Secondary effects include increased stress, disease susceptibility, and predation.

The Northern Hemisphere (where a greater proportion of ESA-listed species occur) is warming faster than the Southern Hemisphere, although land temperatures are rising more rapidly than over the oceans (Poloczanska et al. 2009). In the western North Atlantic, sea surface temperatures have been unusually warm in recent years (Blunden and Arndt 2016). A study by (Polyakov et al. 2010), suggests that the North Atlantic overall has been experiencing a general warming trend over the last 80 years of 0.031 ± 0.006 degrees Celsius per decade in the upper 2,000 meters of the ocean. The ocean along the United States eastern seaboard is also much saltier than historical averages (Blunden and Arndt 2014). The direct effects of climate change will result in increases in atmospheric temperatures, changes in sea surface temperatures, patterns of precipitation, and sea level.

For sea turtles, temperature regimes generally lead toward female-biased nests (Hill et al. 2015). Acevedo-Whitehouse and Duffus (2009) proposed that the rapidity of environmental changes, such as those resulting from global warming, can harm immunocompetence and reproductive parameters in wildlife to the detriment of population viability and persistence. An example of this is the altered sex ratios observed in sea turtle populations worldwide (Fuentes et al. 2010; Mazaris et al. 2008; Reina et al. 2009; Robinson et al. 2009). This does not appear to have yet affected population viabilities through reduced reproductive success, although nesting and emergence dates of days to weeks in some locations have changed over the past several decades (Poloczanska et al. 2009). Altered ranges can also result in the spread of novel diseases to new areas via shifts in host ranges (Schumann et al. 2013; Simmonds and Eliott 2009).

Changes in global climatic patterns will likely have profound effects on the coastlines of every continent by increasing sea levels and the intensity, if not the frequency, of hurricanes and tropical storms (Wilkinson and Souter 2008). A half-degree-Celsius increase in temperatures during hurricane season from 1965 to 2005 correlated with a 40 percent increase in cyclone activity in the Atlantic. Sea levels have risen an average of 1.7 millimeters per year over the 20th century due to glacial melting and thermal expansion of ocean water; this rate will likely increase. The current pace is nearly double this, with a 20-year trend of 3.2 millimeters per year (Blunden and Arndt 2014). This is largely due to thermal expansion of water, with minor contributions from melt water (Blunden and Arndt 2014). Based on computer models, these phenomena would inundate nesting beaches of sea turtles, change patterns of coastal erosion and sand accretion that are necessary to maintain those beaches, and would increase the number of turtle nests destroyed by tropical storms and hurricanes (Wilkinson and Souter 2008). Inundation itself reduces hatchling success by creating hypoxic conditions within inundated eggs (Pike et al. 2015). In addition, flatter beaches preferred by smaller sea turtle species would be inundated sooner than would steeper beaches preferred by larger species (Hawkes et al. 2014). The loss of nesting beaches, by itself, would have catastrophic effects on sea turtle populations globally if they are unable to colonize new beaches that form or if the beaches do not provide the habitat attributes (sand depth, temperature regimes, refuge) necessary for egg survival. In some areas, increases in sea level alone may be sufficient to inundate sea turtle nests and reduce hatching success (Caut et al. 2009). Storms may also cause direct harm to sea turtles, causing “mass” strandings and mortality (Poloczanska et al. 2009). Increasing temperatures in sea turtle nests alters sex ratios, reduces incubation times (producing smaller hatchling), and reduces nesting success due to exceeded thermal tolerances (Fuentes et al. 2010; Fuentes et al. 2011; Fuentes et al. 2009). Smaller individuals likely experience increased predation (Fuentes et al. 2011).

Changes to the global climate are also likely to be a threat to smalltooth sawfish and the habitats they use. The Intergovernmental Panel on Climate Change has stated that global climate change is unequivocal (IPCC 2007) and its impacts to coastal resources may be significant. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, changes in the amount and timing of precipitation, and changes in air and water temperatures (EPA 2012; NOAA 2012). The impacts to smalltooth sawfish cannot, for the most part, currently be predicted with any degree of certainty, but we can project some effects to the coastal habitats where they reside. We know that the coastal habitats that contain red mangroves and shallow, euryhaline waters will be directly impacted by climate change through sea level rise, which is expected to exceed one meter globally by 2100 according to Meehl et al. (2007), Pfeffer et al. (2008), and Vermeer and Rahmstorf (2009). Sea level rise will impact mangrove resources, as sediment surface elevations for mangroves will not keep pace with conservative projected rates of elevation in sea level (Gilman et al. 2008). Sea level increases will also affect the amount of shallow water available for juvenile smalltooth sawfish nursery habitat, especially in areas where there is shoreline armoring (e.g., seawalls). Further, the changes in precipitation coupled with sea level rise may also alter salinities of coastal habitats, reducing the amount of available smalltooth sawfish nursery habitat.

Gulf sturgeon are within a region the Intergovernmental Panel on Climate Change (IPCC) predicts will experience overall climatic drying (IPCC 2008). Sturgeon are already susceptible to reduced water quality resulting from inputs of nutrients; contaminants from industrial activities and non-point sources; and interbasin transfers of water. The IPCC report projects with high confidence that higher water temperatures and changes in extremes in this region, including floods and droughts, will affect water quality and exacerbate many forms of water pollution—from sediments, nutrients, dissolved organic carbon, pathogens, pesticides, and salt, as well as thermal pollution—with possible negative impacts on ecosystems (IPCC 2008). In addition, sea level rise is projected to extend areas of salinization of groundwater and estuaries, resulting in a decrease of freshwater availability for humans and ecosystems in coastal areas. Some of the most populated areas of this region are low-lying, and the threat of salt water entering into its aquifers with projected sea level rise is a concern (USGRG 2004). Existing water allocation issues would be exacerbated, leading to an increase in reliance on inter-basin water transfers to meet municipal water needs, further stressing water quality. Dams, dredging, and poor water quality have already modified and restricted the extent of suitable habitat for Gulf sturgeon spawning and nursery habitat. Changes in water availability (depth and velocities) and water quality (temperature, salinity, DO, contaminants, etc.) in rivers and coastal waters inhabited by Gulf sturgeon resulting from climate change will further modify and restrict the extent of suitable habitat for Gulf sturgeon. Effects could be especially harmful since these populations have already been reduced to low numbers, potentially limiting their capacity for adaptation to changing environmental conditions (Belovsky 1987; Salwasser et al. 1984; Soulé 1987; Thomas 1990). The Southeast has experienced an ongoing period of drought since 2007. Florida has been hit particularly hard with drought compared to all other states in the region (Fuchs 2017). Abnormally low stream flows can restrict access by sturgeon to habitat areas and exacerbate water quality issues such as water temperature, reduced DO, nutrient levels, and contaminants.

7.2 Fisheries

Globally, 6.4 million tons of fishing gear is lost in the oceans every year (Wilcox et al. 2015). Fishery interaction remains a major factor in sea turtle recovery and, frequently, the lack thereof. It is estimated that 62,000 loggerhead sea turtles have been killed as a result of incidental capture and drowning in shrimp trawl gear in 2001 (Epperly et al. 2002a). Although turtle excluder devices and other bycatch reduction devices have significantly reduced the level of bycatch to sea turtles and other marine species in U.S. waters, mortality still occurs in Gulf of Mexico waters. In addition to commercial bycatch, recreational hook-and-line interaction also occurs. Cannon and Flanagan (1996) reported that from 1993 to 1995, at least 170 Kemp’s ridley sea turtles were hooked or tangled by recreational hook-and-line gear in the northern Gulf of Mexico. Of these, 18 were dead stranded turtles, 51 were rehabilitated turtles, five died during rehabilitation, and 96 were reported as released by fishermen.

Overutilization of Atlantic sturgeon, including the Gulf subspecies, from directed fishing caused initial severe declines in the Southeast, from which they have never rebounded. Further, continued overutilization as bycatch in commercial fisheries is an ongoing impact to Gulf sturgeon subpopulations. All sturgeon species are more sensitive to bycatch mortality because they are a long-lived species, have an older age at maturity, have lower maximum reproductive rates, and a large percentage of egg production occurs later in life. Based on these life history traits, Boreman (1997) calculated that Atlantic sturgeon can only withstand the annual loss of up to five percent of their population to bycatch mortality without suffering population declines. Mortality rates of Atlantic sturgeon taken as bycatch in various types of fishing gear range between zero and 51 percent, with the greatest mortality occurring in sturgeon caught by sink gillnets. Atlantic sturgeon are particularly vulnerable to being caught in sink gillnets. Little data exists on bycatch in the Southeast and high levels of bycatch underreporting are suspected. However, fisheries known to incidentally catch Atlantic sturgeon occur throughout the marine range of the species and in some riverine waters as well. In addition, stress or injury to Atlantic sturgeon taken as bycatch but released alive may result in increased susceptibility to other threats, such as poor water quality (e.g., exposure to toxins and low dissolved oxygen). This may result in reduced ability to perform major life functions, such as foraging and spawning, or even post-capture mortality.

Bycatch mortality is cited as the primary cause for the decline in smalltooth sawfish in the United States (NMFS 2010b). While there has never been a large-scale directed fishery, smalltooth sawfish easily become entangled in fishing gears (gillnets, otter trawls, trammel nets, and seines) directed at other commercial species, often resulting in serious injury or death (NMFS 2009a). This has historically been reported in Florida (Snelson and Williams 1981), Louisiana (Simpfendorfer 2002), and Texas (Baughman 1943). For instance, one fisherman interviewed by Evermann and Bean (1898) reported taking an estimated 300 smalltooth sawfish in just one netting season in the Indian River Lagoon, Florida. The Florida net ban passed in 1995 has led to a reduction in the number of smalltooth sawfish incidentally captured, "…by prohibiting the use of gill and other entangling nets in all Florida waters, and prohibiting the use of other nets larger than 500 square feet in mesh area in nearshore and inshore Florida waters[1]" (FLA. CONST. art. X, § 16). However, the threat of bycatch currently remains in commercial fisheries (e.g., South Atlantic shrimp fishery, Gulf of Mexico shrimp fishery, federal shark fisheries of the South Atlantic, and the U.S. Gulf of Mexico reef fish fishery), though anecdotal information collected by NMFS ports agents suggest smalltooth sawfish captures are now rare. In addition to incidental bycatch in commercial fisheries, smalltooth sawfish have historically been and continue to be captured by recreational fishermen. Encounter data (NSED 2012) and past research (Caldwell 1990) document that rostrums are sometimes removed from smalltooth sawfish caught by recreational fishermen, thereby reducing their chances of survival. While the current threat of mortality associated with recreational fisheries is expected to be low given that possession of the species in Florida has been prohibited since 1992, bycatch in recreational fisheries remains a potential threat to the species.

7.3 Vessel Strikes

Vessel strikes are a poorly-studied threat, but have the potential to be an important source of mortality to sea turtle populations (Work et al. 2010). All sea turtles must surface to breathe, and several species are known to bask at the surface for long periods. Although sea turtles can move rapidly, sea turtles apparently are not able to avoid vessels moving at more than four kilometers per hour; most vessels move faster than this in open water (Hazel et al. 2007; Work et al. 2010). Given the high level of vessel traffic in the Gulf of Mexico, frequent injury and mortality could affect sea turtles in the region. Hazel et al. (2007) suggested that green turtles may use auditory cues to react to approaching vessels rather than visual cues, making them more susceptible to strike as vessel speed increases. Each state along the east coast of the United States and the Gulf of Mexico has several hundred thousand recreational vessels registered, including Florida with nearly one million, the highest number of registered boats in the United States (NMMA 2007; USCG 2003; USCG 2005). Private and commercial vessel operations also have the potential to interact with sea turtles. Vessels servicing the offshore oil and gas industry are estimated to make 115,675 to 147,175 trips annually, and many commercial vessels travel to and from some of the largest ports in the United States (MMS 2007; USN 2008).

[1] "nearshore and inshore Florida waters" means all Florida waters inside a line three miles seaward of the coastline along the Gulf of Mexico and inside a line one mile seaward of the coastline along the Atlantic Ocean.

While Gulf sturgeon do not have to surface to breath, they may also be impacted by vessel strikes. Vessel strikes are a documented threat to Atlantic sturgeon, and injuries consistent with vessel interactions have been documented in Gulf sturgeon (ASSRT 2007; USFWS 2009). Given that smalltooth sawfish are primarily a benthic species, interactions between vessels and smalltooth sawfish are likely rare.

7.4 United States Military Activities

Naval activities conducted during training exercises in designated naval operating areas and training ranges have the potential to adversely affect ESA-listed sea turtles and fishes. Species occurring in the action area could experience stressors from several naval training ranges or facilities. Sea turtles travel widely in the North Atlantic and could be exposed to naval activities in several ranges. The Virginia Capes, Cherry Point, and Jacksonville-Charleston Operating Areas are situated consecutively along the migratory corridor for sea turtles, and the Key West, Gulf of Mexico, Bermuda, and Puerto Rican Complexes have the potential to overlap the range of sea turtles species. Gulf sturgeon and smalltooth sawfish have more restricted ranges than sea turtles, but may still overlap with some of these military activities. Naval activities to which individuals could be exposed include, among others, vessel and aircraft transects, munition detonations, and sonar use all of which may harass ESA-listed turtles.

Anticipated impacts include harassment resulting in changes from foraging, resting, and other behavioral states that require lower energy expenditures to traveling, avoidance, and behavioral states that require higher energy expenditures. Behavioral responses that result from stressors associated with these training activities are expected to be temporary and would not affect the reproduction, survival, or recovery of these species.

In 2013, NMFS issued a biological opinion to the U.S. Navy on all testing and training activities in the Atlantic basin for 2014 to 2018 (Table 10 and Table 11) (NMFS 2013a). These actions may result in behavioral and hearing loss effects, other sub-lethal injuries that lead to fitness consequences, and mortality that can lead to the loss of individuals from their populations.

Table 10. Annual take authorized for United States Navy testing activities in the Atlantic basin.

Sea turtle species	Behavioral and temporary threshold shift	Permanent threshold shift	Organ injury	Mortality
Hardshell sea turtles	5,132	10	242	49
Kemp’s ridley	292	0	17	4
Leatherback	6,362	29	162	57
Loggerhead	1,017	15	578	81

Table 11. Annual take authorized for United States Navy training activities in the Atlantic basin.

Sea turtle species	Behavioral and temporary threshold shift	Permanent threshold shift	Organ injury	Mortality
Hardshell sea turtles	12,216	22	4	2
Kemp's ridley	302	2	1	1
Leatherback	8,909	23	2	1
Loggerhead	16,812	34	7	4

Currently, there is not much known about the effect of military activities on Gulf sturgeon and smalltooth sawfish. In our 2014 biological opinion for the Navy's activities in the Atlantic basin, we recognized that the potential for mortality of smalltooth sawfish and Gulf sturgeon from explosions was very low in any given year, but the potential for injury leading to mortality over a longer period existed. However, we could not quantify the number of takes of Gulf sturgeon or smalltooth sawfish due to the lack of information on fishes' locations during testing activities especially in shallow coastal waters (NMFS 2013a).

The U.S. Air force also conducts testing and training activities within the action area, with operations based out of Eglin Air Force Base. In 2017, we concluded programmatic consultation with the Air Force on these activities, which include air-to-surface activities such as the firing or dropping of munitions including bombs, missiles, rockets, and gunnery rounds from aircraft toward targets located on the Gulf of Mexico (NMFS 2017a). In our 2017 biological opinion, we found that these activities would expose sea turtles to acoustic stressors resulting from underwater explosives, which may cause disturbance and behavioral responses, temporary (impairment) and permanent (injury) hearing thresholds shifts, and serious injury or mortality. Given the location and nature of these activities, we found that they are unlikely to affect ESA-listed fishes. Based on the proposed military activities, and the Air Force's proposed mitigation measures, we issued incidental take of ESA-listed turtles (Table 12), and concluded that the proposed action was not likely to jeopardize the continued existence of ESA-listed turtles within the action area.

Table 12. Annual ESA-listed sea turtles takes incidental to the United States Air Force's Eglin Gulf Testing and Training Range activities.

ESA-Listed Species	Mortality/ Serious Injury	Impairment	Disturbance	Behavioral Response
Green Turtle (North Atlantic DPS)	28	39	1,056	11,139
Kemp's Ridley Turtle	29	40	1,079	10,905
Loggerhead Turtle (Northwest Atlantic DPS)	57	79	2,148	22,610
Leatherback Turtle	10	17	436	5,257

7.5 Dredging and Dams

Dredging is common within U.S. coastal waters. Construction and maintenance of federal navigation channels and dredging in sand mining sites have been identified as sources of sea turtle mortality and are currently being undertaken along the U.S. East Coast, such as in Port Everglades, Florida. Hopper dredges in the dredging mode are capable of moving relatively quickly compared to sea turtle swimming speed and can thus overtake, entrain, and kill sea turtles as the suction draghead(s) of the advancing dredge catch up to resting or swimming turtles. Entrained sea turtles rarely survive. Relocation trawling frequently occurs in association with dredging projects to reduce the potential for dredging to injure or kill sea turtles (Dickerson et al. 2007). Dredging has been documented to capture or kill 168 sea turtles from 1995 to 2009 in the Gulf of Mexico, including 97 loggerheads, 35 Kemp's ridleys, 32 greens, and three unidentified sea turtles (USACE 2010).

Dredging also threatens Gulf sturgeon. Riverine, nearshore, and offshore areas are often dredged to support commercial shipping and recreational boating, construction of infrastructure, and marine mining. Environmental impacts of dredging include the direct removal/burial of organisms; turbidity/siltation effects; contaminant resuspension; noise/disturbance; alterations to hydrodynamic regime and physical habitat; and actual loss of riparian habitat (Chytalo 1996; Winger et al. 2000). According to Smith and Clugston (1997), dredging and filling impact important habitat features of Atlantic sturgeon as they disturb benthic fauna, eliminate deep holes, and alter rock substrates. Maintenance dredging occurs regularly in numerous parts of all seven river drainages that are used by Gulf sturgeon and will result in reduced dissolved oxygen (DO) and upriver movement of the salt wedge, restricting spawning habitat (USFWS and NMFS 2009).

Dams for hydropower generation, flood control, and navigation adversely affect Gulf sturgeon habitat by impeding access to spawning, developmental, and foraging habitat, modifying free-flowing rivers to reservoirs, physically damaging fish on upstream and downstream migrations, and altering water quality in the remaining downstream portions of spawning and nursery habitat. Fish passage has not proven very successful in minimizing the impacts of dams on Gulf sturgeon, as they do not regularly use existing fish passage devices, which are generally designed to pass pelagic fish (i.e., those living in the water column) rather than bottom-dwelling species like sturgeon. All of the dams identified in the original listing of Gulf sturgeon continue to block Gulf sturgeon movement to historic spawning grounds, and in the most recent status review an additional six proposed dams were identified that may negatively impact Gulf sturgeon movement (USFWS and NMFS 2009). Thus, dams continue to be a major threat to Gulf sturgeon spawning.

7.6 Entrainment, Entrapment, and Impingement in Power Plants

There are dozens of power plants in coastal areas of the action area (Muyskens et al. 2015). Sea turtles have been affected by operation of cooling-water systems of electrical generating plants. We do not have data for many of these, but have reason to believe that impacts to sea turtles, particularly loggerhead and green sea turtles, may be important. For example, in over 40 years of operation at the St. Lucie Nuclear Power Plant in Florida, 16,600 sea turtles have been captured to avoid being drawn into cooling structures (which likely would kill sea turtles that enter), and 297 have died (NMFS 2016b). These included: 9,552 loggerheads (including 180 mortalities), 6,886 green (including 112 mortalities), 42 leatherback (no mortalities), 67 Kemp's ridley (including four mortalities), and 65 hawksbill sea turtles (including one mortality) (NMFS 2016b). Only since 2001 have the mortalities been classified as causally (or non-causally) related to operation of St. Lucie Nuclear Power Plant, and not all mortalities were causal to St. Lucie Nuclear Power Plant operations: 59 percent of dead loggerheads were causal to St. Lucie Nuclear Power Plant operation, 46 percent of greens, and none of hawksbills (no leatherback or Kemp's ridley mortalities occurred since 2001) (NMFS 2016b).

Effects from cooling system operations generally involve stress, injury, and mortality from being captured, entrained, or impinged by cooling water intake systems. Cooling water discharge (which is warmer than the surrounding water temperature) can alter habitat around the outflow pipe. This can present advantages (such as shelter from cold water temperatures that may stun sea turtles and allow for unseasonal growth of marine plants that green sea turtles may forage upon) and disadvantages (such as altering normal ecology sea turtles and sturgeon rely upon and result in individuals depending on unnatural conditions that can be problematic if a plant is decommissioned or goes offline) for ESA-listed species.

While power plants have not been identified as a major threat to Gulf Sturgeon, they do pose threats to Atlantic and shortnose sturgeon as they are susceptible to impingement on cooling water intake screens at power plants (ASSRT 2007; NMFS 1998). In general, electric power and nuclear power generating plants can affect sturgeon by impinging larger fish on cooling water intake screens and entraining larval fish. Similarly, power plants do not appear to be a major threat to smalltooth sawfish. However, a smalltooth sawfish was impinged upon cooling water intake structures at the St. Lucie Nuclear Power Plant, but released alive and in apparently good condition (NMFS 2016c).

7.7 Oil and Gas Activities

The U.S. Army Corps of Engineers and the Bureau of Ocean Energy Management authorize oil and gas exploration (via seismic activity), well development, production, and abandonment/rig removal activities that may adversely affect sea turtles. Both of these agencies have consulted with NMFS on these types of activities. The impacts of these activities have been analyzed during consultations for individual and multi-lease sales. NMFS anticipates incidental takes of sea turtles from vessel strikes, noise, marine debris, and the use of explosives to remove oil and gas structures.

The northern Gulf of Mexico is the location of massive industrial activity associated with oil and gas extraction and processing. Over 4,000 oil and gas structures are located outside of state waters in the northern Gulf of Mexico; 90 percent of these occur off Louisiana and Texas (USN 2009). This is both detrimental and beneficial for sea turtles. These structures appreciably increase the amount of hard substrate in the marine environment and provide shelter and foraging opportunities for species like loggerhead sea turtles (Parker Jr. et al. 1983; Stanley and Wilson 1989). However, the Bureau of Ocean Energy Management requires that structures must be removed within one year of lease termination. Many of these structures are removed by explosively severing the underwater supportive elements, which produces a shock wave that kills, injures, or disrupts marine life in the blast radius (Gitschlag et al. 1997).

For sea turtles, this means death or serious injury for individuals within a few hundred meters of the structure and overt behavioral (potentially physiological) impacts for individuals further away from the structure (Duronslet et al. 1986; Klima et al. 1988). Although observers and procedures are in place to mitigate impacts to sea turtles (i.e., not blasting when sea turtles are present), not all sea turtles are observed all the time, and low-level sea turtle injury and mortality still occurs (Gitschlag and Herczeg 1994; Gitschlag et al. 1997). Two loggerheads were killed in August 2010, and one Kemp's ridley was killed in July 2013, along with several additional stunning or sub-lethal injuries reported over the past five years. In an August 28, 2006 biological opinion, NMFS issued incidental take for Bureau of Ocean Energy Management-permitted explosive structure removals (NMFS 2006a). These levels were far surpassed by the *Deepwater Horizon* incident.

7.8 Habitat Degradation

A number of factors may directly or indirectly affect ESA-listed species in the action area by degrading habitat. In-water construction activities (e.g., pile driving associated with shoreline projects) in both inland waters as well as coastal waters in the action area can produce sound levels sufficient to disturb sea turtles under some conditions. Pressure levels from 190 to 220 dB re 1 µPa at 1 meter were reported for piles of different sizes in a number of studies (NMFS 2006c). The majority of the sound energy associated with pile driving is in the low frequency range (less than 1,000 Hertz) (Illingworth Rodkin Inc. 2004; Reyff 2003), which is likely the frequency range at which sea turtles hear best. Dredging operations also have the potential to emit sounds at levels that could disturb sea turtles. Depending on the type of dredge, peak sound pressure levels from 100 to 140 dB re 1 µPa at 1 meter were reported in one study (Clarke et al. 2003). As with pile driving, most of the sound energy associated with dredging is in the low-frequency range, less than 1,000 Hertz (Clarke et al. 2003).

Several measures have been adopted to reduce the sound pressure levels associated with in-water construction activities or prevent exposure of sea turtles to sound. For example, a six-inch block of wood placed between the pile and the impact hammer used in combination with a bubble curtain can reduce sound pressure levels by about 20 dB (NMFS 2008). Alternatively, pile driving with vibratory hammers produces peak pressures that are about 17 dB lower than those generated by impact hammers (Nedwell and Edwards 2002). Other measures used in the action area to reduce the risk of disturbance from these activities include avoidance of in-water construction activities during times of year when sea turtles may be present, monitoring for sea turtles during construction activities, and maintenance of a buffer zone around the project area, within which sound-producing activities would be halted when sea turtles enter the zone (NMFS 2008).

Marine debris is a significant concern for listed species and their habitats. Marine debris accumulates in gyres throughout the oceans. The input of plastics into the marine environment also constitutes a significant degradation to the marine environment. In 2010, an estimated 4.8 to 12.7 million metric tons of plastic entered the ocean globally (Baulch and Simmonds 2015).

For sea turtles, marine debris is a problem primarily due to individuals ingesting debris and blocking the digestive tract, causing death or serious injury (Laist et al. 1999; Lutcavage et al. 1997). Schuyler et al. (2015) estimated that, globally, 52 percent of individual sea turtles have ingested marine debris. Gulko and Eckert (2003) estimated that between one-third and one-half of all sea turtles ingest plastic at some point in their lives; this figure is supported by data from Lazar and Gracan (2011), who found 35 percent of loggerheads had plastic in their gut. A Brazilian study found that 60 percent of stranded green turtles had ingested marine debris (Bugoni et al. 2001), although loggerhead turtles had a lesser frequency of marine debris ingestion. Plastic may be ingested out of curiosity or due to confusion with prey items. Marine debris consumption has been shown to depress growth rates in post-hatchling loggerhead turtles, elongating the time required to reach sexual maturity and increasing predation risk (McCauley and Bjorndal 1999). Sea turtles can also become entangled and die in marine debris, such as discarded nets and monofilament line (Laist et al. 1999; Lutcavage et al. 1997; NRC 1990).

Although beach nourishment or placing sand on beaches within the action area may provide more sand, the quality of that sand, and hence the nesting beach, may be less suitable than pre-existing natural beaches. Sub-optimal nesting habitat may cause decreased nesting success, place an increased energy burden on nesting females, result in abnormal nest construction, and reduce the survivorship of eggs and hatchlings (Ackerman 1980; Mann 1978; Mortimer 1990).

Beach armoring (e.g., bulkheads, seawalls, soil retaining walls, rock revetments, sandbags, and geotextile tubes) also occurs within the action area and can impede a turtle's access to upper regions of the beach/dune system, thereby limiting the amount of available nesting habitat (Mazaris et al. 2009). Impacts also can occur if structures are installed during the nesting season. For example, unmarked nests can be crushed or uncovered by heavy equipment, nesting turtles and hatchlings can be caught in construction debris or excavations, and hatchlings can be trapped in holes or crevices of exposed riprap and geotextile tubes. In many areas of the world, sand mining (removal of beach sand for upland construction) seriously reduce or degrade/destroy sea turtle nesting habitats or interfere with hatchling movement to sea (NMFS 2003).

Modification and loss of habitat, especially nursery habitat, is also a contributing factor in the decline of smalltooth sawfish. Activities such as agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater runoff contribute to these losses (SAFMC 1998). Large areas of coastal habitat were modified or lost between the mid-1970s and mid-1980s within the United States (Dahl and Johnson 1991). Since then, rates of loss have decreased, but habitat loss continues. From 1998 to 2004, approximately 64,560 acres of coastal wetlands were lost along the Atlantic and Gulf coasts of the United States, of which approximately 2,450 acres were intertidal wetlands consisting of mangroves or other estuarine shrubs (Stedman and Dahl 2008). Further, Orlando Jr. et al. (1994) analyzed 18 major southeastern estuaries and recorded over 703 miles of navigation channels and 9,844 miles of shoreline with modifications. In Florida, coastal development often involves the removal of mangroves and the armoring of shorelines through seawall construction. Changes to the natural freshwater flows into estuarine and marine waters through construction of canals and other water control devices have had other impacts: altered the temperature, salinity, and nutrient regimes; reduced both wetlands and submerged aquatic vegetation; and degraded vast areas of coastal habitat utilized by smalltooth sawfish (Gilmore 1995; Reddering 1988; Whitfield and Bruton 1989). While these modifications of habitat are not the primary reason for the decline of smalltooth sawfish abundance, it is likely a contributing factor and almost certainly hampers the recovery of the species. Juvenile sawfish and their nursery habitats are particularly likely to be affected by habitat loss or modification due to their affinity for shallow, estuarine systems. Although many forms of habitat modification are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue to threaten survival and recovery of the species in the future.

Gulf sturgeon rely on a variety of water quality parameters to successfully carry out their life functions. Low dissolved oxygen and the presence of contaminants modify the quality of Gulf sturgeon habitat and in some cases, restrict the extent of suitable habitat for life functions. Habitat modifications such as erosion, changes in riparian condition, presence of unpaved roads, and presence of agriculture can alter these water quality parameters and adversely affect Gulf sturgeon (USFWS and NMFS 2009). While data on the effects of habitat degradation on Gulf sturgeon are sparse, studies on Atlantic and shortnose sturgeon are informative. Secor (1995) noted a correlation between low abundances of Atlantic sturgeon during this century and decreasing water quality caused by increased nutrient loading and increased spatial and temporal frequency of hypoxic (low oxygen) conditions. Sturgeon are more highly sensitive to low dissolved oxygen than other fish species (Niklitschek and Secor 2009), and low dissolved oxygen in combination with high temperature is particularly problematic for Atlantic sturgeon. Studies have shown that juvenile Atlantic sturgeon experience lethal and sublethal (metabolic, growth, feeding) effects as dissolved oxygen drops and temperatures rise (Niklitschek and Secor 2005; Niklitschek and Secor 2009; Secor and Gunderson 1998). Beyond reductions in dissolved oxygen, Gulf sturgeon habitat can be drastically modified due to pollutants, as discussed further below.

7.9 Pollutants

Coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise and boat traffic can degrade marine habitats used by sea turtles (Colborn et al. 1996). The development of marinas and docks in inshore waters can negatively impact nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not likely affect the more pelagic waters, the species of turtles analyzed in this biological opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

There are studies on organic contaminants and trace metal accumulation in green and leatherback turtles (Aguirre et al. 1994; Corsolini et al. 2000). Mckenzie et al. 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 turtle size were observed in green turtles, most likely attributable to a change in diet with age.

Sakai et al (1995) found the presence of metal residues occurring in loggerhead turtle organs and eggs. Storelli et al. (1998) analyzed tissues from twelve loggerhead 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 are 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.

The Gulf of Mexico is a sink for massive levels of pollution from a variety of marine and terrestrial sources, which ultimately can interfere with ecosystem health and particularly that of sea turtles. Sources include the petrochemical industry in and along the Gulf of Mexico, wastewater treatment plants, septic systems, industrial facilities, agriculture, animal feeding operations, and improper refuse disposal. The Mississippi River drains 80 percent of U.S. cropland (including the fertilizers, pesticides, herbicides, and other contaminants that are applied to it) and discharges into the Gulf of Mexico (MMS 1998). Agricultural discharges and discharges from large urban centers (e.g., Tampa) contribute contaminants as well as coliform bacteria to Gulf of Mexico habitats (Garbarino et al. 1995). These contaminants can be carried long distances from terrestrial or nearshore sources and ultimately accumulate in offshore pelagic environments (USCOP 2004). The ultimate impacts of this pollution are poorly understood.

Significant attention has been paid to nutrient enrichment of Gulf of Mexico waters, which leads to algal blooms (including harmful algal blooms), oxygen depletion, loss of seagrass and coral reef habitat, and the formation of a hypoxic “dead zone” (USCOP 2004). This hypoxic event occurs annually from as early as February to as late as October, spanning roughly 12,700 square kilometers (although in 2005 the “dead zone” grew to a record size of 22,000 square kilometers) from the Mississippi River Delta to Galveston, Texas (Louisiana Universities Marine Consortium 2015; LUMCON 2005; Rabalais et al. 2002; Rabotyagov et al. 2014; Turner and Rabalais 2016). Although sea turtles do not extract oxygen from sea water, numerous staple prey items of sea turtles, such as fish, shrimp, and crabs, do and are killed by the hypoxic conditions (Craig et al. 2001; Rabotyagov et al. 2014). More generally, the “dead zone” decreases biodiversity, alters marine food webs, and destroys habitat (Craig et al. 2001; Rabalais et al. 2002; Rabotyagov et al. 2014). High nitrogen loads entering the Gulf of Mexico from the Mississippi River is the likely culprit; nitrogen concentrations entering the Gulf of Mexico have increased three fold over within 60 years (Rabalais et al. 2002; Turner and Rabalais 2016).

Pollutants are also is believed to impact sturgeon worldwide, and Gulf sturgeon are no exception (Berg 2006). Such pollutants may come from agricultural, industrial, or municipal activities and can cause a variety of physical, behavioral, and physiological responses including muscle atrophy, abnormality of gonad, sperm and egg development, morphogenesis of organs, tumors, and disruption of hormone production (USFWS and NMFS 2009). Given Gulf sturgeon’s life history (long-lived, slow growing, residency to particularly riverine and estuarine habitats, and benthic foraging), they may be particularly susceptible to the accumulation of environmental pollutants. For example, 20 juvenile Gulf sturgeon from the Suwannee River, in Florida, were found to have increased metals concentrations with an increase in individual length (Alam et al. 2000). While state and federal water quality standards regulate and protect Gulf sturgeon from these pollutants to some extent, they are not able to eliminate pollutants completely, and as such, pollutants continue to be a threat to Gulf sturgeon (USFWS and NMFS 2009). While pollutants are not considered a major threat to smalltooth sawfish, they may have similar adverse effects to those described above for Gulf sturgeon, but the extent to which they impact smalltooth sawfish is currently unknown (NMFS 2010a; Seitz and Poulakis 2006).

7.10 Disease and Non-native Species Introductions

A disease known as fibropapilloma is a major threat to green turtles in some areas of the world. Fibropapilloma is characterized by tumorous growths, which can range in size from very small to extremely large, and are found both internally and externally. Large tumors can interfere with feeding and essential behaviors, and tumors on the eyes can cause permanent blindness (Foley et al. 2005). Fibropapilloma was first described in green turtles in the Florida Keys in the 1930s. Since then it has been recorded in many green turtle populations around the world, most notably present in green turtles of Hawaii, Florida, and the Caribbean. In Florida, up to 50 percent of the immature green turtles captured in the Indian River Lagoon are infected, and there are similar reports from other sites in Florida, including Florida Bay, as well as from Puerto Rico and the U.S. Virgin Islands. In addition, scientists have documented fibropapilloma in populations of loggerhead, olive ridley, and flatback turtles (Huerta et al. 2000). The effects of fibropapilloma at the population level are not well understood and could be a serious threat to their recovery. The cause of the disease remains unknown. Research to determine the cause of this disease is a high priority and is underway.

An increased human presence at some nesting beaches or close to nesting beaches has lead to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs and an increased presence of native species (e.g. raccoons, armadillos, and opossums) that raid and feed on turtle eggs. Non-native vegetation has invaded many coastal areas and often outcompetes native species. Non-native vegetation is usually less-stabilizing and can lead to increased erosion and degradation of suitable nesting habitat. Non-native vegetation may also form impenetrable root mats that can prevent proper nest cavity excavation, invade and desiccate eggs, or trap hatchlings. In light of these issues, conservation and long-term protection of sea turtle nesting and foraging habitats is an urgent and high priority need.

7.11 Scientific Research and Permits

Scientific research has and will continue to impact ESA-listed sea turtle and fishes within the action area. Authorized research on ESA-listed sea turtles includes capture and handling, satellite, internal and external tagging, blood and tissue collection, ultrasound, laparoscopy, and imaging. Currently, there are 19 active permits involving ESA-listed turtles within the action area (Permit Nos. 16109, 16253, 16598, 16733, 17183, 17304, 17381, 17506, 18069, 18136, 18926, 19288, 19496, 19508, 19528, 19621, 19627, 19637, 19716). This represents a substantial amount of research, but only one permit (Permit No. 16253) authorizes unintentional mortality (three loggerhead turtles (Northwest Atlantic DPS), two Kemp's ridley turtles, two green turtles (North Atlantic DPS), one leatherback turtle, one hawksbill turtle, and one olive ridley turtle (All other areas)). Beyond this, these permits are not expected to impact the fitness of individual turtles. While there are currently no active research permits for Gulf sturgeon under NMFS jurisdiction, the U.S. Fish and Wildlife Service permits scientific research on Gulf sturgeon in riverine habitats outside of the action area for this consultation. Authorized research for smalltooth sawfish includes capture and handling, satellite, internal and external tagging, blood and tissue collection, and imaging. There are currently three active permits for smalltooth sawfish within the action area (Permit Nos. 17787, 17316, 15802), but none are anticipate to cause mortality, serious injury, or impact the fitness of individual smalltooth sawfish.

8 Effects of the Action

Section 7 regulations define "effects of the action" as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 C.F.R. §402.02). Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur. This effects analyses section is organized following the stressor, exposure, response, risk assessment framework.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50

C.F.R. §402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

In this section, we describe the potential stressors associated with the proposed action, the probability of individuals of ESA-listed species being exposed to these stressors based on the best scientific and commercial evidence available, and the probable responses of those individuals (given probable exposures) based on the available evidence. As described in Section 2, for any responses that would be expected to reduce an individual's fitness (i.e., growth, survival, annual reproductive success, or lifetime reproductive success), the assessment would consider the risk posed to the viability of the population(s) those individuals comprise and to the ESA-listed species those populations represent. For this consultation, we are particularly concerned about behavioral and stress-based physiological disruptions and potential unintentional mortality that may result in animals that fail to feed, reproduce, or survive because these responses are likely to have population-level consequences. The purpose of this assessment and, ultimately, of this consultation is to determine if it is reasonable to expect the proposed action to have effects on ESA-listed species that could appreciably reduce their likelihood of surviving and recovering in the wild.

8.1 Stressors Associated with the Proposed Action

Stressors are any physical, chemical, or biological entity that may induce an adverse response either in an ESA-listed species or their designated critical habitat. The issuance of Permit No. 20455 would authorize several research activities directed at dolphins, but these activities may also expose ESA-listed turtles and fishes within the action area to a variety of stressors. Vessel operations present a range of stressors including vessel traffic and visual and auditory disturbances. Dolphin seine net captures present a range of stressors including disturbance and possible capture and/or entanglement. Acoustic playbacks would present the single stressor of an acoustic stimuli.

8.2 Mitigation to Minimize or Avoid Exposure

Several aspects of the proposed action are designed to minimize ESA-listed species' exposure to the potential stressors associated with the research activities. These include the experience and measures taken the researchers and conditions specified in the permit, as proposed by the Permits Division.

Dr. Wells has extensive experience conducting research on dolphins within the action area using the methods described here (NMFS 2016d). In fact, his research project is one of the longest running projects of its kind, being nearly 50 years old. Given this experience, Dr. Wells is well equipped to conduct his research activities in a way that minimize adverse affects to ESA-listed species. In his permit application, Dr. Wells outlines the following measures designed to minimize exposure and effects to ESA-listed species:

> "We do not plan to adversely affect any non-target species. Our research boat operations, especially inshore, will be through waters inhabited by endangered West

Indian manatees (*Trichechus manatus latirostris*) and several species of sea turtles (e.g., loggerhead sea turtles (threatened), green sea turtles (endangered), and Kemp's ridley sea turtles (critically endangered). We do not expect to strike any of these animals with our vessels, and we have not struck any of these animals in the more than 46-year history of our program. I am not aware of any way to meaningfully quantify the numbers of manatees and turtles that might be incidentally harassed by our research vessel operations, as these animals are largely unseen below the water's surface. However, the potential contribution of our activities to overall levels of impacts from boat traffic from all sources should be considered miniscule. To place our research vessel operations into perspective relative to other boat traffic faced by these animals, there are nearly 40,000 boats registered in the home range of the Sarasota Bay bottlenose dolphin community alone, and boats pass within 100 meters of each dolphin in the bay on average once every six minutes during daylight hours (Nowacek et al. 2001). We operate outboard powered (four-stroke) research vessels, ranging in length from six to nine meters. We are specifically trying to find marine mammals, and our team is highly trained and experienced in seeing marine animals and objects of interest in the water, so we engage in a level of vigilance when scanning waters ahead of our boats that far exceeds that of most recreational or even commercial boat operators. When we see non-target species in the path of the vessel, we alter our course (and often reduce speed as well) to avoid them. We will not set the capture net in areas where non-target species are seen.

Our bottlenose dolphin capture-release operations in shallow estuarine habitats have the potential to encounter manatees and turtles, although such encounters are rare. We minimize encounters through the use of dedicated, experienced observers on our research vessels, and by scanning the intended set area before deploying the dolphin capture net. If a turtle or manatee is seen in the target area, we will not deploy the net and move to another area. Should a manatee or turtle be seen inside the net enclosure, the net circle will be opened, the net will be retrieved, and we will move to another area to continue our work. Should a manatee or turtle become entangled in the net, we will carefully disentangle and release it immediately. Our field team is exceptionally well-qualified to deal with such an unexpected and unusual event. Our research team typically includes 10 to 20 experienced marine mammal and sea turtle veterinarians, as well as members of the State of Florida's Fish and Wildlife Conservation Commission's (FWC) manatee rescue team, staff from multiple marine mammal and sea turtle stranding response programs (Mote Marine Laboratory's Stranding Investigations Program, FWC Marine Mammal Pathobiology Lab, FWC Southwest Florida Field Station, Clearwater Marine Aquarium, Harbor Branch Oceanographic Institution, IFAW; the Sarasota Dolphin Research Project is a designee under Mote's stranding Letter or Authorization), and numerous experienced marine mammal

> handlers, trainers, and keepers. We have never injured or killed a manatee or a sea turtle in the 46 plus years of our research program's existence.
>
> We refrain from setting our capture net when manatees or marine turtles are seen nearby, but on very rare occasions, turtles or manatees have not been seen until after the net corral was set around them. In the 46 years since we began conducting capture-release research, we have caught only two green juvenile sea turtles, and this occurred more than two decades ago. Both turtles were released alive and in good condition – because the documentation requirements were different then, and because there was no harm to the turtles, no detailed records exist. Since 1970, there have been three cases in which manatees were encircled or approached the dolphin capture net. The most recent case, in 2014, involved a single manatee observed swimming gently into the open dolphin net, and disentangling itself as the Florida Fish and Wildlife Conservation Commission Manatee Rescue Coordinator, a member of our dolphin capture-release team, approached to assist it if necessary. No intervention was required as the animal swam away from the net, and we retrieved the net. In both other cases, the net was retrieved and the manatees were released without handling. On rare occasions we catch small sharks (bonnethead, blacknose, blacktip) or large snook in the net, and it is not uncommon to catch stingrays. These are released alive when possible. We have never caught birds in the net. There are no corals in the areas where we set our net. We frequently set the net in seagrass meadows as this is prime dolphin habitat, but the net does not damage the meadows; we specifically use a lighter weight lead line than is used in some NOAA dolphin nets, in part to minimize the potential for damage to aquatic vegetation."

While Dr. Wells does not specifically address Gulf sturgeon or smalltooth sawfish above, he does discuss measures taken to avoid exposing non-target fish more generally, and these apply to Gulf sturgeon or smalltooth sawfish. In addition, to the measures taken above, Dr. Wells regularly coordinates his dolphin seine net captures with the MMHSRP. In fact, this coordination would be a condition of his permit. With this coordination, Dr. Wells and the MMHSRP utilize the same or similar methods to avoid incidental captures of ESA-listed turtles and fishes, and reduce the overall total number of dolphin captures that are performed across the MMHSRP and Dr. Wells' research program. As a result of this coordination, we expect a reduction in the chances that ESA-listed turtles and fishes are exposed to stressors from these dolphin seine net captures.

In addition to these mitigation measures taken by the researchers, the Permits Division proposed to include the following terms and conditions related to ESA-listed species in the main body of the permit:

1. Nets must be continuously monitored. When movements indicate that an animal has encountered the net, Researchers must immediately check the net either by snorkeling

along the net in clear water or by pulling up on the top line such that the full depth of the net is viewed along the entire length.

2. To the maximum extent feasible, researchers must be aware of the presence and location of non-target protected species at all times as they conduct netting activities. Researchers must make every effort to prevent interactions with these species.
3. Netting must not be initiated when non-target marine mammals, sea turtles, or other protected species are observed within the vicinity of the research. Animals must be allowed to either leave or pass through the area safely before netting is initiated.
4. Researchers must stop netting activities and immediately free any non-target protected species captured. An incident report must be submitted.
5. Researchers must closely examine the net during and after captures to ensure that no animals have been left in the net. The net must be removed from the water as quickly as feasible.
6. The Permit Holder must coordinate research activities with the NMFS Marine Mammal Health and Stranding Response Program and other Permit Holders working on the same species to avoid unnecessary duplication of research and disturbance of animals.
7. Playback studies must be limited to 15 minutes in duration, not exceed 150 dB re 1 µPa at 1 meter, and must not be broadcast to animals closer than two meters.

In addition, the Permits Division proposed to include the following appendix as part of the permit that specifically focuses on minimizing takes and effect to non-target, ESA-listed species:

All incidentally captured species (e.g., turtles and fishes) must be released alive as soon as possible.

a) Sea Turtles

1. Researchers must:
   a. Handle turtles according to procedures specified in 50 CFR 223.206(d)(1)(i) (see below). Use care when handling live animals to minimize any possible injury.
   b. Use appropriate resuscitation techniques on any comatose turtle prior to returning it to the water.
   c. When possible, transfer injured, compromised, or comatose animals to rehabilitation facilities and allow them an appropriate period of recovery before return to the wild.
   d. Have an experienced veterinarian, veterinary technician, or rehabilitation facility (i.e., medical personnel) on call for emergencies.
2. If an animal becomes highly stressed, injured, or comatose during capture or handling or is found to be compromised upon capture, Researchers must forego or cease activities that will further significantly stress the animal (erring on the side of caution) and contact the on call medical personnel as soon as possible. Compromised turtles include animals

that are obviously weak, lethargic, positively buoyant, emaciated, or that have severe injuries or other abnormalities resulting in debilitation. One of the following options must be implemented (in order of preference):

  a. Based on the instructions of the veterinarian, if necessary, immediately transfer the animal to the veterinarian or to a rehabilitation facility to receive veterinary care.
  b. If medical personnel cannot be reached, the Permit Holder should err on the side of caution and bring the animal to shore for medical evaluation and rehabilitation as soon as possible.
  c. If the animal cannot be taken to a rehabilitation center due to logistical or safety constraints, allow it to recuperate as conditions dictate, and return the animal to the sea.
     i. The Permit Holder is responsible for following the status of any sea turtle transported to rehab as a result of permitted activities and reporting the final disposition (death, permanent injury, recovery and return to wild, etc.) of the animal to the Chief, Permits Division.

3. If holding sea turtles for resuscitation or recovery, Researchers must
   a. Protect sea turtles from temperature extremes (ideal air temperature range is between 70°F and 80°F).
   b. Provide adequate air flow.
   c. Keep sea turtles moist when the temperature is ≥ 75°F (e.g., using moist towels - not placing the turtle in a container filled with water).
   d. Keep the area surrounding the turtle free of materials that could be accidentally ingested.
4. During release, turtles must be lowered as close to the water's surface as possible to prevent injury.
5. Researchers must carefully monitor newly released turtles' apparent ability to swim and dive in a normal manner. If a turtle is not behaving normally within one hour of release, the turtle must be recaptured and taken to a rehabilitation facility.
6. Leatherbacks
   a. Extra care must be exercised when handling and releasing leatherbacks. Leatherbacks have more friable skin and softer bones than hardshell turtles. Researchers must:
      i. Only board leatherbacks if they can be safely brought on the vessel.

ii. Handle and support leatherbacks from underneath, with one person on either side of the turtle.

iii. Not turn leatherbacks on their backs.

§ 223.206 Exceptions to prohibitions relating to sea turtles.

(d)(1) *Handling and resuscitation requirements.*

(i) Any specimen taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

(A) Sea turtles that are actively moving or determined to be dead as described in paragraph (d)(1)(i)(C) of this section must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

(B) Resuscitation must be attempted on sea turtles that are comatose, or inactive, as determined in paragraph (d)(1) of this section, by:

(1) Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 up to 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

(2) Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

(3) Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

(C) A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

b) Gulf Sturgeon

i. If a sturgeon is incidentally caught during netting, efforts must be made to return it to neutral buoyancy prior to and during release. Sturgeon tend to inflate their swim bladder when stressed and in air. If the fish has air in its bladder, it will float and be susceptible to sunburn or bird attacks. Air must be released by gently applying ventral pressure in a posterior to anterior direction. The specimen must then be propelled rapidly downward during release.

ii. All efforts must be made to release the animal as soon as possible while minimizing potential harm. This includes keeping the fish in the water to the maximum extent possible.

iii. When tangle netting, Researchers must have equipment (e.g., large hoop net) to safely support and board the fish on the vessel for disentanglement.

iv. From “A protocol for Use of Shortnose, Atlantic, Gulf, and Green Sturgeons” (Kahn and Mohead 2010): When water temperatures are above 73°F for green sturgeon or 77°F for Atlantic, Gulf, or shortnose sturgeon, handling time should be minimized. If the researcher observes a severely stressed sturgeon, efforts should be made to revive the fish and release it in a healthy condition.

c) Smalltooth Sawfish

v. All efforts must be made to release the fish as soon as possible while minimizing potential harm. This includes keeping the fish in the water to the maximum extent possible and cutting the net from the rostrum and body of the animal. Do not attempt to disentangle the rostrum from the net.

vi. Researchers must have equipment (e.g., large hoop net) to safely support and board the fish on the vessel for disentanglement if necessary.

d) Submerged Aquatic Vegetation (SAV) and Coral Communities

vii. Researchers must take all practicable steps including the use of charts, GIS, sonar, fish finders, or other electronic devices to determine characteristics and suitability of bottom habitat prior to using gear to identify and avoid conducting net sets on SAV and corals.

viii. No gear may be set, anchored on, or pulled across corals.

ix. If research gear is lost, diligent efforts must be made to recover the lost gear to avoid further damage to benthic habitat and impacts related to “ghost fishing.”

8.3 Exposure Analysis

In this section, we quantify the likely exposure of ESA-listed species to the activities and associated stressors that may result from the proposed action (Section 3). As described previously, all research activities are directed at either bottlenose or Atlantic spotted dolphins, so any take of ESA-species would be incidental to these activities. ESA-listed fishes and turtles may be exposed vessel operations, acoustic playbacks, and incidental capture during dolphin seine net captures.

ESA-listed turtles and fishes may be exposed to vessel operation, but given that during Dr. Wells' vessel operations, there would always be multiple experienced researchers on the lookout for animals at all times, and if sighted, animals would be avoided, we expect any such interactions to be at a distance. It is possible that observers will miss detecting an ESA-listed turtle or fish near the surface or that the research vessel will pass over a turtle or fish below. However, given that in Dr. Wells' 40 plus years of research he has never noted any impacts to ESA-listed turtles and fishes from his vessel operations, we expect such exposure to be extremely rare.

ESA-listed turtles and fishes could be exposed to acoustic playbacks studies. However, for playback studies that would occur during net captures, no exposure to ESA-listed turtles or fishes is expected since researchers would have already released any incidentally captures species prior to commencing playback studies, and with the proposed acoustic stimuli, areas outside the capture net would not be ensonified in a matter that would affect ESA-turtles or fishes any more than typical dolphin whistles. For, playbacks that would occur outside of net captures, we expect that any such exposure to ESA-listed turtles and fishes would be at a distance given that researchers would constantly be on the lookout for other non-target animals. In fact, these studies would only be conducted under very controlled circumstances, as part of the study design is to isolate one or a few individual dolphins to whom acoustic stimuli would be played back. In addition, if any exposure to ESA-listed turtles of fishes were to occur, the sound levels turtles and fishes would receive would be at or below those they would be exposed to from the nearby dolphins themselves.

During seine net captures, ESA-listed turtles and fishes may be incidentally captured or become entangled in the net. To estimate the exposure of ESA-listed turtles and fishes to incidental capture/entanglement, we relied on the number of seine nets Dr. Wells' has previously deployed, the number of previously incidentally captured ESA-listed turtles and fishes, and Dr. Well's estimates of the number of future net deployments that would be conducted under Permit No. 20455. While the Permits Division requested specific incidental take numbers for non-target species (10 hardshell turtles of any species in the action area, two leatherback turtles, two smalltooth sawfish, and one Gulf sturgeon), here we estimated the likely exposure using the best available data to insure that the requested take was reasonably likely to occur.

The best available data regarding incidental capture of non-target species during bottlenose dolphin seine net captures comes from Dr. Wells' annual reports. These include data on the number of net deployments and previous incidents of incidental capture/entanglement of non-target, ESA-listed species. These data indicate that from June 1984 to June 1990, a minimum of 151 seine nets were deployed. This number represents a minimum since records were only available for those deployments that ultimately resulted in dolphin captures; the number of unsuccessful net deployments during this time period is unknown. From June 1991 to May 2016, 315 net deployments occurred, including both successful and unsuccessful deployments. Thus, at a minimum Dr. Wells' research program has deployed 466 nets between June 1985 and May 2016. During this time, a total of two ESA-listed turtles (presumably green turtles as noted by Dr. Wells in his application) were incidentally captured and released unharmed, and no ESA-listed fishes were incidentally captured. Thus, historical data from Dr. Wells' indicate that turtles are captured on 0.43 percent of all seine net deployments. While Dr. Wells indicated that the two previously incidentally captured sea turtles were juvenile green turtles, no incident reports and few details are available regarding these historic captures. As such, we conservatively assume that these turtles could have been from any of the species/DPSs that are found within the action area, and so apply this 0.43 percent rate across species. For Gulf sturgeon and smalltooth sawfish, which to date have not been incidentally captured, the current rate of incidental capture is zero percent. While these incidental capture rates (0.43 percent for all ESA-listed turtles, and zero percent for Gulf sturgeon and smalltooth sawfish) represent the current incidental rates based on the best available data, they represent single point estimates with no measure of variation. As a result, we estimated the maximum expected future incidental take rates by making a conservative assumption that an individual from any of these species could be captured on the next net deployment. Accordingly, maximum expected future incidental take rates were calculated according to the following formula:

$$ITR_{fmax} = \frac{1 + IT_h}{1 + ND_h}$$

Here ITR_{fmax} represents the maximum expected future incidental take rate, IT_h represents the number of historic incidental takes, and ND_h represents the number of historic seine net deployments. Based on this formula, our estimates of the maximum expected future incidental take rates are conservative and slightly higher than that directly calculated from the historic dataset. From this, we estimated the maximum expected future incidental take rate of ESA-listed turtles to be 0.64 and of Gulf sturgeon and smalltooth sawfish to be 0.21 percent. These rates are lower than was recently estimated during consultation with the MMHSRP for their marine mammal seine net captures. However, given the multitude of differences between Dr. Wells' research program and the MMHSRP, and the fact that Dr. Wells' data indicate an overall lower incidental capture rate for ESA-listed turtles, we rely on these rates to estimate exposure of ESA-listed turtles and fishes to incidental capture and entanglement from the research proposed under Permit No. 20455.

Given the above maximum expected future incidental take rate estimates, we needed to estimate number of future net deployments in order to determine the number of individuals from each species likely to be incidentally captured. During consultation, Dr. Wells' informed us that the maximum number of seine net deployments (both successful and unsuccessful) that has occurred in past research in any given year was 31, which only occurred once, and on average 13 seine nets were deployed each year. Since predicting the number of seine net deployments that will occur in the future is uncertain and depends on multiple factors including weather, and staff, equipment, and funding availability, and the needs of specific research projects, we conservatively estimated that Dr. Wells' would deploy a maximum of 31 seine nets per year for the duration of Permit No. 20455.

To obtain final estimates of the annual expect future incidental take of non-target species that would result from Dr. Wells' dolphin seine net captures, we multiplied the maximum expected future incidental take rates for each species or species group (Gulf sturgeon, smalltooth sawfish, or ESA-listed turtles) by 31 net deployments, and rounded these estimates up to the nearest whole numbers to represent individual animals. From this, we estimate the following number of ESA-listed turtles and fishes may be incidentally exposed annually to capture and/or entanglement during Dr. Wells' dolphin seine net captures: one ESA-listed turtle of any species found in the action area (green [North Atlantic DPS], hawksbill, Kemp's ridley, leatherback, loggerhead [Northwest Atlantic DPS], or olive ridley turtle), one smalltooth sawfish (U.S. DPS), and one Gulf sturgeon. Thus, over the life of the permit we expect up to five ESA-listed turtles, five smalltooth sawfish, and five Gulf sturgeon may be incidentally captured in dolphin seine net captures. However, given that we do not know when Dr. Wells' previous two incidental turtle captures occurred, meaning they could have both occurred in a single year, and the fact that the MMHSRP recently captured two ESA-listed turtles during dolphin net captures in the span of two days (NMFS 2016a), we increased the estimated annual incidental take of ESA-listed turtles to two turtles from any of the species found within the action area (green (North Atlantic DPS), hawksbill, Kemp's ridley, leatherback, loggerhead (Northwest Atlantic DPS), or olive ridley turtle), resulting in an estimated total of 10 incidental takes of ESA-listed turtles over the life of the permit.

8.4 Response Analysis

Given the exposure detailed above, in this section we describe the range of responses among ESA-listed species that may result from the stressors associated with the activities that would be authorized under Permit No. 20455. These include stressors associated with vessel operations, seine net captures, and acoustic playbacks. Our response analysis considers and weighs evidence of adverse consequences, as well as evidence suggesting the absence of such consequences.

In general, interactions with these stressors have the potential to cause some sort of disturbance. Responses by animals to human disturbance are similar to their responses to potential predators (Beale and Monaghan 2004; Frid 2003; Frid and Dill 2002; Gill et al. 2001; Harrington and Veitch 1992; Lima 1998; Romero 2004). These responses manifest themselves as stress responses in which an animal perceives human activity as a potential threat and undergoes physiological changes to prepare for a flight or fight response or more serious physiological changes with chronic exposure to stressors. They can also lead to interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Frid and Dill 2002; Romero 2004; Sapolsky et al. 2000; Walker et al. 2005). Further, these responses have been associated with abandonment of sites (Sutherland and Crockford 1993), reduced reproductive success (Giese 1996; Mullner et al. 2004), and the death of individual animals (Bearzi 2000; Daan 1996; Feare 1976).

Stress is an adaptive response and does not normally place an animal at risk. However, distress involves a stress response resulting in a biological consequence to the individual. The stress response of fish and reptiles involves the hypothalamic-pituitary-adrenal axis being stimulated by a stressor, causing a cascade of physiological responses, such as the release of the stress hormones cortisol, adrenaline (epinephrine), glucocorticosteroids, and others (Atkinson et al. 2015; Barton 2002; Bayunova et al. 2002; Busch and Hayward 2009; Lankford et al. 2005; McConnachie et al. 2012; Wagner et al. 2002). These hormones subsequently can cause short-term weight loss, the release of glucose into the blood stream, impairment of the immune and nervous systems, elevated heart rate, body temperature, blood pressure, fatigue, cardiovascular damage, and alertness, and other responses (Aguilera and Rabadan-Diehl 2000; Busch and Hayward 2009; Dierauf and Gulland 2001; Guyton and Hall 2000; NMFS 2006b; Omsjoe et al. 2009; Queisser and Schupp 2012; Romero 2004; Wagner et al. 2002), particularly over long periods of continued stress (Desantis et al. 2013; Sapolsky et al. 2000).

In some species, stress can also increase an individual's susceptibility to gastrointestinal parasitism (Greer 2008). In highly-stressful circumstances, or in species prone to strong "fight-or-flight" responses, more extreme consequences can result, including muscle damage and death (Cowan and Curry 2008; Cowan and Curry 2002; Curry and Edwards 1998; Herraez et al. 2007). The most widely-recognized indicator of vertebrate stress, cortisol, normally takes hours to days to return to baseline levels following a significantly stressful event, but other hormones of the hypothalamic-pituitary-adrenal axis may persist for weeks.

Several studies have suggested that stress can adversely impact female reproduction through alterations in the estrus cycle (Herrenkohl and Politch 1979; Moberg 1991; Mourlon et al. 2011; Rivier and Rivest 1991). This is likely due to changes in sex steroids and growth hormone levels associated with the stress response (Sapolsky et al. 2000). Komesaroff et al. (1998) found that estrus may inhibit the stress response to some extent, although several studies suggest estrus and the follicular stage may be susceptible to stress-induced disruption (see Rivier (1991) and Moberg (1991) for reviews). Most of these studies were conducted with single or multiple invasive methodologies or chronic stress; we do not expect stressors associated with the proposed research to be nearly as stressful.

In sum, the common underlying stressor of a human disturbance caused by the activities that would occur under Permit No. 20455 may lead to a variety of different stress related responses. However, given the relatively short duration of the activities relative to sea turtle, Gulf sturgeon, and smalltooth sawfish life histories, we do not anticipate these responses to result in negative fitness consequences. In addition to possibly causing a stress related response, each activity is likely to produce unique responses as detailed further below.

8.4.1 Vessel Operations

Potential response of sea turtles to vessels, vessel noise and visual stimuli (vessels and shadows) include disturbance, and potentially startle responses, avoidances, or other behavioral reactions. Sea turtles are frequently exposed to research, ecotourism, commercial, government, and private vessel traffic. Some sea turtles may habituate to vessel noise, and may be more likely to respond to the sight of a vessel rather than the sound of a vessel, although both may play a role in prompting reactions (Hazel et al. 2007). Given their frequent exposure to vessels within the action area, and the fact that researchers would constantly be on the lookout for sea turtles in order to avoid any vessel-turtle interactions, we expect any behavioral reactions to be short-term in nature and not result in any impacts to fitness.

Gulf sturgeon and smalltooth sawfish may also exhibit behavioral responses to vessel noise and disturbance (Popper et al. 2014). Like sea turtles, these responses may include startle responses, avoidance behavior, or other indications of disturbance that may result in a stress response as described above. Because of the short-term and localized nature of Dr. Wells' vessel operations, any behavioral responses to vessels by Gulf sturgeon and smalltooth sawfish are expected to be temporary and not have a measurable effect on any individual's fitness. Popper et al. (2014) suggests that low frequency vessel noise (primarily from shipping traffic) may mask sounds of biological importance for fish. However, any potential masking would be temporary, as both the fish and vessel would be transiting the action area. Furthermore, both sturgeon and elasmobranchs, to which smalltooth sawfish belong, do not appear particularly sensitive to sound (Casper et al. 2012; Popper 2005).

Based on the above review, we expect ESA-listed turtles and fishes to respond to vessel operations by exhibiting no response or mild behavioral responses. We expect that any such responses would be short-term, with individuals resuming normal behavioral soon after the vessel or animal has moved further away. Given the short-term and behavioral nature of these responses, we do not expect there to be any meaningful effect to ESA-listed turtles and fishes, and as such, find the effects of vessel operations to be insignificant.

In addition to causing short-term behavioral responses in sea turtles, Gulf sturgeon, and smalltooth sawfish, it is possible that research vessels will strike individual sea turtles or ESA-listed fish. However, we are aware of no sea turtle or ESA-listed fish vessel strikes from decades of research permitted by the Permits Division. Furthermore, Dr. Wells' research team would be on constant lookout for marine animals at the surface, in all directions around the boat, as they search for dolphins. Given this, we find it highly unlikely that vessel strikes will occur, and thus, the risk of vessel strike is discountable. In conclusion, we find that ESA-listed sea turtles, Gulf sturgeon, and smalltooth sawfish in the action area are not likely to be adversely affected by vessel operations and we will not discuss effects from this activity further in this biological opinion.

8.4.2 Seine Net Captures

Capture and/or entanglement can cause a stress response in sea turtles (Gregory 1994; Gregory and Schmid 2001; Hoopes et al. 1998; Jessop et al. 2004; Jessop et al. 2003; Thomson and Heithaus 2014), sturgeon (Kahn and Mohead 2010; Lankford et al. 2005), and other fishes including smalltooth sawfish (Korte et al. 2005; Moberg 2000; Sapolsky et al. 2000). Although corticosterone does not appear to increase with entanglement time for green and Kemp's ridley turtles (Snoddy et al. 2009), we expect any incidental capture of a turtle or fish to be a stressful experience as indicated by severe metabolic and respiratory imbalances resulting from forced submergence (Gregory and Schmid 2001; Harms et al. 2003; Stabenau and Vietti 2003). We also expect behavioral responses (attempts to break loose of the netting via rapid swimming and biting) as well as physiological responses (release of stress hormones; Gregory et al. 1996; Gregory and Schmid 2001; Harms et al. 2003; Hoopes et al. 2000; Stabenau and Vietti 2003). While we expect captured/entangled individuals to be rapidly removed from the net, responses associated with subsequent stressors would likely continue. For example, handling has been shown to result in progressive changes in blood chemistry in Kemp's ridley turtles, indicating a continued stress response (Gregory and Schmid 2001; Hoopes et al. 2000). Encircling net captures may also entail a slightly greater risk of vessel-strike to sea turtles and fishes than described above. However, as these animals would be evading capture, they would generally be moving away from the vessel. In addition, trained spotters would be on the lookout for any non-targeted species that may be encircled in the net, and activities would be stopped if such a non-target animal were present.

Additional risk to sea turtles in entanglement nets results from forced submersion. Sea turtles forcibly submerged in any type of restrictive gear eventually suffer fatal consequences from prolonged anoxia and/or seawater infiltration of the lungs (Lutcavage et al. 1997). Trawl studies have found that no mortality or serious injury occurred in tows of 50 minutes or less, but these increased rapidly to 70 percent after 90 minutes (Epperly et al. 2002b; Henwood and Stuntz 1987). However, mortality has been observed in summer trawl tows as short as 15 minutes (Sasso and Epperly 2006). Metabolic changes that can impair a sea turtle's ability to function can occur within minutes of a forced submergence. Serious injury and mortality is likely due to acid-base imbalances resulting from accumulation of carbon dioxide and lactate in the bloodstream (Lutcavage et al. 1997); this imbalance can become apparent in captured, submerged sea turtles after a few minutes (Stabenau et al. 1991). Sea turtles entangled in nets exhibiting lethargy can die even with professional supportive care, possibly due to severe exertion resulting in muscle damage (Phillips et al. 2015). To minimize the time any incidentally capture turtle is submerged, researchers would inspect the net prior to attending to the captured marine mammal and release any incidentally caught animal. We do not expect any sea turtle to require extensive recovery, but the terms and conditions set forth in the proposed permit should mitigate sea turtles being released that have not recovered from forced submergence and/or the accumulation of other stressors that can cumulatively impair physiological function.

Another potential source of accidental mortality during capture, restraint, and handling, for air breathers turtles, is drowning in a net. However, as the target animals of these captures are obligate air breathers (marine mammals), nets would be specifically designed to prevent animals from drowning (light lead lines allow for entangled animals to reach the surface). Therefore, if a sea turtle becomes entangled in a net, death by drowning is unlikely to occur.

Smalltooth sawfish and sturgeon entangled in nets would likely experience stress in association with the event and some lacerations associated netting. However, they should be capable of continued respiration. If disentangled according to NOAA-approved protocols (NMFS 2009a), no further injury should occur. We expect incidental capture, handling, and restraint of sturgeon to cause short-term stress (Kahn and Mohead 2010). This can be exacerbated by less than ideal environmental conditions, such as relatively high water temperature (higher than 28 degrees Celsius), high salinity, or low dissolved oxygen, potentially resulting in mortality or failure to breed (Hastings et al. 1987; Jenkins et al. 1993; Kynard et al. 2007; Moser and Ross 1995; Niklitschek 2001; Niklitschek and Secor 2009; Secor and Niklitschek 2002; Secor and Gunderson 1998; Secor and Niklitschek 2001). We do not expect the additional stress associated with brief capture, handling, and restraint to result in more than short-term stress if the researchers follow guidelines outlined in Kahn and Mohead (2010) and best practice guidelines established by the Smalltooth Sawfish Recovery Team (NMFS 2009a).

For incidentally captured and released sea turtles, sturgeon, and sawfish, the duration of encounter is expected to be minutes not hours and most would be released without handling. Because of this, we expect ESA-listed sea turtles, sturgeon, and sawfish to experience only minor stress and to resume normal behavior quickly with no long-term adverse impacts to individuals encountered.

8.4.3 Acoustic Playbacks

As noted previously, ESA-listed turtles and fishes may be exposed to sounds of dolphin whistles during in water acoustic playback studies. However, we do not expect any response specifically associated with these studies since the sounds (frequencies and source levels) that would be used are those of dolphin whistles, which can already be heard in the environment from dolphins themselves. Furthermore, playback studies would be directed at dolphins and dolphins are likely to be vocalizing before, during, and after the playback studies. We find it extremely unlikely that any nearby sea turtles or ESA-listed fish would 1) be able to distinguish playback whistles from actual dolphin whistles and 2) exhibit any response beyond that which they would show to naturally occurring dolphin whistles in the environment. As such, we find that the effects of acoustic playbacks on ESA-listed turtles, Gulf sturgeon, and smalltooth sawfish are insignificant. In conclusion, we find that ESA-listed sea turtles, Gulf sturgeon, and smalltooth sawfish in the action area are not likely to be adversely affected by acoustic playbacks and we will not discuss effects from this activity further in this biological opinion.

8.5 Risk Analysis

In this section we assess the consequences of the responses to the individuals that have been exposed, the populations those individuals represent, and the species those populations comprise. Whereas the *Response Analysis* (Section 8.4) identified the potential responses of ESA-listed species to the proposed action, this section summarizes our analysis of the expected risk to individuals, populations, and species given the expected exposure to those stressors (as described in Section 8.3) and the expected responses to those stressors (as described in Section 8.4).

We measure risks to individuals of endangered or threatened species using changes in the individuals' "fitness," which may be indicated by changes the individual's growth, survival, annual reproductive success, and lifetime reproductive success. When we do not expect ESA-listed animals exposed to an action's effects to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise. As a result, if we conclude that ESA-listed animals are *not* likely to experience reductions in their fitness, we would conclude our assessment. If, however, we conclude that individual animals are likely to experience reductions in fitness, we would assess the consequences of those fitness reductions on the population(s) those individuals belong to.

As noted in the *Response Analysis*, none of the activities as proposed with the mitigation measures to minimize exposure and associated responses, are expected reduce the long-term fitness of any individual ESA-listed species. As such, the issuance of Permit No. 20455 is not expected to present any risk to populations, DPSs, or species listed under the ESA.

9 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 C.F.R. §402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

This section attempts to identify the likely future changes and their impact on ESA-listed and their critical habitats in the action area. This section is not meant to be a comprehensive socio-economic evaluation, but a brief outlook on future changes on the environment. Projections are based upon recognized organizations producing best-available information and reasonable rough-trend estimates of change stemming from these data. However, all changes are based upon projections that are subject to error and alteration by complex economic and social interactions. During this consultation, we searched for information on future state, tribal, local, or private (non-Federal) actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the *Environmental Baseline* (Section 7), which we expect will continue in the future. Anthropogenic effects include climate changes, fisheries interactions, vessel strikes, military activities, dredging and dams, interactions with power plants, oil and gas activities, habitat degradation, pollution, non-native species introductions, and scientific research, although some of these activities would involve a federal nexus and thus be subject to future ESA section 7 consultation. An increase in these activities could result in an increased effect on ESA-listed species; however, the magnitude and significance of any anticipated effects remain unknown at this time. The best scientific and commercial data available provide little specific information on any long-term effects of these potential sources of disturbance on ESA-listed species.

10 INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the *Effects of the Action* (Section 8) to the *Environmental Baseline* (Section 7) and the *Cumulative Effects* (Section 9) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the *Status of Endangered Species Act Protected Resources* (Section 6).

The following discussion summarize the probable risks the proposed action poses to threatened and endangered species that are likely to be exposed. This summary integrates the exposure profiles presented previously with the results of our response analyses for each of the actions considered in this biological opinion.

As discussed in Section 6, several ESA-listed species are likely to be adversely affected by the proposed action. We expect that an unspecified number of ESA-listed sea turtles, Gulf sturgeon, and smalltooth sawfish may be exposed to vessel operations and acoustic playbacks. However, we determined that these activities are not likely to adversely affect ESA-listed sea turtles, Gulf sturgeon, and smalltooth sawfish as their effects are either insignificant or discountable. Based on historic data from Dr. Wells and similar activities, we determined that on an annual basis a maximum of two ESA-listed turtles from any of the species found within the action area (green (North Atlantic DPS), hawksbill, Kemp's ridley, leatherback, loggerhead (Northwest Atlantic DPS), or olive ridley turtle), one Gulf sturgeon, and one smalltooth sawfish may be incidentally captured or become entangled in nets during dolphin seine net captures. We expect the responses to such incidental takes to consistent of short-term, low-low level behavioral and stress related responses, but not long-term adverse health impacts, or effects on fitness.

The status of each species, as described in Section 6, varies greatly. The North Atlantic DPS of green turtles is relatively large and appears to be increasing. Hawksbill turtles in the Atlantic appear to be doing better than elsewhere in the world with recent data showing population increases. However, this increase is not expected to continue and several nesting beaches have recently shown a decline. Kemp's ridley turtles are the most endangered of all sea turtles, and while their abundance has increased substantially since the 1980s, data from recent years indicate the population is in decline in some areas. Leatherback turtles in the Atlantic are doing much better than those in the Pacific, particularly in the Gulf of Mexico, where the population is thought to be increasing. A substantial portion of the Northwest Atlantic DPS of loggerhead turtles occurs within the action area, but their abundance appears to be in decline. While Olive ridely turtles are likely the most abundant sea turtles in the world, within the Gulf of Mexico they have shown substantial declines in recent decades. Gulf sturgeon river populations within the action area are relatively small, and most appear to be either stable or increasing in size. Finally, trend data indicate the abundance of smalltooth sawfish is stable, but their extremely small population size and low intrinsic rates of population growth make their recovery uncertain.

A variety of current and past anthropogenic threats impacts these ESA-listed species within the action area including climate changes, fisheries interactions, vessel strikes, military activities, dredging and dams, interactions with power plants, oil and gas activities, habitat degradation, pollution, non-native species introductions, and scientific research. All of these activities are expected to continue into the future, but the magnitude at which, and their future impacts on the survival and recovery of ESA-listed species is not reliably predictable.

Considering the activities to which the ESA-listed species within the action area are likely to be exposed, their potential responses to these activities, the status of each species, and the baseline anthropogenic threats they face, we determined that the issuance of research Permit No. 20455 will result in short-term, low-level behavioral and stress responses to individual animals incidentally captured in the nets. The effects to individuals are not likely to result in negative consequences to the fitness of any population, DPS or species of sea turtles, sturgeon, or sawfish.

11 Conclusion

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS’ biological opinion that the proposed action is not likely to jeopardize the continued existence or recovery of green (North Atlantic DPS), hawksbill, Kemp’s ridley, leatherback, loggerhead (Northwest Atlantic DPS), or olive ridley turtles (All other areas), or Gulf sturgeon, or smalltooth sawfish.

12 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is further defined as an act that “creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (NMFSPD 02-110-19). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

12.1 Amount or Extent of Take

Section 7 regulations require NMFS to specify the impact of any incidental take of endangered or threatened species; that is, the amount or extent, of such incidental taking on the species (50 CFR § 402.14(i)(1)(i)). The amount of take represents the number of individuals that are expected to be taken by actions while the extent of take or "the extent of land or marine area that may be affected by an action" may be used if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (51 FR 19953).

We expect that up to two ESA-listed sea turtles will be taken each year in the form of harassment during Dr. Wells dolphin seine net captures. In total these takes may be of any species or DPS within the action area including: green (North Atlantic DPS), hawksbill, Kemp's ridley, leatherback, loggerhead (Northwest Atlantic DPS), or olive ridley turtles (All other areas). Over the five years of the permitted activities, a total of 10 ESA-listed sea turtles of the species listed above may be taken in the form of harassment as the result of net entanglement or capture. No mortalities of ESA-listed sea turtles is anticipated or exempted from the prohibition on incidental take provided by this incidental take statement.

We expect that up to one Gulf sturgeon and one smalltooth sawfish will be taken each year in the form of harassment during Dr. Wells dolphin seine net captures, for a total of up to five Gulf sturgeon and five smalltooth sawfish over five years. No mortalities of Gulf sturgeon or smalltooth sawfish is anticipated or exempted from the prohibition on incidental take provided by this incidental take statement.

12.2 Effects of the Take

In this biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to ESA-listed species or destruction or adverse modification of designated critical habitat.

12.3 Reasonable and Prudent Measures

The measures described below are nondiscretionary, and must be undertaken by the Permits Division so that they become binding conditions for the exemption in section 7(o)(2) to apply. Section 7(b)(4) of the ESA requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA and the proposed action may incidentally take individuals of ESA-listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. To minimize such impacts, reasonable and prudent measures, and term and conditions to implement the measures, must be provided. Only incidental take resulting from the agency actions and any specified reasonable and prudent measures and terms and conditions identified in the incidental take statement are exempt from the taking prohibition of section 9(a), pursuant to section 7(o) of the ESA.

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 C.F.R. §402.02). NMFS believes the reasonable and prudent measures described below are necessary and appropriate to minimize the impacts of incidental take on threatened and endangered species:

1. The Permits Division must ensure that all possible measures are taken to minimize adverse effects from incidental capture or entanglement.
2. The Permits Division must monitor and report all incidental takes of ESA-listed species to the ESA Interagency Cooperation Division.

12.4 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the Permits Division must comply with the following terms and conditions that implement the Reasonable and Prudent Measure described above and outline the mitigation, monitoring, and reporting measures required by the section 7 regulations (50 CFR 402.14(i)). These terms and conditions are non-discretionary. If the researchers or Permits Division fail to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

The following terms and conditions implement reasonable and prudent measure 1:

1. The Permits Division must ensure that Dr. Wells educates all researchers involved in dolphins seine net captures on the potential non-target ESA-listed species that may be present in locations where seine net captures will take place.
2. The Permits Division must ensure that Dr. Wells educates all researchers involved in dolphins seine net captures on the mitigation measures detailed in Section 8.2 of this biological opinion (and further described in Permit No. 20455), and below in 4.
3. The Permits Division must ensure that all researchers working under Permit No. 20455 implement and monitor the effectiveness of the mitigation measures detailed in Section 8.2 of this biological opinion (and further described in Permit No. 20455), and below in 4.
4. Following any incidental capture or entanglement the Permits Division must ensure that researchers:
    a. Release animals as close as possible to the location where they were encountered, but outside of the netting activity area in order to reduce the potential of re-encountering the animal.
    b. Observe and document the animal's apparent ability to swim, dive, and behave in a normal manner prior to the release of sea turtles.

   c. Hold sturgeon and sawfish vertically and immersed in water, move individuals front to back to aid stimulation with freshwater passage over the gills, and observe and document signs of vigor and ability to swim prior to the release of sturgeon and sawfish.
   d. Observe and watch all species following release to ensure additional recovery is not needed.

The following terms and conditions implement reasonable and prudent measure 2:

1. The Permits Division must ensure that researchers document all interactions with ESA-listed species authorized in the incidental take statement, including any pertinent detail (species, type of interaction, location, date, size, water and air temperature, any obvious patterns and photos if possible).
2. The Permits Division must ensure that researchers immediately stop a particular activity, and the Permits Division must contact the Chief, NMFS ESA Interagency Cooperation Division at 301-427-8405 if authorized take is exceeded in any of the following ways:
   a. More ESA-listed animals are taken than are anticipated in the incidental take statement and exempted from the take prohibitions.
   b. ESA-listed animals are taken in a manner not authorized by this incidental take statement.
   c. ESA-listed species other than those exempted from the take prohibitions by this incidental take statement are taken.
3. The Permits Division shall report the annual number of incidental takes of each ESA-listed species that occurs under this incidental take statement. The annual report from the Permits Division is due by September 30 for each year the permit is valid, unless otherwise delayed by the submission of Dr. Wells' annual report (due August 31 each year). Reports must be submitted to the Chief, ESA Interagency Coordination Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Silver Spring, MD 20910.

13 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans or develop information (50 C.F.R. §402.02).

We make the following conservation recommendations:

1. The Permits Division should attempt to coordinate the efforts of Dr. Wells, the MMHSRP, and any other researchers permitted to capture marine mammals using seine nets to the maximum extent practical in order to minimize incidental take of ESA-listed sea turtles and fishes. Such coordination should involve information sharing among researchers on previous incidents of incidental captures, methods used to reduce and avoid incidental capture, and planned capture activities such that the total number of seine nets deployed is minimized.

2. The Permits Division should consider permitting sea turtle, sturgeon, and sawfish researchers (or allowing those already permitted) to take samples and data from animals incidentally captured during marine mammal seine net operations in order to maximize data collection for the recovery of these species, and minimize the total number of ESA-listed sea turtles and fishes that are captured across researchers.

In order for NMFS' Office of Protected Resources Endangered Species Act Interagency Cooperation Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their critical habitat, the Permits Division should notify the Endangered Species Act Interagency Cooperation Division of any conservation recommendations they implement in their final action.

14 Reinitiation Notice

This concludes formal consultation for the Permits Division's proposal to issuance Permit No. 20455. As 50 C.F.R. §402.16 states, 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 agency action that may affect ESA-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 ESA-listed species or designated critical habitat that was not considered in this biological opinion.

(4) A new species is listed or critical habitat designated under the ESA that may be affected by the action.

15 REFERENCES

Abele, L. G., and W. Kim. 1986. An illustrated guide to the marine decapod crustaceans of Florida. State of Florida, Department of Environmental Regulation 8(1).

Acevedo-Whitehouse, K., and A. L. J. Duffus. 2009. Effects of environmental change on wildlife health. Philosophical Transactions of the Royal Society of London B Biological Sciences 364(1534):3429-3438.

Ackerman, R. A. 1980. Physiological and ecological aspects of gas exchange by sea turtle eggs. American Zoologist 20(3):575-583.

Aguilera, G., and C. Rabadan-Diehl. 2000. Vasopressinergic regulation of the hypothalamic-pituitary-adrenal axis: Implications for stress adaptation. Regulatory Peptides 2296(1-2):23-29.

Aguirre, A. A., G. H. Balazs, B. Zimmerman, and F. D. Galey. 1994. Organic contaminants and trace metals in the tissues of green turtles (*Chelonia mydas*) afflicted with fibropapillomas in the Hawaiian Islands. Marine Pollution Bulletin 28(2):109-114.

Alam, S. K., M. S. Brim, G. A. Carmody, and F. M. Parauka. 2000. Concentrations of heavy and trace metals in muscle and blood of juvenile gulf sturgeon (*Acipenser oxyrinchus desotoi*) from the Suwannee River, Florida. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances and Environmental Engineering (5):645-660.

Asper, E. D. 1975. Techniques of live capture of smaller Cetacea. Journal of the Fisheries Research Board of Canada 32(7):1191-1196.

ASSRT. 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Regional Office, Atlantic Sturgeon Status Review Team.

Atkinson, S., D. Crocker, D. Houser, and K. Mashburn. 2015. Stress physiology in marine mammals: How well do they fit the terrestrial model? Journal of Comparative Physiology B Biochemical, Systemic and Environmental Physiology 185(5):463-486.

Avens, L., J. C. Taylor, L. R. Goshe, T. T. Jones, and M. Hastings. 2009. Use of skeletochronological analysis to estimate the age of leatherback sea turtles *Dermochelys coriacea* in the western North Atlantic. Endangered Species Research 8(3):165-177.

Bagley, D. A., W. E. Redfoot, and L. M. Ehrhart. 2013. Marine turtle nesting at the Archie Carr NWR: Are loggerheads making a comeback? Pages 167 *in* T. Tucker, and coeditors, editors. Thirty-Third Annual Symposium on Sea Turtle Biology and Conservation. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Baltimore, Maryland.

Barnosky, A. D., and coauthors. 2012. Approaching a state shift in Earth's biosphere. Nature 486(7401):52-58.

Barton, B. A. 2002. Stress in fishes: A diversity of responses with particular reference to changes in circulating corticosteroids. Integrative and Comparative Biology 42(3):517-525.

Baughman, J. L. 1943. Notes on Sawfish, Pristis perotteti Müller and Henle, Not Previously Reported from the Waters of the United States. Copeia 1943(1):43-48.

Baulch, S., and M. P. Simmonds. 2015. An update on research into marine debris and cetaceans. IWC Scientific Committee, San Diego, California.

Bayunova, L., I. Barannikova, and T. Semenkova. 2002. Sturgeon stress reactions in aquaculture. Journal of Applied Ichthyology 18(4-6):397-404.

Belovsky, G. E. 1987. Extinction models and mammalian persistence. Pages 35-57 *in* M. E. Soulé, editor. Viable Populations for Conservation. Cambridge University Press.

Benson, S. R., and coauthors. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles,Dermochelys coriacea. Ecosphere 2(7):art84.

Berg, J. 2006. A review of contaminant impacts on the Gulf of Mexico sturgeon, *Acipenser oxyrinchus desotoi*. U.S. Fish and Wildlife Service, Panama City, Florida.

Bigalow, H. B., and W. C. Schroeder. 1953. Fishes of the western North Atlantic, Part 2- Sawfishes, Guitarfishes, Skates and Rays. Sears Foundation for Marine Research 1:588pp.

Bjorndal, K. A., and A. B. Bolten. 2010. Hawksbill sea turtles in seagrass pastures: success in a peripheral habitat. Marine Biology 157:135-145.

Bjorndal, K. A., A. B. Bolten, and M. Y. Chaloupka. 2005. Evaluating trends in abundance of immature green turtles, *Chelonia mydas*, in the greater Caribbean. Ecological Applications 15(1):304-314.

Blunden, J., and D. S. Arndt. 2014. State of climate in 2013. Bulletin of the American Meteorological Society 95(7):S1-S257.

Blunden, J., and D. S. Arndt. 2016. State of the Climate in 2015. Bulletin of the American Meteorological Society 97(8):1-300.

Boreman, J. 1997. Sensitivity of North American sturgeons and paddlefish to fishing mortality. Environmental Biology of Fishes 48(1):399-405.

Bugoni, L., L. Krause, and M. V. Petry. 2001. Marine debris and human impacts on sea turtles in southern Brazil. Marine Pollution Bulletin 42(12):1330-1334.

Busch, D. S., and L. S. Hayward. 2009. Stress in a conservation context: A discussion of glucocorticoid actions and how levels change with conservation-relevant variables. Biological Conservation 142(12):2844-2853.

Caldwell, S. 1990. Texas sawfish: Which way did they go? Tide Jan.-Feb.:16-19.

Cannon, A. C., and J. P. Flanagan. 1996. Trauma and treatment of Kemp's ridley sea turtles caught on hook-and-line by recreational fisherman. Sea Turtles Biology and Conservation Workshop.

Carlson, J. K., and J. Osborne. 2012. Relative abundance of smalltooth sawfish (Pristis pectinata) based on the Everglades National Park Creel Survey. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center.

Carlson, J. K., J. Osborne, and T. W. Schmidt. 2007. Monitoring the recovery of smalltooth sawfish, Pristis pectinata, using standardized relative indices of abundance. Biological Conservation 136(2):195-202.

Carlson, J. K., and C. A. Simpfendorfer. 2015. Recovery potential of smalltooth sawfish, Pristis pectinata, in the United States determined using population viability models. Aquatic Conservation: Marine and Freshwater Ecosystems 25(2):187-200.

Carr, A. 1983. All the way down upon the Suwannee River. Audubon 85:78-101.

Carr, S. H., F. Tatman, and F. A. Chapman. 1996. Observations on the natural history of the Gulf of Mexico sturgeon (*Acipenser oxyrinchus desotoi*, Vladykov 1955) in the Suwannee River, southeastern United States. Ecology of Freshwater Fish 5(4):169-174.

Casper, B. M., M. B. Halvorsen, and A. N. Popper. 2012. Are sharks even bothered by a noisy environment? Adv Exp Med Biol 730:93-7.

Caut, S., E. Guirlet, and M. Girondot. 2009. Effect of tidal overwash on the embryonic development of leatherback turtles in French Guiana. Marine Environmental Research 69(4):254-261.

Chaloupka, M., and coauthors. 2008. Encouraging outlook for recovery of a once severely exploited marine megaherbivore. Global Ecology and Biogeography 17(2):297-304.

Chapman, D. D., and coauthors. 2011. Genetic diversity despite population collapse in a critically endangered marine fish: the smalltooth sawfish (*Pristis pectinata*). Journal of Heredity 102(6):643-652.

Chapman, F., and S. Carr. 1995. Implications of early life stages in the natural history of the Gulf of Mexico sturgeon, *Acipenser oxyrinchus desotoi*. Environmental Biology of Fishes 43(4):407-413.

Chytalo, K. 1996. Summary of Long Island Sound dredging windows strategy workshop. Management of Atlantic Coastal Marine Fish Habitat: Proceedings of a workshop for habitat managers. ASMFC Habitat Management Series #2.

Clarke, D., C. Dickerson, and K. J. Reine. 2003. Characterization of underwater sounds produced by dredges. Third Specialty Conference on Dredging and Dredged Material Disposal, Orlando, Florida.

Clugston, J. O., A. M. Foster, and S. H. Carr. 1995. Gulf sturgeon (*Acipenser oxyrinchus desotoi*) in the Suwannee River, Florida, USA. Pages 212-224 *in* A. D. Gershanovich, and T. I. J. Smith, editors. Proceedings of the International Symposium on Sturgeons. VNIRO Publishing, Moscow.

Colborn, T., D. Dumanoski, and J. P. Myers. 1996. Our stolen future: are we threatening our fertility, intelligence, and survival? A scientific detective story. Dutton Publishing, New York, New York.

Conant, T. A., and coauthors. 2009. Loggerhead sea turtle (*Caretta caretta*) 2009 status review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service August 2009:222 pages.

Corsolini, S., S. Aurigi, and S. Focardi. 2000. Presence of polychlorobiphenyls (PCBs) and coplanar congeners in the tissues of the Mediterranean loggerhead turtle *Caretta caretta*. Marine Pollution Bulletin 40(11):952-960.

Cowan, D. E., and B. E. Curry. 2008. Histopathology of the alarm reaction in small odontocetes. Journal of Comparative Pathology 139(1):24-33.

Cowan, D. F., and B. E. Curry. 2002. Histopathological assessment of dolphins necropsied onboard vessels in the eastern tropical Pacific tuna fishery. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Craft, N. M., B. Russell, and S. Travis. 2001. Identification of Gulf sturgeon spawning habitats and migratory patterns in the Yellow and Escambia River systems. Final Report to the Florida Marine Research Institute, Fish and Wildlife Conservation Commission. Northwest Florida Aquatic and Buffer Preserves, Florida Department of Environmental Protection; Apalachicola National Estuarine Research Reserve.

Craig, J. K., and coauthors. 2001. Ecological effects of hypoxia on fish, sea turtles & marine mammals in the northwestern Gulf of Mexico. Coastal and Estuarine Studies 58:269-291.

Curry, B. E., and E. F. Edwards. 1998. Investigation of the potential influence of fishery-induced stress on dolphins in the eastern tropical Pacific Ocean: Research planning. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Dahl, T. E., and C. E. Johnson. 1991. Status and trends of wetlands in the conterminous United States, mid-1970s to mid-1980s. U.S. Fish and Wildlife Service, Washington, D.C.

Desantis, L. M., B. Delehanty, J. T. Weir, and R. Boonstra. 2013. Mediating free glucocorticoid levels in the blood of vertebrates: Are corticosteroid-binding proteins always necessary? Functional Ecology 27:107-119.

Dickerson, D., and coauthors. 2007. Effectiveness of relocation trawling during dredging for reducing inciodental take of sea turtles. Pages 509-530 *in* R. E. Randell, editor 2007 World Dredging Congress, Lake Buena Vista, Florida.

Dierauf, L., and M. Gulland. 2001. Marine mammal unusual mortality events. Pages 69-81 *in* CRC Handbook of Marine Mammal Medicine. CRC Press.

Doney, S. C. 2010. The growing human footprint on coastal and open-ocean biogeochemistry. Science 328(5985):1512-1516.

Duronslet, M. J., and coauthors. 1986. The effects of an underwater explosion on the sea turtles *Lepidochelys kempii* and *Caretta caretta* with observations of effects on other marine organisms. National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Dutton, P. H., B. W. Bowen, D. W. Owens, A. Barragan, and S. K. Davis. 1999. Global phylogeography of the leatherback turtle (*Dermochelys coriacea*). Journal of Zoology 248:397-409.

Dutton, P. H., V. Pease, and D. Shaver. 2006. Characterization of mtDNA variation among Kemp's ridleys nesting on Padre Island with reference to Rancho Nuevo genetic stock. Pages 189 *in* Twenty-Sixth Annual Conference on Sea Turtle Conservation and Biology.

Eckert, K., B. Wallace, J. Frazier, S. Eckert, and P. Pritchard. 2012. Synopsis of the biological data on the leatherback sea turtle (Dermochelys coriacea). .172.

Edwards, R. E., F. M. Parauka, and K. J. Sulak. 2007. New insights into marine migration and winter habitat of Gulf sturgeon. American Fisheries Society Symposium 57:14.

Edwards, R. E., K. J. Sulak, M. T. Randall, and C. B. Grimes. 2003. Movements of Gulf sturgeon (*Acipenser oxyrinchus desotoi*) in nearshore habitat as determined by acoustic telemetry. Gulf of Mexico Science 21:59-70.

Ehrhart, L. M., D. A. Bagley, and W. E. Redfoot. 2003. Loggerhead turtles in the Atlantic Ocean: Geographic distribution, abundance, and population status. Pages 157-174 *in* A. B. Bolten, and B. E. Witherington, editors. Loggerhead Sea Turtles. Smithsonian Institution Press, Washington, D. C.

EPA. 2012. Climate Change. www.epa.gov/climatechange/index.html.

Epperly, S., and coauthors. 2002a. Analysis of sea turtle bycatch in the commercial shrimp fisheries of southeast U.S. waters and the Gulf of Mexico. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center.

Epperly, S., and coauthors. 2002b. Analysis of sea turtle bycatch in the commercial shrimp fisheries of southeast U.S. waters and the Gulf of Mexico. U.S. Department of Commerce NMFS-SEFSC-490.

Evermann, B. W., and B. A. Bean. 1898. Indian River and its fishes.

FFWCC. 2006. Long-term monitoring program reveals a decline in Florida loggerhead sea turtle nesting Florida Fish and Wildlife Conservation Commission.

FFWCC. 2007. Florida statewide nesting beach survey data–2005 season. Florida Fish and Wildlife Conservation Commission.

FFWCC. 2016. Index nesting beach survey totals (1989-2016). Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Foley, A. M., B. A. Schroeder, A. E. Redlow, K. J. Fick-Child, and W. G. Teas. 2005. Fibropapillomatosis in stranded green turtles (Chelonia mydas) from the eastern United States (1980-98): Trends and associations with environmental factors. Journal of Wildlife Diseases 41(1):29-41.

Foster, A. M., and J. P. Clugston. 1997. Seasonal Migration of Gulf Sturgeon in the Suwannee River, Florida. Transactions of the American Fisheries Society 126(2):302-308.

Fox, D. A., and J. E. Hightower. 1998. Gulf sturgeon estuarine and nearshore marine habitat use in Choctawhatchee Bay, Florida. Annual Report for 1998 to the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Panama City, Florida:29 pp.

Fox, D. A., J. E. Hightower, and F. M. Parauka. 2000. Gulf sturgeon spawning migration and habitat in the Choctawhatchee River system, Alabama-Florida. Transactions of the American Fisheries Society 129(3):811-826.

Fox, D. A., J. E. Hightower, and F. M. Parauka. 2002. Estuarine and Nearshore Marine Habitat Use by Gulf Sturgeon from the Choctawhatchee River System, Florida. Pages 19-34 *in* American Fisheries Society Symposium. American Fisheries Society.

Fuchs, B. 2017. National Drought Summary – May 2, 2017. National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration, Lincolin, Nebraska.

Fuentes, M. M. P. B., M. Hamann, and C. J. Limpus. 2010. Past, current and future thermal profiles of green turtle nesting grounds: Implications from climate change. Journal of Experimental Marine Biology and Ecology 383:56-64.

Fuentes, M. M. P. B., C. J. Limpus, and M. Hamann. 2011. Vulnerability of sea turtle nesting grounds to climate change. Global Change Biology 17:140-153.

Fuentes, M. M. P. B., and coauthors. 2009. Proxy indicators of sand temperature help project impacts of global warming on sea turtles in northern Australia. Endangered Species Research 9:33-40.

Gago, P. T., and coauthors. 2012. Establishment of arribada censusing methodology at olive ridley (*Lepidochelys olivacea*) Nicaraguan rookeries. Pages 219 *in* T. T. Jones, and B. P. Wallace, editors. Thirty-First Annual Symposium on Sea Turtle Biology and Conservation. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, San Diego, California.

Garbarino, J. R., and coauthors. 1995. Heavy metals in the Mississippi River.

Gilman, E. L., J. Ellison, N. C. Duke, and C. Field. 2008. Threats to mangroves from climate change and adaptation options: A review. Aquatic Botany 89(2):237-250.

Gilmore, G. R. 1995. Environmental and Biogeographic Factors Influencing Ichthyofaunal Diversity: Indian River Lagoon. Bulletin of Marine Science 57(1):153-170.

Gitschlag, G. R., and B. A. Herczeg. 1994. Sea turtle observations at explosive removals of energy structures. Marine Fisheries Review 56(2):1-8.

Gitschlag, G. R., B. A. Herczeg, and T. R. Barcak. 1997. Observations of sea turtles and other marine life at the explosive removal of offshore oil and gas structures in the Gulf of Mexico. Gulf Research Reports 9(4):247-262.

Greer, A. W. 2008. Trade-offs and benefits: Implications of promoting a strong immunity to gastrointestinal parasites in sheep. Parasite Immunology 30(2):123-132.

Gregory, L. F. 1994. Capture stress in the loggerhead sea turtle (*Caretta caretta*). University of Florida, Gainesville.

Gregory, L. F., T. S. Gross, A. Bolten, K. Bjorndal, and L. J. Guillette. 1996. Plasma corticosterone concentrations associated with acute captivity stress in wild loggerhead sea turtles (*Caretta caretta*). General and Comparative Endocrinology 104:312-320.

Gregory, L. F., and J. R. Schmid. 2001. Stress responses and sexing of wild Kemp's ridley sea turtles (*Lepidochelys kempii*) in the northwestern Gulf of Mexico. General and Comparative Endocrinology 124:66-74.

Groombridge, B. 1982. Kemp's Ridley or Atlantic Ridley, *Lepidochelys kempii* (Garman 1880). Pages 201-208 *in* The IUCN Amphibia, Reptilia Red Data Book.

Gu, B., D. M. Schell, T. Frazer, M. Hoyer, and F. A. Chapman. 2001. Stable Carbon Isotope Evidence for Reduced Feeding of Gulf of Mexico Sturgeon during Their Prolonged River Residence Period. Estuarine, Coastal and Shelf Science 53(3):275-280.

Gulko, D., and K. L. Eckert. 2003. Sea Turtles: An Ecological Guide. Mutual Publishing, Honolulu, Hawaii.

Guyton, A. C., and J. E. Hall. 2000. Textbook of Medical Physiology, 10th edition. W.B. Saunders Company, Phildelphia, Pennsylvania.

Harms, C. A., K. M. Mallo, P. M. Ross, and A. Segars. 2003. Venous blood gases and lactates of wild loggerhead sea turtles (Caretta caretta) following two capture techniques. Journal of Wildlife Diseases 39(2):366-374.

Hastings, R. W., J. C. O'Herron II, K. Schick, and M. A. Lazzari. 1987. Occurrence and distribution of shortnose sturgeon, *Acipenser brevirostrum*, in the upper tidal Delaware River. Estuaries 10(4):337-341.

Hawkes, L. A., A. C. Broderick, H. Godfrey, B. Godley, and M. J. Witt. 2014. The impacts of climate change on marine turtle reproductoin success. Pages 287-310 *in* B. Maslo, and L. Lockwood, editors. Coastal Conservation. Cambridge University Press, Cambridge.

Hays, G. C. 2000. The implications of variable remigration intervals for the assessment of population size in marine turtles. J Theor Biol 206(2):221-7.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. 2007. Vessel speed increases collision risk for the green turtle *Chelonia mydas*. Endangered Species Research 3:105-113.

Heise, R. J., S. T. Ross, M. F. Cashner, and W. T. Slack. 1999. Movement and habitat use for the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) in the Pascagoula drainage of Mississippi: Year III, Museum Technical Report No. 74. U.S. Fish and Wildlife Service.

Henwood, T. A., and W. E. Stuntz. 1987. Analysis of sea turtle captures and mortalities during commercial shrimp trawling. Fishery Bulletin 85:813-817.

Heppell, S. S., and coauthors. 2005. A population model to estimate recovery time, population size, and management impacts on Kemp's ridley sea turtles. Chelonian Conservation and Biology 4(4):767-773.

Herraez, P., and coauthors. 2007. Rhabdomyolysis and myoglobinuric nephrosis (capture myopathy) in a striped dolphin. Journal of Wildlife Diseases 43(4):770-774.

Herrenkohl, L. R., and J. A. Politch. 1979. Effects of prenatal stress on the estrous cycle of female offspring as adults. Experientia 34:1240.

Heupel, M. R., J. K. Carlson, and C. A. Simpfendorfer. 2007. Shark nursery areas: concepts, definition, characterization and assumptions. Marine Ecology Progress Series 337:287-297.

Hightower, J. E., K. P. Zehfuss, D. A. Fox, and F. M. Parauka. 2002. Summer habitat use by Gulf sturgeon in the Choctawhatchee River, Florida. Journal of Applied Ichthyology 18:595-600.

Hildebrand, H. H. 1963. Hallazgo del area de anidacion de la tortuga marina "lora", *Lepidochelys kempi* (Garman), en la costa occidental del Golfo de Mexico (Rept., Chel.). Ciencia, Mexico 22:105-112.

Hill, J. E., F. V. Paladino, J. R. Spotila, and P. S. Tomillo. 2015. Shading and watering as a tool to mitigate the impacts of climate change in sea turtle nests. PLoS One 10(6):e0129528.

Hoopes, L. A., A. M. J. Landry, and E. K. Stabenau. 2000. Physiological effects of capturing Kemp's ridley sea turtles, *Lepidochelys kempii*, in entanglement nets. Canadian Journal of Zoology 78:1941-1947.

Hoopes, L. A., A. M. Landry Jr., and E. K. Stabenau. 1998. Preliminary assessment of stress and recovery in Kemp's ridleys captured by entanglement netting. Pages 201 *in* S. P. Epperly, and J. Braun, editors. Seventeenth Annual Sea Turtle Symposium.

Horrocks, J. A., and coauthors. 2001. Migration routes and destination characteristics of post-nesting hawksbill turtles satellite-tracked from Barbados, West Indies. Chelonian Conservation and Biology 4(1):107-114.

Huerta, P., and coauthors. 2000. First confirmed case of fibropapilloma in a leatherback turtle (*Dermochelys coriacea*). Pages 193 *in* A. Mosier, A. Foley, and B. Brost, editors. Proceedings of the 20th Annual Symposium on Sea Turtle Biology and Conservation. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SESFC-477.

Huff, J. A. 1975. Life history of Gulf of Mexico sturgeon, *Acipenser oxrhynchus desotoi*, in Suwannee River, Florida. Florida Department of Natural Resources, Marine Research Laboratory.

Illingworth Rodkin Inc. 2004. Conoco/Phillips 24-inch steel pile installation – Results of underwater sound measurements. Conoco, Phillips Company.

IPCC. 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland.

IPCC. 2008. Climate Change and Water, Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp.

IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)], Geneva, Switzerland.

Isaac, J. L. 2009. Effects of climate change on life history: Implications for extinction risk in mammals. Endangered Species Research 7(2):115-123.

James, M. C., R. A. Myers, and C. A. Ottensmeyer. 2005. Behaviour of leatherback sea turtles, *Dermochelys coriacea*, during the migratory cycle. Proceedings of the Royal Society Biological Sciences Series B 272(1572):1547-1555.

Jenkins, W. E., T. I. J. Smith, L. D. Heyward, and D. M. Knott. 1993. Tolerance of shortnose sturgeon, *Acipenser brevirostrum*, juveniles to different salinity and dissolved oxygen concentrations. Pages 476-484 *in* Annual Conference of the Southeastern Association of Fish and Wildlife Agencies.

Jessop, T. S., J. M. Sumner, C. J. Limpus, and J. M. Whittier. 2004. Interplay between plasma hormone profiles, sex and body condition in immature hawksbill turtles (*Eretmochelys imbricata*) subjected to a capture stress protocol. Comparative Biochemistry and Physiology A Molecular and Integrative Physiology 137(1):197-204.

Jessop, T. S., A. D. Tucker, C. J. Limpus, and J. M. Whittier. 2003. Interactions between ecology, demography, capture stress, and profiles of corticosterone and glucose in a free-living population of Australian freshwater crocodiles. General and Comparative Endocrinology 132(1):161-170.

Kahn, J., and M. Mohead. 2010. A protocol for use of shortnose, Atlantic, gulf, and green sturgeons. National Marine Fisheries Service.

Klima, E. F., G. R. Gitschlag, and M. L. Renaud. 1988. Impacts of the explosive removal of offshore petroleum platforms on sea turtles and dolphins. Marine Fisheries Review 50(3):33-42.

Komesaroff, P. A., M. Esler, I. J. Clarke, M. J. Fullerton, and J. W. Funder. 1998. Effects of estrogen and estrous cycle on glucocorticoid and catecholamine responses to stress in sheep. American Journal of Physiology - Endocrinology and Metabolism 275(4):E671-E678.

Korte, S. M., J. M. Koolhaas, J. C. Wingfield, and B. S. McEwen. 2005. The Darwinian concept of stress: Benefits of allostasis and costs of allostatic load and the trade-offs in health and disease. Neuroscience and Biobehavioral Reviews 29:3-38.

Kynard, B., M. Breece, M. Atcheson, M. Kieffer, and M. Mangold. 2007. Status of shortnose sturgeon in the Potomac River: Part I -- field studies. National Park Service, E 2002-7, Washington, D. C.

Laist, D. W., J. M. Coe, and K. J. O'Hara. 1999. Marine debris pollution. Pages 342-366 *in* J. R. Twiss Jr., and R. R. Reeves, editors. Conservation and Management of Marine Mammals. Smithsonian Institution Press, Washington, D.C.

Lamont, M. M., I. Fujisaki, and R. R. Carthy. 2014. Estimates of vital rates for a declining loggerhead turtle (Caretta caretta) subpopulation: implications for management. Marine Biology 161(11):2659-2668.

Lankford, S. E., T. E. Adams, R. A. Miller, and J. J. Cech Jr. 2005. The cost of chronic stress: Impacts of a nonhabituating stress response on metabolic variables and swimming performance in sturgeon. Physiological and Biochemical Zoology 78:599-609.

Law, R. J., and coauthors. 1991. Concentrations of trace metals in the livers of marine mammals (seals, porpoises and dolphins) from waters around the British Isles. Marine Pollution Bulletin 22(4):183-191.

Lazar, B., and R. Gračan. 2011. Ingestion of marine debris by loggerhead sea turtles, *Caretta caretta*, in the Adriatic Sea. Marine Pollution Bulletin 62(1):43-47.

Leroux, R. A., and coauthors. 2012. Re-examination of population structure and phylogeography of hawksbill turtles in the wider Caribbean using longer mtDNA sequences. Journal of Heredity 103(6):806-820.

Loughlin, T., L. Cunningham, N. J. Gales, R. Wells, and I. L. Boyd. 2010. Marking and capturing. Pages 16-41 *in* I. L. Boyd, W. D. Bowen, and S. J. Iverson, editors. Marine Mammal Ecology and Conservation: A Handbook of Techniques. Oxford University Press.

Louisiana Universities Marine Consortium. 2015. Press Release Gulf of Mexico Dead Zone. Louisiana Universities Marine Consortium.

LUMCON. 2005. Mapping of dead zone completed. Louisiana Universities Marine Consortium, Chauvin, Louisiana.

Lutcavage, M. E., P. Plotkin, B. Witherington, and P. L. Lutz. 1997. Human impacts on sea turtle survival. Pages 387-409 *in* The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

Mann, T. M. 1978. Impact of developed coastline on nesting and hatchling sea turtles in southeastern Florida. Master's Thesis, Florida Marine Research Publications.

Márquez, M. R., A. Villanueva, and P. M. Burchfield. 1989. Nesting population, and production of hatchlings of Kemp's ridley sea turtle at Rancho Nuevo, Tamaulipas, Mexico. Pages 16-19 *in* C. W. C. Jr., and A. M. L. Jr., editors. First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation, and Management.

Mason, W. T., and J. P. Clugston. 1993. Foods of the gulf sturgeon in the Suwannee River, Florida. Transactions of the American Fisheries Society 122(3):378-385.

Masuda, A. 2010. Natal Origin of Juvenile Loggerhead Turtles from Foraging Ground in Nicaragua and Panama Estimated Using Mitochondria DNA.

Mazaris, A. D., A. S. Kallimanis, S. P. Sgardelis, and J. D. Pantis. 2008. Do long-term changes in sea surface temperature at the breeding areas affect the breeding dates and reproduction performance of Mediterranean loggerhead turtles? Implications for climate change. Journal of Experimental Marine Biology and Ecology 367:219-226.

Mazaris, A. D., G. Matsinos, and J. D. Pantis. 2009. Evaluating the impacts of coastal squeeze on sea turtle nesting. Ocean and Coastal Management 52(2):139-145.

McCauley, S., and K. Bjorndal. 1999. Conservation implications of dietary dilution from debris ingestion: Sublethal effects in post-hatchling loggerhead sea turtles. Conservation Biology 13(4):925-929.

McClellan, C. M., J. Braun-McNeill, L. Avens, B. P. Wallace, and A. J. Read. 2010. Stable isotopes confirm a foraging dichotomy in juvenile loggerhead sea turtles. Journal of Experimental Marine Biology and Ecology 387:44-51.

McConnachie, S. H., and coauthors. 2012. Consequences of acute stress and cortisol manipulation on the physiology, behavior, and reproductive outcome of female Pacific salmon on spawning grounds. Hormones and Behavior 62(1):67-76.

McKenzie, C., B. J. Godley, R. W. Furness, and D. E. Wells. 1999. Concentrations and patterns of organochlorine contaminants in marine turtles from Mediterranean and Atlantic waters. Marine Environmental Research 47:117-135.

Meehl, G. A., and coauthors. 2007. Global climate projections. Pages 747-846 *in* S. Solomon, and coeditors, editors. Climate Change 2007: The Physical Science Basis. Cambridge University Press, Cambridge, UK and New York, NY.

Menzel, R. W. 1971. Checklist of the marine fauna and flora of the Apalachee Bay and the St. George Sound area. Third Edition. Department of Oceanography, Florida State University, Tallahassee, FL.

Miller, J. D., K. A. Dobbs, C. J. Limpus, N. Mattocks, and A. M. Landry. 1998. Long-distance migrations by the hawksbill turtle, Eretmochelys imbricata, from north-eastern Australian. Wildlife Research 25:89-95.

MMS. 1998. Gulf of Mexico OCS oil and gas lease sales 171, 174, 177, and 180, Western Planning Area, Final Environmental Impact Statement. U.S. Department of the Interior, Minerals Management Service.

MMS. 2007. Eastern Gulf of Mexico OCS oil and gas lease sale 224. U.S. Department of the Interior, Minerals Management Service.

Moberg, G. P. 1991. How behavioral stress disrupts the endocrine control of reproduction in domestic animals. Journal of Dairy Science 74:304-311.

Moberg, G. P. 2000. Biological response to stress: Implications for animal welfare. Pages 1-21 *in* G. P. Moberg, and J. A. Mench, editors. The Biology of Animal Stress. Oxford University Press, Oxford, United Kingdom.

Monzon-Arguello, C., C. Rico, A. Marco, P. Lopez, and L. F. Lopez-Jurado. 2010. Genetic characterization of eastern Atlantic hawksbill turtles at a foraging group indicates major undiscovered nesting populations in the region. Journal of Experimental Marine Biology and Ecology in press(in press):in press.

Morrow, J. V., J. P. Kirk, K. J. Killgore, H. Rogillio, and C. Knight. 1998. Status and Recovery Potential of Gulf Sturgeon in the Pearl River System, Louisiana–Mississippi. North American Journal of Fisheries Management 18(4):798-808.

Mortimer, J. A. 1990. The influence of beach sand characteristics on the nesting behavior and clutch survival of green turtles (*Chelonia mydas*). Copeia 1990(3):802-817.

Moser, M. L., and S. W. Ross. 1995. Habitat use and movements of shortnose and Atlantic sturgeons in the lower Cape Fear River, North Carolina. Transactions of the American Fisheries Society 124(2):225.

Mourlon, V., L. Naudon, B. Giros, M. Crumeyrolle-Arias, and V. Daugé. 2011. Early stress leads to effects on estrous cycle and differential responses to stress. Physiology & Behavior 102:304-310.

Musick, J. A., and C. J. Limpus. 1997. Habitat utilization, and migration in juvenile sea turtles. Pages 137-163 *in* P. L. Lutz, and J. A. Musick, editors. The biology of sea turtles. CRC Press, Boca Raton, Florida.

Muyskens, J., D. Keating, and S. Granados. 2015. Mapping how the United States generates its electricity. The Washington Post, Washington, D.C.

Nedwell, J., and B. Edwards. 2002. Measurement of underwater noise in the Arun River during piling at county wharf, Littlehampton. Subacoustech Ltd, Southampton, UK.

Niklitschek, E. J. 2001. Bioenergetics Modeling and Assessment of Suitable Habitat for Juvenlie Atlantic and Shortnose Sturgeons (*Acipenser oxyrinchus* and *A. brevirostrum*) in the Chesapeake Bay. University of Maryland at College Park.

Niklitschek, E. J., and D. H. Secor. 2005. Modeling spatial and temporal variation of suitable nursery habitats for Atlantic sturgeon in the Chesapeake Bay. Estuarine, Coastal and Shelf Science 64(1):135-148.

Niklitschek, E. J., and D. H. Secor. 2009. Dissolved oxygen, temperature and salinity effects on the ecophysiology and survival of juvenile Atlantic sturgeon in estuarine waters: II. Model development and testing. Journal of Experimental Marine Biology and Ecology 381(1):S161-S172.

NMFS-SEFSC. 2009. An assessment of loggerhead sea turtles to estimate impacts of mortality reductions on population dynamics. NMFS Southeast Fisheries Science Center.

NMFS. 1998. Final recovery plan for the shortnose sturgeon *Acipenser brevirostrum*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland.

NMFS. 2003. Biological opinion on the continued operation of Atlantic shark fisheries (commercial shark bottom longline and drift gillnet fisheries and recreational shark fisheries) under the Fishery Management Plan for Atlantic tunas, swordfish, and sharks (HMS FMP) and the proposed rule for Draft Amendment 1 to the HMS FMP. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland.

NMFS. 2005. Biological opinion on the continued authorization of reef fish fishing under the Gulf of Mexico (GOM) reef fish fishery management plan (RFFMP) and proposed amendment 23. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division.

NMFS. 2006a. Biological opinion on permitting structure removal operations on the Gulf of Mexico outer continental shelf and the authorization for take of marine mammals incidental to structure removals on the Gulf of Mexico outer continental shelf. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland.

NMFS. 2006b. Biological opinion on the 2006 Rim-of-the-Pacific Joint Training Exercises (RIMPAC). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland.

NMFS. 2006c. Biological opinion on the issuance of Section 10(a)(1)(A) permits to conduct scientific research on the southern resident killer whale (*Orcinus orca*) distinct population segment and other endangered or threatened species. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Region, Seattle, Washington.

NMFS. 2008. Recovery plan for southern resident killer whales (*Orcinus orca*). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Region, Seattle, Washington.

NMFS. 2009a. Recovery Plan for Smalltooth Sawfish (Pristis pectinata). Pages 102 *in*. Prepared by the Smalltooth Sawfish Recovery Team for the National Marine Fisheries Service, Silver Spring, MD.

NMFS. 2009b. Smalltooth sawfish recovery plan (*Pristis pectinata*). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Report prepared by the Smalltooth Sawfish Recovery Team for NMFS, NOAA, U.S. Department of Commerce, Silver Spring, Maryland.

NMFS. 2010a. Smalltooth Sawfish 5-year review: Summary and evaluation. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Protected Resources Division, St. Petersburg, FL.

NMFS. 2010b. Smalltooth Sawfish (Pristis pectinata Latham) 5-Year Review: Summary and Evaluation. Pages 51 *in* N. M. F. S. P. R. Division, editor, St. Petersburg, FL.

NMFS. 2010c. Smalltooth sawfish (Pristis pectinata) 5-year review: summary and evaluation. N. O. A. A. National Marine Fisheries Service, Commerce, editor. Protected Resources Division, St. Petersburg, FL.

NMFS. 2011a. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (Lepidochelys kempii), Second Revision. Pages 156 *in* USFWS, editor, Silver Spring, MD.

NMFS. 2011b. Permit No. 522-1785 Annual Reports. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Silver Spring, Maryland.

NMFS. 2013a. Biological Opinion and Conference Opinion on Atlantic Fleet Training and Testing Activities. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2012-9025, Silver Spring, Maryland.

NMFS. 2013b. Hawksbill sea turtle (*Eremochelys imbricata*) 5-year review: Summary and evaluation. National Marine Fisheries Service and U.S. Fish and Wildlife Service.

NMFS. 2013c. Leatherback Sea Turtle (Dermochelys coriacea) 5-Year Review: Summary and Evaluation. N. a. USFWS, editor.

NMFS. 2014. ESA Section 7 Consultation for Permit Number 17787 (Southeast Fisheries Science Center) to Authorize Research on Smalltooth Sawfish along the Coast of Florida. N. O. A. A. National Marine Fisheries Service, Commerce, editor. Protected Resources.

NMFS. 2015. Kemp's Ridley Sea Turtle (Lepidochelys kempii) 5-year Review: Summary and Evaluation. Silver Spring, MD.

NMFS. 2016a. Biological Opinion (Corrected) on the Issuance of a Scientific Research Permit No. 18786-01 to the National Marine Fisheries Service Marine Mammal Health and Stranding Response Program, and Implementation! of the Marine Mammal Health and Stranding Response Program. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2016-9166, Silver Spring, Maryland.

NMFS. 2016b. Biological Opinion on Continued Opeation of St. Lucie Nuclear Power Plant, Units 1 and 2 in St. Lucie County, Florida. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland.

NMFS. 2016c. Continued operation of St. Lucie Nuclear Power Plant, Units 1 and 2 in St. Lucie County, Florida. National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

NMFS. 2016d. Permit Application for Sarasota Dolphin Research Program Activities. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Permit No. 20455, Silver Spring, Maryland.

NMFS. 2016e. Permit No. 15543 Annual Reports. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Silver Spring, Maryland.

NMFS. 2017a. Biological and Conference Opinion on Air Force Eglin Gulf Testing and Training Range Activities. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, FPR-2016-9151, Silver Spring, Maryland.

NMFS. 2017b. Biological Opinion on the Issuance of Permit No. 19508 for Scientific Research on Sea Turtles along the Eastern Coast of Florida and the Northern and Eastern Gulf of Mexico. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2017-9184, Silver Spring, Maryland.

NMFS. 2017c. Biological Opinion on the Issuance of Permit No. 20339 to the NMFS Southeast Fisheries Center and Permit No. 19621-01 to Michael Arendt (South Carolina Department of Natural Resources, Marine Resources Division) for Scientific Research on Sea Turtles. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2017-9185, Silver Spring, Maryland.

NMFS, and USFWS. 1991. Recovery plan for U.S. population of loggerhead turtle (*Caretta caretta*). National Marine Fisheries Service and U.S. Fish and Wildlife Service, Washington, D. C.

NMFS, and USFWS. 2007a. Hawksbill sea turtle (*Eretmochelys imbricata*) 5-year review: Summary and evaluation National Marine Fisheries Service and U.S. Fish and Wildlife Service, Silver Spring, Maryland.

NMFS, and USFWS. 2007b. Kemp's ridley sea turtle (*Lepidochelys kempii*) 5-year review: Summary and evaluation. National Marine Fisheries Service and U.S. Fish and Wildlife Service, Silver Spring, Maryland.

NMFS, and USFWS. 2007c. Loggerhead sea turtle (*Caretta caretta*) 5-year review: Summary and evaluation. National Marine Fisheries Service and U.S. Fish and Wildlife Service, Silver Spring, Maryland.

NMFS, and USFWS. 2008a. Draft recovery plan for the northwest Atlantic population of the loggerhead sea turtle (*Caretta caretta*): Second revision. National Marine Fisheries Service and U.S. Fish and Wildlife Service, Silver Spring, Maryland.

NMFS, and USFWS. 2008b. Recovery plan for the northwest Atlantic population of the loggerhead sea turtle (*Caretta caretta*), second revision. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland.

NMFS, and USFWS. 2014. Olive ridley sea turtle (*Lepidochelys olivacea*) 5-year review: Summary and evaluation. NOAA, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland.

NMFS, USFWS, and SEMARNAT. 2010. Draft bi-national recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*), second revision. National Marine Fisheries Service, U.S. Fish and Wildlife Service, and SEMARNAT, Silver Spring, Maryland.

NMMA. 2007. 2006 recreational boating statistical abstract. National Marine Manufacturers Association, Chicago, Illinois.

NOAA. 2012. Understanding Climate. http://www.climate.gov/#understandingClimate.

Norton, S. L., and coauthors. 2012. Designating critical habitat for juvenile endangered smalltooth sawfish in the United States. Marine and Coastal Fisheries 4(1):473-480.

Nowacek, S. M., R. S. Wells, and A. R. Solow. 2001. Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. Marine Mammal Science 17(4):673-688.

NRC. 1990. Sea turtle mortality associated with human activities. National Academy Press, National Research Council Committee on Sea Turtle Conservation, Washington, D.C.

NSED. 2012. National Sawfish Encounter Database. Florida Museum of Natural History, editor, Gainesville, FL.

Odenkirk, J. S. 1989. Movements of Gulf of Mexico sturgeon in the Apalachicola River, Florida. Pages 230-238 *in* Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies.

Omsjoe, E. H., and coauthors. 2009. Evaluating capture stress and its effects on reproductive success in Svalbard reindeer. Canadian Journal of Zoology 87(1):73-85.

Orlando Jr., S. P., and coauthors. 1994. Salinity Characteristics of South Atlantic Estuaries. NOAA, Office of Ocean Resources Conservation and Assessment, Silver Spring, MD.

Parauka, F. M., S. K. Alam, and D. A. Fox. 2001. Movement and Habitat Use of Subadult Gulf Sturgeon in Choctawhatchee Bay, Florida. Pages 280-297 *in* Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies.

Parauka, F. M., W. J. Troxel, F. A. Chapman, and G. L. McBay. 1991. Hormone-Induced Ovulation and Artificial Spawning of Gulf of Mexico Sturgeon (*Acipenser oxyrhynchus desotoi*). The Progressive Fish-Culturist 53(2):113-117.

Parker Jr., R. O., D. R. Colby, and T. D. Willis. 1983. Estimated amount of reef habitat on a portion of the U.S. South Atlantic and Gulf of Mexico continental shelf. Bulletin of Marine Science 33(4):935-940.

Pfeffer, W. T., J. T. Harper, and S. O'Neel. 2008. Kinematic Constraints on Glacier Contributions to 21st-Century Sea-Level Rise. Science 321(5894):1340-1343.

Phillips, B. E., S. A. Cannizzo, M. H. Godfrey, B. A. Stacy, and C. A. Harms. 2015. Exertional myopathy in a juvenile green sea turtle (*Chelonia mydas*) entangled in a large mesh gillnet. Case Reports in Veterinary Medicine 2015.

Pike, D. A., E. A. Roznik, and I. Bell. 2015. Nest inundation from sea-level rise threatens sea turtle population viability. Royal Society Open Science 2:150127.

Plotkin, P. 2003. Adult migrations and habitat use. Pages 225-241 *in* P. L. Lutz, J. A. Musick, and J. Wyneken, editors. Biology of sea turtles, volume II. CRC Press, Boca Raton, Florida.

Poloczanska, E. S., C. J. Limpus, and G. C. Hays. 2009. Vulnerability of marine turtles in climate change. Pages 151-211 *in* D. W. Sims, editor. Advances in Marine Biology, volume 56. Academic Press, Burlington.

Polyakov, I. V., V. A. Alexeev, U. S. Bhatt, E. I. Polyakova, and X. Zhang. 2010. North Atlantic warming: patterns of long-term trend and multidecadal variability. Climate Dynamics 34:439-457.

Popper, A. N. 2005. A review of hearing by sturgeon and lamprey. U.S. Army Corps of Engineers, Portland District.

Popper, A. N., T. J. Carlson, B. M. Casper, and M. B. Halvorsen. 2014. Does man-made sound harm fishes? Journal of Ocean Technology 9(1):11-20.

Poulakis, G., and J. C. Seitz. 2004. Recent occurrence of the smalltooth sawfish, *Pristis pectinata* (Elasmobranchiomorphi: Pristidae), in Florida Bay and the Florida Keys, with comments on sawfish ecology. Florida Scientist 67(1):27-35.

Poulakis, G., and coauthors. 2014. Smalltooth Sawfish (*Pristis pectinata*) Research and Outreach: an Interdisciplinary Collaborative Program, Port Charlotte, Florida.

Poulakis, G. R., P. W. Stevens, A. A. Timmers, T. R. Wiley, and C. A. Simpfendorfer. 2011. Abiotic affinities and spatiotemporal distribution of the endangered smalltooth sawfish, *Pristis pectinata*, in a south-western Florida nursery. Marine and Freshwater Research 62(10):1165.

Price, E. R., and coauthors. 2004. Size, growth, and reproductive output of adult female leatherback turtles *Dermochelys coriacea*. Endangered Species Research 5:1-8.

Queisser, N., and N. Schupp. 2012. Aldosterone, oxidative stress, and NF-κB activation in hypertension-related cardiovascular and renal diseases. Free Radical Biology and Medicine 53:314-327.

Rabalais, N., R. Turner, and D. Scavia. 2002. Beyond science into policy: Gulf of Mexico hyposiz and the Mississippi River. BioScience 52(2).

Rabotyagov, S. S., C. L. Kling, P. W. Gassman, N. N. Rabalais, and R. E. Turner. 2014. The Economics of Dead Zones: Causes, Impacts, Policy Challenges, and a Model of the Gulf of Mexico Hypoxic Zone. Review of Environmental Economics and Policy 8(1):58-79.

Reddering, J. S. V. 1988. Prediction of the effects of reduced river discharge on estuaries of the south-eastern Cape Province, South Africa. South African Journal of Science 84:726-730.

Reina, R. D., P. A. Mayor, J. R. Spotila, R. Piedra, and F. V. Paladino. 2002. Nesting ecology of the leatherback turtle, *Dermochelys coriacea*, at Parque Nacional Marino Las Baulas, Costa Rica: 1988-1989 to 1999-2000. Copeia 2002(3):653-664.

Reina, R. D., J. R. Spotila, F. V. Paladino, and A. E. Dunham. 2009. Changed reproductive schedule of eastern Pacific leatherback turtles *Dermochelys coriacea* following the 1997-98 El Niño to La Niña transition. Endangered Species Research 7:155-161.

Reyff, J. A. 2003. Underwater sound levels associated with constuction of the Benicia-Martinez Bridge. lllingworth and Rodkin, Inc.

Rivier, C., and S. Rivest. 1991. Effect of stress on the activity of the Hypothalamic-Pituitary-Gonadal Axis: Peripheral and Central Mechanisms. Biology of Reproduction 45:523-532.

Robinson, R. A., and coauthors. 2009. Travelling through a warming world: Climate change and migratory species. Endangered Species Research 7:87-99.

Rogillio, H. E., and coauthors. 2007. Gulf sturgeon movements in the Pearl River drainage and the Mississippi Sound. North American Journal of Fisheries Management 27:89-95.

Romero, L. M. 2004. Physiological stress in ecology: Lessons from biomedical research. Trends in Ecology and Evolution 19(5):249-255.

Ross, S. T., R. J. Heise, M. A. Dugo, and W. T. Slack. 2001. Movement and habitat use of the Gulf sturgeon *Acipenser oxyrinchus desotoi* in the Pascagoula drainage of Mississippi: Year V. U.S. Fish and Wildlife Service, Project No. E-1, Segment 16, Department of Biological Sciences, University of Southern Mississippi, and Mississippi Museum of Natural Science.

Ross, S. T., and coauthors. 2009. Estuarine and Coastal Habitat Use of Gulf Sturgeon *Acipenser oxyrinchus desotoi* in the North-Central Gulf of Mexico. Estuaries and Coasts 32(2):360-374.

Rostal, D. C. 2007. Reproductive physiology of the ridley sea turtle. Pages 151-165 *in* P. T. Plotkin, editor. Biology and Conservation of Sea Turtles. Johns Hopkins University Press, Baltimore, Maryland.

Rostal, D. C., J. S. Grumbles, R. A. Byles, M. R. Marquez, and D. W. Owens. 1997. Nesting physiology of Kemp's ridley sea turtles, *Lepidochelys kempii*, at Rancho Nueveo, Tamaulipas, Mexico, with observation on population estimates. Chelonian Conservation and Biology 2(4):538-547.

SAFMC. 1998. Final Plan for the South Atlantic Region: Essential Fish Habitat Requirements for the Fishery Management Plan of the South Atlantic Fishery Management Council. South Atlantic Fishery Management Council, Charleston, SC.

Salwasser, H., S. P. Mealey, and K. Johnson. 1984. Wildlife population viability: a question of risk. Pages 421-439 *in* Transactions of the North American Wildlife and Natural Resources Conference.

Sanzenbach, E. 2011a. LDWF restocking Pearl River after fish kill. Slidell Sentry, Slidell, Louisiana.

Sanzenbach, E. 2011b. LDWF settles with paper plant from fish kill. Slidell Sentry, Slidell, Louisiana.

Sapolsky, R. M., L. M. Romero, and A. U. Munck. 2000. How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions. Endocrine Reviews 21(1):55-89.

Sasso, C. R., and S. P. Epperly. 2006. Seasonal sea turtle mortality risk from forced submergence in bottom trawls. Fisheries Research 81(1):86-88.

Schmid, J. R. 1998. Marine turtle populations on the west-central coast of Florida: Results of tagging studies at the Cedar Keys, Florida, 1986-1995. Fishery Bulletin 96(3):589-602.

Schmidt, J. 1916. Marking experiments with turtles in the Danish West Indies. Danmarks Fiskeri-og Harundersogelser Meddelelser 5(1):1-26.

Schumann, N., N. J. Gales, R. G. Harcourt, and J. P. Y. Arnould. 2013. Impacts of climate change on Australian marine mammals. Australian Journal of Zoology 61(2):146-159.

Schuyler, Q. A., and coauthors. 2015. Risk analysis reveals global hotspots for marine debris ingestion by sea turtles. Global Change Biology.

Secor, D. 1995. Chesapeake Bay Atlantic sturgeon: current status and future recovery. Summary of findings and recommendations from a workshop convened 8 November 1994 at Chesapeake Biological Laboratory. Chesapeake Bay Biological Laboratory, Center for Estuarine and Environmental Studies, University of Maryland System, Solomons, MD.

Secor, D., and E. J. Niklitschek. 2002. Sensitivity of sturgeons to environmental hypoxia: a review of physiological and ecological evidence. Pages 61-78 *in* Sixth International Symposium on Fish Physiology, Toxicology, and Water Quality, La Paz, B. C. S., Mexico.

Secor, D. H., and T. E. Gunderson. 1998. Effects of hypoxia and temperature on survival, growth, and respiration of juvenile Atlantic sturgeon, *Acipenser oxyrinchus*. Fishery Bulletin 96:603-613.

Secor, D. H., and E. J. Niklitschek. 2001. Hypoxia and sturgeons. University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory, Technical Report Series No. TS-314-01-CBL, Solomons, Maryland.

Seitz, J. C., and G. R. Poulakis. 2002. Recent occurrence of sawfishes (Elasmobranchiomorphi: Pristidae) along the southwest coast of Florida (USA). Florida Scientist 65(4):256-266.

Seitz, J. C., and G. R. Poulakis. 2006. Anthropogenic effects on the smalltooth sawfish (Pristis pectinata) in the United States. Mar Pollut Bull 52(11):1533-40.

Seminoff, J. A., and coauthors. 2015. Status reviw of the green turtle (*Chelonia mydas*) under the Endnagered Species Act. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Shamblin, B. M., and coauthors. 2014. Geographic patterns of genetic variation in a broadly distributed marine vertebrate: New insights into loggerhead turtle stock structure from expanded mitochondrial DNA sequences. PLoS One 9(1):e85956.

Shamblin, B. M., and coauthors. 2012. Expanded mitochondrial control region sequences increase resolution of stock structure among North Atlantic loggerhead turtle rookeries. Marine Ecology Progress Series 469:145-160.

Shamblin, B. M., and coauthors. 2016. Mexican origins for the Texas green turtle foraging aggregation: A cautionary tale of incomplete baselines and poor marker resolution. Journal of Experimental Marine Biology and Ecology.

Shoop, C. R., and R. D. Kenney. 1992. Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs 6:43-67.

Simmonds, M. P., and W. J. Eliott. 2009. Climate change and cetaceans: Concerns and recent developments. Journal of the Marine Biological Association of the United Kingdom 89(1):203-210.

Simpfendorfer, C. A. 2000. Predicting population recovery rates for endangered western Atlantic sawfishes using demographic analysis. Environmental Biology of Fishes 58(4):371-377.

Simpfendorfer, C. A. 2002. Smalltooth sawfish: the USA's first endangered elasmobranch? Endangered Species UPDATE 19(3):53-57.

Simpfendorfer, C. A. 2005. Threatened fishes of the world: *Pristis pectinata* Latham, 1794 (Pristidae). Environmental Biology of Fishes 73(1):20-20.

Simpfendorfer, C. A., G. R. Poulakis, P. M. O'Donnell, and T. R. Wiley. 2008. Growth rates of juvenile smalltooth sawfish Pristis pectinata Latham in the western Atlantic. Journal of Fish Biology 72(3):711-723.

Simpfendorfer, C. A., and T. R. Wiley. 2004. Determination of the distribution of Florida's remnant sawfish population, and identification of areas critical to their conservation. Mote Marine Laboratory Technical Report.

Simpfendorfer, C. A., T. R. Wiley, and B. G. Yeiser. 2010. Improving conservation planning for an endangered sawfish using data from acoustic telemetry. Biological Conservation 143(6):1460-1469.

Simpfendorfer, C. A., and coauthors. 2011. Environmental influences on the spatial ecology of juvenile smalltooth sawfish (*Pristis pectinata*): results from acoustic monitoring. PLoS One 6(2):e16918.

Slack, W. T., S. T. Ross, R. J. Heise, and J. A. E. III. 1999. Movement and habitat use of the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) in the Pascagoula drainage of Mississippi: year II. Department of Biological Sciences, University of Southern Mississippi, and Mississippi Museum of Natural Science. Funded by U.S. Fish and Wildlife Service.

Smith, T. I. J., and J. P. Clugston. 1997. Status and management of Atlantic sturgeon, Acipenser oxyrinchus, in North America. Environmental Biology of Fishes 48(1-4):335-346.

Snelson, F. F., and S. E. Williams. 1981. Notes on the occurrence, distribution, and biology of elasmobranch fishes in the Indian River Lagoon System, Florida. Estuaries 4(2):110-120.

Snoddy, J. E., M. Landon, G. Blanvillain, and A. Southwood. 2009. Blood biochemistry of sea turtles captured in gillnets in the Lower Cape Fear River, North Carolina, USA. Journal of Wildlife Management 73(8):1394-1401.

Soulé, M. E. 1987. Where do we go from here? Pages 175-183 *in* M. E. Soulé, editor. Viable Populations for Conservation. Cambridge University Press.

Spotila, J. R., and coauthors. 1996. Worldwide population decline of *Dermochelys coriacea*: Are leatherback turtles going extinct? Chelonian Conservation and Biology 2(2):209-222.

Spotila, J. R., R. D. Reina, A. C. Steyermark, P. T. Plotkin, and F. V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405:529-530.

Stabenau, E. K., T. A. Heming, and J. F. Mitchell. 1991. Respiratory, acid-base and ionic status of Kemp's ridley sea turtles (*Lepidochelys kempi*) subjected to trawling. Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology 99A(1/2):107-111.

Stabenau, E. K., and K. R. N. Vietti. 2003. The physiological effects of multiple forced submergences in loggerhead sea turtles (*Caretta caretta*). Fishery Bulletin 101(4):889-899.

Stabile, J., J. R. Waldman, F. Parauka, and I. Wirgin. 1996. Stock structure and homing fidelity in Gulf of Mexico sturgeon (*Acipenser oxyrinchus desotoi*) based on restriction fragment length polymorphism and sequence analyses of mitochondrial DNA. Genetics 144(2):767-75.

Stanley, D. R., and C. A. Wilson. 1989. Utilization of offshore platforms by recreational fishermen and scuba divers off the Louisiana coast. Bulletin of Marine Science 44(2):767-775.

Stedman, S., and T. E. Dahl. 2008. Status and trends of wetlands in the coastal watersheds of the Eastern United States 1998-2004. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and U.S. Department of the Interior, U.S. Fish and Wildlife Service.

Storelli, M. M., G. Barone, A. Storelli, and G. O. Marcotrigiano. 2008. Total and subcellular distribution of trace elements (Cd, Cu and Zn) in the liver and kidney of green turtles (*Chelonia mydas*) from the Mediterranean Sea. Chemosphere 70(5):908-913.

Storelli, M. M., E. Ceci, and G. O. Marcotrigiano. 1998. Distribution of heavy metal residues in some tissues of *Caretta caretta* (Linnaeus) specimen beached along the Adriatic Sea (Italy). Bulletin of Environmental Contamination and Toxicology 60:546-552.

Sulak, K. J., and J. P. Clugston. 1999. Recent advances in life history of Gulf of Mexico sturgeon, *Acipenser oxyrinchus desotoi*, in the Suwannee River, Florida, USA: a synopsis. Journal of Applied Ichthyology 15(4-5):116-128.

Tapilatu, R. F., and coauthors. 2013. Long-term decline of the western Pacific leatherback, *Dermochelys coriacea*: A globally important sea turtle population. Ecosphere 4:15.

TEWG. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Turtle Expert Working Group.

TEWG. 2007. An assessment of the leatherback turtle population in the Atlantic Ocean. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, Turtle Expert Working Group.

Thomas, C. D. 1990. What Do Real Population Dynamics Tell Us About Minimum Viable Population Sizes? Conservation Biology 4(3):324-327.

Thomson, J. A., and M. R. Heithaus. 2014. Animal-borne video reveals seasonal activity patterns of green sea turtles and the importance of accounting for capture stress in short-term biologging. Journal of Experimental Marine Biology and Ecology 450:15-20.

Thorson, T. B. 1976. Observations on the reproduction of the sawfish, Pristis perotteti, in lake Nicaragua, with recommendations for its conservation.

Tomas, J., and J. A. Raga. 2008. Occurrence of Kemp's ridley sea turtle (Lepidochelys kempii) in the Mediterranean. Marine Biodiversity Records 1(01).

Turner, R. E., and N. N. Rabalais. 2016. 2016 Forecast: Summer Hypoxic Zone Size Northern Gulf of Mexico.

USACE. 2010. Sea turtle data warehouse. U.S. Army Corps of Engineers.

USCG. 2003. 2002 national recreational boating survey state data report. United States Coast Guard, Columbus, Ohio.

USCG. 2005. Boating statistics - 2005. United States Coast Guard, Washington D.C.

USCOP. 2004. An ocean blueprint for the 21st century. U.S. Commission on Ocean Policy, Washington, D.C.

USFWS. 2002. Report on the Mexico/United States of America population restoration project for the Kemp's ridley sea turtle, *Lepidochelys kempii*, on the coasts of Tamaulipas and Veracruz, Mexico. U.S. Fish and Wildlife Service.

USFWS. 2006. Report on the Mexico/United States of America population restoration project for the Kemp's ridley sea turtle, *Lepidochelys kempii*, on the coasts of Tamaulipas, and Veracruz, Mexico. United States Fish and Wildlife Service.

USFWS. 2009. Gulf Sturgeon (Acipenser oxyrinchus destoi) 5-year review: summary and evaluation. S. R. USFWS, Panama City Ecological Services Field Office, National Marine Fisheries Service, Office of Protected Resources, editor, St. Petersburg, FL.

USFWS, and GSMFC. 1995. Gulf sturgeon recovery plan. U.S. Fish and Wildlife Service, Gulf States Marine Fisheries Commission, Atlanta, Georgia.

USFWS, and NMFS. 1992. Recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). U.S. Fish and Wildlife Service and National Marine Fisheries Service, St. Petersburg, Florida.

USFWS, and NMFS. 2009. Gulf sturgeon (*Acipenser oxyrinchus desotoi*) 5-year review: Summary and evaluation. U.S. Fish and Wildlife Service and National Marine Fisheries Service.

USFWS, N. a. 2007. Green Sea Turtle (Chelonia mydas) 5 year Review: Summary and Evaluation. Pages 105 *in*.

USGRG. 2004. U.S. National Assessment of the Potential Consequences of Climate Variability and Change, Regional Paper: The Southeast. U.S. Global Research Group. Washington, D.C., August 20, 2004.

USN. 2008. Biological evaluation for the Gulf of Mexico rangle complex. U.S. Navy.

USN. 2009. Gulf of Mexico range complex final environmental impact statement/overseas environmental impact statement (EIS/OEIS) volume 1 (version 3). United States Navy, Norfolk, Virginia.

Vermeer, M., and S. Rahmstorf. 2009. Global sea level linked to global temperature. Proceedings of the National Academy of Sciences 106(51):21527-21532.

Vladykov, V. D., and J. R. Greely. 1963. Order Acipenseroidei. Fishes of Western North Atlantic. Yale.

Wagner, E. J., R. E. Arndt, and B. Hilton. 2002. Physiological stress responses, egg survival and sperm motility for rainbow trout broodstock anesthetized with clove oil, tricaine methanesulfonate or carbon dioxide. Aquaculture 211:353-366.

Waldman, J. R., and I. I. Wirgin. 1998. Status and restoration options for Atlantic sturgeon in North America. Conservation Biology 12(3):631-638.

Wallace, B. P., S. S. Kilham, F. V. Paladino, and J. R. Spotila. 2006. Energy budget calculations indicate resource limitation in Eastern Pacific leatherback turtles. Marine Ecology Progress Series 318:263-270.

Wallace, B. P., and coauthors. 2007. Maternal investment in reproduction and its consequences in leatherback turtles. Oecologia 152(1):37-47.

Whitfield, A. K., and M. N. Bruton. 1989. Some biological implications of reduced freshwater inflow into eastern Cape estuaries: a preliminary assessment. South African Journal of Science 85:691-694.

Wilcox, C., and coauthors. 2015. Understanding the sources and effects of abandoned, lost, and discarded fishing gear on marine turtles in northern Australia. Conservation Biology 29(1):198-206.

Wiley, T. R., and C. A. Simpfendorfer. 2010. Using public encounter data to direct recovery efforts for the endangered smalltooth sawfish *Pristis pectinata*. Endangered Species Research 12:179-191.

Wilkinson, C., and D. Souter. 2008. Status of Caribbean coral reefs after bleaching and hurricanes in 2005. Global Coral Reef Monitoring Network, and Reef and Rainforest Research Centre, Townsville.

Williams, A. B., and coauthors. 1989. Common and scientific names of aquatic invertebrates from the United States and Canada: decapod crustaceans, volume Special Publication 17. American Fisheries Society, Bethesda, Maryland.

Winger, P. V., P. J. Lasier, D. H. White, and J. T. Seginak. 2000. Effects of Contaminants in Dredge Material from the Lower Savannah River. Archives of Environmental Contamination and Toxicology 38(1):128-136.

Witherington, B., P. Kubilis, B. Brost, and A. Meylan. 2009. Decreasing annual nest counts in a globally important loggerhead sea turtle population. Ecological Applications 19(1):30-54.

Wooley, C. M., and E. J. Crateau. 1985. Movement, microhabitat, exploitation, and management of Gulf of Mexico sturgeon, Apalachicola River, Florida. North American Journal of Fisheries Management 5(4):590-605.

Work, P. A., A. L. Sapp, D. W. Scott, and M. G. Dodd. 2010. Influence of small vessel operation and propulsion system on loggerhead sea turtle injuries. Journal of Experimental Marine Biology and Ecology 393(1-2):168-175.

Zurita, J. C., and coauthors. 2003. Nesting loggerhead and green sea turtles in Quintana Roo, Mexico. Pages 25-127 *in* J. A. Seminoff, editor Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation, Miami, Florida.

Zwinenberg, A. J. 1977. Kemp's ridley, *Lepidochelys kempii* (Garman 1880), undoubtedly the most endangered marine turtle today (with notes on the current status of *Lepidochelys olivacea*). Bulletin of the Maryland Herpetological Society 13(3):378-384.

16 Appendices

Appendix A: Draft Permit No. 20455 (May, 24 2017)

*Final permit may have minor changes that would not affect this biological opinion.

Permit No. 20455
Expiration Date: May 31, 2022
Reports Due: August 31st, annually

PERMIT TO TAKE PROTECTED SPECIES[2] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to Randall Wells, Ph.D., Chicago Zoological Society's Sarasota Dolphin Research Program, c/o Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota, Florida 34236, (hereinafter "Permit Holder"), pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*); and the regulations governing the taking and importing of marine mammals (50 CFR Part 216). The permitted activity may result in incidental takes of Endangered Species Act (ESA) listed species. Those takes are authorized in an incidental take statement in the ESA Section 7 Biological Opinion prepared for this permit and are reflected in Appendix 1, Table 2.

II. Abstract

The objectives of the permitted activity, as described in the application, are to develop and maintain a complete knowledge of the resident community of bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida and along the entire west coast of Florida, by assessing and monitoring dolphin health and body condition, reproduction, population structure and dynamics, trophic patterns, acoustics, hearing abilities, and metabolic rate studies. In addition, evaluation of human interactions, environmental contaminants, oil spill impacts, and harmful algae on these dolphins will be studied. This project will also continue studies of Atlantic spotted dolphin (*Stenella frontalis*) ranging patterns, dive behavior, habitat use and health assessment over the West Florida Shelf.

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including attachments and appendices. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

[2] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through May 31, 2022. This permit expires on the date indicated and is non-renewable. This permit may be extended by the Director, NMFS Office of Protected Resources, pursuant to applicable regulations and the requirements of the MMPA.

2. Researchers must immediately stop permitted activities and the Permit Holder must contact the Chief, NMFS Permits and Conservation Division (hereinafter "Permits Division") for written permission to resume:

   a. If serious injury or mortality[3] of protected species reaches that specified in Appendix 1.

   b. If authorized take[4] is exceeded in any of the following ways:

      x. More animals are taken than allowed in the Tables of Appendix 1.

      xi. Animals are taken in a manner not authorized by this permit.

      xii. Protected species other than those authorized by this permit are taken.

   c. Following incident reporting requirements at Condition E.2.

   d. If injury or health problems arise following experimental remote deployment of fin-mounted tags. See Condition B.5.o. Reauthorization of remote tag deployment will be based on evaluation of the report and may be denied or delayed if the report has not been received or approved.

---

[3] This permit allows for unintentional serious injury and mortality caused by the presence or actions of researchers up to the limit in Table 1 of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling procedures; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[4] By regulation, a take under the MMPA means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

4. The Permit Holder may continue to possess biological samples[5] acquired[6] under this permit after permit expiration without additional written authorization, provided the samples are maintained as specified in this permit.

B. Number and Kinds of Protected Species, Locations, and Manner of Taking

1. The tables in Appendix 1 outline the number of protected species, by species and stock, authorized to be taken, and the locations, manner, and time period in which they may be taken.

2. Researchers working under this permit may collect visual images (e.g., photographs, video) in addition to the photo-identification or behavioral photo-documentation authorized in Appendix 1 as needed to document the permitted activities, provided the collection of such images does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Table 1 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS MMPA Permit No. 20455. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:

   a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

   b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

   c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

[5] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.
[6] Authorized methods of sample acquisition are specified in Appendix 1.

d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

Counting and Reporting Takes

a. Count and report a take of a cetacean regardless of whether you observe a behavioral response to the permitted activity.

b. Count and report 1 take per cetacean per day including all approaches[7] in water, attempts to capture, and remotely biopsy or tag.
   i. If any of your Level A attempts on a single day are unsuccessful but make contact with the animal, count the take for the day against your sampling or tagging take row.
   ii. If all of your Level A attempts on a single day are unsuccessful but do not make contact with the animal, count the take against your Level B (harassment) take row.

c. Count and report 1 take per cetacean per day for animals observed during sound playback trials.

d. During Unmanned Aircraft System (UAS) surveys, count 1 take per cetacean approached per day, regardless of the number of passes.

General

e. Researchers must approach animals cautiously and retreat if behaviors indicate the approach may be interfering with reproduction, feeding, or other vital functions.

f. Where females with calves are authorized to be taken, Researchers:
   i. Must immediately terminate efforts if there is any evidence that the activity may be interfering with pair-bonding or other vital functions;
   ii. Must not position the research vessel between the mother and calf;

[7] An “approach” is defined as a continuous sequence of maneuvers involving a vessel equipment, or researcher’s body, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards for sperm and baleen whales (except minke whales) and 50 yards for all other cetaceans.

iii. Must approach mothers and calves gradually to minimize or avoid any startle response;

iv. Must discontinue an approach if a calf is actively nursing; and

v. Must, if possible, sample the calf first to minimize the reaction when sampling mother/calf pairs.

Remote Biopsy Sampling and Tagging

g. Researchers may attempt (deploy or discharge/fire) each procedure (biopsy sample or tag) on an animal 3 times a day.

h. A remote biopsy sampling or tag attachment attempt must be discontinued if an animal exhibits repetitive, strong, adverse reactions to the activity or vessel.

i. Researchers must use sterile[8] biopsy tips and invasive tag anchors (pins, bolts, etc.). Sterilization procedures must follow the Institutional Animal Care and Use Committee (IACUC) approved protocol (e.g., gas or cold sterilization), as described in the application.

   i. If the biopsy tip, or tag anchors become contaminated and are no longer sterile (e.g., missed attempt, contacts seawater, physical contact) prior to use, a new sterile biopsy tip or tag anchor must be used.

   ii. If a new, sterile biopsy tip is not available, the contaminated tip must be completely cleaned and disinfected[9] following the IACUC approved protocol described in the application.

   iii. If new sterile[7] tag anchors are not available, the researcher must cease tagging efforts until sterile alternatives are available.

j. Before attempting to biopsy sample or tag an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated sampling or tagging of any individual.

k. Researchers must not attempt to biopsy or tag a cetacean anywhere forward of the pectoral fin.

Remote Biopsy Sampling

[8] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods (CDC 2008). These methods should follow the IACUC-approved protocol for sterilization (e.g., gas or cold sterilization).

[9] Disinfection= eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects usually by liquid chemicals (CDC 2008).

l. Researchers may biopsy sample calves greater than approximately 8 months old and females accompanied by these calves. However, no calf less than approximately 8 months old or females accompanying these calves may be sampled.

Experimental Deployment for Remote Fin-mount Tagging

m. Researchers may remotely fin-mount tag free-swimming calves greater than approximately 1.5 years old and females accompanied by these calves.
   i. Researchers may not remotely fin-mount tag:
      1. Any calves less than approximately 1.5 years old;
      2. Mothers of young of the year calves[10]; or
      3. Obviously pregnant females.

n. No more than 1 fin-mount tag, may be remotely attached at one time to an animal.

o. Researchers must intervene if any injuries or health problems arise as a result of a remote fin-mount tag deployment, if intervention is practicable.
   i. Based on consultation with a veterinarian, if necessary and advisable, intervention may require capture, veterinary examination and treatment, and tag removal.
   ii. Indications of health problems following remote fin-mount tagging that may require intervention include, but are not limited to, unusual changes in locomotion, respiration, behavior, or body condition, and signs of infection.
   iii. Following any interventions, researchers must submit an incident report following to the Permits Office as described in Condition E.2.

p. The Permit Holder must coordinate remote tagging activities with the NMFS Marine Mammal Health and Stranding Response Program for assistance with responding to injuries or health problems due to remote tag deployments.

Active Acoustics

[10] Young-of-the-year (YoY) are calves during the first calendar year of their life. In Sarasota Bay, these typically range in age from newborn to up to about 8 months of age.

q. Playback studies must be limited to 15 minutes in duration, must not exceed 169 dB re 1 µPa at 1 meter, and must not be broadcast to animals closer than 10 meters.

r. A playback episode must be discontinued if an animal exhibits repetitive strong adverse reactions to the playback activity or the vessel.

Unmanned Aircraft Systems (UAS)

s. Researchers are authorized to use a vertical take-off and landing (VTOL) UAS.

t. UAS must be flown at an altitude of 18 meters (60 feet) or higher for counts and observations. Brief descents for detailed images to visualize wounds, lesions, entanglements, or other body condition parameters must be no lower than 7 meters.

Captures: General

u. At least 1 veterinarian with marine mammal experience must be present during capture, sampling, tagging, and release operations.

v. Only highly experienced and well-trained personnel may capture animals.

w. Every effort should be made to capture no more than 5 animals in a net set at a time. If more animals are captured, the additional animals must be immediately released unless a veterinarian determines that doing so could have a negative impact on individual dolphins.

x. Tables 3 and 4 of Appendix 2 specify the method of capture and procedures authorized for each species, life stage, and pregnancy status.

y. Capturing calves:
   i. For bottlenose dolphins: no calves less than approximately 8 months of age (as determined by known age, relative size, and behavior) and animals accompanied by these calves may be targeted for capture (See Table 3).
   ii. For Atlantic spotted dolphins: no calves of any age (as determined by known age, relative size, and behavior) and animals accompanied by calves may be targeted for capture (See Table 4).

z. Nets must be continuously monitored. When movements indicate that an animal has encountered the net, Researchers must immediately check the net either by snorkeling along the net in clear water or by pulling up on the top line such that the full depth of the net is viewed along the entire length.

aa. To the maximum extent feasible, researchers must be aware of the presence and location of non-target protected species at all times as they conduct netting activities. Researchers must make every effort to prevent interactions with these species.

bb. Netting must not be initiated when non-target marine mammals, sea turtles, or other protected species are observed within the vicinity of the research. Animals must be allowed to either leave or pass through the area safely before netting is initiated.

cc. Researchers must stop netting activities and immediately free any non-target protected species captured per Condition A.2. An incident report must be submitted as described in Condition E.2 (See Appendices 4 and 5).

dd. Researchers must closely examine the net during and after captures to ensure that no animals have been left in the net. The net must be removed from the water as quickly as feasible.

ee. Every effort should be made to limit the maximum amount of time any cetacean may be held (capture to release) to 4 hours.

ff. Researchers must adhere to the following precautions when capturing and working up animals:

i. Minimize handling time;

ii. Keep animals cool and wet during triage and/or transport;

iii. Immediately cease research-related procedures if an animal is showing signs of acute stress (e.g., overexertion, constant muscle tension, abnormal respiration or heart rate, etc.) that may lead to serious injury, capture myopathy, other disease conditions, or death; and

iv. A crash kit and staff trained to use the kit must be onsite for all captures.

gg. Ultrasound examination to determine pregnancy should be attempted on all adult females unless the attending veterinarian determines it would risk the safety of the animal or personnel.

hh. Pregnant females in their 2nd or 3rd trimester must not be placed on the processing boat or otherwise restrained in a manner that could cause stress or injury (See Appendix 2).

ii. The Permit Holder must coordinate capture research activities with the NMFS Marine Mammal Health and Stranding Response Program and other Permit Holders working on the same species to avoid unnecessary duplication of research and disturbance of animals. Aspects of the capture research that should be coordinated include:
   i. Geographic location, population, and seasonality of sampling sites;
   ii. Permanent marking system, including unique freeze-branding numbering system;
   iii. Laboratory analyses; and
   iv. Final disposition and repository of samples.

<u>Captures: Biological Sampling</u>

jj. Only highly experienced and well-trained personnel may perform intrusive activities, including biopsy, blood collection, and tagging. An experienced marine mammal veterinarian must directly supervise or perform these activities.

kk. Samples must be collected in a humane manner (i.e., that which involves the least possible degree of pain and suffering).

ll. Sterile, disposable sampling equipment (e.g., biopsy punches) must be used to the maximum extent possible. When disposables are not available, clean all instruments using non-toxic and non-irritating disinfectants between and prior to each use following the IACUC approved protocol described in the application.

mm. Always use sterile needles for sampling and injections of drugs or other approved substances.

nn. A local anesthetic should be administered with appropriate equipment when biopsy sampling (e.g., full core samples).
   i. Local anesthetic for dorsal fin tag attachment is at the discretion of the attending veterinarian.
   ii. Local anesthetic is <u>not</u> necessary for simple blood draws or superficial lesion biopsy (< 15 mm).

<u>Blood Sampling</u>:

oo. When feasible, do not exceed 4 needle insertions per animal.

pp. Volume limits are at the discretion of the attending veterinarian but must not exceed 10% of the circulating blood volume, or 1% body weight, per animal per capture.

Captures: Tagging

qq. Researchers must use sterile[11] tag anchors (pins, bolts, etc.). Sterilization procedures must follow the IACUC approved protocol (e.g. gas or cold sterilization), as described in the application.

i. If the tag anchors become contaminated and are no longer sterile (e.g., missed attempt, contacts seawater, physical contact) prior to use, a new sterile tag anchor must be used.
ii. If new sterile[7] tag anchors are not available, the researcher must cease tagging efforts until sterile alternatives are available.

rr. Researchers may suction-cup tag:
For bottlenose dolphins:

i. Calves greater than approximately 8 months old and females accompanied by these calves may be suction-cup tagged.
ii. No third trimester pregnant females may be suction-cup tagged.

For spotted dolphins:
iii. No calves may be suction-cup tagged.
iv. No third trimester pregnant females may be suction-cup tagged.

ss. Researchers may attach fin-mount tags to the dorsal fin of bottlenose and spotted dolphin calves greater than approximately 1.5 years or older and females accompanied by these calves.

i. No calf less than approximately 1.5 years old may be fin-mount tagged.

ii. Females with calves less than approximately 8 months old may not be fin-mount tagged.

iii. Third trimester pregnant females may not be fin-mount tagged.

[11] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods (CDC 2008). These methods should follow the IACUC-approved protocol for sterilization (e.g., gas or cold sterilization).

tt. No more than 2 tags, 1 suction-cup and 1 fin-mount tag, may be attached at one time to an animal.

uu. Researchers must intervene if any injuries or health problems arise as a result of a fin-mount tag attachment following capture and release, if intervention is practicable.

i. Based on consultation with a veterinarian, if necessary and advisable, intervention may require re-capture, veterinary examination and treatment, and tag removal.

ii. Indications of health problems following fin-mount tagging that may require intervention include, but are not limited to, unusual changes in locomotion, respiration, behavior, or body condition, and signs of infection.

iii. Following any interventions, researchers must submit an incident report following to the Permits Office as described in Condition E.2.

<u>Captures: Mortalities</u>

vv. The Permit Holder must notify the Permits Division by phone (301-427-8401) within 2 days of any mortality event and must within 2 weeks submit an incident report as described in Condition E.2.

ww. If an animal dies as a result of permitted activities, a necropsy should be performed, except where not feasible such as in remote areas with limited personnel. Gross necropsy findings should be included as part of an incident report. Final necropsy findings (e.g., histology and other analyses) must be submitted when complete.

<u>Captures: Active Acoustics</u>

xx. Playback studies must be limited to 15 minutes in duration, not exceed 150 dB re 1 μPa at 1 meter, and must not be broadcast to animals closer than 2 meters.

yy. A playback episode must be discontinued if an animal exhibits repetitive strong adverse reactions to the playback activity or the vessel.

<u>Non-target Species</u>

zz. This permit does not authorize takes of any protected species not identified in Tables 1 and 2, including those species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS; e.g., manatees). Should other protected species be encountered during the research activities authorized under this permit, researchers must exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment. See Appendix 4 and 5 for complete mitigation measures for non-target species.

6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.

a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37).

b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the:

i. species and, where known, age and sex;

ii. date of collection, acquisition, or import;

iii. type of sample (e.g., blood, skin, bone);

iv. origin (i.e., where collected or imported from); and

v. legal authorization for original sample collection or import.

c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

d. The Permit Holder may request approval of additional Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the:

i. name and affiliation of the recipient;

ii. address of the recipient;

iii. types of samples to be sent (species, tissue type); and

iv. type of analysis or whether samples will be curated.

e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.

g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E.3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

a. Principal Investigator – Randall Wells, Ph.D.

b. Co-Investigator(s) – See Appendix 3 for list of names and corresponding activities.

c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit.

b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:

   a. individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

   b. individuals included as backup for those personnel essential to the conduct of the permitted activity, and

   c. individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations (e.g., veterinarians, pilots – including UAS operators) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.

7. The Permit Holder may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.

8. Submit requests to add CIs or change the PI by one of the following:

   a. the online system at https://apps.nmfs.noaa.gov;

   b. an email attachment to the permit analyst for this permit; or

   c. a hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when:

   a. Engaged in a permitted activity.

   b. A protected species is in transit incidental to a permitted activity.

   c. A protected species taken or imported under the permit is in the possession of such persons.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

1. The Permit Holder must submit incident, annual, and final reports containing the information and in the format specified by the Permits Division.

   a. Reports must be submitted to the Permits Division by one of the following:

      i. the online system at https://apps.nmfs.noaa.gov;

      ii. an email attachment to the permit analyst for this permit; or

      iii. a hard copy mailed or faxed to the Chief, Permits Division.

b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

2. Incident Reporting

a. If the total number of mortalities is reached, or authorized takes have been exceeded as specified in Conditions A.2 and B.5, the Permit Holder must:

i. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;

ii. Submit a written report within 2 weeks of the incident as specified below; and

iii. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

b. Any time a serious injury or mortality of a protected species occurs, or intervention is required, including during remote tag deployment (See Conditions at B.5.n), a written report must be submitted within two weeks.

c. The incident report must include (1) a complete description of the events and (2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

3. Annual reports describing activities conducted during the previous permit year (from June 1 to May 31) must:

a. be submitted by August 31 each year for which the permit is valid, and

b. include a tabular accounting of takes and a narrative description of activities and effects.

c. include data on disturbance rates of marine mammals specific to UAS operations. Details should include, but not be limited to: species, altitude and angle of approach, context of exposure (e.g., behavioral states), and observed behavioral responses to the UAS.

4. A final report summarizing activities over the life of the permit must be submitted by November 30, or, if the research concludes prior to permit expiration, within 180 days of completion of the research.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division.

F. Notification and Coordination

1. The Permit Holder must provide written notification of planned field work to the applicable NMFS Region at least two weeks prior to initiation of each field trip/season. If there will be multiple field trips/seasons in a permit year, a single summary notification may be submitted per year.

   a. Notification must include the:
      i. locations of the intended field study and/or survey routes;

      ii. estimated dates of activities; and

      iii. number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant "in training").

   b. Notification must be sent to the Southeast Assistant Regional Administrator for Protected Resources:

      Southeast Region, NMFS, 263 13th Ave South, St. Petersburg, FL 33701; phone (727)824-5312; fax (727)824-5309
      Email (*preferred*): nmfs.ser.research.notification@noaa.gov

2. To the maximum extent practical, the Permit Holder must coordinate permitted activities with activities of other Permit Holders conducting the same or similar activities on the same species, in the same locations, or at the same times of year to avoid unnecessary disturbance of animals. Contact the Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:

a. allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe permitted activities; and

b. providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of Subpart D [Permit Sanctions and Denials] of 15 CFR Part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:

a. in order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under Section 103 of the MMPA and Section 4 of the ESA;

b. in a case in which a violation of the terms and conditions of the permit is found;

c. in response to a written request[12] from the Permit Holder;

d. if NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and

e. if NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

[12] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR Part 904.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.

   a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.

   b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder

   a. agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and all restrictions and requirements under the MMPA;

   b. acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and

   c. acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

______________________________ ________________

Donna S. Wieting Date Issued
Director, Office of Protected Resources
National Marine Fisheries Service

Appendix 1: Tables Specifying the Kinds of Protected Species, Locations, and Manner of Taking.

Table 1. Annual takes for dolphins off the west coast of Florida during vessel surveys, including the use of unmanned aircraft systems. See Tables 3 and 4 for detailed description of procedures by age-class and pregnancy status.

Line	Species (Stock)	Life stage[13]	No. Takes[14]	Takes Per Animal	Take Action	Procedures	Details
1	Dolphin, bottlenose (Range-wide)	All	9,700	10	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Tracking	Some dolphins may be exposed to active acoustic whistle playbacks. Estimated average of 10 sightings and approaches per year.
2		Non-neonate	225	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Tracking	Typically only one biopsy sample will be taken/individual/yr, but some research may require resampling within a year. Calves aged approximately 8 months and older may be biopsy sampled.
3			25	1		Count/survey; Instrument, dorsal fin attachment; Observations, behavioral; Photo-ID; Photograph/Video; Sample, skin biopsy; Remote vehicle, aerial (VTOL); Tracking	Attach satellite-linked tags to free-swimming dolphins, and collect skin/cartilage sample from core. Calves aged approximately 1.5 years and older may be tagged.
4			34	2	Capture/ Handle/ Release	Acoustic, active playback/broadcast; Acoustic, passive recording; Auditory brainstem response test; Instrument, dorsal fin/ridge attachment; Instrument, suction-cup (e.g., VHF, TDR); Lavage; Mark, freeze brand; Mark, roto tag; Measure; Observation, monitoring; Observations, behavioral; Other; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, anal swab; Sample, blood; Sample, blowhole swab; Sample, exhaled air; Sample, fecal ; Sample, milk (lactating females); Sample, skin and blubber biopsy; Sample, skin biopsy; Sample, tooth extraction; Sample, urine; Tracking; Ultrasound; Weigh	Captures by seine net or hoop net. A second capture may occur for the possibility of seasonal projects or unintentional recaptures when with targeted animals. Other= dorsal fin notch, X-rays; administer drug (SQ or IM); esophageal catheter. See Table 3 for detailed description of tests not used with specific age and reproductive classes.

[13] See Tables 3 and 4 for details of authorized procedures by age-class and pregnancy status for bottlenose (Table 3) and Atlantic spotted dolphins (Table 4).

[14] Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 1. Annual takes for dolphins off the west coast of Florida during vessel surveys, including the use of unmanned aircraft systems. See Tables 3 and 4 for detailed description of procedures by age-class and pregnancy status.

Line	Species (Stock)	Life stage[13]	No. Takes[14]	Takes Per Animal	Take Action	Procedures	Details
5	Dolphin, bottlenose (Range-wide)	Non-neonate	10	2	Capture/ Handle/ Release	Acoustic, active playback/broadcast; Acoustic, passive recording; Auditory brainstem response test; Instrument, dorsal fin/ridge attachment; Instrument, suction-cup (e.g., VHF, TDR); Lavage; Mark, freeze brand; Mark, roto tag; Measure; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, anal swab; Sample, blood; Sample, blowhole swab; Sample, exhaled air; Sample, fecal; Sample, milk (lactating females); Sample, skin and blubber biopsy; Sample, skin biopsy; Sample, tooth extraction; Sample, urine; Tracking; Ultrasound; Weigh	Captures for field metabolic rate studies with administration of isotopes, radiography. A second capture is required for final blood draw. Capture by seine or hoop net. Other= dorsal fin notch, X-rays, administer drug (SQ or IM); administer labeled water (IV); esophageal catheter. See Table 3 for detailed description of procedures by specific age and reproductive classes
6			6	2		Acoustic, active playback/broadcast; Acoustic, passive recording; Auditory brainstem response test; Insert ingestible telemeter pill; Instrument, dorsal fin/ridge attachment; Instrument, suction-cup (e.g., VHF, TDR); Lavage; Mark, freeze brand; Mark, roto tag; Measure; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, anal swab; Sample, blood; Sample, blowhole swab; Sample, exhaled air; Sample, fecal; Sample, milk (lactating females); Sample, skin and blubber biopsy; Sample, skin biopsy; Sample, tooth extraction; Sample, urine; Tracking; Ultrasound; Weigh	Stomach pill study. A second capture may occur for the possibility of seasonal projects or incidental recaptures when with targeted animals. Other= dorsal fin notch, x-rays; administer drug (SQ or IM).
7		All	2	1	Unintentional mortality	Import/Export/Receive, parts; Intentional (directed) mortality; Necropsy; Unintentional mortality	Over life of permit. Unintentional mortality during captures and handling. Intentional= euthanasia for humane purposes where warranted. Includes necropsy salvage of parts.

Table 1. Annual takes for dolphins off the west coast of Florida during vessel surveys, including the use of unmanned aircraft systems. See Tables 3 and 4 for detailed description of procedures by age-class and pregnancy status.

Line	Species (Stock)	Life stage[13]	No. Takes[14]	Takes Per Animal	Take Action	Procedures	Details
8	Dolphin, Atlantic spotted (Northern Gulf of Mexico Stock)	All	875	10	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Tracking	Some dolphins may be exposed to active acoustic whistle playbacks. Estimated average of 10 sightings and approaches per year.
9		Non-neonate	75	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Tracking	Remote biopsy and playback work. Calves aged approximately 8 months and older may be biopsy sampled.
10			25	1		Count/survey; Instrument, dorsal fin attachment; Observations, behavioral; Photo-ID; Photograph/Video; Sample, skin biopsy; Remote vehicle, aerial (VTOL); Tracking	Attach satellite-linked tags to free-swimming dolphins, and collect skin sample from core. Calves aged approximately 1.5 years and older may be tagged.
11		Adult/ Juvenile	25	1	Capture/ Handle/ Release	Acoustic, active playback/broadcast; Acoustic, passive recording; Auditory brainstem response test; Instrument, dorsal fin/ridge attachment; Instrument, suction-cup (e.g., VHF, TDR); Lavage; Mark, freeze brand; Mark, roto tag; Measure; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, anal swab; Sample, blood; Sample, blowhole swab; Sample, exhaled air; Sample, fecal; Sample, milk (lactating females); Sample, skin and blubber biopsy; Sample, skin biopsy; Sample, tooth extraction; Sample, urine; Tracking; Ultrasound; Weigh	Capture by hoop net. Other= dorsal fin notch, x-rays; administer drug (SQ or IM). See Table 4 for detailed description of procedures by specific age and reproductive classes.
12		All	2	1	Unintentional mortality	Import/Export/Receive, parts; Intentional (directed) mortality; Necropsy; Unintentional mortality	During life of permit. Unintentional mortality during captures and handling. Intentional= euthanasia for humane purposes where warranted. Includes necropsy salvage of parts.

[11] See Tables 3 and 4 in Appendix 2 for detailed descriptions of procedures by age-class and pregnancy status for bottlenose (Table 3) and Atlantic spotted dolphins (Table 4).
[12] Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Appendix 1: Tables Specifying the Kinds of Protected Species, Locations, and Manner of Taking.

Table 2. Annual incidental take of non-target species during research authorized in Table 1. This take is authorized by the incidental take statement in the ESA Section 7 Biological Opinion prepared for this permit. Activities may occur year-round off the west coast of Florida.

Line No.	Species; (Stock/DPS); Status	Life Stage and Sex	No. Animals	No. Takes/ Animal	Take Action	Procedures	Details
1	Green sea turtle; (North Atlantic DPS); NMFS Threatened	Non-neonate; Male and Female	2 per species; not to exceed 2 turtles for all species combined	1	Capture/ Handle/ Release; Harass	Incidental capture and harassment	Incidental take and live release of 2 turtles of any species, annually.
2	Hawksbill sea turtle; (Range-wide); NMFS Endangered						
3	Kemp's ridley sea turtle; (Range-wide); NMFS Endangered						
4	Loggerhead sea turtle; (Northwest Atlantic DPS); NMFS Threatened						
5	Olive ridley sea turtle; (Range-wide); NMFS Threatened						
6	Leatherback sea turtle; (Range-wide); NMFS Endangered						
7	Smalltooth sawfish; (U.S. DPS); NMFS Endangered	Non-neonate; Male and Female	1	1	Capture/ Handle/ Release; Harass	Incidental capture and harassment	Incidental take and live release, annually.
8	Gulf Sturgeon; (Range-wide); NMFS Threatened		1	1			

Appendix 2: Summary Tables of Permitted Activities and Health Assessment Procedures by Age and Pregnancy Status.

Table 3. Summary of permitted activities and health assessment procedures by age and pregnancy status for bottlenose dolphins. YOY=Young of the year.

Procedures for bottlenose dolphins		Remote activities		Capture and remote activities						
		YoY Calves (birth to ~8 months)	Mothers of YoYs	Calves from 8 months to 1.5 years	Mothers of Calves from 8 months to 1.5 years	Calves > 1.5 years	Non-Calves	1st Trimester Pregnant Females	2nd Trimester Pregnant Females	3rd Trimester Pregnant Females
Level B activities- Observation; Photo-ID; Photogrammetry; Photograph/Video; UAS		y	y	y	y	y	y	y	y	y
Remote	Remote Biopsy	n	n	y	y	y	y	y	y	y
	Remote tag, Fin-mount free-swimming dolphin	n	n	n	y	y	y	y	y	n
Capture	Capture	n	n	y	y	y	y	y	y	y
	Acoustics- active playback and passive recording	n	n	y	y	y	y	y	in water	n
	Auditory brainstem response test	n	n	y	y	y	y	y	in water	n
	Biopsy- skin and blubber; OR skin only	n	n	y	y	y	y	y	y	n
	Esophageal catheter	n	n	n	y	y	y	n	n	n
	Instrument, dorsal fin attachment (VHF, satellite-linked tags)	n	n	n	y	y	y	y	y	n
	Instrument, suction cup (DTAGs)	n	n	y	y	y	y	y	y	n
	Lavage	n	n	y	y	y	y	y	n	n
	Mark- freeze brand; roto tag; fin notch	n	n	y	y	y	y	y	y	y
	Measure	n	n	y	y	y	y	y	y	abbreviated
	Sample- anal or blowhole swab	n	n	y	y	y	y	y	n	n
	Sample, blood	n	n	y	y	y	y	y	y	y
	Sample- exhaled air, fecal, urine, or tooth extraction	n	n	y	y	y	y	y	n	n
	Sample, milk	n	n	n/a	y	n/a	y	y	n	n
	Tracking	n	n	y	y	y	y	y	y	n
	Ultrasound	n	n	y	y	y	y	y	y	abbreviated
	Weigh	n	n	y	y	y	y	y	y	n
	X-ray	n	n	y	y	y	y	y	n	n
	Forestomach temperature	n	n	n	y	y	y	y	n	n
	Field metabolic rates (requires recapture)	n	n	n	n	y	y	y	n	n

Table 4. Summary of permitted activities and health assessment procedures by age and pregnancy status for Atlantic spotted dolphins. YOY= Young of the year calves.

	Procedures for Atlantic spotted dolphins	Remote activities					Capture and remote activities			
		YoY Calves (birth to ~8 months)	Mothers of YoYs	Calves from 8 months to 1.5 years	Mothers of Calves from 8 months to 1.5 years	Calves > 1.5 years	Non-Calves	1st Trimester Pregnant Females	2nd Trimester Pregnant Females	3rd Trimester Pregnant Females
	Level B activities- Observation; Photo-ID; Photogrammetry; Photograph/Video; UAS	y	y	y	y	y	y	y	y	y
Remote	Remote Biopsy	n	n	y	y	y	y	y	y	y
Remote	Remote tag, Fin-mount free-swimming dolphin	n	n	n	y	y	y	y	y	n
Capture	Capture	n	n	n	n	n	y	y	y	y
Capture	Acoustic, active playback/broadcast	n	n	y	y	y	y	y	n	n
Capture	Acoustic, passive recording	n	n	n	n	n	y	y	n	n
Capture	Auditory brainstem response test	n	n	n	n	n	y	y	on float	n
Capture	Biopsy- skin or skin/blubber	n	n	y	y	y	y	y	y	n
Capture	Instrument, dorsal fin attachment (VHF, satellite-linked tags)	n	n	n	y	y	y	y	y	n
Capture	Instrument, suction cup (DTAG)	n	n	n	n	n	y	y	y	n
Capture	Lavage	n	n	n	n	n	y	y	n	n
Capture	Mark, freeze brand	n	n	n	n	n	y	y	n	n
Capture	Mark, roto tag or fin notch	n	n	n	n	n	y	y	y	y
Capture	Measure	n	n	n	n	n	y	y	y	abbreviated
Capture	Sample, anal or blowhole swab	n	n	n	n	n	y	y	n	n
Capture	Sample, blood	n	n	n	n	n	y	y	y	y
Capture	Sample- fecal, urine, milk, exhaled air, or tooth extraction	n	n	n	n	n	y	y	n	n
Capture	Tracking	n	n	n	y	y	y	y	y	n
Capture	Ultrasound	n	n	n	n	n	y	y	y	abbreviated
Capture	Weigh	n	n	n	n	n	y	y	y	n
Capture	X-ray	n	n	n	n	n	y	y	n	n
Capture	Forestomach temperature	n	n	n	n	n	n	n	n	n
Capture	Field metabolic rates	n	n	n	n	n	n	n	n	n

Appendix 3: NMFS-Approved Personnel and Authorized Recipients for Permit No. 20455. The following individuals are approved pursuant to the terms and conditions under Section C of this permit.

	Activity	PI	CIs																				
		R. Wells	J. Allen	A.	D. Costa	K. Bassos-	E. McCabe	S.	R. Cassoff	M. Cook	A. Fahlman	D. Fauquier	V. Janik	D. Mann	J. Maresh	K. McHugh	M. Moore	L. Sayigh	M. Scott	S. Shippee	C. Toms	P. Tyack	R. Tyson
	Photo-id, Photograph, Video, Photogrammetry	X	X	X		X	X	X	X							X	X		X	X	X		X
	Count/survey	X	X	X		X	X	X	X							X	X		X	X	X		
	Observation, behavior	X	X	X	X	X	X	X	X				X		X	X	X	X	X	X	X	X	X
	UAS- Remote vehicle VTOL								X								X						
	Acoustics	X											X					X	X			X	X
	Remote Biopsy Lead	X	X	X																	X		
	Remote tag, suction-cup	X	X	X									X									X	X
	Remote tag, Finmount free-swimming dolphin	X	X	X															X				
	Tracking	X	X	X	X	X	X	X					X		X	X		X	X	X		X	X
	Lead and conduct Capture/ Release (seine and hoop nets)	X	X	X															X				
	Assist with Capture / Release				X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
Handle	Administer drug, IM or SQ	X										X					X						
Handle	Administer, labeled water	X			X							X			X								
Handle	Instrument, Finmount tag	X	X	X													X		X				
Handle	Instrument, suction-cup tag	X	X	X															X	X			X
Handle	Insert stomach pill	X										X								X			
Handle	AEP Testing									X				X									
Handle	Acoustics, active playback or passive recording	X											X					X	X			X	X
Handle	Esophageal catheter	X									X	X											
Handle	Mark, notch, rototag or freeze-brand	X	X	X								X							X				
Handle	Measure and weigh	X	X	X								X							X				
Handle	Restrain	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Handle	Sample, blood	X										X											
Handle	Sample, skin/blubber biopsy											X											
Handle	Sample, fecal, urine, or milk											X											
Handle	Sample, exhaled air	X										X											
Handle	Sample, lavage	X										X											
Handle	Sample, swab blowhole or anal	X										X											
Handle	Sample, tooth extraction											X											
Handle	Ultrasound											X											

Biological samples authorized for collection or acquisition in Table 1 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit.

Authorized Recipient	Sample Type	Disposition
Cornell University, Animal Health Diagnostic Center, Ithaca, NY	Serum, plasma, and whole EDTA blood	Analysis and curation of remaining samples
John Kucklick, NIST/Hollings Marine Laboratory Charleston, SC	Whole blood, serum, plasma, blubber, skin, milk, urine, feces	
Sylvain DeGuise, University of Connecticut, Storrs, CT	Whole blood, serum	
Marion Neely, NOAA- Hollings Marine Lab, Charleston, SC	Whole blood	
Spencer Fire, Florida Institute of Technology, Melbourne, FL	Blood spot cards, gastric, urine, feces, urine	
Stephanie Venn-Watson, Cynthia Smith National Marine Mammal Foundation San Diego CA	Whole blood, plasma, serum, urine	
Patricia Rosel, NOAA Lafayette, LA	Skin (DMSO)	
Kelly Robinson, University of St. Andrews, St. Andrews, Fife, United Kingdom	Plasma	
Gina Ylitalo, Northwest Fisheries Science Center, Seattle, WA	Plasma	
Michael Walsh, Nicole Stacy, Laurie Adler, Shelby Loos, Ashley Barratclough University of Florida, Gainesville FL	Urine, blowhole swabs, feces, gastric, feces, skin swab, genital swab, plasma	
David Relman, M.D., Stanford University, Palo Alto, CA	Whole blood, urine, feces, swabs, gastric samples	
Debbie Duffield, Portland State University, Portland, OR	Blood	
Megan Stolen, Hubbs-SeaWorld Research, Melbourne Beach, FL	Tooth	
Peggy Ostrom, Sam Rossman Michigan State University, East Lansing, MI	Tooth, skin, plasma, red blood cells	
Michael Moore Woods Hole Oceanographic Institution	Whole blood	
Jay Grimes, Corey Russo University of Southern Mississippi Ocean Springs, MS	Whole blood, skin, swabs (blowhole, fecal, genital)	
Michael Janech, Medical University of South Carolina, Charleston, SC	Whole blood	
Dan Costa Long Marine Lab, Santa Cruz, CA	Serum	
Lance Miller, Melinda Conners, Chicago Zoological Society, Brookfield, IL	Oral fluid, feces	
Craig Harms, North Carolina State University, Morehead City, NC	Plasma, urine	
Leslie Hart, Barbara Beckingham College of Charleston, Charleston, SC	Blubber, urine	
Nick Kellar, Southwest Fisheries Science Center, La Jolla, CA	Blubber	
Rachel Wilson, Florida State University, Tallahassee, FL	Skin	

Appendix 4: Requirements for Minimizing Incidental Take and Effects on Non-target Turtle, Fishes, Submerged Aquatic Vegetation (SAV) and Coral Communities

All incidentally captured species (e.g., turtles and fishes) must be released alive as soon as possible.

a) <u>Sea Turtles</u>

1. Researchers must:
   a. Handle turtles according to procedures specified in 50 CFR 223.206(d)(1)(i) (see below). Use care when handling live animals to minimize any possible injury.

   b. Use appropriate resuscitation techniques on any comatose turtle prior to returning it to the water.

   c. When possible, transfer injured, compromised, or comatose animals to rehabilitation facilities and allow them an appropriate period of recovery before return to the wild.

   d. Have an experienced veterinarian, veterinary technician, or rehabilitation facility (i.e., medical personnel) on call for emergencies.

2. If an animal becomes highly stressed, injured, or comatose during capture or handling or is found to be compromised upon capture, Researchers must forego or cease activities that will further significantly stress the animal (erring on the side of caution) and contact the on call medical personnel as soon as possible. Compromised turtles include animals that are obviously weak, lethargic, positively buoyant, emaciated, or that have severe injuries or other abnormalities resulting in debilitation. One of the following options must be implemented (in order of preference):

   a. Based on the instructions of the veterinarian, if necessary, immediately transfer the animal to the veterinarian or to a rehabilitation facility to receive veterinary care.

   b. If medical personnel cannot be reached, the Permit Holder should err on the side of caution and bring the animal to shore for medical evaluation and rehabilitation as soon as possible.

   c. If the animal cannot be taken to a rehabilitation center due to logistical or safety constraints, allow it to recuperate as conditions dictate, and return the animal to the sea.

i. The Permit Holder is responsible for following the status of any sea turtle transported to rehab as a result of permitted activities and reporting the final disposition (death, permanent injury, recovery and return to wild, etc.) of the animal to the Chief, Permits Division.

1. If holding sea turtles for resuscitation or recovery, Researchers must
   a. Protect sea turtles from temperature extremes (ideal air temperature range is between 70°F and 80°F).

   b. Provide adequate air flow.

   c. Keep sea turtles moist when the temperature is ≥ 75°F (e.g., using moist towels - not placing the turtle in a container filled with water).

   d. Keep the area surrounding the turtle free of materials that could be accidentally ingested.

5. During release, turtles must be lowered as close to the water's surface as possible to prevent injury.

6. Researchers must carefully monitor newly released turtles' apparent ability to swim and dive in a normal manner. If a turtle is not behaving normally within one hour of release, the turtle must be recaptured and taken to a rehabilitation facility.

7. Leatherbacks

   a. Extra care must be exercised when handling and releasing leatherbacks. Leatherbacks have more friable skin and softer bones than hardshell turtles. Researchers must:

      i. Only board leatherbacks if they can be safely brought on the vessel.

      ii. Handle and support leatherbacks from underneath, with one person on either side of the turtle.

      iii. Not turn leatherbacks on their backs.

§ 223.206 Exceptions to prohibitions relating to sea turtles.

(d)(1) *Handling and resuscitation requirements.*

(ii) Any specimen taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

(A) Sea turtles that are actively moving or determined to be dead as described in paragraph (d)(1)(i)(C) of this Section must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

(B) Resuscitation must be attempted on sea turtles that are comatose, or inactive, as determined in paragraph (d)(1) of this Section, by:

(4) Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 up to 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

(5) Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

(6) Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

(C) A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

b) Gulf Sturgeon

i. If a sturgeon is incidentally caught during netting, efforts must be made to return it to neutral buoyancy prior to and during release. Sturgeon tend to inflate their swim bladder when stressed and in air. If the fish has air in its bladder, it will float and be susceptible to sunburn or bird attacks. Air must be released by gently applying ventral pressure in a posterior to anterior direction. The specimen must then be propelled rapidly downward during release.

ii. All efforts must be made to release the animal as soon as possible while minimizing potential harm. This includes keeping the fish in the water to the maximum extent possible.

iii. When tangle netting, Researchers must have equipment (e.g., large hoop net) to safely support and board the fish on the vessel for disentanglement.

iv. From "A protocol for Use of Shortnose, Atlantic, Gulf, and Green Sturgeons" (Kahn and Mohead 2010): When water temperatures are above 73°F for green sturgeon or 77°F for Atlantic, Gulf, or shortnose sturgeon, handling time should be minimized. If the researcher observes a severely stressed sturgeon, efforts should be made to revive the fish and release it in a healthy condition.

c) Smalltooth Sawfish

i. All efforts must be made to release the fish as soon as possible while minimizing potential harm. This includes keeping the fish in the water to the maximum extent possible and cutting the net from the rostrum and body of the animal. Do not attempt to disentangle the rostrum from the net.

ii. Researchers must have equipment (e.g., large hoop net) to safely support and board the fish on the vessel for disentanglement if necessary.

d) Submerged Aquatic Vegetation (SAV) and Coral Communities

i. Researchers must take all practicable steps including the use of charts, GIS, sonar, fish finders, or other electronic devices to determine characteristics and suitability of bottom habitat prior to using gear to identify and avoid conducting net sets on SAV and corals.

ii. No gear may be set, anchored on, or pulled across corals.

iii. If research gear is lost, diligent efforts must be made to recover the lost gear to avoid further damage to benthic habitat and impacts related to "ghost fishing."

Appendix 5. U.S. Fish and Wildlife Service (USFWS) Standard Conditions for Netting in Manatee Habitat

Permittees engaged in netting activities in manatee habitat shall comply with the following conditions to protect manatees during project-related activities:

1. All project personnel shall be informed that manatees may be found in the project area and that there are civil and criminal penalties for harming, harassing, and/or killing manatees, which are protected under the Federal Marine Mammal Protection Act, the Endangered Species Act, and other Federal, State, and Commonwealth laws and regulations.

2. Boat operators must avoid collisions with manatees through prudent seamanship and by adhering to Federal, State, and Commonwealth measures to prevent collisions with manatees, including Permit Conditions 3.(c) and 4.(a) below. In Florida, information about Federal and State manatee speed zones can be found at: http://myfwc.com/wildlifehabitats/managed/manatee/protection-zones/

3. Project personnel shall take steps to avoid the accidental capture of manatees in nets and associated gear. These steps shall include:

    a. Restricting netting activities to between one-half hour after sunrise and one-half hour before sunset.

    b. Monitoring netting sites for at least 15 minutes before deploying gear to ensure that manatees are not in the action area. Manatees must be allowed to leave or pass through the area safely before setting any nets. Animals must not be herded away or harassed into leaving.

    c. Having at least one experienced, dedicated observer watching for manatees during project-related activities and ensuring that all personnel are alert to the presence of manatees. Personnel should be encouraged to use sunglasses with polarized lenses to improve the likelihood of seeing manatees on and below the water's surface.

    d. Monitoring nets and float lines constantly. Stopping all active netting, including vessel movements, when a manatee(s) comes within 100 feet of the action area. Activities may resume when the manatee(s) has moved 100 feet from the area or when it's been 30 minutes since the animal(s) was last seen.

    e. Maintaining gear to minimize the likelihood of entangling manatees. Gear-related lines and ropes must be kept taut and free of kinks and knots. Stiff line or cable should be strung across the mouths of hoop and funnel nets at a perpendicular angle (to form an "X") to prevent manatees from entering these nets.

4. If a manatee is accidentally captured:

   a. Immediately discontinue netting operations and turn off or idle boat motors.

   b. Verify that the animal is entangled in your gear. Manatees occasionally appear in netting operations but are not entangled; they may also test or push against nets without entanglement.

   c. For manatees entangled in gear, these animals are under duress and are known to injure people and damage nets and other gear. Project personnel should exercise extreme caution when in the presence of captured animals.

   d. Monitor the manatee's breathing and behavior to assess its condition. Healthy animals surface to breathe about once every four minutes. Entangling nets, float lines, and other gear should be kept loose enough to allow animals to surface and breathe.

   e. If a manatee's breathing pattern or behavior suggests that the animal is unduly stressed, stop any activities causing or contributing to the animal's distress.

   f. All options for safely and expeditiously removing an animal from entangling gear shall be identified and considered. If it is determined that the animal can be removed without significant risk to human safety, detailed plans, including safety measures, shall be described to project personnel prior to rescuing the animal.

   g. When handling an entangled manatee, the animal's powerful tail should be avoided. Personnel handling entangling gear should avoid getting fingers, arms, legs, etc., caught in gear. Personal belongings that could entangle in gear (loose clothing, wrist watches, jewelry, etc.) should be removed prior to handling entangled animals and gear.

   h. In the case of animals that are not seriously entangled, plans should consider releasing tension on entangling gear to enable an animal to free itself. For more seriously entangled manatees, plans will likely include pulling, unwrapping, cutting, etc., entangling gear from the animal's head, trunk, tail, and/or flippers.

   i. If a manatee is entangled in a seine net, the best course of action is to stop and open the set, creating as large a window as possible for the manatee to swim out of. If the net set has been completed, one end of the net should be released and a window in the net circumference should be opened to allow the manatee to swim out.

j. If in the opinion of project personnel the manatee cannot be rescued without significant risk to human safety, authorized stranding responders shall be contacted for assistance. In Florida, the Florida Fish and Wildlife Conservation Commission's Wildlife Alert dispatcher shall be called for assistance. (See "To Report Accidental Manatee Captures" for contact information).

k. In the event that stranding responders assist with a rescue, project personnel shall aid and support responders as directed to safely and expeditiously rescue the animal.

l. All accidental manatee captures shall be reported immediately to State or Commonwealth wildlife officials. In Florida, the Florida Fish and Wildlife Conservation Commission's Wildlife Alert dispatcher must be notified. Within 24 hours of an accidental manatee capture, captures must also be reported to manatee staff at the USFWS's North Florida Ecological Services Office, the local USFWS ecological services office (if different), and to the Chief of Permits, NMFS, Permits and Conservation Division. (See "To Report Accidental Manatee Captures" for contact information.)

m. Within 30-days of an accidental capture, the permittee shall submit a written report to manatee staff at the USFWS's North Florida Ecological Services Office, the local USFWS ecological services office (if different), and to the Chief of Permits, NMFS, Permits and Conservation Division describing the circumstances and gear that led to the capture of the manatee, the condition of the animal, steps taken to rescue the animal, and any recommendations to prevent and minimize any future entanglements.

5. In the event an accidental capture results in injury to or the death of a manatee:

a. Project activities must stop and State or Commonwealth wildlife officials must be contacted immediately. In Florida, the Florida Fish and Wildlife Conservation Commission's Wildlife Alert dispatcher must be notified. (See "To Report Accidental Manatee Captures" for contact information).

b. Authorized stranding responders shall be asked to provide aid to injured animals and, in the event of a death, to salvage the carcass.

c. Injured animals shall be treated by a licensed and experienced veterinarian or by experienced animal care staff working in consultation with a licensed and experienced veterinarian.

d. In the event of a death, a necropsy should be performed by a qualified veterinarian or by persons experienced in marine mammal necropsies to evaluate the cause of death. In Florida, manatee necropsies are conducted by the State's Marine Mammal Pathobiology Laboratory.

e. Within 24 hours of a manatee injury or death, the event must be reported to manatee staff at the USFWS's North Florida Ecological Services Office, the local USFWS ecological services office (if different), and to the Chief of Permits, NMFS, Permits and Conservation Division.

f. Within 30-days of an injury or death, the permittee shall submit a written report to the USFWS and NMFS describing the circumstances and gear that led to the injury or death of the manatee and the steps taken to rescue the animal. The report shall include information from attending responders, veterinarian(s) and/or staff and shall include descriptions of injuries and trauma, likely causes of injuries, trauma, or death, and any recommendations to minimize future injuries or death.

6. USFWS, in consultation with NMFS and other appropriate authorities (including State or Commonwealth officials) and individuals, will review all event-related information and will recommend to NMFS if, in USFWS' opinion, the project should be authorized to continue as permitted, continue with modifications necessary to prevent additional injuries or deaths from occurring, or if permit revocation procedures should be initiated.

7. To Report Accidental Manatee Captures, Including Injured and Dead Manatees:

   a. NMFS, Permits and Conservation Division
      Phone: 301-427-8401

   b. Florida Fish and Wildlife Conservation Commission, Wildlife Alert
      Phone: 888 404-3922

   c. USFWS, North Florida Ecological Services Office
      Phone: 904-731-3336 and FAX: 904-731-3045