NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7 BIOLOGICAL AND CONFERENCE OPINIONS

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

Activity Considered: Issuance of a permit amendment to Raymond Carthy (University of Florida, Permit No. 17183-02)

Consultation Conducted By: Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service

Approved:

Perry Gayaldo

for Donna S. Wieting
Director, Office of Protected Resources

Date: MAR 18 2016

Public Consultation Tracking System (PCTS) number: FPR-2016-9148

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ACRONYMS AND ABBREVIATIONS

C-Celsius

CFR- Code of Federal Regulations
cm-centimeter
dB-decibel
DDE-dichlorodiphenyldichloroethylene
DDT-dichlorodiphenyltrichloroethane
DPS-Distinct Population Segment
ESA-Endangered Species Act
kg-kilogram
km-kilometer
m-meter
mL-milliliter
NAO-North Atlantic Oscillation
NMFS-National Marine Fisheries Service
NOAA-National Oceanic and Atmospheric Administration
PCB-polychlorinated biphenyl
PIT-Passive Integrated Transponder
US-United States
USC- United States Code
USFWS-United States Fish and Wildlife Service

1 INTRODUCTION

Section 7 (a)(2) of the Endangered Species Act (ESA) requires Federal agencies to insure their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. When a Federal agency's action "may affect" a protected species, that agency is required to consult formally with the National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) or the United States Fish and Wildlife Service (USFWS), depending on the endangered species (50 Code of Federal Regulations [CFR] §402.14(a)). Federal agencies are exempt from this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS or the USFWS concurs with that conclusion (50 CFR §402.14(b)).

Section 7 (b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide a biological opinion (opinion) stating how the Federal agencies' actions will affect ESA-listed species and their critical habitat under their jurisdictions. If incidental take is expected, Section 7 (b)(4) requires the consulting agency to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to lessen such impacts.

For the actions described in this document, the action agency is the NMFS' Office of Protected Resources-Permits and Conservation Division (Permits Division), which proposes to authorize permit amendment 17183-02 for increases in the number of Kemp's ridley sea turtles permitted for capture (from 50 to 200 annually) as well as the number of green and Kemp's ridley sea turtles permitted for acoustic tagging (from 30 to 50 green sea turtles annually and from 20 to 40 Kemp's ridley's sea turtles annually). All of these additional individuals may also be exposed to directed close approach, tangle net capture, restraint, handling, epibiote removal, flipper and passive integrated transponder (PIT) tagging, biopsy, blood sampling, measurement, and lavage. In addition, activities authorized under the current permit 17183-01 will continue to green and Kemp's ridley sea turtles as well as hawksbill and loggerhead sea turtles. The consulting agency for this proposal is the NMFS Office of Protected Resources-Endangered Species Act Interagency Cooperation Division.

This opinion and incidental take statement were prepared by NMFS Endangered Species Act Interagency Cooperation Division in accordance with Section 7(b) of the ESA and implementing regulations at 50 CFR §402. This document represents NMFS' opinion on the effects of these actions on proposed, endangered, and threatened species and critical habitat that has been designated for those species. A complete record of this consultation is on file at NMFS' Office of Protected Resources in Silver Spring, Maryland.

1.1 Consultation History

On April 24, 2013, the ESA Interagency Cooperation Division issued a biological opinion on permit 17183.

On July 29 2015, the NMFS' Permits Division published a notice in the Federal Register soliciting public comment on its intent to issue the proposed permit amendment.

On July 30 2015, the NMFS' Permits Division provided initial information on the proposed permit and associated actions on the part of the applicant for review by the ESA Interagency Cooperation Division and other reviewers.

On August 7 2015, the ESA Interagency Cooperation Division received a request for formal consultation from NMFS' Permits Division to authorize Permit amendment 17183-02 to Raymond Carthy (University of Florida). Information was sufficient to initiate consultation on this date.

On January 14 2016, the ESA Interagency Cooperation Division requested additional information from the NMFS' Permits Division. The NMFS' Permits Division provided the requested additional information to the ESA Interagency Cooperation Division the same day.

2 DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the issuance of an amendment to a scientific research permit (File No. 17183-02) to Raymond Carthy, University of Florida, pursuant to Section 10(A)(1)(a) of the ESA of 1973, as amended (16 USC 1531 et seq.), to conduct scientific research on green and Kemp's ridley sea turtles. The purposes of the proposed permit amendment are to characterize the assemblage of Kemp's ridleys using the nearshore waters of the northern Gulf of Mexico as well as define key life-history information for Kemp's ridleys in the northern Gulf of Mexico including population connectivity, sex ratio, and abundance and survival rates. In addition, these increased takes will help address the objectives of learning more about habitat use and movement patterns. Table 1 summarizes the actions to which individual sea turtles will be exposed.

The applicant is requesting additional takes for the same activities that he is currently conducting. Recent reporting by the applicant shows that the applicant has been utilizing all take for Kemp's ridley sea turtles in each of the past two years. Reporting also indicates that green sea turtles are regularly taken for research activities. The applicant intends to expand current research efforts and methods into new areas (Eglin Air Force Base). Based upon this information, an increase in the number of Kemp's ridleys and green sea turtles was requested. The applicant's methods will be identical to those currently being used.

Table 1. Actions to which ESA-listed or proposed species will be exposed under proposed permit amendment 17183-02 which have not yet undergone consultation.

Sea turtle species	Number of individuals taken annually	Total takes authorized over the life of the permit	Actions
Green (*Chelonia mydas*)-Florida population	200	600	Capture, handle, restrain; epibiota removal; flipper, and/or PIT tag; lavage; blood sample biopsy; weigh
	50	150	Capture, handle, restrain; epibiota removal; acoustic, flipper, and/or PIT tag; lavage; blood sample biopsy; weigh
Kemp's ridley (*Lepidochelys kempii*)	160	480	Capture, handle, restrain; epibiota removal; flipper, and/or PIT tag; lavage; blood sample biopsy; weigh
	40	120	Capture, handle, restrain; epibiota removal; acoustic, flipper, and/or PIT tag; lavage; blood sample biopsy; weigh

2.1 Capture

Turtles will be captured by various methods including: (1) entanglement net capture; (2) hand capture while snorkeling or by free-diving from a slow moving boat; (3) strike-netting; and (4) hand/scoop net capture in nearshore and coastal waters, (Blumenthal et al. 2010; Seminoff et al. 2002a). Turtles will be released at or very close to the capture site.

Entanglement net: Large-mesh entanglement nets will be constructed of 2 millimeter diameter nylon twine with a stretched diagonal mesh of 12 inches. The lengths of the nets range from 100 to 250 meters and the depths range from 8 to 16 feet. Researchers will set the nets at the surface extending vertically through the water column. Floats will be embedded in the top line of the net at 10m intervals in order to assist researchers in spotting entangled animals, and the bottom line is weighted so that the net stretches from surface to bottom. Nets will be continuously hand-checked every 20 minutes, and any non-targeted bycatch will be removed from the nets and released immediately. Entangled turtles will be promptly removed from the net and brought to shore or placed inside the boat (Balazs et al. 1987). Set times vary by location, but typically do not exceed 12 hours (nest monitored twice per hour). No more than two nets are set at one time and these are set in series. If many turtles are caught within the first couple of hours the nets will be pulled.

Hand capture: Researchers using snorkeling equipment will capture resting/free-swimming hard shell sea turtles by hand, carefully ascending to the surface (no decompression required) where they will hand individual turtles to an assistant on board the research vessel. Each captured turtle will be carefully brought on board, taking precautions to minimize stress. Boats will not be used to chase turtles into the shallows for easier capture. The shallow areas will be avoided so as to not impact corals and sea grasses and damage the vessel. Only one turtle will be captured and worked up during any given tagging event. If turtles take notice of the diver and attempt flight, they will not be pursued. If any procedural difficulties occur during the capture process the turtle will be immediately released in a manner that ensures its safety.

Strike-netting: When a turtle is spotted, researchers release a 150 meter by 2.4 meter net made of 20.3 centimeter by 20.3 centimeter mesh line, and quickly circle the animal while letting out the net, deployed from an 8 foot net tender dinghy towed behind a 17 foot Boston whaler boat. Once a turtle becomes entangled, the net will be pulled aboard the boat and the turtle immediately removed for further processing (see additional research activities described below).

Hand or dip net: When a turtle is spotted at the surface in shallow water, a net will be placed under the turtle and it will be carefully and safely lifted or “scooped” out of the water and onto the deck of the research vessel.

2.2 Handling, measuring, and weighing

Researchers will use care when handling animals to minimize any possible injury. Captured sea turtles will be held on board in a rectangular tub approximately two feet wide by three feet long by one foot deep. Researchers will place a foam pad on the bottom of the tub and a cloth will be placed over the turtle's eyes to help calm the turtle and restrict movement. During all measurements and sampling, sea turtles will be sheltered from direct sunlight, wind, or rain. Under severe weather conditions or an unforeseen emergency (e.g., physical injury to personnel, etc.) 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. As soon as conditions allow, researchers will return each turtle near the capture site. Turtles captured using netting techniques will be released at the capture site within two hours of capture.

All captured and recaptured turtles will be measured, weighed, and photographed on board. Straight carapace length will be measured from the nuchal notch to the posterior-most portion of the rear marginals using a forester's caliper while curved carapace length will be measured using a flexible tape. Each turtle will also be weighed using a hanging spring scale (35 kilogram [kg] maximum). Researchers will exercise caution so as to ensure that turtles are not dropped or injured during the weighing activities. Turtles will also be photographed/video and carefully examined. Turtles with fibropapilloma will be kept separate from other turtles and separate sets of measuring, weighing and tagging gear will be used. Each set of equipment will be used to measure and weigh turtles will be cleaned and disinfected with a mild disinfectant solution before each turtle is measured. The turtles will be monitored to ensure that it is breathing, and examined for injuries, barnacles or any abnormalities.

2.3 Blood

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 30 seconds with 70 percent ethanol and Betadine to avoid infection. To facilitate bleeding of the cervical sinus, turtles will be positioned so that their head is lower than the body. The blood sample will be taken using a 21 gauge, 1-1.5 inch vacutainer needle and a heparinized vacutainer tube, processed and frozen. Researchers will use smaller needles (23 gauge, 0.5 in) to obtain samples from smaller turtles. Researchers will ensure that the total volume of blood taken from each turtle will not exceed one milliliter per kg of turtle weight and for turtles weighing less than one kg, a single blood sample will not exceed six percent of the turtle's total blood volume. Due to permit conditions, attempts (needle insertions) to extract blood from the neck must 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 3 millileters (mL) of blood per one kg of animal will be collected (SEFSC 2008).

2.4 Tissue sampling

Tissue samples will be collected, preserved and archived for future genetic analysis, disease related studies, and foraging ecology studies using stable isotope analysis. All sea turtles will be sampled once and researchers will make sure that recaptures are not sampled a second time in any given year. Following established procedures, researchers will obtain tissue samples using a new sterile biopsy punch (standard four to six millimeters) from the posterior edge of a rear flipper of each turtle. The sample site will be properly cleaned and disinfected with 10 percent providone iodine and isopropyl alcohol to prevent infection. Samples will then be stored in 70 percent ethanol and analyzed at a later date. After the tissue sample has been taken, slight pressure will be applied to the area using gauze and 10 percent povidine-iodine until there is no visible bleeding. A new sterile biopsy punch will be used on each animal.

2.5 Carapace marking

Non-toxic, white polyester resin paint will be used to mark the sea turtle with a specific number for identification and tracking. The paint will dry within 10 min and is expected to wear off after about a month. The researchers will wear nitrile gloves, and the turtles will be held in the shade to prevent over-heating.

2.6 Flipper and passive integrated transponder (PIT) tagging

All sea turtles captured in the study will be checked for existing flipper tags and scanned for existing internal PIT tags. If any turtle has not been previously flipper-tagged, an oxidation and corrosion resistant metal tag (Inconel) will be applied to the trailing edge of a front 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). Should a turtle not have a PIT tag, one will be inserted subcutaneously into a front flipper or into the shoulder per established protocols (Wyneken et al. 2010) 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 are then 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 turtle is missing any of its original tags, replacement tags will be applied. 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. Recaptured turtles will not be retagged unless tag loss has occurred. Flipper tags will be placed on the trailing edge of each fore 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 turtles, and 10 percent povidine-iodine will be applied to the tag site pre and post inserting the tag to prevent infection. A separate set of applicators will be used with turtles afflicted with fibropapilloma. 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 are strategically located to accommodate future growth in young turtles. Ideally, 25-33% 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 turtles to avoid cross contamination. Tag applicators will also be routinely inspected and discarded when they cease to function properly.

2.7 Satellite and acoustic transmitter attachment

Researchers will apply satellite and acoustic transmitters to a maximum of 30 green, 20 loggerheads, 20 Kemp's ridley, and 5 hawksbill sea turtles under the proposed permit ammendment. Satellite tags may be attached alone or as a combination with archival or acoustic/radio transmitting tags. All tags will be employed with a hydrodynamic design/attachment in mind. Attaching two miniature satellite transmitters on the same turtle provides valuable data relating to tag failure and animal mortality. No more than two tags will be placed on a turtle at any one time (e.g., satellite-acoustic, satellite-radio, satellite-satellite, etc.).

Before transmitter attachment, the carapace of each turtles will be scrubbed and epibionts will be removed. Satellite transmitters will be attached at the highest point of the carapace where the first and second vertebral scutes meet while acoustic transmitters will be attached at the base of the carapace near the tail, using minimum adhesives (Jones et al. 2011). All transmitters will be coated with antifouling paint. Transmitters will not exceed five percent of the turtle's body weight and attachment materials will be configured and stream-lined to minimize effects of buoyancy and drag on the turtle's swimming ability as required by the proposed permit. Based on tag configurations and battery life, researchers anticipate that tags will remain attached to turtles for approximately one year.

Satellite and acoustic tags are to be attached to the carapace using a two-part Power-Fast® epoxy glue. The epoxy emits no odor and produces minimal heat when activated. Drying time varies from 20-60 minutes, depending on ambient temperatures and humidity. Care will be taken to avoid fumes in holding box or use of solvents or solvent rags close to the head. When attaching acoustic transmitters, small holes are drilled through the outer edges of the marginal scutes and the instrument is then wired and glued in place. Sonic tagged turtles will be tracked using hand-held hydrophones from a 17-foot Boston Whaler. Relocation and tracking of the animals will take place daily following tag attachment.

The turtles will be held on the shore or on the boat (adjacent to capture location) for no longer than 3 hours until resin/epoxy has cured and then released back into the water at the point of capture. Turtles will be held in a certified large animal carrier and kept in the shade (natural or canvas tarp) during transmitter attachment. Turtles that are placed on the boat deck or in an animal carrier will have a towel or yoga mat placed under them for protection of their plastron. Once the resin is properly cured, turtles are released back into the water at the point of capture.

Handling time during capture activities should be minimized to reduce the potential for additional stress. Satellite tags remain on a turtle for less than two years. If tagged animals are opportunistically recaptured, transmitters (gear) may be removed.

2.8 Gastric lavage

Researchers will extract dietary samples to provide insight into feeding habits, consumption levels, and diet selection (Legler 1977). Dietary samples will be carefully extracted from the captured turtles using gastric lavage or stomach flushing as described in several previous studies, including Forbes and Limpus (1993) and Makowski et al. (2006). The lavage process flushes food items that are in the esophagus and mouth areas (Balazs 1980; Forbes and Limpus 1993; Legler 1977). Turtles will be held on their back with their posterior end slightly elevated. After the turtle's mouth was opened, a standard veterinary canine oral speculum or similar mouth gag (small or medium, depending on the size of the 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 turtle to avoid esophageal damage. Two sizes of surgical tubes will be available, as well as a set for turtles suspected of being infected with fibropapillomatosis and a set for non-fibropapillomatosis 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 3 minutes in order to reduce the chance of the turtle inhaling during the process. After food samples are collected, the use of the bilge pump will be ceased and water and food then allowed to drain until flow ceases. To assist with drainage, the anterior end of the 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. 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.

2.9 Transport and holding

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 1-2 hours. When biotelemetric instruments are attached, holding time will increase to a maximum 3 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.

2.10 Release

Turtles will be released where they were captured. During release turtles will be lowered as close to the water's surface as possible to prevent potential injuries. All newly released turtles will be observed by researchers and researchers will record observations on the turtle's apparent ability to swim and dive in a normal manner.

At the conclusion of the study, turtles that are tagged with transmitters may be recaptured to remove the transmitter gear. Removal of the transmitters at the end of the experiment is a non-invasive procedure. These animals will not be sampled again to minimize impacts to the animals. Should they not be recaptured, the transmitters will eventually be shed by normal surface flaking of the carapace scutes. Satellite tags generally remain on a turtle from 4 to 6 months to less than 2 years.

2.11 NMFS Permits Division's permit conditions

The following information outlines the main mitigation measures researchers will employ to minimize the potential for any adverse impacts to the target species (green and Kemp's ridley sea turtles) as well as any additional ESA-listed species in the action area. The research project is designed to minimize the potential of any stress, pain or suffering. All the investigators and personnel involved are experienced in capturing sea turtles and will undertake the following precautions. Turtles will be handled carefully so they do not incur additional injury during or after research procedures. Antiseptic methods such as sterilizing equipment and the use of antiseptic solutions such as betadine or alcohol at tag sites will be standard protocol to prevent the transmittal of disease and prevent infection. Turtles found to have serious injuries will be evaluated for possible transport to a rehabilitation facility. The following specific research conditions are placed on the research to ensure compliance with appropriate research protocols:

1. The Permit Holder will be responsible for all activities of any individual who is operating under the authority of the proposed permit. The Principal Investigator will share this responsibility. Individuals operating under the specified Permit and conducting the activities authorized herein, must be approved by NMFS. Alternatively, there must be a NMFS approved individual present to supervise these activities until such time that the other individuals have been approved by NMFS.

2. Accidental mortality of authorized sea turtles: If a turtle is seriously injured or dies during sampling, the Permit Holder must cease research immediately and notify the Chief, Permits and Conservation Division by phone (301-427-8401) as soon as possible, but no later than two days following the event. The Permit Holder must re-evaluate the techniques that were used and those techniques must be revised accordingly to prevent further injury or death. The Permit Holder must submit a written report describing the circumstances surrounding the event. The Permit Holder must send this report to the Chief, Permits and Conservation Division, F/PR1, 1315 East-West Highway, Silver Spring, Maryland 20910. Pending review of these circumstances, NMFS may suspend authorization of research activities or amend the Permit in order to allow research activities to continue.

3. An annual report will be submitted and reviewed by NMFS for each year the permit is valid. In addition to an account of actual 'take' that occurred, the reports will a narrative description of activities and effects. 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.

4. Instruments and equipment that comes in contact with sea turtles must be cleaned and disinfected between animals, and shall be the appropriate weight/size ratio to the receiving animal.

5. The Permit Holder may conduct the activities authorized by this permit 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. Compromised or injured sea turtles must not be handled or sampled by other permit holders working under separate research permits if their activities will further compromise the animal.

6. When handling and/or tagging turtles displaying fibropapilloma tumors and/or lesions, researchers will use the following procedures:

    - Clean and disinfect all equipment that comes into contact with the turtle, between the processing of each turtle, and

    - Maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors and/or lesions. Equipment that comes in contact with the turtle must be cleaned and disinfected between the processing of each turtle.

7. All turtles shall be examined for existing tags, including 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 kilohertz tags. Use new, sterile tag applicators (needles). The application site must be cleaned and then scrubbed with a disinfectant (e.g., Betadine) 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.

8. Flipper tagging with metal tags – All tags shall be cleaned (e.g., oil residue) and disinfected before being used.

9. Netting special conditions

    - Nets used to catch turtles must be of large enough to diminish bycatch of other species.

    - Highly visible buoys shall be attached to the float line of each net such that they are spaced at an interval of every 10 yards or less.

    - Nets must be checked at least every 30 minutes, and more frequently whenever turtles or other bycatch organisms are observed in the net. If water temperatures are $\leq 10^{o}$ Celsius (C) or $\geq 30^{o}$ C, 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. The float line of all nets shall be observed at all times for movements that indicate an animal has encountered the net. When this occurs the net must be immediately checked.

    - 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.

- 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).
- Nets must not be put in the water when marine mammals are observed within the vicinity of the research, and the marine mammals must be allowed to either leave or pass through the area safely before net setting is initiated. Should any marine mammals enter the research area after the 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. If marine mammals remain within the vicinity of the research area, nets must be removed.
- If a marine mammal is entangled, researchers must stop netting activities and immediately free the animal; notify the appropriate NMFS Regional Stranding Coordinator as soon as possible; and report the incident as specified.

10. Blood sampling:

- Blood samples must be taken by experienced personnel.
- New disposable needles must be used on each animal.
- Collection sites must always be scrubbed with alcohol or another antiseptic prior to sampling.
- If an animal cannot be adequately immobilized for blood sampling or conditions on the boat preclude the safety and health of the turtle, samples must not be taken.
- Attempts (needle insertions) to extract blood from the neck must be limited to a total of four, two on either side.
- A single sample must not exceed 3 mL per 1 kg of animal.
- Sampling period. Within a 45-day period of time, the cumulative blood volume taken from a single turtle must not exceed the maximum safe limit described above. 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 three months from the last blood sampling event.
- 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 three months or will be sampled within the next three months by other researchers. The permit holder must contact the other researchers

working in the area that could capture the same turtles to ensure that none of the above limits are exceeded.

11. Gastric lavage

- The actual lavaging of the turtle must not exceed three minutes.
- 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.
- 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).
- Disinfectants must be used according to label directions; however, exposure time should be increased for rough and/or porous items (a dip and rinse is not sufficient). Disinfection can be compromised (incomplete) if items are contaminated with debris and/or have rough or porous surfaces.
- Care must be taken that disinfecting solutions are clean and active and that proper rinsing occurs after disinfection.
- A separate set of equipment must be used for infected and non-infected animals.

12. Biopsy (tissue-skin) sampling:

- A new biopsy punch must be used on each turtle.
- Sterile techniques must be used at all times. 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). The tissue surface must be thoroughly swabbed once with both Betadine and alcohol, sampled, and then thoroughly swabbed again with just Betadine. The procedure area and hands must be clean.
- 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.

13. Carapace marking:

- For turtles approximately four years old or younger- Paint must be applied without crossing suture lines (margins) if the paint will remain on the shell for three months or more.

- For juvenile turtles older than four years of age- Paint must be applied without crossing suture lines (margins) if the paint will remain on the shell for one year or more.

- For adult turtles- Paint must be applied without crossing suture lines (margins) if the paint will remain on the shell for two years or more.

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

14. Sonic tagging:

    - Adequate ventilation around the head of the turtle must be provided during the attachment of satellite tags or attachment of radio/sonic tags if attachment materials produce fumes. To prevent skin or eye contact with harmful chemicals used to apply tags, turtles must not be held in water during the application process.

    - When drilling through marginal scutes, a separate drill bit must be used for each turtle. Bits may be reused if sterilized by autoclave before reuse.

    - Total combined weight of all transmitter attachments must not exceed 5% of the animal's body mass. No more than two telemetry tags may be attached at one time.

    - Each attachment must be made so that there is no risk of entanglement. The transmitter attachment must either 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 carapace length of the turtle. It must include a corrodible, breakaway link that will release the unit after its battery life.

    - Transmitters must not be placed at the peak height of the carapace.

    - Researchers must make attachments as hydrodynamic as possible.

15. General handling and releasing of turtles: The Principal Investigator, Co-investigator(s), or Research Assistant(s) acting on the Permit Holder's behalf must use care when handling live animals to minimize any possible injury, and appropriate resuscitation techniques must be used on any comatose turtle prior to returning it to the water. Whenever possible, stressed or injured animals should be transferred to rehabilitation facilities and allowed an appropriate period of recovery before return to the wild. An experienced veterinarian, veterinary technician, or rehabilitation facility must be named for emergencies. All turtles must be handled according to procedures specified in 50 CFR 223.206(d)(1)(i).

16. Turtles are to be protected from temperature extremes of heat and cold, and kept moist during sampling. The turtle will be provided adequate air flow. The area surrounding the turtle may not contain any materials that could be accidentally ingested.

17. During release, turtles shall be lowered as close to the water's surface as possible, to prevent potential injuries. 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.

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

19. For any listed sturgeon species encountered:

    - Sturgeon tend to inflate their swim bladder when stressed and in air. If the fish has air in its bladder, it will float and be susceptible to sunburn or bird attacks. Efforts must be made to return the fish to neutral buoyancy prior to and during release. Air must be released by gently applying ventral pressure in a posterior to anterior direction. The specimen must then be propelled rapidly downward during release. For help with any questions relating to sturgeon researchers should contact Karen Herrington, USFWS, at (850) 769-0552 extension 250 or Stephanie Bolden, Protected Resources, Southeast Regional Office, NMFS, at (727) 570-5312 (Fax: 727-570-5517). The Permit Holder must report any sturgeon interactions to NMFS' Assistant Regional Administrator for Protected Resources, Southeast Regional Office, within 14 days of the incident (F/SER3, 9721 Executive Center Drive North, St. Petersburg, Florida 33702). This report must contain: the description of the take and final disposition of the sturgeon (i.e., released in good health, etc.).

20. Researchers must take all practicable steps including the use of charts, geographic information system, sonar, fish finders, or other electronic devices to determine characteristics and suitability of bottom habitat prior to using gear to identify submerged aquatic vegetation, coral communities, and live/hard bottom habitats and avoid setting gear in such areas. No gear may be set, anchored on, or pulled across submerged aquatic vegetation, coral or hard/live bottom habitats. If research gear is lost, diligent efforts will be made to recover the lost gear to avoid further damage to benthic habitat and impacts related to "ghost fishing."

2.12 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 CFR 402.02).

The action area for permit 17183-02 will encompass all of the action area previously consulted on (Apalachicola Bay, St. Joseph Bay, St. Andrews Bay, Choctawhatchee Bay, and Pensacola

Bay) as well as areas around Eglin Air Force Base in the northeastern Gulf of Mexico along Florida (Figure 1).

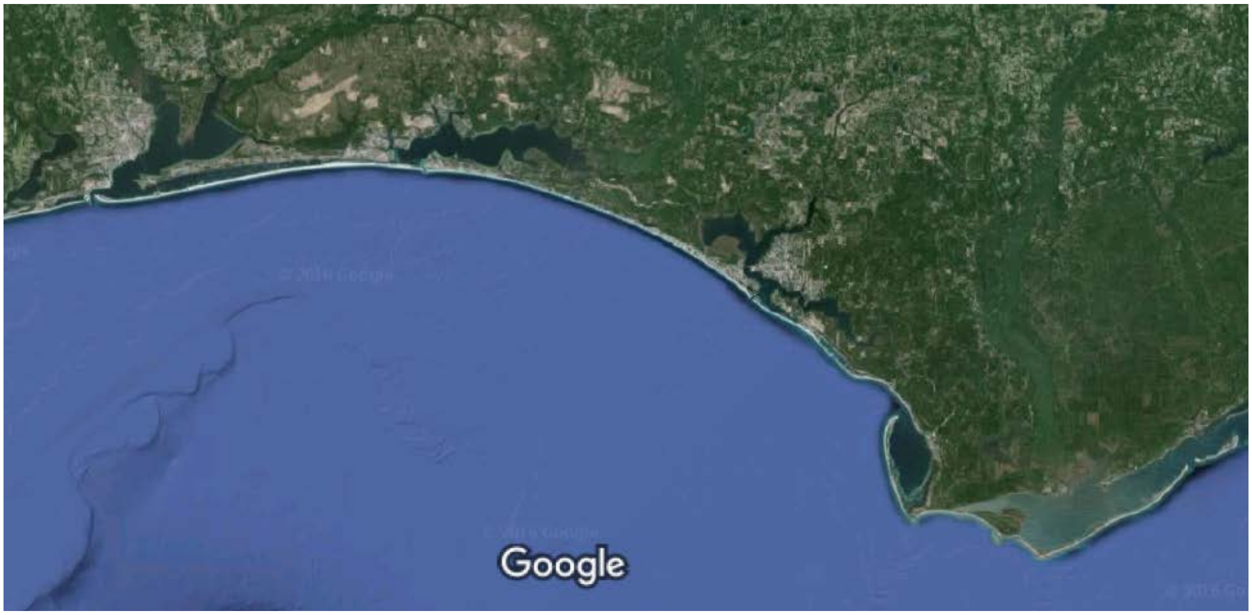

Figure 1. The panhandle of Florida, including the bay systems of the action area.

2.13 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 permit 17183-02, we did not identify any interrelated or interdependent actions.

3 OVERVIEW OF NMFS' ASSESSMENT FRAMEWORK

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

"To jeopardize the continued existence of an ESA-listed species" means to engage in an action that reasonably will be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of an ESA-listed or proposed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02). The jeopardy analysis considers both survival and recovery of the species.

Section 7 assessment involves the following steps:

1) We identify the proposed action and those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on the physical, chemical, and biotic environment within the action area, including the spatial and temporal extent of those stressors.

2) We identify the ESA-listed or proposed species and designated critical habitat that are likely to co-occur with those stressors in space and time.

3) 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.

4) We identify the number, age (or life stage), and gender of ESA-listed or proposed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. This is our exposure analysis.

5) We evaluate the available evidence to determine how those ESA-listed or proposed species are likely to respond given their probable exposure. This is our response analyses.

6) We assess the consequences of these responses to the individuals that have been exposed, the populations those individuals represent, and the species those populations comprise. This is our risk analysis.

7) The adverse modification analysis considers the impacts of the proposed action on the critical habitat features and conservation value of designated critical habitat. This opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we relied upon a new regulatory definition that defines destruction or adverse modification as "a direct or indirect alteration that appreciably diminishes 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." (81 FR 7214). For designated critical habitat, we assess the consequences of responses given exposure on the value of the critical habitat for the conservation of the species for which the habitat has been designated.

8) We describe any cumulative effects of the proposed action in the action area. Cumulative effects, as defined in our implementing regulations (50 CFR §402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate Section 7 consultation.

9) We integrate and synthesize factors one through nine by considering the effects of the action to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

    a) Reduce appreciably the likelihood of both survival and recovery of the ESA-listed or proposed species in the wild by reducing its numbers, reproduction, or distribution; or

    b) Reduce the conservation value of designated or proposed critical habitat. These assessments are made in full consideration of the status of the species and critical habitat.

10) We state our conclusions regarding jeopardy and the destruction or adverse modification of critical habitat.

If, in completing the last step in the analysis, we determine the action under consultation is likely to jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat, we must identify a reasonable and prudent alternative to the action. The reasonable and prudent alternative must not be likely to jeopardize the continued existence of ESA-listed species nor adversely modify their designated critical habitat and it must meet other regulatory requirements.

To conduct these analyses, we rely on all the best scientific and commercial evidence available to us. This evidence consists of:

- The environmental assessment submitted by the Permit's Division
- Monitoring reports submitted by past research
- Reports from NMFS Science Centers
- Reports prepared by natural resource agencies in states and other countries
- Reports from nongovernmental organizations involved in marine conservation issues

- The information provided by NMFS' Permits Division when it initiated formal consultation
- The general scientific literature
- Our expert opinion

To conduct these analyses, we rely on the best scientific and commercial evidence available to us. This evidence consists of the environmental assessment submitted by the Permit's Division, monitoring reports of past research, reports from NMFS Science Centers; reports prepared by natural resource agencies in states and other countries, reports from non-governmental organizations involved in marine conservation issues, the information provided by NMFS' Permits and Conservation Division when it initiated formal consultation, the general scientific literature, and our expert opinion. We also referred to an internal electronic library that represents a major repository on the biology of ESA-listed species under the NMFS' jurisdiction.

We supplemented these searches with electronic searches of doctoral dissertations and master's theses. These searches specifically tried to identify data or other information that supports a particular conclusion (for example, a study that suggests whales will exhibit a particular response to acoustic exposure or close vessel approach) as well as data that do not support that conclusion. When data are equivocal or when faced with substantial uncertainty, our decisions are designed to avoid the risks of incorrectly concluding that an action will not have an adverse effect on listed species when, in fact, such adverse effects are likely (i.e., Type II error).

4 Status of ESA-Listed and Proposed Species

This section identifies the ESA-listed and proposed species that potentially occur within the action area that may be affected by permit 17183-02 (Table 2). It then summarizes the biology and ecology of those species that is pertinent to this consultation and what is known about species' life histories in the action area. The species potentially occurring within the action area are ESA-listed or proposed in Table 2, with their regulatory status. This does not include species that we do not expect will be affected by the action.

Table 2. Proposed, threatened, and endangered species that may be affected by the Permit Division's proposed permit 17183-02.

Species	ESA Status	Critical Habitat	Recovery Plan
Fin whale (*Balaenoptera physalus)*	Endangered E – 35 FR 18319	-- --	75 FR 47538
Humpback whale (*Megaptera novaeangliae)*	Endangered E – 35 FR 18319	-- --	55 FR 29646
Sei whale (*Balaenoptera borealis)*	Endangered E – 35 FR 18319	-- --	76 FR 43985
Sperm whale (*Physeter macrocephalus)*	Endangered E – 35 FR 18319	-- --	75 FR 81584
Green sea turtle (*Chelonia mydas*): Florida breeding population	Threatened E – 43 FR 32800	-- --	NOAA website
Green sea turtle (*Chelonia mydas*): North Atlantic Distinct Population Segment (DPS)	Proposed threatened E – 80 FR 15271		
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered E - 35 FR 8491	-- --	57 FR 38818
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered E – 35 FR 18319	-- --	56 FR 38424
Loggerhead sea turtle (*Caretta caretta*): Northwest Atlantic DPS	Threatened E – 76 FR 58868	79 FR 39856 (proposed)	74 FR 2995
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered E – 61 FR 17	44 FR 17710	63 FR 28359
Largetooth sawfish (*Pristis perotteti)*	Endangered E – 79 FR 73977	-- --	74 FR 3566
Gulf sturgeon (*Acipenser oxyrinchus desotoi*)	Threatened E – 56 FR 49653	68 FR 13370	67 FR 39107

4.1 ESA-listed and proposed species and critical habitat not likely to be adversely affected

NMFS uses two criteria to identify the ESA-listed or proposed species 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 or proposed species or designated critical habitat. If we conclude that an ESA-listed or proposed species or designated critical habitat is not likely to be exposed to the proposed activities, we must also conclude 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 or proposed 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 ESA-listed or proposed species 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 or proposed 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 constituting an adverse effect. That means the ESA-listed or proposed 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 will be an adverse effect if it did impact a listed species), but it is very unlikely to occur.

4.2 Cetaceans

The directed focus of the research should avoid exposing any listed cetacean in the action area to harassment and the potential for a ship strike during transit is highly unlikely given the experience of the observers at spotting listed species and avoiding any non-targeted species as they are encountered. The permit will be conditioned so that larger nets will not be set if marine mammals are observed in the area, which minimizes the effects to other non-target species. If a whale is observed in the action area, it will be avoided and the vessel will operate at a reduced speed, will maintain a minimum distance of 100 yards, following marine mammal viewing guidelines, and therefore are not likely to be exposed to the effects from the proposed action.

Therefore, issuance of permit amendment 17183-02 is not expected to have an effect on ESA-listed marine mammals, and they will not be considered further in this Opinion.

4.3 Sea turtles

Leatherback sea turtles inhabit the waters off the coast of Florida including the Gulf of Mexico and may therefore be incidentally harassed through net capture (particularly for set nets). However, the researchers authorized under permit 17183-01 are experienced in turtle surveys and will restrict their research to the targeted species. Leatherback sea turtles do nest in the action area but researchers have never encountered a leatherback in the study area during surveys conducted in the past. Based on these data, NMFS believes the probability of this species being exposed to the effects of the research activities to be highly unlikely and the threats posed to this species are discountable. Therefore, the proposed research permit modifications are not likely to adversely affect leatherback sea turtles and this species will not be considered further in this Opinion.

The proposed permit amendment 17183-02 will not change in any aspect the activities that are authorized under permit 17183-01 that affect ESA-listed hawksbill and northwestern Atlantic DPS loggerhead sea turtles. These activities have previously undergone undergone ESA consultation. No additional activities are being authorized that will affect these species. Therefore, the action of issuing additional take for green and Kemp’s ridley sea turtle is not expected to have an effect on hawksbill and northwestern Atlantic DPS loggerhead sea turtles.

4.4 Sea turtle critical habitat

On July 18, 2013, NMFS proposed critical habitat for loggerhead sea turtles along the US Atlantic and Gulf of Mexico coasts from North Carolina to Mississippi (78 FR 43005). Although loggerhead sea turtle critical habitat has been proposed in the action area (particularly nearshore reproductive critical habitat), we do not expect any aspect of the proposed action to “result in a loss of habitat conditions that allow for (a) hatchling egress from the water's edge to open water; and (b) nesting female transit back and forth between the open water and the nesting beach during nesting season”, which are identified in the proposed critical habitat designation as issues that will impact the critical habitat (78 FR 43005). Therefore, the proposed research permit modifications are expected to have no effect on proposed loggerhead sea turtle critical habitat and this critical habitat will not be considered further in this Opinion.

4.5 Largetooth sawfish

Largetooth sawfish historically occupied waters in the Gulf of Mexico off Texas and Florida and therefore have the possibility of being present during research activities. However, sightings of largetooth sawfish in the Panhandle region of Florida are extremely rare and the last reported sighting of the species in Florida waters occurred in 1941 (Burgess et al. 2009). Researchers did not report any sightings of largetooth sawfish in monitoring reports submitted since 2008 under the original permit. While the possibility exists that transient fish may enter Florida’s waters, NMFS believes it is highly unlikely that these species will be exposed to effects from the proposed action. Therefore, the proposed action is not likely to adversely affect endangered largetooth sawfish and this species will not be considered further in this Opinion.

4.6 Gulf sturgeon

The Gulf sturgeon is an anadromous fish, spending cool months (primarily October through March) in estuarine bays or in the greater Gulf of Mexico waters and spending warmer months (i.e., March through May) in freshwater coastal streams and rivers (Fox et al. 2000). Historically, the Gulf sturgeon occurred from the Mississippi River to Tampa Bay in Florida (Wooley and Crateau 1985) with sporadic occurrences recorded as far west as the Rio Grande River between Texas and Mexico, and as far east and south as Florida Bay (Wooley and Crateau 1985). Its present range extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east to the Suwannee River in Florida (USFWS and NMFS 2009). However, Gulf sturgeon have not been encountered during the course of the researcher's activities, which have extended for several years. Because of the lack of encounters, we believe the proposed action is not likely to adversely affect threatened Gulf sturgeon and this species will not be considered further in this Opinion.

4.7 Gulf sturgeon critical habitat

Critical habitat is designated for Gulf sturgeon in 14 geographic areas (units) including rivers and tributaries and nearshore Gulf of Mexico waters utilized by the species for spawning and foraging habitat. The proposed research activities are expected to be conducted in the following three designated units: Unit 6 (i.e., Apalachicola River system in Franklin, Gulf, Liberty, Calhoun, Jackson, and Gadsen counties, Florida), unit 11 (i.e., Florida Nearshore Gulf of Mexico in Escambia, Santa Rosa, Okaloosa, Walton, Bay and Gulf counties, Florida), and unit 13 (i.e., Apalachicola Bay in Gulf and Franklin counties, Florida).

The conservation value identified for this critical habitat designation includes the following: abundant prey items within riverine habitats for larval and juvenile life stages and within estuarine and marine habitats for juvenile, subadult, and adult life stages; riverine spawning sites with substrates suitable for egg deposition and development; riverine aggregation areas believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions; a flow regime necessary for normal behavior, growth, and survival of all life stages in the riverine environment and necessary for maintaining spawning sites in suitable condition for egg attachment, eggs sheltering, resting, and larvae staging; water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics necessary for normal behavior, growth, and viability of all life stages; sediment quality, including texture and other chemical characteristics necessary for normal behavior, growth, and viability of all life stages; and safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats.

Researchers are not expected to have a measurable impact on prey items, riverine spawning sites, flow regimes, water quality, sediment quality, or migratory pathways. Permit conditions require researchers to remove anchors and gear in a manner that avoids dragging them across the bottom to avoid disturbing sediments and any turbidity from placing set nets on the bottom of estuarine areas is expected to be minimal. The research team has experience performing similar types of surveys and will be expected to take all proper precautions to avoid any physical disturbance or minimizing the impact of an accidental fuel spill. NMFS believes that exposure of Gulf sturgeon critical habitat to the proposed research activities will not be expected to impact the quality, quantity, and/or availability of primary constituent elements nor will it impact the conservation value of the affected units. Therefore, the proposed action is expected to have no effect on Gulf sturgeon critical habitat and this critical habitat will not be considered further in this Opinion.

4.8 ESA-listed species and critical habitat likely to be adversely affected

This opinion examines the status of each ESA-listed or proposed species (Kemp's ridley and green sea turtles) that is likely to be affected by the proposed action. The status is determined by the level of risk the ESA-listed or proposed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The *Status of ESA-Listed or Proposed Species* section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02.

One factor affecting the range-wide status of sea turtles, and aquatic habitat at large, is climate change. Although the effects of climate change are ongoing, many of the expected effects are likely to occur years to centuries from now, well beyond when the proposed permits will expire. We primarily discuss climate change as a threat common to all species addressed in this opinion, rather than in each of the species-specific narratives. As we better understand responses to climate change, we address these effects in relevant species-specific sections.

In general, based on forecasts made by the Intergovernmental Panel on Climate Change, climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the near future (IPCC 2002; IPCC 2014). From 1906 to 2006, global surface temperatures have risen 0.74º C and continue at an accelerating pace; 11 of the 12 warmest years on record since 1850 have occurred since 1995 (Poloczanska et al. 2009). Furthermore, 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). North Atlantic and Pacific sea surface temperatures have shown trends in being anonymously warm in recent years (Blunden and Arndt 2013). The ocean along the US eastern seaboard is also much saltier than historical averages (Blunden and Arndt 2013). 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). For sea turtles nesting in the Caribbean, temperature projections in 2030 suggest less than 3% of hatchlings will be male in leatherback, hawksbill, and green sea turtles; all of these are 36% male or less at present (Laloë et al. 2016). This can result in heavily feminized populations incapable of fertilization of available females (Laloë et al. 2014). This is not considered to be imminent and presently has the advantage of shifting the natural rates of population growth higher (Laloë et al. 2014). Oceanographic models project a weakening of the thermohaline circulation resulting in a reduction of heat transport into high latitudes of Europe as well as an increase in the mass of the Antarctic and Greenland ice sheets, although the magnitude of these changes remain unknown. Species that are shorter-lived, larger body size, or generalist in nature are liable to be better able to adapt to climate change over the long term versus those that are longer-lived, smaller-sized, or rely on specialized habitats (Brashares 2003; Cardillo 2003; Cardillo et al. 2005; Issac 2009; Purvis et al. 2000). Climate change is most likely to have its most pronounced effects on species whose populations are already in tenuous positions (Isaac 2008). As such, we expect the risk of extinction to listed species to rise with the degree of climate shift associated with global warming.

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

Climate change has been linked to changing ocean currents as well. Rising carbon dioxide levels have been identified as a reason for a poleward shift in the Eastern Australian Current, shifting warm waters into the Tasman Sea and altering biotic features of the area (Johnson et al. 2011; Poloczanska et al. 2009). Similarly, the Kuroshio Current in the western North Pacific (an important foraging area for juvenile sea turtles) has shifted as a result of altered long-term wind patterns over the Pacific Ocean (Blunden and Arndt 2013; Poloczanska et al. 2009). Ocean temperatures around Iceland are linked with alterations in the continental shelf ecosystem there, including shifts in minke whale diet (Víkingsson et al. 2014).

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% increase in cyclone activity in the Atlantic. Sea levels have risen an average of 1.7 millimeters per year over the 20th century due to glacial melting and thermal expansion of ocean water; this rate will likely increase. The current pace is nearly double this, with a 20-year trend of 3.2 millimeters per year (Blunden and Arndt 2013). This is largely due to thermal expansion of water, with minor contributions from melt water (Blunden and Arndt 2013). Based on computer models, these phenomena will inundate nesting beaches of sea turtles, change patterns of coastal erosion and sand accretion that are necessary to maintain those beaches, and will 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 will be inundated sooner than will steeper beaches preferred by larger species (Hawkes et al. 2014). The loss of nesting beaches, by itself, will 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. 2009b; Fuentes et al. 2010; Fuentes et al. 2009c). Smaller individuals likely experience increased predation (Fuentes et al. 2009b).

Climactic shifts also occur because of natural phenomena. In the North Atlantic, this primarily concerns fluctuations in the North Atlantic Oscillation (NAO), which results from changes in atmospheric pressure between a semi-permanent high pressure feature over the Azores and a subpolar low pressure area over Iceland (Curry and McCartney 2001; Hurrell 1995; Stenseth et al. 2002). This interaction affects sea surface temperatures, wind patterns, and oceanic circulation in the North Atlantic (Stenseth et al. 2002). The NAO shifts between positive and negative phases, with a positive phase having persisted since 1970 (Hurrell 1995). North Atlantic conditions experienced during positive NAO phases include warmer than average winter weather in central and eastern North America and Europe and colder than average temperatures in Greenland and the Mediterranean Sea (Visbeck 2002). Effects are most pronounced during winter (Taylor et al. 1998). This can change the oceanographic characteristics of hawksbill sea turtle habitat, which could affect the ability of areas to support foraging, breeding, or other vital life history parameters. Fluctuations in North Atlantic sea surface temperature are linked with variations in hawksbill nesting in the southern Gulf of Mexico (del Monte-Luna et al. 2012).

4.8.1 Green sea turtle

Populations. Populations are distinguished generally by ocean basin and more specifically by nesting location. However, NMFS recently proposed to designate green sea turtles in the North Atlantic as a separate DPS (80 FR 15271) based on genetic discreetness and lack of overlap in breeding range of other DPSs (Seminoff et al. 2015)(Table 3).

Table 3. Locations and most recent abundance estimates of North Atlantic green sea turtles as annual nesting females (AF) and annual nests (AN).

Location	Most recent abundance	Reference
Western Atlantic Ocean		
Tortuguero, Costa Rica	17,402-37,290 AF	(Troëng and Rankin 2005)
Aves Island, Venezuela	335-443 AF	(Vera 2007)
Galibi Reserve, Suriname	1,803 AF	(Weijerman et al. 1998)
Isla Trindade, Brazil	1,500-2,000 AF	(Moreira and Bjorndal 2006)
Central Atlantic Ocean		
Ascension Island, UK	3,500 AF	(Broderick et al. 2006)
Eastern Atlantic Ocean		
Poilao Island, Guinea-Bissau	7,000-29,000 AN	(Catry et al. 2009)
Bioko Island, Equatorial Guinea	1,255-1,681 AN	(Tomas et al. 1999)

Distribution. Green sea turtles have a circumglobal distribution, occurring throughout tropical, subtropical waters, and, to a lesser extent, temperate waters.

Growth and reproduction. Most green sea turtles exhibit particularly slow growth rates, which have been attributed to their largely plant-eating diet (Bjorndal 1982). Growth rates of juveniles vary substantially among populations, ranging from less than 1 cm/year (Green 1993) to greater than 5 cm/year (McDonald Dutton and Dutton 1998), likely due to differences in diet quality, duration of foraging season (Chaloupka et al. 2004), and density of turtles in foraging areas (Balazs and Chaloupka 2004; Bjorndal et al. 2000; Seminoff et al. 2002b). Hart et al. (2013a) found growth rates of green sea turtles in the US Virgin Islands to range from 0 to 9.5 cm annually (mean of 4.1, standard deviation of 2.4). The largest growth rates were in the 30-39 cm class. If individuals do not feed sufficiently, growth is stunted and apparently does not compensate even when greater-than-needed resources are available (Roark et al. 2009). In general, there is a tendency for green sea turtles to exhibit monotonic growth (declining growth rate with size) in the Atlantic and non-monotonic growth (growth spurt in mid-size classes) in the Pacific, although this is not always the case (Balazs and Chaloupka 2004; Chaloupka and Musick 1997; Seminoff et al. 2002b). It is estimated that green sea turtles reach a maximum size just under 100 cm in carapace length (Tanaka 2009). A female-bias has been identified from studies of green sea turtles (Wibbels 2003).

Consistent with slow growth, age-to-maturity for green sea turtles appears to be the longest of any sea turtle species and ranges from about 20 to 40 years or more (Balazs 1982; Chaloupka et al. 2004; Chaloupka and Musick 1997; Frazer and Ehrhart 1985; Hirth 1997; Limpus and Chaloupka 1997; Seminoff et al. 2002b; Zug et al. 2002; Zug and Glor 1998). Estimates of reproductive longevity range from 12 to 26 years in the North Atlantic beaches studied (Frazer and Ladner 1986; Richards et al. 2011). Considering that mean duration between females returning to nest ranges from 2 to 3 years (Troëng and Chaloupka 2007b; Witherington and Ehrhart 1989; Zurita et al. 1994), these reproductive longevity estimates suggest that a female may nest 3 to 11 seasons over the course of her life. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 9-18 day intervals (Hart et al. 2013b; Johnson and Ehrhart 1996; Troeng et al. 2005; Witherington and Ehrhart 1989). Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest. Roughly 62% of eggs hatch in Florida nests (Seminoff et al. 2015). Females usually have 2-4 or more years between breeding seasons, whereas males may mate every year (Balazs 1983). Based on reasonable means of three nests per season and 100 eggs per nest (Hirth 1997), a female may deposit 9 to 33 clutches, or about 900 to 3,300 eggs, during her lifetime. Nesting sites appear to be related to beaches with relatively high exposure to wind or wind-generated waves (Santana Garcon et al. 2010). Temperatures affects sex determination, with 81% of green sea turtle eggs being female in Florida nests (Rogers 2013).

Once hatched, sea turtles emerge and orient towards a light source, such as light shining off the ocean. They enter the sea in a “frenzy” of swimming activity, which decreases rapidly in the first few hours and then gradually over the first several weeks (Ischer et al. 2009; Okuyama et al. 2009). Factors in the ocean environment have a major influence on reproduction (Chaloupka 2001; Limpus and Nicholls 1988; Solow et al. 2002). It is also apparent that during years of heavy nesting activity, density dependent factors (beach crowding and digging up of eggs by nesting females) may impact hatchling production (Tiwari et al. 2005; Tiwari et al. 2006). Precipitation, proximity to the high tide line, and nest depth can also significantly affect nesting success (Cheng et al. 2009). Precipitation can also be significant in sex determination, with greater nest moisture resulting in a higher proportion of males (Leblanc and Wibbels 2009). Green sea turtles often return to the same foraging areas following nesting migrations (Broderick et al. 2006; Godley et al. 2002). Once there, they move within specific areas, or home ranges, where they routinely visit specific localities to forage and rest (Godley et al. 2003; Makowski et al. 2006; Seminoff and Jones 2006; Seminoff et al. 2002a; Taquet et al. 2006). It is also apparent that some green sea turtles remain in pelagic habitats for extended periods, perhaps never recruiting to coastal foraging sites (Pelletier et al. 2003).

In general, survivorship tends to be lower for juveniles and subadults than for adults. Adult survivorship has been calculated to range from 0.82-0.97 versus 0.58-0.89 for juveniles (Chaloupka and Limpus 2005; Seminoff et al. 2003; Troëng and Chaloupka 2007a), with lower values coinciding with areas of human impact on green sea turtles and their habitats (Bjorndal et al. 2003; Campbell and Lagueux 2005).

Habitat. Green turtles appear to prefer waters that usually remain around 20º C in the coldest month, but may occur considerably north of these regions during warm-water events, such as El Niño. Stinson (1984) found green turtles to appear most frequently in US coastal waters with temperatures exceeding 18º C. Further, green sea turtles seem to occur preferentially in drift lines or surface current convergences, probably because of the prevalence of cover and higher prey densities that associate with flotsam. For example, in the western Atlantic Ocean, drift lines commonly containing floating *Sargassum* species are capable of providing juveniles with shelter (NMFS and USFWS 1998). Underwater resting sites include coral recesses, the underside of ledges, and sand bottom areas that are relatively free of strong currents and disturbance. Available information indicates that green turtle resting areas are near feeding areas (Bjorndal and Bolten 2000). Strong site fidelity appears to be a characteristic of juveniles green sea turtles along the Pacific Baja coast (Senko et al. 2010).

Green sea turtles in the Gulf of Mexico tend to remain along the coast (lagoons, channels, inlets, and bays), with nesting primarily occurring in Florida and Mexico and infrequent nesting in all other areas (Landry and Costa 1999; Meylan et al. 1995a; NMFS and USFWS 1991; USAF 1996). Foraging areas seem to be based on seagrass and macroalgae abundance, such as in the Laguna Madre of Texas. However, green sea turtles may also occur in offshore regions, particularly during migration and development. Sea turtles frequently forage far from their nesting beaches. Sea turtles foraging in the western Gulf of Mexico almost exclusively stem from Gulf of Mexico and northern Caribbean rookeries (Anderson et al. 2013).

Status and trends. Federal listing of the green sea turtle occurred on July 28, 1978, with all populations listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are endangered (43 FR 32800). The International Union for Conservation of Nature (IUCN) has classified the green turtle as “endangered.”

On March 23, 2015, NMFS proposed to relist green sea turtles as separate DPSs globally (80 FR 15271). If finalized, the new listing designations will have the North Atlantic DPS (proposed threatened) co-occurring with the action area. The North Atlantic DPS extends from the boundary of South and Central America, north to 10.5° North, 77° West, then extending due east across the Atlantic Ocean at 19° North latitude to the African continent, and extending north along the western coasts of Africa and Europe (west of 5.5° West longitude) to 48° North latitude (Figure 2).

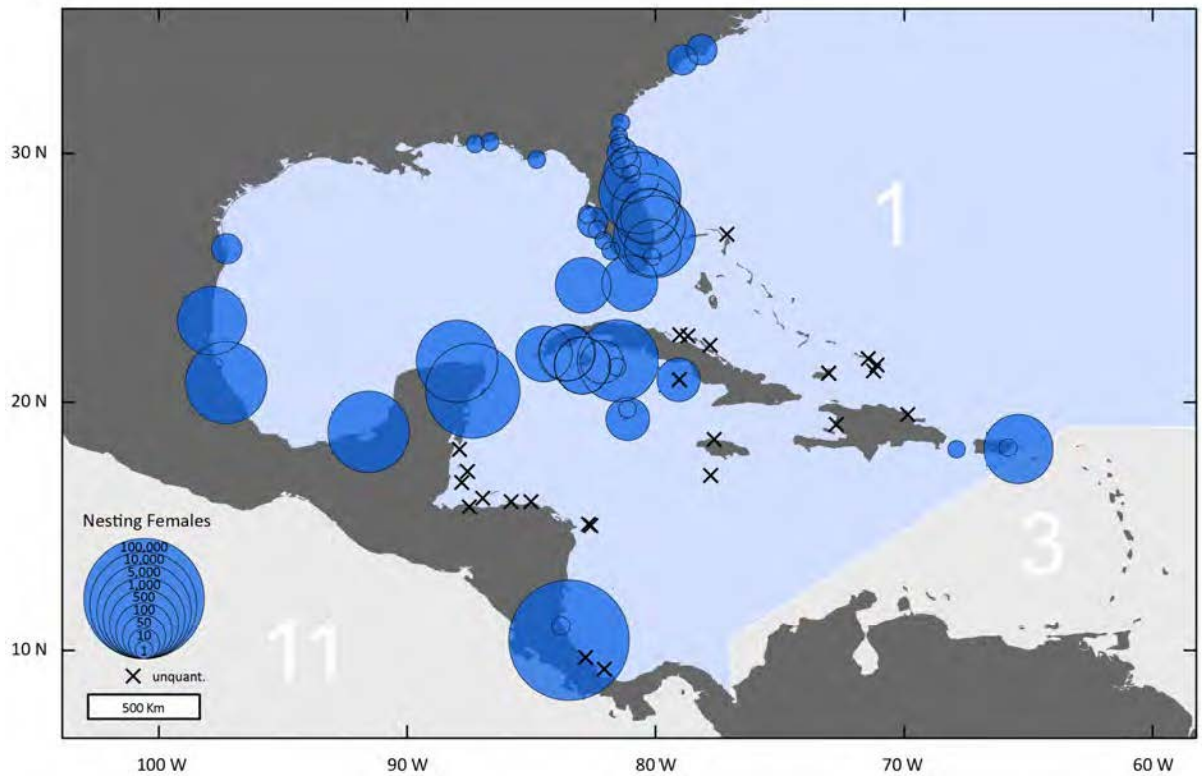

Figure 2. Close up of nesting distribution of green turtles in the western North Atlantic DPS (blue shading). Size of circles indicates estimated nester abundance. Locations marked with 'x' indicate nesting sites lacking abundance information (Limpus 2008).

No trend data are available for almost half of the important nesting sites, where numbers are based on recent trends and do not span a full green sea turtle generation, and impacts occurring over four decades ago that caused a change in juvenile recruitment rates may have yet to be manifested as a change in nesting abundance. The numbers also only reflect one segment of the population (nesting females), who are the only segment of the population for which reasonably good data are available and are cautiously used as one measure of the possible trend of populations.

Atlantic Ocean. A total of 73 nesting beaches are known to host green sea turtle nesting in the North Atlantic, of which 48 have been assessed for abundance (Seminoff et al. 2015). Primary sites for green sea turtle nesting in the Atlantic/Caribbean include: (1) Yucatán Peninsula, Mexico; (2) Tortuguero, Costa Rica; (3) Aves Island, Venezuela; (4) Galibi Reserve, Suriname; (5) Isla Trindade, Brazil; (6) Ascension Island, United Kingdom; (7) Bioko Island, Equatorial Guinea; and (8) Bijagos Achipelago, Guinea-Bissau (NMFS and USFWS 2007a). Nesting at all of these sites was considered to be stable or increasing with the exception of Bioko Island and the Bijagos Archipelago where the lack of sufficient data precludes a meaningful trend assessment for either site (NMFS and USFWS 2007a). Tortuguero hosts roughly 79% of the 167,000 nesters estimated to occur in the North Atlantic DPS (Seminoff et al. 2015).

Seminoff (2004) reviewed green sea turtle nesting data for eight sites in the western, eastern, and central Atlantic. Seminoff (2004) concluded that all sites in the central and western Atlantic showed increased nesting, with the exception of nesting at Aves Island, Venezuela, while both sites in the eastern Atlantic demonstrated decreased nesting. These sites are not inclusive of all green sea turtle nesting in the Atlantic. However, other sites are not believed to support nesting levels high enough that will change the overall status of the species in the Atlantic (NMFS and USFWS 2007a). Only one nester was observed in 2011-2012 in Manatee County (Seminoff et al. 2015), which forms the southern border of the action area.

By far, the most important nesting concentration for green sea turtles in the western Atlantic is in Tortuguero, Costa Rica (NMFS and USFWS 2007a). Nesting in the area has increased considerably since the 1970s and nest count data from 1999-2003 suggest nesting by 17,402-37,290 females per year (NMFS and USFWS 2007a). The number of females nesting per year on beaches in the Yucatán, at Aves Island, Galibi Reserve, and Isla Trindade number in the hundreds to low thousands, depending on the site (NMFS and USFWS 2007a).

The vast majority of green sea turtle nesting within the southeastern US occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995b). Green sea turtle nesting in Florida has been increasing since 1989 (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute Index Nesting Beach Survey Database). Since establishment of index beaches in 1989, the pattern of green turtle nesting shows biennial peaks in abundance with a generally positive trend during the ten years of regular monitoring. This is perhaps due to increased protective legislation throughout the Caribbean (Meylan et al. 1995b). A total statewide average (all beaches, including index beaches) of 5,039 green turtle nests were laid annually in Florida between 2001 and 2006, with a low of 581 in 2001 and a high of 9,644 in 2005 (NMFS and USFWS 2007a). Data from index nesting beaches substantiate the dramatic increase in nesting. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008, further dropping under 3,000 in 2009, but that consecutive drop was a temporary deviation from the normal biennial nesting cycle for green turtles, as 2010 saw an increase back to 8,426 nests on the index nesting beaches (Florida Fish and Wildlife Conservation Commission, Index Nesting Beach Survey Database). Occasional nesting has been documented along the Gulf coast of Florida (Meylan et al. 1995b). More recently, green turtle nesting occurred on Bald Head Island, North Carolina; just east of the mouth of the Cape Fear River; on Onslow Island; and on Cape Hatteras National Seashore. Increased nesting has also been observed along the Atlantic coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). Recent modeling by Chaloupka et al. (2008) using data sets of 25 years or more has resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9%, and the Tortuguero, Costa Rica, population growing at 4.9%.

There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas of the southeastern US. However, information on incidental captures of immature green sea turtles at the St. Lucie Power Plant in St. Lucie County, Florida, shows that the annual number of immature green sea turtles captured by their offshore cooling water intake structures has increased significantly. Green sea turtle annual captures averaged 19 for 1977-1986, 178 for 1987-1996, and 262 for 1997-2001 (Florida Power and Light Company St. Lucie Plant 2002). More recent unpublished data shows 101 captures in 2007, 299 in 2008, 38 in 2009 (power output was cut—and cooling water intake concomitantly reduced—for part of that year) and 413 in 2010. Ehrhart et al. (2007) documented a significant increase in in-water abundance of green turtles in the Indian River Lagoon area.

Connectivity of nesting groups seems good, with a given foraging region generally supporting individuals from multiple breeding areas (Seminoff et al. 2015).

Natural threats. Herons, gulls, dogfish, and sharks prey on hatchlings. Adults face predation primarily by sharks and to a lesser extent by killer whales. Predators (primarily of eggs and hatchlings) also include dogs, pigs, rats, crabs, sea birds, reef fishes, and groupers (Bell et al. 1994; Witzell 1981). All sea turtles except leatherbacks can undergo "cold stunning" if water temperatures drop below a threshold level, which can be lethal. Several such events have occurred over the past decade from Texas to New England, involving hundreds of green sea turtles each time (Seminoff et al. 2015). For unknown reasons, the frequency of a disease called fibropapillomatosis is much higher in green sea turtles than in other species and threatens a large number of existing subpopulations. The incidence of fibropapillomatosis varies widely by location (including areas close to one another), but ranges from 8-72% in Florida waters and seems to be linked to degradation of foraging habitat (Seminoff et al. 2015). A to-date unidentified virus may aid in the development of fibropapillomatosis (Work et al. 2009). Green sea turtles with an abundance of barnacles have been found to have a much greater probability of having health issues (Flint et al. 2009). The fungal pathogens *Fusarium falciforme* and *F. keratoplasticum* can kill in excess of 90% of sea turtle embryos they infect and may constitute a major threat to nesting productivity under some conditions (Sarmiento-Ramırez et al. 2014).

Anthropogenic threats. Major anthropogenic impacts to the nesting and marine environment affect green sea turtle survival and recovery (Patino-Martinez 2013). At nesting beaches, green sea turtles rely on intact dune structures, native vegetation, and normal beach temperatures for nesting (Ackerman 1997). Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 1997b). These factors may directly, through loss of beach habitat, or indirectly, through changing thermal profiles and increasing erosion, serve to decrease the amount of nesting area available to nesting females and may evoke a change in the natural behaviors of adults and hatchlings (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). Ingestion of plastic and other marine debris is another source of morbidity and mortality (Stamper et al. 2009), apparently due to the resemblance to jellyfish prey (Schuyler et al. 2014). Marine debris easily blocks the digestive tract (Santos et al. 2015). Vessel strike has been documented in about 18% of stranded green sea turtles in the southeastern US from 2005 to

2009, so vessel strike is likely a significant cause of injury and mortality in the region (Seminoff et al. 2015). Further, the introduction of alien algae species threatens the stability of some coastal ecosystems and may lead to the elimination of preferred dietary species of green sea turtles (De Weede 1996). Low-level bycatch has also been documented in longline fisheries (Petersen et al. 2009). From 1997 to 2009, 481 (just under 10%) of stranded green sea turtles in Florida were reported entangled, hooked, or otherwise involved with fishery gear such as hook and lines or trap pots (Seminoff et al. 2015). Very few green sea turtles are bycaught in US fisheries (Finkbeiner et al. 2011), with the exception of shrimp trawl fisheries. From 1997 to 1998, Epperly et al. (2002a) estimated 48,239 green sea turtle interactions with shrimp trawls. NMFS (2002a) estimated 4,620-7,055 green sea turtles are killed or injured in Gulf of Mexico and southern US shrimp trawls annually. Between 1991 and 2011, an average of 8,169 green sea turtles were harvested annually along the Caribbean coast of Nicaragua (over 171,000 over this period); a rate that has been in decline potentially due to population depletion (Lagueux et al. 2014). Low-levels of female nester and egg harvest occur at Tortuguero Beach, but are much reduced compared to former levels (Seminoff et al. 2015). Green sea turtles are also harvested illegally in Cuba (Seminoff et al. 2015). Nicaragua formerly harvested 10,000 green sea turtles annually until the practice was outlawed in 1977 (Seminoff et al. 2015). Illegal levels are now reduced, but remain a threat for local breeding groups as thousands of turtles have still been taken in recent years (Seminoff et al. 2015). Harvesting, either legal or illegal, also continues in Belize, Puerto Rico, The Bahamas, Jamaica, and the Cayman Islands (Seminoff et al. 2015).

Sea level rise may have significant impacts on green turtle nesting on Pacific atolls. These low-lying, isolated locations could be inundated by rising water levels associated with global warming, eliminating nesting habitat (Baker et al. 2006; Fuentes et al. 2010). Green sea turtles along Florida nest earlier in association with higher sea surface temperatures (Weishampel et al. 2010). Fuentes et al. (2010) predicted that rising temperatures will be a much greater threat in the long term to the hatching success of sea turtle turtles in general and green sea turtles along northeastern Australia particularly. Green sea turtles emerging from nests at cooler temperatures likely absorb more yolk that is converted to body tissue than do hatchlings from warmer nests (Ischer et al. 2009). Predicted temperature rises may approach or exceed the upper thermal tolerance limit of sea turtle incubation, causing widespread failure of nests (Fuentes et al. 2010). Although the timing of loggerhead nesting depends on sea-surface temperature, green sea turtles do not appear to be affected (Pike 2009).

Green sea turtles have been found to contain the organochlorines chlordane, lindane, endrin, endosulfan, dieldrin, dichlorodiphenyltrichloroethane (DDT), and polychlorinated biphenyl (PCB) (Gardner et al. 2003; Miao et al. 2001). Levels of PCBs found in eggs are considered far higher than what is fit for human consumption (Van de Merwe et al. 2009). The heavy metals copper, lead, manganese, cadmium, and nickel have also been found in various tissues and life stages (Barbieri 2009). Arsenic also occurs in very high levels in green sea turtle eggs (Van de Merwe et al. 2009). These contaminants have the potential to cause deficiencies in endocrine, developmental, and reproductive health, as well as depress immune function in loggerhead sea turtles (Keller et al. 2006; Storelli et al. 2007). Exposure to sewage effluent may also result in green sea turtle eggs harboring antibiotic-resistant strains of bacteria (Al-Bahry et al. 2009). Dichlorodiphenyldichloroethylene (DDE) has not been found to influence sex determination at levels below cytotoxicity (Keller and McClellan-Green 2004; Podreka et al. 1998). To date, no tie has been found between pesticide concentration and susceptibility to fibropapillomatosis, although degraded habitat and pollution have been tied to the incidence of the disease (Aguirre et al. 1994; Foley et al. 2005). Flame retardants have been measured from healthy individuals (Hermanussen et al. 2008). It has been theorized that exposure to tumor-promoting compounds produced by the cyanobacteria *Lyngbya majuscule* could promote the development of fibropapillomatosis (Arthur et al. 2008). It has also been theorized that dinoflagellates of the genus *Prorocentrum* that produce the tumorogenic compound okadoic acid may influence the development of fibropapillomatosis (Landsberg et al. 1999).

4.8.2 Kemp’s ridley sea turtle

Population. Kemp’s ridley sea turtles are considered to consist of a single population, although expansion of nesting may indicate differentiation.

Distribution. The Kemp's ridley was formerly known only from the Gulf of Mexico and along the Atlantic coast of the US (TEWG 2000a). However, recent records support Kemp’s ridley sea turtles distribution extending into the Mediterranean Sea on occasion (Tomas and Raga 2008). The vast majority of individuals stem from breeding beaches at Rancho Nuevo on the Gulf of Mexico coast of Mexico, with some reintroduction expansion into Texas (Shaver and Caillouet Jr. 2015).

Growth and reproduction. Kemp's ridleys require approximately 1.5 to two years to grow from a hatchling to a size of approximately 7.9 inches long, at which size they are capable of making a transition to a benthic coastal immature stage, but can range from one to four years or more (Caillouet et al. 1995; Ogren 1989; Schmid 1998; Schmid and Witzell 1997b; Snover et al. 2007b; TEWG 2000a; Zug et al. 1997). Based on the size of nesting females, it is assumed that turtles must attain a size of approximately 23.6 inches long prior to maturing (Marquez-M. 1994). Growth models based on mark-recapture data suggest that a time period of seven to nine years will be required for this growth from benthic immature to mature size (Schmid and Witzell 1997b; Snover et al. 2007b). Currently, age to sexual maturity is believed to range from approximately 10 to 17 years for Kemp's ridleys (Caillouet Jr. et al. 1995; Schmid and Witzell 1997a; Snover et al. 2007a; Snover et al. 2007b). However, estimates of 10 to 13 years predominate in previous studies (Caillouet et al. 1995; Schmid and Witzell 1997b; TEWG 2000a).

Habitat. Stranding data indicate that immature turtles in this benthic stage are found in coastal habitats of the entire Gulf of Mexico and US Atlantic coast (Morreale et al. 2007; TEWG 2000a). Developmental habitats for juveniles occur throughout the entire coastal Gulf of Mexico and US Atlantic coast northward to New England (Morreale et al. 2007; Schmid 1998; Wibbels et al. 2005). Key foraging areas in the Gulf of Mexico include Sabine Pass, Texas; Caillou Bay and Calcasieu Pass, Louisiana; Big Gulley, Alabama; Cedar Keys, Florida; and Ten Thousand Islands, Florida (Carr and Caldwell 1956; Coyne et al. 1995; Ogren 1989; Schmid 1998; Schmid et al. 2002; Witzell et al. 2005). Foraging areas studied along the Atlantic coast include Pamlico Sound, Chesapeake Bay, Long Island Sound, Charleston Harbor, and Delaware Bay. Near-shore waters of 120 feet or less provide the primary marine habitat for adults, although it is not uncommon for adults to venture into deeper waters (Byles 1989; Mysing and Vanselous 1989; Renaud et al. 1996; Shaver et al. 2005; Shaver and Wibbels 2007a).

Benthic coastal waters of Louisiana and Texas seem to be preferred foraging areas for Kemp's ridley sea turtles (particularly passes and beachfronts), although individuals may travel along the entire coastal margin of the Gulf of Mexico (Landry and Costa 1999; Landry et al. 1996; Renaud 1995). Sightings are less frequent during winter and spring, but this is likely due to lesser sighting effort during these times (Keinath et al. 1996; Shoop and Kenney 1992).

Status and trends. The Kemp's ridley sea turtle was listed as endangered on December 2, 1970 (35 FR 18319). Internationally, the Kemp's ridley is considered the most endangered sea turtle (NRC 1990a; USFWS 1999).

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, or a projection of roughly 234 turtles (TEWG 2000a; USFWS and NMFS 1992). Beginning in the 1990s, an increasing number of beaches in Mexico were being monitored for nesting, and the total number of nests on all beaches in Tamaulipas and Veracruz in 2002 was over 6,000; the rate of increase from 1985 ranged from 14-16% (Heppell et al. 2005; TEWG 2000a; USFWS 2002). In 2006, approximately 7,866 nests were laid at Rancho Nuevo with the total number of nests for all the beaches in Mexico estimated at about 12,000 nests, which amounted to about 4,000 nesting females based on three nests per female per season (Rostal 2007; Rostal et al. 1997; USFWS 2006). Considering remigration rates, the population included approximately 7,000 to 8,000 adult female turtles at that time (Marquez et al. 1989; Rostal 2007; TEWG 2000a). The 2007 nesting season included an arribada of over 4,000 turtles over a three-day period at Rancho Nuevo (P. Burchfield, pers. comm. in NMFS and USFWS 2007c). The increased recruitment of new adults is illustrated in the proportion of first time nesters, which has increased from 6% in 1981 to 41% in 1994. Average population growth was estimated at 13% per year between 1991 and 1995 (TEWG 1998). In 2008, there were 17,882 nests in Mexico (Gladys Porter Zoo 2008), and nesting in 2009 reached 21,144 (Burchfield 2010). In 2010, nesting declined significantly, to 13,302 but it is too early to determine if this is a one-time decline or if is indicative of a change in the trend. Preliminary estimates of 2011 and 2012 nesting supports 19,368 and 20,197 nests, respectively (back to 2009 levels)(Gallaway et al. 2013). Population modeling used by the TEWG (2000b) projected that Kemp's ridleys could reach the recovery plan's intermediate recovery goal of

10,000 nesters by the year 2015. Recent calculations of nesting females determined from nest counts show that the population trend is increasing towards that recovery goal, with an estimate of 4,047 nesters in 2006 and 5,500 in 2007 (NMFS and USFWS 2007b). Over one million hatchlings were released in 2011 and 2012 (Gallaway et al. 2013).

Nesting has also expanded geographically, with a Headstart program reestablishing nesting on South Padre Island starting in 1978. Growth remained slow until 1988, when rates of return started to grow slowly (Shaver and Wibbels 2007b). Nesting rose from 6 in 1996 to 128 in 2007, 195 in 2008, and 197 in 2009. Texas nesting then experienced a decline similar to that seen in Mexico for 2010, with 140 nests (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm), but nesting rebounded in 2011 with a record 199 nests (National Park Service data, http://www.nps.gov/pais/naturescience/current-season.htm).

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 were alive at this time.

Natural threats. Sea turtles face predation primarily by sharks and to a lesser extent by killer whales. All sea turtles except leatherbacks can undergo "cold stunning" if water temperatures drop below a threshold level, which can pose lethal effects. Kemp's ridley sea turtles are particularly prone to this phenomenon along Cape Cod (Innis et al. 2009). In the last five years (2006-2010), the number of cold-stunned turtles on Cape Cod beaches averaged 115 Kemp's ridleys. The fungal pathogens *Fusarium falciforme* and *F. keratoplasticum* can kill in excess of 90% of sea turtle embryos they infect and may constitute a major threat to nesting productivity under some conditions (Sarmiento-Ramırez et al. 2014).

Anthropogenic threats. Population decline has been curtailed due to the virtual elimination of sea turtle and egg harvesting, as well as assistance in hatching and raising hatchlings (head-start). However, habitat destruction remains a concern in the form of bottom trawling and shoreline development. Trawling destroys habitat utilized by Kemp's ridley sea turtles for feeding and construction activities can produce hazardous runoff. Bycatch is also a source of mortality for Kemp's ridley sea turtles (McClellan et al. 2009), with roughly three-quarters of annual mortality attributed to shrimp trawling prior to turtle excluder device regulations (Gallaway et al. 2013). However, this has dropped to an estimated one-quarter of total mortality nearly 20 years after turtle excluder devices were implemented in 1990 (Gallaway et al. 2013). In 2010, due to reductions in shrimping effort and turtle excluder device use, shrimp-trawl related mortality appears to have dropped to 4% (1,884) of total mortality (65,505 individuals)(Gallaway et al. 2013). This increased to 3,300 individuals in 2012 (20% of total mortality)(Gallaway et al. 2013). Finkbeiner et al. (2011) estimated that annual bycatch interactions total at least 98,300 individuals annually for US Atlantic fisheries (resulting in 2,700 mortalities or more). The vast majority of fisheries interactions with sea turtles in the US are either Kemp's ridley's or loggerhead sea turtles (Finkbeiner et al. 2011).

Toxin burdens in Kemp's ridley sea turtles include DDT, DDE, PCBs, perfluorooctanoic acid, perfluorooctane sulfonate, chlordane, and other organochlorines (Keller et al. 2005; Keller et al. 2004; Lake et al. 1994; Rybitski et al. 1995). These contaminants have the potential to cause deficiencies in endocrine, developmental and reproductive health, and are known to depress immune function in loggerhead sea turtles (Keller et al. 2006; Storelli et al. 2007). Along with loggerheads, Kemp's ridley sea turtles have higher levels of PCB and DDT than leatherback and green sea turtles (Pugh and Becker 2001). Organochlorines, including DDT, DDE, dichlorodiphenyldichloroethane, and PCBs have been identified as bioaccumulative agents and in greatest concentration in subcutaneous lipid tissue (Rybitski et al. 1995). Five PCB congeners composed most of the contaminants: 153/132, 138/158, 180, 118, and 187 in order of concentration. PCBs have also been identified in the liver, ranging in concentration from 272 ng/g to 655 ng/g of wet weight, values that are several fold higher than in other sea turtle species (Lake et al. 1994). However, concentrations are reportedly 5% of that which causes reproductive failure in snapping turtles. Blood samples may be appropriate proxies for organochlorines in other body tissues (Keller et al. 2004).

Perfluorinated compounds in the forms of PFOA and PFOS have been identified in the blood of Kemp's ridley turtles (Keller et al. 2005). Perfluorononanoic acids have also been detected. It is likely that age and habitat are linked to perfluorinated compounds bioaccumulation.

Oil can also be hazardous to Kemp's ridley turtles, with fresh oil causing significant mortality and morphological changes in hatchlings, but aged oil having no detectable effects (Fritts and McGehee 1981). Blood levels of metals are lower in Kemp's ridley sea turtles than in other sea turtles species or similar to them, with copper, lead, mercury, silver, and zinc having been identified (Innis et al. 2008; Orvik 1997). It is likely that blood samples can be used as an indicator of metal concentration. Mercury has been identified in all turtle species studied, but are generally an order of magnitude lower than toothed whales. The higher level of contaminants found in Kemp's ridley sea turtles are likely due to this species tendency to feed higher on the food chain than other sea turtles. Females from sexual maturity through reproductive life should have lower levels of contaminants than males because contaminants are shared with progeny through egg formation.

5 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 CFR 402.02).

5.1 Habitat degradation

A number of factors may be directly or indirectly affecting listed species in the action area by degrading habitat. These include ocean noise, marine debris, and fisheries impacts.

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 (dB) re 1 micropascal were reported for piles of different sizes in a number of studies (NMFS 2006b). The majority of the sound energy associated with pile driving is in the low frequency range (<1,000 Hertz) (Illingworth and Rodkin Inc. 2001; Illingworth and Rodkin Inc. 2004; Reyff 2003), which is the frequency range sea turtles hear best at. 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, <1000 Hertz (Clarke et al. 2003).

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

Marine debris is a significant concern for listed species and their habitats. Marine debris has been discovered to be accumulating 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). Law et al. (2010) presented a time series of plastic content at the surface of the western North Atlantic Ocean and Caribbean Sea from 1986 to 2008. More than 60% of 6,136 surface plankton net tows collected small, buoyant plastic pieces. The data identified an accumulation zone east of Bermuda that is similar in size to the accumulation zone in the Pacific Ocean.

For sea turtles, marine debris is a problem due primarily to individuals ingesting debris and blocking the digestive tract, causing death or serious injury (Laist et al. 1999; Lutcavage et al. 1997a). Schuyler et al. (2015) estimated that, globally, 52% 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 (2010), who found 35% of loggerheads had plastic in their gut. Over 50% of loggerheads had marine debris in their guts (greater than 96% of which was plastic) in the Indian Ocean (Hoarau et al. 2014). One study found 37% of dead leatherback turtles had ingested various types of plastic (Mrosovsky et al. 2009). A Brazilian study found that 60% of stranded green sea turtles had ingested marine debris (primarily plastic and oil; (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; for example, plastic bags can resemble jellyfish (Milton and Lutz 2003). 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 (Laist et al. 1999; Lutcavage et al. 1997a; NRC 1990b; O'Hara et al. 1988). Studies of shore cleanups have found that marine debris washing up along the northern Gulf of Mexico shoreline amounts to about 100 kg/kilometer (km) (ACC 2010; LADEQ 2010; MASGC 2010; TGLO 2010). Sea turtles can also become entangled and die in marine debris, such as discarded nets and monofilament line (Laist et al. 1999; Lutcavage et al. 1997a; NRC 1990b; O'Hara et al. 1988).

5.2 Entrapment and entanglement in fishing gear

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. NMFS (2002b) estimated that 62,000 loggerhead sea turtles have been killed as a result of incidental capture and drowning in shrimp trawl gear. Although turtle excluder devices and other bycatch reduction devices have significantly reduced the level of bycatch to sea turtles and other marine species in US 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.

5.3 Dredging

Marine dredging vessels are common within US 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 US 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 overtakes the resting or swimming turtle. 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 (USACOE 2010).

5.4 US Navy training and testing activities

Naval activities conducted during training exercises in designated naval operating areas and training ranges have the potential to adversely harm sea turtles. 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 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, will 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 will not affect the reproduction, survival, or recovery of these species.

From 2009-2012, NMFS issued a series of biological opinions to the US 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, 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 2014, NMFS issued a biological opinion to the US Navy on all testing and training activities in the Atlantic basin (Table 4 and Table 5). These actions will include the same behavioral and hearing loss effects as described above, but will 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 4. Annual take authorized for US Navy testing activities in the North Atlantic.

Sea turtle species	Behavioral and temporary threshold shift	Permanent threshold shift	Organ injury	Mortality
Hardshell sea turtles	5,132	10	242	49
Kemp's ridley	292	0	17	4

Table 5. Annual take authorized for US Navy training activities in the North Atlantic.

Sea turtle species	Behavioral and temporary threshold shift	Permanent threshold shift	Organ injury	Mortality
Hardshell sea turtles	12,216	22	4	2
Kemp's ridley	302	2	1	1

5.5 Pollutants

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 (see *Status of ESA-listed and Proposed Species* section). 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% 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, as well as discharges from large urban centers (ex.: 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 (km^2) (although in 2005 the "dead zone" grew to a record size of 22,000 km^2) from the Mississippi River Delta to Galveston, Texas (LUMCON 2005; MMS 1998; Rabalais et al. 2002; USGS 2010). 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).

5.6 Oil spills and releases

Oil pollution has been a significant concern in the Gulf of Mexico for several decades due to the large amount of extraction and refining activity in the region. Routine discharges into the northern Gulf of Mexico (not including oil spills) include roughly 88,200 barrels of petroleum per year from municipal and industrial wastewater treatment plants and roughly 19,250 barrels from produced water discharged overboard during oil and gas operations (MMS 2007b; USN 2008). These sources amount to over 100,000 barrels of petroleum discharged into the northern Gulf of Mexico annually. Although this is only 10% of the amount discharged in a major oil spill, such as the Exxon *Valdez* spill (roughly 1 million barrels), this represents a significant and "unseen" threat to Gulf of Mexico wildlife and habitats. Generally, accidental oil spills may amount to less than 24,000 barrels of oil discharged annually in the northern Gulf of Mexico, making non-spilled oil normally one of the leading sources of oil discharge into the Gulf of Mexico, although incidents such as the 2010 *Deepwater Horizon* incident are exceptional (MMS 2007a). The other major source from year to year is oil naturally seeping into the northern Gulf of Mexico. Although exact figures are unknown, natural seepage is estimated at between 120,000 and 980,000 barrels of oil annually (MacDonald et al. 1993; MMS 2007b).

Although non-spilled oil is the primary contributor to oil introduced into the Gulf of Mexico, concern over accidental oil spills is well-founded. Over five million barrels of oil and one million barrels of refined petroleum products are transported in the northern Gulf of Mexico daily (MMS 2007b); worldwide, it is estimated that 900,000 barrels of oil are released into the environment as a result of oil and gas activities (Epstein and (Eds.). 2002). Even if a small fraction of the annual oil and gas extraction is released into the marine environment, major, concentrated releases can result in significant environmental impacts. Because of the density of oil extraction, transport, and refining facilities in the Houston/Galveston and Mississippi Delta areas (and the extensive activities taking place at these facilities), these locations have the greatest probability of experiencing oil spills. Oil released into the marine environment contains aromatic organic chemicals known to be toxic to a variety of marine life; these chemicals tend to dissolve into the air to a greater or lesser extent, depending on oil type and composition (Yender et al. 2002). Solubility of toxic components is generally low, but does vary and can be relatively high (0.5-167 parts per billion; (Yender et al. 2002)). Use of dispersants can increase oil dispersion, raising the levels of toxic constituents in the water column, but speeding chemical degradation overall (Yender et al. 2002). The remaining oil becomes tar, which forms floating balls that can be transported thousands of kilometers into the North Atlantic. The most toxic chemicals associated with oil can enter marine food chains and bioaccumulate in invertebrates such as crabs and shrimp to a small degree (prey of some sea turtles (Law and Hellou 1999; Marsh et al. 1992)), but generally do not bioaccumulate or biomagnify in finfish (Baussant et al. 2001; Meador et al. 1995; Varanasi et al. 1989; Yender et al. 2002). Sea turtles are known to ingest and attempt to ingest tar balls, which can block their digestive systems, impairing foraging or digestion and potentially causing death (NOAA 2003), ultimately reducing growth, reproductive success, as well as increasing mortality and predation risk (Fraser 2014). Tarballs were found in the digestive tracts of 63% of post hatchling loggerheads in 1993 following an oil spill and 20% of the same species and age class in 1997 (Fraser 2014). Although the effects of dispersant chemicals on sea turtles is unknown, testing on other organisms have found currently used dispersants to be less toxic than those used in the past (NOAA 2003). It is possible that dispersants can interfere with surfactants in the lungs (surfactants prevent the small spaces in the lungs from adhering together due to surface tension, facilitating large surface areas for gas exchange), as well as interfere with digestion, excretion, and salt gland function (NOAA 2003). Oil exposure can also cause acute damage on direct exposure to oil, including skin, eye, and respiratory irritation, reduced respiration, burns to mucous membranes such as the mouth and eyes, diarrhea, gastrointestinal ulcers and bleeding, poor digestion, anemia, reduced immune response, damage to kidneys or liver, cessation of salt gland function, reproductive failure, and death (NOAA 2003; NOAA 2010b; Vargo et al. 1986c; Vargo et al. 1986b; Vargo et al. 1986a). Nearshore spills or large offshore spills can oil beaches on which sea turtles lay their eggs, causing birth defects or mortality in the nests (NOAA 2003; NOAA 2010b).

Several oil spills have impacted the northern Gulf of Mexico over the past few years, largely due to hurricanes. The impacts of Hurricane Ivan in 2004 on the Gulf Coast included pipeline damage causing 16,000 barrels of oil to be released and roughly 4,500 barrels of petroleum products from other sources (BOEMRE 2010; USN 2008). The next year, Hurricane Katrina caused widespread damage to onshore oil storage facilities, releasing 191,000 barrels of oil (LHR 2010). Another 4,530 barrels of oil were released from 70 other smaller spills associated with hurricane damage. Shortly thereafter, Hurricane Rita damaged offshore facilities resulting in 8,429 barrels of oil released (USN 2008).

Major oil spills have impacted the Gulf of Mexico for decades (NMFS 2010). Until 2010, the largest oil spill in North America occurred in the Bay of Campeche (1979), when a well "blew out", allowing oil to flow into the marine environment for nine months, releasing 2.8-7.5 million barrels of oil. Oil from this release eventually reached the Texas coast, including the Kemp's ridley sea turtle nesting beach at Rancho Nuevo, where 9,000 hatchlings were airlifted and released offshore (NOAA 2003). Over 7,600 cubic meters of oiled sand was eventually removed from Texas beaches and 200 gallons of oil were removed from the area around Rancho Nuevo (NOAA 2003). Eight dead and five live sea turtles were recovered during the oil spill event; although cause of deaths were not determined, oiling was suspected to play a part (NOAA 2003). Also in 1979, the oil tanker *Burmah Agate* collided with another vessel near Galveston, Texas, causing an oil spill and fire that ultimately released 65,000 barrels of oil into estuaries, beachfronts, and marshland along the northern and central Texas coastline (NMFS 2010). Clean-up of these areas was not attempted due to the environmental damage such efforts will have caused. Another 195,000 barrels of oil are estimated to have been burned in a multi-month-long fire aboard the *Burmah Agate* (NMFS 2010). The tanker *Alvenus* grounded in 1984 near Cameron, Louisiana, spilling 65,500 barrels of oil which spread west along the shoreline to Galveston (NMFS 2010). One oiled sea turtle was recovered and released (NOAA 2003). In 1990, the oil tanker *Megaborg* experienced an accident near Galveston during the lightering process and released 127,500 barrels of oil, most of which burned off in the ensuing fire (NMFS 2010).

On April 20 2010, a fire and explosion occurred aboard the semisubmersible drilling platform *Deepwater Horizon* roughly 80 km southeast of the Mississippi Delta (NOAA 2010a). The platform had 17,500 barrels of fuel aboard, which likely burned, escaped, or sank with the platform (NOAA 2010a). However, once the platform sank, the riser pipe connecting the platform to the wellhead on the seafloor broke in multiple locations, initiating an uncontrolled release of oil from the exploratory well. Over the next three months, oil was released into the Gulf of Mexico, resulting in oiled regions of Texas, Louisiana, Mississippi, Alabama, and Florida and widespread oil slicks throughout the northern Gulf of Mexico that closed more than one-third of the Gulf of Mexico Exclusive Economic Zone to fishing due to contamination concerns. Apart from the widespread surface slick, massive undersea oil plumes formed, possibly through the widespread use of dispersants and reports of tarballs washing ashore throughout the region were common. Although estimates vary, roughly 4.1 million barrels of oil were released directly into the Gulf of Mexico (USDOI 2012). During surveys in offshore oiled areas, 1,050 sea turtles were seen and half of these were captured (Witherington et al. 2012). Of the 520 sea turtles captured, 394 showed signs of being oiled (Witherington et al. 2012). A large majority of these were juveniles, mostly green (311) and Kemp’s ridley sea turtles (451) (Witherington et al. 2012). An additional 78 adult or subadult loggerheads were observed (Witherington et al. 2012). However, specific causes of injury or death have not yet been established for many of these individuals as investigations into the role of oil in these animals’ health status continue. Captures of sea turtles along the Louisiana’s Chandeleur Islands in association with emergency sand berm construction resulted in 185 loggerheads, eight Kemp’s ridley, and a single green sea turtle being captured and relocated (Dickerson and Bargo 2012). In addition, 274 nests along the Florida panhandle were relocated that ultimately produced 14,700 hatchlings, but also had roughly 2% mortality associated with the translocation (MacPherson et al. 2012). Females that laid these nests continued to forage in the area, which was exposed to the footprint of the oil spill (Hart et al. 2014). Large areas of *Sargassum* were affected, with some heavily oiled or dispersant-coated *Sargassum* sinking and other areas accumulating oil where sea turtles could inhale, ingest, or contact it (Powers et al. 2013; USDOI 2012). Of 574 sea turtles observed in these *Sargassum* areas, 464 were oiled (USDOI 2012).

Oil can also cause indirect effects to sea turtles through impacts to habitat and prey organisms. Seagrass beds may be particularly susceptible to oiling as oil contacts grass blades and sticks to them, hampering photosynthesis and gas exchange (Wolfe et al. 1988). If spill cleanup is attempted, mechanical damage to seagrass can result in further injury and long-term scarring.

Loss of seagrass due to oiling will be important to green sea turtles, as this is a significant component of their diets (NOAA 2003). The loss of invertebrate communities due to oiling or oil toxicity will also decrease prey availability for hawksbill, Kemp's ridley, and loggerhead sea turtles (NOAA 2003). Furthermore, Kemp's ridley and loggerhead sea turtles, which commonly forage on crustaceans and mollusks, may ingest large amounts of oil due oil adhering to the shells of these prey and the tendency for these organisms to bioaccumulate the toxins found in oil (NOAA 2003). It is suspected that oil adversely impacted the symbiotic bacteria in the gut of herbivorous marine iguanas when the Galapagos Islands experienced an oil spill, contributing to a >60% decline in local populations the following year. The potential exists for green sea turtles to experience similar impacts, as they also harbor symbiotic bacteria to aid in their digestion of plant material (NOAA 2003). Dispersants are believed to be as toxic to marine organisms as oil itself.

Gulf sturgeon and other marine and anadromous fish species can be impacted by oil contamination directly through uptake by the gills, ingestion of oil or oiled prey, effects on eggs and larval survival, and through contamination of foraging and spawning sites. Studies after the *Exxon Valdez* oil spill demonstrated that fish embryos exposed to low levels of poly aromatic hydrocarbons in weathered crude oil develop a syndrome of edema and craniofacial and body axis defects (Incardona et al. 2005).

5.7 Seismic surveys and oil and gas development

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% 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, providing shelter and foraging opportunities for species like loggerhead sea turtles (Parker et al. 1983; Stanley and Wilson 2003). However, the Minerals Management Service 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 out (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 (G. Gitschlag, NOAA, pers. comm.). Current annual authorized takes due to the Minerals Management Services' Outer Continental Shelf oil and gas exploration, development, production, and abandonment activities are 30 sea turtles, including no more than one each of Kemp's ridley, green, hawksbill, or leatherback turtles and no more than ten loggerhead turtles (NMFS 1988). These levels were far surpassed by the *Deepwater Horizon* incident.

5.8 Hurricanes

The Gulf of Mexico is prone to major tropical weather systems, including tropical storms and hurricanes. The impacts of these storms on sea turtles in the marine environment is not known, but storms can cause major impacts to sea turtle eggs on land, as nesting frequently overlaps with hurricane season, particularly Kemp's ridley sea turtles (NRC 1990b). Mortality can result both from drowning of individuals while still in the egg or emerging from the nest as well as causing major topographic alteration to beaches, preventing hatchling entry to marine waters. Kemp's ridley sea turtles are likely highly sensitive to hurricane impacts, as their only nesting locations are in a limited geographic area along southern Texas and northern Mexico (Milton et al. 1994). In 2010, Hurricane Alex made landfall in this area; surprisingly, few nests were lost (Jaime Pena, Gladys Porter Zoo, pers. comm.). Tropical storm Hermine arrived too late in 2010 to impact eggs or hatchlings at Rancho Nuevo (Donna Shaver, NPS, pers. comm.).

5.9 Invasive species

Invasive species have been referred to as one of the top four threats to the world's oceans consistently ranked behind habitat degradation and alteration (Pughiuc 2010; Raaymakers 2003; Raaymakers and Hilliard 2002; Terdalkar et al. 2005; Wambiji et al. 2007). In most cases, habitat is directly affected by human alterations, such as hydromodification, mining, dredging, drilling, and construction. However, invasive species, facilitated by human commerce or climate change, have the ability to directly alter ecosystems on which listed species rely.

Invasive species are a major threat to many ESA-listed species. For species listed by the USFWS, 26% were listed partially because of the impacts of invasive species and 7% were listed because invasive species were the major cause of listing (Anttila et al. 1998). Pimentel et al. (2004) found that roughly 40% of listed species are at risk of becoming endangered or extinct completely or in part because of invasive species, while Wilcove et al. (1998) found this to be 49%, with 27% of invertebrates, 37% of reptiles, 53% of fishes, and 57% of plants imperiled partly or wholly because of non-native invasions. In some regions of the world, up to 80% of species facing extinction are threatened by invasive species (Pimentel et al. 2004; Yan et al. 2002). Clavero and Garcia-Bertro (2005) found that invasive species were a contributing cause to over half of the extinct species in the International Union for the Conservation of Nature database; invasive species were the only cited cause in 20% of those cases. Richter et al. (1997) identified invasive species as one of three top threats to threatened and endangered freshwater species in the US as a whole.

Although we recognize that invasive species are a major driver of native species decline and contributor to listing, invasive species have not yet been identified in the action area as being significant to the biology of the ESA-listed resources here. We do recognize that many invasions have and continue to go undetected and likely have consequences outside the bounds of current knowledge. We considered this uncertainty in this consultation and expect that habitat alteration (resulting in prey base shifts) as well as parasite and disease exposure may have in the past or presently be impacting sea turtles.

5.10 Entrainment in power plants

Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of electrical generating plants. A comprehensive biological opinion that covers all power plant cooling water intakes was issued by the USFWS and NMFS in May 2014, but does not identify amount or extent of ESA-listed species expected to be taken. This will be undertaken on a case-by-case basis for each power plant, but will generally involve stress from being captured in entrainment structures and mortality of individuals stuck on entrainment grates or sucked into coolant systems.

5.11 Ship-strikes

Sea turtle ship strikes are a poorly-studied threat, but has the potential to be an important source of mortality to sea turtle populations (Work et al. 2010). All sea turtles must surface to breath 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 move out of the way of vessels moving at more than 4 km/hour; most vessels move far faster than this in open water (Hazel et al. 2007; Work et al. 2010). This, combined with the massive level of vessel traffic in the Gulf of Mexico, has the potential to result in frequent injury and mortality to sea turtles in the region (MMS 2007b). 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 Gulf of Mexico has several hundred thousand recreational vessels registered, including Florida with nearly one million-the highest number of registered boats in the United States-and Texas with over 600,000 (ranked sixth nationally)(NMMA 2007; USCG 2003; USCG 2005). Commercial vessel operations are also extensive. Vessels servicing the offshore oil and gas industry are estimated to make 115,675 to 147,175 trips annually, apart from commercial vessels travelling to and from some of the largest ports in the US (such as New Orleans and Houston)(MMS 2007a; USN 2008).

Sea turtles may also be harassed by the high level of helicopter activity over Gulf of Mexico waters. It is estimated that between roughly 900,000 and 1.5 million helicopter take-offs and landings are undertaken in association with oil and gas activities in the Gulf of Mexico annually (NRC 1990b; USN 2008). This likely includes numerous overflights of sea turtles, an activity which has been observed to startle and at least temporarily displace sea turtles (USN 2009).

5.12 Scientific research and permits

Scientific research permits issued by the NMFS currently authorize studies of ESA-listed species in the North Atlantic Ocean, some of which extend into portions of the action area for the proposed project. Authorized research on ESA-listed sea turtles includes capture, handling, and restraint, satellite, sonic, and PIT tagging, blood and tissue collection, lavage, ultrasound, captive experiments, laparoscopy, and imaging. Research activities involve "takes" by harassment, with some resulting mortality. It is noteworthy that although the numbers tabulated below represent the maximum number of "takes" authorized in a given year, monitoring and reporting indicate that the actual number of "takes" rarely approach the number authorized. Therefore, it is unlikely that the level of exposure to research techniques indicated below has or will occur in the near term. However, our analysis assumes that these "takes" will occur since they have been authorized. It is also noteworthy that these "takes" are distributed across the Atlantic Ocean, mostly from Florida to Maine, and in the eastern Gulf of Mexico. Although sea turtles are generally wide-ranging, we do not expect many of the authorized "takes" to involve individuals who will also be "taken" under the proposed research considered in this opinion. There are numerous permits[1] issued since 2009 under the provisions of the ESA authorizing scientific research on sea turtles. The consultations which took place on the issuance of these ESA scientific research permits each found that the authorized activities will not result in jeopardy to the species or adverse modification of designated critical habitat.

Tables 6 and 7 show the number of takes authorized for green and Kemp's ridley sea turtles in the action area in scientific research permits.

[1] Permit numbers: 633-1778, 775-1875, 1036-1744, 1058-1733, 10014, 14451, 14856, 15575, 16109, 16239, 16325, 16388, and 17355. See https://apps.nmfs.noaa.gov/index.cfm for additional details.

Table 6. Green sea turtle takes in the Atlantic Ocean.

Year	Capture/handling /restraint	Satellite,sonic, or pit tagging	Blood/tissue collection	Lavage	Ultrasound	Captive experiment	Laparoscopy	Imaging	Mortality
2009	3,093	3,093	3,009	1,860	555	66	74	72	6
2010	3,753	3,753	3,669	2,480	555	66	74	72	6
2011	4,255	4,255	3,505	2,990	564	66	74	72	20
2012	3,354	3,354	2,622	2,210	704	66	74	72	18.2
2013	5,001	5,001	4,325	3,654	1,903	91	398	396	4.2
2014	4,336	3,686	3,660	3,044	1,408	65	324	324	4.2
2015	4,280	3,630	3,610	3,044	1,408	65	324	324	4.2
2016	2,960	2,960	2,940	1,734	1,408	65	324	324	4.2
Total	**31,032**	**29,732**	**27,340**	**21,016**	**8,505**	**550**	**1,666**	**1,656**	**67**

Permit numbers: 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.

Table 7. Kemp's ridley sea turtle takes in the Atlantic Ocean.

Year	Capture/handling /restraint	Satellite,sonic, or pit tagging	Blood/tissue collection	Lavage	Ultrasound	Captive experiment	Laparoscopy	Imaging	Mortality
2009	1,394	1,394	1,195	425	371	56	53	53	5
2010	1,402	1,402	1,203	426	371	56	53	53	5
2011	2,210	2,210	1,368	976	400	56	53	53	9
2012	2,229	2,219	1,561	972	450	56	53	53	7.2
2013	2,836	2,852	2,190	1,627	990	116	213	218	3.2
2014	2,010	2,026	1,964	706	619	60	160	165	3.2
2015	1,833	1,849	1,819	706	619	60	160	165	3.2
2016	1,420	1,436	1,406	300	264	40	125	125	3.2
Total	**15,334**	**15,388**	**12,706**	**6,138**	**4,084**	**500**	**870**	**885**	**39**

Permit numbers: 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.

5.13 The impact of the baseline on ESA-listed and proposed species

ESA-listed resources are exposed to a wide variety of past and present state, Federal, or private actions and other human activities that have already occurred or continue to occur, in the action area. Federal projects in the action area that have already undergone formal or early Section 7 consultation, and state or private actions that are contemporaneous with this consultation also impact ESA-listed resources. However, the impact of those activities on the status, trend, or the demographic processes of threatened and endangered species remains largely unknown. To the best of our ability, we summarize the effects we can determine based on the information available to us in this section.

Climate change has and will continue to impact sea turtles throughout the action area as well as throughout the range of the populations. Sex ratios of several species are showing a bias, sometimes very strongly, towards females due to higher incubation temperatures in nests. We expect this trend will continue and possibly may be exacerbated to the point that nests may become entirely feminized, resulting in severe demographic issues for affected populations in the future. Hurricanes may become more intense and/or frequent, impacting the nesting beaches of sea turtles and resulting in increased loss of nests over wide areas.

Ingestion and entanglement in marine debris is expected to result in sea turtle morbidity and mortality. Some individuals may be killed in dredging operations. Oil spill, as well as oil and gas development activities, have directly harmed sea turtles as well as damaged the habitat in which sea turtles live through releases of pollutants and increasing oceanic sound levels within the region. Agricultural releases into the Mississippi River particular and North American waters in general have resulted in areas of anoxia and habitat deterioration in which sea turtle prey cannot survive or experience regular, high-level mortality. Military activities are likely to cause individual fitness or mortality issues in most sea turtle populations along the eastern seaboard. This is due to exposure to high-level sounds from detonations and other activities. Disease and prey distributions may well shift in response to changing ocean temperatures or current patterns, altering the morbidity and mortality regime faced by sea turtles and the availability of prey. Invasive species may alter the habitat on which sea turtles rely. Additional mortality is expected from entrainment in power plants and shipstrike. Stress, metabolic costs, and mortality are expected to result from permitted research activities.

6 EFFECTS OF THE ACTION ON ESA-LISTED AND PROPOSED SPECIES AND CRITICAL HABITAT

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 CFR 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 on the regulatory definition of “to jeopardize the continued existence of a listed species,” which is “to engage in an action that will 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 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The proposed issuance of permit 17183-02 will authorize “takes” by harassment of green and Kemp’s ridley sea turtles during the proposed research by the applicant by directed close approach, tangle net capture, restraint, handling, epibiote removal, flipper and PIT tagging, biopsy, blood sampling, measurement, and lavage. In this section, we describe the potential physical, chemical, or biotic stressors associated with the proposed actions, 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 the *Approach to the Assessment* section, for any responses that will be expected to reduce an individual’s fitness (i.e., growth, survival, annual reproductive success, or lifetime reproductive success), the assessment will consider the risk posed to the viability of the population(s) those individuals comprise and to the ESA-listed species those populations represent. The purpose of this assessment and, ultimately, of this Opinion 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.

For this consultation, we are particularly concerned about behavioral and stress-based physiological disruptions and potential unintentional pathology that may result in animals that fail to survive, feed, or breed successfully or fail to complete their life history because these responses are likely to have population-level consequences as well as the potential for mortality. The ESA does not define harassment nor has the NMFS defined the term pursuant to the ESA through regulation. For this Opinion, we define harassment similar to the USFWS’s regulatory definition of “harass”: an intentional or unintentional human act or omission that creates the probability of injury to an individual animal by disrupting one or more behavioral patterns that are essential to the animal’s life history or its contribution to the population the animal represents.

6.1 Stressors associated with the proposed action

The assessment for this consultation identified several possible stressors associated with the proposed research activities, including

1. research vessel transit,
2. capture,
3. handling and restraint following capture,
4. application of flipper, acoustic, and/or PIT tags,
5. tissue and blood sampling, and
6. lavage.

Based on a review of available information, this opinion determined which of these possible stressors will be likely to occur, and which will be discountable or insignificant.

Research vessel transit introduces sound energy into the marine environment and poses a risk for shipstrike of ESA-listed or proposed sea turtles. We are unaware of any communications or acoustic cues that sea turtles will miss as a result of sound energy introduced by vessels associated with the proposed research and thus consider this aspect insignificant. The level of vessel transit is expected to be relatively low compared to the amount of overall vessel traffic and the incidence of ship strike that is known to occur. Considering the level of vessel transit that researchers propose to undertake and lack of shipstrike known to occur in the researcher's past, the risk of shipstrike is extremely unlikely to occur and is therefore discountable and not considered further in this opinion.

6.2 Mitigation to minimize or avoid exposure

Under permit 17183-02, numerous measures will be taken to avoid exposing ESA-listed species to the proposed activities and to reduce the potential for stress or pathological outcomes of exposed individuals. This includes extensive disinfection protocols, protection from temperature extremes, separate materials used on fibropapillomatosis individuals, continual monitoring of nets, limiting soak time to 30 minutes, limiting blood volume that can be sampled, and limiting the size of attachments that can be used, among others.

6.3 Exposure analysis

Exposure analyses identify the ESA-listed and proposed 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* 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 proposed permit identifies these parameters and will allow for capture, handling, restraint, as well as flipper and PIT tagging, blood, tissue, and biopsy sampling, morphometric measurements, and lavage (Table 8). The applicant is requesting to conduct multiple activities on any given animal. For example, an individual will likely be exposed to a minimum of capture, handling, restraint, flipper and/or PIT tagging (if these tags are not already present), morphometrics, blood sampling and biopsy, and lavage under the proposed permit. The applicant currently holds a permit and is conducting these activities on these species in these areas. However, the proposed permit allows for additional numbers of the same activities to be conducted, as well as to be expanded into areas around Eglin Air Force Base. An individual may be captured multiple times per year, but exposed only once to all other activities.

Table 8. Actions to which ESA-listed or proposed species will be exposed under proposed permit amendment 17183-02.

Sea turtle species	Number of individuals taken annually	Total takes authorized over the life of the permit	Actions
Green (*Chelonia mydas*)-Florida population	200	600	Capture, handle, restrain; epibiota removal; flipper, and/or PIT tag; lavage; blood sample biopsy; weigh
	50	150	Capture, handle, restrain; epibiota removal; acoustic, flipper, and/or PIT tag; lavage; blood sample biopsy; weigh
Kemp's ridley (*Lepidochelys kempii*)	160	480	Capture, handle, restrain; epibiota removal; flipper, and/or PIT tag; lavage; blood sample biopsy; weigh
	40	120	Capture, handle, restrain; epibiota removal; acoustic, flipper, and/or PIT tag; lavage; blood sample biopsy; weigh

The applicant has been conducting this research for some years and has provided recent annual reports summarizing this research. These reports show that the applicant has been reaching the take limit for Kemp's ridley sea turtles. Based upon this, a request to increase the number of takes authorized is justified based upon the level of effort undertaken and considering the desired expansion of effort into another area (Eglin Air Force Base). The applicant has provided documentation explaining "we are able to capture 10-15 (Kemp's ridley sea turtle) individuals per sampling trip. We sample at least twice per month from March through October which totals at least 16 sampling events and if we continue to capture 10-15 individuals per trip, will result in 160 to 240 Kemp's captured. We will continue with this sampling for at least 3 years to ensure sufficient sample size for mark-recapture analyses." Based upon this, we believe the requested annual increase from 50 to 200 Kemp's ridleys is reasonable.

Annual reports from 2014 and 2015 do not support a lack of available takes for green sea turtles. However, the Permits Division provided information that the researchers will be undertaking additional effort and expand into new locations where green sea turtles are likely to found. The increase is fairly small, from 30 to 50 individuals per year. Given that the researchers are somewhat unsure as to how many more green sea turtles will actually be captured as a result of additional effort and operating in locations they have not used before, increasing annual tagging attempts from 30 to 50 is warranted.

6.4 Response analysis

As discussed in the *Overview of NMFS' Assessment Framework* section, response analyses determine how ESA-listed or proposed resources are likely to respond after exposure to an action's effects on the environment or directly on species themselves. For the purposes of consultation, our assessments try to detect potential lethal, sub-lethal (physiological), or behavioral responses that might result in reducing the fitness of ESA-listed or proposed individuals. Ideally, response analyses will consider and weigh 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 (Beale and Monaghan 2004; Frid 2003; Frid and Dill 2002; Gill et al. 2001; Harrington and Veitch 1992; Lima 1998; Romero 2004). These responses manifest themselves as stress responses (in which an animal perceives human activity as a potential threat and undergoes physiological changes to prepare for a flight or fight response), interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Frid and Dill 2002; Romero 2004; Sapolsky et al. 2000b; Walker et al. 2005). These responses have been associated with abandonment of sites (Sutherland and Crockford 1993), reduced reproductive success (Giese 1996; Mullner et al. 2004), and the death of individual animals (Bearzi 2000; Daan 1996; Feare 1976). Stress is an adaptive response and does not normally place an animal at risk. However, distress involves a stress response resulting in a biological consequence to the individual. The mammalian and reptilian stress response involves the hypothalamic-pituitary-adrenal axis being stimulated by a stressor, causing a cascade of physiological responses, such as the release of the stress hormones cortisol, adrenaline (epinephrine), glucocorticosteroids, and others (Atkinson et al. 2015; Busch and Hayward 2009). These hormones subsequently can cause short-term weight loss, the release of glucose into the blood stream, impairment of the immune and nervous systems, elevated heart rate, body temperature, blood pressure, fatigue, cardiovascular damage, and alertness, and other responses (Aguilera and Rabadan-Diehl 2000; Busch and Hayward 2009; Dierauf and Gulland 2001; Guyton and Hall 2000; NMFS 2006a; Omsjoe et al. 2009b; Queisser and Schupp 2012; Romero 2004), particularly over long periods of continued stress (Desantis et al. 2013; Sapolsky et al. 2000a). In some species, stress can also increase an individual's susceptibility to gastrointestinal parasitism (Greer 2008). In highly-stressful circumstances, or in species prone to strong "fight-or-flight" responses, more extreme consequences can result, including muscle damage and death (Cowan and Curry 1998; Cowan and Curry 2002; Cowan and Curry 2008; Herraez et al. 2007). The most widely-recognized indicator of vertebrate stress, cortisol, normally takes hours to days to return to baseline levels following a significantly stressful event, but other hormones of the hypothalamic-pituitary-adrenal axis may persist for weeks (Dierauf and Gulland 2001). Mammalian stress levels can vary by age, sex, season, and health status

(Cockrem 2013; Delehanty and Boonstra 2012; Gardiner and Hall 1997; Hunt et al. 2006; Keay et al. 2006; Place and Kenagy 2000; Romero et al. 2008; St. Aubin et al. 1996). Marine mammal hormones associated with stress responses as well as other body systems may become imbalanced due to exposure to chlorinated hydrocarbons (Brouwer et al. 1989; Jin et al. 2015). In general, stress response pathways appear to be very similar to those in better-studied terrestrial mammal systems, although important difference in the renin-angiotensin-aldosterone system and catecholamines exist likely stemming from fasting and diving life history traits in many marine mammals (Atkinson et al. 2015). Smaller mammals react more strongly to stress than larger mammals (Peters 1983); a trend reflected in data from Gauthier and Sears (1999) where smaller whale species react more frequently to biopsy than larger whales. Stress is lower in immature right whales than adults and mammals with poor diets or undergoing dietary change and have higher fecal cortisol levels (Hunt et al. 2006; Keay et al. 2006).

Several studies have suggested that stress can adversely impact female reproduction through alterations in the estrus cycle (Herrenkohl and Politch 1979; Moberg 1991; Mourlon et al. 2011; Rivier 1991). This is likely due to changes in sex steroids and growth hormone levels associated with the stress response (Sapolsky et al. 2000a). 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 River (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. Under less invasive and acutely stressful methods (but more invasive than those proposed by the applicant), Omsjoe et al. (2009a) found no impacts to the percentage of individuals with offspring the following year following chase, capture, and restraint of reindeer (ungulates in general are prone to strong, potentially lethal stress responses). Overall, we do not expect reproduction to be impaired primarily because of the lack extreme stressors used by studies to induce adverse reproductive impacts and the acute nature of the stressors involved.

6.4.1 Capture

Capture is one of the means by which stress responses described above can occur in sea turtles (Gregory 1994; Gregory and Schmid 2001b; Hoopes et al. 1998; Jessop et al. 2004; Jessop et al. 2003; Thomson and Heithaus 2014).

Sea turtles captured during the course of proposed research will be captured via entanglement netting. Although corticosterone does not appear to increase with entanglement time for green and Kemp's ridley sea turtles (Snoddy et al. 2009), we expect capture to be a stressful experience as indicated by severe metabolic and respiratory imbalances resulting from forced submergence (Gregory and Schmid 2001a; Harms et al. 2003; Stabenau and Vietti 2003). We also expect behavioral responses (attempts to break loose of the netting via rapid swimming and biting) as well as physiological responses (release of stress hormones; (Gregory et al. 1996; Gregory and Schmid 2001a; Harms et al. 2003; Hoopes et al. 2000; Stabenau and Vietti 2003). We expect individuals captured entanglement net to be rapidly removed from the net, although responses associated with subsequent stressors will continue. For example, handling has been shown to result in progressive changes in blood chemistry indicative of a continued stress response (Gregory and Schmid 2001a; Hoopes et al. 2000).

Additional risk to sea turtles is involved with capturing sea turtles in entanglement nets due to forced submersion. Sea turtles forcibly submerged in any type of restrictive gear eventually suffer fatal consequences from prolonged anoxia and/or seawater infiltration of the lungs (Lutcavage et al. 1997a). Trawl studies have found that no mortality or serious injury occurred in tows of 50 minutes or less, but these increased rapidly to 70% after 90 minutes (Epperly et al. 2002b; Henwood and Stuntz 1987). However, metabolic changes that can impair a sea turtles' ability to function can occur within minutes of a forced submergence. Serious injury and mortality is likely due to acid-base imbalances resulting from accumulation of carbon dioxide and lactate in the bloodstream (Lutcavage et al. 1997a); this imbalance can become apparent in captured, submerged sea turtles after a few minutes (Stabenau et al. 1991). Recovery times can take 20 hours or more (Henwood and Stuntz 1987). To minimize the effects of this type of capture, nets will be tended continuously. We do not expect any sea turtle to require extensive recovery, but methodology proposed by the applicant (holding comatose or behaviorally abnormal sea turtles and monitoring sea turtles after research procedures are complete) should mitigate sea turtles being released that have not recovered from forced submergence and/or the accumulation of other stressors that can cumulatively impair physiological function. In addition, veterinary assistance will be sought for these individuals.

We also expect that activity budgets of captured individuals will be altered after release, with more time spent actively swimming for several hours to a day after release (Thomson and Heithaus 2014). After this period, we expect that individuals will engage in resting and feeding activities to a greater extent (Thomson and Heithaus 2014).

6.4.2 Morphometrics

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.

6.4.3 Flipper and PIT tagging

All sea turtles will also be scanned or visually inspected for PIT and flipper tags, respectively. If either of these is absent, then individuals will be tagged with them. Both procedures involve the implantation of tags in or through skin and/or muscle of the flippers. PIT tags remain internal while flipper tags have both internal and external components. For both, internal tag parts are expected to be biologically inert. In addition to the stress sea turtles are expected to experience by handling and restraint associated with inspection and tagging, we expect an additional stress response associated with the short-term pain experienced during tag implantation (Balazs 1999). We expect disinfection methods proposed by the applicant should mitigate infection risks from tagging. Wounds are expected to heal without infection. Tags are designed to be small, physiologically inert, and not hinder movement or cause chafing; we do not expect the tags themselves to negatively impact sea turtles (Balazs 1999). Flipper tags occasionally come off of turtle flippers, which may cause tissue ripping and subsequent trauma and infection risk. However, other researchers encounter individuals who have lost flipper tags and have not observed these individuals to be in any different body condition than turtles lacking tags or those who still retain their tags.

6.4.4 Biopsy

Sea turtles will also be biopsied during the course of the research. We expect that this will involve stress associated with pain stimuli (Balazs 1999). Although the skin will be breached and tissue exposed, we expect disinfection protocols to make the risk of infection minimal from the small hole that will be produced by the biopsy punch. Disinfection of biopsy punches and surgical equipment will also reduce the risk of pathogen spread between individuals.

6.4.5 Blood sampling

Sea turtles are also expected to experience a short-term stress response in association with the handling, restraint, and pain associated with blood sampling. Taking a blood sample from the sinuses in the dorsal side of the neck is a routine procedure (Owens 1999), although it requires knowledgeable and experienced staff to do correctly and requires the animal to be restrained (DiBello et al. 2010; Wallace and George 2007). According to Owens (1999), with practice, it is possible to obtain a blood sample 95% of the time and the sample collection time should be about 30 seconds in duration. Sample collection sites are always sterilized prior to needle insertions, which will be limited to two on either side of the neck. Bjorndal et al. (2010) found that repeated scute, blood, and skin sampling of the same individual loggerhead sea turtles did not alter growth, result in scarring, or apparently impact other physiological or health parameters.

6.4.6 Lavage

Lavage, or stomach flushing, is a standard practice to investigate the diet of sea turtles and fishes (Legler 1977). This involves flushing fluids into and out of the esophagus and upper stomach region, removing food and prey in the process for analysis (Forbes 1999). The procedure itself can result in damage to the jaws or esophagus if not performed correctly (Forbes 1999). If water is injected too quickly, serious injury or death may result (Forbes 1999). However, the applicant indicates that dozens of lavage procedures have been undertaken without any of these adverse effects noted. Reportedly, no more than 10 minutes should be involved with the procedure. Laparoscopy indicates no damage to the intestine and recapture of apparently healthy individuals support the process at least generally not causing adverse health effects (Forbes 1999).

This action involves a metabolic cost to the target individual, as it deprives individuals of whatever prey had recently been swallowed, as well as the investment in initial gastric secretions involved with its digestion. If no prey are present, this cost is significantly reduced. This action can also benefit the individual by removing parasites in these areas.

6.5 Risk analysis

Research activities that will take place under the permit are not expected to result in sea turtle mortality. The research activities will, however, result in temporary stress to the animal, which is not expected to have more than short-term effects on individual green and Kemp's ridley sea turtles. Wound healing is also expected for days to weeks later. These effects are expected to be short-term based on previous experiences with other researchers and available scientific literature. This research will affect the individuals by harassing sea turtles during the research thus raising levels of stressor hormones, and individuals may experience some discomfort during capture, restraint, measuring, biopsy, blood sampling, tagging, lavage, and other procedures. Based on past observations of similar research, these effects are expected to dissipate within approximately a day.

Biopsy, tissue and blood sampling, and tagging are all activities that will break the integument and create the potential for infection or other physiological disruptions. The applicant has extensive procedures in place to reduce the potential for infection or disease transmission. To date, the applicant has not documented a case of infection or mortality in sea turtles which were exposed to these 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. We include a *Conservation Recommendation* that encourages the documentation of potential infection or pathology cases (or lack thereof) in individuals that are re-captured subsequent to being exposed to these procedures.

Flipper-tagged sea turtles will experience a greater degree of drag through the water than they otherwise will. This drag will be experienced continually over years after flipper tags are applied. 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.

Some individuals will also incur a metabolic coast due to loss of prey during lavage. However, this loss is expected to be small and easily replaceable.

Overall, for a large majority of sea turtles, the proposed action is not expected to have more than short-term stress effects and some longer-term effects associated with wound healing from biopsy, blood sampling, and tagging. The data generated by the applicant regarding these populations over the duration of this study will provide beneficial information that will be important to the management and recovery of proposed and endangered species. The information collected as a direct result of permit issuance will be used to implement the goals identified in the recovery plan for green and Kemp's ridley sea turtles.

6.6 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.

We expect that those aspects described in the *Environmental Baseline* will continue to impact ESA-listed resources into the foreseeable future. We expect climate change, ship-strikes, research, pollution, oil and gas development, anthropogenic ocean noise, entrainment in power plants, exposure to military activities, dredging, directed harvest, entanglement, and bycatch to continue into the future. Movement towards bycatch reduction and greater foreign protections of sea turtles are generally occurring throughout the Atlantic Ocean and Gulf of Mexico, which may aid in recovery of sea turtle populations. Risk of ship strike will likely increase in the future as more vessels are used in commercial and recreational marine activities.

Although quantifying an incremental change in survival for the species considered in this consultation due to the cumulative effects is not possible, it is reasonably likely that those effects within the action areas will have a small, long-term, negative effect on the likelihood of their survival and recovery.

6.7 Integration and synthesis

The *Integration and synthesis* section is the final step in our assessment of the risk posed to species and critical habitat because of implementing the proposed action. In this section, we add the *Effects of the Action on ESA-Listed Species and Critical Habitat* (Section 6) to the *Environmental Baseline* (Section 5) and the *Cumulative effects* (Section 6.6) to formulate the agency's biological and conference opinion as to whether the proposed action is likely to: "reduce appreciably the likelihood of both the survival and recovery of a ESA-listed and proposed species in the wild by reducing its numbers, reproduction, or distribution." This assessment is made in full consideration of the *Status of ESA-Listed and Proposed Species* (Section 4).

As explained in the *Overview of NMFS' Assessment Framework* section, risks to listed individuals are measured using changes to an individual's "fitness" – i.e., the individual's growth, survival, annual reproductive success, and lifetime reproductive success. When ESA-listed or proposed animals exposed to an action's effects are not expected to experience reductions in fitness, we will not expect the action to have adverse consequences on the viability of the population(s) those individuals represent or the species those populations comprise (Anderson 2000; Brandon 1978; Mills and Beatty 1979; Stearns 1992). As a result, if the assessment indicates that ESA-listed or proposed animals are not likely to experience reductions in their fitness, we conclude our assessment. If possible reductions in individuals' fitness are likely to occur, the assessment considers the risk posed to population(s) to which those individuals belong, and then to the species those population(s) represent.

The *Status of ESA-Listed and Proposed Species* discussion describes how listed sea turtles range-wide have been adversely affected by human-induced factors such as commercial fisheries, direct harvest of sea turtles, and modification or degradation of the sea turtle's terrestrial and aquatic habitat. Effects occurring in terrestrial habitats have generally resulted in the loss of eggs or hatchling sea turtles, or nesting females, while those occurring in aquatic habitat have caused the mortality of juvenile, subadult and adult sea turtles through ingestion of debris or pollution. Similarly, the actions discussed in the *Environmental Baseline*, as well as those considered under *Cumulative effects* all pose the potential to result in take of sea turtle species that resulted in stress or possible mortality.

The following discussion summarizes the probable risks the proposed actions pose to threatened and endangered species and critical habitat 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.

We expect all targeted sea turtles to experience some degree of stress response to approach, capture, restraint, biopsy, blood and tissue sampling, lavage, and tagging attempts. We also expect many of these individuals to respond behaviorally by attempting to elude capture, fight when initially captured, startle when blood sampled, biopsied, or tagged, lavaged, 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 lavaged 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 single individual to experience a fitness consequence as a result of the proposed actions and, by extension, do not expect population-level effects.

7 CONCLUSION

After reviewing the *Status of ESA-listed and Proposed Species*, the *Environmental Baseline* within the action areas, the *Effects of the Action on ESA-Listed Species and Critical Habitat*, any effects of interrelated and interdependent actions, and *Cumulative Effects*, it is NMFS' opinion these proposed actions are not likely to jeopardize the continued existence of green or Kemp's ridley sea turtles or proposed North Atlantic DPS green sea turtles. No critical habitat is expected to be affected.

8 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. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(b)(4) and Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

We do not expect incidental take of threatened or endangered species as a result of the proposed actions because all actions that may affect ESA-listed species will be undertaken in a directed manner.

9 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 CFR 402.02).

1. The Endangered Species Act Interagency Cooperation Division recommends that annual reports submitted to the Permits Division require detail on the response of listed individuals to permitted activities. 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.
2. If individuals exposed to biopsy and/or tissue sampling are re-encountered, the applicant should document the health condition of these individuals and report their findings in a given year’s annual report. This will help the Endangered Species Act Interagency Cooperation Division verify assumptions in this opinion that such procedures are not likely to result in pathological outcomes as a result of these activities.

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

10 REINITIATION OF CONSULTATION

This concludes formal consultation for the Permit's Division proposed issuance of permit 17183-02. 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 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 critical habitat that was not considered in this opinion, or (4) a new species is ESA-listed or critical habitat designated that may be affected by the action.

If the proposed listing of the North Altantic green sea turtle DPS becomes final, the Permits and Conservation Division should contact the ESA interagency Cooperation Division to determine if the findings in this conference opinion remain supported. If the ESA interagency Cooperation Division reviews the proposed action and finds that there have been no significant changed in the action as planned or in the information used during the conference, the ESA interagency Cooperation Division will confirm the conference opinion as the biological opinion on the project and no further Section 7 consultation will be necessary.

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