NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7
BIOLOGICAL OPINION

Title: Biological Opinion on the Issuance of Permit No. 17304-03 for Scientific Research on Sea Turtles in the Gulf of Mexico

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

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Donna S. Wieting
Director, Office of Protected Resources

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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 insure 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 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 concurs 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 an 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 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 the NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter referred to as "the Permits Division") for its issuance of a scientific research permit (Appendix A) pursuant to section 10(a)(1)(A) of the ESA. Permit No. 17304-03 authorizes the capture of green (North Atlantic distinct population segment (DPS)), hawksbill, Kemp's ridley, and loggerhead (Northwest Atlantic DPS) sea turtles in the Gulf of Mexico from the Florida/Alabama border to the Louisiana/Texas border. The Permits Division proposes to issue the scientific research Permit No. 17304-03 modification to authorize the capture of an additional one-hundred green (North Atlantic DPS) sea turtles in the Gulf of Mexico and expand the research area along the Texas coast from the Louisiana/Texas border to the Texas/Mexico border.

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 (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 the NMFS opinion on the effects of these actions on ESA-listed species and designated critical habitat. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

This ongoing research is the continuation of a project that began in 2013 under Permit No. 17304. The original permit authorized the capture via hand/rodeo, tangle net, dip net, strike net, and trawl with marking, biological sampling, tagging and recapture of green (North Atlantic DPS), hawksbill, Kemp's ridley, and loggerhead (Northwest Atlantic) sea turtles in the Gulf of Mexico from the Florida/Alabama border to the Louisiana/Texas border. The Permit modification No. 17304-01 authorized an increase to the number of permitted animals that could receive tracking devices. The Permit modification No. 17304-02 authorized an additional capture technique of trawling within the action area of the Florida/Alabama border to the Louisiana/Texas border in the Gulf of Mexico.

In partnership with the Bureau of Ocean Energy Management (BOEM), the researchers are initiating a new project as part of the Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS). The overall intent of GoMMAPPS is to collect broad-scale surveys for protected species to inform the distribution and abundance of marine animals across years and seasons. This information will help BOEM and the Bureau of Safety and Environmental Enforcement assess the risk to sea turtles of various activities associated with oil and gas operations in the GoM. The U.S. Geological Survey will be leading the sea turtle portion of the GoMMAPPS project which involves capturing, sampling and tracking turtles in BOEM's central and western planning areas. This project is funded by BOEM for five years.

The Permit modification No. 17304-03 would expand the action area to authorize capture from the Louisiana/Texas border to the Texas/Mexico border in the Gulf of Mexico into BOEM's central and western planning areas. In addition, one-hundred more green (North Atlantic DPS) sea turtles would be authorized for capture and research.

1.2 Consultation History

The following dates are important to the history of the current consultation:

- The permit application was submitted and early technical assistance/review of the permit was requested of the ESA Interagency Cooperation Division on February 8, 2017.
- On February 22, 2017, the NMFS Permits Division deemed the application complete.
- On February 22, 2017, the completed initiation package was sent from the NMFS Permits Division to the ESA Interagency Cooperation Division.

- On May 10, 2017, the ESA Interagency Cooperation Division initialized formal consultation on Permit No. 17304-03.

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), and 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. In this Section, we also identify those *Species and Designated Critical Habitat Not Likely to be Adversely Affected* (Section 6.1), and those *Species and Designated Critical Habitat Likely to be Adversely Affected* (Section 6.2).

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 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 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 and stock assessment reports)
- 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 is the issuance of the scientific research Permit No. 17304-03 modification to Kristen Hart, U.S. Geological Survey, Wetland and Aquatic Research Center, pursuant to section 10(a)(1)(a) of the ESA, to conduct research on green (North Atlantic DPS), hawksbill, Kemp's ridley, and loggerhead (Northwest Atlantic DPS) sea turtles.

The purpose of the proposed permit modification is the continuation of a long-term project studying green (North Atlantic DPS), hawksbill, Kemp's ridley, and loggerhead (Northwest Atlantic DPS) sea turtles. Turtles will be captured via hand/rodeo, tangle net, dip net, strike net, and trawl for marking, biological sampling, and recapture to study their ecology, genetic origin, and habitat use patterns. The proposed annual take of each sea turtle species under Permit No. 17304-03 is found in Table 1. Each action is summarized below. Detail as to procedures within the proposed action can be found within the current biological opinion for Permit No. 17304-02 (NMFS 2016b).

Table 1. Proposed annual take of sea turtles under Permit No. 17304-03.

Species	Listing Unit	Number of Animals	Take Action	Collect Method	Procedures
Green Sea Turtle	North Atlantic DPS[1]	180	Capture/ Handle/ Release	Hand, Tangle/Dip/Rodeo/ Strike Net or Capture under another authority[5]	Epibiota removal; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Weigh
Green Sea Turtle	North Atlantic DPS[1]	20	Capture/ Handle/ Release	Hand, Tangle/Dip/Rodeo/ Strike Net or Capture under another authority[5]	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag)[4]; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh
Hawksbill Sea Turtle	Range-wide	20	Capture/ Handle/ Release	Hand, Tangle/Dip/Rodeo/ Strike Net or Capture under another authority[5]	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag)[4]; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh
Loggerhead Sea Turtle	Northwest Atlantic DPS[1]	200	Capture/ Handle/ Release	Hand, Tangle/Dip/Rodeo/ Strike Net or Capture under another authority[5]	Epibiota removal; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Weigh
Loggerhead Sea Turtle	Northwest Atlantic DPS[1]	100	Capture/ Handle/ Release	Hand, Tangle/Dip/Rodeo/ Strike Net or Capture under another authority[5]	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag)[4]; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh
Kemp's Ridley Sea Turtle	Range-wide	210	Capture/ Handle/ Release	Hand, Tangle/Dip/Rodeo/ Strike Net or Capture under another authority[5]	Epibiota removal; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Weigh
Kemp's Ridley Sea Turtle	Range-wide	90	Capture/ Handle/ Release	Hand, Tangle/Dip/Rodeo/ Strike Net or Capture under another authority[5]	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag)[4]; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh

[1]DPS=distinct population segment; [2]PIT=passive integrated transponder; [3]VHF=very high frequency; [4]No more than three tags on an animal at one time: acoustic data logger (ADL), acoustic, and satellite; [5]Capture under another authority from relocation trawling.

3.1 Capture

Researchers will bottom-trawl throughout Louisiana waters out to three nautical miles and in depths ranging from six to forty feet. Exact locations will be randomly selected immediately

prior to each sampling trip, but will be decided based upon locations of dredging projects and sea turtle hotspots. A fifty-four foot long diesel aluminum research vessel will serve as the research vessel. A turtle excluder device (TED) will not be used, but large-mesh webbing will be used to minimize fisheries by-catch. The deployed trawl net will be forty-two feet wide at the mouth, three feet wide at the top of the cod end, and two and a half feet wide at the tail of the cod end. Nets will be brought on board using winches, and sea turtles will be removed and immediately checked for health status and existing tags. Nets will be in the water for a total of forty-two minutes, with a bottom time of thirty minutes. Trawl speeds will be up to 3.5 knots. Trawls will occur throughout the year for one week at each location and eight weeks throughout a year.

3.2 Handling, Restraint, and Release

Researchers will exercise care when handling sea turtles to minimize any possibility of injury. During all measurements and sampling, sea turtles will be sheltered from direct sunlight, wind, and rain. Under severe weather conditions or an unforeseen emergency requiring a return to shore, researchers will secure tubs carrying sea turtles to the bottom of the boat and transport them to shore. During transport and holding on land, sea turtles will remain in the tubs with towels over their heads. Turtles captured using netting techniques will be released at the capture site within thirty minutes of capture, or twelve hours of capture if captured by trawl and satellite tagged. Holding time for each animal will not exceed the amount of time necessary to measure, weigh, tag, examine, and collect samples. Under normal circumstances, an individual will be held for approximately thirty minutes. When biotelemetric instruments are attached, holding time may increase to a maximum twelve hours. Certified large animal carriers will be used for transport and short-term holding of turtles. If an animal is captured that requires veterinary treatment, it will be transported to the veterinary facility in a certified large animal carrier with a wet absorbent pad covering it to keep it cool. Sea turtles will be released roughly where they were captured. During release, sea turtles will be lowered as close to the water's surface as possible to prevent potential injuries. All newly released sea turtles will be observed by researchers, and researchers will document the sea turtle's apparent ability to swim and dive in a normal manner. As soon as conditions allow, researchers will return each sea turtle near the capture site (no more than five nautical miles away) over the side of the vessel, away from the propeller, and only after ensuring that the vessel’s propeller is in the neutral, or disengaged, position. Turtles shall be kept no longer than twelve hours prior to release (to allow transmitter epoxy to dry and transport). At the conclusion of the study, sea turtles that are tagged with transmitters may be recaptured to remove the transmitter gear. Should they not be recaptured, the transmitters would eventually be shed by normal surface flaking of the carapace scutes. Satellite tags generally remain on a sea turtle from four to six months to less than two years.

3.3 Flipper and Passive Integrated Transponder Tagging

All sea turtles captured in the study will be checked for existing flipper tags and scanned for existing internal passive integrated transponder (PIT) tags. If any turtle has not been previously tagged, an Inconel tag will be applied to the trailing edge of the rear flipper typically in either the

first (closest to the body) or second scale, using the standard technique described in the Marine Turtle Specialist Group Manual on Research Techniques (Eckert et al. 1999). Recaptured turtles will not be retagged unless tag loss has occurred. Double tagging with PIT and flipper tags minimizes the probability of complete tag loss of sampled turtles during the study. These tags are expected to last several years. Flipper tags will be placed on the trailing edge of each rear flipper. If the recommended tagging site is damaged or is unsuitable for tag application, then an alternative site will be used. All tagging equipment will be cleaned with isopropyl alcohol before each use and between sea turtles, and 10 percent povidine-iodine will be applied to the tag site before and after inserting the tag to prevent infection. A separate set of applicators will be used with sea turtles afflicted with fibropapillomatosis (FP). Tag applicators will also be routinely inspected and discarded when they cease to function properly. The applicant will make certain that the locking mechanisms are correctly aligned and that the tag locks in place. However, care should be taken to ensure tags are not cinched too tight against the flipper without room to move freely, and that the tag is not applied too far into the edge of the flipper and is strategically located to accommodate future growth in young turtles. Ideally, twenty-five to thirty-three percent of the tag should extend beyond the edge of the flipper after application. Tag applicators (pliers) will be cleaned and disinfected with alcohol swabs between sea turtles to avoid cross contamination. Should a sea turtle not have a PIT tag, one will be inserted subcutaneously into a front flipper or into the fleshy area dorsal to the flipper claw, using a disposable pre-sterilized needle applicator to eliminate the possibility of cross contamination. Prior to the insertion of any tag, the skin in the target area will be scrubbed with an antiseptic. PIT needles will then be disposed of after each application. PIT tags are read with a scanner and are designed to last the life of the turtle. If a previously tagged sea turtle is missing any of its original tags, replacement tags will be applied.

3.4 Satellite Tagging

A subset of turtles will be fitted with transmitters. Satellite tags may be attached alone or as a combination with archival or acoustic/radio transmitting tags. Each attachment will be made as hydrodynamically as possible, so that there is no risk of entanglement. Attaching up to threeminiature transmitters on the same individual provides valuable data relating to tag failure and animal mortality. No more than three tags will be placed on a large sea turtle at any one time. Before satellite transmitter attachment, the carapace of each sea turtle will be scrubbed and cleaned with isopropyl alcohol and epibionts removed. Satellite and accelerometer tags (which are part of the satellite tag) will be attached using a two-part cool setting epoxy (Superbond) to secure the transmitter to the carapace. Satellite transmitters will be attached just behind the highest point of the carapace where the first and second vertebral scutes meet to minimize drag. Drying time varies from twenty to sixty minutes, depending on ambient temperatures and humidity. Transmitters will not exceed five percent of the sea turtle's body weight, and attachment materials will be configured and streamlined to minimize effects of buoyancy and drag on the sea turtle's swimming ability. Based on tag configurations and battery life, researchers anticipate that tags will remain attached to sea turtles for approximately one year.

Accelerometer (which would be attached along with a satellite tag) attachment follows the same protocol used for affixing satellite tags. Acoustic tags will be attached at the base of the carapace near the tail using small holes drilled through the outer edges of the marginal scutes and the instrument will be wired and glued in place using stainless steel wire and crimps and a small amount of West Marine putty/epoxy. The wire serves as a corrosive link, as it degrades after approximately three years. The epoxy emits no odor and produces minimal heat when activated. A new drill bit will be used for each tagged sea turtle. If bleeding occurs during the drilling process, the procedure will cease, and sterile gauze will be applied with pressure to the area of bleeding until it stops. Vigilant care will be made to avoid epoxy or drilling coming in contact with marginal seams (sutures) and/or the sea turtle's soft tissue. Drying time varies from twenty to thirty minutes, depending on ambient temperatures and humidity. All of the edges and corners of the tag application will be smoothed to minimize any potential for entanglement and to help maintain as much of a hydrodynamic surface as possible. Care will be taken to avoid fumes in holding box or use of solvents or solvent rags close to the head. Once the epoxy is properly cured, sea turtles will be released back into the water at the point of capture. Precautions will be taken to avoid any of epoxy dripping onto or otherwise touching the rest of the sea turtle. Adequate ventilation around the head of the sea turtle will be provided during the attachment, in order to ensure that any fumes are not inhaled. The sea turtle's head will also be protected using a towel, and researchers will wipe off any materials that might be dripping. Handling time during capture activities should be minimized to reduce the potential for additional stress. Satellite tags will remain on a sea turtle for less than two years. When tagged animals are opportunistically recaptured, transmitters may be removed.

3.5 Morphometrics

All captured and recaptured sea turtles would be measured, weighed, and photographed. Straight carapace length will be measured from the nuchal notch to the posterior-most portion of the rear marginals using standard calipers while curved carapace length will be measured using a flexible cloth measuring tape (Eckert et al. 1999). Each sea turtle will also be weighed using a digital scale or appropriate-sized spring scale. Sea turtles would be placed in a sling, and the sling will be hung from the scale. For small sea turtles (less than twenty kilograms), the scale would be held by hand. For sea larger turtles (greater than twenty kilograms), the scale will be hung from a tripod. Researchers will exercise caution to ensure that sea turtles are not dropped or injured during weighing activities. Sea turtles will also be photographed/videoed and carefully examined. Sea turtles with FP will be kept separate from other sea turtles and separate sets of measuring, weighing and tagging gear will be used. Each set of equipment will be used to measure and weigh sea turtles will be cleaned and disinfected with a mild disinfectant solution before each sea turtle is measured. Sea turtles will be monitored to ensure that they are breathing, and examined for injuries, barnacles, or any abnormalities.

3.6 Blood Sampling

Blood samples will be taken from the dorsal cervical sinus immediately after sea turtles are safely secured on deck. The skin at the sampling site will be scrubbed for a minimum of thirty seconds with water and ten percent provo-iodine or other antiseptic (i.e., ninety-one percent isopropyl alcohol) to avoid infection. To facilitate bleeding of the cervical sinus, sea turtles will be positioned so that their head is lower than the body. The blood sample will be taken using a twenty-one gauge, 1 to 1.5 inch vacutainer needle (Owens and Ruiz 1980), researchers will use smaller needles (25 gauge, 0.5 inch) to obtain samples from smaller sea turtles. Researchers will ensure that the total volume of blood taken from each sea turtle would not exceed one milliliter per one kilogram of sea turtle weight and for sea turtles weighing less than one kg, a single blood sample would not exceed six percent of the sea turtle's total blood volume. Due to permit conditions, attempts (needle insertions) to extract blood from the neck will be limited to a total of four with two attempts allowed for either side of the neck. During blood sampling, precautions will be taken to prevent a back and forth, or rocking movement of the needle once it is inserted. No blood sample will be taken should conditions on the boat preclude the safety and health of the turtle. No more than three milliliters per kilogram per animal would be collected.

3.7 Biopsy

All sea turtles will be tissue sampled once, and researchers will make sure that recaptures are not sampled a second time in any given year. Following established procedures (Dutton and Balazs 1995) researchers will obtain tissue samples using a new sterile biopsy punch (standard four to six millimeter) from the posterior edge of a rear flipper of each sea turtle. The sample site will be properly cleaned and disinfected to prevent infection. After the tissue sample has been taken, slight pressure will be applied to the area using gauze and a disinfectant until there is no visible bleeding. A new sterile biopsy punch will be used on each animal.

3.8 Lavage

Dietary samples will be carefully extracted from the captured sea turtles using gastric lavage or stomach flushing as described in Forbes (1999) and Makowski et al. (2006). The lavage process flushes food items that are in the esophagus and mouth areas (Legler 1977; Balazs 1980; Forbes and Limpus 1993; NMFS 2016b). Sea turtles will be held on their back with their posterior end slightly elevated. After the sea turtle's mouth was opened, a standard veterinary canine oral speculum or similar mouth gag (small or medium, depending on the size of the sea turtle) will be inserted just posterior to the anterior tip of the rhamphotheca to keep the jaws from closing. A soft plastic veterinarian's stomach tube will be lubricated with vegetable oil and cautiously inserted into the mouth and down the length of the esophagus. Tube sizes will vary with the size of the individual sea turtle to avoid esophageal damage. Two sizes of surgical tubes will be available, as well as a separate set for FP sea turtles. Seawater will be pumped through the tube, and the tube will then be gently moved back and forth along the length of the esophagus. The returning flow or the injected water out of the mouth carrying food particles will be collected in a sampling container held below. The gastric lavage procedure will not exceed three minutes in

order to reduce the chance of the sea turtle inhaling during the process. After food samples are collected, the use of the bilge pump will cease and water and food then allowed to drain, until flow ceases. To assist with drainage, the anterior end of the sea turtle will be placed lower than the rest of the body. The tube will be removed first followed by the removal of the gag, and the head will be elevated to allow for drainage of any remaining water towards the esophagus. Sea turtles will be held in this position until regular breathing resumes. Only one sample will be obtained per individual. All lavage equipment will be disinfected between animals. No severely compromised or sick animals will be lavaged.

3.9 Carapace Sampling and Marking

Researchers will collect carapace samples for long-term stable isotope sampling. Two samples be will collect from the third lateral scute, (right side preferably). The sample site will be cleaned and disinfected before and after the procedure to prevent infection. A sterile six-millimeter biopsy punch will be used to obtain the sample, ensuring that all layers of the scute are removed. A new biopsy punch will be used to take a second scute sample adjacent to the first. The carapace of the sea turtle will be dried with a towel prior to marking. Once the carapace is dry, a non-toxic commercially-available resin paint pen will be used to mark an area on the carapace that is approximately six by six inches. The paint will be used to mark the sea turtle with a specific number for identification and tracking. The paint dries within ten minutes, and is expected to wear off after about a month. Researchers will wear nitrile gloves, and the sea turtles will be held in the shade to prevent over-heating.

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 use, apart from the action under consideration. For the issuance of Permit No.17304-03, there are no interrelated or interdependent actions.

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 proposed action would occur in the Gulf of Mexico from the Florida/Alabama border to the Texas/Mexico border (Figure 1). The figure shows the sampling location for current Permit No. 17304-02 (light blue) and area that is requested in this amendment for Permit No. 17304-03 (pink and red). The red polygon represents the area where the researchers are requesting direct captures (hand/rodeo, tangle net, dip net) and the pink polygon represents an estimate of the area that is requested to sample turtles via trawl and those caught during legal trawling activities. This request does not include sampling in the Flower Gardens Bank National Marine Sanctuary or any other protected area (except Padre Island National Seashore).

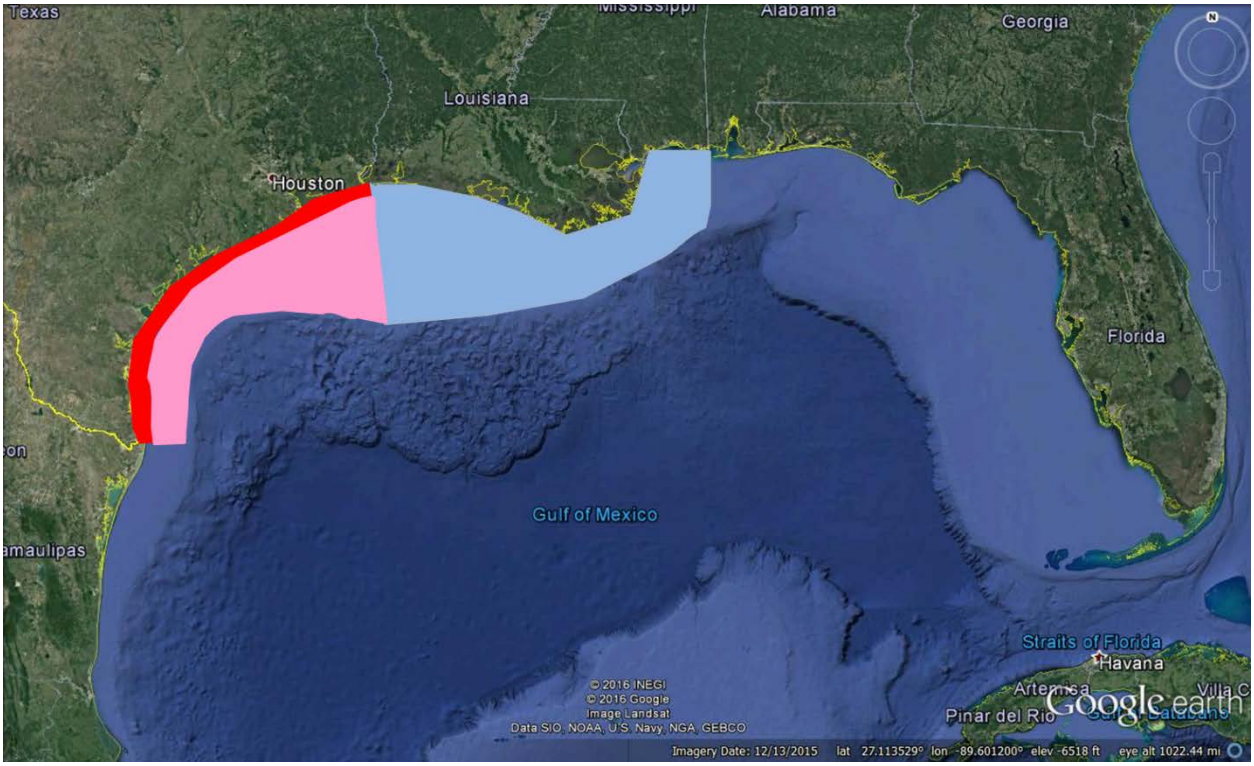


Figure 1. Action area for Permit No. 17304-03 in the Gulf of Mexico. The sampling location for Permit No. 17304-02 (light blue) and the area that is being requested in this amendment for Permit No. 17304-03 (pink and red).

6 STATUS OF ENDANGERED SPECIES ACT PROTECTED RESOURCES

This section identifies the ESA-listed species that potentially occur within the action area that may be affected by the issuance of Permit No. 17301-03. It then summarizes the biology and ecology of those species and what is known about their life histories in the action area. The species and designated critical habitat potentially occurring within the action area are ESA-listed in Table 2, along with each regulatory status.

Table 2. ESA-listed species and designated critical habitat that may be affected by the issuance of Permit No. 17304-03.

Species	ESA Status	Critical Habitat	Recovery Plan
Green sea turtle (*Chelonia mydas*) North Atlantic DPS	Threatened 81 FR 20057 04/06/2016	Designated, Not in the Action Area	FR Notice Not Available U.S. Atlantic 1991
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered 35 FR 8491 06/02/1970	Designated; Not in the Action Area	57 FR 38818 U.S. Caribbean, Atlantic, and Gulf of Mexico 1992
Loggerhead sea turtle (*Caretta caretta*) Northwest Atlantic DPS	Threatened 76 FR 58868 09/22/2011	79 FR 39856 2014	74 FR 2995 Northwest Atlantic 2009
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered 35 FR 18319 12/02/1970	Not Designated	75 FR 12496 U.S. Caribbean, Atlantic, and Gulf of Mexico (2nd) 2011
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered 35 FR 8491 06/02/1970	Designated; Not in the Action Area	63 FR 28359 U.S. Caribbean, Atlantic, and Gulf of Mexico 1991
Smalltooth sawfish (*Pristis pectinata*) U.S. portion of range	Endangered 68 FR 15674 04/01/2003	Designated; Not in the Action Area	74 FR 3566 2009
Sperm Whale (*Physeter macrocephalus*)	Endangered 35 FR 18319 12/02/1970	None Designated	75 FR 81584 Range-wide 2010
Bryde's Whale (*Balaenoptera edeni*) Northern Gulf of Mexico stock	NMFS proposed Endangered 12/08/2016	None Desginated	N/A

6.1 Species and Designated Critical Habitat Not Likely to be Adversely Affected

NMFS uses two criteria to identify the ESA-listed or critical habitat that are not likely to be adversely affected by the proposed action, as well as the effects of activities that are interrelated to or interdependent with the Federal agency's proposed action. The first criterion is exposure, or some reasonable expectation of a co-occurrence, between one or more potential stressors associated with the proposed activities and ESA-listed species or designated critical habitat. If we conclude that an ESA-listed species or designated critical habitat is not likely to be exposed to the proposed activities, we must also conclude that the species or critical habitat is not likely to be adversely affected by those activities.

The second criterion is the probability of a response given exposure. ESA-listed species or designated critical habitat that is exposed to a potential stressor but is likely to be unaffected by the exposure is also not likely to be adversely affected by the proposed action. We applied these criteria to the species ESA-listed in Table 2, and we summarize our results below.

An action warrants a "may affect, not likely to be adversely affected" finding when its effects are wholly *beneficial, insignificant* or *discountable*. *Beneficial* effects have an immediate positive effect without any adverse effects to the species or habitat. Beneficial effects are usually

discussed when the project has a clear link to the ESA-listed species or its specific habitat needs and consultation is required because the species may be affected.

Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. That means the ESA-listed species may be expected to be affected, but not harmed or harassed.

Discountable effects are those that are extremely unlikely to occur. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action and that would be an adverse effect if it did impact a listed species), but it is very unlikely to occur.

The species and designated critical habitat that are not likely to be adversely affected are found in Table 3.

Table 3. Species and designated critical habitat in the action area that will not likely be adversely affected by Permit No. 17301-03.

Species	ESA Status	Critical Habitat
Loggerhead sea turtle critical habitat (*Caretta caretta*) Northwest Atlantic DPS	Threatened 76 FR 58868 09/22/2011	79 FR 39856 2014
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered 35 FR 8491 06/02/1970	Designated; Not in the Action Area
Smalltooth sawfish (*Pristis pectinata*) U.S. portion of range	Endangered 68 FR 15674 04/01/2003	Designated; Not in the Action Area
Sperm Whale (*Physeter macrocephalus*)	Endangered 35 FR 18319 12/02/1970	None Designated
Bryde's Whale (*Balaenoptera edeni*) Northern Gulf of Mexico stock	NMFS proposed Endangered 12/08/2016	None Desginated

6.1.1 Loggerhead Sea Turtle, Designated Critical Habitat

In 2014, NMFS designated critical habitat for loggerhead (Northwest Atlantic DPS) sea turtles (79 FR 39856). The specific areas identified by NMFS were included because they provide protection to loggerhead sea turtles which include Neritic (nearshore reproductive, foraging, winter, breeding, and migratory) and *Sargassum* habitat.

The study area may overlap with designated critical habitat for loggerhead sea turtles. However, the expansion of the research area will not affect more than what was previously analyzed in the biological opinion for the original Permit No. 17304 and subsequent modification of Permit No. 17304-02 (NMFS 2013a, 2016b). The manner of work will not change and permit conditions

mitigate the effect of research on aquatic vegetation. It is extremely unlikely that the research activities will affect this designated critical habitat, therefore, the actions are discountable. We concur with the Permits Division that the issuance of Permit No. 17304-03 is not likely to adversely affect the designated critical habitat for loggerhead (Northwest Atlantic DPS) sea turtles.

6.1.2 Leatherback Sea Turtle

Additional listed species may occur in the expanded research area, such as leatherback sea turtles. However, due to the nature and timing of the activities, and that the activities are directed to specific sea turtle species, other turtles are not expected to be affected by the research. In addition, leatherback sea turtles have no previously been encountered during the past three years of research. If these species are encountered, researchers will cease activities until the animals have left the area. Researchers will not approach non-target species. The effects of the proposed research on leatherback sea turtles was analyzed in the previous biological opinions for the original Permit No. 17304 and subsequent modification of Permit No. 17304-02 (NMFS 2013a, 2016b) and was determined not likely to be adversely affected. It is extremely unlikely that the research activities will affect these species, therefore, the actions are discountable.

6.1.3 Smalltooth Sawfish

The historical range of the endangered smalltooth sawfish is found in the proposed research area. However, the expansion of the research as proposed will not increase the risk of encountering this species since smalltooth sawfish are found mainly in the peninsula of Florida and have not been recently observed in the proposed new research area. The affect to smalltooth sawfish has already been analyzed in the biological opinion for Permit No. 17304-02 (NMFS 2016b) and had the determination of not likely to be adversely affected. It is extremely unlikely that the research activities will affect smalltooth sawfish, therefore, the actions are discountable.

We concur with the Permits Division that the issuance of Permit No. 17304-03 is not likely to adversely affect the smalltooth sawfish and they are not addressed further in this opinion.

6.1.4 Sperm and Bryde's Whales

ESA-listed cetacean species may occur in the action area, but would not be affected by the proposed research due to mitigation measures for marine mammals included in the draft permit (Appendix A). Sperm whales are widely distributed toothed whale found in all major oceans. The Bryde's whale is a widely distributed baleen whale found in tropical and subtropical oceans. The Gulf of Mexico subspecies of Bryde's whale is found in the northeastern Gulf of Mexico near De Soto Canyon. The occurrence of these two species in the action area is rare. The directed focus of the research should avoid any ESA-listed cetaceans in the action area. If a whale is observed, it would be avoided and the vessel would operate at a reduced speed while maintain a distance of one hundred yards. Therefore, no ESA-listed cetaceans would be exposed to the effects of the proposed action.

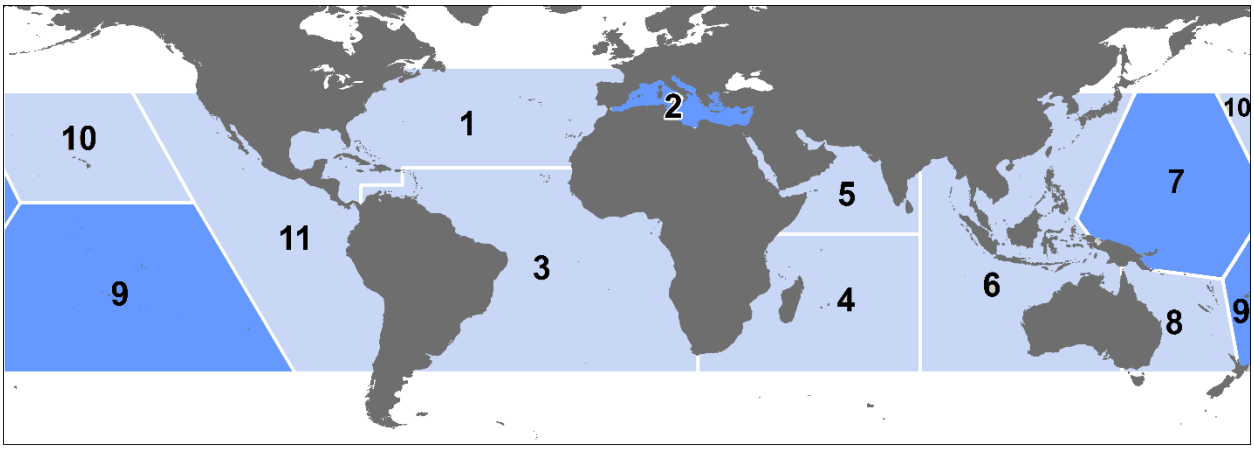
We concur with the Permits Division that the issuance of Permit No. 17304-03 is not likely to adversely affect leatherback sea turtles and ESA-listed cetaceans, so they are not addressed further in this opinion.

6.2 Species and Critical Habitat Likely to be Adversely Affected

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.

6.2.1 Green Sea Turtle, North Atlantic Distinct Population Segment

The green sea turtle is globally distributed and commonly inhabits nearshore and inshore waters, occurring throughout tropical, subtropical and, to a lesser extent, temperate waters (Figure 2). The North Atlantic DPS green turtle is found in the north Atlantic Ocean and Gulf of Mexico (Figure 3).



Threatened (light blue) and endangered (dark blue) green turtle DPSs:
1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11. East Pacific.

Figure 2. Map depicting range and distinct population segment boundaries for green turtles.

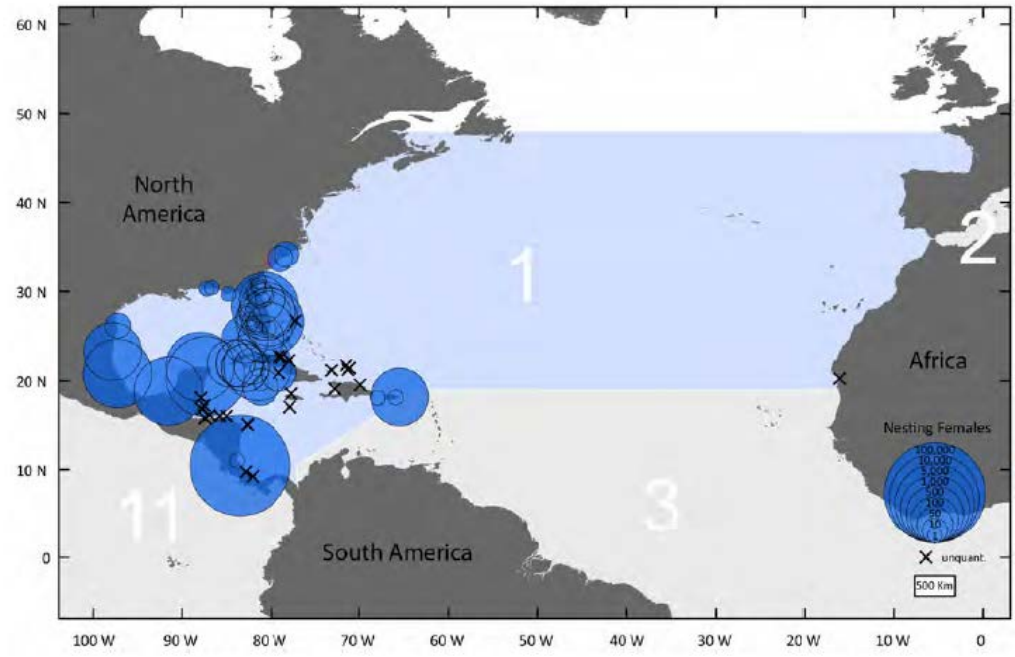


Figure 3. Geographic range of the North Atlantic distinct population segment green turtle, with location and abundance of nesting females (Seminoff et al. 2015).

The green sea 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 (1 meter) (Figure 4).

Figure 4. Green sea turtle. Credit: Mark Sullivan, NOAA.

The species was listed under the ESA on July 28, 1978 (43 FR 32800). 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 4). The North Atlantic DPS is listed as threatened.

Table 4. Summary of North Atlantic distinct population segment green sea turtle listing and recovery plan information.

Species	Common Name	Distinct Population Segment	ESA Status	Critical Habitat	Recovery Plan
Chelonia mydas	Green sea turtle	North Atlantic DPS	Threatened 81 FR 20057 04/06/2016	63 FR 46693 Puerto Rico 1998	FR Notice Not Available U.S. Atlantic 1991

We used information available in the 2007 Five Year Review (NMFS and USFWS 2007a) and 2015 Status Review (Seminoff et al. 2015) to summarize the life history, population dynamics and status of the species, as follows.

Life History

Age at first reproduction for females is twenty to forty years. Green sea turtles lay an average of three nests per season with an average of 100 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. After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. Adult turtles exhibit site fidelity and migrate hundreds to thousands of kilometers from nesting beaches to foraging areas. Green sea 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.

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 sea turtle.

Worldwide, nesting data at 464 sites indicate that 563,826 to 564,464 females nest each year. The North Atlantic DPS of green turtles has an estimated 30,058 to 64,396 female nesters in 2010 with an increasing population (Seminoff et al. 2015). For the North Atlantic DPS, the 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 4 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).

Green turtles from the North Atlantic DPS range from the boundary of South and Central America (7.5°N, 77°W) in the south, throughout the Caribbean, the Gulf of Mexico, and the U.S. Atlantic coast to New Brunswick, Canada (48°N, 77°W) in the north. The range of the DPS then extends due east along latitudes 48°N and 19°N to the western coasts of Europe and Africa. Nesting occurs primarily in Costa Rica, Mexico, Florida and Cuba.

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 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); U.S. (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 30,052-64,396 (Seminoff et al. 2015). In the U.S., green turtles nest primarily along the central and southeast coast of Florida where an estimated 8,426 females nest annually.

Critical Habitat

On September 2, 1998, NMFS designated critical habitat for green sea turtles (63 FR 46694), which include coastal waters surrounding Culebra Island, Puerto Rico. Seagrass beds surrounding Culebra provide important foraging resources for juvenile, subadult and adult green sea 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. The designated critical habitat is not found in the action area of this proposed permit.

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 (NMFS and USFWS 1991a, 1998). 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.

6.2.2 Hawksbill Sea Turtle

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

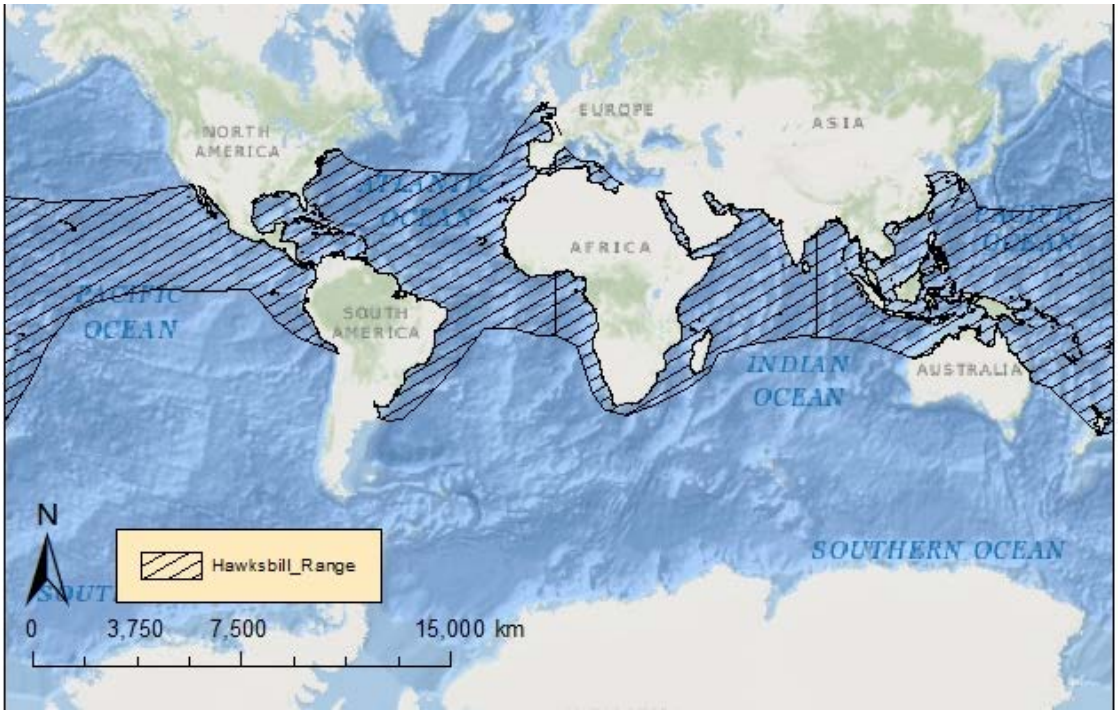


Figure 5. Map identifying the range of the endangered hawksbill sea turtle.

The hawksbill sea 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).

Figure 6. Hawksbill sea turtle. Credit: Jordan Wilkerson.

The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and listed as endangered under the ESA since 1973 (Table 5).

Table 5. Summary of Hawksbill sea turtle listing and recovery information.

Species	Common Name	Distinct Population Segment	ESA Status	Critical Habitat	Recovery Plan
Eretmochelys imbricata	Hawksbill sea turtle	N/A	Endangered 35 FR 8491 06/02/1970	63 FR 46693 Atlantic 1998	57 FR 38818 U.S. Caribbean, Atlantic and Gulf of Mexico 1992

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

Life History

Hawksbill sea turtles reach sexual maturity at 20 to 40 years of age. Females return to their natal beaches every 2 to 5 years to nest (an average of 3 to 5 times per season). Clutch sizes are large (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 cm 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 sea 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 (Miller et al. 1998; Horrocks et al. 2001).

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 eighty eight nesting sites worldwide indicate that 22,004 to 29,035 females nest annually (NMFS and USFWS 2013). 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 fifteen 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 and USFWS 2013).

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 sea 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; Monzón-Argüello 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 (Musick and Limpus 1997; Bjorndal and Bolten 2010).

Status

Long-term data on the hawksbill sea turtle indicate that sixty-three sites have declined over the past twenty to one-hundred years (historic trends are unknown for the remaining twenty-five sites). Recently, twenty-eight sites (68 percent) have experienced nesting declines, ten have experienced increases, three have remained stable, and forty-seven have unknown trends. The greatest threats to hawksbill sea 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 one-hundred 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 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 199-332 nesting females annually, and the other sites combined host 51-85 nesting females annually (NMFS and USFWS 2007b). Within the U.S., hawksbills are most common in Puerto Rico and its associated islands and in the U.S. Virgin Islands. In the continental U.S., hawksbills are found primarily in Florida and Texas, though they have been recorded in all the Gulf States and along the east coast as far north as Massachusetts. In Florida, hawksbills are observed on the reefs off Palm Beach, Broward, Miami-Dade, and Monroe Counties. Most sightings involve post-hatchlings and juveniles. These small turtles are believed to originate from nesting beaches in Mexico.

Critical Habitat

On September 2, 1998, NMFS established critical habitat for hawksbill sea turtles around Mona and Monito Islands, Puerto Rico (63 FR 46693). Aspects of these areas that are important for hawksbill sea turtle survival and recovery include important natal development habitat, refuge from predation, shelter between foraging periods, and food for hawksbill sea turtle prey. The designated critical habitat for hawksbill does not occur in the action area for the proposed permit.

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 sea 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

6.2.3 Loggerhead Sea Turtle, Northwest Atlantic Distinct Population Segment

Loggerhead sea turtles are circumglobal, 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 7).

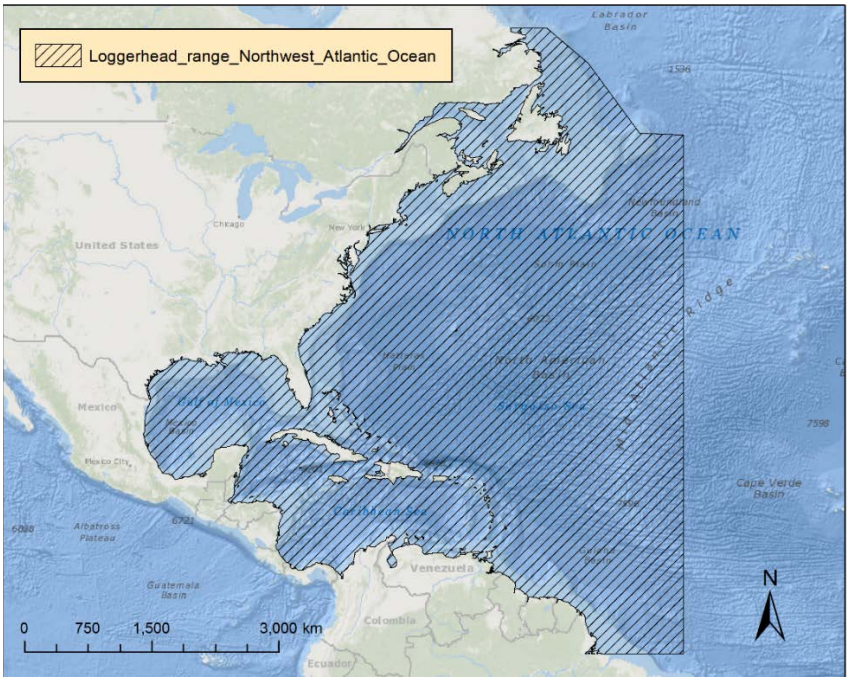


Figure 7. Map identifying the range of the Northwest Atlantic loggerhead sea turtle.

The loggerhead sea turtle is distinguished from other turtles by its reddish-brown carapace, large head and powerful jaws (Figure 8). The species was first listed as threatened under the ESA in 1978 (43 FR 32800).

Figure 8. Loggerhead sea turtle. Credit: NOAA.

On September 22, 2011, the NMFS designated nine distinct population segments of loggerhead sea turtles, with the Northwest Atlantic Ocean DPS listed as threatened (75 FR 12598) (Table 6).

Table 6. Summary of Northwest Atlantic Ocean distinct population segment loggerhead turtle listing and recovery information.

Species	Common Name	Distinct Population Segment	ESA Status	Critical Habitat	Recovery Plan
Caretta caretta	Loggerhead sea turtle	Northwest Atlantic	Threatened 76 FR 58868 09/22/2011 43 FR 32800 07/28/1978	79 FR 39856 Atlantic and GOM 2014	74 FR 2995 Notice Northwest Atlantic 2009

We used information available in the 2009 Status Review (Conant et al. 2009) and the final listing rule (76 FR 58868) to summarize the life history, population dynamics and status of the species, as follows.

Life History

Mean age at first reproduction for female loggerhead sea turtles is thirty 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.

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 sea 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 DPS is estimated at 20,000 to 40,000 females, and 53,000 to 92,000 nests annually (NMFS SEFSC 2009). Based on genetic information, 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 2008).

The Peninsular Florida Recovery Unit hosts more than 10,000 females nesting annually, which constitutes eighty-seven 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 one hundred nests annually in Cay Sal in the Bahamas (NMFS and USFWS 2008).

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 sixty nesting females (NMFS and USFWS 2007d).

The Gulf of Mexico Recovery Unit has between one hundred to 999 nesting females annually, and a mean of 910 nests per year.

The population growth rate for each of the four of the recovery units for the Northwest Atlantic DPS (Peninsular Florida, Northern, Northern Gulf of Mexico, and Greater Caribbean) all exhibit 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 2007d).

The nesting subpopulation in the Florida panhandle has exhibited a significant declining trend from 1995 to 2005 (NMFS and USFWS 2007d; Conant et al. 2009). Recent model estimates predict an overall population decline of seventeen percent for the St. Joseph Peninsula, Florida subpopulation of the Northern Gulf of Mexico recovery unit (Lamont et al. 2014).

Based on genetic analysis of nesting subpopulations, the Northwest Atlantic Ocean DPS is further divided into five recovery units: Northern, Peninsular Florida, Dry Tortugas, Northern Gulf of Mexico, and Greater Caribbean (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 ten 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 (seventy-one to eighty-eight 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).

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 Within the Action Area

The greatest concentration of loggerheads occurs in the Atlantic Ocean and the adjacent Caribbean Sea, primarily on the Atlantic coast of Florida, with other major nesting areas located

on the Yucatán Peninsula of Mexico, Columbia, Cuba, and South Africa (Márquez 1990; LGL Ltd. 2007). Among the five subpopulations (also termed recovery units) in the Northwest Atlantic Ocean DPS, loggerhead females lay 53,000-92,000 nests per year in the southeastern US and the Gulf of Mexico, and the total number of nesting females are 32,000-56,000 (TEWG 1998; NMFS 2001).

Loggerheads associated with the South Florida recovery unit occur in higher frequencies in the Gulf of Mexico (where they represent about 10 percent of the loggerhead captures). The peninsular Florida recovery unit is the largest loggerhead nesting assemblage in the Northwest Atlantic Ocean DPS. A near-complete state-wide nest census (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 2008). The statewide estimated total for 2010 was 73,702 (FFWCC 2016). The 2010 index nesting number is the largest since 2000. With the addition of data through 2010, the nesting trend for the Northwest Atlantic Ocean DPS is slightly negative and not statistically different from zero (no trend) (NMFS and USFWS 2010).

An analysis of Florida index nesting beach data shows a 26 percent nesting decline between 1989 and 2008, and a mean annual rate of decline of 1.6 percent despite a large increase in nesting for 2008, to 38,643 nests (NMFS and USFWS 2008; Witherington et al. 2009; www.myfwc.com 2016). In 2009, nesting levels, while still higher than the lows of 2004, 2006, and 2007, dropped below 2008 levels to approximately 32,717 nests, but in 2010, a large increase was seen, with 47,880 nests on the index nesting beaches (FFWCC 2016). Although not directly comparable to these index nesting numbers, nesting counts from 2011-2015 have shown a generally stable trend (www.seaturtle.org 2016).

The south Florida recovery unit of loggerheads may be critical to the survival of the species in the Atlantic because of the recovery unit's size, and in the past it was considered second in size only to the Oman nesting aggregation (NMFS and USFWS 1991b). The South Florida recovery unit increased at about 5.3 percent per year from 1978-1990, and was initially increasing at 3.9-4.2 percent after 1990. An analysis of nesting data from 1989-2005, a period of more consistent and accurate surveys than in previous years, showed a detectable trend and, more recently (1998-2005), analysis revealed evidence of a declining trend of approximately 22.3 percent (FFWCC 2006, 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 (www.nmfs.noaa.gov/pr 2006). Based on the small sizes of almost all nesting aggregations in the Atlantic, the large numbers of individuals killed in fisheries, and the decline of the only large nesting aggregation, the DPS is determined to be in decline (Conant et al. 2009).

Critical Habitat

NMFS has designated critical habitat for the Northwest Atlantic Ocean DPS loggerhead sea turtles. On July 10, 2014, NMFS and the U.S. Fish and Wildlife Service designated critical habitat for the Northwest Atlantic Ocean DPS loggerhead sea turtles along the U.S. Atlantic and Gulf of Mexico coasts from North Carolina to Mississippi (79 FR 39856) (Figure 10). These areas contain one or a combination of nearshore reproductive habitat, winter area, breeding areas, and migratory corridors. The critical habitat is categorized into thirty-eight occupied marine areas and 685 miles of nesting beaches. The physical or biological features and 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.

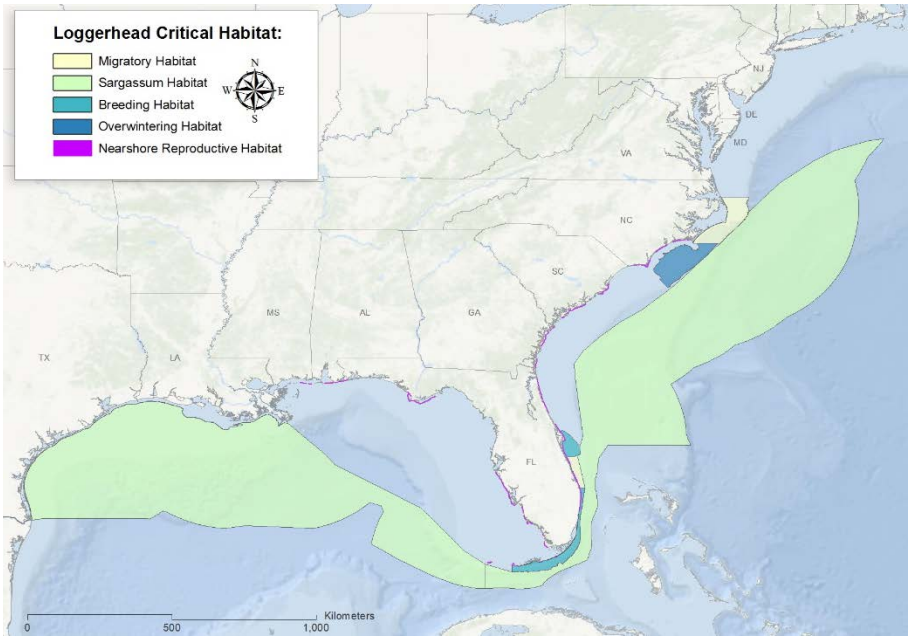


Figure 9. Map identifying designated critical habitat for the Northwest Atlantic distinct population segment loggerhead sea turtles.

Recovery Goals

See the 2009 Final Recovery Plan for the Northwest Atlantic Population 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.

6.2.4 Kemp's Ridley Sea Turtle

The Kemp's ridley turtle is considered to be the most endangered sea turtle, internationally (Zwinenberg 1977; Groombridge 1982; TEWG 2000). 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 10).

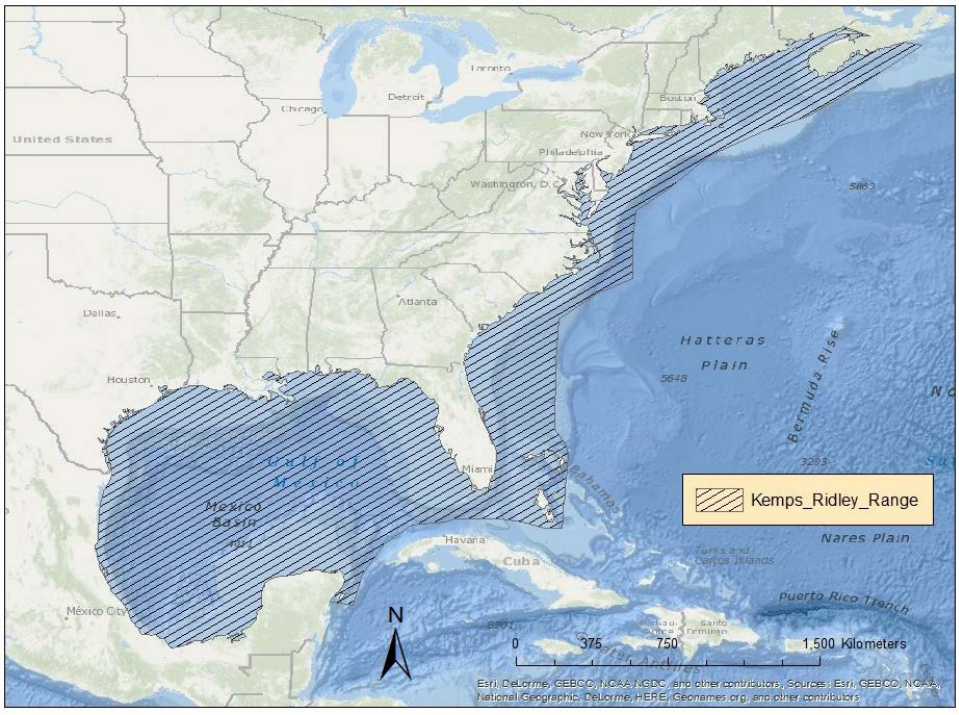


Figure 10. Map identifying the range of the Kemp's ridley sea turtle.

Kemp's ridley sea turtles the smallest of all sea turtle species, with a nearly circular top shell and a pale yellowish bottom shell (Figure 11).

Figure 11. Kemp's ridley sea turtle. Credit: National Oceanic and Atmospheric Administration.

The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and listed as endangered under the ESA since 1970 (Table 7).

Table 7. Summary of Kemp's ridley sea turtle listing and recovery information.

Species	Common Name	Distinct Population Segment	ESA Status	Critical Habitat	Recovery Plan
Lepidochelys kempii	Kemp's ridley sea turtle	Range-wide	Endangered 35 FR 18319 12/02/1970	Not Designated	75 FR 12496 U.S. Caribbean, Atlantic, and Gulf of Mexico (2nd) 2011

We used information available in the revised recovery plan (NMFS and USFWS 2011) and the Five-Year Review (NMFS and USFWS 2015) to summarize the life history, population dynamics and status of the species, as follows.

Life History

Females mature at twelve 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 ninety-seven to one hundred 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 sea turtles use these nearshore coastal habitats from April through November, but move towards more suitable overwintering habitat in deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops. 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 and USFWS 2011).

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 sea 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 and USFWS 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 and USFWS 2015).

From 1980 to 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased fifteen 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 and USFWS 2011). 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 occurs from the Gulf of Mexico and along the Atlantic coast of the U.S. (TEWG 2000). Kemp's ridley sea 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 and USFWS 2011).

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 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 (USFWS and NMFS 1992; TEWG 2000). 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 14-16 percent (TEWG 2000; USFWS 2002; Heppell et al. 2005). 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 et al. 1997; USFWS 2006; Rostal 2007). Considering remigration rates, the population included approximately 7,000 to 8,000 adult female turtles at that time (Márquez et al. 1989; TEWG 2000; Rostal 2007). The 2007 nesting season included an arribada of over 4,000 turtles over a three-day period at Rancho Nuevo (NMFS and USFWS 2007c). The increased recruitment of new adults is illustrated in the proportion of first time nesters, which has increased from 6 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.

Critical Habitat

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

Recovery Goals

See the 2011 Final Bi-National (U.S. and Mexico) Revised Recovery Plan for Kemp's ridley sea 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 ridley sea 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 U.S. and Mexican laws.

7) Implement international agreements.

8) Enforce laws.

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).

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° 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° 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 ºCelsius 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 (Mazaris et al. 2008; Reina et al. 2009; Robinson et al. 2009; Fuentes et al. 2010).

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 (Simmonds and Eliott 2009; Schumann et al. 2013).

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 1965-2005 correlated with a 40 *percent* increase in cyclone activity in the Atlantic. Sea levels have risen an average of 1.7 mm/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 mm/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. 2009; Fuentes et al. 2010; Fuentes et al. 2011). Smaller individuals likely experience increased predation (Fuentes et al. 2011).

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. 2002). 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.

7.2.1 Federal Activities

Threatened and endangered sea turtles are adversely affected by several types of fishing gears used throughout the action area. Gillnet, longline, other types of hook-and-line gear, trawl gear, and pot fisheries have all been documented as interacting with sea turtles. Available information suggests sea turtles can be captured in any of these gear types when the operation of the gear overlaps with the distribution of sea turtles. For all fisheries for which there is a fishery management plan (FMP) or for which any federal action is taken to manage that fishery, impacts have been evaluated under section 7. Formal section 7 consultation have been conducted on the following fisheries, occurring at least in part within the action area, found likely to adversely affect threatened and endangered sea turtles: Atlantic bluefish, Atlantic herring, Atlantic mackerel/squid/butterfish, Atlantic sea scallop, Atlantic swordfish/tuna/shark/billfish, coastal migratory pelagic, dolphin-wahoo, Gulf of Mexico reef fish, monkfish, Northeast multispecies, South Atlantic snapper-grouper, Southeast shrimp trawl, spiny dogfish, red crab, skate, commercial directed shark, summer flounder/scup/black sea bass fisheries, tilefish, Atlantic highly migratory species fishery, Gulf of Mexico /South Atlantic spiny lobster, and Gulf of Mexico stone crab. An Incidental Take Statement has been issued for the take of sea turtles in each of the fisheries. A brief summary of each consultation is provided below but more detailed information can be found in the respective biological opinions.

NMFS found the operation of the Atlantic bluefish fishery was likely to adversely affect Kemp's ridley and loggerhead sea turtles, but not likely to jeopardize their continued existence (NMFS 2010a). The majority of commercial fishing activity in the North and Mid-Atlantic occurs in the late spring to early fall, when bluefish (and sea turtles) are most abundant in these areas (NMFS 2005).

NMFS' consultation on the Atlantic Herring fishery FMP concluded that the federal herring fishery may adversely affect loggerhead, leatherback, Kemp's ridley, and green sea turtles as a result of capture in gear used in the fishery, but not jeopardize their continued existence. NMFS currently authorizes the use of trawl, purse seine, and gillnet gear in the commercial herring fishery (64 FR 4030). There is no direct evidence of takes of ESA-listed species in the herring fishery from the NMFS sea sampling program. However, observer coverage of this fishery has been minimal. Sea turtles have been captured in comparable gear used in other fisheries that occur in the same area as the herring fishery. Consultation on the Atlantic herring fishery was reinitiated on March 23, 2005, due to new information on the effects of the fishery on the Gulf of Maine DPS of Atlantic salmon and sea turtles. That consultation was completed in February 2010 and determined that the herring fishery is not likely to adversely affect any ESA-listed species, including sea turtles. Murray (2006) estimated zero sea turtle takes in trawl gear by the Atlantic herring fishery. In addition, over the five year period from 2004 to 2008, higher than normal observer coverage occurred in the herring fishery, without any observed takes of sea turtles.

The Atlantic mackerel/squid/butterfish fisheries are managed under a single FMP that includes both the short-finned squid and long-finned squid fisheries. The most recent biological opinion concluded that the continued authorization of the FMP was likely to adversely affect sea turtles, but not jeopardize their continued existence (NMFS 2010g). Trawl gear is the primary fishing gear for these fisheries, but several other types of gear may also be used, including hook-and-line, pot/trap, dredge, pound net, and bandit gear. Entanglements or entrapments of sea turtles have been recorded in one or more of these gear types.

It was previously believed that the Atlantic sea scallop fishery was unlikely to take sea turtles given differences in depth and temperature preferences for sea turtles and the optimal areas where the fishery occurs. However, after the reopening of a closed area in the mid-Atlantic, and the accumulation of more extensive observer effort, NMFS conducted a formal section 7 consultation on the fishery. NMFS concluded that operation of the fishery may adversely affect loggerhead, Kemp's ridley, green, and leatherback sea turtles as a result of capture in scallop dredge and/or trawl gear.

The Atlantic highly migratory species (HMS) pelagic fisheries for swordfish, tuna, and billfish are known to incidentally capture large numbers of sea turtles, particularly in the pelagic longline component. Pelagic longline, pelagic driftnet, bottom longline, and/or purse seine gear have all been documented taking sea turtles. A permanent prohibition on the use of driftnet gear in the swordfish fishery was published in 1999.

NMFS completed a consultation on the continued authorization of the coastal migratory pelagic fishery in the Gulf of Mexico and South Atlantic (NMFS 2007). In the Gulf of Mexico, hook-and-line, gillnet, and cast net gears are used. Gillnets are the primary gear type used by commercial fishermen in the South Atlantic regions as well, while the recreational sector uses hook-and-line gear. The hook-and-line effort is primarily trolling. The biological opinion

concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by operation of the fishery. However, the proposed action was not expected to jeopardize the continued existence of any of these species.

The South Atlantic FMP for the dolphin-wahoo fishery was approved in December 2003. NMFS's consultation concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by the longline component of the fishery, but it was not expected to jeopardize their continued existence (NMFS 2003). In addition, pelagic longline vessels can no longer target dolphin-wahoo with smaller hooks because of hook size requirements in the pelagic longline fishery.

The incidental take for sea turtles specified in the February 2005 biological opinion on the Gulf of Mexico reef fish fishery was substantially exceeded in 2008 by the bottom longline component of the fishery. In May 2009, NMFS published an emergency rule, which was intended to reduce the number of sea turtle takes by the reef fish fishery in the short-term while the Gulf of Mexico Fishery Management Council develops long-term measures in Amendment 31 to the Reef Fish Fishery Management Plan. The new biological opinion, which considered the continued authorization of reef fish fishing under the Reef Fish Fishery Management Plan, including any measures proposed in Amendment 31, was completed October 2009.

The federal monkfish fishery occurs from Maine to the North Carolina/South Carolina border and is jointly managed by the New England Fishery Management Council and Mid-Atlantic Fishery Management Council, under the Monkfish FMP (NMFS 2010b). The current commercial fishery operates primarily in the deeper waters of the Gulf of Maine, Georges Bank, and southern New England, and effort has recently increased dramatically in the mid-Atlantic. The monkfish fishery uses several gear types that may entangle sea turtles, including gillnet, trawl gear and scallop dredges, which are the principal gear types that have historically landed monkfish. Monkfish (also known as "goosefish" or "angler") are found in inshore and offshore waters from the northern Gulf of St. Lawrence to Florida, although primarily distributed north of Cape Hatteras. As fishing effort moves further south, there is a greater potential for interactions with sea turtles.

Following an event in which over 200 sea turtle carcasses washed ashore in an area where large mesh gillnetting had been occurring, NMFS published new restrictions for the use of gill nets with larger than 8-inch stretched mesh, in the exclusive economic zone off of North Carolina and Virginia (67 FR 71895, December 3, 2002). This rule was in response to a direct need to reduce the impact of this fishery on sea turtles. The rule was subsequently modified on April 26, 2006, by modifying the restrictions to the use of gillnets with greater than or equal to 7-inch stretched mesh when fished in federal waters from the North Carolina/South Carolina border to Chincoteague, Virginia.

Multiple gear types are used in the Northeast Multispecies fishery FMP, which manages 15 different commercial fisheries. Data indicated that gear type of greatest concern is the sink gillnet gear, which has taken loggerhead and leatherback sea turtles (i.e., in buoy lines and/or net

panels). The Northeast multi species sink gillnet fishery has historically occurred from the periphery of the Gulf of Maine to Rhode Island in water as deep as 360 feet. In recent years, more of the effort in the fishery has occurred in offshore waters and into the Mid-Atlantic. Participation in this fishery has declined because extensive groundfish conservation measures have been implemented; the latest of these occurring under Amendment 13 to the Multispecies FMP. Consultation on the Northeast Multispecies fishery was reinitiated on April 2, 2008, based on new information on the capture of loggerhead sea turtles in this fishery (NMFS 2010c).

The South Atlantic snapper-grouper fishery uses spear and powerhead, black sea bass pot, and hook-and-line gear. Hook-and-line gear used in the fishery includes commercial bottom longline gear and commercial and recreational vertical line gear (e.g., handline, bandit gear, and rod-and-reel). The consultation found only hook-and-line gear likely to adversely affect, green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles.

The Southeast shrimp trawl fishery affects more sea turtles than all other activities combined (NRC 1990). Revisions to the TED regulations (68 FR 8456, February 21, 2003), requiring larger openings in TEDs enhanced the TED effectiveness in reducing sea turtle mortality resulting from trawling. This determination was based, in part, on the opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl related mortality by 94 percent for loggerheads and 97 percent for leatherbacks. Interactions between sea turtles and the shrimp fishery may also be declining because of reductions of fishing effort unrelated to fisheries management actions. In recent years, low shrimp prices, rising fuel costs, competition with imported products, and the impacts of recent hurricanes in the Gulf of Mexico have all impacting the shrimp fleets; in some cases reducing fishing effort by as much as 50 percent for offshore waters of the Gulf of Mexico (GMFMC 2007).

Indirect effects of shrimp trawling on sea turtles would include the disturbance of the benthic habitat by the trawl gear. The effect bottom trawls have on the seabed is mainly a function of bottom type. In areas where repeated trawling occurs, fundamental shifts in the structure of the benthic community have been documented (Auster et al. 1996) which may affect the availability of prey items for foraging turtles. The overall effect to benthic communities that may result from long-term and chronic disturbance from shrimp fishing is not understood and needs further evaluation.

The primary gear types for the spiny dogfish fishery are sink gillnets, otter trawls, bottom long line, and driftnet gear (NMFS 2010d). Spiny dogfish are landed in every state from Maine to North Carolina, throughout a broad area with the distribution of landings varying by area and season. During the fall and winter months, spiny dogfish are captured principally in Mid-Atlantic waters from New Jersey to North Carolina. During the spring and summer months, spiny dogfish are landed mainly in northern waters from New York to Maine. Sea turtles can be incidentally captured in all gear sectors of this fishery. Although there have been delays in implementing the FMP, quota allocations are expected to be substantially reduced over the 4.5-year rebuilding schedule; this should result in a substantial decrease in effort directed at spiny dogfish. The

reduction in effort should be of benefit to protected turtle species by reducing the number of gear interactions that occur.

The red crab fishery is a pot/trap fishery that occurs in deep waters along the continental slope. There have been no recorded takes of ESA-listed species in the red crab fishery. However, given the type of gear used in the fishery, takes of loggerhead and leatherback sea turtles may be possible where gear overlaps with the distribution of ESA-listed species. The red crab commercial fishery has traditionally been composed of less than six vessels fishing trap gear. The fishery appears to have remained small (approximately two vessels) through the mid-1990's. But between 1995 and 2000 there were as many as five vessels with the capacity to land an average of approximately 78,000 pounds of red crab per trip. Following concerns that red crab could be overfished, an FMP was developed and became effective on October 21, 2002.

Traditionally, the main gear types used in the skate fishery (NMFS 2010h) include mobile otter trawls, gillnet gear, hook and line, and scallop dredges, although bottom trawling is by far the most common gear type with gillnet gear is the next most common gear type. The Northeast skate complex is comprised of seven different skate species. The seven species of skate are distributed along the coast of the northeast United States from the tide line to depths exceeding 700m (383 fathoms). There have been no recorded takes of ESA-listed species in the skate fishery. However, given that sea turtles interactions with trawl and gillnet gear have been observed in other fisheries, sea turtle takes in gear used in the skate fishery may be possible where the gear and sea turtle distribution overlap.

The commercial HMS Atlantic shark fisheries (NMFS 2008a) uses bottom longline and gillnet gear. The recreational sector of the fishery uses only hook-and-line gear. To protect declining shark stocks the proposed action seeks to greatly reduce the fishing effort in the commercial component of the fishery. These reductions are likely to greatly reduce the interactions between the commercial component of the fishery and sea turtles.

The Summer Flounder, Scup and Black Sea Bass fisheries (NMFS 2010e) are known to interact with sea turtles. Otter trawl gear is used in the commercial fisheries for all three species. Floating traps and pots/traps are used in the scup and black sea bass fisheries, respectively. Significant measures have been developed to reduce the take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl (which would include fisheries for other species like scup and black sea bass). TEDs are required throughout the year for trawl nets fished from the North Carolina/South Carolina border to Oregon Inlet, North Carolina, and seasonally (March 16-January 14) for trawl vessels fishing between Oregon Inlet, North Carolina, and Cape Charles, Virginia.

The North Carolina inshore fall southern flounder gillnet fishery was identified as a source of large numbers of sea turtle mortalities in 1999 and 2000, especially loggerhead sea turtles. In 2001, NMFS issued an ESA section 10 permit to North Carolina with mitigated measures for the southern flounder fishery. Subsequently, the sea turtle mortalities in these fisheries were

drastically reduced. The reduction of sea turtle mortalities in these fisheries reduces the negative effects these fisheries have on the environmental baseline.

The management unit for the tilefish fishery management plan is all golden tilefish under United States jurisdiction in the Atlantic Ocean north of the Virginia/North Carolina border. Tilefish have some unique habitat characteristics, and are found in a warm water band (8 to 18° C) approximately 250 to 1200 feet deep on the outer continental shelf and upper slope of the U. S. Atlantic coast. Because of their restricted habitat and low biomass, the tilefish fishery in recent years has occurred in a relatively small area in the Mid-Atlantic Bight, south of New England and west of New Jersey.

The Atlantic HMS and Associated Fisheries are known to take sea turtles via pelagic longline, pelagic driftnet, bottom longline, hand line (including bait nets), and/or purse seine gear. The opinion analyzed the effects of proposed regulatory modifications to the HMS fishery management plan that address the impacts of the HMS pelagic longline fishery on endangered green, hawksbill, Kemp's ridley, and leatherback sea turtles and on threatened loggerhead sea turtles. However, the proposed action was not expected to jeopardize the continued existence of any of these.

Based on limited observer data available, NMFS also anticipates that continued operation of the U.S. shark drift gillnet portion of the fishery would result in the capture of loggerhead sea turtles, leatherbacks, Kemp's ridley sea turtles, and hawksbill sea turtles. NMFS anticipates that continued operation of the bottom longline fishery component would result in the capture of loggerhead sea turtles, leatherback, Kemp's ridley, green, and hawksbill sea turtles. Since potential for take in other HMS fisheries is low, NMFS anticipated that the proposed action was not expected to jeopardize the continued existence of any of these.

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

The commercial Gulf of Mexico/South Atlantic spiny lobster fishery (NMFS 2013c) consists of diving, bully net and trapping sectors; recreational fishers are authorized to use bully net and hand-harvest gears. The consultation determined that, although evidence that the commercial

trap sector of the fishery adversely affects these species, the continued authorization of the fishery would not jeopardize the continued existence of green, hawks bill, Kemp's ridley leatherback, and loggerhead sea turtles.

The Gulf of Mexico stone crab fishery (NMFS 2013c) is unique in that only the claws of the crab are harvested (Muller et al. 2006). The fishery operates primarily nearshore and fishing techniques have changed little since the implementation of the federal Stone Crab Fishery Management Plan. The commercial and recreational fishery consists of trap/pot, and recreational hand harvest. Stone crab traps are known to adversely affect sea turtles via entanglement and forced submergence. The fishery is currently management through spatial-temporal closures, effort limitations, harvest limitations, permit requirements, trap construction requirements, and a passive trap limitation program managed by the State of Florida. Recreational fishers must follow the same guidelines as commercial fishers unless otherwise noted. The consultation determined the continued authorization of the fishery would not jeopardize the continued existence of green, hawksbill, Kemp's ridley leatherback, and loggerhead sea turtles.

7.2.2 State or Private Activities

Various fishing methods used in state fisheries, including trawling, pot fisheries, fly nets, and gillnets are known to incidentally take listed species, but information on these fisheries is sparse (NMFS SEFSC 2001). Although few of these state regulated fisheries are currently authorized to incidentally take listed species, several state agencies have approached NMFS to discuss applications for a section 10(a)(1)(B) incidental take permit. Since the NMFS issuance of a section 10(a)(1)(B) permit requires formal consultation under section 7 of the ESA, the effects of these activities are considered in section 7 consultation. Any fisheries that come under a section 10(a)(1)(B) permit in the future will likewise be subject to section 7 consultation. Although the past and current effects of these fisheries on listed species is currently not determinable, NMFS believes that ongoing state fishing activities may be responsible for seasonally high levels of observed stranding of sea turtles on both the Atlantic and Gulf of Mexico coasts. Most of the state data are based on extremely low observer coverage or sea turtles were not part of data collection; thus, these data provide insight into gear interactions that could occur but are not indicative of the magnitude of the overall problem. In addition to the lack of interaction data, there is another issue that complicates the analysis of impacts to sea turtles from these fisheries. Certain gear types may have high levels of sea turtle takes, but very low rates of serious injury or mortality. For example, the hook and line takes rarely result in death, but trawls and gillnets frequently do. Leatherbacks seem to be susceptible to a more restricted list of fisheries, while the hard shelled turtles, particularly loggerheads, seem to appear in data on almost all of the state fisheries.

Other state bottom trawl fisheries that are suspected of incidentally capturing sea turtles are the horseshoe crab fishery in Delaware and the whelk trawl fishery in South Carolina and Georgia. In South Carolina, the whelk trawling season opens in late winter and early spring when offshore bottom waters are greater than 55°F. One criterion for closure of this fishery is water

temperature: whelk trawling closes for the season and does not reopen throughout the state until six days after water temperatures first reach 64°F in the Fort Johnson boat slip. Based on the South Carolina Department of Natural Resources Office of Fisheries Management data, approximately six days will usually lapse before water temperatures reach 68°F, the temperature at which sea turtles move into state waters. From 1996-1997, observers onboard whelk trawlers in Georgia reported a total of three Kemp's ridley, two green, and two loggerhead sea turtles captured in 28 tows for a catch per unit effort of 0.3097 turtles/100 ft. net hour. As of December 2000, turtle exclusion devices are required in Georgia state waters when trawling for whelk. Trawls for cannonball jellyfish and Florida try nets may also be a source of interactions.

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

Georgia and South Carolina prohibit gillnets for all but the shad fishery. This fishery was observed in South Carolina for one season by the NMFS Southeast Fishery Science Center (McFee et al. 1996). No takes of protected species were observed. Florida banned all but very small nets in state waters, as has the state of Texas. Louisiana, Mississippi, and Alabama have also placed restrictions on gillnet fisheries within state waters such that very little commercial gillnetting takes place in southeast waters, with the exception of North Carolina. Gillnetting activities in North Carolina associated with the southern flounder fishery had been implicated in large numbers of sea turtle mortalities. The Pamlico Sound portion of that fishery was closed and has subsequently been reopened under a section 10(a)(1)(B) permit.

Pound nets are a passive, stationary gear that are known to incidentally capture loggerhead sea turtles in Massachusetts, Rhode Island, New Jersey, Maryland, New York (Morreale and Standora 1998), Virginia (Bellmund et al. 1987), and North Carolina (Epperly et al. 2000). Although pound nets are not a significant source of mortality for loggerheads in New York (Morreale and Standora 1998) and North Carolina (Epperly et al. 2000), they have been implicated in the stranding deaths of loggerheads in the Chesapeake Bay from mid-May through early June (Bellmund et al. 1987). Pound net leaders with greater than or equal to 12 inches (30.5 cm) stretched mesh and leaders with stringers have been documented to incidentally take sea turtles (Bellmund et al. 1987; NMFS SEFSC 2001).

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

Recreational fishermen have reported hooking turtles when fishing from boats, piers, and beach, banks, and jetties. Commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines have also reported hooked turtles. A detailed summary of the known impacts of hook and line incidental captures to loggerhead sea turtles can be found in the Turtle Expert Working Group reports (TEWG 1998, 2000, 2007).

7.3 Vessel Strikes

Potential sources of adverse effects from federal vessel operations in the action area and throughout the range of sea turtles include operations of the U.S. Navy and the U.S. Coast Guard, which maintain the largest Federal vessel fleets, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (NOAA), and the Army Corps of Engineers. NMFS has conducted formal consultations with the U.S. Navy and the U.S. Coast Guard, and NOAA on their vessel operations. Through the ESA section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to ESA-listed species. At the present time, however, they present the potential for some level of interaction.

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 4 km/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 and along the Atlantic coast, frequent injury and mortality could affect sea turtles in the region. Hazel et al. (2007) suggested that green sea 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 U.S. and the Gulf of Mexico has several hundred thousand recreational vessels registered, including Florida with nearly one million which is the highest number of registered boats in the United States (USCG 2003, 2005; NMMA 2007). Private and commercial vessel operations also have the potential to interact with sea turtles. For example, shipping traffic in Massachusetts Bay is estimated at 1,200 ship crossings per year with an average of three per day. 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).

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 harm sea turtles and sturgeon. Species occurring in the action area could experience stressors from several naval training ranges or facilities listed below. Listed individuals travel widely in the North and South Atlantic and could be exposed to naval activities in several ranges.

- The Virginia Capes, Cherry Point, and Jacksonville-Charleston Operating Areas, which 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.

Naval activities to which individuals could be exposed include, among others, vessel and aircraft transects, munition detonations, and sonar use.

Anticipated impacts from harassment include changes from foraging, resting, and other behavioral states that require lower energy expenditures to traveling, avoidance, and behavioral states that require higher energy expenditures and, therefore, would represent significant disruptions of the normal behavioral patterns of the animals that have been exposed. 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.

From 2009-2012, NMFS issued a series of biological opinions to the U.S. Navy for training activities occurring within their Virginia Capes, Cherry Point, and Jacksonville Range Complexes that anticipated annual levels of take of listed species incidental to those training activities through 2014. During the proposed activities 344 hardshell sea turtles (any combination of green, hawksbill, Kemp's ridley, olive ridley, or northwest Atlantic loggerhead sea turtles) per year were expected to be harassed as a result of their behavioral responses to mid- and high-frequency active sonar transmissions.

In 2013, NMFS issued a biological opinion to the U.S. Navy on all testing and training activities in the Atlantic basin and Gulf of Mexico (Table 7) (NMFS 2013b). These actions would include the same behavioral and hearing loss effects as described above, but would also include other sub-lethal injuries that lead to fitness consequences and mortality that can lead to the loss of individuals from their populations.

Table 8. Annual total of model-predicted impacts on sea turtles for training activities using sonar and other active non-implusive acoustic sources for United States Navy testing activities in the North Atlantic.

Sea turtle species	Harassment Temporary threshold shift	Injury Permanent threshold shift
Hardshell sea turtles	12,131	11
Kemp's ridley	263	0
Leatherback	8,806	9
Loggerhead	16,624	16

7.5 Dredging

Marine dredging vessels are 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).

7.6 Entrainment, Entrapment, and Impingement in Power Plants

There are dozens of power plants in coastal areas of the United States, from South Carolina to Texas (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 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 2016a). These included: 9552 loggerheads (including 180 mortalities), 6886 green (including 112 mortalities), 42 leatherback (no mortalities), 67 Kemp's ridley (including four mortalities), and 65 hawksbill sea turtles (including one mortality) (NMFS 2016a). 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 2016a). The current incidental take limits for operation at the St. Lucie Nuclear Power Plant for severe causal injury are: seven green turtles annually and three loggerheads (Northwest Atlantic

DPS) annually (NMFS 2016a). The current incidental take limits for causal mortalities are: five green turtles annually, and three loggerhead (Northwest Atlantic DPS) turtles annually (NMFS 2016a).

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.

7.7 United States Oil and Gas Exploration

The Army Corps of Engineers and the Minerals Management Service authorize oil and gas exploration, well development, production, and abandonment/rig removal activities that may adversely affect sea turtles. Both of these agencies have consulted numerously with the NMFS on these types of activities. These activities include the use of seismic arrays for oil and gas exploration in the Gulf of Mexico, the impacts of which have been analyzed in opinions 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 opinion, NMFS issued incidental take for Bureau of Ocean Energy Management-permitted explosive structure removals of three sea turtles per year, or eighteen sea turtles during the following six

years of detonations (NMFS 2006a). These levels were far surpassed by the *Deepwater Horizon* incident.

7.8 Habitat Degradation

A number of factors may be directly or indirectly affecting 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 190-220 decibels to 1 micropascal 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) (Reyff 2003; Illingworth Rodkin Inc. 2004), which is 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 micropascal 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 decibels (NMFS 2008b). 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 2008b).

Marine debris is a significant concern for ESA-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 4.8-12.7 million metric tons of plastic entered the ocean globally (Baulch and Simmonds 2015).

For sea turtles, marine debris is a problem due primarily to individuals ingesting debris and blocking the digestive tract, causing death or serious injury (Lutcavage et al. 1997; Laist et al. 1999). 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 sea turtles had ingested marine debris (Bugoni et al. 2001). Loggerhead sea turtles had a lesser frequency of marine debris ingestion. Plastic is possibly 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 sea 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 (NRC 1990; Lutcavage et al. 1997; Laist et al. 1999).

Although beach nourishment, or placing sand on beaches, 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 (Mann 1978; Ackerman 1980; Mortimer 1990).

Beach armoring (e.g., bulkheads, seawalls, soil retaining walls, rock revetments, sandbags, and geotextile tubes) 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 get caught in construction debris or excavations, and hatchlings can get 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). NOAA, the U.S. Geological Survey, and partners predict the third largest Gulf of Mexico summer dead zone ever measuring 22,720 square kilometers (Rabalais and Turner 2017).

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 sea 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 sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals and porpoises (Law et al. 1991). No information on detrimental threshold concentrations 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 United States 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 (MMS 1998; Rabalais et al. 2002; LUMCON 2005). 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). More generally, the “dead zone” decreases biodiversity, alters marine food webs, and destroys habitat (Craig et al. 2001; Rabalais et al. 2002). 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).

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) which 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 similar to that which would be conducted under Permit No. 17304-03 has and will continue to impact ESA-listed sea turtles within the action area. Authorized research on ESA-listed sea turtles includes: capturing/handling; satellite, sonic or PIT tagging; blood/tissue collecting, lavage, ultrasound, laparoscopy, and imaging. Annual takes of ESA-listed species resulting from research activities that are currently permitted by NMFS within the action area can be seen in Table 9 through 12 for green, hawksbill, loggerhead, and Kemp's ridley sea turtles from 2009 to 2016. The actual number of individual sea turtles affected by scientific research is not known. However, for all species, the number affected is assumed to be less than the total number authorized. This is because, if researchers meets or exceed the number of turtle takes allowed in their permit, they must stop the activity and notify the Permits Division. A permit modification or new permit and a new or re-initiated ESA section 7 consultation would be done prior to the continuation of the research activity. Additional take of sea turtles permitted would be reflected in new or modified permits and hence also reflected in the tables below.

Table 9. Green sea turtle takes permitted in the Atlantic Ocean from 2009 to 2016.

Year	Capture/ Handling/ Restraint	Satellite, sonic or PIT tagging	Blood/ tissue collection	Lavage	Ultrasound	Laparoscopy	Imaging	Mortality
2009	3,093	3,093	3,009	1,860	555	74	72	6
2010	3,753	3,753	3,669	2,480	555	74	72	6
2011	4,255	4,255	3,505	2,990	564	74	72	20
2012	3,354	3,354	2,622	2,210	704	74	72	18.2
2013	5,001	5,001	4,325	3,654	1,903	398	396	4.2
2014	4,336	3,686	3,660	3,044	1,408	324	324	4.2
2015	4,280	3,630	3,610	3,044	1,408	324	324	4.2
2016	2,960	2,960	2,940	1,734	1,408	324	324	4.2
Total	**31,032**	**29,732**	**27,340**	**21,016**	**8,505**	**1,666**	**1,656**	**67**

Permit Nos.: 1450, 1462, 1501, 1506, 1507, 1518, 1522, 1526, 1527, 1540, 1544, 1551, 1552, 1570, 1571, 1576, 10014, 10022, 13306, 13307, 13543, 13544, 13573, 14506, 14508,14622, 14655, 14726, 14949, 15112, 15135, 15552, 15556, 15575, 15606, 15802, 16134, 16146, 16174, 16194, 16253, 16556, 16598, 16733, 17183, 17304, 17355, 17381, 17506, and 18069. All DPSs included, but numbers are mostly the Atlantic Ocean DPS.

Table 10. Hawksbill sea turtle takes permitted in the Atlantic Ocean from 2009 to 2016.

Year	Capture/ Handling/ Restraint	Satellite, sonic or PIT tagging	Blood/ tissue collection	Lavage	Ultrasound	Mortality
2009	1,088	1,088	1,081	464	254	0
2010	1,424	1,424	1,417	534	254	0
2011	1,959	1,959	1,955	914	255	0
2012	1,462	1,456	1,452	904	255	0
2013	1,423	1,417	1,415	844	320	39
2014	1,114	1,108	1,106	550	66	39
2015	1,032	1,026	1,026	550	66	39
2016	1,106	1,050	1,013	500	66	39
Total	10,608	10,528	10,465	5,260	1,536	156

Permit Nos.: 1462, 1501, 1506, 1507, 1518, 1526, 1527, 1540, 1544, 1551, 1552, 1570, 1571, 1576, 1599, 10014, 10022, 13306, 13307, 13543, 13544, 14272, 14508, 14726, 14506, 14508, 14622, 14655, 14726, 14949, 15112, 15135, 15552, 15566, 15575, 15606, 15802, 16134, 16146, 16194, 16253, 16598, 16733, 17183, 17304, 17355, 17381, and 17506

Table 11. Loggerhead sea turtle takes permitted in the North Atlantic Ocean from 2009 to 2016.

Year	Capture/ Handling/ Restraint	Satellite, sonic or PIT tagging	Blood/ tissue collection	Lavage	Ultrasound	Laparoscopy	Imaging	Mortality
2009	5,462	5,462	5,044	1,165	1,322	109	123	111
2010	5,464	5,464	5,046	1,205	1,322	109	116	111
2011	7,165	7,165	6,097	1,420	1,667	148	114	122.2
2012	4,791	4,791	3,741	1,370	1,429	161	114	29.8
2013	5,909	5,909	4,859	2,609	2,519	401	354	24.8
2014	4,052	3,912	3,862	1,460	1,543	292	240	24.8
2015	3,935	3,795	3,795	1,470	1,543	292	240	7.8
2016	3,510	3,510	3,510	1,255	1,543	292	240	7.8
Total	**40,288**	**40,008**	**35,954**	**11,954**	**12,888**	**1,804**	**1,541**	**439.2**

Permit Nos.: 1450, 1462, 1501, 1506, 1507, 1522, 1526, 1527, 1540, 1544, 1551, 1552, 1570, 1571, 1576, 1599, 10014, 10022, 13306, 13307, 13543, 13544, 14249, 14622, 14506, 14508, 14622, 14655, 14726, 15112, 15552, 15566, 15575, 15606, 15802, 16134, 16146, 16194, 16253, 16556, 16598, 16733, 17183, 17304, 17355, 17381, 17506, and 18069. All DPSs are included, but numbers are mostly the Northwest Atlantic Ocean DPS.

Table 12. Kemp's ridley sea turtle takes in the Atlantic Ocean from 2009 to 2016.

Year	Capture/ Handling/ Restraint	Satellite, sonic or PIT tagging	Blood/ tissue collection	Lavage	Ultrasound	Laparoscopy	Imaging	Mortality
2009	1,394	1,394	1,195	425	371	53	53	5
2010	1,402	1,402	1,203	426	371	53	53	5
2011	2,210	2,210	1,368	976	400	53	53	9
2012	2,229	2,219	1,561	972	450	53	53	7.2
2013	2,836	2,852	2,190	1,627	990	213	218	3.2
2014	2,010	2,026	1,964	706	619	160	165	3.2
2015	1,833	1,849	1,819	706	619	160	165	3.2
2016	1,420	1,436	1,406	300	264	125	125	3.2
Total	**15,334**	**15,388**	**12,706**	**6,138**	**4,084**	**870**	**885**	**39**

Permit Nos.: 1462, 1501, 1506, 1507, 1526, 1527, 1540, 1544, 1551, 1552, 1570, 1571, 1576, 10014, 10022, 13306, 13543, 13544, 14508, 14726, 14506, 14622, 14655, 14726, 15112, 15135, 15552, 15566, 15575, 15606, 15802, 16134, 16194, 16253, 16556, 16598, 16733, 17183, 17304, 17355, 17381, 17506, and 18069.

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.

The destruction and adverse modification analysis considers whether the action produces "a direct or indirect alteration that appreciably diminished the value of critical habitat for the conservation of a 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.

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 3 of this opinion, 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 as well as the potential for mortality. 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. We do not expect different responses to each activity based on the species of sea turtle. That is, we expect green turtle and hawksbill turtle responses to each of the procedures to be similar. Hence, we summarize the likely stress and risk to each species together.

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.

17304-03 would authorize several research activities that may expose sea turtles to a variety of stressors. Each research activity presents a unique set of stressors. The potential stressors we expect to result from the proposed action are:

1) capture with handing and restraint following capture;

2) measuring and marking;

3) sampling (tissue, blood, carapace, fecal);

4) gastric lavage;

5) epibiota removal, and

6) application of flipper tags, acoustic tags, accelerometers, PIT tags, and satellite transponders

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 proposed research activities. These include the experience and measures taken by the researchers themselves and the terms and conditions specified in the permit, as proposed by the Permits Division (Appendix 1).

This ongoing research is the continuation of previous research that began in 2011. The proposed procedures have been performed by Kristen Hart and co-investigators for many years. All previous activities were thoroughly analyzed and found they would not jeopardize listed species, appreciably reduce the likelihood of survival or recovery of sea turtles, or destroy or adversely modify designated critical habitat.

To minimize the effects of the actions proposed for the current permit, the applicant will:

1) Use care when handling live animals to minimize any possible injury.

2) Captured individuals are kept protected from temperature extremes, provided with adequate air flow, kept moist, and ensure area around turtle is free of materials that could be ingested.

3) Travel at low or idle boat speeds all the time and not engage the motor when near sea turtles.

4) Clean and disinfect all equipment (tagging equipment, tape measures, etc.) and surfaces that comes in contact with sea turtles between the processing of each turtle

In addition to these mitigation measures taken by the applicant, the Permits Division will include mitigation measures as part of the terms and conditions (Section B5) of the permit found in Appendix A of this document.

The Permits Division will require individuals conducting the research activities to possess qualifications commensurate with their roles and responsibilities. In accordance, the only

personnel authorized to conduct the research would be the Primary Investigator Kristen Hart, listed Co-Investigator's, and research assistants. We anticipate that requiring that the research be conducted by experienced personnel will further minimize impacts to the ESA-listed species that may be exposed to the stressors, as these individuals should be able to recognize adverse responses and cease or modify their research activities accordingly.

8.3 Exposure Analysis

Exposure analyses identify the ESA-listed species that are likely to co-occur with the actions' effects on the environment in space and time, and identify the nature of that co-occurrence. The exposure analysis also identifies, as possible, the number, age or life stage, and gender of the individuals likely to be exposed to the actions' effects and the population(s) or subpopulation(s) those individuals represent. The issuance of Permit No. 17304-03 will authorize research activities that have been ongoing for several years and NMFS includes research effort and subsequent exposure and response data in its assessment of exposure where data are available.

Permit No. 17304-03 has previous annual reports and supplementary data available to help NMFS estimate the likely future levels of exposure. Research permits have required the applicants to report activities every year. These reports provide us with the opportunity to evaluate the applicants' past performance as a mechanism to estimate future performance (individual exposure, response, and take). We believe this is the best tool available to us to estimate the exposure, response, and take that ESA-listed species will be exposed to under the following proposed permits.

The applicant's current Permit No. 17304, Permit modification No. 17304-02 and their accompanying annual reports, applications, and biological assessments were available to evaluate these research activities. The applicant's annual reports from 2013 through 2016 are summarized in Table 13. A summary of the proposed exposures, including the cumulative exposure over the entire five-year duration of the permit, can be seen below in Table 14.

Table 13. Number of annual takes that occurred from 2013 through 2016 during past performance of Permit No. 17304.

Sea turtle species	Life Stage	Procedures	Actual Take[1]
Green	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	88
Hawksbill	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	0
Loggerhead	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	17
Kemp's ridley	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	11

[1]One take per animal, not all animals received every procedure listed; [2]PIT=passive integrated transponder; [3]VHF=very high frequency.

Table 14. Number of exposures to activities expected under Permit No. 17304-03 over the permit's lifespan.

Sea turtle species	Life Stage	Procedures	Takes per Individual Animal[1]	No. of Animals Authorized per Year	Cumulative No. Animals Over Five Years	Cumulative Takes per Animal Over Five Years[2]
Green	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	1	200	1,000	5
Hawksbill	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	1	20	100	5
Loggerhead	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	1	300	1,500	5
Kemp's ridley	All except hatchling	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF[3] tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT[2] tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	1	300	1,500	5

1Not all turtles receive all listed procedures; Individual turtles are subjected to procedures one time per year and no more than 3 transmitters on an animal at one time; [2]PIT=passive integrated transponder; [3]VHF=very high frequency.

Worldwide, nesting data at 464 sites indicate that 563,826 to 564,464 females nest each year. The North Atlantic DPS of green turtles has an estimated 30,058 to 64,396 female nesters in 2010 with an increasing population (Seminoff et al. 2015). Although no historical records of

abundance are known, hawksbill sea turtles are considered to be severely depleted due to the fragmentation and low use of current nesting beaches (NMFS and USFWS 2007b). Worldwide, an estimated 21,212 to 28,138 hawksbills nest each year among 83 sites. Among the sites with historic trends, all show a decline during the past 20 to 100 years. The Northwest Atlantic DPS of loggerhead is estimated at 32,000 to 56,000 nesting females with populations in decline or not enough information to make a trend (TEWG 1998; NMFS 2001). Gallaway et al. (2013) estimated that nearly 189,000 female Kemp's ridley sea turtles over the age of two years were alive in 2012. Extrapolating based on sex bias, the authors estimated that nearly a quarter million age-two or older Kemp's ridleys alive now with counts show that the population trend is increasing towards recovery. Based on these current population estimates, the proposed exposure to research activities represents a small portion of the population for each species of sea turtle.

8.4 Response Analysis

Given the exposure estimated above, in this section we describe the range of responses among ESA-listed sea turtles that may result from the stressors associated with the research activities that would be authorized under Permit No. 17304-03. These include stressors associated the following activities: capture with handing and restraint following capture; measuring and marking; sampling (tissue, blood, carapace, fecal); gastric lavage; epibiota removal, and application of flipper tags, acoustic tags, accelerometers, PIT tags, and satellite transponders. For the purposes of consultation, our assessment tries to detect potential lethal, sub-lethal (or physiological), or behavioral responses that might reduce the fitness of individuals. Our response analysis considers and weighs evidence of adverse consequences, as well as evidence suggesting the absence of such consequences.

There is mounting evidence that wild animals respond to human disturbance in the same way that they respond to predators (Harrington and Veitch 1992; Lima 1998; Gill et al. 2001; Frid 2003; Beale and Monaghan 2004; 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), interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Sapolsky et al. 2000; Frid and Dill 2002; Romero 2004; Walker et al. 2005). These responses have been associated with abandonment of sites (Sutherland and Crockford 1993), reduced reproductive success (Giese 1996; Müllner et al. 2004), and the death of individual animals (Feare 1976; Daan 1996; Bearzi 2000).

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 (Barton 2002; Bayunova et al. 2002; Wagner et al. 2002; Lankford et al. 2005; Busch and Hayward 2009; McConnachie et al. 2012; Atkinson et al. 2015). 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; Guyton and Hall 2000; Dierauf and Gulland 2001; Wagner et al. 2002; Romero 2004; NMFS 2006b; Busch and Hayward 2009; Omsjoe et al. 2009; Queisser and Schupp 2012), particularly over long periods of continued stress (Sapolsky et al. 2000; Desantis et al. 2013).

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 (Curry and Edwards 1998; Cowan and Curry 2002; Herraez et al. 2007; Cowan and Curry 2008). 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; Rivier and Rivest 1991; Mourlon et al. 2011). 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.

The common underling stressor of a human disturbance caused by the research activities that would be authorized under Permit No. 17304-03 may lead to a variety of different stress related responses which we discuss below. For a thorough analysis, refer to the biological opinion for Permit No. 17304-02 (NMFS 2016b).

8.4.1 Capture, Handling, and Restraint

Capture can cause stress responses in sea turtles (Gregory 1994; Hoopes et al. 1998; Gregory and Schmid 2001; Jessop et al. 2003, 2004; Thomson and Heithaus 2014). We also expect behavioral responses (attempts to break away via rapid swimming and biting) as well as physiological responses such as the release of stress hormones (Stabenau et al. 1991; Gregory et al. 1996; Hoopes et al. 2000; Gregory and Schmid 2001; Harms et al. 2003).

Capture methods will include dip-netting, strike-netting, tangle-netting, rodeo capture and hand capture. Although researchers are not proposing to trawl specifically to capture turtles for this project, they propose to tag and sample turtles opportunistically captured by permitted trawling vessels that are working in the study area (dredging, nourishment, etc). Tangle netting will not be the primary form of capture. Nets used to catch turtles will be of large enough mesh size to diminish bycatch of other species, and highly visible buoys will be attached to the float line of

each net and spaced at intervals of every ten yards or less. Researchers will take precautions to minimize potential adverse effects. The net will be deployed by boat and carefully monitored from the boat continuously. Researchers will place fixed bullet-shaped styrofoam floats (which will bob whenever a large animal is entangled in the net) on the portions of the net that are out of the water, and these will alert them to the presence of a turtle, so that they can check the nets quickly retreive a turtle.

Turtles will be handled in such a way as to avoid injury to the turtles themselves and to the researchers. During extremely warm weather, the turtle will be kept in the shade. If for some unexpected reason that is not possible, the turtle's carapace and head will be covered with a wet towel to avoid desiccation. During cooler weather, the towel will not be wet to avoid hypothermia. Hard-shelled turtles will be kept in large, plastic containers before sampling and prior to release. All turtles will be placed on foam pads for added comfort and to minimize the potential for flipper injuries during restraint. Under the applicant’s current Permit No. 17304-02, all recaptured turtles since 2013 had increases in growth and were in good health.

NMFS expects no mortality or long-term adverse effects as a result of capture or the activities to bring a captured turtle aboard the research vessel. Animals may attempt to evade researchers when approached, indicating some level of stress. The stress is expected to be short-term and animals should quickly resume normal behavior once released. These capture techniques are already permitted and used by other researchers and represent a negligible risk of injury or mortality. Individuals will be constantly monitored once captured and all work will stop if an animal appears to be in danger. No mortality is expected using any type of capture technique or gear. Additionally, these methods will not affect the physical or biological environment.

8.4.2 Measuring and Marking

Once sea turtles have been captured, individuals will be handled and exposed to various activities of greater or lesser degrees of invasiveness. Each sea turtle will be exposed to morphometric measurement, including carapace size and individual weight. Although these activities are not considered invasive, we expect individual sea turtles to experience a continued stress response due to the handling and restraint necessary to conduct these activities.

Turtles will be handled in such a way as to avoid injury to the turtles themselves and to the researchers. During extremely warm weather, the turtle's carapace and head will be covered with a wet towel to avoid desiccation. Hard-shelled turtles will kept in large, plastic containers before sampling and prior to release. All turtles will be placed on foam pads for added comfort. If a turtle becomes stressed during the sampling process, we will cover the eyes with a wet towel; this often has a calming effect on the turtle.

Measuring and marking can result in raised levels of stressor hormones in sea turtles. The additional on-board holding time imposes an additional stressor on these already acidotic turtles (Hoopes et al. 2000). It has been suggested that the muscles used by sea turtles for swimming

might also be used during lung ventilation (Butler et al. 1984). Thus, an increase in breathing effort in negatively buoyant animals may have heightened lactate production.

The measuring and weighing procedures are simple, non-invasive, with a relatively short time period and NMFS does not expect that individual turtles would normally experience more than short-term stresses as a result of these activities. No injury is expected from these activities, and turtles will be worked up as quickly as possible to minimize stresses resulting from their capture.

8.4.3 Sampling: Tissue, Blood, Carapace, and Fecal

The sampling activities that would be authorized by this permit can result in raised levels of stressor hormones in sea turtles and would be in addition to any stresses or effects already experienced during capture. It is no expected that the collection of a tissue and carapace sample will cause any additional significant stress or discomfort to the turtle beyond what was experienced during the other research activities. Sterile techniques will be utilized to minimize the possibility of infection at the biopsy sites. The procedure will not be performed on any compromised animals (e.g., those that are emaciated or having heavy parasite loads, bacterial infections, etc.). During the more than five years since implementing this manner of collecting DNA samples, the Hart-U.S. Geological Survey team has not encountered any infections or mortality resulting from this procedure.

It is not expected that individual turtles will experience more than short-term stresses during blood sampling. Taking an approximately five millileter blood sample from the sinuses in the dorsal side of the neck is now a routine procedure (Owens 1999). According to Owens (1999), with practice, it is possible to obtain a blood sample ninety-five percent of the time and the sample should be about thirty seconds in duration. Blood samples will be taken by NMFS-approved personnel only. Dr. Hart has been trained by other NMFS researchers in the techniques of blood sampling and has used these techniques successfully on turtles through other permits (e.g. Permit No. 1541 and Permit No. 13307). If a blood sample is not collected after four attempts (two on either side of the neck), the procedure will be stopped to avoid stressing the animal.

Fecal samples will be collected either after turtles have defecated during biological sampling or by digital extraction of feces from the cloaca. Those turtles that do not defecate during the sampling period will be temporarily overturned onto the carapace and restrained. While wearing lubricated latex gloves, a finger will be inserted into the cloaca of the turtle to feel for the presence of a fecal mass. This procedure might result in some minor discomfort to the turtle with no lasting effects.

Effects of these procedures would be low-level pain, handling discomfort, possible hemorrhage at the site. There is a small risk of infection. Mitigation to minimize or avoid these risks (such as pressure and disinfection) lessen those possibilities. The sea turtles are to experience a short-term stress response in association with the handling, restraint, and pain associated with tissue, carapace, blood, and fecal sampling. The applicants have experience in tissue and blood

sampling and no sea turtle mortalities have occurred during the previous sampling activity from the applicant under any previous permit that we are aware of, nor are we aware of any meaningful pathological consequences by sampled individuals on the part of the applicant.

8.4.4 Gastric Lavage

The feeding habits of turtles can be determined by a variety of methods, but the method used under this research permit is gastric lavage or stomach flushing. This comparatively simple and reliable technique has been used to successfully sample the gut contents of various vertebrate animal groups without harm to the animal (Forbes 1999). This technique has been successfully used on green, hawksbill, olive ridley and loggerhead turtles ranging in size from twenty-five to one hundred and fifteen centimeters curved carapace length (CCL). Forbes (1999) stated that many individual turtles have been lavaged more than three times without any known detrimental effect. Individuals that have been recaptured from the day after the procedure up to three years later appear to be healthy and to feed normally. As well, laparoscopic examination of the intestines following the procedure has not detected any swelling or damage to the intestines.

The ends of tubing will be rounded by melting them with a flame and allowing them to cool which ensures that the tubing will not damage the walls of the esophagus during insertion. The tube will be aligned exterior to the turtle to pre-measure the distance to the caudal margin of the pectoral scute of the plastron, roughly corresponding to the level of the stomach, and mark the distance on the tube for that particular turtle with either tape or erasable marker. The tube will be passed no further than this mark, or no further than they will pass without resistance. Whereas individual turtles are likely to experience discomfort during this procedure, NMFS does not expect individual turtles to experience more than short-term distress and injuries are not anticipated.

8.4.5 Epibiota Removal

Epibionts (barnacles, algae, etc.) will be carefully removed from the carapace at the site of transmitter attachment(s) using a paint-scraper. In general, where the first and second vertebral scutes meet is the ideal location to place the transmitter as this section of the carapace rises to a maximum point above the sea surface each time the turtle breathes and the base antenna on the transmitter will break the plane of the water's surface. Attachment media, will also encompass sections of the first and third vertebral scutes as well as the first and second costal scutes. These areas will be thoroughly scrubbed and rinsed with fresh water, dried, and then lightly sanded with sandpaper. When smooth, the entire area will be lightly wiped with an alcohol pad or a small amount of acetone. It is a short-duration, non-invasive procedure, with no evidence of harm to turtles under previous permits.

8.4.6 Application of Tags and Transponders

Sea turtles will be tagged with flipper tags, acoustic tags, accelerometers, PIT tags, and/or satellite transponders. All tags will be sterilized as well as the area of attachment to minimize the

possibility of infection. No compromised or sick turtles will receive acoustic tags, accelerometers or satellite tags.

Turtles can experience some discomfort during PIT-tagging procedures and these procedures will produce some level of pain. The discomfort is usually short and highly variable between individuals (Balazs 1999). Most turtles barely seem to notice the tag application, while a few others exhibit a marked response. NMFS expects the stresses to be minimal and short-term and that the small wound-site resulting from a tag applied to the front flipper should heal completely in a short period of time, similar to what happens when a human has his or her ear pierced for an earring. Similarly, turtles that must be re-tagged should also experience minimal short-term stress and heal completely in a short period of time. Re-tagging is not expected to appreciably affect these turtles. The proposed tagging methods have been regularly employed in sea turtle research with little lasting impact on the individuals tagged and handled (Balazs 1999).

Sea turtles have low-frequency hearing sensitivity and are potentially affected by sound energy in the band below 1,000 hertz (Lenhardt 2003). Bartol et al. (1999) found the effective bandpass of the loggerhead sea turtle to be between at least 250 and 1,000 hertz. Ridgeway et al. (1969) found the maximum sensitivity of green sea turtle hearing to fall within 300 to 500 hertz with a sharp decline at 750 hertz. Since the sonic tags authorized for sea turtle tracking research would be well above this hearing threshold, these tags would not be heard by the turtles. NMFS would not expect the transmitters to interfere with turtles' normal activities after they are released. Another important consideration is whether the sounds emitted by the sonic transmitters would attract potential predators, primarily sharks. Unfortunately, hearing data on sharks is limited. Casper and Mann (2004) examined the hearing abilities of the nurse shark and results showed that this species detects low-frequency sounds from 100 to 1,000 hertz, with best sensitivity from 100 to 400 hertz. Myrberg (2001) explained that audiograms have been published on elasmobranchs. Although we do not have hearing information for all the sharks that could potentially prey on sea turtles, estimates for hearing sensitivity in available studies provided ranges of 25 to 1,000 hertz. In general, these studies found that shark hearing is not as sensitive as in other tested fishes, and that sharks are most sensitive to low-frequency sounds (Casper et al. 2003). Thus, it appears that the sonic transmitters would not attract potential shark predators to the turtles, because the frequency of the sonic tags is well above the 1,000 hertz threshold.

The transmitters will be affixed to the central section of the turtles' carapace using epoxy and/or resined fiberglass using the method further described following Balazs et al. (1996) and Van Dam et al. (2008). However, whenever possible, transmitters will not be placed at the peak height of the carapace to make attachments as hydrodynamic as possible (Jones et al. 2011). Turtles are held for no longer than necessary after attaching the transmitters to allow adhesives to set. These areas will be thoroughly scrubbed and rinsed with fresh water, dried, and then lightly sanded with sandpaper. When smooth, the entire area will be lightly wiped with an alcohol pad. NMFS does not expect any negative effects of these chemicals on the turtles. Drying time will vary from twenty to sixty minutes depending on ambient temperatures and humidity. When the

attachment materials are dry the turtle will then be released at or near the exact point of capture. The researchers have successfully recaptured tagged turtles and have found them to be in good health. Based on past experience with these types of techniques by other turtle researchers, NMFS expects that the turtles will experience some small additional stress from attaching acoustic (sonic) transmitters, but not significant increases in stress or discomfort to the turtle beyond what was experienced during other research activities. We do not expect the transmitters or the tracking to interfere with the turtles normal activities after they are released.

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.

Sampling (blood, tissue, and carapace) and flipper/PIT tagging are all activities that will break the integument and create the potential for infection or other physiological disruptions. The applicant and co-investigators have procedures in place to reduce the potential for infection or disease transmission. To date, the applicants have not documented a case of infection or mortality in sea turtles, which were exposed to these research activities. Based on this past performance and the rigor of aseptic conditions, we do not expect any individuals to develop infections or experience other pathological conditions associated with these activities.

Flipper- and satellite-tagged sea turtles will experience a greater degree of drag through the water than they otherwise would. This drag would be experienced continually over years after flipper tags are applied and over shorter periods of months to a year for tags applied to the carapace. However, we expect the amount of drag to be minimal. To date, many thousands of sea turtles have been flipper tagged in relatively standard ways, and we are unaware of flipper tagging leading to reduced growth, impaired mobility or altered migration, deteriorated body condition, or other outcomes that could impair the survival, growth, or reproductive potential of any individual sea turtle.

Any time a turtle is removed from its natural habitat and handled, it undoubtedly experiences stress. However, based on observations over decades of research, the applicant's proposed procedures have had minor, if any, adverse effects on the captured turtles. This is evidenced by

the subsequent recapture of previously encountered sea turtles as well as telemetry data that do not indicate abnormalities in turtle movement or behavior post-encounter. Many turtles have been recaptured from the applicant's in-water netting programs have later been observed on nesting beaches as adults; some turtles captured inshore and exhibiting fibropapillomas have later been recaptured with regressed or no tumors. Negative impacts on the turtles will be minimized by covering turtles with wet towels and keeping them in the shade while being held, disinfecting tagging equipment, disinfecting holding areas and tubs, following antiseptic protocol when drawing blood or taking biopsies, reducing hydrodynamic drag from transmitters via transmitter profile, placement, and attachment method, and releasing the turtles as soon as possible.

The research activities that would take place under Permit No. 17304-03 are not expected to result in sea turtle mortality. The research activities under the proposed permit will result in temporary stress to the sea turtles that is not expected to have more than short-term effects on individual North Atlantic green, hawksbill, Northwest Atlantic loggerhead, and Kemp's ridley sea turtles.

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 areas of the Federal actions subject to consultation (50 CFR 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.

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 change, ship strikes, sound, military activities, fisheries, pollution, and scientific research, although some of these activities would involve a federal nexus and thus, but 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 sea turtle populations.

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 the Species and Critical Habitat* (Section 6).

Here we summarize the probable risks the proposed action poses to threatened and endangered species that are likely to be exposed. These summaries integrate the exposure profiles presented previously with the results of our response analyses for each of the actions considered in this opinion.

As discussed above, we do not expect different responses to each activity from based on the species of sea turtle. That is, we expect green turtle and hawksbill turtle responses to each of the procedures to be similar. Hence, we summarize the likely risk to each species together.

We expect all targeted sea turtles to experience some degree of stress response to handling and restraint following capture, blood, tissue, and carapace sampling, epibiont removal, and PIT/flipper tagging, acoustic/accelerometer and satellite transponder attachment. We also expect many of these individuals to respond behaviorally by attempting to fight when initially captured, startle when blood sampled, biopsied, or tagged, and strongly swim away when released. We do not expect more than temporary displacement or removal of individuals for a period of hours from small areas as a result of the proposed actions. Individuals responding in such ways may temporarily cease feeding, breeding, resting, or otherwise disrupt vital activities. However, we do not expect that these disruptions will cause a measureable impact to any individual's growth or reproduction.

We expect all tagged individuals to experience additional physiological reactions associated with foreign body penetration into the muscle, including inflammation, scar tissue development, and/or a small amount of drag associated with the applied tags. We also do not expect any pathological responses to procedures that breach the skin. A small metabolic cost to individuals held for several hours will also occur. Responses here should be limited to wound healing that should not impair the survival, growth, or reproduction of any individual.

Overall, we do not expect any population to experience a fitness consequence as a result of the proposed actions and, by extension, do not expect species-level effects.

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 actions are not likely to jeopardize the continued existence or recovery of the North Atlantic DPS green, hawksbill, Northwest Atlantic DPS loggerhead, or Kemp's ridley sea turtles. Further, we do not

expect the issuance of Permit No. 17304-03 to destroy or adversely modify any designated critical habitat.

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 an incidental take statement.

All activities associated with the issuance of Permit No. 17304-03 involves directed take for the purposes of scientific research. Therefore, NMFS does not expect the proposed action would incidentally take threatened or endangered species such that an incidental take statement is not warranted.

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).

The ESA Interagency Cooperation Division recommends that annual reports submitted to the Permits Division require detail on the exposure and response of listed individuals to permitted activities. The specific activities that each sea turtle is exposed should be identified. A minimum of general comments on response can be informative regarding methodological, population, researcher-based responses in future consultations. The number and types of responses observed should be summarized and include responses of both target and non-target individuals. This will greatly aid in analyses of likely impacts of future activities.

The Permits Division should work with the sea turtle recovery team and the research community to develop protocols that would have sufficient power to determine the cumulative impacts (that

is, includes the cumulative lethal, sub-lethal, and behavioral consequences) of existing levels of research on individuals populations of sea turtles. The Permits Division should review the annual reports and final reports submitted by researchers that have conducted research on sea turtles as well as any data and results that can be obtained from the permit holders. This should be used to estimate the numbers of sea turtles killed and harassed by these investigations, and how the harassment affects the life history of individual animals.

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

14 REINITIATION NOTICE

This concludes formal consultation for the Permits Division proposed issuance of Permit No. 17304-03. As 50 CFR 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 incidental take is exceeded, (2) new information reveals effects of the agency action that may affect ESA-listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the ESA-listed species or designated critical habitat that was not considered in this opinion, or (4) a new species is ESA-listed or designated critical habitat designated that may be affected by the action.

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16 APPENDICES

16.1 Appendix A, Permit Terms and Conditions

This permit is issued to Kristen Hart, Ph.D., U.S. Geological Survey, 3321 College Ave., Davie, Florida, 33314, (hereinafter "Permit Holder"), pursuant to the provisions of the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226). **This permit modifies and replaces Permit No. 17304-02.**

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through September 30, 2018. This permit expires on the date indicated and is non-renewable. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources, pursuant to applicable regulations and the requirements of the ESA.

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[1] of protected species occurs. See Condition E.2 for reporting requirements.

   b. if authorized take[2] is exceeded, including accidental takes of protected species not listed in this permit. See Condition E.2 for reporting requirements.

[1] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers. This includes, but is not limited to: 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.

[2] 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. By regulation, a take under the Marine Mammal Protection Act (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

3. The Permit Holder may continue to possess biological samples acquired under this permit after permit expiration without additional written authorization.

B. Number and Kind(s) of Protected Species, Location(s) and Manner of Taking

1. Table 1 in Appendix 1 outlines the number of protected species 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 images (e.g., photographs, video) in addition to the photography 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 a NMFS Permit. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for photography, filming, or audio recording activities not essential to achieving the objectives of the permitted activities, including allowing persons not essential to the research (e.g., a documentary film crew) to be present, provided:

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

b. Non-essential photography, filming, or recording activities will not influence the conduct of permitted activities or result in takes of protected species.

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.

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.

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:

Capture Methods

a. Entanglement Netting

i. Nets used to catch turtles must be of large enough mesh size to diminish bycatch of other species.

ii. Highly visible buoys must be attached to the float line of each net and spaced at intervals of every 10 yards or less.

iii. Nets must be checked at intervals of less than 30 minutes, and more frequently whenever turtles or other organisms are observed in the net. If water temperatures are ≤ 10°C (50°F) or ≥ 30°C (86°F), nets must be checked at less than 20-minute intervals. "Net checking" is defined as a complete and thorough visual check of the net either by snorkeling 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.

iv. The float line of all nets must be observed at all times for movements that indicate an animal has encountered the net. When this occurs the net must be immediately checked.

v. Researchers must plan for unexpected circumstances or demands of the research activities and have the ability and resources to meet net checking requirements at all times (e.g., if one animal is very entangled and requires extra time and effort to remove from the net, researchers must have sufficient staff and resources to continue checking the rest of the net at the same time).

vi. FP Nets: Nets used at sites where fibropapillomatosis (FP) is known to occur must be thoroughly disinfected prior to use in areas where FP is either not known to be present, is considered uncommon, or where there is limited or no information on FP prevalence. Drying nets in sunlight may be used as an additional measure to inactivate FP-associated herpes virus.

b. Trawling: Tow times must not exceed 30 minutes bottom time (42 minutes doors in to doors out).

c. Avoiding Marine Mammals

1. Researchers must make every effort to prevent interactions with marine mammals. Researchers must be aware of the presence and location of these animals at all times as they conduct trawling activities.

2. Trawling must not be initiated when marine mammals, except dolphins or porpoises, are observed within the vicinity of the study area, and the marine mammals must be allowed to either leave or pass through the area safely before net setting or trawling is initiated.

a. Should any marine mammals enter the research area after tangle nets have been set the lead line must be raised and dropped in an attempt to make marine mammals in the vicinity aware of the net.

b. If marine mammals remain within the vicinity of the research area, tangle nets must be removed.

c. If a marine mammal becomes entangled or dies, Researchers must:

a. Stop netting activities and immediately free the animal,

b. Notify the appropriate NMFS Regional Stranding Coordinator as soon as possible (http://www.nmfs.noaa.gov/pr/health/coordinators.htm), and

c. Report the incident as specified in Condition E.2,

Permitted activities will be suspended until the Permits Division has granted approval to continue research per Condition E.2.

Turtles Captured Under Another Authority Prior to Research Activities

d. Research activities may be performed on sea turtles from other sources only if the Permit Holder can demonstrate that the sea turtles were taken legally (e.g., covered by the incidental take statement [ITS] of an ESA Section 7 biological opinion with a "no jeopardy" conclusion).

e. If the capture authority reduces the take level for a species during the life of the permit, researchers may only conduct procedures on the reduced take limit for that capture source.

f. Researchers must only use turtles if they appear in good health and are active, and if there is no chance that further stress from the research may compromise the animal.

General Handling, Resuscitation, and Release

g. Researchers must:

   i. Handle turtles according to procedures specified in 50 CFR 223.206(d)(1)(i) (See Attachment 1). Use care when handling live animals to minimize any possible injury;

   ii. Use appropriate resuscitation techniques on any comatose turtle prior to returning it to the water;

   3. When possible, transfer injured animals to rehabilitation facilities and allow them an appropriate period of recovery before return to the wild; and

   4. Have an experienced veterinarian, veterinary technician, or rehabilitation facility on call for emergencies.

h. If an animal becomes highly stressed, injured, or comatose, Researchers must contact a veterinarian immediately. Based on the instructions of the veterinarian, if necessary, the animal must be immediately transferred to the veterinarian or to a rehabilitation facility to receive veterinary care.

In addition to Condition A.2, 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.

i. Compromised or Injured Sea Turtles

i. Compromised animals include turtles that are overheated, emaciated, or have a heavy parasite load or severe bacterial infection.

ii. The Permit Holder may conduct the authorized activities on compromised or injured sea turtles, but only if the activities will not further compromise the animal. Care must be taken to minimize handling time and reduce further stress to the animal.

iii. Compromised or injured sea turtles must not be handled or sampled by other permit holders working under separate research permits if their activities would further compromise the animal.

j. While holding sea turtles, Researchers must:

a. protect sea turtles from temperature extremes (ideal air temperature range is between 21°C (70°F) and 27°C (80°F),

b. provide adequate air flow,

c. keep sea turtles moist when the temperature is ≥ 23°C (75°F), and

d. keep the area surrounding the turtle free of materials that could be accidentally ingested.

k. Holding time should be minimized whenever possible. Turtles must be released within 12 hours of capture.

l. During release, turtles must be lowered as close to the water's surface as possible to prevent injury.

m. 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.

Handling, Measuring, Weighing, Passive Integrated Transponder (PIT) and Flipper Tagging

n. Researchers must:

i. Clean and disinfect all equipment (tagging equipment, tape measures, etc.) and surfaces that comes in contact with sea turtles between the processing of each turtle.

ii. Maintain a designated set of instruments and other items should be used on turtles with FP. Items that come into contact with sea turtles with FP should not be used on turtles without tumors. All measures possible should be exercised to minimize exposure and cross-contamination between affected turtles and those without apparent disease, including use of disposable gloves and thorough disinfection of equipment and surfaces. Appropriate disinfectants include 10% bleach and other viricidal solutions with proven efficacy against herpes viruses.

iii. Examine turtles for existing flipper and PIT tags before attaching or inserting new ones. If existing tags are found, the tag identification numbers must be recorded. Researchers must have PIT tag readers capable of reading 125, 128, 134.2, and 400 kHz tags.

iv. Clean and disinfect:

a. flipper tags (e.g., to remove oil residue) before use;

b. tag applicators, including the tag injector handle, between sea turtles; and

c. the application site before the tag pierces the animal's skin.

o. PIT Tagging

i. Use new, sterile tag applicators (needles) each time.

ii. The application site must be cleaned and then scrubbed with two replicates of a medical disinfectant solution (e.g., Betadine, Chlorhexidine) followed by 70% alcohol before the applicator pierces the animal's skin. If it has been exposed to fluids from another

animal, the injector handle must be disinfected between animals.

p. Marking the Carapace

i. Researchers must use non-toxic paints that do not generate heat or contain xylene or toluene.

ii. Researchers must minimize the amount of paint used to visibly mark animals.

Sampling

q. Blood sampling

a. Blood samples must be directly taken by or supervised by experienced personnel.

b. New disposable needles must be used on each animal.
c. Collection sites must be scrubbed with medical disinfectant solution (e.g., Betadine, Chlorhexidine) followed by 70% alcohol prior to sampling. Two applications of alcohol may be used if disinfectant solutions may affect intended analyses.

d. Samples must not be taken if an animal cannot be adequately immobilized for blood sampling or conditions on the boat preclude the safety and health of the turtle.

e. Attempts (needle insertions) to extract blood from the neck must be limited to a total of four, two on either side. Best practices must be followed, including retraction of the needle to the level of the subcutis prior to redirection to avoid lacerating vessels and causing other unnecessary soft tissue injury.

f. Blood Volume Limits

a. *Sample volume.* The volume of blood withdrawn must be the minimal volume necessary to complete permitted activities. A single sample must not exceed 3 ml per 1 kg of animal.

b. *Sampling period.* Cumulative blood volume taken from a single turtle must not exceed the maximum safe limit described above within a 45-day period. If more than 50% of the maximum safe limit is taken, in a single event or cumulatively from repeat sampling events, from a single turtle within a 45-day period that turtle must not be re-sampled for 3 months from the last blood sampling event.

c. *Research coordination.* Researchers must, to the maximum extent practicable, attempt to determine if any of the turtles they blood sample may have been sampled within the past 3 months or will be sampled within the next 3 months by other researchers. The Permit Holder must make efforts to contact other researchers working in the area that could capture the same turtles to ensure that none of the above limits are exceeded.

d. *Turtles weighing 1 kg or less.* A single sample must not exceed 6% of total blood volume. Total blood volume is estimated as 7% of total body weight. If additional samples are to be taken in less than two months on the same turtle, sample size must not exceed 3 ml/kg of turtle.

r. Biopsy Sampling

i. A new biopsy punch must be used on each turtle.

ii. Aseptic techniques must be used at all times. Skin samples must be collected from the trailing edge of a flipper if possible and practical (preference should be given to a rear flipper if practical). At a minimum, collection sites must be scrubbed with medical disinfectant solution (e.g., Betadine, Chlorhexidine) followed by 70% alcohol prior to sampling. Two applications of alcohol may be used if disinfectant solutions may affect intended analyses. The procedure area and Researchers' hands must be clean.

iii. If it can be easily determined (through markings, tag number, etc.) that a sea turtle has been recaptured and has been already sampled by this permit, no additional biopsy samples may be collected from the animal over the permit year.

s. Transfer of Biological Samples

i. Samples may be sent to the Authorized Recipients listed in Appendix 2 provided that:

1. The analysis or curation is related to the research objectives of this permit.
2. A copy of this permit accompanies the samples during transport and remains on site during analysis or curation.

ii. Samples remain in the legal custody of the Permit Holder while in the possession of Authorized Recipients.

iii. The transfer of biological samples to anyone other than the Authorized Recipients in Appendix 2 requires written approval from the Chief, Permits Division.

iv. Samples cannot be bought or sold.

t. Gastric Lavage

i. The actual lavaging of the turtle must not exceed three minutes.

ii. Once the samples have been collected, water must be turned off and water and food allowed to drain until all flow has stopped. The posterior of the turtles must be elevated slightly to assist in drainage.

iii. Researchers must thoroughly clean equipment prior to disinfection (viruses can remain protected in organic matter, the disinfectant can't get to them if they're protected in this matter).

iv. A separate set of equipment must be used for infected and non-infected animals.

u. Fecal Sampling: Turtles must be larger than 50 cm standard carapace length for digital extraction of feces.

Instrument Attachments

v. Up to 3 transmitters (accelerometer + acoustic tag + satellite tag) may be placed on an animal at one time where authorized in Table 1.

w. Temperature Depth Recorders, Very High Frequency, sonic or satellite tags:

i. Total combined weight of all transmitter attachments must not exceed 5% of the animal's body mass.

ii. Each attachment must be made so that there is minimal risk of entanglement. The transmitter attachment must contain a weak link (where appropriate) or have no gap between the transmitter and the turtle that could result in entanglement. The lanyard length (if used) must be less than half of the turtle's carapace length. It must include a corrosive, breakaway link that will release the unit after its battery life.

iii. Transmitters must not be placed at the peak height of the carapace whenever possible.

iv. Researchers must make attachments as hydrodynamic as possible.

v. Adequate ventilation around the head of the turtle must be provided during the attachment of transmitters if attachment materials produce fumes. Turtles must not be held in water during application to prevent skin or eye contact with harmful chemicals.

vi. When drilling through marginal scutes, procedures must follow aseptic techniques with two alternating applications of medical disinfectant (e.g., Betadine, Chlorhexidine) followed by 70% alcohol. A separate

drill bit must be used for each turtle. Bits may be reused if sterilized by autoclave or cold sterilization (e.g., gluteraldehyde) before reuse.

Non-Target Species

x. Bycatch: All incidentally captured species (e.g., fishes) must be released alive as soon as possible.

y. Manatees: See Appendix 3 for conditions.

z. Submerged Aquatic Vegetation (SAV; e.g., seagrass) Coral Communities, Hard and Live Bottom Habitat

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 SAV, coral communities, and live/hard bottom habitats and avoid setting gear in such areas.

ii. No gear may be set, anchored on, or pulled across Gulf sturgeon critical habitat, SAV, coral or hard/live bottom habitats.

iii. If research gear is lost, diligent efforts would be made to recover the lost gear to avoid further damage to benthic habitat and impacts related to "ghost fishing."

iv. Seagrasses. Researchers must avoid conducting research over, on, or immediately adjacent to any seagrass species. If these species cannot be avoided, then the following avoidance/minimization measures must be implemented:

a. To reduce the potential for sea grass damage, anchors must be set by hand when water visibility is acceptable. Anchors must be placed in unvegetated areas within seagrass meadows or areas having relatively sparse vegetation coverage. Anchor removal must be conducted in a manner that would avoid the dragging of anchors and anchor chains.

b. Researchers must take great care to avoid damaging any sea grass species and if the potential for anchor or net drag is evident researchers must suspend research activities immediately.

c. Researchers must be careful not to tread or trample on seagrass and coral reef habitat.

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 – Kristen Hart, Ph.D.

b. Co-Investigators –See Appendix 2 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. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

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 to conduct activities authorized under the permit (e.g., veterinarians, pilots) must be duly licensed 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, except as specifically provided for in an Incidental Take Statement or Incidental Take Permit for the specific commercial activity.

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 or PI 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 by one of the following:

- the online system at https://apps.nmfs.noaa.gov
- an email attachment to the permit analyst for this permit
- a hard copy mailed or faxed to the Chief, PermitsDivision 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; and

   c. a protected species taken 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. Reports

1. The Permit Holder must submit annual, final, and incident 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
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 reports: must be submitted within two weeks of serious injury and mortality events or exceeding authorized takes, as specified in Condition A.2.

a. The incident report must include a complete description of the events and identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceedence of authorized take.

b. In addition to the written report, the Permit Holder must contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than within two business days of the incident.

c. 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.

3. Annual reports describing activities conducted during the previous permit year (from October 1 to September 30 of the following year) must:

a. be submitted by December 30 each year for which the permit is valid; and

b. include a tabular accounting of takes and a narrative description of activities and effects.

4. A final report summarizing activities over the life of the permit must be submitted by March 30, 2019, 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 following 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 above Regional Office listed in F.1.b 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 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[3] 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

[3] 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.

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 modifications for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the ESA and 15 CFR Part 904.

2. NMFS 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 NMFS 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 222-226, and all restrictions and requirements under the MMPA and the ESA;

   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.

Appendix 1: Table Specifying the Protected Species, Location, and Manner of Taking

Table 1: Authorized Annual Takes of Adult, Subadult, and Juvenile Sea Turtles in the Northern Gulf of Mexico **from the AL/FL border to the TX/Mexico border**. Turtles obtained from relocation trawling must be legally captured via an incidental take statement as part of a valid ESA Section 7 Biological Opinion. ADL = acoustic data logger.

SPECIES	LISTING UNIT/STOCK	NO. ANIMALS	OBSERVE/COLLECT METHOD	PROCEDURES	DETAILS
Turtle, green sea	North Atlantic DPS (NMFS Threatened)	**180**	Trawl, Hand/rodeo, tangle net, strike net, dip net OR capture under another authority	Epibiota removal; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Weigh	Capture under another authority = relocation trawling.
Turtle, green sea	North Atlantic DPS (NMFS Threatened)	20	Trawl, Hand/rodeo, tangle net, strike net, dip net OR capture under another authority	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	Capture under another authority = relocation trawling. A turtle may receive up to 3 tags: ADL, acoustic, and satellite tags.
Turtle, hawksbill sea	Range-wide (NMFS Endangered)	20	Trawl, Hand/rodeo, tangle net, strike net, dip net OR capture under another authority	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	Capture under another authority = relocation trawling. A turtle may receive up to 3 tags: ADL, acoustic, and satellite tags.

Table 1: Authorized Annual Takes of Adult, Subadult, and Juvenile Sea Turtles in the Northern Gulf of Mexico **from the AL/FL border to the TX/Mexico border**. Turtles obtained from relocation trawling must be legally captured via an incidental take statement as part of a valid ESA Section 7 Biological Opinion. ADL = acoustic data logger.

SPECIES	LISTING UNIT/STOCK	NO. ANIMALS	OBSERVE/COLLECT METHOD	PROCEDURES	DETAILS
Turtle, loggerhead sea	Range-wide (NMFS Threatened)	100	Trawl, Hand/rodeo, tangle net, strike net, dip net OR capture under another authority	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	Capture under another authority = relocation trawling. A turtle may receive up to 3 tags: ADL, acoustic, and satellite tags.
Turtle, loggerhead sea	Range-wide (NMFS Threatened)	200	Trawl, Hand/rodeo, tangle net, strike net, dip net OR capture under another authority	Epibiota removal; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Weigh	Capture under another authority = relocation trawling.
Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	90	Trawl, Hand/rodeo, tangle net, strike net, dip net OR capture under another authority	Epibiota removal; Instrument, drill carapace attachment; Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Tracking; Weigh	Capture under another authority = relocation trawling. A turtle may receive up to 3 tags: ADL, acoustic, and satellite tags.
Turtle, Kemp's ridley sea	Range-wide (NMFS Endangered)	210	Trawl, Hand/rodeo, tangle net, strike net, dip net OR capture under another authority	Epibiota removal; Lavage; Mark, carapace (temporary); Mark, flipper tag; Mark, PIT tag; Measure; Photograph/Video; Recapture (gear removal); Sample, blood; Sample, fecal; Sample, scute scraping; Sample, tissue; Weigh	Capture under another authority = relocation trawling.

Appendix 2: Approved Personnel and Authorized Sample Recipients for Permit No. 17304-**03**.

The following individuals are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name of Co-Investigator	Authorized Activities
Dan Catizone	All research activities except capture via dip net, trawl, lavage, and transmitter attachments via drilling through the carapace
Mike Cherkiss	All research activities
Andrew Crowder	All research activities except capture by trawl
Mathew Denton	All research activities except capture by tangle net and trawling and lavage
Margaret Lamont	All research activities except lavage and fecal sampling
Devon Nemire-Pepe	All research activities except capture by tangle net, lavage, and transmitter attachments via drilling through the carapace
David Roche	All research activities except capture by tangle net and trawl, lavage, and transmitter attachments via drilling through the carapace
Dave Seay	All research activities except capture by trawl, lavage, and transmitter attachments via drilling through the carapace
Thomas Selby	All research activities except capture by trawl
Donna Shaver	All research activities except transmitter attachments via drilling through the carapace
Brian Smith	All research activities except capture by tangle net, and trawl, lavage, and transmitter attachments via drilling through the carapace
Mandy Tumlin	Dip net capture, rodeo capture, capture by trawl, photograph, measure, handling, tracking, and epoxy transmitter attachments

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.5.s.iii of the permit:

Sample Type	Disposition	Authorized Recipient
Tissue samples	Analysis	Dr. Amanda Demopolous, USGS Southeast Ecological Science Center, Gainesville, FL
Scute, blood, and skin samples	Analysis	Dr. Hannah Vander Zanden, University of Florida
Scute samples	Analysis	Dr. Kim Reich, Texas A&M University
Blood and tissue samples	Analysis	Dr. Margaret Hunter, USGS Southeast Ecological Science Center, Gainesville, FL
Blood and tissue samples	Analysis	Dr. Brian Shamblin, NMFS Southwest Fisheries Science Lab in LaJolla, CA
Blood and tissue samples	Analysis	Dr. Eugenia Naro-Maciel, American Museum of Natural History, New York, NY
Blood samples	Analysis	Dr. Thane Wibbels at University of Alabama

Appendix 3: Manatee Conditions Provided by the U.S. Fish and Wildlife Service

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.(d) 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 NMFS Chief, 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 NMFS Chief, 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 NMFS Chief, 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.

To Report Accidental Manatee Captures, Including Injured and Dead Manatees

Permitting Office

NMFS Chief of Permits and Conservation Division

PHONE: 301 427-8401

Florida Fish and Wildlife Conservation Commission, Wildlife Alert

PHONE: 888 404-3922

U.S Fish and Wildlife Service (USFWS), North Florida Ecological Services Office

PHONE: 904 731-3336 and FAX: 904 731-3045

U.S Fish and Wildlife Service (USFWS), Alabama Ecological Services Office

PHONE: 251 441-5181

U.S Fish and Wildlife Service (USFWS), Louisiana Ecological Services Office

PHONE: 337 291-3100

U.S Fish and Wildlife Service (USFWS), Mississippi Ecological Services Office

PHONE: 601 965-4900

For Florida manatees outside of Florida, contact respective state wildlife officials:

Alabama (Dauphin Island Sea Lab's Manatee Sightings Network)

PHONE: 866 493-5803

Louisiana (Louisiana Department of Wildlife and Fisheries)

PHONE: 800 256-2749

Mississippi (Mississippi Department of Wildlife, Fisheries, and Parks)

PHONE: 800 BE SMART (237-6278)

Attachment 1: § 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.