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F/SER31:FI
SERO-2019-00635

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Ref.: FEMA DR-4337-FL PW 2371, City of Holly Hill, Sunrise Park North Main Pier, Volusia County, Florida

Dear Ms. Hyatt:

The enclosed Biological Opinion (Opinion) was prepared by the National Marine Fisheries Service (NMFS) pursuant to Section 7(a)(2) of the Endangered Species Act. The Opinion considers the effects of a proposal by the Federal Emergency Management Agency (FEMA) to authorize the replacement of a public fishing pier. We base this Opinion on project-specific information provided in the consultation package as well as NMFS's review of published literature. This Opinion analyzes the potential for the project to affect the following species: green sea turtle (North Atlantic and South Atlantic distinct population segments [DPS]), hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS).

The project has been assigned the tracking number SERO-2019-00635 in our new NMFS Environmental Consultation Organizer (ECO). Please refer to the ECO number in any future inquiries regarding this consultation. We look forward to cooperation with you on other FEMA projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Francesca Innocenti, Consultation Biologist, by phone at 727-209-5995, or by email at Francesca.Innocenti@noaa.gov.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure
File: 1514-22.o



**Endangered Species Act - Section 7 Consultation
Biological Opinion**

Lead Action Agency: Federal Emergency Management Agency, Region 4

Applicant: City of Holly Hill, Florida

Activity: Sunrise Park North Main Pier Replacement, Holly Hill, Volusia County, Florida

Project: DR-4337-FL PW 2371

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

Tracking Number: SERO-2019-00635

Approved by:

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

Date Issued:

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
CPUE	Catch per unit effort
CR	Conservation Recommendation(s)
DDT	Dichlorodiphenyltrichloroethane
DPS	Distinct Population Segment(s)
DWH	<i>Deepwater Horizon</i>
DTRU	Dry Tortugas Recovery Unit
ECO	NMFS Environmental Consultation Organizer
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FP	Fibropapillomatosis disease
FR	Federal Register
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
ITS	Incidental Take Statement
NA	North Atlantic
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Association
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
Opinion	Biological Opinion
PCB	Polychlorinated Biphenyls
PCTS	NMFS Public Consultation Tracking System
PFC	Perfluorinated Chemicals
PFRU	Peninsular Florida Recovery Unit
PRD	Protected Resources Division
PRM	Post-release Mortality
RPM	Reasonable and Prudent Measure(s)
SA	South Atlantic
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SCDNR	South Carolina Department of Natural Resources
SCL	Straight Carapace Length
STSSN	Sea Turtle Stranding and Salvage Network
T&Cs	Terms and Condition(s)
TED	Turtle Exclusion Device

TEWG	Turtle Expert Working Group
U.S.	United States
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

Units of Measure

°C	Degrees Celsius
cm	Centimeter(s)
°F	Degrees Fahrenheit
ft	Foot/feet
kg	Kilogram(s)
mi	Mile(s)
oz	Ounce(s)

Introduction

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. §1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a federal agency may affect a protected species or its critical habitat, that agency is required to consult with either the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the protected species that may be affected.

Consultations on most listed marine species and their designated critical habitat are conducted between the action agency and NMFS. Consultations are concluded after NMFS determines the action is not likely to adversely affect listed species or critical habitats, or issues a Biological Opinion (Opinion) that determines whether a proposed action is likely to jeopardize the continued existence of a federally listed species, or destroy or adversely modify federally designated critical habitat. The Opinion also states the amount or extent of listed species incidental take that may occur and develops nondiscretionary measures that the action agency must take to reduce the effects of said anticipated/authorized take. The Opinion may also recommend discretionary conservation measures. No incidental destruction or adverse modification of critical habitat may be authorized. The issuance of an Opinion detailing NMFS's findings concludes ESA Section 7 consultation.

Based on our review associated with the Federal Emergency Management Agency's (FEMA's) Region 4 proposal to replace the Sunrise Park North Main Pier in Holly Hill, Volusia County, Florida (DR-4337-FL PW 2371), this Opinion analyzes the potential for the project to affect the following species: green sea turtle (North Atlantic [NA] and South Atlantic [SA] distinct population segments [DPS]), hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic [NWA] DPS), and smalltooth sawfish (United States [U.S.] DPS). Our determinations are based on information provided by FEMA, the Florida Sea Turtle and Stranding and Salvage Network (STSSN), and the published literature cited herein.

Updates to the regulations governing interagency consultation (50 Code of Federal Regulations [CFR] part 402) were effective on October 28, 2019 [84 Federal Register [FR] 44976]. This consultation was pending at that time, and we are applying the updated regulations to the consultation. As the preamble to the final rule adopting the regulations noted, "[t]his final rule does not lower or raise the bar on Section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." We have reviewed the information and analyses relied upon to complete this Biological Opinion in light of the updated regulations and conclude the Opinion is fully consistent with the updated regulations.

1. CONSULTATION HISTORY

The following is the consultation history for the NMFS Environmental Consultation Organizer (ECO) tracking number SERO-2019-00635, Sunrise Park North Main Pier.

- On May 28, 2019, NMFS received a request for consultation under Section 7 of the ESA from FEMA for project number DR-4337-FL PW 2371.
- NMFS requested additional information from FEMA regarding project details on October 22, 2019. We received a full response on December 6, 2019, and initiated consultation that day.
- NMFS requested additional information on April 8, 2020, and received FEMA's response on April 20, 2020.
- During our internal quality control and legal review process, NMFS requested additional information on June 2, 2020. We received a response on June 9, 2020.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Proposed Action

FEMA proposes to provide funds to the City of Holly Hill (the applicant) to replace the public Sunrise Park North Main Pier to its original function. This project is necessary due to damages sustained during Hurricane Irma in 2017.

The applicant proposes to repair the existing damaged pier and maintain the original footprint of the 340 foot (ft) long pier (2,720 square feet [ft²]), and a 696 ft² terminal section. Proposed repairs include the installation of 63 (14inch [in]) concrete piles, 85 (10 in) wooden piles, and 3,416 ft² of aluminum decking. New piles and decking will be installed via impact hammer using a barge and crane located on land. All materials removed from the project will be disposed in an upland location. Work will occur during daylight hours only. The project is anticipated to be completed within 12 months.

Upon completion, Sunrise Park North Main Pier will be accessible to anglers from 6am-10pm, 365 days a year. Estimated usage will vary daily and seasonally. The applicant estimates approximately 20 anglers/day. The pier will not be staffed by an attendant. There are no fish cleaning stations proposed with this pier.

To minimize potential impacts to ESA-listed species, FEMA will add the following conditions to the grant to be followed by the applicant during construction:

- The existing parking lot must be used for delivery and storage of the majority of construction material and equipment.
- Prior to the onset of construction activities, the applicant or designated agent will conduct a meeting with all construction staff to discuss identification of the sea turtles and smalltooth sawfish, their protected status, what to do if any are observed within the project area, and applicable penalties that may be imposed if State or Federal regulations are violated. All personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing ESA-listed species or marine mammals.

- All construction personnel must watch for and avoid collision with ESA-listed species. Vessel operators must avoid potential interactions and operate in accordance with the following protective measures:
 - All vessels associated with the construction project shall operate at “Idle Speed/ No Wake” at all times while operating in water depths where the draft of the vessel provides less than a 4-ft clearance from the bottom and in all depths after a protected species has been observed in and has departed the area.
 - All vessels will follow marked channels and routes using the maximum water depth whenever possible.
 - Operation of any mechanical construction equipment, including vessels, shall cease immediately if an ESA-listed species is observed within a 50-ft radius of construction equipment or if a whale is seen within 500 yards of construction equipment, and shall not resume until the species has departed the area of its own volition.
 - If the detection of species is not possible during certain weather conditions (e.g., fog, rain, wind), then in-water operations will cease until weather conditions improve and detection is again feasible.
- When in-water project construction takes place from floating equipment (e.g., barge), prop or wheel-washing is prohibited.
- The applicant will be required to obtain all applicable Federal, state, and local permits and will comply with conditions set forth in each. These requirements include all State of Florida and USACE permits. Failure to obtain permits or comply with these conditions may jeopardize the applicant’s receipt of FEMA funding.
- Any collision with or injury to any ESA-listed species occurring during the construction shall be reported immediately to NMFS’s Protected Resources Division (PRD) at (1-727-824- 5312) or by email to takereport.nmfsser@noaa.gov.

To minimize potential impacts to ESA-listed species, FEMA will add the following conditions to the grant to be followed by the applicant post-construction:

- The applicant will coordinate an agreement with the Florida Sea Turtle Stranding Coordinator to assist as needed with the rehabilitation of recreational hook-and line sea turtle captures. The contact information is as follows: Dr. Allen M. Foley, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Jacksonville Field Laboratory, 370 Zoo Parkway, Jacksonville, FL 32218; Email: allen.foley@myfwc.com; Phone: 904-696-5904; Fax: -5903
- The applicant will post signage that will instruct anglers not to dispose of fish carcasses and/or fishing line or debris in the water. In addition,
 - Fishing line recycling receptacles will be placed along the pier in order to prevent fishing line and debris from being disposed of in the water or on the shore. Receptacles will be clearly marked and will be emptied regularly to ensure they do not overfill and that fishing lines are disposed of properly.
 - Trash receptacles and fishing line recycling bins will be installed prior to opening the pier for public use, and emptied 2 times a week.
- Upon completion of the pier, educational signs must be posted in a visible locations, alerting users of listed species in the area. Sign designs and installation methods are

provided at the following website:

[https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational signs](https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs).

- Signs will be posted at least at the entrance to and terminal end of the pier. Signs will be installed prior to opening the pier for public use.
- The applicant will post the “Save Dolphins, Sea Turtles, Sawfish, and Manta Ray” sign.
- The applicant will conduct out-of-water cleanup on a regular basis, removing any trash or debris from around the pier.
- The applicant will conduct in-water pier cleanup on at least an annual basis, removing any derelict tackle or fishing line attached to the pier.
- The applicant will use sea turtle friendly lighting, i.e., long wavelength amber, orange, or red LED lighting only. Though the pier is not on or adjacent to a known sea turtle nesting beach, it is recommended that lights will be mounted only on the pier and not on shore, will be mounted as low to the ground as possible, and shielding structures will be added.

2.2 Proposed Action Area

The Sunrise Park North Main Pier is located in a public park at 1135 Riverside Drive, Holly Hill, Florida (Latitude: 29.249342, Longitude: -81.034954). The Sunrise Park North Main Pier is located on the Halifax River, which runs parallel to the east coast of Florida. The nearest inlet from the Atlantic Ocean is the Ponce de Leon inlet, which is approximately 20 miles (mi) to the southeast. The closest inlet to the north is about 60 mi.

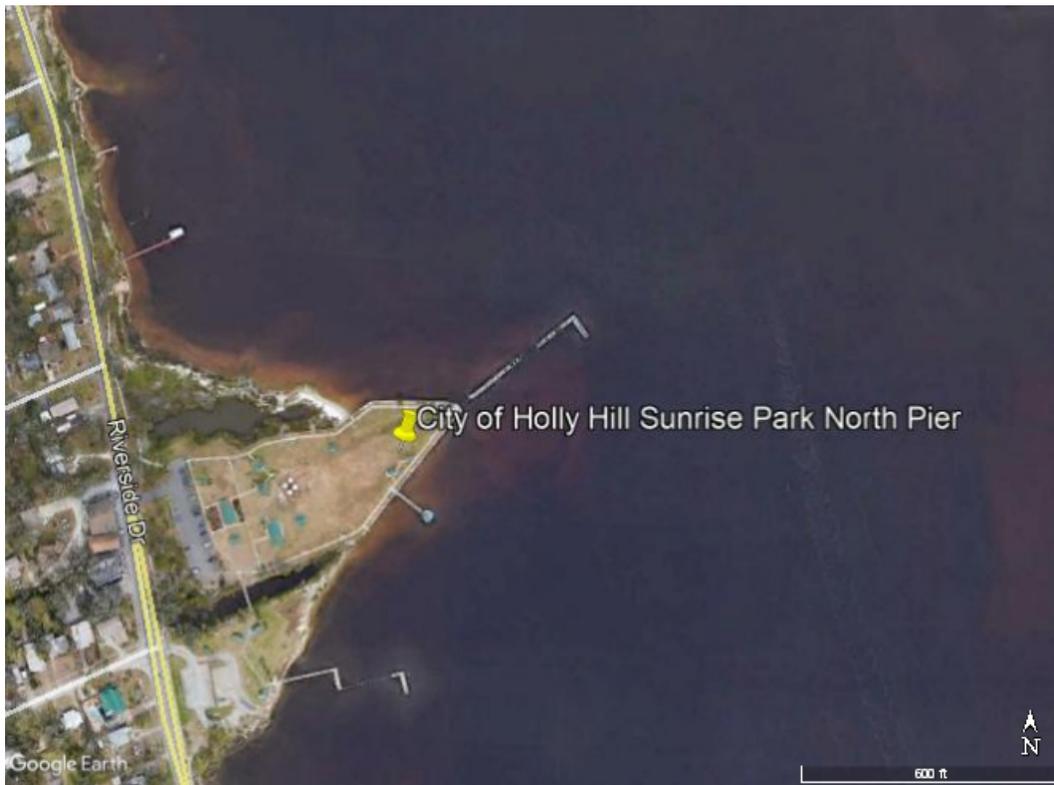
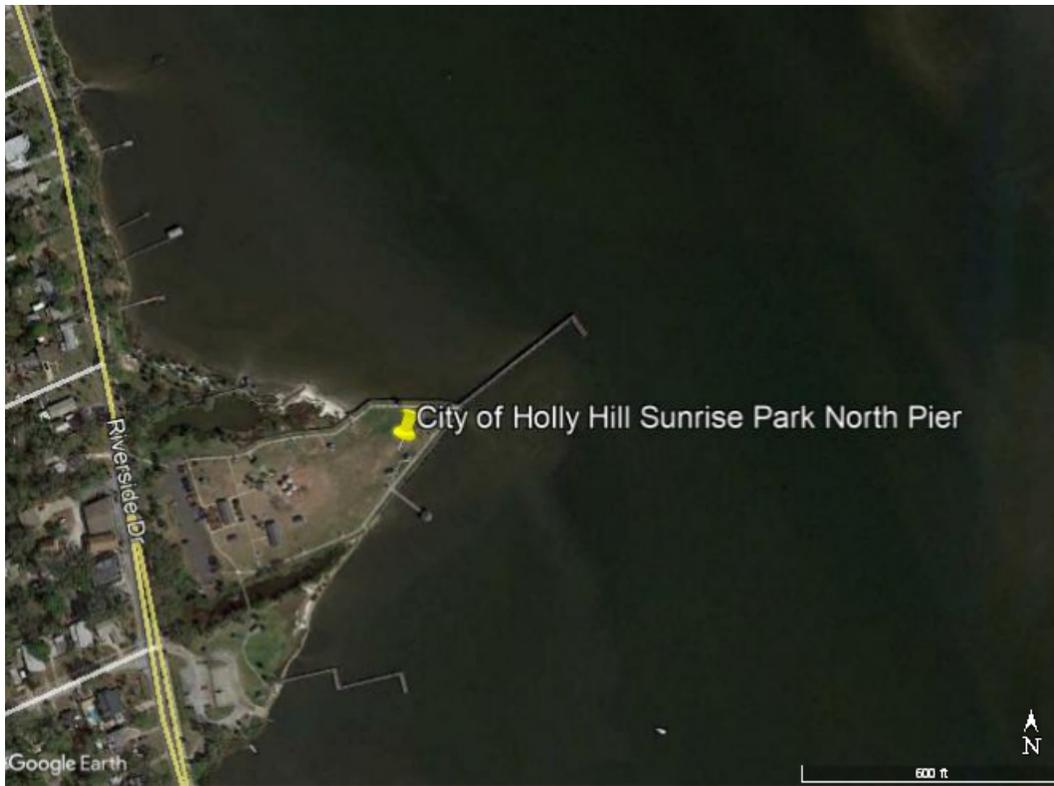


Figure 1. Top: The Sunrise Park North Pier in March 2017 prior to Hurricane Irma. Bottom: The current remaining structure at Sunrise Park North Main Pier (©Google 2020).

The action area is defined by regulation as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action” (50 CFR 402.02). As such, the action area for this project includes the pier’s physical footprint, the immediate substrate and water affected by turbidity and noise from pile driving (705 ft) during construction, and the surrounding water accessible to recreational anglers upon completion of the proposed action (i.e., casting distance or approximately 200 ft).

The City of Holly Hill Sunrise Park North Main Pier was originally built in 1995. Historically, substrate in the project area has consisted of silty mud with isolated shell fragments. There are no recent benthic surveys for the project area. The applicant identified that a bathymetric survey is part of the engineering services contracted by the City. It will be completed once FEMA obligates funding for the project to start. At this time, there is no known seagrass or other submerged aquatic vegetation, corals, or mangroves around the pier. According to the Seagrass Habitat Mapper in Florida (Fish and Wildlife Research Institute [FWRI] 2017), the pier does not have any seagrass mapped in the area (neither continuous nor patchy). The water depth around the pier is approximately 5-6 ft.

3. STATUS OF THE SPECIES

Table 1 provides the effect determinations for ESA-listed species FEMA and/or NMFS believe may be affected by the proposed action.

Table 1. Effects Determinations for Species FEMA and/or NMFS Believes May Be Affected by the Proposed Action

Species	ESA Listing Status	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
Green (NA DPS)	T	LAA	LAA
Green (SA DPS)	T	LAA	LAA
Hawksbill	E	NLAA	NE
Kemp’s ridley	E	NLAA	NE
Leatherback	E	NLAA	NE
Loggerhead (NWA DPS)	T	LAA	LAA
Fish			
Smalltooth sawfish (U.S. DPS)	E	LAA	NLAA

E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect; LAA = likely to adversely affect; NE = no effect

To determine which sea turtle species were most likely to occur within the action area, we reviewed the inshore STSSN data for Florida Zone 29 for the years 2007-2016. Zone 29 runs along the east coast of Florida from 29° N to 30° N and includes portions of Brevard, Volusia, Flagler, and St. John’s Counties (from New Smyrna Beach to Vilano Beach).

According to this 10-year dataset, leatherback sea turtle, hawksbill sea turtle, and Kemp’s ridley sea turtle are rarely present in inshore areas along the east central coast of Florida (Table 2). No hook-and-line captures of Kemp’s ridley, hawksbill or leatherback turtles were reported. Although Kemp’s ridley sea turtles can be found on Florida’s Atlantic Coast, they are far more prevalent in the Gulf of Mexico. The absence of Kemp’s ridley sea turtles in 10 years of stranding data for Florida Zone 29 is a good indication that they are rare in the area because Kemp’s ridley sea turtles tend to be coastal and are well represented in the stranding data in areas where they are more abundant. Additionally, hawksbill and leatherback sea turtles have very specific life history strategies, which are not supported at the action area. Leatherback sea turtles have a pelagic, deepwater life history, where they forage primarily on jellyfish. Hawksbill sea turtles typically inhabit inshore reef and hard bottom areas where they forage primarily on encrusting sponges. Based on the foregoing, we do not believe Kemp’s ridley, hawksbill or leatherback sea turtles are likely to be caught on or entangled in recreational hook-and-line gear at the pier. We believe green sea turtles and loggerhead sea turtles frequently occur within the action area and would be at risk to construction effects and future recreational fishing interactions that will occur at the Sunrise Park North Main Pier upon replacement. Further, until we have a genetic analysis with a larger sample size across more of the Atlantic Ocean by our Southwest Fisheries Science Center genetics lab, we assume that the individuals from both the NA and SA DPSs of green sea turtle could be in the action area.

Table 2. Inshore Sea Turtle Data for Florida Zone 29 as supplied by the Florida STSSN (2007-2016)

Species	Number of Sea Turtles Stranded or Salvaged	Number of Sea Turtles Reported Caught on Recreational Hook-and-Line or Entangled in Gear
Green sea turtle	278	30
Hawksbill sea turtle	1	0
Kemp’s ridley sea turtle	3	0
Leatherback sea turtle	0	0
Loggerhead sea turtle	119	3
Unknown	5	0

3.1 Potential Routes of Effect Not Likely To Adversely Affect Listed Species

Potential effects to listed species include injury from construction equipment or materials. We believe this route of effect is highly unlikely to occur. Because these species are highly mobile, we expect them to move away from the project site if disturbed. The applicants’ implementation of NMFS’s *Sea Turtle and Smalltooth Sawfish Construction Conditions* will further reduce the risk by requiring all construction workers to watch for sea turtles and smalltooth sawfish. Operation of any mechanical construction equipment will cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of moving equipment. Activities will not resume until the animal has departed the project area of its own volition. Further, if at any point a sea turtle and/or smalltooth sawfish is observed within 50 ft of the work site all construction will cease until the species has departed the project area of its own volition.

Sea turtles and smalltooth sawfish may be affected by their temporary inability to access the project area due to their avoidance of construction activities, related noise, and the use of turbidity curtains. We anticipate any habitat avoidance effects to these species will be temporary, and therefore, insignificant. Although construction activities are expected to be completed within 12 months, all activities will occur only during daytime hours and animals may move freely around the action area at night. Further, given the action area's lack of seagrass or mangrove shorelines, use of the area by sea turtle species or smalltooth sawfish for foraging and refuge is expected to be infrequent.

Sea turtles and smalltooth sawfish may be injured due to entanglement in improperly discarded fishing gear resulting from future use of the repaired pier after completion of the proposed action. We believe this route of effect is highly unlikely, and therefore, discountable. We expect that anglers will appropriately dispose of fishing gear when disposal bins are available. The applicant will install and maintain fishing line recycling receptacles and trashcans with lids at the entrance of the pier to keep debris out of the water. The receptacles will be clearly marked and will be emptied regularly to ensure they are not overfilled and that fishing lines are disposed of properly. Further, to minimize the accumulation of fishing line over time, the applicant will perform in-water cleanups at least annually, and out-of-water cleanups on a regular basis. Improperly disposed of and lost/snagged fishing gear is considered below in the Effects of the Action.

Potential effects to smalltooth sawfish also include the risk of physical injury from recreational hook-and-line capture resulting from future use of the repaired pier after completion of the proposed action. We believe that this route of effect is highly unlikely, and therefore, discountable. The International Sawfish Encounter Database (unpublished data last updated January 2017) contains only 13 encounters (6 recreational hook-and-line captures, 6 commercial fishing interactions, 1 undetermined fishing interaction, and 1 sighting) in Volusia County, Florida (A. Brame, NOAA NMFS Southeast Regional Office [SERO] Smalltooth Sawfish Species Coordinator, to D. Bethea, NOAA NMFS SERO Protected Resources Division, on June 21, 2018). Of those 13 encounters, none occurred in the Halifax River. The closest interactions with smalltooth sawfish to the action area occurred in Ponce de Leon Inlet (20 mi south of the action area) and all 3 were commercial fishing interactions. All other encounters are either in Indian River Lagoon (85 mi south of the action area), along the Atlantic coast near Daytona Beach, or offshore.

Furthermore, as stated above, educational signage for sea turtles and smalltooth sawfish, and the FWC Wildlife Hotline will be posted at the entrance to the pier and on the terminal platform upon completion of the pier, which is a beneficial effect. While signage will not reduce the potential risk of recreational hook-and-line interaction, it will encourage anglers to report interactions, thus providing valuable data to researchers and resource managers.

Effects to ESA-listed fish species and sea turtles as a result of noise created by construction activities can physically injure animals in the project area or change animal behavior in the project area. Injurious effects can occur in 2 ways. First, immediate adverse effects can occur to listed species if a single noise event exceeds the threshold for direct physical injury. Second, effects can result from prolonged exposure to noise levels that exceed the daily cumulative

exposure threshold for the animals, and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. Behavioral effects can be adverse if such effects interfere with animals migrating, feeding, resting, or reproducing, for example. Our evaluation of effects to listed species as a result of noise created by construction activities is based on the analysis prepared in support of the Opinion for SAJ-82.¹ The noise analysis in this consultation evaluates effects to ESA-listed fish species and sea turtles identified by NMFS as potentially affected in the table above.

Based on our noise calculations, installation of concrete piles up to 24-in in diameter by impact hammer will not cause single-strike or peak-pressure injurious noise effects. However, the cumulative sound exposure level of multiple pile strikes over the course of a day may cause injury to ESA-listed fish species and sea turtles up to 72 ft (22 m) away from the pile. Due to the mobility of ESA-listed fish species and sea turtles, and because the project occurs in open water, we expect them to move away from noise disturbances. Because we anticipate the animal will move away, we believe that an animal's suffering physical injury from noise is extremely unlikely to occur and is therefore discountable. An animal's movement away from the injurious sound radius is a behavioral response, with the same effects discussed below.

The installation of concrete piles up to 24-in in diameter using an impact hammer could also result in behavioral effects at radii 705 ft (215 m) for ESA-listed fish species and 151 ft (46 m) for sea turtles. Due to the mobility of ESA-listed fish species and sea turtles, we expect them to move away from noise disturbances in this open-water environment. Because there is similar habitat nearby, we believe behavioral effects will be insignificant. If an individual chooses to remain within the behavioral response zone, it could be exposed to behavioral noise impacts during pile installation. Since installation will occur only during the day, these species will be able to resume normal activities during quiet periods between pile installations and at night. Therefore, we anticipate adverse effects associated with behavioral responses to noise effects will be insignificant.

3.2 Potential Routes of Effect Likely To Adversely Affect Listed Species

NMFS determined the potential route of effect likely to adversely affect green and loggerhead sea turtles is the risk of physical injury from recreational hook-and-line use resulting from future use of the pier after completion of the proposed action.

Hook-and-line gear commonly used by recreational anglers fishing from fishing piers can adversely affect sea turtles via entanglement, hooking, and trailing line. Sea turtles released alive may later succumb to injuries sustained at the time of capture or from exacerbated trauma from fishing hooks or lines that were ingested, entangled, or otherwise still attached when they were released. Of the sea turtles hooked or entangled that do not die from their wounds, some may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns. The applicant has stated there will be no fish cleaning stations associated with the City of Holly Hill Sunrise Park North Main Pier. Trash receptacles will be clearly marked and will be emptied 2 times a week. This will reduce the likelihood of sea turtles

¹ NMFS. Biological Opinion on Regional General Permit SAJ-82 (SAJ-2007-01590), Florida Keys, Monroe County, Florida. June 10, 2014.

becoming habituated to a food source once the pier is re-opened to the public for recreational fishing. A more in-depth discussion of the effects of hook-and-line capture to sea turtles is discussed in Effects of the Action below.

As stated above, educational signage will be installed in visible locations upon completion of the pier. This will provide information to the public on how to handle and report encounters with sea turtle species. Signs will not reduce the potential risk of recreational hook-and-line interaction with sea turtles, but they will help reduce the severity of injury to incidentally captured animals. The signs will also encourage anglers to report interactions, thus providing valuable data to researchers and resource managers.

3.3 Status of Sea Turtles

Section 3.3.1 addresses the general threats that confront all sea turtle species. Sections 3.3.2 – 3.3.3 address information on the distribution, life history, population structure, abundance, population trends, and unique threats to each species of sea turtle likely to be adversely affected by the proposed action.

3.3.1 General Threats Faced by All Sea Turtle Species

Sea turtles face numerous natural and man-made threats that shape their status and affect their ability to recover. Many of the threats are either the same or similar in nature for all listed sea turtle species. Those identified in this section are discussed in a general sense for all sea turtles. Threat information specific to a particular species are then discussed in the corresponding status sections where appropriate.

Fisheries

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS and USFWS 1991a; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS and USFWS 2008b; NMFS et al. 2011). Domestic fisheries often capture, injure, and kill sea turtles at various life stages. Sea turtles in the pelagic environment are exposed to U.S. Atlantic pelagic longline fisheries. Sea turtles in the benthic environment in waters off the coastal U.S. are exposed to a suite of other fisheries in federal and state waters. These fishing methods include trawls, gillnets, purse seines, hook-and-line gear (including bottom longlines and vertical lines [e.g., bandit gear, handlines, and rod-reel]), pound nets, and trap fisheries. Refer to the Environmental Baseline of this Opinion for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area. The southeast U.S. shrimp fisheries have historically been the largest fishery threat to benthic sea turtles in the southeastern U.S., and continue to interact with and kill large numbers of sea turtles each year.

In addition to domestic fisheries, sea turtles are subject to direct as well as incidental capture in numerous foreign fisheries, further impeding the ability of sea turtles to survive and recover on a global scale. For example, pelagic stage sea turtles, especially loggerheads and leatherbacks, circumnavigating the Atlantic are susceptible to international longline fisheries including the

Azorean, Spanish, and various other fleets (Aguilar et al. 1994; Bolten et al. 1994). Bottom longlines and gillnet fishing is known to occur in many foreign waters, including (but not limited to) the northwest Atlantic, western Mediterranean, South America, West Africa, Central America, and the Caribbean. Shrimp trawl fisheries are also occurring off the shores of numerous foreign countries and pose a significant threat to sea turtles similar to the impacts seen in U.S. waters. Many unreported takes or incomplete records by foreign fleets make it difficult to characterize the total impact that international fishing pressure is having on listed sea turtles. Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

Non-Fishery In-Water Activities

There are also many non-fishery impacts affecting the status of sea turtle species, both in the ocean and on land. In nearshore waters of the U.S., the construction and maintenance of federal navigation channels has been identified as a source of sea turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles (NMFS 1997). Sea turtles entering coastal or inshore areas have also been affected by entrainment in the cooling-water systems of electrical generating plants. Other nearshore threats include harassment and/or injury resulting from private and commercial vessel operations, military detonations and training exercises, in-water construction activities, and scientific research activities.

Coastal Development and Erosion Control

Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. 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. 1997). These factors may decrease the amount of nesting area available to females and change the natural behaviors of both adults and hatchlings, directly or indirectly, through loss of beach habitat or changing thermal profiles and increasing erosion, respectively (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). In addition, coastal development is usually accompanied by artificial lighting which can alter the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings that are drawn away from the water (Witherington and Bjorndal 1991). In-water erosion control structures such as breakwaters, groins, and jetties can impact nesting females and hatchling as they approach and leave the surf zone or head out to sea by creating physical blockage, concentrating predators, creating longshore currents, and disrupting of wave patterns.

Environmental Contamination

Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g., dichlorodiphenyltrichloroethane [DDT], polychlorinated biphenyls [PCB], and perfluorinated chemicals [PFC]), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly

injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

The April 20, 2010, explosion of the Deepwater Horizon (DWH) oil rig affected sea turtles in the Gulf of Mexico. An assessment has been completed on the injury to Gulf of Mexico marine life, including sea turtles, resulting from the spill (DWH Trustees 2015a). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil and/or had ingested oil. The spill resulted in the direct mortality of many sea turtles and may have had sublethal effects or caused environmental damage that will impact other sea turtles into the future. Information on the spill impacts to individual sea turtle species is presented in the Status of the Species sections for each species.

Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g., tar balls, plastic bags/pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the pelagic environment (i.e., leatherbacks, juvenile loggerheads and juvenile green turtles).

Climate Change

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

Climate change impacts on sea turtles currently cannot be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of sea turtles may result (NMFS and USFWS 2007b). In sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25-35 degrees Celsius (°C) (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007a).

The effects from increased temperatures may be intensified on developed nesting beaches where shoreline armoring and construction have denuded vegetation. Erosion control structures could potentially result in the permanent loss of nesting beach habitat or deter nesting females (NRC 1990). These impacts will be exacerbated by sea level rise. If females nest on the seaward side of the erosion control structures, nests may be exposed to repeated tidal overwash (NMFS and USFWS 2007c). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting

sites and decrease available nesting habitat (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006).

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

Other Threats

Predation by various land predators is a threat to developing nests and emerging hatchlings. The major natural predators of sea turtle nests are mammals, including raccoons, dogs, pigs, skunks, and badgers. Emergent hatchlings are preyed upon by these mammals as well as ghost crabs, laughing gulls, and the exotic South American fire ant (*Solenopsis invicta*). In addition to natural predation, direct harvest of eggs and adults from beaches in foreign countries continues to be a problem for various sea turtle species throughout their ranges (NMFS and USFWS 2008).

Diseases, toxic blooms from algae and other microorganisms, and cold stunning events are additional sources of mortality that can range from local and limited to wide-scale and impacting hundreds or thousands of animals.

3.3.2 Status of Green Sea Turtle – North Atlantic and South Atlantic DPSs

The green sea turtle was originally listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. On April 6, 2016, the original listing was replaced with the listing of 11 DPS (81 FR 20057 2016) (Figure 2). The Mediterranean, Central West Pacific, and Central South Pacific DPSs were listed as endangered. The NA, SA, Southwest Indian, North Indian, East Indian-West Pacific, Southwest Pacific, Central North Pacific, and East Pacific DPSs were listed as threatened. For the purposes of this consultation, only the SA DPS and NA DPS will be considered, as they are the only two DPSs with individuals occurring in the Atlantic and Gulf of Mexico waters of the U.S.

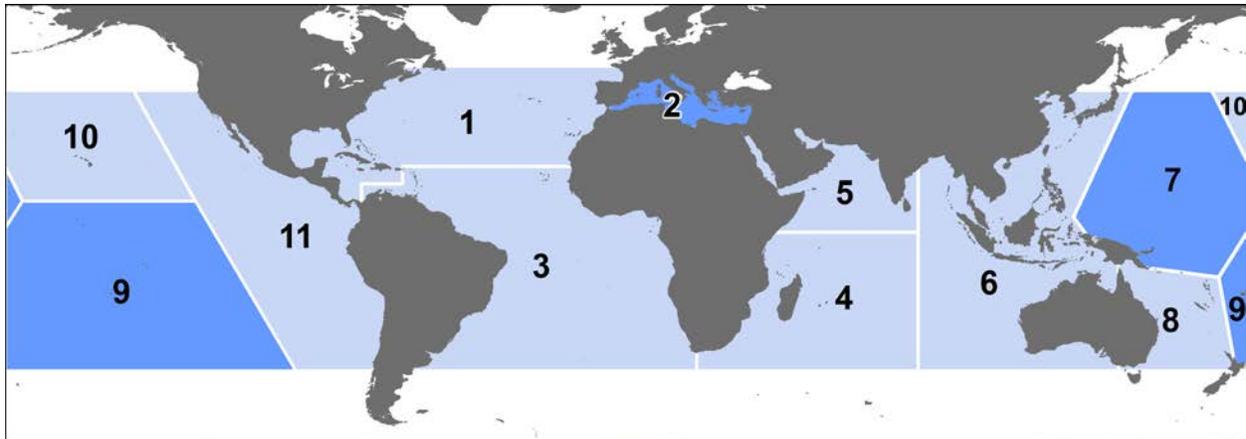


Figure 2. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

Species Description and Distribution

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

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

Differences in mitochondrial DNA properties of green sea turtles from different nesting regions indicate there are genetic subpopulations (Bowen et al. 1992; FitzSimmons et al. 2006). Despite the genetic differences, sea turtles from separate nesting origins are commonly found mixed together on foraging grounds throughout the species' range. Within U.S. waters individuals from both the NA and SA DPSs can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, two small-scale studies provide an insight into the degree of mixing on the foraging grounds. An analysis of cold-stunned green turtles in St. Joseph Bay, Florida (northern Gulf of Mexico) found approximately 4% of individuals came from nesting stocks in the SA DPS (specifically Suriname, Aves Island, Brazil, Ascension Island, and Guinea Bissau) (Foley et al. 2007). On the Atlantic coast of Florida, a study on the foraging grounds off Hutchinson Island found that approximately 5% of the turtles sampled came from the Aves Island/Suriname nesting

assemblage, which is part of the SA DPS (Bass and Witzell 2000). All of the individuals in both studies were benthic juveniles. Available information on green turtle migratory behavior indicates that long distance dispersal is only seen for juvenile turtles. This suggests that larger adult-sized turtles return to forage within the region of their natal rookeries, thereby limiting the potential for gene flow across larger scales (Monzón-Argüello et al. 2010). While all of the mainland U.S. nesting individuals are part of the NA DPS, the U.S. Caribbean nesting assemblages are split between the NA and SA DPS. Nesters in Puerto Rico are part of the NA DPS, while those in the U.S. Virgin Islands are part of the SA DPS. We do not currently have information on what percent of individuals on the U.S. Caribbean foraging grounds come from which DPS.

North Atlantic DPS Distribution

The NA DPS boundary is illustrated in Figure 2. Four regions support nesting concentrations of particular interest in the NA DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo), U.S. (Florida), and Cuba. By far the most important nesting concentration for green turtles in this DPS is Tortuguero, Costa Rica. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and North Carolina, South Carolina, Georgia, and Texas, U.S.A. In the eastern North Atlantic, nesting has been reported in Mauritania (Fretey 2001).

The complete nesting range of NA DPS green sea turtles within the southeastern United States includes sandy beaches between Texas and North Carolina, as well as Puerto Rico (Dow et al. 2007; NMFS and USFWS 1991a). The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard south through Broward counties.

In U.S. Atlantic and Gulf of Mexico waters, green sea turtles are distributed throughout inshore and nearshore waters from Texas to Massachusetts. Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984; Hildebrand 1982; Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon system in Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward Counties (Guseman and Ehrhart 1992; Wershoven and Wershoven 1992). The summer developmental habitat for green sea turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997). Additional important foraging areas in the western Atlantic include the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito Coast of Nicaragua, the Caribbean coast of Panama, scattered areas along Colombia and Brazil (Hirth 1971), and the northwestern coast of the Yucatán Peninsula.

South Atlantic DPS Distribution

The SA DPS boundary is shown in Figure 2, and includes the U.S. Virgin Islands in the Caribbean. The SA DPS nesting sites can be roughly divided into four regions: western Africa,

Ascension Island, Brazil, and the South Atlantic Caribbean (including Colombia, the Guianas, and Aves Island in addition to the numerous small, island nesting sites).

The in-water range of the SA DPS is widespread. In the eastern South Atlantic, significant sea turtle habitats have been identified, including green turtle feeding grounds in Corisco Bay, Equatorial Guinea/Gabon (Formia 1999); Congo; Mussulo Bay, Angola (Carr and Carr 1991); as well as Principe Island. Juvenile and adult green turtles utilize foraging areas throughout the Caribbean areas of the South Atlantic, often resulting in interactions with fisheries occurring in those same waters (Dow et al. 2007). Juvenile green turtles from multiple rookeries also frequently utilize the nearshore waters off Brazil as foraging grounds as evidenced from the frequent captures by fisheries (Lima et al. 2010; López-Barrera et al. 2012; Marcovaldi et al. 2009). Genetic analysis of green turtles on the foraging grounds off Ubatuba and Almofala, Brazil show mixed stocks coming primarily from Ascension, Suriname and Trindade as a secondary source, but also Aves, and even sometimes Costa Rica (North Atlantic DPS)(Naro-Maciel et al. 2007; Naro-Maciel et al. 2012). While no nesting occurs as far south as Uruguay and Argentina, both have important foraging grounds for South Atlantic green turtles (Gonzalez Carman et al. 2011; Lezama 2009; López-Mendilaharsu et al. 2006; Prosdocimi et al. 2012; Rivas-Zinno 2012).

Life History Information

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

After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007a). Green sea turtles exhibit particularly slow growth rates of about 0.4-2 in (1-5 cm) per year (Green 1993), which may be attributed to their largely herbivorous, low-net energy diet (Bjorndal 1982). At approximately 8-10 in (20-25 cm) carapace length, juveniles leave the pelagic environment and enter nearshore developmental habitats such as protected lagoons and open coastal areas rich in sea grass and marine algae.

Growth studies using skeletochronology indicate that green sea turtles in the western Atlantic shift from the oceanic phase to nearshore developmental habitats after approximately 5-6 years (Bresette et al. 2006; Zug and Glor 1998). Within the developmental habitats, juveniles begin the switch to a more herbivorous diet, and by adulthood feed almost exclusively on seagrasses and algae (Rebel 1974), although some populations are known to also feed heavily on invertebrates (Carballo et al. 2002). Green sea turtles mature slowly, requiring 20-50 years to reach sexual maturity (Chaloupka and Musick 1997; Hirth 1997).

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

Status and Population Dynamics

Accurate population estimates for marine turtles do not exist because of the difficulty in sampling turtles over their geographic ranges and within their marine environments. Nonetheless, researchers have used nesting data to study trends in reproducing sea turtles over time. A summary of nesting trends and nester abundance is provided in the most recent status review for the species (Seminoff et al. 2015), with information for each of the DPSs.

North Atlantic DPS

The NA DPS is the largest of the 11 green turtle DPSs, with an estimated nester abundance of over 167,000 adult females from 73 nesting sites. Overall this DPS is also the most data rich. Eight of the sites have high levels of abundance (i.e., <1000 nesters), located in Costa Rica, Cuba, Mexico, and Florida. All major nesting populations demonstrate long-term increases in abundance (Seminoff et al. 2015).

Tortuguero, Costa Rica is by far the predominant nesting site, accounting for an estimated 79% of nesting for the DPS (Seminoff et al. 2015). Nesting at Tortuguero appears to have been increasing since the 1970's, when monitoring began. For instance, from 1971-1975 there were approximately 41,250 average annual emergences documented and this number increased to an average of 72,200 emergences from 1992-1996 (Bjorndal et al. 1999). Troëng and Rankin (2005) collected nest counts from 1999-2003 and also reported increasing trends in the population consistent with the earlier studies, with nest count data suggesting 17,402-37,290 nesting females per year (NMFS and USFWS 2007a). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica population's growing at 4.9% annually.

In the continental U.S., green sea turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida (Meylan et al. 1994; Weishampel et al. 2003). Occasional nesting has also been documented along the Gulf Coast of Florida (Meylan et al.

1995). Green sea turtle nesting is documented annually on beaches of North Carolina, South Carolina, and Georgia, though nesting is found in low quantities (up to tens of nests) (nesting databases maintained on www.seaturtle.org).

In Florida, index beaches were established to standardize data collection methods and effort on key nesting beaches. Since establishment of the index beaches in 1989, the pattern of green sea turtle nesting has generally shown biennial peaks in abundance with a positive trend during the 10 years of regular monitoring (Figure 3). According to data collected from Florida's index nesting beach survey from 1989-2018, green sea turtle nest counts across Florida have increased dramatically, from a low of 267 in the early 1990s to a high of 38,954 in 2017. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in 2010 and 2011, and a return to the trend of biennial peaks in abundance thereafter (Figure 3). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9% at that time. Increases have been even more rapid in recent years.

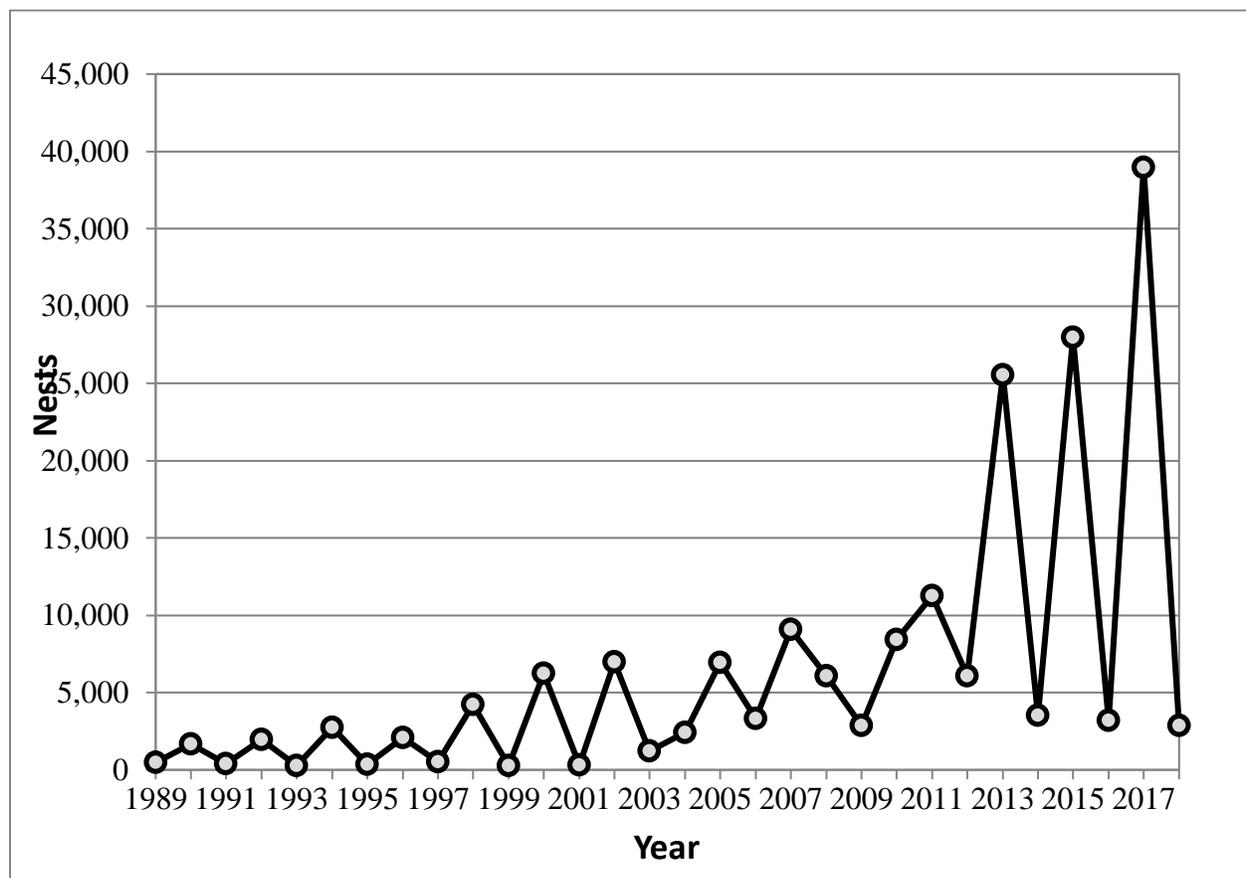


Figure 3. Green sea turtle nesting at Florida index beaches since 1989.

Similar to the nesting trend found in Florida, in-water studies in Florida have also recorded increases in green turtle captures at the Indian River Lagoon site, with a 661 percent increase over 24 years (Ehrhart et al. 2007), and the St. Lucie Power Plant site, with a significant increase in the annual rate of capture of immature green turtles (SCL<90 cm) from 1977 to 2002 or 26

years (3,557 green turtles total; M. Bressette, Inwater Research Group, unpubl. data; Witherington et al. 2006).

South Atlantic DPS

The SA DPS is large, estimated at over 63,000 nesters, but data availability is poor. More than half of the 51 identified nesting sites (37) did not have sufficient data to estimate number of nesters or trends (Seminoff et al. 2015). This includes some sites, such as beaches in French Guiana, which are suspected to have large numbers of nesters. Therefore, while the estimated number of nesters may be substantially underestimated, we also do not know the population trends at those data-poor beaches. However, while the lack of data was a concern due to increased uncertainty, the overall trend of the SA DPS was not considered to be a major concern as some of the largest nesting beaches such as Ascension Island, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Others such as Trindade (Brazil), Atol das Rocas (Brazil), and Poilão and the rest of Guinea-Bissau seem to be stable or do not have sufficient data to make a determination. Bioko (Equatorial Guinea) appears to be in decline but has less nesting than the other primary sites (Seminoff et al. 2015).

In the U.S., nesting of SA DPS green turtles occurs on the beaches of the U.S. Virgin Islands, primarily on Buck Island. There is insufficient data to determine a trend for Buck Island nesting, and it is a smaller rookery, with approximately 63 total nesters utilizing the beach (Seminoff et al. 2015).

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.3.1.

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

and shallow water) (Foley et al. 2005). FP is cosmopolitan, but it has been found to affect large numbers of animals in specific areas, including Hawaii and Florida (Herbst 1994; Jacobson 1990; Jacobson et al. 1991).

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

Whereas oil spill impacts are discussed generally for all species in Section 3.3.1, specific impacts of the DWH spill on green sea turtles are considered here. Impacts to green sea turtles occurred to offshore small juveniles only. A total of 154,000 small juvenile greens (36.6% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. A large number of small juveniles were removed from the population, as 57,300 small juvenile greens are estimated to have died as a result of the exposure. A total of 4 nests (580 eggs) were also translocated during response efforts, with 455 hatchlings released (the fate of which is unknown) (DWH Trustees 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources, which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

While green turtles regularly use the northern Gulf of Mexico, they have a widespread distribution throughout the entire Gulf of Mexico, Caribbean, and Atlantic, and the proportion of the population using the northern Gulf of Mexico at any given time is relatively low. Although it is known that adverse impacts occurred and numbers of animals in the Gulf of Mexico were reduced as a result of DWH, the relative proportion of the population that is expected to have been exposed to and directly impacted by the DWH event, as well as the impacts being primarily to smaller juveniles (lower reproductive value than adults and large juveniles), reduces the impact to the overall population. It is unclear what impact these losses may have caused on a population level, but it is not expected to have had a large impact on the population trajectory moving forward. However, recovery of green turtle numbers equivalent to what was lost in the northern Gulf of Mexico as a result of the spill will likely take decades of sustained efforts to reduce the existing threats and enhance survivorship of multiple life stages (DWH Trustees 2015b).

3.3.3 Status of Loggerhead Sea Turtle – Northwest Atlantic DPS

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

Species Description and Distribution

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

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

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

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

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

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

Life History Information

The Northwest Atlantic Loggerhead Recovery Team defined the following 8 life stages for the loggerhead life cycle, which include the ecosystems those stages generally use: (1) egg (terrestrial zone), (2) hatchling stage (terrestrial zone), (3) hatchling swim frenzy and transitional stage (neritic zone²), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008b). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008b). Loggerhead hatchlings are 1.5-2 inches long and weigh about 0.7 oz (20 g).

² Neritic refers to the nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 meters.

As post-hatchlings, loggerheads hatched on U.S. beaches enter the “oceanic juvenile” life stage, migrating offshore and becoming associated with *Sargassum* habitats, driftlines, and other convergence zones (Carr 1986; Conant et al. 2009; Witherington 2002). Oceanic juveniles grow at rates of 1-2 inches (2.9-5.4 cm) per year (Bjorndal et al. 2003; Snover 2002) over a period as long as 7-12 years (Bolten et al. 1998) before moving to more coastal habitats. Studies have suggested that not all loggerhead sea turtles follow the model of circumnavigating the North Atlantic Gyre as pelagic juveniles, followed by permanent settlement into benthic environments (Bolten and Witherington 2003; Laurent et al. 1998). These studies suggest some turtles may either remain in the oceanic habitat in the North Atlantic longer than hypothesized, or they move back and forth between oceanic and coastal habitats interchangeably (Witzell 2002). Stranding records indicate that when immature loggerheads reach 15-24 in (40-60 cm) SCL, they begin to reside in coastal inshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico (Witzell 2002).

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

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

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

which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics

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

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

Peninsular Florida Recovery Unit

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008b). The statewide estimated total for 2017 was 96,912 nests (FWRI nesting database).

In addition to the total nest count estimates, the Florida Fish and Wildlife Research Institute (FWRI) uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years. This provides a better tool for understanding the nesting trends (Figure 4). FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2017; <http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/>). Over that time period, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represented a new record for loggerheads on the core index beaches. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but non-significant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose slightly again to 48,983 in 2018, which is still the 4th highest total since 2001. However, it is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.) it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani, et al. 2019).

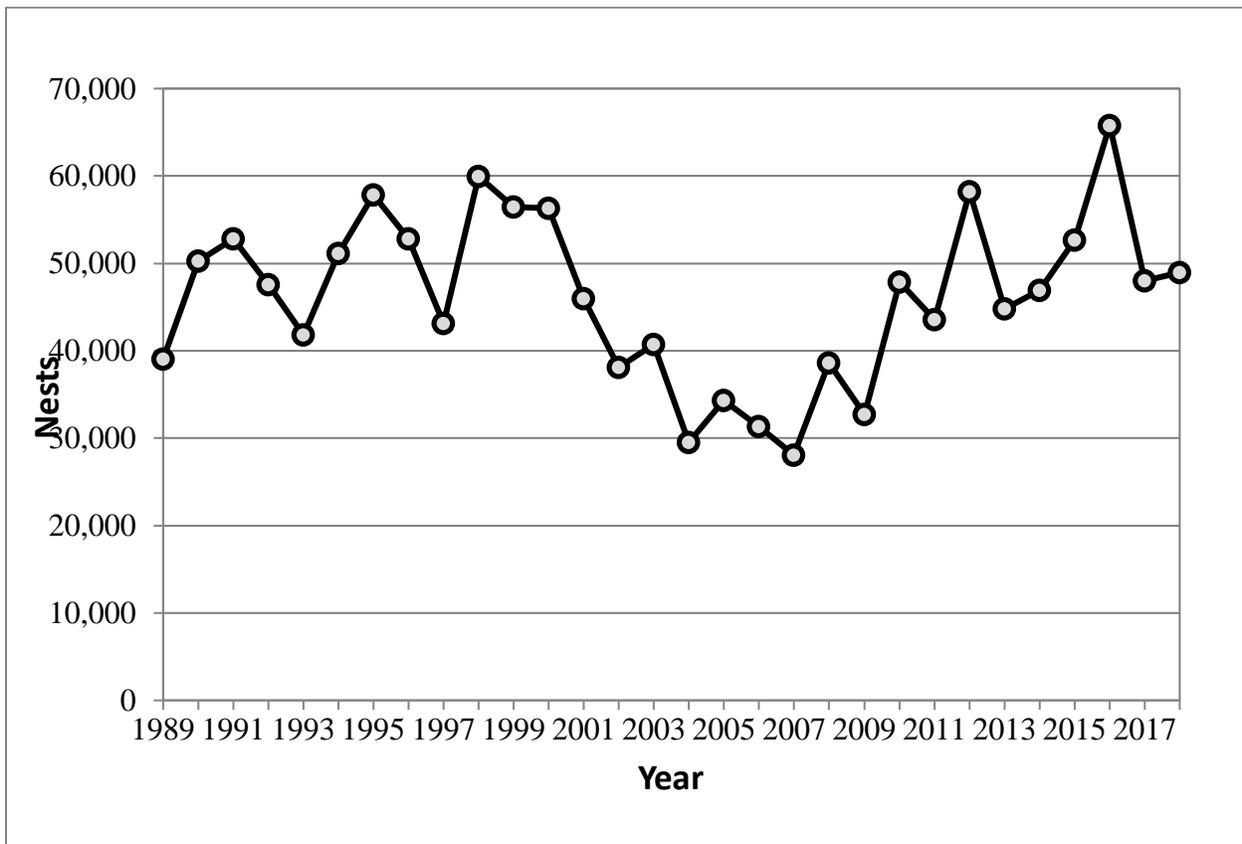


Figure 4. Loggerhead sea turtle nesting at Florida index beaches since 1989.

Northern Recovery Unit

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

Data since that analysis (Table 3) are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, <http://www.georgiawildlife.com/node/3139>). South Carolina and North Carolina nesting have also begun to shift away from the past declining trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016. Nesting in 2017 and 2018 declined relative to 2016, back to levels seen in 2013 to 2015.

Table 3. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org)

Year	Georgia	South Carolina	North Carolina	Totals
2008	1,649	4,500	841	6,990
2009	998	2,182	302	3,472
2010	1,760	3,141	856	5,757
2011	1,992	4,015	950	6,957
2012	2,241	4,615	1,074	7,930
2013	2,289	5,193	1,260	8,742
2014	1,196	2,083	542	3,821
2015	2,319	5,104	1,254	8,677
2016	3,265	6,443	1,612	11,320
2017	2,155	5,232	1,195	8,582
2018	1,735	2,762	765	5,262
2019	3,945	8,774	2,291	15,010

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009-2013, with a subsequent steep drop in 2014. Nesting then rebounded in 2015 and 2016, setting new highs each of those years. Nesting in 2017 dropped back down from the 2016 high, but was still the second highest on record (Figure 5). South Carolina has not updated its Index Beach information, but it likely follows a similar pattern to the statewide data in Table 3 above.

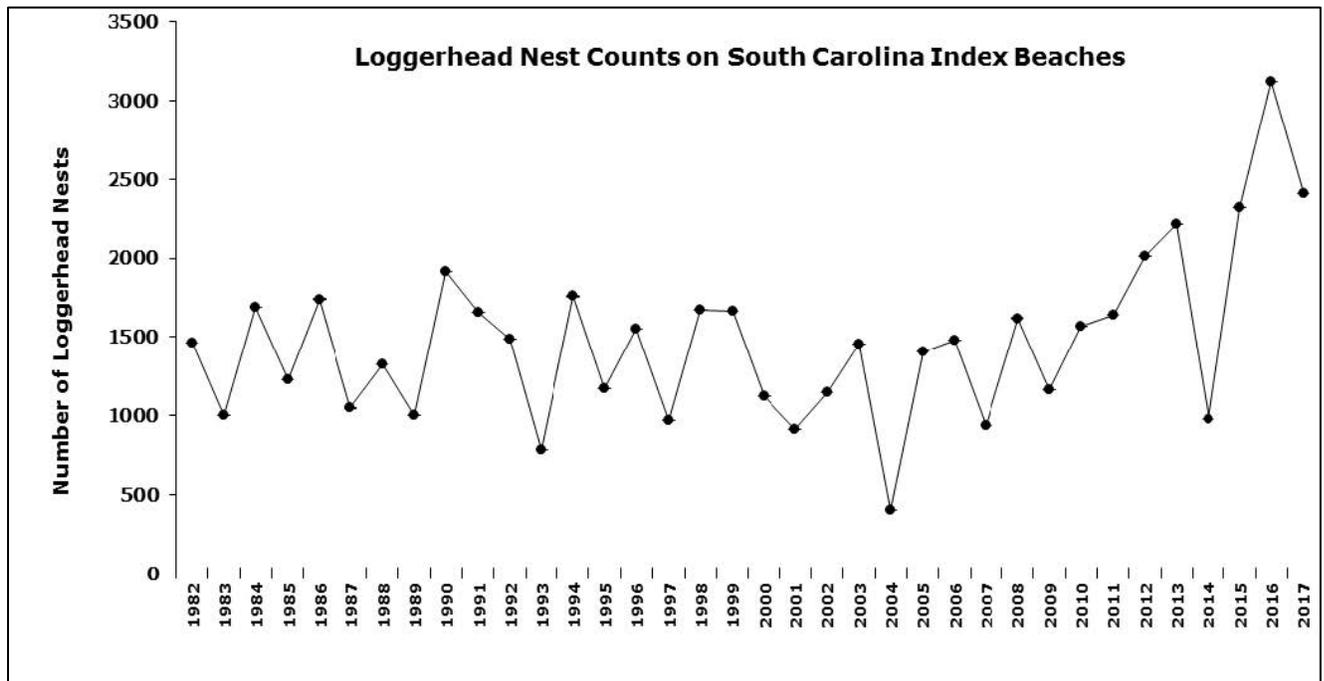


Figure 5. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: <http://www.dnr.sc.gov/seaturtle/nest.htm>)

Other NWA DPS Recovery Units

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

In-water Trends

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

Population Estimate

The NMFS Southeast Fisheries Science Center developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (NMFS-SEFSC 2009). The model uses the range of published information for the various parameters including mortality by stage, stage duration (years in a stage), and fecundity parameters such as eggs per nest, nests per nesting female, hatchling emergence success, sex ratio, and remigration interval. Resulting trajectories of model runs for each

individual recovery unit, and the western North Atlantic population as a whole, were found to be very similar. The model run estimates from the adult female population size for the western North Atlantic (from the 2004-2008 time frame) suggest the adult female population size is approximately 20,000-40,000 individuals, with a low likelihood of females' numbering up to 70,000 (NMFS-SEFSC 2009). A less robust estimate for total benthic females in the western North Atlantic was also obtained, yielding approximately 30,000-300,000 individuals, up to less than 1 million (NMFS-SEFSC 2009). A preliminary regional abundance survey of loggerheads within the northwestern Atlantic continental shelf for positively identified loggerhead in all strata estimated about 588,000 loggerheads (interquartile range of 382,000-817,000). When correcting for unidentified turtles in proportion to the ratio of identified turtles, the estimate increased to about 801,000 loggerheads (interquartile range of 521,000-1,111,000) (NMFS-NEFSC 2011).

Threats

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 3.3.1. Yet the impact of fishery interactions is a point of further emphasis for this species. The joint NMFS and USFWS Loggerhead Biological Review Team determined that the greatest threats to the NWA DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009).

Regarding the impacts of pollution, loggerheads may be particularly affected by organochlorine contaminants; they have the highest organochlorine concentrations (Storelli et al. 2008) and metal loads (D'Ilio et al. 2011) in sampled tissues among the sea turtle species. It is thought that dietary preferences were likely to be the main differentiating factor among sea turtle species. Storelli et al. (2008) analyzed tissues from stranded loggerhead sea turtles and found that mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals, and porpoises (Law et al. 1991).

While oil spill impacts are discussed generally for all species in Section 3.3.1, specific impacts of DWH on loggerhead sea turtles are considered here. Impacts to loggerhead sea turtles occurred to offshore small juveniles as well as large juveniles and adults. A total of 30,800 small juvenile loggerheads (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp's ridleys, the majority of nesting for the loggerhead NWA DPS occurs on the Atlantic coast, and thus loggerheads were impacted to a relatively lesser degree. However, it is

likely that impacts to the NGMRU of the loggerhead NWA DPS would be proportionally much greater than the impacts occurring to other recovery units. Impacts to nesting and oiling effects on a large proportion of the NGMRU recovery unit, especially mating and nesting adults likely had an impact on the NGMRU. Based on the response injury evaluations for Florida Panhandle and Alabama nesting beaches (which fall under the NGMRU), the Trustees estimated that approximately 20,000 loggerhead hatchlings were lost due to DWH oil spill response activities on nesting beaches. Although the long-term effects remain unknown, the DWH oil spill event impacts to the NGMRU may result in some nesting declines in the future due to a large reduction of oceanic age classes during the DWH oil spill event. Although adverse impacts occurred to loggerheads, the proportion of the population that is expected to have been exposed to and directly impacted by the DWH oil spill event is relatively low. Thus we do not believe a population-level impact occurred due to the widespread distribution and nesting location outside of the Gulf of Mexico for this species.

Specific information regarding potential climate change impacts on loggerheads is also available. Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80% female offspring for loggerheads nesting near Southport, North Carolina. The same increase in air temperatures at nesting beaches in Cape Canaveral, Florida, would result in close to 100% female offspring. Such highly skewed sex ratios could undermine the reproductive capacity of the species. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most nests, leading to egg mortality (Hawkes et al. 2007). Warmer sea surface temperatures have also been correlated with an earlier onset of loggerhead nesting in the spring (Hawkes et al. 2007; Weishampel et al. 2004), short inter-nesting intervals (Hays et al. 2002), and shorter nesting seasons (Pike et al. 2006).

4. ENVIRONMENTAL BASELINE

By regulation (50 CFR 402.02), environmental baselines for Opinions refer to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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. The consequences to the listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Focusing on the impacts of the activities in the action area specifically allows us to assess the prior experience and state (or condition) of the endangered and threatened individuals. This consideration is important because in some states or life history stages, or areas of their ranges, listed individuals will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action.

4.1 Status of Sea Turtles within the Action Area

Based on stranding, and recreational hook-and-line data, green sea turtle (NA and SA DPSs) and loggerhead sea turtle (NWA DPS) may be located in the action area and may be affected by recreational fishing upon completion of the proposed action. These sea turtle species are migratory, traveling to forage grounds or for reproduction purposes. The nearshore waters of Volusia County, Florida, are likely used by these species of sea turtle for developmental and foraging habitat. NMFS believes that no individual sea turtle is likely to be a permanent resident of the action area, although some individuals may be present at any given time. These same individuals will migrate into offshore waters of the Gulf of Mexico, Caribbean Sea, and other areas of the North Atlantic Ocean at certain times of the year, and thus may be affected by activities occurring there; therefore, the status of sea turtle species in the action area, as well as the threats to sea turtles in the action area are considered to be the same as those discussed in Sections 3.3.1-3.3.3.

4.2 Factors Affecting Sea Turtles within the Action Area

4.2.1 Federal Actions

ESA Section 7 Consultations

We have consulted on several projects in the Halifax River where the project is located. However, other than the proposed action, no other federally permitted projects are known to have occurred within the action area, as per a review of the NMFS Protected Resources Division's completed consultation database by the consulting biologist on March 20, 2020.

ESA Section 10 Permits

Sea turtles are the focus of research activities authorized by Section 10 permits under the ESA. The ESA allows the issuance of permits to take listed species for the purposes of scientific research and enhancement (Section 10(a)(1)(A)). In addition, the ESA allows for NMFS to enter into cooperative agreements with states, developed under Section 6 of the ESA, to assist in recovery actions of listed species. However, we believe activities under these permits are not likely to occur within the proposed small, discrete action area.

4.2.2 State or Private Actions

Recreational Fishing

Recreational fishing as regulated by the Florida can affect protected species or their habitats within the action area. Pressure from recreational fishing in and adjacent to the action area is likely to continue. Observations of state recreational fisheries have shown that loggerhead sea turtles are known to bite baited hooks and frequently ingest the hooks. Hooked sea turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial anglers fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001). Additionally, lost fishing gear such as line cut after snagging on rocks, or

discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the Turtle Expert Working Group (TEWG) reports (1998; 2000).

Sunrise Park North Main Pier was originally built in 1995. The pier sustained damages during Hurricane Matthew in 2016 and Hurricane Irma in 2017. There has never been a reported capture of a sea turtle from the Sunrise Park North Main Pier according to the Florida STSSN.

4.2.3 Marine Debris and Acoustic Impacts

A number of activities that may affect green and loggerhead sea turtles in the action area include anthropogenic marine debris and acoustic effects. The effects from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to sea turtles from these sources.

4.2.4 Marine Pollution and Environmental Contamination

Sources of pollutants along the coastal areas include atmospheric loading of PCBs, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, and groundwater and other discharges (Vargo et al. 1986). In addition, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, and boat traffic can degrade marine habitats used by sea turtles (Colburn et al. 1996). Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems (Bowen and Valiela 2001; Rabalais et al. 2002). The effects on larger embayments are unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated. The development of marinas and docks in inshore waters can negatively impact nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not likely affect the more pelagic waters, the species analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

There are studies on organic contaminants and trace metal accumulation in green sea turtles (Aguirre et al. 1994; Caurant et al. 1999; Corsolini et al. 2000). McKenzie et al. (1999) measured concentrations of PFCs and organochlorine pesticides (such as DDT) in sea turtle tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008). Dietary preferences were likely the main differentiating factor among species. Decreasing lipid contaminant burdens with turtle size were observed in green turtles, most likely attributable to a change in diet with age. Storelli et al. (1998) analyzed tissues from 12 loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals and porpoises (Law et al. 1991a).

4.2.5 Stochastic Events

Stochastic (i.e., random) events, such as hurricanes, occur in Florida and can affect the action area. These events are unpredictable and their effect on the recovery of green and loggerhead sea turtles is unknown; yet, they have the potential to directly impede recovery if animals die as a result or indirectly if important habitats are damaged. Other stochastic events, such as a cold snap, can injure or kill these species.

5. EFFECTS OF THE ACTION

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

First, we will discuss general effects of the action and types of injuries that can occur to sea turtles via recreational hook-and-line capture. Then, we will estimate the number of sea turtles anticipated to be captured at the pier based on the best available data regarding the number of sea turtles that have been reported captured via recreational hook-and-line and the estimated number of unreported recreational hook-and-line captures in the surrounding area. We will then estimate the survival rate of sea turtles post capture (i.e., post-release mortality [PRM]) based on data from the Florida STSSN and rehabilitation facilities and the severity of the injury during capture. Finally, we will use the best available data to estimate the numbers of captures at the proposed pier by species.

5.1 Effects of Hook-and-Line Captures to Sea Turtles

Hook-and-line gear commonly used by recreational anglers fishing from fishing piers can adversely affect sea turtles via entanglement, hooking, and trailing line. Sea turtles released alive may later succumb to injuries sustained at the time of capture or from exacerbated trauma from fishing hooks or lines that were ingested, entangled, or otherwise still attached when they were released. Of the sea turtles hooked or entangled that do not die from their wounds, some are likely to suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns.

The current understanding of the effects of hook-and-line gear on sea turtles relates primarily to the effects observed in association with commercial fisheries (particularly longline fisheries); few data exist on the effects of recreational fishing on sea turtles. Dead sea turtles found stranded with hooks in their digestive tract have been reported, though it is assumed that most sea turtles hooked by recreational fishers are released alive (Thompson 1991). Little information exists on the frequency of recreational fishing captures and the status of the sea turtles after they are caught. Regardless, the types of effects that sea turtles are likely to experience as a result of interactions with commercial fisheries (i.e., entanglement, hooking, and trailing line) are expected to be the same as those that might occur in recreational hook-and-line gear. The

following discussion summarizes in greater detail the available information on how individual sea turtles may be affected by interactions with hook-and-line gear.

5.1.1 Entanglement

Sea turtles are particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles reveal that hook-and-line gear can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If the sea turtle is entangled when young, the fishing line becomes tighter and more constricting as the sea turtle grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage. Sea turtles have been found entangled in many different types of hook-and-line gear. Entangling gear can interfere with a sea turtle's ability to swim or impair its feeding, breeding, or migration. Entanglement may even prevent surfacing and cause drowning.

5.1.2 Hooking

Sea turtles are also injured and killed by being hooked. Hooking can occur as a result of a variety of scenarios, some depend on the foraging strategies and diving and swimming behavior of the various species of sea turtles. Sea turtles are either hooked externally in the flippers, head, shoulders, armpits, or beak, or internally inside the mouth or when the animal has swallowed the bait (Balazs et al. 1995). Swallowed hooks are of the greatest threat. A sea turtle's esophagus (throat) is lined with strong conical papillae directed towards the stomach (White 1994). The presence of these papillae in combination with an S-shaped bend in the esophagus make it difficult to see hooks when looking through a sea turtle's mouth, especially if the hooks have been deeply ingested. Because of a sea turtle's digestive structure, deeply ingested hooks are also very difficult to remove without seriously injuring the turtle. A sea turtle's esophagus is also firmly attached to underlying tissue; thus, if a sea turtle swallows a hook and tries to free itself or is hauled on board a vessel, the hook can pierce the sea turtle's esophagus or stomach and can pull organs from its connective tissue. These injuries can cause the sea turtle to bleed internally or can result in infections, both of which can kill the sea turtle.

If a hook does not lodge into, or pierce, a sea turtle's digestive organs, it can pass through the digestive system entirely (Aguilar et al. 1995; Balazs et al. 1995) with little damage (Work 2000). For example, a study of loggerheads deeply hooked by the Spanish Mediterranean pelagic longline fleet found ingested hooks could be expelled after 53 to 285 days (average 118 days) (Aguilar et al. 1995). If a hook passes through a sea turtle's digestive tract without getting lodged, the hook probably has not harmed the turtle.

5.1.3 Trailing Line

Trailing line (i.e., line left on a sea turtle after it has been captured and released) poses a serious risk to sea turtles. Line trailing from a swallowed hook is also likely to be swallowed, which may irritate the lining of the digestive system. The line may cause the intestine to twist upon itself until it twists closed, creating a blockage ("torsion"), or may cause a part of the intestine to slide into another part of intestine like a telescopic rod ("intussusception") which also leads to blockage. In both cases, death is a likely outcome (Watson et al. 2005). The line may also

prevent or hamper foraging, eventually leading to death. Trailing line may also become snagged on a floating or fixed object, further entangling a turtle and potentially slicing its appendages and affecting its ability to swim, feed, avoid predators, or reproduce. Sea turtles have been found trailing gear that has been snagged on the sea floor, or has the potential to snag, thus anchoring them in place (Balazs 1985). Long lengths of trailing gear are more likely to entangle the sea turtle, eventually leading to impaired movement, constriction wounds, and potentially death.

5.2 Captures of Sea Turtles at the Sunrise Park North Main Pier

5.2.1 Estimating Reported Captures

The 10-year STSSN dataset (2007-2016) (Table 2) contains no reported captures of sea turtles at the Sunrise Park North Main Pier; however, we believe sea turtles have likely been captured and not reported based on historic data. There have been 2 reported captures of sea turtles at 2 inshore, fishing structures in Zone 29 (each structure accounts for 1 capture each). Because these 2 structures are in a similar habitat and location with each other (i.e., located inshore in Zone 29), we assume sea turtle behavior, density, and species composition are relatively the same for both. In addition, because these 2 structures are of a similar size to each other (i.e., smaller, public fishing structures), they likely have similar angler effort. Further, we assume anglers fishing from these 2 structures use similar baits, equipment, and fishing techniques. Therefore, the potential for interactions with sea turtles is likely the same for both of these fishing structures.

Whether sea turtle interactions are reported varies depending on a number of factors, including whether there are signs encouraging reporting and angler behavior; sometimes anglers do not report encounters with ESA-listed species due to concerns over their personal liability or public perception at the time of the capture even if there are posted signs. Given this variability, it is difficult to estimate reporting behavior; however, we assume that similar fishing structures within the same zone could have similar reporting rates. Therefore, the potential for future reported captures is relatively the same for all similar, inshore fishing structures in Zone 29.³

Thus, we believe that the best available data to estimate the number of expected reported captures from the Sunrise Park North Main Pier in the future is found by using the historic reported sea turtle captures across inshore, public fishing structure in Zone 29. Because there are only 2 similar structures with reported interaction data and each structure accounts for only 1 reported capture (i.e., average of 1 reported capture per structure over the 10-year dataset), we use the following equation to calculate the future estimated expected annual number of reported recreational hook-and-line captures of sea turtles at the Sunrise Park North Main Pier:

³ Historic reported captures of sea turtle species is the best available data to estimate the potential for future reported captures of those species in light of the 20-year trend in increased nesting. There is no in water population data that we can use to justify increased taking of those species at piers.

$$\begin{aligned}
& \text{Expected Annual Reported Captures at Sunrise Park North Main Pier} \\
& = \text{Average Reported Captures at Inshore Fishing Structures in Zone 29 (2007 – 2016)} \\
& \quad \div 10 \text{ years} \\
& = 1 \div 10 \\
& \qquad \qquad \qquad = 0.1000 \text{ per year (Table 4, Line 1)}
\end{aligned}$$

5.2.2 Estimating Unreported Captures

While we believe the best available information for estimating future captures at the Sunrise Park North Main Pier is an average of the reported captures at similar sized/used public fishing structures in the surrounding area (excluding piers that have no reported interactions), we also recognize the need to account for unreported captures. In the following section, we use the best available data to estimate the number of unreported recreational hook-and-line captures. To the best of our knowledge, only 2 fishing pier surveys aimed at collecting data regarding unreported recreational hook-and-line captures of ESA-listed species have been conducted in the Southeast. One is from Charlotte Harbor, Florida (Gulf of Mexico-side of Florida), and the other is from Mississippi.

The fishing pier survey in Charlotte Harbor, Florida, was conducted at 26 fishing piers in smalltooth sawfish critical habitat (Hill 2013). During the survey, 93 anglers were asked a series of open-ended questions regarding captures of sea turtles, smalltooth sawfish, and dolphins, including whether or not they knew these encounters were required to be reported and if they did report encounters. The interviewer also noted conditions about the pier including if educational signs regarding reporting of hook-and-line captures were present at the pier. Hill (2013) found that only 8% of anglers would have reported a sea turtle hook-and-line capture (i.e., 92% of anglers would not have reported a sea turtle capture).

NMFS conducted the fishing pier survey in Mississippi that interviewed 382 anglers (Cook et al. 2014). This survey indicated that approximately 60% of anglers who incidentally captured a sea turtle on hook-and-line reported it (i.e., 40% of anglers would not have reported a sea turtle capture) (Cook et al. 2014). It is important to note that in 2012 educational signs were installed at all fishing piers in Mississippi, alerting anglers to report accidental hook-and-line captures of sea turtles. After the signs were installed, there was a dramatic increase in the number of reported sea turtle hook-and-line captures. Though this increase in reported captures may not solely be related to outreach efforts, it does highlight the importance of educational signs on fishing piers. The STSSN in Mississippi (M. Cook, STSSN, per comm. to N. Bonine, NMFS Protected Resources Division, April 17, 2015) indicated that inconsistency in reporting of captures may also be due to anglers' concerns over their personal liability, public perception at the time of the capture, or other consequences from turtle captures. Since it is illegal to harm an endangered species, anglers are often afraid to admit the incidental capture. Similarly, a study of smalltooth sawfish noted that some anglers were apprehensive to continue to report smalltooth sawfish encounters once the species was listed on the ESA, fearing their favorite fishing hole would be closed or restricted due to the known presence of an endangered species (Wiley and Simpfendorfer 2010).

No studies have been conducted to determine the rate of underreporting along the Atlantic coast of Florida. Many fishing structures in Florida have educational signs instructing the public on how to handle encounters with sea turtles; even though the pier will have signs upon completion of the proposed action, we believe it is reasonable (and conservative to the species) to use the higher unreported rate in the (Hill 2013) fishing pier study to estimate the future unreported captures at Sunrise Park North Main Pier. We will address unreported captures by assuming that the expected annual reported captures of 0.1000 sea turtles per year at Sunrise Park North Main Pier represent only 8% of the actual captures and 92% of sea turtle captures will be unreported. To calculate the annual number of unreported recreational hook-and-line captures of sea turtles at Sunrise Park North Main Pier, we use the equation:

$$\begin{aligned}
 & \textit{Expected Annual Unreported Captures at Sunrise Park North Main Pier} \\
 & = (\textit{Expected Annual Reported Captures} \div 8\%) \times 92\% \\
 & = (0.1000 \div 0.08) \times 0.92 \\
 & = 1.1500 \textit{ per year (Table 4, Line 2)}
 \end{aligned}$$

5.2.3 Calculating Total Captures

The number of captures in any given year can be influenced by sea temperatures, species abundances, fluctuating salinity levels in estuarine habitats where piers may be located, and other factors that cannot be predicted. For these reasons, we believe basing our future capture estimate on a 1-year estimated capture is largely impractical. Using our experience monitoring other fisheries, a 3-year time period is appropriate for meaningful monitoring. The triennial takes are set as consecutive 3-year running sums (i.e., 2021-2023, 2022-2024, 2023-2025 and so on) and not for static 3-year periods (i.e., 2020-2022, 2023-2025, 2025-2027, and so on). This approach reduces the likelihood of reinitiation of ESA consultation process because of inherent variability in captures, while still allowing for an accurate assessment of how the proposed action is performing versus our expectations. Table 4 calculates the total sea turtle captures for any 3-year period based on the expected annual reported and unreported captures at the Sunrise Park North Main Pier.

Table 4. Summary of Expected Reported and Unreported Captures at the Sunrise Park North Main Pier

Captures	Total
1. Expected Annual Reported	0.1000
2. Expected Annual Unreported	1.1500
Annual Total	1.2500
Triennial (3-year) Total	3.7500

5.3 Post Release Mortality (PRM) of Sea Turtles

5.3.1 Estimating Post Release Mortality for Reported Captures

Almost all sea turtles that are captured, landed, and reported to the STSSN in Florida are evaluated by a trained veterinarian to determine if they can be immediately released alive or require a rehabilitation facility; exceptions may happen if the sea turtle breaks free before help

can arrive. Sea turtles that are captured and reported to the STSSN may die onsite, may be evaluated, released alive, and subsequently suffer PRM later, or may be evaluated and taken to a rehabilitation facility. Those taken to a rehabilitation facility may be released alive at later date or kept in rehabilitation indefinitely (either due to serious injury or by death). We consider those that are never returned to the wild population to have suffered PRM. The risk of PRM to sea turtles from reported hook-and-line captures will depend on numerous factors, including how deeply the hook is embedded, whether or not the hook was swallowed, whether the sea turtle was released with trailing line, how soon and how effectively the hooked sea turtle was de-hooked or otherwise cut loose and released, and other factors which are discussed in more detail below.

We believe the 10-year Florida STSSN inshore dataset for Zone 29 is the most accurate representation of future post-release mortality for sea turtles. As mentioned above, there are only 2 reported hook-and-line captures from fishing structures in this dataset; therefore, we also include all reported entanglements in fishing gear. Table 5 provides a breakdown of final disposition of the 33 sea turtles caught by recreational hook-and-line gear or entangled in fishing gear in the dataset.

Table 5. Final Disposition of Sea Turtles from Reported Recreational Hook-and-Line Captures and Entangled in Fishing Gear in Florida Zone 29, 2007-2016 (n=33)

	Dead on Site	Evaluated, Released Alive Immediately	Take to Rehab, Released Alive Later	Take to Rehab, Kept/Died in Rehab
Number of Records	12	1	10	10
Percentage	36.4	3.0	30.3	30.3

Of the 33 sea turtles reported captured on recreational hook-and-line or reported entangled in fishing gear in Florida Zone 29, 66.67% were removed from the wild population either through death or being unable to be released from the rehabilitation facility (i.e., lethal captures, 36.4 + 30.3) and 33.33% were released alive back into the wild population immediately (i.e., non-lethal capture; 3.0 + 30.3).

To calculate the annual estimated lethal captures of reported sea turtles at Sunrise Park North Main Pier (i.e., those that are reported and suffer PRM), we use the following equation:

$$\begin{aligned}
 & \text{Annual Reported Lethal Captures at Sunrise Park North Main Pier} = \\
 & \text{Expected Annual Reported Captures at Sunrise Park North Main Pier [Table 4, Line 1]} \\
 & \quad \times 66.67\% \text{ [calculated from Table 5]} \\
 & = 0.1000 \times 0.6667 \\
 & = 0.0667 \text{ (Table 9, Line 1A)}
 \end{aligned}$$

To calculate the estimated annual non-lethal captures of reported sea turtles at Sunrise Park North Main Pier (i.e., those that are reported and survive post-release), we use the following equation:

*Annual Reported Non – lethal Captures at Sunrise Park North Main Pier =
Expected Annual Reported Captures at Sunrise Park North Main Pier [Table 4, Line 1]
× 33.33% [calculated from Table 5]*

= 0.1000 × 0.3333

= 0.0333 (Table 9, Line 1B)

5.3.2 Estimating Post-Release Mortality for Unreported Captures

Sea turtles that are captured and not reported to the STSSN may be released alive and subsequently suffer PRM. The risk of PRM to sea turtles from unreported hook-and-line captures is the same as discussed above in Section 5.3.1 and in more detail below. While the preferred method to release a hooked sea turtle safely is to bring it ashore and de-hook/disentangle it there and release it immediately, that cannot always be accomplished. The next preferred technique is to cut the line as close as possible to the sea turtle's mouth or hooking site rather than attempt to pull the sea turtle up to the pier. Some incidentally captured sea turtles are likely to break free on their own and escape with embedded/ingested hooks and/or trailing line. Because of considerations such as the tide, weather, and the weight and size of a hooked captured sea turtle, some will not be able to be de-hooked, and will be cut free by anglers and intentionally released. These sea turtles will escape with embedded or swallowed hooks, or trailing varying amounts of fishing line, which may cause post-release injury or death.

In January 2004, NMFS convened a workshop of experts to develop criteria for estimating PRM of sea turtles caught in the pelagic longline fishery based on the severity of injury. In 2006, those criteria were revised and finalized (Ryder et al. 2006). In February 2012, the SEFSC updated the criteria again by adding 3 additional hooking scenarios, bringing the total to 6 categories of injury (NMFS 2012a). Table 6 describes injury categories for hardshell sea turtles captured on commercial hook-and-line and the associated PRM estimates for sea turtles released with hook and trailing line greater than or equal to half the length of the carapace (i.e., Release Condition B as defined in (NMFS 2012)).

Table 6. Estimated Post Release Mortality Based on Injury Category for Hardshell Sea Turtles Captured via Recreational Hook-and-Line and Released in Release Condition B (NMFS 2012).

Injury Category	Description	Post-release Mortality
I	Hooked externally with or without entanglement	20%
II	Hooked in upper or lower jaw with or without entanglement—includes ramphotheca (i.e., beak), but not any other jaw/mouth tissue parts	30%
III	Hooked in cervical esophagus, glottis, jaw joint, soft palate, tongue, and/or other jaw/mouth tissue parts not categorized elsewhere, with or without entanglement—includes all events where the insertion point of the hook is visible when viewed through the mouth.	45%
IV	Hooked in esophagus at or below level of the heart with or without entanglement—includes all events where the insertion point of the hook is not visible when viewed through the mouth	60%
V	Entangled only, no hook involved	50%*
VI	Comatose/Resuscitated	60%**

*There is no PRM estimate of Release Condition B for Injury Category V. For Injury Category V we believe it is prudent to use the PRM for Release Condition A (Released Entangled) because we know the sea turtle was released entangled without a hook, but we do not know how much line was remaining.

**For Injury Category 6, we believe it is prudent to use the PRM Release Condition D (Released with All Gear Removed) because we believe that if a fisher took the time to resuscitate the sea turtle, then it is likely the fisher also took the time to disentangle the animal completely before releasing it back into the wild

PRM varies based on the initial injury the animal sustained and the amount of gear left on the animal at the time of release. Again, we will rely on the Florida STSSN inshore dataset for Zone 29 because this data includes the location of where on the animal the sea turtle was hooked or entangled (Table 7).

Table 7. Category of Injury of Sea Turtles from Reported Recreational Hook-and-Line Captures and Entangled in Fishing Gear in Florida Zone 29, 2007-2016 (n=33)

Injury Category	I	II	III	IV	V	VI
Number	6	1	4	1	21	0
Percentage	18.18%	3.03%	12.12%	3.03%	63.61%	0.0%

Like above, we assume that 8% of the sea turtles captured at the pier will be reported, and that reported turtles will be sent to rehabilitation if needed. To estimate the fate of the 92% of sea turtles expected to go unreported, and therefore un-evaluated or rehabilitated, we use the injury category percentages in Table 6 along with the PRM estimates in Table 7 to calculate the weighted PRM rate expected for each injury category. We then sum the weighted PRMs across all injury categories to determine the overall PRM for the sea turtles at the City of Holly Hill Sunrise Park North Main Pier. This overall rate helps us account for the varying severity of future injuries and varying PRM associated with these injuries. Based on the assumptions we have made about the percentage of sea turtles that will be released alive without rehabilitation, the hooking location, and the amount of fishing gear likely to remain on an animal released

immediately at the pier, we estimate a total weighted PRM of 43.64% for 92% of the sea turtles captured, unreported, and released immediately at the Sunrise Park North Main Pier (Table 8).

Table 8. Estimated Weighted and Overall Post Release Mortality for Sea Turtles Released Immediately from Sunrise Park North Main Pier

Injury Category	% Captures [from Table 7]	% Post-release Mortality [from Table 6]	% Weighted Post-release Mortality*
I	18.18	20	3.64
II	3.03	30	0.91
III	12.12	45	5.45
IV	3.03	60	1.82
V	63.64	50	31.82
Total Weighted PRM**			43.64

*Weighted PRM = Percent of Total Captures in Each Injury Category x PRM Rate per Category

**Total Weighted PRM = Sum of Weighted Mortality Rates

To calculate the estimated annual lethal captures of unreported sea turtles, we use the following equation:

$$\begin{aligned}
 & \text{Annual Unreported Lethal Captures at Sunrise Park North Main Pier} \\
 &= \text{Annual Unreported Captures at Sunrise Park North Main Pier [Table 4, Line 2]} \\
 & \quad \times \text{Total Weighted Post – release Mortality [Table 8]} \\
 &= 1.1500 \times 0.4364 \\
 &= 0.5018 \text{ (Table 9, Line 2A)}
 \end{aligned}$$

If the equation for calculating annual lethal captures of unreported sea turtles multiplies the annual unreported captures at Sunrise Park North Main Pier by the total weighted PRM of 43.64%, then the equation for calculating annual non-lethal captures of unreported sea turtles would multiply the annual unreported captures by 56.36% (100% – 43.64%). Therefore, to calculate the estimated annual non-lethal captures of unreported sea turtles, we use the following equation:

$$\begin{aligned}
 & \text{Annual Unreported Non – lethal Captures at Sunrise Park North Main Pier} \\
 &= \text{Annual Unreported Captures at Sunrise Park North Main Pier [Table 4, Line 2]} \\
 & \quad \times 56.36\% \\
 &= 1.1500 \times 0.5636 \\
 &= 0.6481 \text{ (Table 9, Line 2B)}
 \end{aligned}$$

Table 9. Summary of Post Release Mortality at the Sunrise Park North Main Pier

Captures	A. Lethal	B. Non-lethal
1. Annual Reported Captures	0.0667	0.0333
2. Annual Unreported Captures	0.5018	0.6481
Annual Total	0.5685	0.6815
Triennial (3-year) Total	1.7055	2.0444

5.4 Estimating Hook-and-Line Captures at Sunrise Park North Main Pier by Species of Sea Turtle

Of the 33 sea turtles in the Florida STSSN inshore dataset for Zone 29 identifiable to species, 91% were green (n=30) and 9% were loggerhead sea turtles (n=3) (Table 2). We will assume the same species composition for future captures at Sunrise Park North Main Pier for any consecutive 3-year period (Table 10). To be conservative to the species, numbers of captures are rounded up to the nearest whole number. While this results in an increase in the total number of sea turtles, compared to what is presented in the non-species-specific total estimates in Tables 4 and 10, this approach is most conservative to the species, ensures that we are adequately analyzing the effects of the proposed action on whole animals, and allows adverse effects from the proposed action to be more easily tracked. The impacts of future captures to each of the green sea turtle DPSs are discussed in the Jeopardy Analysis and presented in the Incidental Take Statement (Table 11).

Table 10. Estimated Captures of Sea Turtle Species at Sunrise Park North Main Pier for Any Consecutive 3-Year Period

Species	Lethal Captures	Non-lethal Captures	Total Captures for Any 3-Year Period
Green sea turtle (NA or SA DPS)	2 ($1.7055 \times 0.91 = 1.5504$)	2 ($2.0444 \times 0.91 = 1.8586$)	4
Loggerhead sea turtle (NWA DPS)	1 ($1.7055 \times 0.09 = 0.1550$)	1 ($2.0444 \times 0.09 = 0.1859$)	2

6. CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating its Opinions (50 CFR 402.14). Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. At this time, we are not aware of any other non-federal actions being planned or under development in the action area. Within the action area, major future changes are not anticipated in the ongoing human activities described in the environmental baseline. The present, major human uses of the action area are expected to continue at the present levels of intensity in the near future.

7. JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion serve to provide a basis to determine whether the proposed action is likely to jeopardize the continued existence of green and loggerhead sea turtles. In the Effects of the Action, we outlined how the proposed action would affect these species at the individual level and the extent of those effects in terms of the number of associated interactions, captures, and mortalities of each species to the extent possible based on the best available data. Now we assess each of these species' responses to this impact, in terms of overall population effects, and whether the effects of the proposed action, when considered in the context of the status of the species, the environmental baseline, and the

cumulative effects, are likely to jeopardize the continued existence of ESA-listed species in the wild.

To “jeopardize the continued existence of” means to “engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 CFR 402.02). Thus, in making this determination for each species, we must look at whether the proposed action directly or indirectly reduces the reproduction, numbers, or distribution of a listed species. Then, if there is a reduction in 1 or more of these elements, we evaluate whether it would be expected to cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

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

The status of each listed species likely to be adversely affected by the proposed action is reviewed in the Status of the Species. For any species listed globally, our jeopardy determination must find the proposed action will appreciably reduce the likelihood of survival and recovery at the global species range. For any species listed as DPSs, a jeopardy determination must find the proposed action will appreciably reduce the likelihood of survival and recovery of that DPS.

7.1 Green Sea Turtles (NA and SA DPSs)

Within U.S. waters, individuals from both the NA and SA DPS of green sea turtle can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, on the Atlantic coast of Florida, a study on the foraging grounds off Hutchinson Island found that approximately 5% of the turtles sampled came from the Aves Island/Suriname nesting assemblage, which is part of the SA DPS (Bass and Witzell 2000). This information suggests that the vast majority of the anticipated captures in the Atlantic Ocean are likely to come from the NA DPS. However, it is possible that animals from the SA DPS could be captured during the proposed action. For these reasons, we will act conservatively and conduct 2 jeopardy analyses, 1 for each DPS. The NA DPS analysis will assume, based on Bass and Witzell (2000), 95% of animals captured during the proposed

action are from that DPS. Our analysis of the SA DPS will consider that 5% of the green sea turtles affected by the proposed action are from that DPS.

Applying the above percentages to our estimated take of 4 green sea turtles during any consecutive 3-year period, we estimate the following:

- Up to 4 green sea turtles will come from the NA DPS ($4 \times 0.95 = 3.80$, rounded up to 4), of which 2 will be lethal and 2 will be non-lethal.
- Up to 1 green sea turtle will come from the SA DPS ($4 \times 0.05 = 0.20$, rounded up to 1), which could be lethal or non-lethal.

We note that rounding when splitting the take into the 2 DPSs results in a slightly higher combined total (i.e., 5 instead of 4) than the consecutive 3-year estimate presented in Table 10. While we use the higher numbers for purposes of analyzing the likelihood of jeopardy to the DPSs (Sections 7.1.1 and 7.1.2), we do not expect more than 4 green sea turtle takes during any consecutive 3-year period.

7.1.1 NA DPS of Green Sea Turtle

Survival

The proposed action may result in the take of up to 4 green sea turtles (2 lethal, 2 non-lethal) from the NA DPS over any consecutive 3-year period. The potential non-lethal capture of 2 green sea turtles from the NA DPS is not expected to have any measurable impact on the reproduction, numbers, or distribution of the species. The individuals suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. The captures may occur anywhere in the action area, which encompasses a small portion of green sea turtles' overall range/distribution within the NA DPS. Any incidentally caught animal would be released within the general area where caught and no change in the distribution of NA DPS green sea turtles would be anticipated.

The potential lethal take of 2 green sea turtles from the NA DPS during any consecutive 3-year period would reduce the number of NA DPS green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. A lethal interaction would also result in a potential reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, as discussed in this Opinion, an adult green sea turtle can lay up to 7 clutches (usually 3-4) of eggs every 2-4 years, with up to an average of 110-115 eggs/nest, of which a small percentage is expected to survive to sexual maturity. The anticipated lethal take is expected to occur in a small, discrete action area and green sea turtles in the NA DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals. Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the NA DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline,

we outlined the past and present impacts of all state, federal, or private actions and other human activities in or having effects in the action area that have affected and continue to affect the NA DPS. In the Cumulative Effects, we discussed the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 3.2.2 we summarized the available information on number of green sea turtle nesters and nesting trends at NA DPS beaches; all major nesting populations demonstrate long-term increases in abundance (Seminoff et al. 2015). Therefore, nesting at the primary nesting beaches has been increasing over the course of the decades, against the background of the past and ongoing human and natural factors that have contributed to the Status of the Species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Since the nesting trend information for the NA DPS of green sea turtle is clearly increasing, we believe the combined potential lethal take of up to 2 green sea turtles from the NA DPS during any consecutive 3-year period attributed to the piers will not have any measurable effect on that trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the piers is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the green sea turtle NA DPS in the wild.

Recovery

The NA DPS of green sea turtles does not have a separate recovery plan at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) does exist. Since the animals within the NA DPS all occur in the Atlantic Ocean and would have been subject to the recovery actions described in that plan, we believe it is appropriate to continue using that Recovery Plan as a guide until a new plan, specific to the NA DPS, is developed. The Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

- *The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.*
- *A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.*

According to data collected from Florida's index nesting beach survey from 1989-2018, green sea turtle nest counts across Florida index beaches have increased substantially from a low of approximately 267 in the early 1990s to a high of approximately 38,954 in 2017 (See Figure 3), and indicate that the first listed recovery objective is being met. The average number of nests at Florida index beaches for the six years prior to and including 2018 has been well above 5,000 (average of approximately 17,000 nests from 2013-2018; see Figure 3). At all Florida beaches, not just index beaches, the high was 53,103 in 2017 (<https://myfwc.com/research/wildlife/sea-turtles/nesting/green-turtle/> accessed by the consulting biologist on March 10, 2020). There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on

foraging grounds have increased, which is consistent with the criteria of the second listed recovery objective.

The potential lethal take of up to 2 green sea turtle from the NA DPS over any consecutive 3-year period will result in a reduction in numbers when a capture occurs, but it is unlikely to have any detectable influence on the recovery objectives and trends noted above, even when considered in the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects sections discussed in this Opinion. The non-lethal take of 2 green sea turtle from the NA DPS over any three-year consecutive period would not affect the adult female nesting population or number of nests per nesting season. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of NA DPS green sea turtles' recovery in the wild.

Conclusion

The lethal and non-lethal take of green sea turtles from the NA DPS associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the NA DPS of green sea turtle in the wild.

7.1.2 SA DPS of Green Sea Turtle

Survival

The proposed action may result in the take of 1 green sea turtle, which could be lethal or non-lethal, from the SA DPS over any consecutive 3-year period. The potential non-lethal capture of a green sea turtle from the SA DPS is not expected to have any measurable impact on the reproduction, numbers, or distribution of the species. The individuals suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. The captures may occur anywhere in the action area, which encompasses a small portion of green sea turtles' overall range/distribution within the SA DPS. Any incidentally caught animal would be released within the general area where caught and no change in the distribution of SA DPS green sea turtles would be anticipated.

The potential lethal take of 1 SA DPS green sea turtle during any consecutive 3-year period would reduce the number of green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. The lethal interaction would also result in a potential reduction in future reproduction, assuming the individual would be female and would have survived otherwise to reproduce. For example, as discussed above, an adult green sea turtle can lay up to 7 clutches (usually 3-4) of eggs every 2-4 years, with up to an average of 110-115 eggs/nest, of which a small percentage is expected to survive to sexual maturity. The anticipated lethal take is expected to occur in a small, discrete action area and green sea turtles in the SA DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals. Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the DPS,

outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in or having effects in, the action area that have affected and continue to affect this DPS. In the Cumulative Effects, we discussed the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 3.3.2, we summarized available information on number of nesters and nesting trends at SA DPS beaches. Seminoff et al. (2015) estimated that there are greater than 63,000 nesting females in the SA DPS, though they noted the adult female nesting abundance from 37 beaches could not be quantified. The nesting at Poilão, Guinea-Bissau, accounted for approximately 46% of that estimate (approximately 30,000 nesters), with Ascension Island, United Kingdom, (approximately 13,400 nesters; 21%), and the Galibi Reserve, Suriname (approximately 9,400 nesters; 15%) also accounting for a large portion of the overall nesting (Seminoff et al. 2015).

In Section 3.3.2, we summarized available information on number of green sea turtle nesters and nesting trends at SA DPS beaches; some of the largest nesting beaches such as Ascension Island, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Therefore, it is likely that nesting at the primary nesting beaches has been increasing over the course of the decades, against the background of the past and ongoing human and natural factors that have contributed to the status of the species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Since the nesting trend information for SA DPS green sea turtles is likely increasing, we believe the potential lethal take of up to 1 green sea turtle from the SA DPS during any consecutive 3-year period attributed to recreational fishing at the piers will not have any measurable effect on that trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the piers is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the SA DPS of green sea turtle in the wild.

Recovery

Like the NA DPS, the SA DPS of green sea turtles does not have a separate recovery plan in place at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) does exist. Since the animals within the SA DPS all occur in the Atlantic Ocean and would have been subject to the recovery actions described in that plan, we believe it is appropriate to continue using that Recovery Plan as a guide until a new plan, specific to the SA DPS, is developed. In our analysis for the NA DPS, we stated that the Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

- *The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.*
- *A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.*

The nesting recovery objective is specific to the NA DPS, but demonstrates the importance of increases in nesting to recovery. As previously stated, nesting at the primary SA DPS nesting beaches has been increasing over the course of the decades. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting and in-water abundance, however, it is likely that numbers on foraging grounds have increased.

The potential lethal take of up to 1 green sea turtle from the SA DPS during any consecutive 3-year period will result in a reduction in numbers when capture occurs, but it is unlikely to have any detectable influence on the trends noted above, even when considered in context with the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. The non-lethal take of 1 green sea turtle from the SA DPS over any three-year consecutive period would not affect the adult female nesting population or number of nests per nesting season. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the SA DPS of green sea turtles' recovery in the wild.

Conclusion

The lethal or non-lethal captures of green sea turtles associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the SA DPS of green sea turtle in the wild.

7.2 NWA DPS of Loggerhead Sea Turtle

Survival

The proposed action may result in the take of 2 loggerhead sea turtles (1 lethal, 1 non-lethal) from the NWA DPS during any consecutive 3-year period. The potential non-lethal capture of a loggerhead sea turtle from the NWA DPS is not expected to have any measurable impact on the reproduction, numbers, or distribution of the species. The individuals suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of loggerhead sea turtles are anticipated. The captures may occur anywhere in the action area, which encompasses a small portion of loggerhead sea turtles' overall range/distribution within the NWA DPS. Any incidentally caught animal would be released within the general area where caught and no change in the distribution of NWA DPS of loggerhead sea turtle would be anticipated.

The lethal take of 1 loggerhead sea turtle during any consecutive 3-year period associated with the proposed action represents a reduction in numbers. A lethal take could also result in a potential reduction in future reproduction, assuming the individual would be female and would have survived to reproduce in the future. For example, an adult female loggerhead sea turtle can lay approximately 4 clutches of eggs every 3 years, with 100-126 eggs per clutch. Thus, the loss of 2 adult females could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. However, a reduction in the distribution of loggerhead sea turtles is not expected from lethal take attributed to the proposed action. The anticipated lethal take is expected to occur in a small, discrete action area and

loggerhead sea turtles in the NWA DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals. Whether or not the reductions in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival for loggerheads depends on what effect these reductions in numbers and reproduction would have on overall population sizes and trends, i.e., whether the estimated reductions, when viewed within the context of the environmental baseline, status of the species, and cumulative effects are of such an extent that adverse effects on population dynamics are appreciable. In the Status of Species, we considered the status of the DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in or having effects in, the action area that have affected and continue to affect this DPS. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Abundance estimates accounting for only a subset of the entire loggerhead sea turtle population in the western North Atlantic indicate the population is large (i.e., several hundred thousand individuals). In Section 3.3.4, we summarized available information on number of loggerhead sea turtle nesters and nesting trends. Nesting trends across all the recovery units have been steady or increasing over several years against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. Additionally, in-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing.

The proposed action could lethally take 1 loggerhead sea turtle during any consecutive 3-year period. While the loss of 1 loggerhead sea turtle during any consecutive 3-year period is an impact to the population, in the context of the overall population's size and current trend, we do not expect this loss to result in a detectable change to the population numbers or increasing trend. After analyzing the magnitude of the effects of the proposed action, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the loggerhead sea turtle DPS in the wild.

Recovery

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2009) was written prior to the loggerhead sea turtle DPS listings. However, this plan deals with the populations that comprise the current NWA DPS and is therefore, the best information on recovery criteria and goals for the DPS. It lists the following recovery objectives that are relevant to the effects of the proposed actions:

- *Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females.*
- *Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes.*

Recovery is the process of removing threats so self-sustaining populations persist in the wild. The proposed action would not impede progress on carrying out any aspect of the recovery program or achieving the overall recovery strategy. The recovery plan estimates that the population will reach recovery in 50-150 years following implementation of recovery actions. The minimum end of the range assumes a rapid reversal of the current declining trends; the higher end assumes that additional time will be needed for recovery actions to bring about population growth.

Nesting trends have been significantly increasing over several years. We indicated that the lethal take of up to 1 loggerhead sea turtle every 3-years is so small in relation to the overall population, that it would be hardly detectable, even when considered in the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. We believe this is true for both nesting and juvenile in-water populations. Thus, recreational fishing at the pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the loggerhead sea turtles' recovery in the wild.

Conclusion

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

8. CONCLUSION

After reviewing the Status of the Species, Environmental Baseline, Effects of the Action, and Cumulative Effects using the best available data, it is NMFS's Opinion that the proposed action is not likely to jeopardize the continued existence of the NA or SA DPS of green sea turtle or the NWA DPS of loggerhead sea turtle.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption.

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. *Incidental take* is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that would otherwise be considered prohibited under Section 9 or Section 4(d), but which is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the reasonable and prudent measures and the terms and conditions of the Incidental Take Statement (ITS) of the Opinion.

9.1 Anticipated Amount or Extent of Incidental Take

Based on the above information and analyses, NMFS believes that the proposed action is likely to adversely affect green sea turtles (NA or SA DPS) and loggerhead sea turtles (NWA DPS). These effects will result from capture on hook-and-line and entanglement in fishing line or debris upon completion of the pier. NMFS anticipates the following incidental take may occur as a result of the proposed action over any consecutive 3-year period (i.e., 2021-2023, 2022-2024, 2023-2025 etc.).

The take estimates (lethal and non-lethal captures) shown in Table 10 are our best estimates of the total amount of take expected over any consecutive 3-year period. However, as described in Section 5 above, some captures are expected to go unreported. The take limits prescribed in this Opinion that will trigger the requirement to reinitiate consultation must be based on the amount of take that we expect to be *reported* as it will be impossible to count the incidents that go unreported. We believe the best available information for estimating the future level of reporting of captured sea turtles at each of the proposed piers is again the data collected from the Hill (2013) fishing pier study.

In Section 5.2.1, we developed an estimate of the total number of sea turtle captures expected to be reported annually at the Sunrise Park North Main Pier (0.1000; Table 4, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported sea turtle captures at the pier ($0.1000 \times 3 = 0.3000$). We then apply the species breakdown reported in the Florida STSSN dataset (i.e., 91% green sea turtle and 9% loggerhead sea turtle) to the 3-year reported total to estimate the number of each species of sea turtle we expect to be reported captured at each of the proposed piers over any 3-year period (Table 11). As stated above, the 3-year rolling sum approach reduces the likelihood of reinitiation of the ESA consultation process because of inherent variability in captures, while still allowing for an accurate assessment of how the proposed action is performing versus our expectations. For those estimates that come out to be less than 1, we round up to reach a whole number that can be used as a take limit. Rounding like this is most conservative to the species.

It is important to note that the mortality rates estimated above for captured turtles are not likely to be detected in the initial reporting of captures, as most turtles are expected to live for some period following capture. Some of these individuals may be sent to rehab facilities and later die in those facilities, or may be released and die in the wild from undetected injuries, as discussed in our PRM analysis above. While it is also possible that some turtles may die immediately from severe injuries related to angling or entanglement (which will be included in the annual reports discussed below [Terms & Conditions, Section 9.4]), we do not expect that result (see Section 5.1). At the time of the interaction, we expect the take in the ITS below to be non-lethal. As discussed in Section 5.3.1, up to 66.67% of this take could be lethal as a result of post-release mortality, and reports of such post-release mortality are consistent with the analysis in this Opinion and this ITS.

Table 11. Incidental Take Limits at the Sunrise Park North Main Pier by Species for Any 3-Year Period Based on Reported Captures in Section 5.1

Species	Total Estimated Reported Captures	Incidental Take Limit
Green sea turtle (NA or SA DPS)	$0.3000 \times 0.91 = 0.2727$	No more than 1 reported capture over any 3-year consecutive period.*
Loggerhead sea turtle (NWA DPS)	$0.3000 \times 0.09 = 0.0273$	No more than 1 reported capture over any 3-year consecutive period.

*We do not authorize more than 1 green sea turtle take during any consecutive 3-year period, which may come from either the NA or the SA DPS.

9.2 Effect of Take

NMFS has determined the anticipated incidental take is not likely to jeopardize the continued existence of the green sea turtle (NA or SA DPS) or loggerhead sea turtle (NWA DPS).

9.3 Reasonable and Prudent Measures

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

The RPMs and T&Cs are specified as required by 50 CFR 402.14(i)(1)(ii) and (iv) to document the incidental take by the proposed action and to minimize the impact of that take on sea turtles. These measures and conditions are nondiscretionary, and must be implemented by the federal action agency in order for the protection of Section 7(o)(2) to apply. If the applicant fails to adhere to the terms and conditions of this ITS through enforceable terms, and/or fails to retain oversight to ensure compliance with these T&Cs, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of the incidental take, the applicant must report the progress of the action and its impact on the species to NMFS as specified in this ITS [50 CFR 402.14(i)(3)].

NMFS has determined that the following RPMs are necessary and appropriate to minimize impacts of the incidental take of sea turtles related to the proposed action:

1. The federal action agency must ensure that the applicant provides take reports regarding all interactions with ESA-listed species at this fishing pier.
2. The federal action agency must ensure that the applicant minimizes the likelihood of injury or mortality to ESA-listed species resulting from hook-and-line capture or entanglement by activities at this fishing pier.
3. The federal action agency must ensure that the applicant reduces the impacts to incidentally captured ESA-listed species.
4. The federal action agency must ensure that the applicant coordinates periodic fishing line removal (i.e., cleanup) events with non-governmental or other local organizations.

9.4 Terms and Conditions (T&Cs)

The following T&Cs implement the above RPMs:

1. To implement RPM 1, federal action agency must make it a condition of funding that the applicant reports all known angler-reported hook-and-line captures of sea turtles and any other takes of ESA-listed species at Sunrise Park North Main Pier to the NMFS SERO.
 - a. Within 24 hours of any capture, entanglement, stranding, or other take, the applicant must notify NMFS's SERO by email at takereport.nmfsser@noaa.gov.
 - i. Emails must reference this Opinion by the NMFS ECO tracking number for this Opinion (SERO-2019-00635 Sunrise Park North Main Pier) and date of issuance.
 - ii. The email must state the species, date and time of the incident, general location and activity resulting in capture (i.e., fishing from the pier by hook-and-line), condition of the species (i.e., alive, dead, sent to rehabilitation), size of the individual, behavior, identifying features (i.e., presence of tags, scars, or distinguishing marks), and any photos that may have been taken.
 - b. Every year, the applicant must submit a summary report of capture, entanglement, stranding, or other take of ESA-listed species to NMFS's Southeast Regional Office by email: takereport.nmfsser@noaa.gov.
 - i. Emails and reports must reference this Opinion by the NMFS tracking number (SERO-2019-00635 Sunrise Park North Main Pier) and date of issuance.
 - ii. The report will contain the following information: the total number of ESA-listed species captures, entanglements, strandings, or other take that occurred at or adjacent to the pier included in this Opinion.
 - iii. The report will contain all information for any sea turtles taken to a rehabilitation facility holding an appropriate USFWS Native Endangered and Threatened Species Recovery permit.
 - iv. The first report will be submitted by January 31, 2021, and cover the period of time from pier opening to December 31, 2020. The second report will be submitted by January 31, 2022, and cover the prior calendar year 2021 and the partial year covered by the first report. The next report will be submitted by January 31, 2023 covering the prior 3 years, then every year after, covering the rolling 3 year time period.
 - v. Reports will include current photographs of signs and bins required in T&C 2 below, and records of the clean-ups required in T&C 3 below.
2. To implement RPMs 2 and 3, the federal action agency must ensure that the applicant must: :
 - a. Install and maintain the following NMFS Protected Species Educational Sign: "Save the Sea Turtle, Sawfish, and Dolphins."
 - i. Signs will be posted at least at the entrance to and terminal end of the pier.
 - ii. Signs will be installed prior to opening the pier for public use.
 - iii. Photographs of the installed signs will be emailed to NMFS's Southeast Regional Office (takereport.nmfsser@noaa.gov) with the NMFS tracking

- number (SERO-2019-00635 Sunrise Park North Main Pier) and date of issuance.
- iv. Sign designs and installation methods are provided at the following website: <https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs>
 - v. Current photographs of the signs will be included in each annual report required by T&C 1, above.
- b. Install and maintain fishing line recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water.
 - i. Fishing line recycling bins and trash receptacles will be installed prior to opening the pier for public use.
 - ii. Photographs of the installed bins will be emailed to NMFS SERO by email at the address: takereport.nmfs@noaa.gov with the NMFS tracking number for this Opinion (SERO-2019-00635 Sunrise Park North Main Pier) and date of issuance.
 - iii. The applicant must regularly empty the bins and trash receptacles and make sure they are functional and upright.
 - iv. Additionally, current photographs of the bins will be included in each annual report required by T&C 1, above.
3. To implement RPMs 2, 3, and 4, the federal action agency will make it a condition of funding that the applicant must:
 - a. Perform an annual underwater cleanup to remove derelict fishing line and associated gear from around the pier structure.
 - b. Submit a record of each cleaning event in the annual report required by T&C 1 above.

10. 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 endangered and threatened species. Conservation Recommendations (CRs) are designed to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

NMFS believes the following CRs further the conservation of the listed species that will be affected by the proposed action. NMFS strongly recommends that these measures be considered and implemented by the federal action agency:

1. Encourage the Florida sea turtle rehabilitation centers to work with other Southeast U.S. sea turtle rehabilitation facilities on the best handling techniques, data collection and reporting, and public outreach.
2. Encourage research to develop deterrents to discourage turtles from using fishing piers as a habitualized food source.
3. Conduct or fund outreach designed to increase the public's knowledge and awareness of ESA-listed sea turtle species.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, NMFS requests notification of the implementation of any of these or additional CRs.

11. REINITIATION OF CONSULTATION

As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required where the discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of taking specified in the ITS is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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