Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina, South Carolina, and Georgia

Biological Assessment

(April 2014)

U.S. Department of the Interior
Bureau of Ocean Energy Management (BOEM)
Office of Renewable Energy Programs

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List of Acronyms and Abbreviations

ALWTRP	Atlantic Large Whale Take Reduction Plan
ASMFC	Atlantic States Marine Fisheries Commission
BA	Biological Assessment
BO	Biological Opinion
BOEM	Bureau of Ocean Energy Management
dB	decibels
DMA	Dynamic Management Area
DOD	United States Department of Defense
DoN	U.S. Department of the Navy
DPS	Distinct Population Segment
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act
FAA	Federal Aviation Administration
ft	foot/feet
Hz	hertz
IP	Interim Policy
IPF	Impact-Producing Factors
ITS	Incidental Take Statement
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
kg	kilogram
kJ	kilojoule
km	kilometer
lb	pound(s)
mi	mile(s)
met	meteorological
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MW	megawatts
NASA	National Aeronautics and Space Administration
NCSLME	Northeast Continental Shelf Large Marine Ecosystem
NMFS	National Marine Fisheries Service
nmi	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
ODMDS	ocean dredged material disposal site
OPAREAS	operating areas
ORED	offshore renewable energy developments
PCE	Primary Constituent Element
PEIS	Programmatic Environmental Impact Statement
PBR	Potential Biological Removal
PTS	permanent threshold shift
RMS	root-mean-squared
RPMs	Reasonable and Prudent Measures
SAP	site assessment plan

SCDNR	South Carolina Department of Natural Resources
SMA	Seasonal Management Area
SPL	sound pressure level
SPUE	Sightings per Unit Effort
TED	Turtle Excluder Device
TTS	temporary threshold shift
USCG	United States Coast Guard
USACE	United States Army Corps of Engineers
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VACAPES	Atlantic Fleet Training Virginia Capes

1. INTRODUCTION

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, the Bureau of Ocean Energy Management (BOEM) requests consultation with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) on the effects on ESA-listed species from proposed activities in areas on the Southeast Atlantic Outer Continental Shelf (OCS) offshore North Carolina, South Carolina, and Georgia (see Table 1 and Figure 1). The activities being considered include

1. issuing leases;

2. associated site characterization activities that lessees may undertake on those leases (e.g., geophysical, geotechnical, archaeological, and biological surveys); and

3. the subsequent approval of site assessment activities on the leaseholds (e.g., installation and operation of meteorological [met] towers and buoys).

Some of the proposed activities listed above were addressed by a previous consultation with the USFWS and NMFS. Informal consultations with the USFWS determined that geological and geophysical activities and meteorological (met) buoys would have no effect on, or would not likely adversely affect, federally-listed species or designated critical habitats under USFWS jurisdiction, while formal consultations with the NMFS concluded that the same activities may adversely affect ESA-listed species under NMFS jurisdiction (for more detail, see Section 1.2). The surveys considered during these previous consultations with the USFWS and NMFS are necessary to characterize the physical condition of the seafloor and identify archaeological, physical, and biological resources in the area where the met tower or met buoy is to be installed. The met towers and met buoys are necessary to assess the offshore wind resource and also collect additional oceanographic and meteorological data necessary to plan for any future commercial development of the lease area. No later than two years after the cancellation, expiration, relinquishment, or other termination of the lease, the lessee would be required to remove all devices, works, and structures from the site and restore the leased area to its original condition before issuance of the lease.

1.1 Southeast Action Area

This BA addresses activities within the North Carolina, South Carolina, and Georgia Action Areas, which together comprise a total of 352 whole and 156 partial OCS lease blocks (Table 1; Figure 1).

1.1.1 North Carolina Action Area

The North Carolina Action Area comprises three call areas and two planning areas on the Outer Continental Shelf (OCS) off the coast of North Carolina: the Wilmington West, Wilmington East, and Kitty Hawk Call Areas; Planning Area 3; and Planning Area 4 (see Figure 1). These areas comprise a total area of approximately 815,136 hectares and contain 289 whole OCS lease blocks and 156 partial OCS lease blocks. The potential leases for these areas would authorize site characterization activities to be conducted in support of a SAP, COP, or GAP submittal and the construction and/or installation of up to 10 met towers and up to 20 met buoys. The site characterization and met buoy installation was covered in previous consultations and biological opinion with the NMFS (see Section 1.2 below). However, the assessment and letter of concurrence from the USFWS covered only up to six met buoys offshore North Carolina (see Section 1.2 below). This consultation assesses the construction and operation of up to 10 met towers offshore North Carolina and up to 14 additional met buoys for consideration by the USFWS.

All survey work within the three call areas and two planning areas is expected to occur within both federal and state waters less than 100 m (328 ft) deep (USDOI, MMS 2007). The Kitty Hawk Call Area and Planning Area 4 are located in the southern Mid-Atlantic Bight planning region of the Northeast Continental Shelf Large Marine Ecosystem (NCSLME) (Cook and Auster 2007). The coastal waters and OCS in this region will be described in detail in the Environmental Assessment (EA).

For the purposes of the ESA, the proposed North Carolina Action Area is defined 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). For this activity, the proposed North Carolina Action Area includes the project area (the three call areas and two planning areas).

Table 1. Project Area Covered Under This Consultation.

State	Met. Buoys (min-max)	Met. towers (max)	Offshore Area	OCS Blocks	Partial OCS Blocks	Hectares
North Carolina	1-20	10	Wilmington West Call Area	6	9	26,784
			Wilmington East Call Area	51	15	111,984
			Planning Area 3	1	45	45,360
			Planning Area 4	93	51	275,760
			Kitty Hawk Call Area	138	36	355,248
South Carolina	1-6	3	Not yet delineated	30	0	69,120
Georgia	1-6	3	Data Collection Configuration	3	0	6,912
			Not yet delineated	30	0	69,120
TOTAL	3-32	16		352	156	960,288

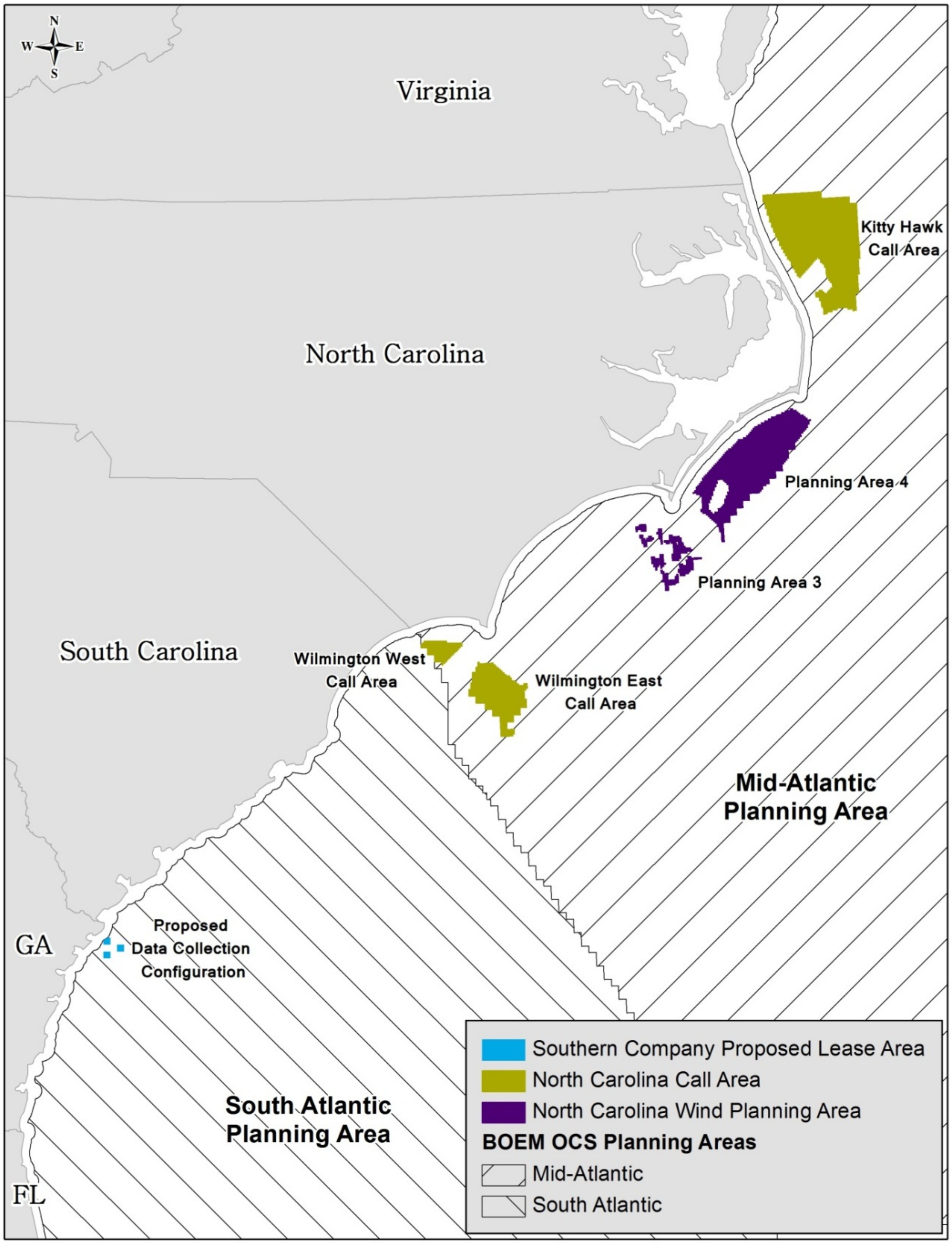

Figure 1-1. Project area map covered under this consultation.

1.1.2 South Carolina Action Area

The proposed action area offshore South Carolina has not yet been spatially delineated. However, BOEM makes the assumption that up to 30 OCS blocks could be leased over the time period from 2013-2020 (Table 1). These potential leases would authorize site characterization activities to be conducted in support of a SAP, COP, or GAP submittal and the construction and/or installation of up to three met towers and up to six met buoys. The site characterization and met buoy installation was covered in previous consultations with the NMFS and USFWS (see Section 1.2 below). This BA assesses only the construction and operation of up to three met towers offshore South Carolina.

1.1.3 Georgia Action Area

The proposed action is to issue a lease for three OCS Blocks (Brunswick NH 17-02 6074, 6174, and 6126) located approximately 3.0 to 11.6 nmi offshore of Tybee Island, Georgia. The lease would authorize the installation, operation, and decommissioning of one met tower within one of the three blocks and/or the deployment, operation, and removal of up to three buoys and associated appurtenances (e.g., Acoustic Doppler Current Profilers or fixed passive acoustic monitors) within these three lease blocks. The buoys and related appurtenances may be moved periodically within the three blocks.

In addition, BOEM makes the assumption that up to an additional 30 lease blocks could be leased over the time period 2013-2020 (see Table 1). These potential leases would authorize site characterization activities to be conducted in support of a SAP, COP, or GAP submittal and the construction and/or installation of up to three met towers and up to six met buoys. The site characterization and met buoy installation for the 30 non-delineated OCS blocks was covered in a previous biological opinion (see Section 1.2 below). This consultation assesses only the construction and operation of up to three met towers.

1.2 Consultation History

The proposed action is similar in many respects to the consultation for the action described in the Environmental Assessment (EA) for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia (NJ-VA EA) and its associated consultations that were finalized in January 2012 (USDOI, BOEM, OREP 2012a). Each of these assessments considered the issuance of leases for wind resource data collection, including geological and geophysical, hazards, and archaeological (GGARCH) site characterization surveys.

However, this consultation more closely follows and builds upon, recently completed ESA consultations for Geological and Geophysical (G&G) Surveys in BOEM's Mid and South Atlantic Planning Areas. Where that consultation evaluated the impacts of survey activity in the Mid and South Atlantic Planning Areas for all BOEM program areas, including the Renewable Energy Program, this consultation will evaluate site assessment activities (e.g., met tower and met buoy installation) within some of BOEM's Mid-Atlantic Planning Area (North Carolina) and the South Atlantic Planning Area. The following is a summary of the consultation history for previous and ongoing NMFS and USFWS consultations for lease issuance and site assessment activities on the Atlantic OCS.

Previous NMFS Consultations on Similar Actions

In March 2011, BOEM initiated informal consultation with NMFS for the issuance of leases, site assessment, and site characterization activities for NJ-VA. The consultation was concluded in a September 20, 2011, letter from NMFS concurring with the determination that the issuance of leases associated with site characterization and subsequent site assessment activities for siting of wind energy facilities in the identified WEAs may affect but is not likely to adversely affect any listed species under NMFS jurisdiction.

On May 24, 2012, BOEM initiated formal consultation for site characterization activities for all of BOEM's program areas (oil and gas, marine minerals, and renewable energy) in the Mid and South Atlantic Planning Areas. The assessment of the renewable energy program's G&G survey activity produced some new modeled estimates of the areas ensonified at Level A and Level B harassment levels during operation of the equipment. That consultation ended on July 19, 2013. While that consultation did not conclude the activity would jeopardize the continued existence of any ESA-listed species, it did require several reasonable and prudent measures (RPMs) and included an incidental take statement (ITS) for ESA-listed marine mammals and sea turtles. This BA will tier off of that previous assessment.

On October 19, 2012, BOEM initiated formal consultation with NMFS for the issuance of leases, site assessment, and site characterization activities in several offshore wind planning areas in the North Atlantic Planning Area. The consultation was finalized on April 10, 2013. While that consultation did not conclude the activity would jeopardize the continued existence of any ESA-listed species, it did require several RPMs and included an ITS for ESA-listed marine mammals and sea turtles.

Previous USFWS Consultations on Similar Actions

The proposed action is similar in many respects to other consultations:

1) The action described in the *Environmental Assessment (EA) for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia (NJ-VA EA)* and its associated BA, which were finalized in January 2012 (USDOI, BOEM, OREP 2012a);

2) *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas* and associated BA; and

3) *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Revised Environmental Assessment* (RIMA EA) and its associated BA that also covers the same activities in the MA WEA.

Each of these assessments considered the issuance of leases for wind resource data collection, including geological and geophysical, hazards, and archaeological (GGARCH) site characterization surveys.

The NJ-VA EA considered issuing leases within all or part of four WEAs. The project area in the NJ-VA EA was comprised of approximately 117 OCS lease blocks across four states. On March 24, 2011, BOEM requested informal ESA Section 7 consultation with the USFWS for lease issuance and site assessment activities off NJ-VA. The consultation was concluded in a letter from the USFWS dated June 20, 2011, concurring with the determination that the met tower and buoy construction activities are not likely to adversely affect the three listed species under USFWS jurisdiction (roseate tern, piping plover, or red knot). The USFWS also found that although the extent to which these species occur between seven and 37 miles (11.3 and 59.5 kilometers) offshore is not well known, the collision risk throughout these Mid-Atlantic WEAs was considered to be negligible. The USFWS recommended the placement of visibility sensors on met towers to provide measures of visibility during low-visibility conditions. On June 11, 2012, BOEM requested consultation with the USFWS for proposed geological and geophysical exploration activities in BOEM's Mid and South Atlantic Planning Areas associated with oil and gas, renewable energy, and the marine minerals programs. On August 7, 2012, BOEM received a letter from the USFWS concurring with BOEM that the proposed G&G exploration activities would have no effect or would not be likely to adversely affect the federally listed species, critical habitats, and shared portions of jurisdictions administered by the USFWS.

The RIMA EA project area was comprised of approximately 13 OCS lease blocks and 29 partial lease blocks. The proposed action consisted of commercial wind energy lease issuance, associated site characterization activities (geophysical, geotechnical, archeological, and biological surveys), and site assessment activities (installation, operation, and decommissioning of met towers and buoys). In a letter dated November 1, 2012, the USFWS concurred with BOEM's determination that the proposed action is not likely to adversely affect the endangered roseate terns, threatened piping plovers, and the candidate red knots. To evaluate future collision risk assessment, the USFWS recommended the placement of visibility sensors on the met towers to collect data on the occurrence, frequency, and duration of poor visibility conditions.

In preparation of this BA, BOEM requested, on June 12, 2013, USFWS concurrence on a list of species to be considered in the assessment required under ESA Section 7(a)(2). On July 8, 2012, the USFWS recommended that the black-capped petrel and the Kirkland's warbler be added to the list of species. The USFWS also commented on the potential effects on all species on the proposed list and any revised list of federally listed species regarding collision with met towers under poor visibility conditions and collision with met towers because of attraction to lights on the towers. They recommended that intermittent lighting be used to reduce collision probabilities for migratory birds.

2. ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the BA action area; the anticipated impacts of all proposed federal projects in the Southeast Action Area that have already undergone formal or early Section 7 consultation; and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR § 402.02).

2.1 Factors Affecting Species within the Southeast Action Area

Historical and ongoing activities that shape the environmental baseline in the Southeast Action Area include shipping and marine transportation; commercial and recreational fishing; military range complexes and civilian space program use; dredging and dredged material disposal; and coastal development.

2.1.1 Shipping and Marine Transportation

Commercial, military, and recreational shipping and marine transportation is common and widespread throughout the Southeast Action Area. The passage of large commercial ships along the inner shelf is limited to shipping fairways and navigation channels that are designed to control the movement of vessels as they approach ports. The largest commercial ports adjacent to the action areas are the ports of Wilmington, North Carolina; Charleston, South Carolina; and Savannah, Georgia. A complete description of theses ports can be found in chapter 4.2.13 in the *Draft Programmatic EIS for Proposed Geological and Geophysical Activities in the Mid-Atlantic and South Atlantic* (USDOI, BOEM 2012b) and is not restated herein.

Large commercial vessels (cargo ships, tankers, and container ships) use these ports to access overland rail and road routes to transport goods throughout the United States. Other vessels using these ports include military vessels, commercial business craft (tug boats, fishing vessels, and ferries), commercial recreational craft (cruise ships and fishing/sightseeing/diving charters), research vessels, and personal craft (fishing boats, house boats, yachts and sailboats, and other pleasure craft).

The USCG designates shipping fairways and establishes traffic separation schemes that control the movement of vessels as they approach ports (33 CFR Part 166). Each of the ports is serviced by a navigation channel maintained by the United States Army Corps of Engineers (USACE). Traffic fairways and the buoys and beacons that serve as aids to navigation are identified on the National Oceanic and Atmospheric Administration's (NOAA) Office of Coast Survey's navigation charts. However, smaller commercial, military, and recreational vessels may travel throughout the North Carolina Action Area. In offshore waters outside certain regulated channels, vessel speed is not regulated.

Historical and ongoing effects on listed species from shipping and marine transportation include vessel strikes; disturbance by vessel traffic and noise; accidental releases of trash and marine debris; and oil spills due to vessel collisions or other accidents.

2.1.2 Commercial and Recreational Fishing

The Southeast Action Area supports some of the most economically important recreational fishing industries in the United States (Southwick Associates, Inc. 2006). Recreational fishing can be classified as nearshore or offshore, depending on the size of vessel and its fishing location (distance from shore).

Nearshore recreational fishing (<4.8 kilometers (km) [3.0 miles (mi)]) consists of anglers fishing from private vessels, beaches, marshes, or manmade structures (e.g., jetties, docks, and piers), whereas offshore fishing consists of anglers fishing from larger vessels (private, rental, charter, or party) in offshore waters (>4.8 km [3.0 mi]).

Commercial fisheries within the Southeast Action Area can be generally categorized into four zones according to where species can be found in the water column and distance from shore. In general, these zones are as follows:

- benthic: inshore (~4.88 km [3.0 mi]) to offshore (~32 km [20.0 mi]); species found within bottom sediments or along the seafloor;
- demersal: inshore (~4.88 km [3.0 mi]) to offshore (~32 km [20.0 mi]); species associated with the bottom (1–2 m [3.3–6.6 ft] above the seafloor) but that are not found within the bottom sediments;
- coastal pelagic: mid-water and surface (~8–32 km [5.0–20.0 mi] from shore); and
- pelagic: mid-water (mesopelagic) and surface (epipelagic) (>64 km [40.0 mi] from shore).

The main commercial fishing gears used along the Atlantic east coast are pots/traps, dredges, trawls, longlines (bottom and pelagic), gillnets, purse seines, and pound nets (Chuenpagdee et al. 2003; Stevenson et al. 2004).

Historical and ongoing effects on listed species from recreational and commercial fishing include vessel strikes; disturbance by vessel traffic and noise; entanglement in lost or discarded fishing gear; incidental taking of demersal fish species as by-catch; effects on prey species due to direct taking of fish and shellfish resources including targeted species and bycatch; and oil spills due to vessel collisions or other accidents.

The programmatic BA and the Draft Programmatic EIS for the *Atlantic OCS Proposed Geological and Geophysical Activities in the Mid-Atlantic and South Atlantic Planning Area* provide additional information about recreational and commercial fishing activities in the Southeast Action Area (USDOI, BOEM 2012a, b).

2.1.3 Military Range Complex and Civilian Space Program Use Areas

Military range complexes and civilian space program use areas, including restricted areas and danger zones, are established in areas off US coastlines to allow military forces to conduct training and testing activities. Military activities can include various air-to-air, air-to-surface, and surface-to-surface naval fleet training, submarine and antisubmarine training, and Air Force exercises (USDOI, BOEM 2012b).

Three military-related restricted areas operated by the United States Department of Defense (DOD) are within the North Carolina Action Area: the Virginia Capes Operating Area, the Cherry Point Operating Area, and the Charleston Operating Area (OPAREAs). The Atlantic Fleet Training Virginia Capes (VACAPES) Range Complex extends from Virginia south along the coastline of North Carolina to a point 105 nmi) southeast of Cape Hatteras (U.S. Fleet Forces Command 2008). The Cherry Point Complex extends along the coastline of central North Carolina, and the Charleston Complex extends along the coastline of southern North Carolina and South Carolina. Training exercises include mine, surface, amphibious, and strike warfare involving bombing and missile exercises and mine neutralization. Airborne, surface, and submarine activities are involved.

Within the VACAPES Range Complex, the National Aeronautics and Space Administration (NASA) has designated danger zones and restricted areas for rocket testing offshore of Wallops Flight Facility; these areas extend into waters offshore North Carolina (see Figure 2-1). These areas have been showered with debris ranging in size from golf balls to the size of a small automobile. Access is restricted during rocket launch activities (33 CFR § 334.525). A danger zone is also designated offshore Camp Lejeune, North Carolina.

The proposed Georgia lease area is within the Jacksonville Range Military Complex, which includes both the Charleston and Jacksonville military OPAREAs. The largest naval facility in the OPAREAs is the Naval Submarine Base at Kings Bay, Georgia, approximately 74 nmi south of the proposed Georgia lease area. Submarines operate throughout all deepwater portions of the OPAREAs, extending south and north and offshore to the Jacksonville Range Complex limits (DoN 2009).

The USACE has established surface danger zones and restricted areas in many areas adjacent to US coastlines. The regulations pertaining to the identification and use of these areas are found at 33 CFR Part 334. The proposed Georgia lease area has no danger zones or restricted areas. There is a military aviation warning area approximately 7 nmi east of OCS lease block 6126 and a DOD danger zone approximately 12 nmi east of lease block 6126. The airspace within the military aviation warning area is designated for aircraft that identify activity that may be hazardous to nonparticipating aircraft or mariners; therefore, aircraft are restricted to between 1,200 and 17,000 feet above sea level (National Geospatial-Intelligence Agency 2013). The danger zone may be used by the U.S. Armed Forces for hazardous operations and may be intermittently closed to the public (USACE 2012).

Military and civilian uses of the offshore sea and air areas are compatible, with navy ships accounting for three percent of the total ship presence out to 200 nmi (U.S. Fleet Forces 2009). Where naval vessels and aircraft conduct operations that are not compatible with commercial or recreational transportation, they are confined to OPAREAs away from commercially used waterways and inside Special Use Airspace (U.S. Fleet Forces 2009). Hazardous operations are communicated to all vessels and operators by use of Notices to Mariners issued by the USCG and Notices to Airmen issued by the Federal Aviation Administration (FAA).

Historical and ongoing effects on listed species from military use include vessel strikes; disturbance by underwater noise from sonars, explosives, and other active acoustic sound sources; disturbance by vessel traffic and noise; disturbance by aircraft traffic and noise; accidental releases of trash and marine debris; and oil spills due to vessel collisions or other accidents (USDOI, BOEM 2012b). Effects from launch operations include vessel strikes; disturbance by sonic booms during launch operations; disturbance by vessel traffic and noise; disturbance by aircraft traffic and noise; strikes from jettisoned launch components; accidental releases of trash and marine debris; and oil spills due to vessel collisions or other accidents.

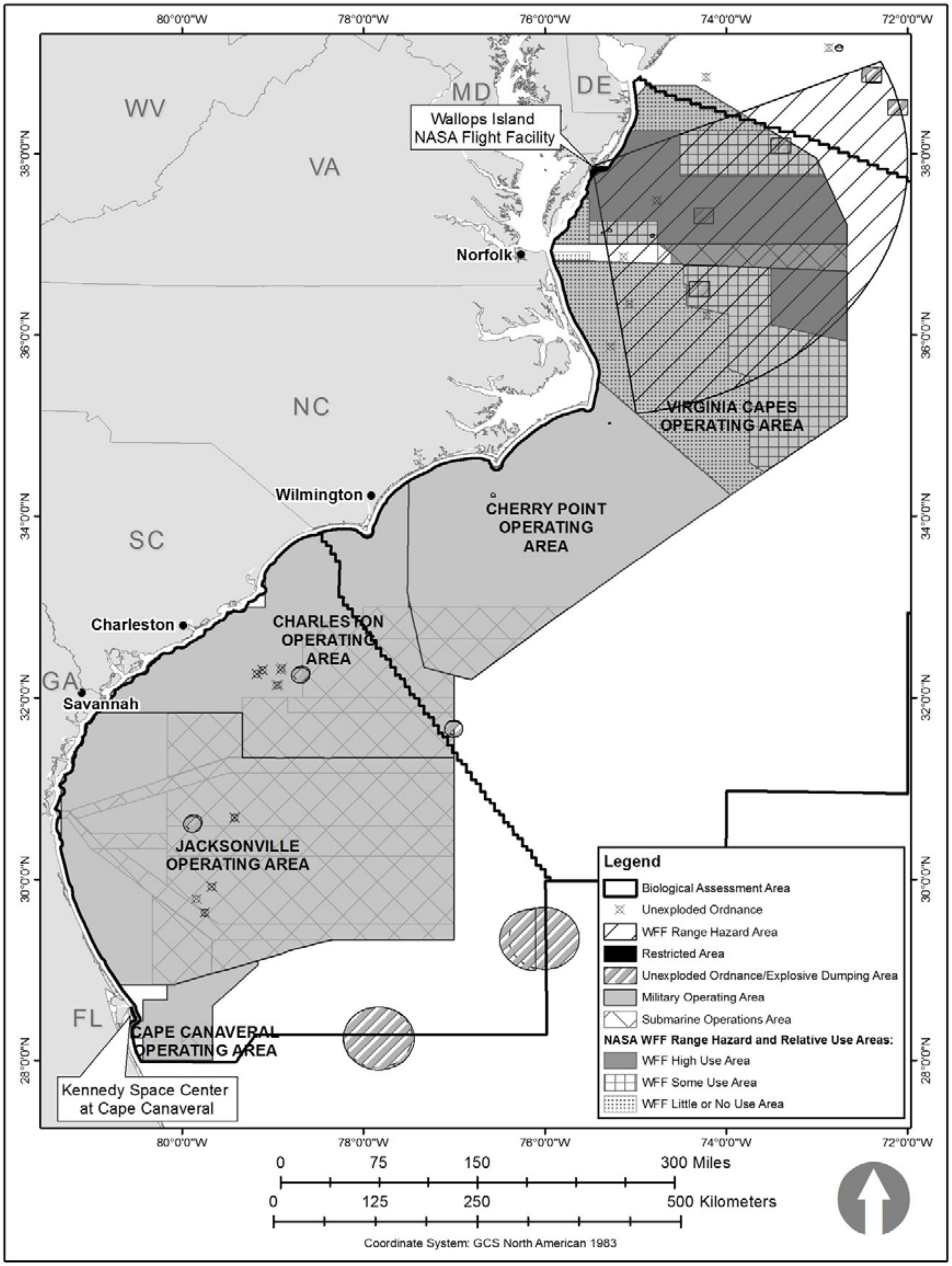

Figure 2-1. Military operating areas and NASA WFF range hazard and use areas (Figure 4-37 Draft Atlantic PEIS OCS/EA BOEM 2012-005)

2.1.4 Dredging and Dredged Material Disposal

Figure 2-2 shows two dredged material disposal sites designated on the OCS offshore North Carolina: one offshore Morehead City and one offshore Wilmington (40 CFR § 228.15). These sites range in size from 7.9 to 27.6 square km (2.3 to 8 square nmi) and are used for the disposal of dredged material from the maintenance of the Morehead City Harbor and Wilmington Harbor, respectively. There is also a 32.3 square km (9.4 square nmi) ocean dredged material disposal site (ODMDS) offshore Wilmington, called New Wilmington, used for the disposal of dredged material from the greater Wilmington vicinity (USEPA 2011).

Three dredged ODMDSs have been designated offshore South Carolina (40 CFR § 228.15) (Figure 2-2), one is Georgetown Harbor, Georgetown; the second is Charleston, used primarily for dredged material from the Charleston Harbor deepening project, and the third is Port Royal (USEPA 2011), ranging in size from 3.4 to 40.53 square km (1 to 11.8 square nmi).

Georgia has two final dredged ODMDSs offshore Georgia (40 CFR § 228.15). One is located off Brunswick Harbor and the second off Savannah (Figure 2-2), ranging in size from 6.9 to 14.6 square km (2 nmi to 4.26 nmi), respectively. According to the Site Management Plan developed by the USACE and USEPA, the average volume of dredged material disposed at the Savannah ODMSD was anticipated to be one million cubic yards per year. In 2012, plans were published to expand the Savannah Harbor port and channel, and the amount of material disposed was anticipated to rise for one year to between four million cubic yards and 12 million cubic yards depending on the depth of the channel agreed upon for the expansion. The operation and maintenance dredging volume would be an additional one million cubic yards. The expansion project is projected to lower the years remaining to reaching capacity of the ODMDS from 50 to 40 years (USACE 2012).

The ODMS offshore Savannah, Georgia, is located adjacent to one of the lease blocks in the proposed action area. Figure 4-3 delineates the ODMSD site northeast of Block 6174 (within OCS Block 6125). Vessel traffic associated with the disposal site will likely not travel through the proposed action area since the lease blocks are not adjacent to the shipping lanes or in the path of the port of Savannah, locations where dredged material would be collected. The location of the disposal site is north of the lease blocks and direct travel from the dredged material collection sites, and the disposal site does not require passing through any of the proposed action area.

Typically, dredge sites are permitted for continuing use, and the activity level varies depending on the dredging requirements for particular ports. Dredging and the disposal of dredged materials are conducted with industry-standard practices to reduce potential effects to the environment, including the suspension of contaminated sediments into the water column. The USACE is the permitting authority for dredged material disposal. However, when issuing a permit, the USACE must obtain the USEPA's concurrence, use USEPA-developed dumping criteria, and use USEPA-designated ocean disposal sites to the maximum extent feasible (33 CFR § 324.4(b)).

Historical and ongoing effects on listed species from dredged material disposal include vessel strikes; disturbance by vessel traffic and noise; incidental taking of sea turtles and demersal fishes (e.g., by hopper dredges); indirect effects due to alteration of benthic habitats and resulting impacts on prey species; accidental releases of trash and marine debris; and oil spills due to vessel collisions or other accidents.

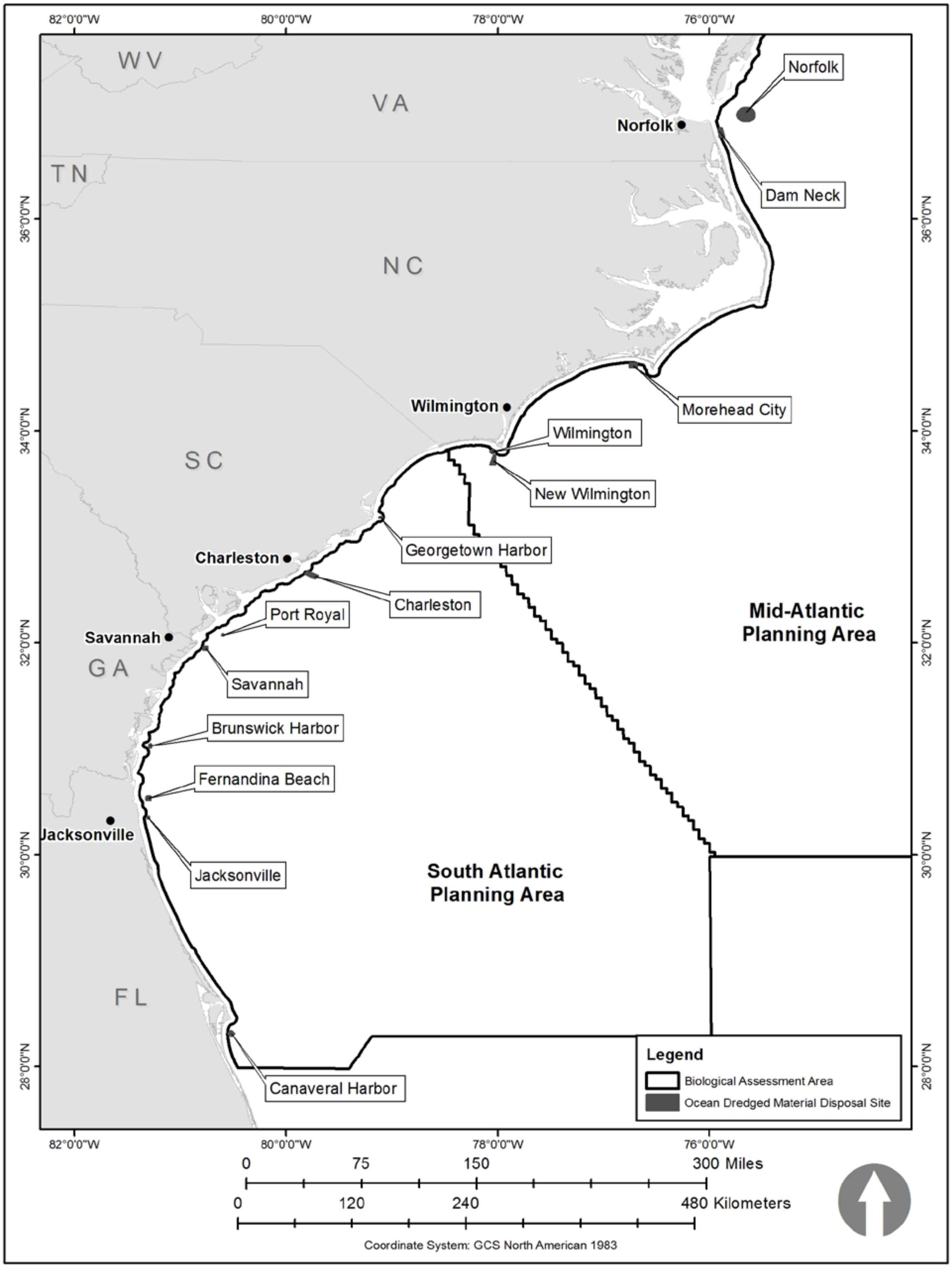

Figure 2-2. Offshore final dredged material disposal sites offshore of the BA Area (USDOI, BOEM 2012b)

2.1.5 Coastal Development

Coastal development includes an array of human activities such as beachfront construction of homes, hotels, restaurants, roads, harbors, jetties, seawalls, and other forms of coastal armoring. Of the listed species in this analysis, sea turtles are the most vulnerable to coastal development through loss of nesting habitat (USDOC, NMFS and USDOI, FWS 2008). Beachfront lighting disorients hatchlings when they emerge from the nest, leading them away from the water and toward roads and buildings where they may die of exposure, fall victim to predators or vehicles, or become trapped by obstacles. Beachfront lighting can also disorient nesting females and may result in failed nesting attempts. Obstacles in the coastal zone, from beach chairs to curbs on roads, also impede females and may result in failed nesting attempts. Construction of coastal armoring creates impenetrable barriers to nesting females and causes unnatural erosion of beaches. Beachfront development and measures to control erosion are impenetrable barriers to nesting sea turtles. Increased erosion due to coastal development may force females to nest below the high water line, resulting in nests being washed away.

Several hundred miles of ocean-facing sandy beaches adjacent to the Southeast Action Area provide suitable nesting habitat for sea turtles. Nests of Loggerhead (*Caretta caretta*), Green (*Chelonia mydas*), Leatherback (*Dermochelys coriacea*), and Kemp's Ridley (*Lepidochelys kempii*) turtles have been identified across this region.

Atlantic coastal development has also affected habitats used by many birds, including the piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii*), and red knot (*Calidris canutus*). Piping plovers in particular are extremely sensitive to human activities, and disturbances from anthropogenic activities can cause the parent birds to abandon their nests (USDOI, FWS 1996).

2.2 Mitigation and Conservation Measures

Mitigation and conservation measures contributing to the environmental baseline are discussed below. Additional mitigation and monitoring applied to the proposed action can be found in Section 7 of this BA.

2.2.1 Marine Mammals

In 1994, NMFS designated three critical habitats for the North Atlantic right whale along the eastern coast of the United States (59 FR 28805 1994). These include Cape Cod Bay/Massachusetts Bay, the Great South Channel, and selected areas off the southeastern United States. Of these critical habitats, the area off northeast Florida and southern Georgia is close to the proposed Georgia lease areas (Figure 2-3). Garrison (2007) suggests that the southeastern U.S. critical habitat northern boundary be extended as far north as the North Carolina coast.

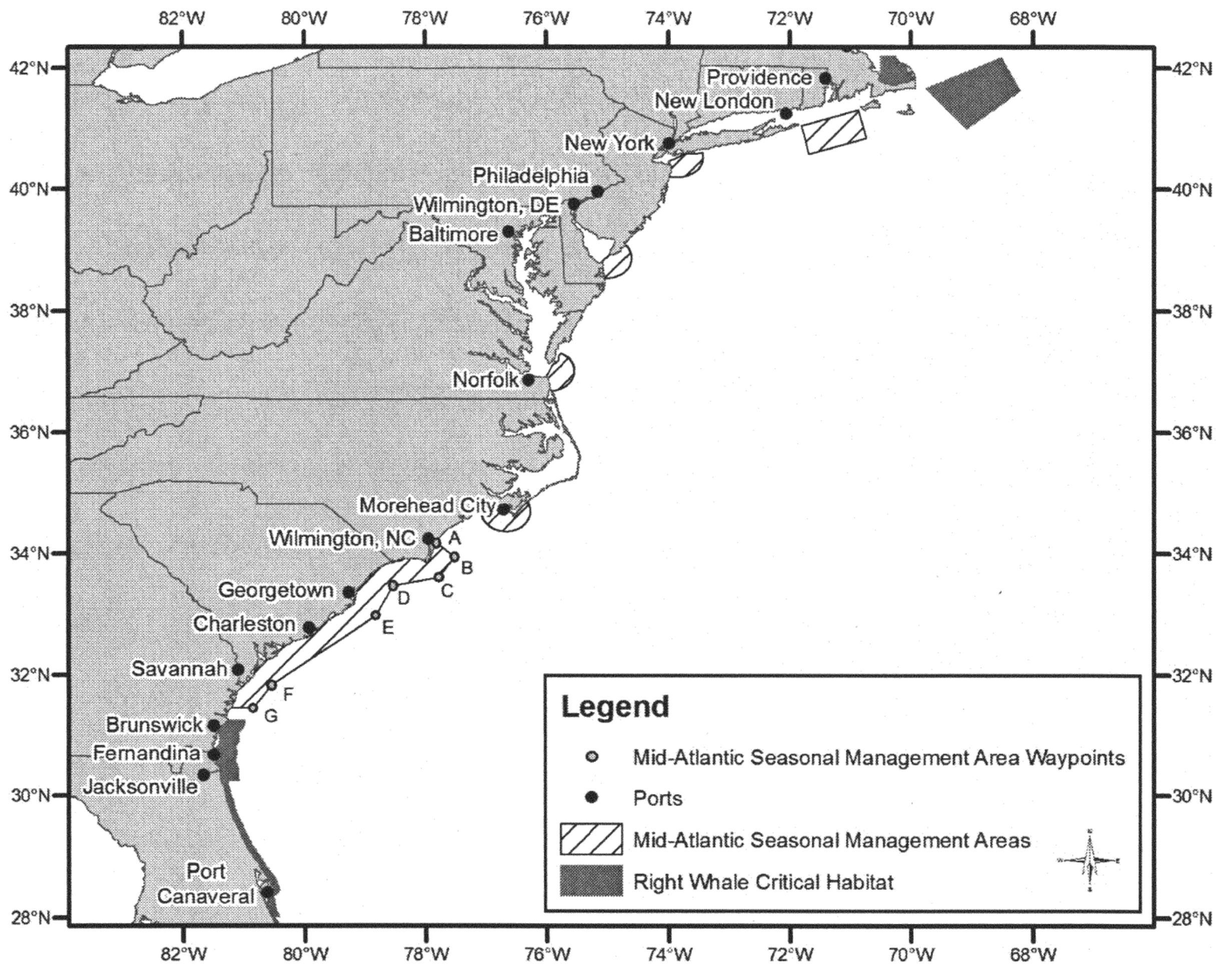

Figure 2-3. Designated critical habitat and seasonal management areas for North Atlantic right whales along the Atlantic coast (50 CFR § 226)

Seasonal Management Areas (SMAs) have been designated for the North Atlantic right whale (*Eubalaena glacialis*) within the Mid-Atlantic and southeast United States (Figure 2-3). These SMAs include vessel speed restrictions under 50 CFR § 224.105. Offshore North Carolina, these restrictions are in effect from November 1 through April 30 and include a combination of both continuous areas and half circles drawn with 37 km (20 nmi) radii around the entrances to certain bays and ports. Within the North Carolina Action Area, SMAs include a continuous zone extending from Wilmington, North Carolina, south to Georgia, and the ports of Morehead City and Beaufort, North Carolina (see Figure 2-3). The Southeast US SMA has seasonal restrictions in effect from November 15 to April 15 of each year within a continuous area that extends from St. Augustine, Florida, to New Brunswick, Georgia, to St. Augustine, Florida, from shore to 37 km (20 nmi) offshore.

In addition to the SMA, other regulatory measures to reduce vessel strikes to large whales include:

- Vessel Approach Restrictions. In one recovery action aimed at reducing vessel-related impacts, including disturbance, NMFS published a proposed rule in August 1996 (61 FR 41116 August 7, 1996) and an interim final rule in February 1997 restricting vessel approach to right whales to a distance of 500 yards.

- Mandatory Ship Reporting System. In April 1998 the USCG submitted a proposal, on behalf of the United States, to the International Maritime Organization (IMO) requesting approval of a mandatory ship reporting (MSR) system in two areas off the East Coast of the United States, the right whale feeding grounds in the Northeast and the right whale calving grounds in the Southeast. The proposal was implemented on July 1, 1999.

- Sighting Advisory System. The right whale Sighting Advisory System (SAS) was initiated in early 1997 as a partnership among several federal and state agencies and other organizations to conduct aerial and shipboard surveys to locate right whales and to alert mariners to right whale sighting locations in a near real-time manner.

- Marine Mammal Health and Stranding Response Program (MMHSRP). A 1992 amendment to the MMPA, the program collects information on endangered large whales through stranding response and data collection via state volunteer networks, biomonitoring, and analytical quality assurance program for tissue samples, working groups, and a national marine mammal tissue bank.

The US Navy has authorization to conduct sonar training under the Atlantic Fleet Sonar Training EIS and associated permits. As part of their authorized action, they have implemented the following mitigation measures to decrease potential effects on marine mammals (DoN 2008):

- avoid important habitats and marine protected areas;
- maneuver to stay at least 457 meters (1,500 ft) away from observed whales;
- implement protective measures for North Atlantic right whales;
- post shipboard lookouts;
- monitor visually and acoustically for marine mammals and sea turtles prior to and during training; and

- reduce source level or shut down sonar if marine mammals are detected within specified exclusion zones (914 meters [3,000 ft] for reduced power; 183 meters [600 ft] for shutdown).

The NMFS implemented the Atlantic Large Whale Take Reduction Plan (ALWTRP) in 1997 to reduce the level of serious injury and mortality of three strategic stocks of large whales (North Atlantic right whales, humpback whales, and fin whales) in commercial gillnets and trap/pot fisheries. The measures identified in the ALWTRP are also designed to benefit minke whales, which are not designated as a strategic stock but are known to be incidentally injured or killed in gillnet and trap/pot fisheries. The ALWTRP has several components, including restrictions on where and how gear can be set; research into whale populations and whale behavior, as well as fishing gear interactions and modifications; outreach to inform and collaborate with fishermen and other stakeholders; and a large whale disentanglement program. This plan is currently being updated; the proposed rule to amend the regulations implementing the plan was published in the *Federal Register* on July 16, 2013 (78 FR 42654).

2.2.2 Sea Turtles

Since one of the greatest sources of mortality for certain sea turtle species is interaction with commercial fishing vessels and gear (Wallace et al. 2010), NMFS, conservation groups, and the commercial fishing industry have been working to develop methods and gear that reduce the incidental capture or harm to sea turtles. Effective measures to reduce turtle bycatch include the use of circle hooks and fish bait in longline fisheries and Turtle Excluder Devices (TEDs) in trawling. A TED is an angled grid of bars with a hinged opening that is fitted into the neck of a shrimp trawl net. The TED is designed to allow small animals, such as shrimp, to pass through the bars into the bag end of the net and allow larger animals, such as marine turtles and sharks, to pass through the hinged door after striking the angled grid bars. Federal fisheries regulations regarding the use of TEDs include:

- 50 CFR § 223.205: Sea Turtles;
- 50 CFR § 223.206: Exemptions to TED Requirements; and
- 50 CFR § 223.207: Currently Approved TED Designs.

Direct injury or mortality of sea turtles by hopper dredges has been well documented along the southeastern and Mid-Atlantic coast (National Research Council [NRC] 1990). Solutions, including modification of dredges and time/area closures, have been successfully implemented to reduce mortalities and injuries in the United States (Conant et al. 2009).

NMFS has published a final rule for sea turtle handling and resuscitation techniques for sea turtles that are incidentally caught during scientific research or fishing activities (66 FR 67495 2001). Persons participating in fishing activities or scientific research are required to handle and resuscitate (as necessary) sea turtles as prescribed in the final rule. These measures help to prevent mortality of hard-shelled turtles caught in fishing or scientific research gear.

The Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle identified five recovery units for the Northwest Atlantic population. Recovery units are "subunits of the listed species that are geographically or otherwise identifiable and essential to the recovery of the species, i.e., recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species" (USDOC, NMFS, DOI, FWS 2008).

Four of these recovery units represent nesting assemblages in the southeastern United States and were delineated based on a combination of geographic isolation and geopolitical boundaries. The Northern Recovery Unit (NRU) is defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range) (USDOC, NOAA, NMFS 2013). NMFS and the USFWS have proposed a new critical habitat for the loggerhead sea turtle that encompasses barrier islands that are within the NRU and adjacent to the Southeast Action Area (see Section 4.3.1.2).

Other conservation measures have targeted conservation and preservation of nesting beaches. For example, during the nesting season, thousands of volunteers around the globe participate in nest protection and monitoring (Seaturtle.org 2013). These efforts are intended to increase survival of eggs and hatchlings in an attempt to increase the success of getting hatchlings into the ocean to offset other mortality factors sea turtles face.

2.2.3 Birds

In 2001, the USFWS designated critical habitat for the wintering population of piping plovers along the coast of North Carolina (50 CFR part 17). Critical habitat areas were subsequently revised in North Carolina in 2008 (73 FR 62816). Coastline habitat essential for the conservation of this listed species includes intertidal beaches, flats, and/or associated dunes extending down to the lowest low-tide mark. This designation is designed to reduce potential impacts from coastal development, beach nourishment, and onshore recreational activities. It should be noted that critical habitat must be considered only under Section 7(a)(2) of the ESA, that is, for actions that only have a federal nexus and not private actions.

National wildlife refuges, national seashores, and other managed areas along the coasts of North Carolina, South Carolina, and Georgia help to maintain and protect habitat for marine and coastal birds including piping plovers, roseate terns, and red knots. These include National Wildlife Refuges (NWRs), national seashores, and numerous state parks, resource conservation areas, nature preserves, aquatic preserves, natural areas, and wildlife management areas.

2.2.4 Fishes

NMFS developed a recovery plan for the smalltooth sawfish (*Pristis pectinata*) in January 2009 (USDOC, NMFS 2009a). The plan recommends specific steps to recover the Distinct Population Segment (DPS), focusing on reducing fishing impacts, protecting important habitats, and educating the public.

Smalltooth sawfish are extremely vulnerable to overexploitation because of their susceptibility to become entangled in nets (USDOC, NMFS 2011). NMFS has developed guidelines for fishermen on how to safely handle and release any sawfish they catch. In addition, the NMFS has developed guidelines to reduce impacts on smalltooth sawfish during coastal dredging and construction projects (USDOC, NMFS 2006).

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is managed under a Fishery Management Plan implemented by the Atlantic States Marine Fisheries Commission (ASMFC). In 1998, the ASFMC instituted a coast-wide moratorium on the harvest of Atlantic sturgeon, which is to remain in effect until there are at least 20 protected age classes in each spawning stock (anticipated to take up to 40 or more years) (USDOC, NMFS 2012). NMFS followed the ASMFC moratorium with a similar moratorium for Federal waters. Amendment 1 to ASMFC's Atlantic sturgeon Fishery Management Plan also includes measures for preservation of existing habitat, habitat restoration and improvement, monitoring of bycatch and stock recovery, and breeding/stocking protocols (USDOC, NMFS 2012). NMFS has not yet finalized a species recovery plan for Atlantic sturgeon since its ESA listing in June 2009.

3. THREATENED AND ENDANGERED SPECIES IN THE SOUTHEAST ACTION AREA

Under the ESA, a species is considered endangered if it is “in danger of extinction throughout all or a significant portion of its range.” A species is considered threatened if it “is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (15 U.S.C. § 1532).

BOEM consulted the USFWS and NMFS to establish the list of threatened and endangered species that could be found in the Southeast Action Area (USDOI, USFWS 2013a; USDOC, NMFS 2013). Federally listed species that could potentially be affected by the proposed action include seven marine mammals, five sea turtles, four birds, and two fishes (Table 2). In addition, two candidate bird species (red knot and black-capped petrel) could also be potentially affected by the proposed action. Candidate species are identified by the USFWS and NMFS as species for which sufficient information is available to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions. Candidate species are provided no statutory protection under ESA. Two fish species previously on the candidate list (alewife and blueback herring) were initially considered as part of this review; however, NMFS issued a negative finding in August 2013 indicating that listing under the ESA is not warranted (78 FR 48944); these species are no longer candidate species, as NMFS currently lists them as Species of Concern. As a result, these species are not included in this review. Critical habitat has been designated for one listed bird species, the piping plover, along the coast of North Carolina. Critical habitat was also recently proposed in the Atlantic and Gulf of Mexico for the Northwest Atlantic Ocean Distinct Population segment of loggerhead sea turtles. Critical habitat is designated for North Atlantic right whales located at the mouth of the Altamaha River, Georgia, to

Jacksonville, Florida, from the shoreline out to 15 nmi offshore (59 CFR 28805), and the West Indian manatee that does not fall within the action area. No critical habitat is designated for Atlantic sturgeon, and critical habitat for smalltooth sawfish does not extend north of Miami, Florida, in the Atlantic.

Sections 4.1 through 4.4 below provide a brief description of the listed and candidate species that may be present in the action area. This BA tiers off of the analysis in BOEM's May 2012 *Programmatic Biological Assessment for the Atlantic OCS Proposed Geological and Geophysical Activities: Mid-Atlantic and South Atlantic Planning Areas* (the Programmatic BA) (BOEM 2012a). Greater detail on the life histories of the species outlined in this section is included in the programmatic BA; this information is incorporated by reference and not repeated in its entirety herein.

Table 2. Federally listed and candidate species considered in this BA

Common Name	Species	ESA Status	Critical Habitat[5]
MARINE MAMMALS			
Blue Whale	*Balaenoptera musculus*	E	N/A
Fin Whale	*Balaenoptera physalus*	E	N/A
Sei Whale	*Balaenoptera borealis*	E	N/A
North Atlantic Right Whale	*Eubalaena glacialis*	E	None
Humpback Whale	*Megaptera novaeangliae*	E	N/A
Sperm Whale	*Physeter macrocephalus*	E	N/A
West Indian Manatee (Florida subspecies)	*Trichechus manatus latirostris*	E	None
SEA TURTLES			
Green Turtle	*Chelonia mydas*	E/T[1]	None
Hawksbill Turtle	*Eretmochelys imbricata*	E	None
Kemp's Ridley Turtle	*Lepidochelys kempii*	E	N/A
Leatherback Turtle	*Dermochelys coriacea*	E	None
Loggerhead turtle	*Caretta caretta*	E/T [2]	Proposed
BIRDS			
Bermuda Petrel	*Pterodroma cahow*	E	N/A
Black-Capped Petrel	*Pterodroma hasitata*	C[3]	-
Kirtland's Warbler	*Setophaga kirtlandii*	E	N/A
Piping Plover	*Charadrius melodus*	T	18 coastal units
Roseate Tern	*Sterna dougallii*	E	N/A
Red Knot	*Calidris canutus*	C[6]	-
FISHES			
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	E/T[4]	N/A
Smalltooth Sawfish	*Pristis pectinata*	E	None

[1]The green turtle is threatened, except for the Florida breeding population, which is endangered (USDOC, NMFS 2007).
[2] Nine DPSs of loggerheads are listed. The Northwest Atlantic DPS is listed as threatened (76 FR 58868).
[3]A USFWS 90-day finding determined that the listing of this species as threatened or endangered is warranted; the USFWS is currently conducting their 12-month review.
[4]Five DPSs of Atlantic sturgeon have been listed under the ESA (77 FR 5914). The Carolina DPS is listed as endangered.
[5]N/A = critical habitat has not been designated for these species anywhere; None = critical habitat has been designated, but not in or near the Southeast Action Area.
[6]The red knot was proposed on September 30, 2013, as threatened under the ESA (78 FR 189, 09/30/2013).

3.1 Marine Mammals

The Southeast Action Area contains seven federally listed marine mammals representing Mysticetes (baleen whales, e.g. north Atlantic right whale), Odontocetes (toothed whales, e.g. sperm whale), and Serenians (West Indian manatee) (Table 2). All marine mammals are also protected under the Marine Mammal Protection Act (MMPA); as relevant, each species is identified by the MMPA stock present within the Southeast Action Area and the status of that stock. [1]

3.1.1 Blue Whale (*Balaenopetera musculus*)

The blue whale is the largest cetacean, found worldwide in all oceans except the high Arctic (Lambertsen 1983; Waring et al. 2012). In the western North Atlantic Ocean, blue whales are found from the Arctic to at least the mid-latitude waters of the North Atlantic. Blue whales have been acoustically detected in deep waters east of the US Exclusive Economic Zone (EEZ) (Clark 1995). Eighteenth and nineteenth century whaling logbooks recorded blue whale sightings in US waters off the Mid-Atlantic and southeast coast (Reeves et al. 2004), but recent sightings in the US EEZ are infrequent. Occasional sightings of blue whales have been made off Cape Cod, Massachusetts, in summer and fall (Wenzel et al. 1988).

Blue whales have been protected from commercial whaling since 1966 under the International Convention for the Regulation of Whaling. The North Atlantic stock of *B. musculus musculus* is listed as endangered by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Waring et al. 2012), endangered under the ESA, and depleted under the MMPA. Critical habitat has not been designated by NMFS for the blue whale. Blue whales in the western North Atlantic are placed within the Western North Atlantic stock, which is classified as strategic because of the species' listing as endangered under the ESA (Waring et al. 2010). The western North Atlantic population is estimated to be in the low hundreds (Waring et al. 2012).

Blue whales use both coastal and pelagic waters, and feeding aggregations are found primarily at the shelf edge (Waring et al. 2012). Blue whales are usually observed alone or in pairs (Jefferson, Webber, and Pitman 2008). Their diet consists primarily of krill (euphausiids), and their depth distribution is usually associated with feeding (Sears 2002). Blue whales reach sexual maturity at five to 15 years; mating in the northern hemisphere occurs in late fall and throughout the winter, although no specific breeding ground has been discovered (Sears 2002). Blue whales are categorized within the low-frequency cetacean functional hearing group (7 hertz (Hz)–22 kHz) (Southall et al. 2007).

Threats for North Atlantic blue whales are poorly known but may include ship strikes, pollution, entanglement in fishing gear, and long-term changes in climate, which may affect the abundance of their prey (USDOC, NMFS 1998).

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1 The MMPA defines the term *stock* as a group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature (50 CFR § 216.3).

3.1.1.1 *Presence within the Southeast Action Area*

In the Southeast Action Area, sightings of blue whales are rare, with one sighting occurring off the coast of northeastern North Carolina in the vicinity of the Kitty Hawk Planning Area (Figure 3-1) (Waring et al. 2012). NMFS stock status reports describe the blue whale as an occasional visitor in US Atlantic EEZ waters, which may represent the current southern limit of its feeding range (Waring et al. 2010).

3.1.2 Fin Whale (*Balaenopetera physalus*)

The fin whale is the second largest species of whale and is distributed widely in every ocean except the Arctic Ocean (USDOC, NMFS 2013a). In the North Atlantic, the fin whale ranges from the Gulf of Mexico to the edge of the Arctic ice pack (USDOC, NMFS 2010a). Fin whales are common in waters of the US EEZ, principally from Cape Hatteras northward. While much remains unknown, the magnitude of the ecological role of the fin whale is impressive. In this region fin whales are probably the dominant large cetacean species during all seasons, having the largest standing stock, the largest food requirements, and therefore the largest impact on the ecosystem of any cetacean species (Waring et al. 2012).

New England waters represent a major feeding ground for fin whales. There is evidence of site fidelity by females and perhaps some segregation by sexual, maturational, or reproductive class in the feeding area. Waring et al. (2012) reported on studies that indicated 49 percent of fin whales sighted in the Massachusetts Bay area feeding grounds were resighted within the same year, and 45 percent were resighted in multiple years (Waring et al., 2012).

Three human activities are known to threaten fin whales: whaling, commercial fishing, and shipping (USDOC, NMFS 2013a). Fin whales are killed and injured in collisions with vessels more frequently than any other whale (USDOC, NMFS 2013a). Schooling fish constitute a large proportion of the fin whale's diet in many areas of the North Atlantic, so trends in fish populations, whether driven by fishery operations, human-caused environmental deterioration, or natural processes, may strongly affect the size and distribution of fin whale populations (USDOC, NMFS 2013a). In 1976 the International Whaling Commission (IWC) protected fin whales from commercial whaling. Fin whales are listed as endangered under the ESA and the IUCN Red List of Threatened Animals and as depleted under the MMPA (USDOC, NMFS 2013a; Waring et al. 2012). NMFS has not designated critical habitat for the fin whale (USDOC, NMFS 2010a). Fin whales off the eastern United States and eastern Canada are believed to constitute a single stock (Western North Atlantic stock) under the present IWC scheme. The ESA currently lists the species as endangered. The Western North Atlantic stock is classified as strategic because of its listing under the ESA. The best current estimated population size of this stock is 3,522 individuals (Waring et al. 2013).

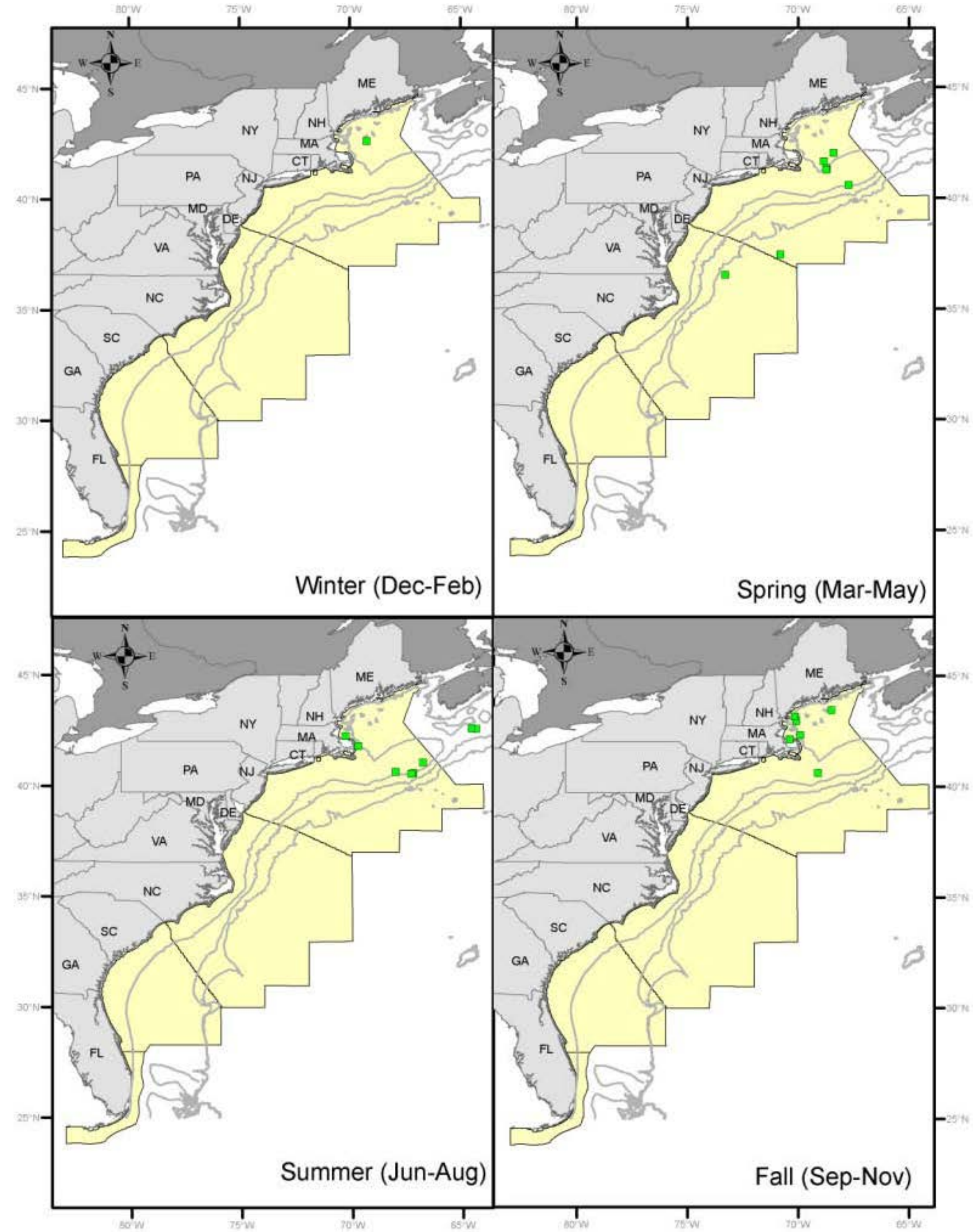

Figure 3-1. Blue whale sighting and stranding observations by season (Waring et al. 2012).

Hain et al. (1992) reported a total of 72 fin whale strandings along the US Atlantic coast during the century in which the report was written. Strandings were relatively evenly distributed by month; however, a majority of the strandings occurred on Cape Cod, Massachusetts, or on Cape Hatteras, North Carolina. Thirty-four confirmed fin whale mortalities were reported in the mortality and serious injury report for the period 2005–2009 along the US eastern seaboard and adjacent Canadian Maritimes (Henry, Cole, and Garron 2011). This figure includes anthropogenic and non-anthropogenic mortalities.

Fin whales are observed singly or in groups of two to seven individuals. Fin whales feed on zooplankton (euphausiids and copepods); small schooling fishes such as capelin, herring, mackerel, sandlance, and blue whiting; and squids (Jefferson, Webber, and Pitman 2008). Fin whale mating and births occur in the winter (November–March), with reproductive activity peaking in December and January. Hain et al. (1992) suggest that calving takes place during October to January in latitudes of the US Mid-Atlantic region. Fin whales are categorized within the low-frequency cetacean functional hearing group (7 Hz–22 kHz) (Southall et al. 2007).

3.1.2.1 *Presence within the North Carolina Action Area*

There have been several fin whale sightings in the North Carolina Action Area. Survey data from both aerial and shipboard surveys from 1978-2010 have been compiled in the North Atlantic Right Whale consortium database and corrected for effort; this data has been used by NMFS to develop Sightings per Unit Effort (SPUE) scores for three whale species: fin whales, North Atlantic right whales, and humpback whales (USDOC, NMFS 2013b). The SPUE scores range from zero to 1,000 and reflect the number of whale sightings, corrected for effort, by all surveys included in the data set. Using this data, monthly average fin whales sightings vary from one to 10 SPUE across the North Carolina Action Area (USDOC, NMFS 2013b). Using sighting data, not corrected for effort, Waring et al. (2012) report approximately 15 fin whale sightings in the vicinity of the Kitty Hawk Call Area and Planning Area 4; most sightings, approximately eight, occurred during the winter months of December through February (Figure 3-2). Fin whales have also been sighted in the same vicinity during the summer and fall months; however, these sightings are rarer, with approximately five sightings during this seasonal time period (Waring et al. 2012). The fin whale was the most common whale species sighted in northwest Atlantic waters, from Cape Hatteras, North Carolina, to Maine, during surveys conducted from 1978 through 1982; fin whales represented 46 percent of all sightings (USDOC, NMFS 2010a; Waring et al. 2010).

Waring et al. (2011) reported that based on an analysis of neonate stranding data, calving takes place during October to January in latitudes of the US Mid-Atlantic region; however, it is unknown where calving, mating, and wintering occurs for most of the population. From 2004–2008 the southernmost reported human caused serious injury or mortalities of fin whales was from North Carolina (Waring et al. 2011).

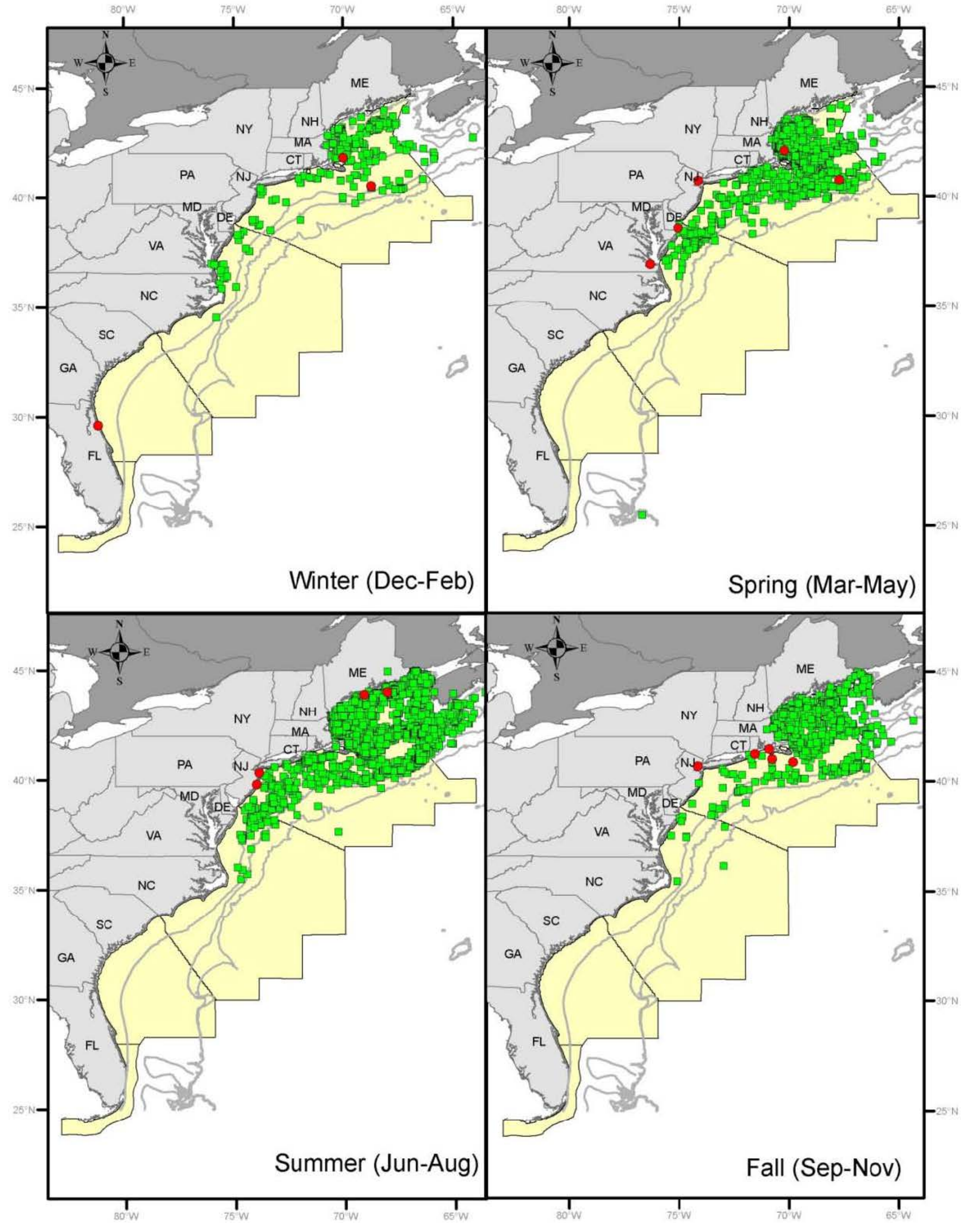

Figure 3-2. Fin whale sighting (green squares) and stranding (red circles) observations by season (Waring et al. 2012).

3.1.2.2 *Presence within the Georgia and South Carolina Action Areas*

Currently available sighting data indicates the sighting of one fin whale on March 8, 2000, approximately 4 nmi southwest of Block 6174 and one stranding on the Florida coast (Right Whale Consortium 2013). The overall sightings data from Waring et al. (2012) is shown in Figure 3-2.

3.1.3 Sei Whale (*Balaenopetera borealis*)

The sei whale is the third largest whale (following the blue and fin whales), with adult lengths ranging from 16–20 meters (52–66 ft). Sei whales live in every ocean except the Arctic Ocean, with a wide, but primarily offshore, distribution in the North Atlantic, the North Pacific, and in the southern hemisphere (Reilly et al. 2008). Off the US Atlantic coast, sightings of sei whales occur primarily in BOEM's North Atlantic Planning Area (Waring et al. 2012). Sei whales in the western North Atlantic are divided into two populations, one that occupies the Scotian shelf (the Nova Scotia stock), and a second that occupies the Labrador Sea (the Labrador Sea stock) (Reeves, Silber, and Payne 1998). The sei whale has been listed as endangered under the ESA since 1973, as endangered under the IUCN Red List of Threatened Animals, and as depleted under the MMPA (USDOC, NMFS 2013a; Waring et al. 2012). Critical habitat has not been designated by NMFS for the sei whale (Waring et al. 2010). Waring et al. (2010) provisionally adopted the Nova Scotia stock definition to represent all sei whales within the action area. There is no current population estimate of sei whales in the western North Atlantic Ocean, though survey data suggest that the Nova Scotia stock size is around 357 individuals (Waring et al. 2013). Two human activities are known to threaten sei whales: whaling and shipping. Sei whales are occasionally killed in collisions with vessels and are occasionally found entangled in fishing gear (USDOC, NMFS 2013a).

Sei whales are largely planktivorous, feeding primarily on euphausiids and copepods, but they will feed on small schooling fishes as well (Jefferson, Webber, and Pitman 2008; Waring et al. 2010). Calving occurs in midwinter within the low latitude portions of the species' range (Jefferson, Webber, and Pitman 2008). Specific breeding and calving areas have not been identified. Sei whales are categorized within the low-frequency cetacean functional hearing group (7 Hz–22 kHz) (Southall et al. 2007).

3.1.3.1 *Presence within the Southeast Action Area*

Sei whales are uncommon with only two sightings occurring in the vicinity of the Kitty Hawk Call Area and Planning Area 4 and no sightings of sei whales in the South Carolina or Georgia Action Areas (Figure 3-3) (Waring et al. 2012).

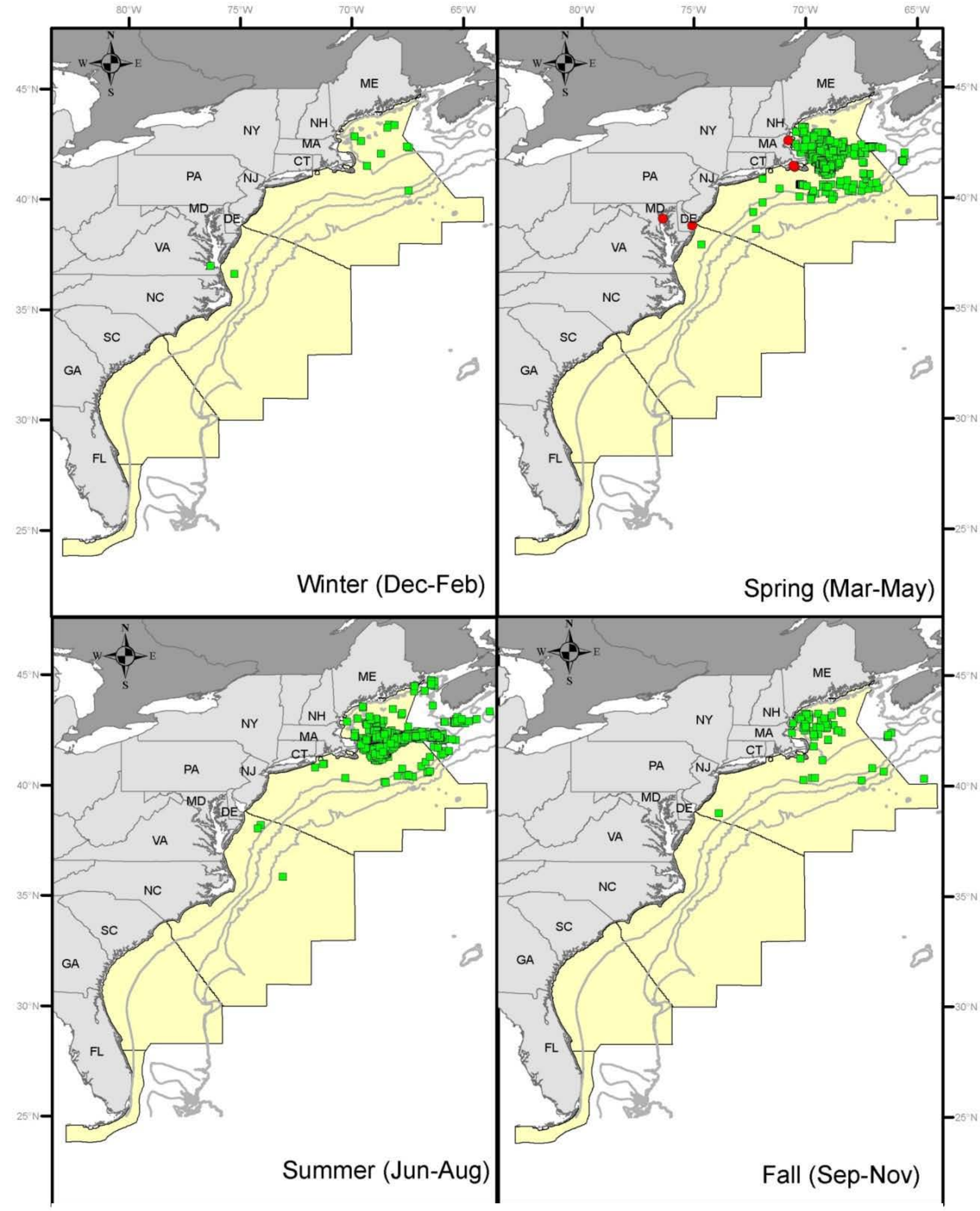

Figure 3-3. Sei whale sighting (green squares) and stranding (red circles) observations by season (Waring et al. 2012).

3.1.4 North Atlantic Right Whale (*Eubalaena glacialis*)

North Atlantic right whales are members of the family Balaenidae found in North Atlantic waters and are found seasonally in both coastal and shelf waters off the US Atlantic coast (Waring et al. 2012). North

Atlantic right whales are medium in size compared to other baleen whale species, with adult sizes ranging from 14–17 m (45–55 ft), where females are generally larger than males. The North Atlantic right whale is usually found within waters of the western North Atlantic between 20° N and 60° N latitude, a range that is from Cuba to Greenland. Generally, individual right whales undergo seasonal coastal migrations from summer feeding grounds off eastern Canada and the US northeast coast to winter calving grounds off the US southeast coast (Figures 3-4 and 3-5). Recent sightings data also show that a few North Atlantic right whales range as far as Newfoundland, the Labrador Basin, and southeast of Greenland (USDOI, BOEM 2012b). Research results suggest the existence of six major congregation areas for North Atlantic right whales, one of which being the coastal waters of the southeastern US (Waring et al. 2010). Threats to the North Atlantic right whale include commercial fishing interactions, vessel strikes, underwater noise, habitat degradation, and predators (USDOC, NMFS 2005; Waring et al. 2010). Additionally, discovery of paralytic shellfish poisoning toxins in both prey and fecal samples suggested that trophic transfer of marine algal toxins from zooplankton prey to North Atlantic right whales could be a contributing factor in the right whale population's failure to recover (Waring et al. 2012). The North Atlantic right whale is considered one of the most critically endangered whales (Jefferson, Webber, and Pitman 2008). The ESA lists it as endangered, and the western Atlantic stock is classified as strategic because the average annual human-related mortality and serious injury exceeds the Potential Biological Removal (PBR) level (Waring et al. 2010). In 2008, the NMFS listed the northern right whale (*Eubalaena spp*.) as two separate, endangered species: the North Pacific right whale (*E. Japonica*) and the North Atlantic right whale (*E. glacialis*) (Waring et al. 2012). In the North Atlantic Ocean, NMFS recognizes two extant groups of right whales: an eastern population and a western population (USDOC, NMFS 2013a). The minimum population size of the western Atlantic stock is estimated at approximately 444 individuals (Waring et al. 2013). In 1994, the NMFS designated three areas of critical habitat for the North Atlantic right whale along the eastern coast of the United States—two offshore Massachusetts and one along the coasts of Florida and Georgia (59 FR 28805). The critical habitat identified along Florida and Georgia is used primarily as a calving and nursery area (USDOC, NMFS 2013a). In 2009, NMFS received a petition to revise and expand the critical habitat to include the US coastal waters of New England Gulf, the Southeast, and the Mid-Atlantic; and the agency is continuing its review for potential revisions to the critical habitat rule (75 FR 193, October 6, 2010). In addition to critical habitat, SMAs for right whales have been designated to reduce ship strikes (see Section 2.2.1).

North Atlantic right whales are usually observed in groups of less than 12 individuals and most often as single individuals or in pairs; however, larger groups may be observed in feeding or breeding areas (Jefferson, Webber, and Pitman 2008). Right whales feed on zooplankton (e.g., calanoid copepods), generally by skimming through concentrated patches of prey at or below the sea surface. Grouping of individual right whales within their congregation areas is likely to be a function of acceptable prey distribution since right whales must locate and exploit extremely dense patches of zooplankton to feed efficiently (Mayo and Marx 1990). The North Atlantic right whale is considered to fall within the low-frequency cetacean functional hearing group (7 Hz–22 kHz) (Southall et al. 2007).

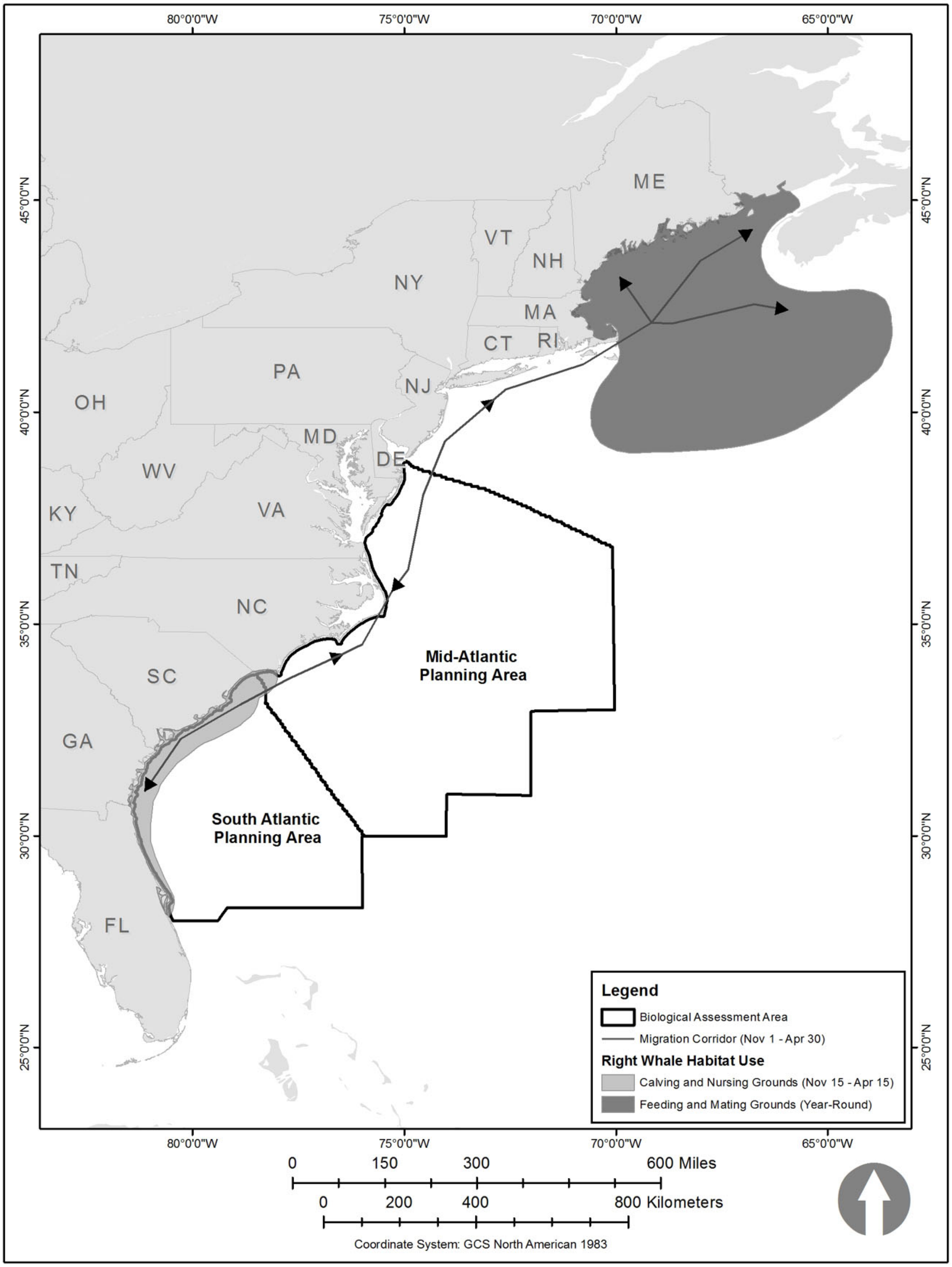

Figure 3-4. North Atlantic right whale seasonal distribution and habitat use along the Atlantic coast (USDOI, BOEM 2012b).

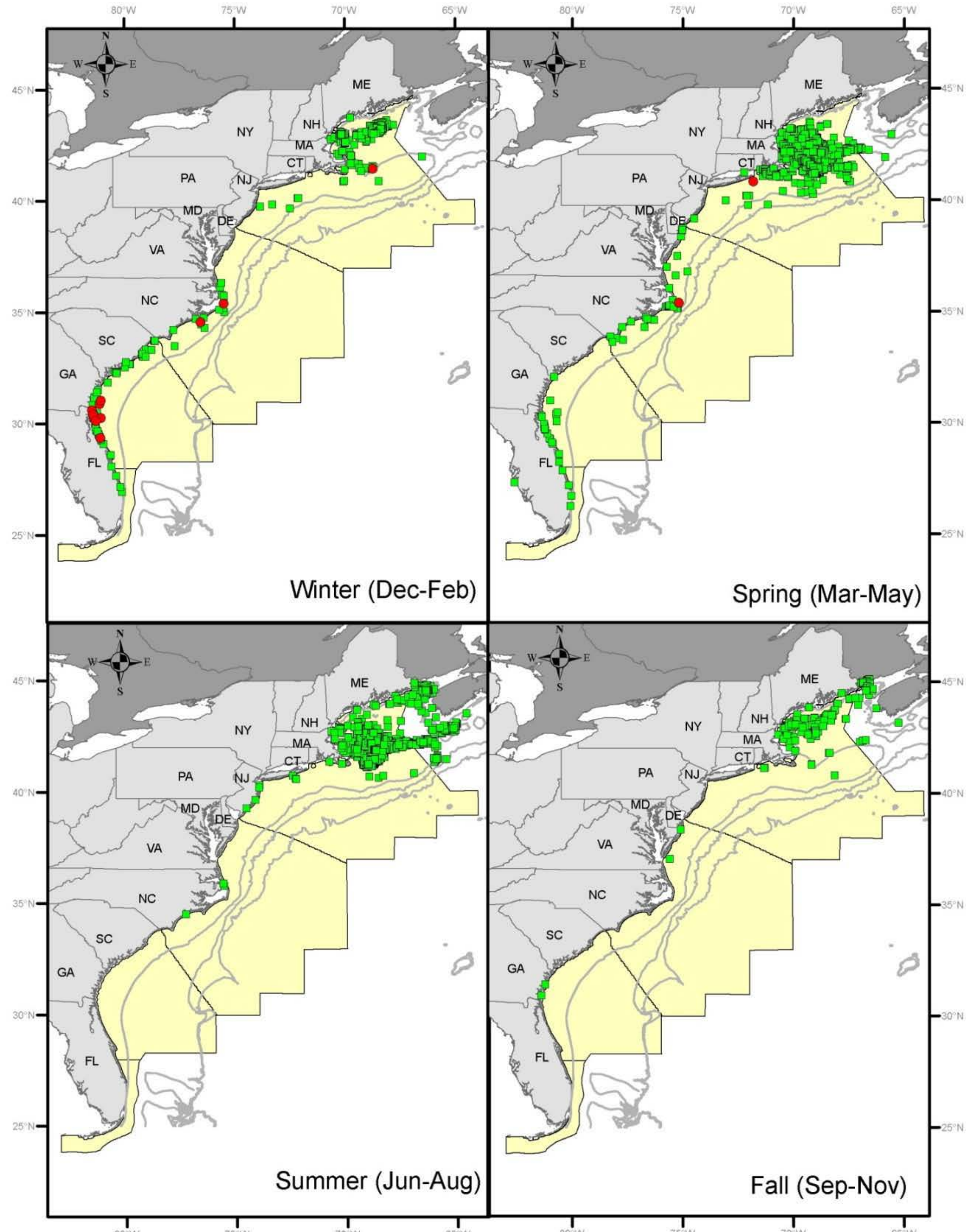

Figure 3-5. North Atlantic right whale sighting (green squares) and stranding (red circles) observations by season (Waring et al. 2012).

3.1.4.1 *Presence within the North Carolina Action Area*

The winter calving grounds and a segment of the migratory corridor are located within the Southeast Action Area. Offshore of North Carolina, north Atlantic right whales are most likely to be sighted during the months of December to May, migrating between summer feeding grounds in New England and winter calving grounds in the southeast offshore Georgia. Calving grounds are in the shallow coastal waters offshore Georgia and Florida. Some mother-calf pairs may use the area from Cape Fear, North Carolina, to South Carolina as a wintering/calving area, though most calving takes place south of the North Carolina Action Area (USDOC, NMFS 2005). Across the North Carolina Action Area, monthly average North Atlantic right whale sightings vary from one to 100 SPUE (USDOC, NMFS 2013b). There have been approximately 28 North Atlantic right whale sightings in the coastal waters of North Carolina during the months of December to May (Figure 3-5). North Atlantic right whales have also been sighted off the coast of North Carolina during the remainder of the year; however, those sightings are more uncommon, with only two sightings occurring during the months of June through November (Figure 3-5) (Waring et al. 2012). The North Carolina Action Area currently has no designated critical habitat.

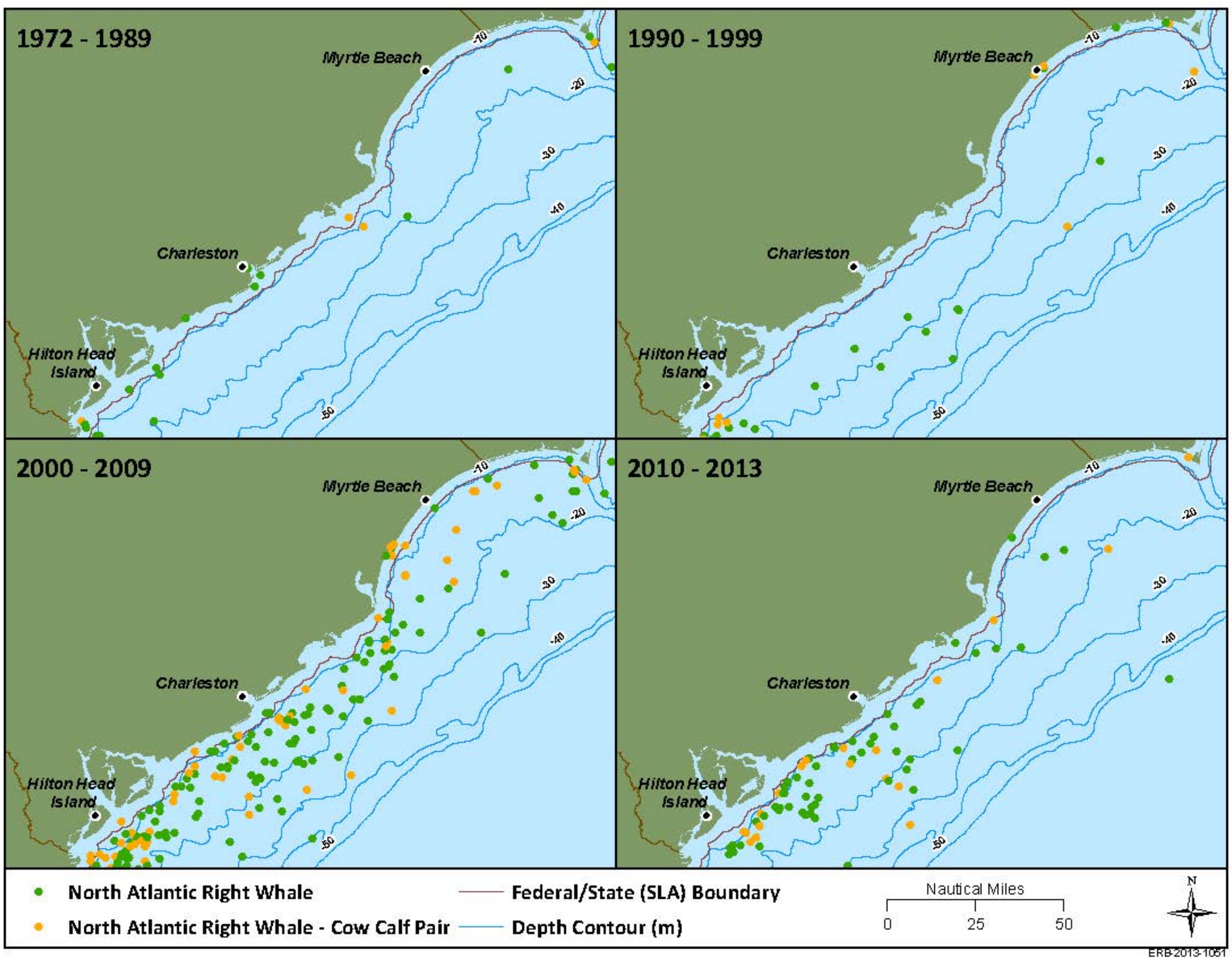

Figure 3-6. Decadal occurrence of North Atlantic right whales along the South Carolina coastline, March 1972–March 2013 (Right Whale Consortium 2013).

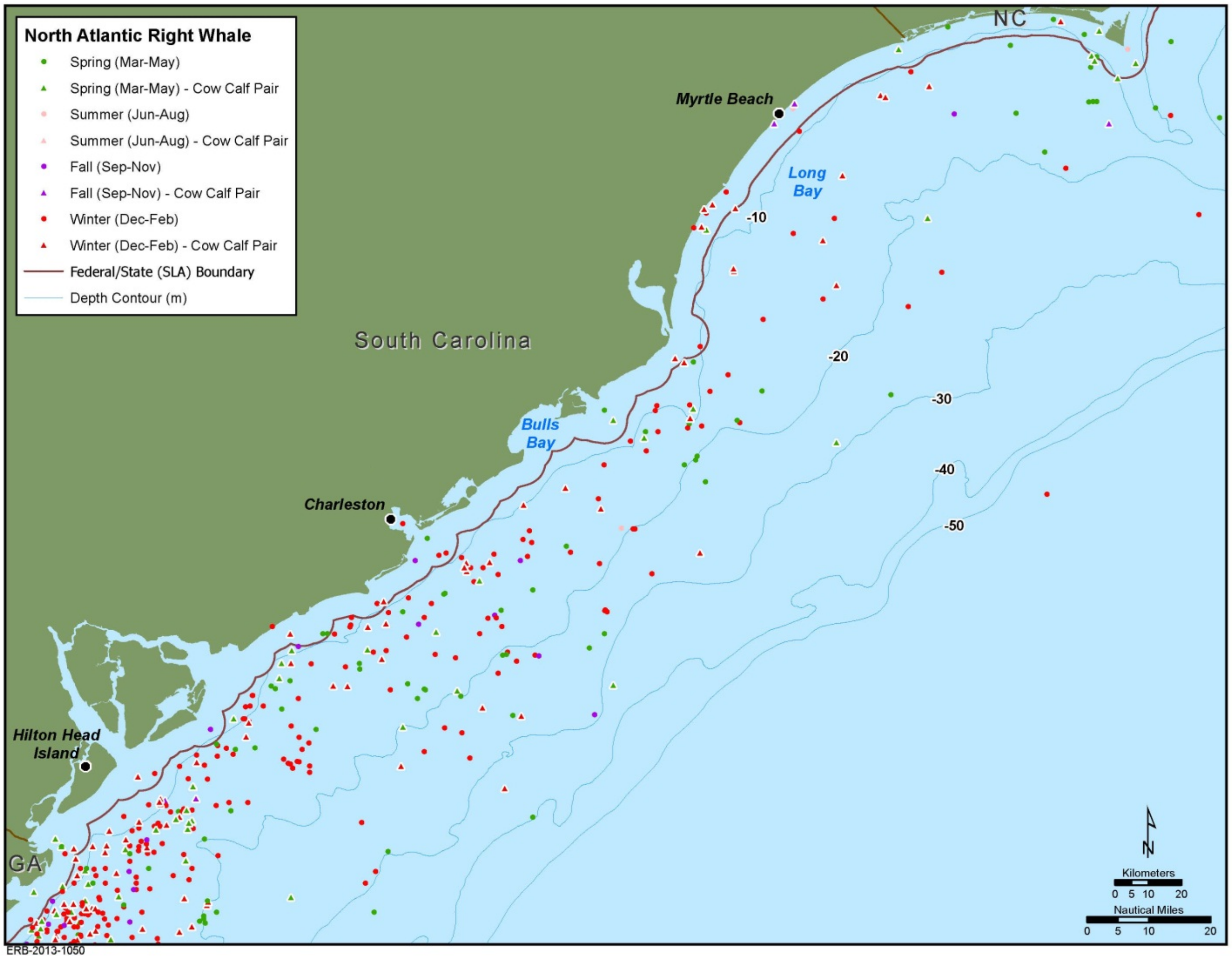

Figure 3-7. Seasonal occurrence of North Atlantic right whales along the South Carolina coastline March 1972–March 2013 (Right Whale Consortium 2013).

3.1.4.2 *Presence within the South Carolina Action Area*

North Atlantic right whales have been recorded along the entire South Carolina coastline since 1972, with a significant increase in sightings occurring between 2000–2009 compared to previous decades (Figure 3-6) (Right Whale Consortium 2013). Most of this increase is probably due to increased survey efforts, but distributional changes or an increase in numbers cannot be discounted. Seasonally, North Atlantic right whales occur along the South Carolina coastline mainly in winter and spring, followed by a few sightings in the fall, all generally occurring in water less than 50 m in depth (Figure 3-7). Females with calves are dispersed along the coastline and seen predominantly in the winter (Figure 3-7). Currently, the South Carolina Action Area has no critical habitat designated, but North Atlantic right whales are considered potential frequent visitors to the South Carolina Action Area during winter and spring months.

3.1.4.3 ***Presence within the Georgia Action Area*** According to 1986–2011 sighting data from the Right Whale Consortium (Figure 3-8), 24 right whale sightings (three mother-calf pairs) were recorded within the proposed Georgia lease areas. Figure 3-9 provides the seasonal distribution since 1997 of sighted North Atlantic right whales within the Georgia Action Area during the fall and winter (Right Whale Consortium 2013). Surveys also indicate that calving right whales frequently use waters off South Carolina and North Carolina, areas that are significantly north of the calving habitat offshore Florida and Georgia (Garrison 2007). Although the main feeding grounds are located offshore Canada and the northeastern United States, right whales also may feed, at least opportunistically, while migrating. Data suggest that not all reproductively active females return to calving and nursery grounds each year, and additional wintering and summering grounds may exist in unsurveyed locations of the western North Atlantic (USDOI, BOEM 2012b). As seasonal migrators, the North Atlantic right whales are considered potential frequent visitors to the Georgia Action Area during fall and winter months.

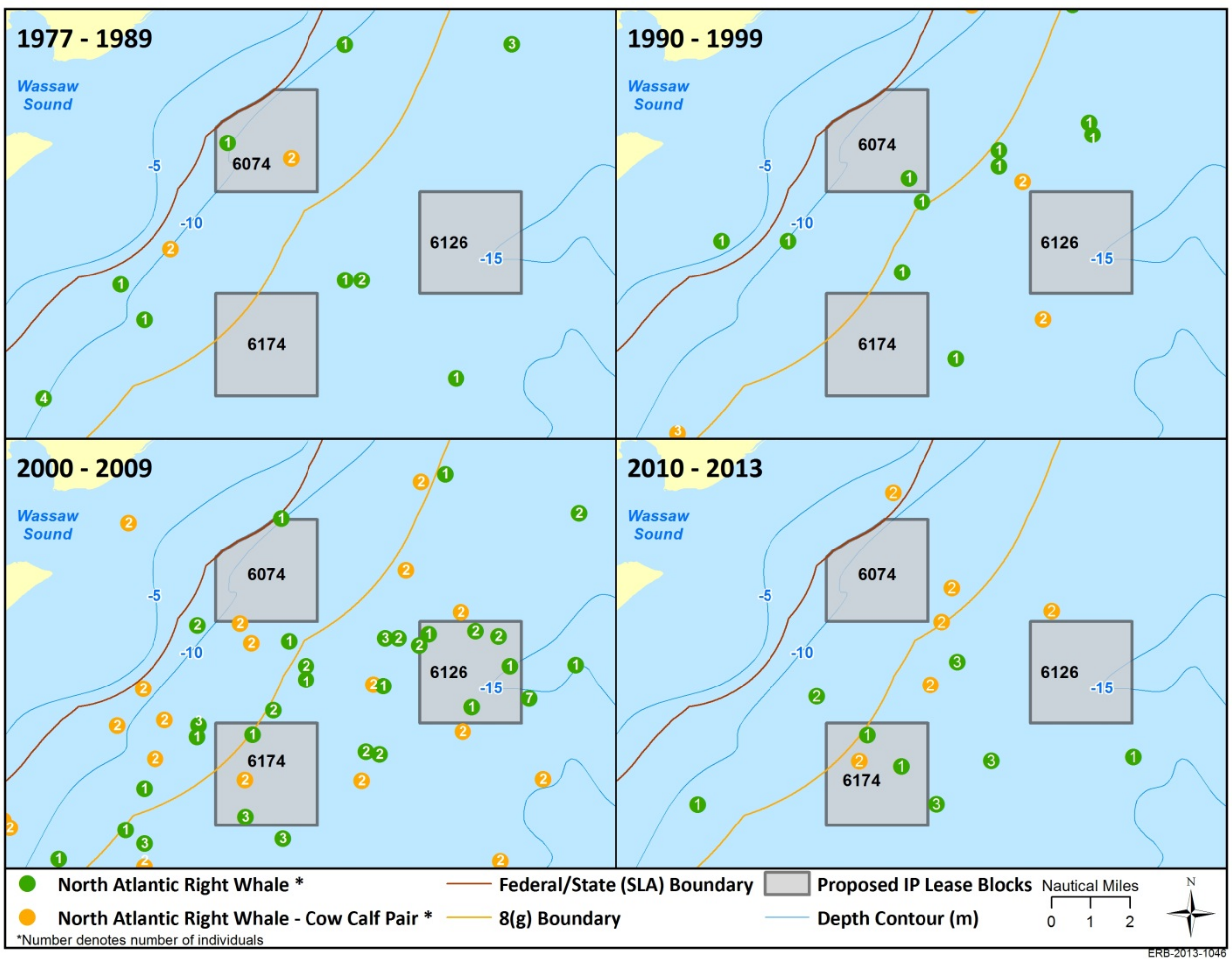

Figure 3-8. Decadal occurrence of North Atlantic right whales in and around GA Lease Blocks 6074, 6126 and 6174, January 1977–March 2013 (Right Whale Consortium 2013).

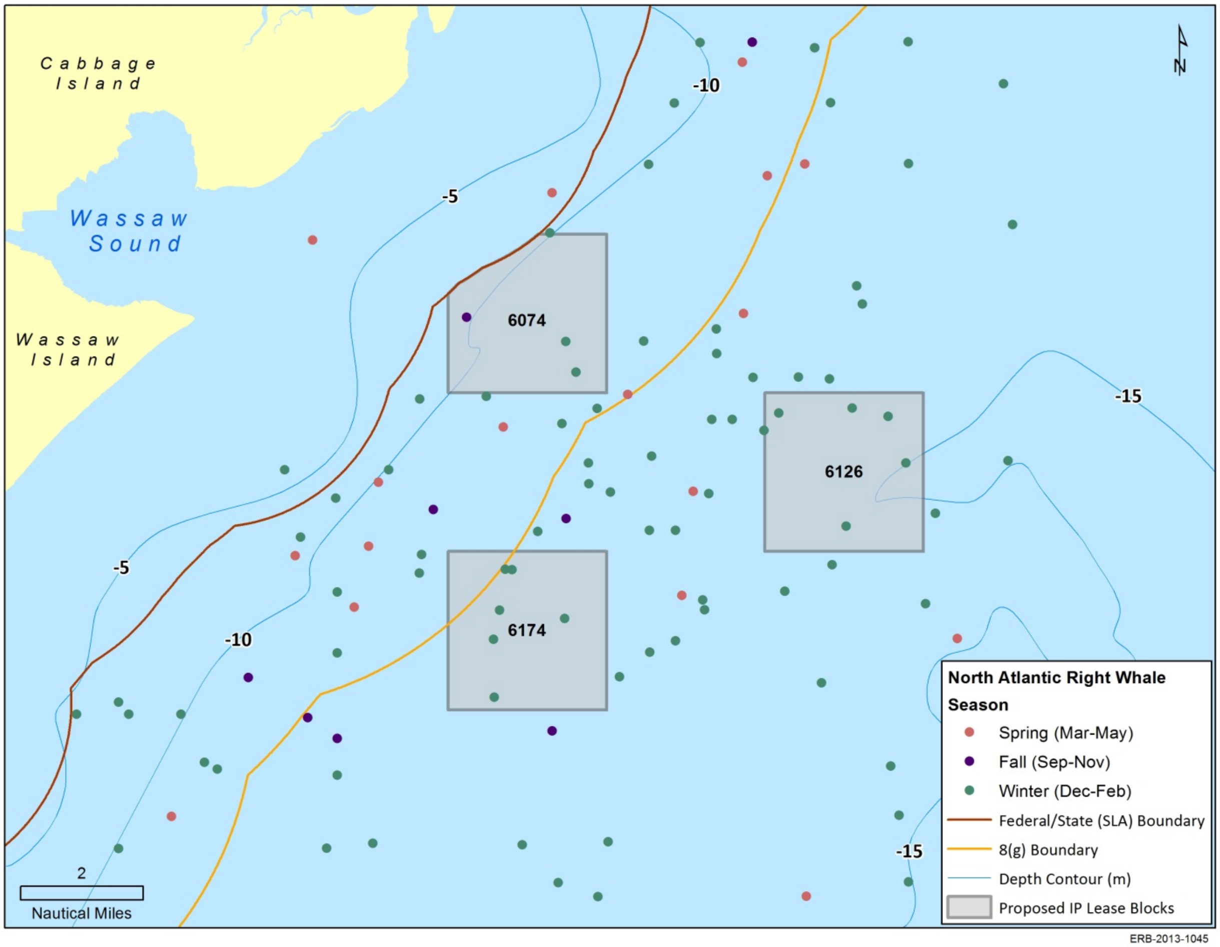

Figure 3-9. Seasonal occurrence of North Atlantic right whales in and around GA Lease Blocks 6074, 6126 and 6174, January 1977–March 2013 (Right Whale Consortium 2013).

3.1.5 Humpback Whale (*Megaptera novaeangliae*)

The humpback whale is a medium-sized (15–18 m or 50–60 ft in length), cosmopolitan whale that may be found from the equator to subpolar latitudes (though less common in the Arctic). Humpback whales are generally found within continental shelf areas and oceanic islands. Sightings data show that humpback whales traverse coastal waters of the southeastern United States (Waring et al. 2010). Whaling, commercial fishing, and shipping are known to threaten humpback whales (USDOC, NMFS 2013a). Humpback whales are currently listed as endangered under the ESA and on the IUCN Red List of Threatened Animals; however, the species is classified in the “Least Concern” category under the IUCN (USDOC, NMFS 2013a; Waring et al. 2012). NMFS has not designated critical habitat for the humpback whale. In 2000, the NMFS Atlantic Stock Assessment Team reclassified western North Atlantic humpback whales as a separate and discrete management stock (Gulf of Maine stock) (Waring et al. 2010), which has a current minimum population estimate of 823 individuals (Waring et al. 2013).

During winter, most whales from most North Atlantic feeding areas (including the Gulf of Maine) mate and calve in the West Indies, where spatial and genetic mixing among subpopulations occurs. Not all whales migrate to the West Indies every winter, and significant numbers of animals are found in mid- and high-latitude regions at this time. An increased number of sightings of humpback whales in the vicinity of the Chesapeake and Delaware Bays occurred in 1992 (Swingle et al. 1993). Wiley et al. (1995) stated that 38 humpback whale strandings occurred during 1985–1992 in the US Mid-Atlantic and southeastern states, while between 1990 and 2000, there were 52 known mortalities from the Mid-Atlantic region (Barco et al. 2002), which suggests the Mid-Atlantic region may also serve as wintering grounds for some Atlantic humpback whales, including juvenile humpbacks (Barco et al. 2002). Whether the increased numbers of sightings represent a distributional change or are simply due to an increase in sighting efforts and/or whale abundance is unknown (Waring et al. 2012). Humpback whales feed on krill and small schooling fishes (Jefferson, Webber, and Pitman 2008) and use unique behaviors; such as bubble nets, bubble clouds, and flashing their flukes and flippers; to herd and capture prey (USDOC, NMFS 1991). They are also one of the few species of baleen whales to use cooperative feeding techniques. Humpback whales are categorized within the low-frequency cetacean functional hearing group (7 Hz–22 kHz) (Southall et al. 2007).

3.1.5.1 *Presence within the North Carolina Action Area*

Across the North Carolina Action Area, monthly average humpback whale sightings vary from one to 10 SPUE (USDOC, NMFS 2013b). Several humpback whales have been sighted in the vicinity of the Kitty Hawk Call Area and Planning Areas 3 and 4 during the winter and spring months (Figure 3-10) (Waring et al. 2012). Approximately 20 sightings of humpback whales have occurred in the vicinity of the Kitty Hawk Call Area and Planning Areas 3 and 4. One sighting in the vicinity of Planning Area 4 has also occurred during the summer months (Waring et al. 2012).

3.1.5.2 *Presence within the South Carolina Action Area*

As indicated in Figure 3-10, two sightings of humpback whales have occurred in South Carolina in the spring as well as three recorded strandings in the spring and one stranding in the winter (Waring et al. 2012). These data suggest that although humpback whales may occur, they are currently known to occur infrequently in the South Carolina Action Area.

3.1.5.3 *Presence within the Georgia Action Area*

In addition to that of Figure 3-10, data from the Right Whale Consortium (2013) indicates that four sightings of humpback whales have been recorded within the Georgia Action Area (but not in the lease blocks) in 1992, 2000, 2002, and 2007, amounting to seven individuals. These data suggest that although humpback whales may occur, they are currently known to occur infrequently in the Georgia Action Area.

3.1.6 Sperm Whale (*Physeter macrocephalus*)

The sperm whale is the largest toothed cetacean, occurring in every ocean except the Arctic Ocean, and typically found along the continental slope or deeper water (Taylor et al. 2008). Off the US Atlantic coast, sightings of sperm whales are concentrated along the shelf break from Cape Hatteras to Georges Bank, primarily in the BOEM Mid-Atlantic and North Atlantic planning areas (Waring et al. 2011).

Three human activities are known to threaten sperm whales: whaling, entanglement in fishing gear, and shipping. Additionally, ship strikes kill sperm whales (USDOC, NMFS 2013a). The sperm whale is currently listed as endangered under the ESA, and in the "vulnerable" category under the IUCN (Waring et al. 2012). Since 1981, the IWC has protected sperm whales have been protected from commercial harvest by the IWC since 1981. NMFS has not designated critical habitat for the sperm whale (USDOC, NMFS 2010b). The IWC recognizes all sperm whales within the northern Atlantic as one stock (North Atlantic stock). Several population estimates from selected regions of sperm whale habitat exist for select time periods; however, at present there is no reliable estimate of total sperm whale abundance in the western North Atlantic (Waring et al. 2013). According to Waring et al. (2013), the best current sperm whale population estimate for the western North Atlantic is 1,593 individuals.

Sperm whales are usually found in medium to large "family unit" groups of 20 to 30 females and their young. Young males leave their natal unit group at an age of four to 21 years old and form loose aggregations called "bachelor schools" with other males of approximately the same age. Older males are usually solitary (Whitehead 2002). Sperm whales feed primarily on cephalopods (squids and octopi) and demersal and mesopelagic fishes (Whitehead 2002; Jefferson, Webber, and Pitman 2008; USDOC, NMFS 2010b). Sperm whales are categorized within the mid-frequency cetacean functional hearing group (150 Hz–160 kHz) (Southall et al. 2007).

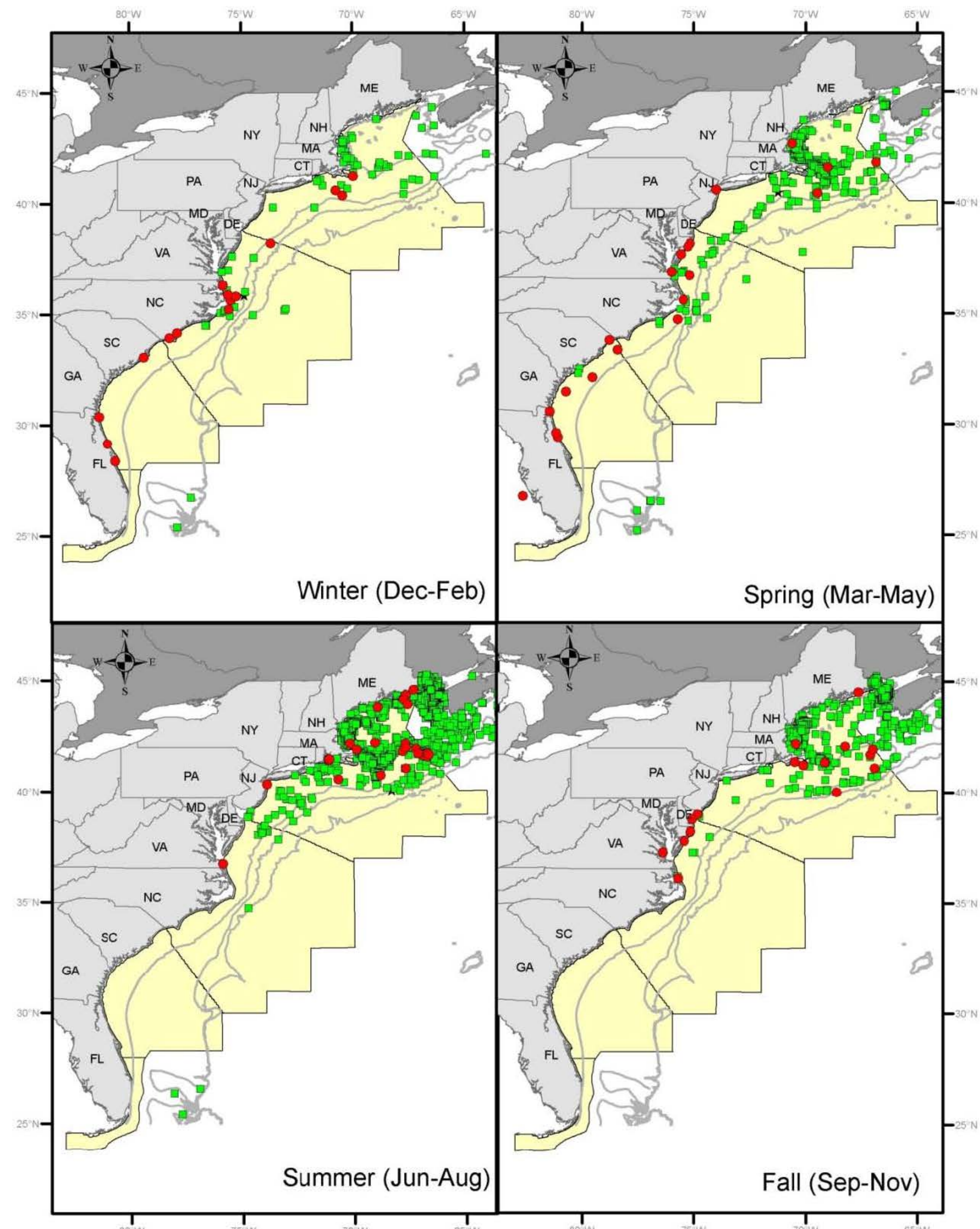

Figure 3-6 Humpback whale sighting (green squares) and stranding (red circles) observations by season (Waring et al. 2012).

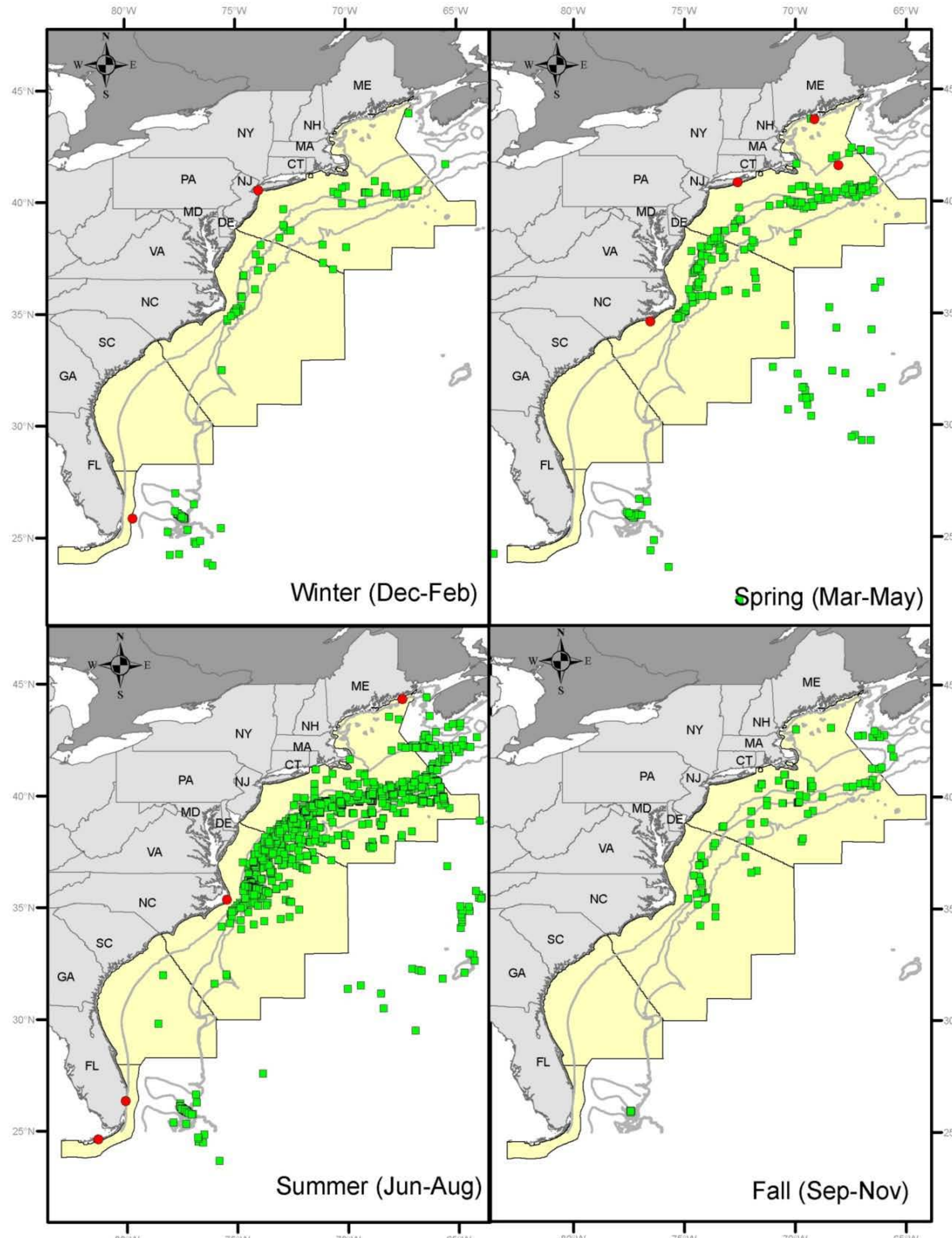

Figure 3-7. Sperm whale sighting (green squares) and stranding (red circles) observations by season (Waring et al. 2012).

3.1.6.1 *Presence within the Southeast Action Area*

Off the US Atlantic coast, sightings of sperm whales are concentrated along the shelf break from Cape Hatteras to Georges Bank, primarily in the BOEM Mid-Atlantic planning areas (Waring et al. 2012). In the western North Atlantic, sperm whales demonstrate a distinct seasonal distribution pattern. In winter, sperm whales concentrate east and northeast of Cape Hatteras. In spring, the distribution center moves northward to waters east of Delaware and Virginia with some individuals found from the central portion of the Mid-Atlantic Bight to the southern portion of Georges Bank. In summer, the distribution also includes continental slope and shelf waters as far as southern New England. In the fall, sperm whale occurrence on the continental shelf and shelf edge is highest in the Mid-Atlantic Bight (USDOI, BOEM 2012b).

The North Carolina Action Area has had several sperm whale sightings year-round; however, the majority of the sightings have occurred during the summer months. These sightings occurred in the vicinity of the Kitty Hawk Call Area and Planning Areas 3 and 4 (Figure 3-11) (Waring et al. 2012).

From 2001–2005 there were 15 reported sperm whale strandings along the US Atlantic coast. Of these strandings one was in South Carolina while six were in Florida. Georgia had no strandings. While the sperm whale may be found in southern waters, it is not a frequent visitor to the Southeast Action Area.

3.1.7 West Indian Manatee, Florida subspecies (*Trichechus manatus latirostris*)

The Florida subspecies of the West Indian manatee is the only sirenian that occurs along the eastern coast of the United States. The average adult West Indian manatee ranges from 3 m – 4 m (10 ft – 13 ft) in length and from 362 kg to 544 kg (800 lbs to 1,200 lbs) in weight (USDOI, BOEM 2012). Florida manatees face anthropogenic problems of two types: direct threats such as strikes by watercraft and threats to manatee habitat, including propeller scarring of seagrass beds (Deutsch et al. 2003).

The Florida manatee is currently listed as endangered under the ESA and a “strategic stock” under the MMPA. The species is also protected under the Florida Manatee Sanctuary Act. The majority of the Atlantic population of the Florida manatee is located in eastern Florida and southern Georgia and managed within four distinct regional management units (USDOI, BOEM 2012).

Manatees are herbivorous, feeding on a wide array of aquatic (freshwater and marine) plants such as water hyacinths and marine seagrasses. They generally prefer shallow seagrass beds, especially areas with access to deep channels. Manatees inhabit the relatively narrow band of water that lies between the barrier beaches and the mainland, occasionally venturing into the ocean close to shore (Deutsch et al. 2003). Manatees use preferred coastal and riverine habitats (e.g., near the mouths of coastal rivers) for resting, mating, and calving (USDOI, BOEM 2012a). Critical habitat was designated for the Florida manatee on September 24, 1976, and includes inland waterways in four northeastern Florida coastal counties (Brevard, Duval, St. Johns, and Nassau) adjacent to the BA Area (USDOI, BOEM 2012b).

3.1.6.1 *Presence within the Southeast Action Area*

Within the northwestern Atlantic, manatees occur in coastal marine, brackish, and freshwater areas from Florida to Virginia, with occasional sightings as far north as Rhode Island (Deutsch et al. 2003), and another manatee was observed in New York (Long Island). Because they have little tolerance for cold, they are generally restricted to inland and coastal waters of peninsular Florida during the winter where they shelter in or near sources of warm water (springs, industrial effluents, and other warm-water sites) (USDOI, BOEM 2012b).

Within the Southeast Action Area, manatees are anticipated to occur seasonally in coastal waters from Georgia to southern South Carolina. In warmer months, Florida manatees range up and down the Georgia coast, particularly southeastern Georgia, appearing as early as March and staying as late as December, depending on the weather, water temperature, and sources of warm water (Deutsch, Self-Sullivan, and Mignucei-Giannoni 2008). The general migration pattern for manatees is characterized by movements to specific core areas that are used for prolonged periods. Manatees have used waters within or adjacent to Savannah, Pinckney Island, Tybee, Wassaw, Harris Neck, and Blackbeard Island NWRs during the summer, feeding in the tidal creeks on various marsh plants (USDOI, USFWS 2012a).

The Atlantic population located in eastern Florida and southern Georgia is managed within four distinct regional management units: Atlantic Coast (northeast Florida to the Florida Keys), Upper St. Johns River (St. Johns River, south of Palakta), Northwest (Florida panhandle to Hernando County), and Southwest (Pasco County to Monroe County). The Atlantic Coast regional management unit is the most relevant to and encompasses the BA Area. A minimum population estimate of Florida manatees is 4,834 individuals (USDOI, USFWS 2012a).

Seventy-eight satellite-tagged Florida manatees revealed that the habitats used by manatees along the 900 km stretch of coastline between the Florida Keys and southern South Carolina varied widely and included estuaries, lagoons, rivers and creeks, shallow bays and sounds, and ocean inlets (Deutsch et al. 2003). Although manatees may occur within the Southeast Action Area, considering their shallow water habitat preferences, this would be an unlikely and uncommon event. BOEM estimates the maximum hearing range for the manatee to be from 0.4 to 46 kHz, but primarily within the 3-5 kHz range (BOEM 2012b).

3.2 Sea Turtles

Five federally-listed sea turtles are found within the Southeast Action Area: the loggerhead turtle, green turtle, hawksbill turtle, Kemp's ridley turtle, and the leatherback turtle (Table 2). Because sea turtles use terrestrial (nesting) and marine environments at different life stages, the USFWS and NMFS share jurisdiction over sea turtles under the ESA; the USFW has jurisdiction over nesting beaches, and NMFS has jurisdiction in the marine environment.

3.2.1 Green Sea Turtle (*Chelonia mydas*)

The green sea turtle is a circumglobal species that is found in the Mediterranean Sea and Pacific, Indian, and Atlantic Oceans, generally found in tropical and subtropical waters between 30° N and 30° S latitude, and, to a lesser extent, in temperate waters. The green sea turtle is the largest cheloniid sea turtle, with adults reaching up to 0.91 m (3 ft) in carapace length and ranging between 136 and 159 kg (300 and 350 lbs) in mass. Three human activities are known to threaten green sea turtles: overharvests of individual animals, incidental capture in commercial fisheries, and human development of coastlines (USDOC, NMFS 2013a). Conservation and recovery strategies have been implemented since green sea turtles were listed under the protection of the ESA in 1978 and include restrictions on beach lighting and hopper dredging during the sea turtle nesting season. Nesting data indicate that between 200 and 1,100 females nest annually on continental U.S. beaches along the eastern coast of the United States.

The green sea turtle diet consists of seagrasses and macroalgae. Nesting generally occurs from June to September in the southeastern United States, and during this time, green turtles can be found on various coastal beaches. After leaving the nest, green sea turtle hatchlings swim along nearshore or offshore waters from Florida to Massachusetts to areas of convergence zones characterized with driftlines and patches of *Sargassum* (USDOC, NMFS and USDOI, FWS 2007a). After nesting, green turtles are found feeding or swimming along nearshore or offshore waters from Florida to Massachusetts. Juvenile green sea turtles occupying developmental habitats north of Florida must migrate south in autumn (Musick and Limpus 1997). Satellite tagging data indicate that green sea turtles display highly migratory behavior, making vast seasonal and annual transoceanic migrations (Godley et al. 2003; Godley et al. 2008; Godley et al. 2010).

The Southeast Action Area has no designated critical habitat for the green sea turtle.

3.2.1.1 *Presence in the North Carolina Action Area*

In the North Carolina Action Area, several satellite-tagged green sea turtles have been tracked in the vicinity of all call and planning areas (Figure 3-12) (Waring et al. 2012). Additionally, there have been four sightings of green sea turtles in the vicinity of the Kitty Hawk Call Area and Planning Area 4 (Figure 3-13) (Waring et al. 2012). Green sea turtles are reported to use the coastal waters of North Carolina as summer foraging habitat (Mansfield et al. 2009) and therefore may occur within nearshore and inshore habitats in the North Carolina Action Area. No green sea turtle nests were recorded from 2001-2007 in North Carolina, but three nests were recorded in 2009 and 18 nests in 2010 (Waring et al. 2012).

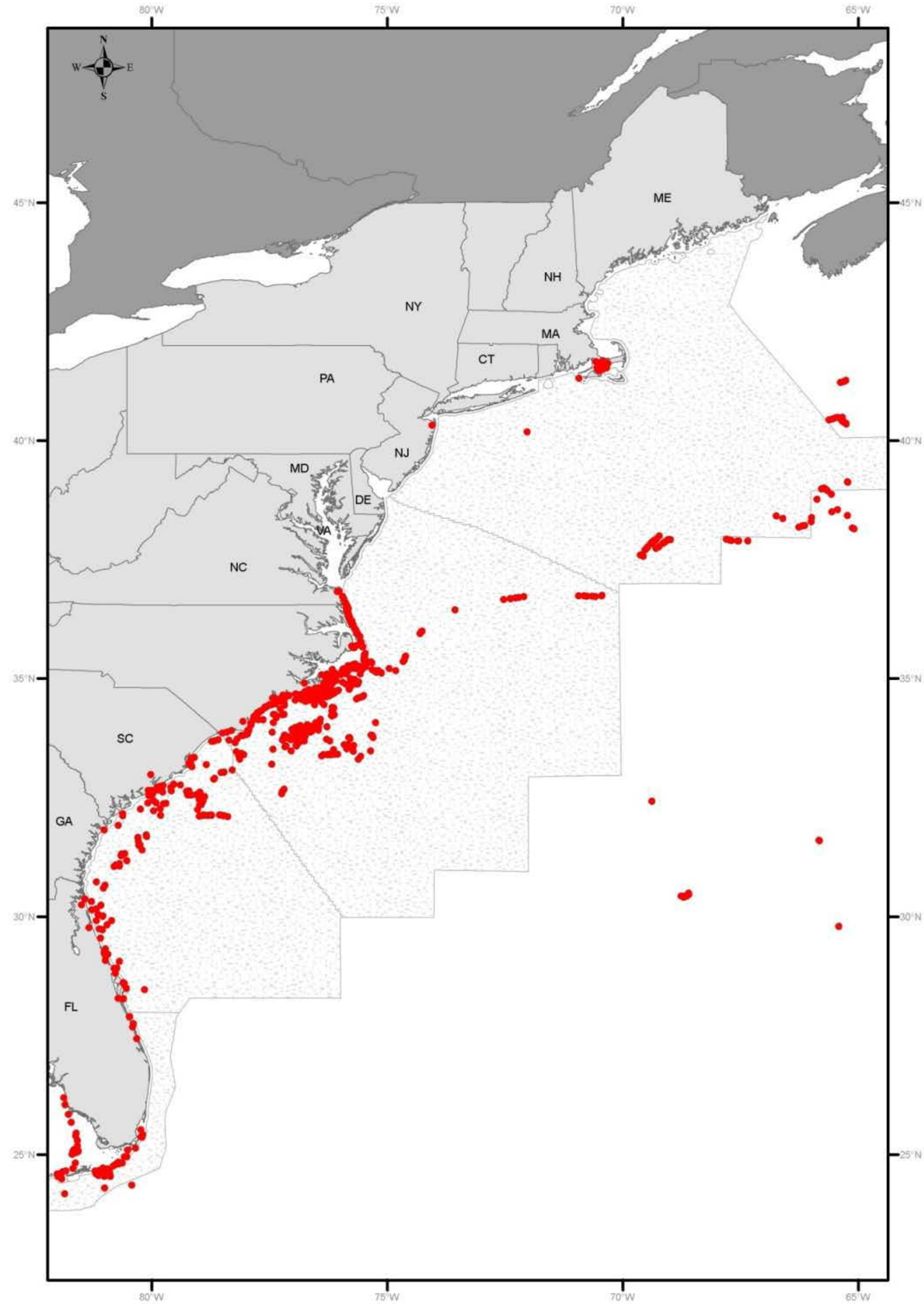

Figure 3-8. Positions of satellite-tagged green sea turtles (Waring et al. 2012).

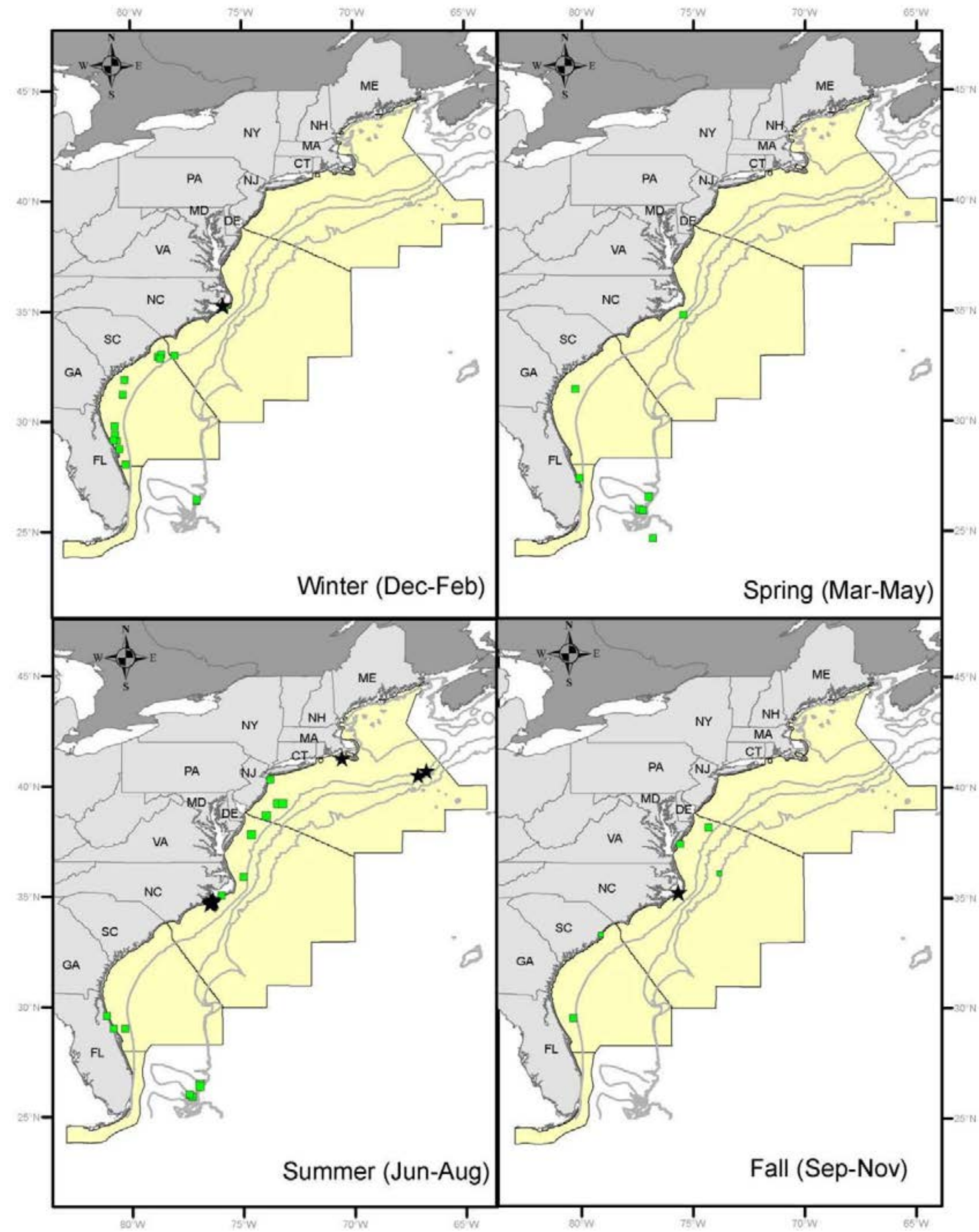

Figure 3-9. Green sea turtle sighting (green squares) and fishery by-catch (black stars) observations by season (Waring et al. 2012).

3.2.1.2 *Presence in the South Carolina Action Area*

According to Waring et al. (2012), a few sightings of green sea turtles have been made in winter and fall, with most sightings occurring in the winter time and tracks of satellite-tagged green turtles are shown in Figure 3-13. Extremely few nests are found along South Carolina beaches, ranging from less than one per year from 2001–2009 and then six in 2010 (Waring et al. 2012).

3.2.1.3 *Presence in the Georgia Action Area*

During surveys from 2001–2010, only six green sea turtle nests in 2010 were counted on Georgia beaches (Waring et al. 2012). A few sightings have been noted in winter and spring (Figure 3-12), but satellite tagging revealed more green sea turtle movements off the Georgia coast (Figure 3-13).

3.2.2 Hawksbill Sea Turtle (*Eretmochelys imbricata*)

The hawksbill sea turtle is a small- to medium-sized circumglobal species found in the Pacific, Indian, and Atlantic Oceans (USDOC, NMFS and USDOI, FWS 2007b). In the North Atlantic, the hawksbill sea turtle can be found from Florida to Massachusetts; however, they are rarely reported north of Florida (Waring et al. 2012). Hawksbill sea turtles primarily nest on Mexican (Yucatán Peninsula) and Caribbean (Puerto Rico [Culebra, Mona, and Vieques Islands] to Barbados) beaches; nesting along the Atlantic Coast is rare (Waring et al. 2012). The hawksbill sea turtle is threatened by many ongoing anthropogenic threats including commercial fishery interactions, habitat loss (e.g., reefs), global climatic changes (sea level rise), and fibropapillomatosis, which is a viral disease that causes tumors in affected turtles (USDOC, NMFS and USDOI, FWS 2007b; USDOC, NMFS 2013). The continued overutilization of hawksbill sea turtles for commercial, recreational, scientific, or educational purposes is another major threat to the recovery of the species (USDOC, NMFS and USDOI, FWS 2007b). The hawksbill sea turtle is currently listed as endangered under the ESA and “Critically Endangered” on the IUCN list (Waring et al. 2012).

Adult hawksbill sea turtles specialize on a diet of sponges and feed selectively on specific species of demosponges (Bjorndal 1997). They may also consume a variety of other food items, such as algae and other benthic invertebrates (Márquez-M 1990). Hawksbill sea turtles display highly migratory behavior with satellite tagging data demonstrating that these turtles display both short and long migrations from nesting to foraging grounds (USDOC, NMFS and USDOI, FWS 2007b; Blumenthal et al. 2009).

The Southeast Action Area has no designated critical habitat for the hawksbill sea turtle.

3.2.2.1 *Presence within the Southeast Action Area*

There have been no sightings of hawksbill sea turtles in the Southeast Action Area; however, there have been two fishery by-catch observations in the vicinity of the Kitty Hawk Call Area in North Carolina (Figure 3-14) and zero to one strandings have been recorded in both South Carolina and Georgia (Figure 3-15) (Waring et al. 2012). The above description indicates the hawksbill sea turtle is an infrequent visitor to the BA Area.

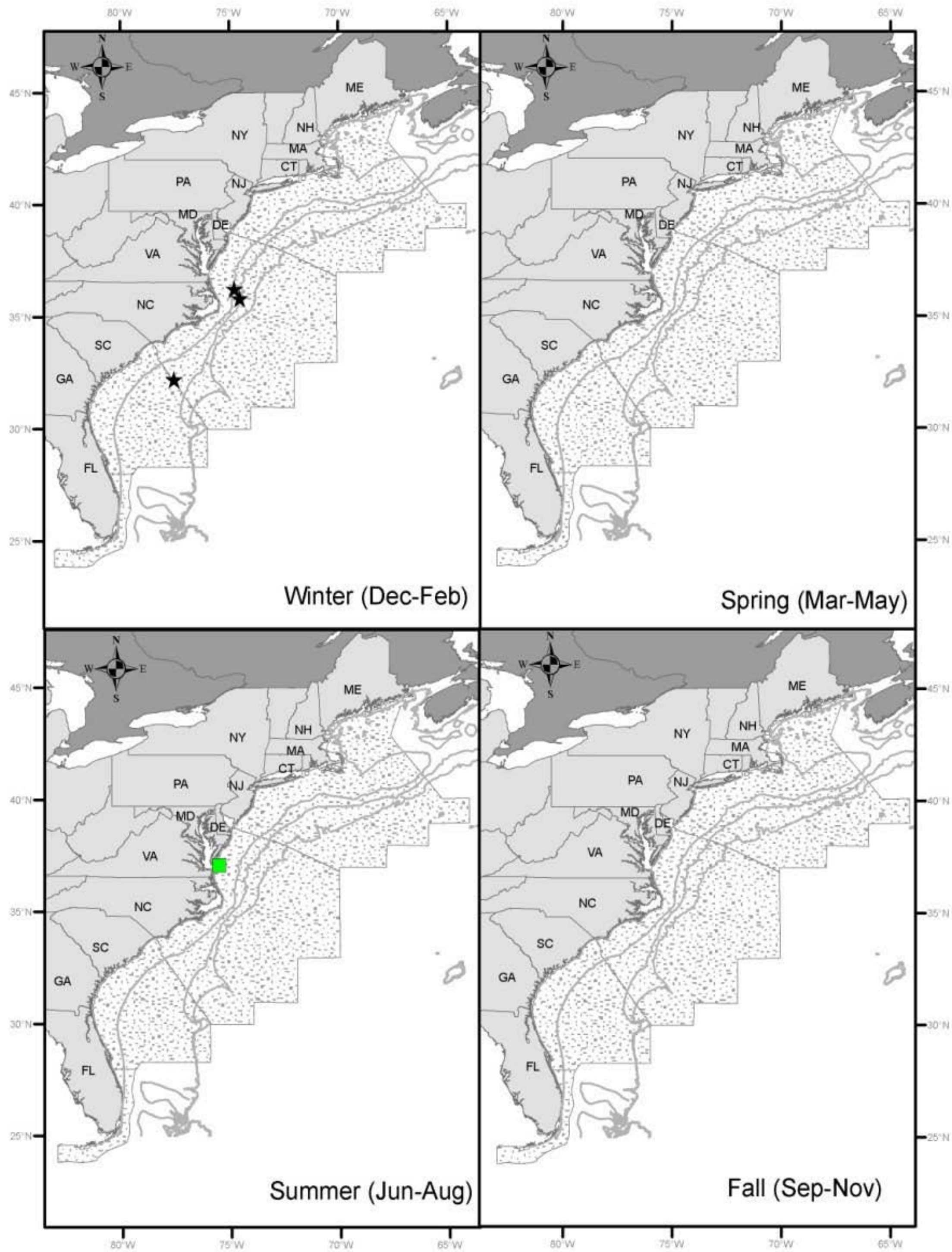

Figure 3-10. Hawksbill sea turtle sighting (green squares) and fishery by-catch (black stars) observations by season (Waring et al. 2012).

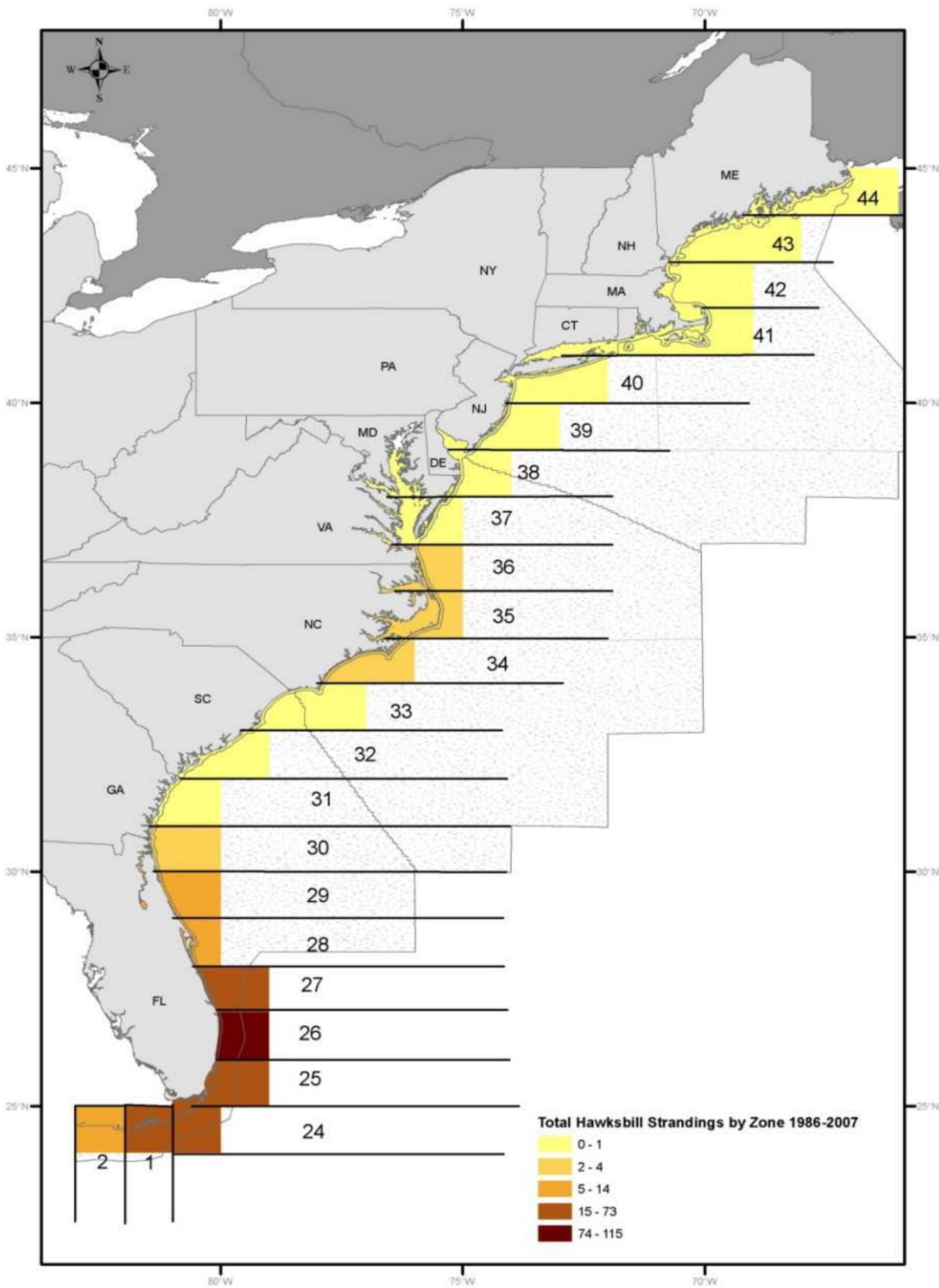

Figure 3-11. Hawksbill sea turtle strandings by zone (Waring et al. 2012).

3.2.3 Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

The Kemp's ridley sea turtle is the smallest sea turtle, generally found in the Gulf of Mexico and occasionally sighted along the East Coast from Florida to New England (USDOC, NMFS et al. 2010). The severe decline in the Kemp's ridley sea turtle population appears to have been heavily influenced by a combination of exploitation of eggs, impacts from fishery interactions, loss of foraging habitat, and marine pollution (USDOC, NMFS 2013a). The Kemp's ridley sea turtle is currently listed as endangered under the ESA. The population is severely depleted, and it is considered the most endangered sea turtle species (USDOI, FWS 1999a). The current population estimate of Kemp's ridley sea turtles is approximately 738 females. The USFWS and NMFS have not designated critical habitat for the Kemp's ridley sea turtle.

The Kemp's ridley sea turtle is a carnivore throughout its life cycle (Márquez-M 1990). Adult and subadult Kemp's ridley sea turtles are benthic feeders that primarily feed on crabs. Other preferred food items include shrimps, mollusks, sea urchins, and fishes (opportunistically) (USDOC, NMFS et al. 2010). Similar to other sea turtles, Kemp's ridley sea turtles display some seasonal and coastal migratory behavior. Coles (1999) indicated that the Mid-Atlantic Bight is an important foraging area for juvenile Kemp's ridley sea turtles during spring through fall. Satellite tagging data indicate that Kemp's ridley sea turtles transit between nearshore and offshore waters (within 28 km [50 mi] from shore) from spring/summer to fall/winter, which coincides with seasonal water temperature changes (USDOC, NMFS et al. 2010). Foraging areas along the Atlantic coast include various embayments and estuarine systems from Florida to New York.

3.2.3.1 *Presence within the North Carolina Action Area*

In the North Carolina Action Area, Kemp's ridleys sea turtle sightings have been noted year-round; however, the majority of the sightings have occurred in the winter and spring months. Kemp's ridley sea turtles have also been sighted during the summer and fall months, but these sightings are rarer, with approximately 10 occurring in the vicinity of the Kitty Hawk Call Area and Planning Area 4 (Figure 3-16) (Waring et al. 2012). There is some evidence of Kemp's ridley sea turtles nesting on beaches within the North Carolina Action Area, but this is considered rare (USDOC, NMFS et al. 2010). In 2010 there were two isolated nesting events: one in the vicinity of the Wilmington Call Areas and one in the vicinity of the Kitty Hawk Call Area (Figure 3-17). Approximately eight satellite-tagged Kemp's ridley sea turtles have been observed in the vicinity of Planning Area 3 and the Wilmington Call Areas (Waring et al. 2012).

3.2.3.2 *Presence within the South Carolina Action Area*

Sightings of Kemp's ridley sea turtles occur mainly in winter, with a few sightings in the spring season off the coast of South Carolina (Figure 3-16). One nesting site was recorded in 2007 (Figure 3-17).

3.2.3.3 *Presence within the Georgia Action Area*

The range of Kemp's ridley sea turtles is shown in Figure 3-16, and the nesting locations are shown in Figure 3-17 (Waring et al. 2012). The Governors' South Atlantic Alliance portal (http://gsaaportal.org/ explore/catalog) presents data collected from trawl surveys conducted in waters adjacent and throughout the Southeast Action Area. According to Mike Arendt of the South Carolina Department of Natural Resources, the Kemp's ridley sea turtle makes up approximately 30 percent of sea turtle captures during these surveys, indicating that the Kemp's ridley sea turtle is found in nearshore waters adjacent to the Georgia Action Area (Avanti 2013).

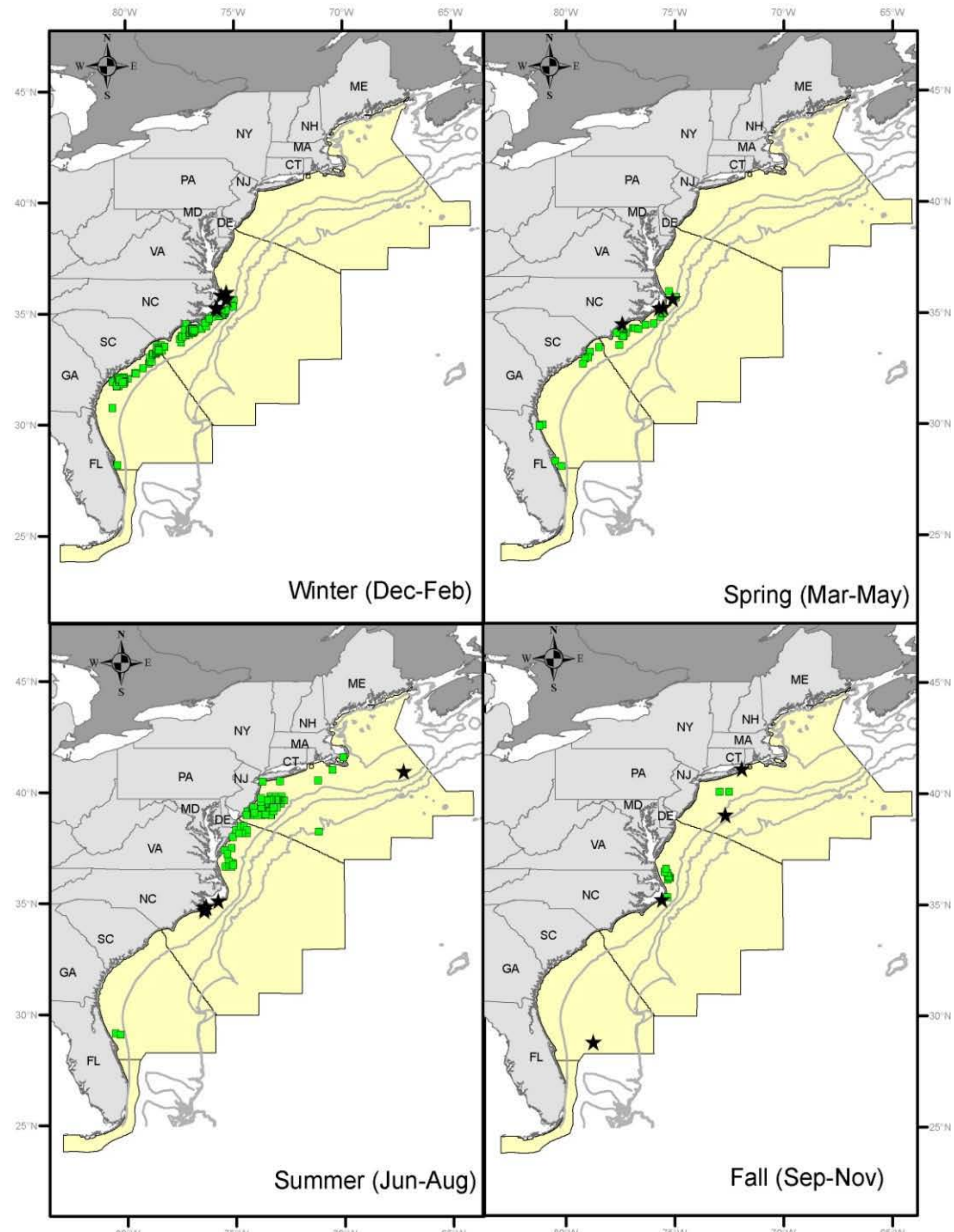

Figure 3-12. Kemp's ridley sea turtle sighting (green squares) and fishery by-catch (black stars) observations by season (Waring et al. 2012).

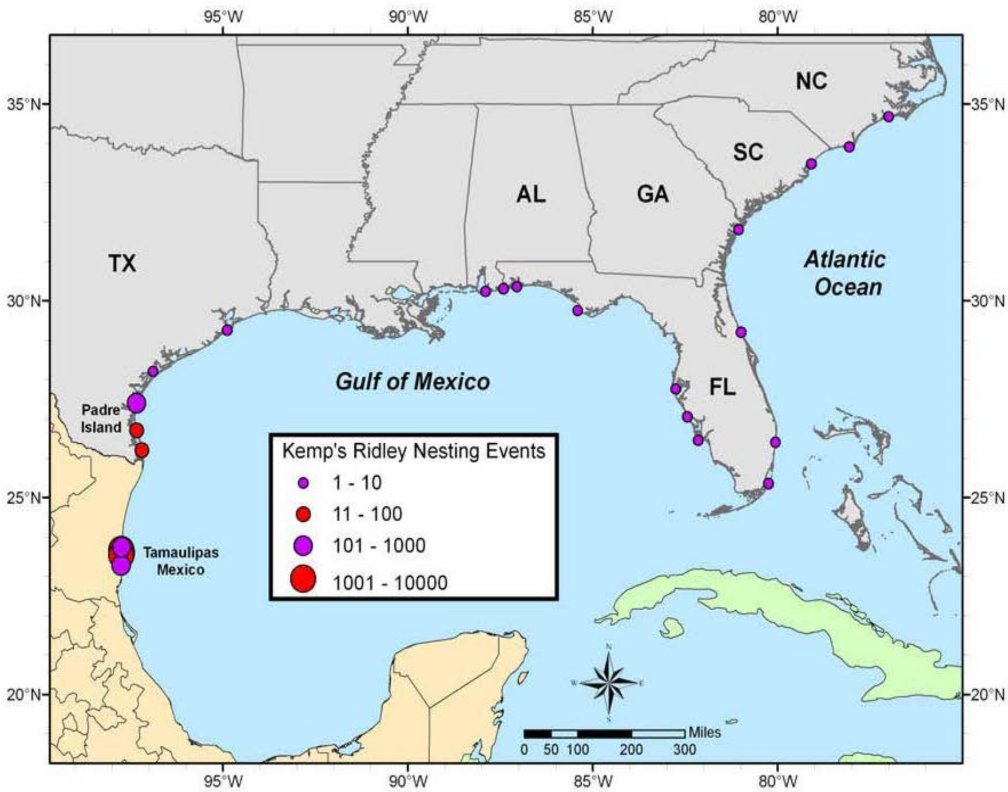

Figure 3-13. Kemp's ridley sea turtle nesting locations in 2007 (Waring et al. 2012).

3.2.4 Leatherback Sea Turtle (*Dermochelys coriacea*)

The leatherback sea turtle is the largest sea turtle, with adults reaching up to 1.8 m (6 ft) in carapace length and 907 kg (2,000 lb) in mass. Leatherback sea turtles have various anthropogenic threats to their recovery which include commercial fisheries; habitat loss (nesting); climate change (e.g., sea level rise, shifts in prey availability); pollution; overutilization for commercial, recreational, scientific, or education purposes (e.g., egg harvesting); and disease (USDOC, NMFS and USDOI, FWS 2007c). The leatherback sea turtle is currently listed as endangered under the ESA and "Critically Endangered" by the IUCN (Waring et al. 2012). The most recent population estimate for leatherback sea turtles in the Atlantic is between 34,000 and 94,000 (USDOC, NMFS and USDOI, FWS 2007c). Recent survey data clearly show that nesting numbers have dramatically increased from 98 nests in 1988 to around 850 nests in the early 2000s (USDOC, NMFS and USDOI, FWS 2007c). Using the number of nests as a population index, the estimated annual growth rate for leatherback sea turtles is around 17 percent (USDOC, NMFS and USDOI, FWS 2007c). The principal nesting beaches for leatherback sea turtles are well south of the North Carolina Action Area, in Florida, although they can range as far north as Georgia (Márquez-M 1990; Ernst, Lovich, and Barbour 1994). This is supported by the South Carolina Department of Natural Resources (SCDNR 2005), which reports that leatherback sea turtles have been documented to nest in Georgia, South Carolina (four leatherback sea turtle nests since 1996), and North Carolina. Leatherback sea turtles primarily feed on pelagic gelatinous invertebrates such as jellyfish and pelagic tunicates (USDOC, NMFS and USDOI, FWS 1992; Bjorndal 1997), and their seasonal movements appear to be correlated with jellyfish seasonal abundance (SCDNR 2005). Leatherback sea turtles begin nesting much earlier in the year than other sea turtle species. Once hatched, hatchlings leave the nest and swim actively offshore. Post-hatchling and oceanic juvenile leatherback sea turtles are more active than other sea turtle species (Wyneken and Salmon 1992). Their requirements for gelatinous prey suggest that they may search for areas of major upwelling.

3.2.4.1 *Presence within the North Carolina Action Area*

In the North Carolina Action Area, leatherback sea turtle sightings have been noted year-round. The majority of the sightings have occurred in two locations: approximately eight sightings have occurred in the vicinity of the Kitty Hawk Call Area in the summer months, and approximately six sightings have occurred in the vicinity of the Wilmington Call Areas in the winter months. Leatherback sea turtles have also been sighted in the vicinity of Planning Areas 3 and 4 during the spring months. Sightings of leatherback sea turtles have occurred in the North Carolina Action Area during the fall months; however, these sightings are less common (Waring et al. 2012). The North Carolina Action Area has no designated critical habitat for the leatherback sea turtle.

3.2.4.2 *Presence within the South Carolina Action Area*

Figure 3-18 indicates that leatherback turtles are known to occur in South Carolina offshore waters, especially during winter and summer months. No critical habitat has been designated for leatherback turtles within the Georgia Action Area.

3.2.4.3 *Presence within the Georgia Action Area*

In the Atlantic United States, leatherback nesting is concentrated in southeast Florida (Turtle Expert Working Group 2007). Nesting in Florida was first documented in 1947 and is now a regular seasonal occurrence. Nesting is rarer north of Florida (Waring et al. 2012). The range of leatherback sea turtle sightings is shown in Figure 3-18. The above information indicates the leatherback sea turtle does visit the Georgia Action Area but is highly migratory. The Georgia Action Area has no designated critical habitat for the leatherback. Critical habitat has been designated within specific areas off the US Virgin Islands and St. Croix.

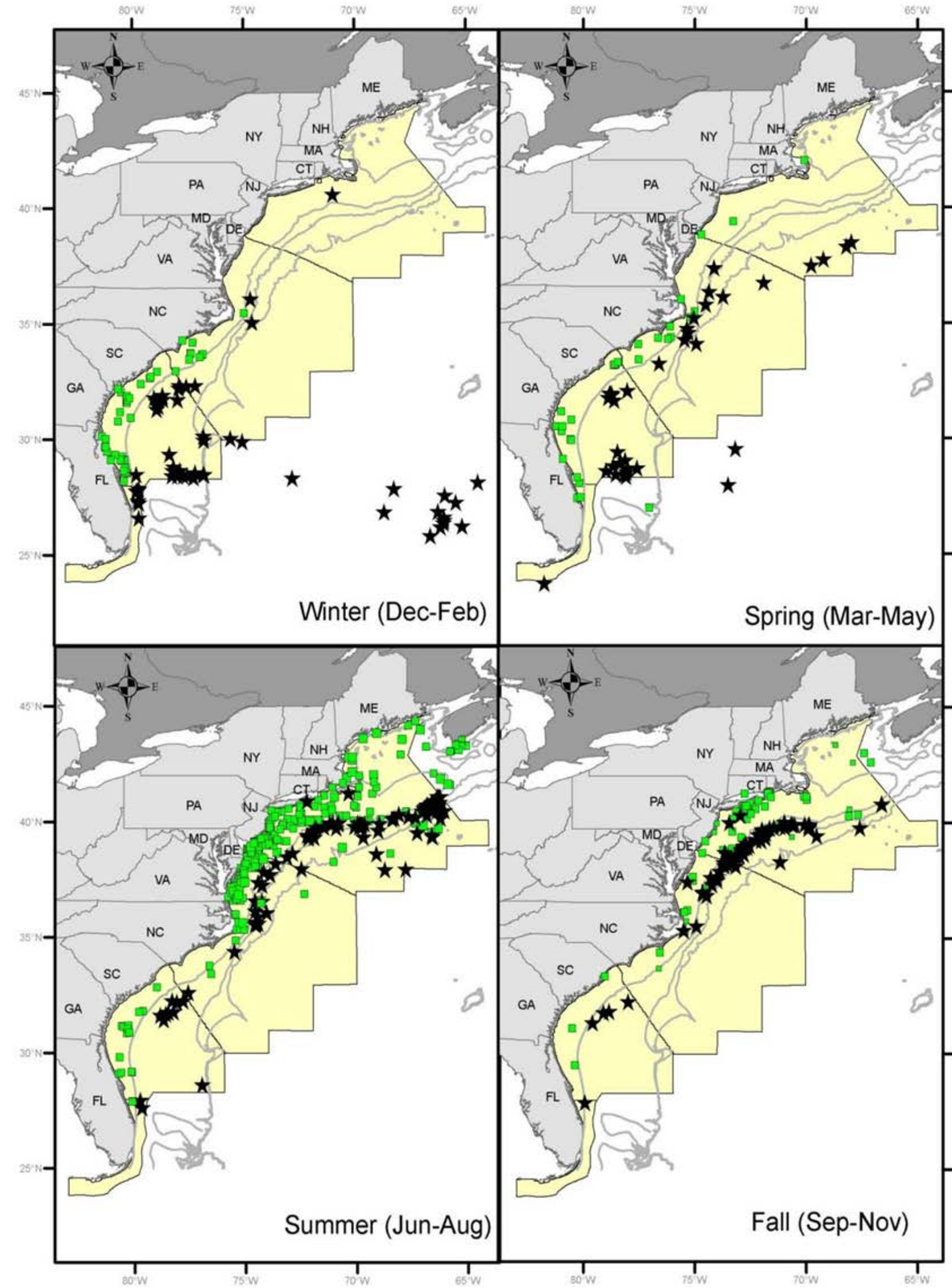

Figure 3-14. Leatherback sea turtle sighting (green squares) and fishery by-catch (black stars) observations by season (Waring et al. 2012).

3.2.5 Loggerhead Sea Turtle (*Caretta caretta*)

The loggerhead is a circumglobal species found from tropical to temperate regions. The loggerhead sea turtle is the largest hard-shelled turtle. They range through the Pacific, Indian, and Atlantic Oceans from Alaska, eastern Russia, Newfoundland, and Norway south to Chile, Australia, and South Africa. In the Atlantic Ocean, the loggerhead turtle is reported as far north as Newfoundland, in the Caribbean Sea, through the Gulf of Mexico, and along the East Coast of the United States. Loggerhead turtles, like other sea turtles, are highly migratory, making various seasonal and annual migrations. It is common for loggerhead turtles to make extended transoceanic journeys and then later return to specific nesting beaches (USDOI, BOEM 2012b). The southeast US coast is among the most important areas in the world for loggerhead nesting. Loggerhead turtle nesting in the western North Atlantic is from April to September with peak nesting occurring in June and July. Age at sexual maturity is late in life at around 35 years of age, and breeding adult females nest, on average, every 2.5–3.7 years. Clutch size is between 100 and 126 eggs, and incubation is between 42 and 75 days. The mean number of nests is 3–5.5 per breeding season, with inter-nesting intervals ranging from 12–15 days (USDOI, BOEM 2012b).

A wide variety of anthropogenic activities adversely affects hatchlings and adult female turtles and their nesting habitat. These include coastal development/construction of fishing piers that alter patterns of erosion and accretion on nesting beaches; placement of erosion control structures and other barriers to nesting; beachfront lighting; vehicular and pedestrian traffic; sand extraction; beach erosion; beach sand placement; beach pollution (ingestion of and entanglement by debris and environmental contaminants); removal of native vegetation; and poaching (USDOC, NMFS 2013a). Similar to most sea turtle populations, the loggerhead sea turtle is severely depleted; however, the population is probably the most stable population of any sea turtle. The loggerhead sea turtle was listed as a threatened species throughout its range under the ESA in 1978 (Waring et al. 2012). In March 2010, the NMFS and USFWS proposed to list the Northwest Atlantic Ocean DPS of loggerhead sea turtles as endangered (75 FR 50; March 16, 2010). The final rule on listing this DPS as threatened was published on September 22, 2011 (76 FR 58868). To date, projections indicate that the Northwest Atlantic loggerhead sea turtle population is slightly declining but expected to recover in the next 50–150 years (USDOC, NMFS and USDOI, FWS 2008). The total number of loggerhead sea turtle nests per year in the United States over the last decade has been estimated at between 47,000 and 90,000 (USDOC, NMFS and USDOI, FWS 2008).

According to the Loggerhead Biological Review Team, there are nine distinct, significant populations of loggerhead sea turtles (termed DPS) (Conant et al. 2009). The Northwest Atlantic Ocean DPS occurs in an area bounded by 60° N latitude to the north and the equator to the south, with 40° W longitude as the eastern boundary. The NMFS has also identified five recovery units (nesting subpopulations) within the Northwest Atlantic DPS (USDOC, NMFS and USDOI, FWS 2008), of which four occur in the southeastern United States and Gulf of Mexico. The Northern Recovery Unit extends from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range).

Loggerhead sea turtles use three different types of habitats throughout their life: terrestrial (beaches), neritic (nearshore waters), and oceanic (open ocean) (USDOC, NMFS and USDOI, FWS 2008). They are carnivores, feeding primarily on mollusks and crustaceans (USDOC, NMFS and USDOI, FWS 2008). Immediately after loggerhead sea turtle hatchlings emerge from the nest, they actively swim offshore into oceanic areas of local convergence zones and major gyre systems, often characterized by accumulations of floating *Sargassum*. Afterward, oceanic juveniles actively migrate to neritic developmental habitats. To avoid cold temperatures, most juvenile loggerhead sea turtles move into waters south of Cape Hatteras, North Carolina, by January (Musick and Limpus 1997).

In July 2013, the NMFS proposed critical habitat for the loggerhead sea turtle along areas of the East Coast and Gulf of Mexico of the United States (78 FR 43005). In Atlantic Ocean waters from New Jersey to Florida and Gulf of Mexico waters along Texas, Louisiana, Mississippi, Alabama, and Florida; the proposed critical habitat includes nearshore reproductive, breeding, migratory, and winter habitat. In a separate rulemaking, the USFWS proposed critical habitat for loggerhead sea turtle nesting beaches on March 25, 2013 (78 FR 18000). The proposed critical habitat includes 90 nesting beaches in coastal counties of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi.

3.2.5.1 *Presence within the North Carolina Action Area*

Satellite-tagged loggerhead sea turtles have been tracked in dense populations in the coastal waters of the North Carolina Action Area (Figure 3-19) (Waring et al. 2012). Additionally, there have been numerous sightings year-round of loggerhead sea turtles along the entire coast of North Carolina (Figure 3-19) (Waring et al. 2012). NMFS proposed critical habitat offshore North Carolina includes loggerhead sea turtle constricted migratory corridor (specifically most of Planning Area 4 north to the southern portion of the Kitty Hawk Call Area) and winter habitat (including Planning Areas 3 and 4). None of the onshore critical habitat proposed by the USFWS (eight nesting beaches of North Carolina) are within the described North Carolina Action Area. The impacts to the proposed critical habitat are discussed in Section 4.3.2.1.

3.2.5.2 *Presence within the South Carolina Action Area*

Loggerhead turtles are common visitors in the South Carolina Action Area throughout the year, but especially during the winter and spring months. The proposed migratory and winter critical habitat for loggerheads does occur within the South Carolina Action Area (see Section 4.3.2.1)

3.2.5.3 *Presence within the Georgia Action Area*

Loggerhead turtles are likely to be the most common sea turtle species in the Georgia Action Area. Based on nesting information, loggerhead turtle nests are primarily located in Florida (91 percent), South Carolina (6.5 percent), Georgia (1.5 percent), North Carolina (1 percent), and Virginia (<1 percent). The NRU is the second largest subpopulation in the United States, and South Carolina represents about 65 percent of those nests (USDOI, BOEM 2012b). After a crash from 1,649 nests in 2008 to 997 nests in 2009, loggerhead nesting in Georgia had increased to 2,218 in 2012 (Georgia Dept. of Natural Resources 2013). In 2013, 655 loggerhead turtle nests were reported on beaches adjacent to the Georgia Action

Area (Seaturtle.org, 2013). Figures 3-19 and 3-20 provide seasonal distribution and tagged loggerhead locations (Waring et al. 2012). The above description indicates the loggerhead is found in the Georgia Action Area. The proposed migratory, breeding, and winter critical habitat for loggerheads does occur within the Georgia Action Area (see Section 4.3.2.1).

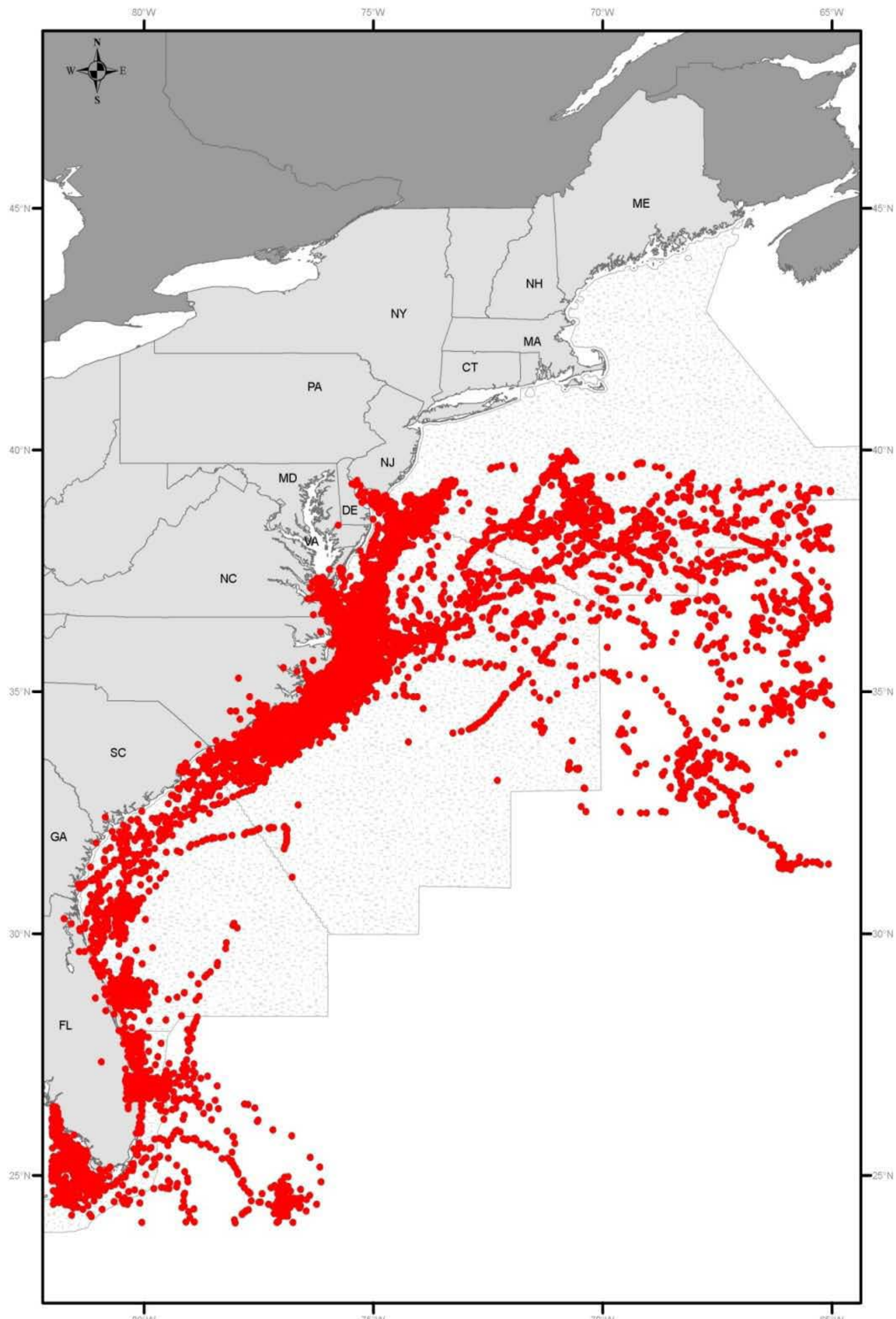

Figure 3-15. Positions of satellite-tagged loggerhead turtles (Waring et al. 2012).

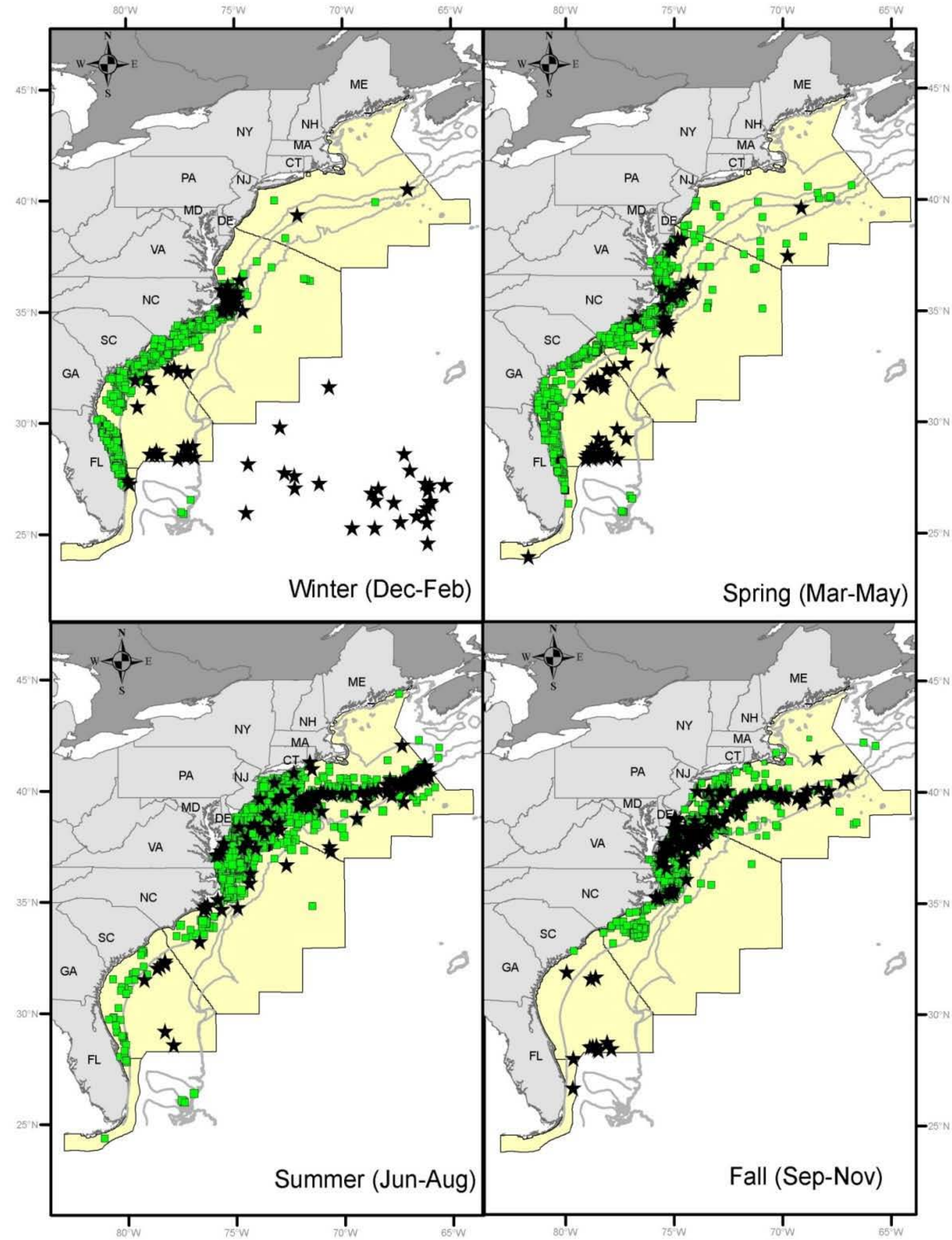

Figure 3-16. Loggerhead sea turtle sighting (green squares) and fishery by-catch (black stars) observations by season (Waring et al. 2012).

3.3 Marine Fish

Two listed fish species are known to occur within the Southeast Action Area: the Atlantic sturgeon and smalltooth sawfish.

3.3.1 Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

The Atlantic sturgeon is an anadromous species distributed along 32 coastal rivers of the eastern coast of North America from Hamilton Inlet, Labrador, Canada, to the Saint Johns River in Florida (Smith and Clugston 1997; ASSRT 2007). On February 6, 2012, NMFS delineated US populations of Atlantic sturgeon into five DPSs: the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs (77 FR 5880 and 77 FR 5914). The NMFS has not designated critical habitat for Atlantic sturgeon. Habitat degradation, incidental catch of sturgeon by commercial fisheries, and the presence of dams in riverine habitats have all contributed to the precipitous decline in population of the species.

A member of the family Acipenseridae, the Atlantic sturgeon co-occurs with shortnose sturgeon in some habitats and uses coastal rivers, estuaries, and the continental shelf during its life history. The Atlantic sturgeon occupies estuarine and marine waters primarily during fall and winter months then ascends the spawning rivers. Atlantic sturgeon are generally slow growing and late maturing, and mature individuals may not spawn every year (generally one to five years between spawning events). Spawning occurs in the freshwater reaches of inhabited rivers from March–April. Larvae develop as they move downstream to the estuarine portion of the spawning river where they may reside as juveniles for two to six years before moving into coastal ocean waters as subadults. In these coastal ocean waters, the subadults may undergo extensive movements usually confined to shelly or gravelly bottoms in 10–50 m (33–164 ft) water depths (Stein, Friedland, and Sutherland 2004). Populations from several rivers will intermingle in shelf waters, eventually returning to their natal rivers to spawn. Laney et al. (2007) identified areas of particular concentration as near sand shoals adjacent to Oregon Inlet, North Carolina.

3.3.1.1 *Presence within the North Carolina Action Area*

The Carolina DPS range covers the North Carolina Action Area. As a result of the declining factors described above, the riverine spawning populations in the Carolina DPS are estimated to be at less than three percent of their historic levels. While sturgeon tend to aggregate within the geographic region of their spawning river, NMFS has identified sturgeon mixing zones in which individuals from different DPSs may be present (USDOC, NMFS 2013c). Specifically, Marine Mixing Zone 2 encompasses the area from Chatham, Massachusetts, to Cape Hatteras and may include individuals from the Gulf of Maine, New York Bight, Chesapeake, and Carolina DPSs. Marine Mixing Zone 3 encompasses the area from Cape Hatteras to the southern tip of Florida and may include individuals from the Carolina and South Atlantic DPSs. As a result, there is the potential for individuals from all DPSs to be found within the North Carolina Action Area (USDOC, NMFS 2013c).

Adult and subadult Atlantic sturgeon occur in the shelf waters of the North Carolina Action Area during fall and winter months. Evidence from extensive tagging programs using trawl-caught fish indicate that shelf areas less than 21.3 m (70 ft) deep offshore Virginia and North Carolina support concentrations of Atlantic sturgeon during fall and winter months (Laney et al. 2007; Dunton et al. 2010). Data are lacking for areas south of Cape Hatteras. Based on their size, most of the individuals caught within the North Carolina Action Area were immature or subadult fish (Stein, Friedland, and Sutherland 2004; Laney et al. 2007).

3.3.1.2 *Presence within the South Carolina Action Area*

South Carolina rivers include both the Carolina DPS and the South Atlantic DPS of Atlantic sturgeon. The South Atlantic DPS includes all Atlantic sturgeon that spawn or are spawned in the watersheds (including all rivers and tributaries) of the Ashepoo, Combahee, and Edisto Rivers (ACE) Basin southward along the South Carolina coast. The marine mixing unit is assumed to be made up of individuals from all five DPSs.

3.3.1.3 *Presence within the Georgia Action Area*

Georgia rivers known to have current spawning populations within the range of the South Atlantic DPS include the Savannah, Ogeechee, Altamaha, and Satilla Rivers (USDOC, NMFS 2013c). The marine mixing unit offshore Georgia is assumed to be made up of individuals from all five DPS.

3.3.2 Smalltooth Sawfish (*Pristis pectinata*)

The smalltooth sawfish is a tropical, marine, and estuarine fish that inhabits shallow waters of inshore bars, mangrove edges, and seagrass beds (USDOC, NMFS 2000). Sawfishes get their name from their "saws," which are long, flat snouts edged with pairs of teeth that are used to locate, stun, and kill prey. Historically, the smalltooth sawfish occurred throughout the Gulf of Mexico and north to Long Island Sound on the East Coast. However, the species has declined due to bycatch in commercial and recreational fisheries and loss and degradation of juvenile habitat (such as mangrove forests) (USDOC, NMFS 2009a); as a result, the specie's range is currently limited to peninsular Florida.

The smalltooth sawfish normally inhabits shallow waters (10 m [33 ft] or less) often near river mouths or in estuarine lagoons over sandy or muddy substrates. According to the NMFS 2010 status review new data has shown that "smaller smalltooth sawfish occur in shallower water, and larger sawfish occur regularly at depths greater than 32 ft (10 m)" (USDOC, NOAA, NMFS 2010c). The status report also indicated that almost all of the sawfish <3 m (<10 ft) in length were found in water less than 10 m (32 ft) deep, and 46 percent of encounters with sawfish >3 m (10 ft) in Florida Bay and the Florida Keys were reported to occur at depths between 70 and 122 m (200 and 400 ft). Shallow water less than 1 m (3 ft) appears to be an important nursery area for young smalltooth sawfish, particularly in areas where mangrove trees are present. Smalltooth sawfish feed on benthic invertebrates and fishes. The saw has been considered as a trophic apparatus, used to herd and even impale shallow-water schooling fishes such as herrings and mullets (Breder 1952). It appears more likely that the saw is used to rake the seafloor to uncover partially buried invertebrates.

3.3.2.1 *Presence within the Southeast Action Area*

The presence of smalltooth sawfish in the Southeast Action Area would be rare. Critical habitat has been designated for the smalltooth sawfish in the waters of southwest Florida and Florida Bay (74 CFR § 45353). Population status in areas north of southern Florida is virtually unknown. A search of the National Sawfish Encounter Database managed by the Florida Museum of Natural History Sawfish Implementation Team revealed only two recent sightings of smalltooth sawfish in the vicinity of the Southeast Action Area: one off Florida and another from Georgia reported by a bottom longline fishery observer who documented the capture of an estimated 4.0 m (13 ft) adult from depths of 45.6–72.6 m (152–242 ft) (Simpfendorfer and Wiley 2006). As a result, the presence of the smalltooth sawfish in the Southeast Action Area is probably unlikely but cannot be ruled out.

3.4 Birds

The Atlantic coast is a major flyway for birds, including terrestrial species, shorebirds, waterbirds, and marine birds. Four federally listed birds may be found within the BA area: Bermuda petrel (or cahow), Kirtland's warbler, piping plover, and roseate tern. In addition, two candidate species, black-capped petrel and red knot, may be found within the BA area. The black-capped petrel is currently under review by the USFWS to determine if the species should be proposed as threatened or endangered under the ESA. On September 30, 2013, the red knot was proposed as threatened under the ESA (78 FR 189).

3.4.1 Bermuda Petrel (*Pterodroma cahow*)

The Bermuda petrel (or cahow, as it is known locally on Bermuda) is a member of the gadfly petrel group (genus *Pterodroma*), which is a highly pelagic bird widespread in tropical and subtropical seas (Warham 1990; Brooke 2004). Endemic to Bermuda, the Bermuda petrel was believed to be extinct in the 1620s; however, 18 breeding pairs were found on rocky islets in Castle Harbour in 1951, and an extensive conservation program has since developed, resulting in a record 101 breeding pairs in 2012 (Madeiros 2012). Bermuda petrels are known still to breed from October to June on rocky inlets in Castle Harbour and on Nonsuch Island, Bermuda (Warham 1990; Onley and Scofield 2007); however, the species' distribution outside of the breeding season is poorly known.

Bermuda petrels are extremely aerial birds and rarely land on the sea, feeding by snatching food or "dipping" near the sea surface. They are known to feed at night, primarily on squids but also on fishes and invertebrates to a lesser degree. They are also known to scavenge dead or dying prey floating on or near the sea surface (Warham 1990).

3.4.1.1 *Presence within the North Carolina Action Area*

There are confirmed sightings of Bermuda petrels offshore North Carolina (Lee 1984, 1987) with many of the most recent sightings offshore Cape Hatteras in May and June (eBird 2013a). From these sightings, it is presumed that this species may occur within offshore waters of the North Carolina Action Area, although their presence in this area is probably rare. The USFWS has not designated critical habitat for the Bermuda petrel.

3.4.1.2 *Presence within the South Carolina Action Area*

The Bermuda petrel migrates to the North Atlantic along the western Gulf Stream but is an expected vagrant (USDOI, BOEM 2012). There are no confirmed sightings of Bermuda petrels offshore South Carolina (eBird 2013a). The action area's 30 OCS blocks are along this migratory path, so though rare, the Bermuda petrel could occur offshore.

3.4.1.3 *Presence within the Georgia Action Area*

The Bermuda petrel migrates to the North Atlantic along the western Gulf Stream but is an expected vagrant (USDOI, BOEM 2012). There are no confirmed sightings of Bermuda petrels offshore Georgia (eBird 2013a). The action area's 3 OCS blocks are along this migratory path, so although rare, the Bermuda petrel could occur offshore Georgia (USDOI, BOEM 2012).

3.4.2 Black-Capped Petrel (*Pterodroma hasitata*)

The black-capped petrel is a nocturnal seabird found in North America and the Caribbean. Loss and degradation of forest habitat on the island of Hispaniola (which includes Haiti and the Dominican Republic), predation by introduced mammalian predators, and collisions with communication towers have all contributed to the bird's decline; potential and emerging threats at sea include fisheries by-catch, collisions with wind farm structures and oil platforms, and oil spills (Goetz, Norris, and Wheeler 2012). Today, there are only 13 known breeding colonies and an estimated 600 to 2,000 breeding pairs. Current breeding populations are known only on the island of Hispaniola (Goetz, Norris, and Wheeler 2012).

The black-capped petrel feeds primarily on squid and small fish picked from the ocean surface. This seabird forages at sea, primarily at night. On land, black-capped petrels nest in colonies along the forested mountain cliffs on Hispaniola (Goetz, Norris, and Wheeler 2012; 77 FR 37367). Black-capped petrels are generally restricted to relatively deep water (200–2,000 m), and they are most common in waters more than 1,000 m in depth (Simons, Lee, and Haney 2013). However, black-capped petrels can be seen off the Outer Banks of North Carolina, the Georgia Embayment, and other portions of the South Atlantic Bight (Cape Hatteras, North Carolina, to Cape Canaveral, Florida) (Simons, Lee, and Haney 2013).

In September 2011, Wild Earth Guardians submitted a petition to the USFWS to list the black-capped petrel as an endangered or threatened species under the ESA. In response to this petition, the USFWS initiated a 90-day review, which concluded on June 21, 2012, with the agency finding that the petition presented substantial information indicating that listing may be warranted. The USFWS then initiated a 12-month status review to determine whether listing of the black-capped petrel is warranted (77 FR 37367). To date, this review is still in process.

3.4.2.1 *Presence within the North Carolina Action Area*

While the black-capped petrel is known to breed only on Hispaniola, the at-sea range of the petrel includes the North Carolina Action Area—extending from the Gulf Stream waters off North Carolina to the waters off the coast of northeastern Brazil. Numerous sightings of black-capped petrels have been recorded offshore North Carolina, particularly in the vicinity of Cape Hatteras (Simons, Lee, and Haney 2013; eBird 2013b). Sightings have been recorded as recently as 2013 (eBird 2013b).

3.4.2.2 *Presence within the South Carolina Action Area*

The at-sea range of the petrel includes the South Carolina Action Area. Sightings of black-capped petrels have been recorded offshore South Carolina (Simons, Lee, and Haney 2013; eBird 2013b).

3.4.2.3 *Presence within the Georgia Action Area*

The at-sea range of the petrel includes the Georgia Action Area. Sightings of black-capped petrels have been recorded offshore Georgia (Simons, Lee, and Haney 2013; eBird 2013b).

3.4.3 Kirtland's Warbler (*Setophaga kirtlandii*)

The Kirtland's warbler was federally listed as endangered in 1967. It is a relatively large wood warbler, measuring approximately 14 cm long and weighs 12–15 g (USDOI, FWS 2012b). The Kirtland's warbler migrates south from its nesting grounds in the Upper and Lower Peninsulas of Michigan to its wintering grounds in the Bahamas archipelago. The USFWS has not designated critical habitat for the Kirtland's warbler. Loss and degradation of nesting habitat has played a significant role in the decline of this species, as this bird is known to breed only in young jack-pine forests in 13 counties in Michigan. Nest parasitism by brown-headed cowbirds has also significantly contributed to the species' decline (USDOI, FWS 1999b; 2012b). Following listing under the ESA, the Kirtland's warbler population level remained relatively stable at approximately 200 singing males, and shortly after 1987, the population began a dramatic increase, reaching a record high of 1,828 singing males in 2011 (USDOI, FWS 2012b). Since the implementation of the brown-headed cowbird control program, the Kirtland's warbler population size has closely tracked the amount of suitable habitat on the landscape in northern Lower Michigan (Donner, Probst, and Ribic 2008).

Kirtland's warblers are primarily insectivorous and forage by gleaning pine needles, leaves, and ground cover and gathering flying insects on the wing. Birds begin their spring migration from the Bahamas to Michigan in mid-April to early May. Fall migration to the Bahamas begins between August and October. Kirtland's warblers migrate alone in the fall rather than in groups (Sykes et al. 1989).

3.4.3.1 *Presence within the North Carolina Action Area*

There are several records of Kirtland's warblers along the shores of Florida, South Carolina, and North Carolina during spring and fall migrations (see Figure 6 in USDOI, FWS 2012b). This species may pass over the North Carolina Action Area during migration.

3.4.3.2 *Presence within the South Carolina Action Area*

There are several records of Kirtland's warblers along the shores of Florida, South Carolina, and North Carolina during spring and fall migrations (see Figure 6 in USDOI, FWS 2012b).This species may pass over the South Carolina Action Area during migration.

3.4.3.3 *Presence within the Georgia Action Area*

There are several records of Kirtland's warblers along the shores of Florida, South Carolina, and North Carolina during spring and fall migrations (see Figure 6 in USDOI, FWS 2012b). This species may pass over the Georgia Action Area during migration.

3.4.4 Piping Plover (*Charadrius melodus*)

The piping plover is a small migratory shorebird that breeds in sandy dune-beach-riparian habitat along the Atlantic Coast, the Great Lakes, and the Great Plains regions of the United States and winters in coastal habitats of the southeastern United States, coastal Gulf of Mexico, and the Caribbean (Elliot-Smith et al. 2004; USDOI, FWS 2009). The Great Lakes breeding population is listed as endangered, while the Atlantic Coast and Great Plains breeding populations are listed as threatened (USDOI, FWS 2009). Critical wintering habitat has been established for the species along the coast of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (66 FR 36038-36143). Only the Atlantic Coast population is likely to occur within the project area.

The most likely cause of its population declines and the primary anthropogenic threat to piping plovers is coastal development. Other threats include disturbance by humans, dogs, and vehicles on sandy beach and dune habitat (Elliott-Smith et al. 2004; USDOI, FWS 2009). Despite these population pressures, there is little risk of near-term extinction of the Atlantic Coast population of piping plovers (Plissner and Haig, 2000), and since the listing of this species in 1986, the Atlantic Coast piping plover population has increased 240 percent, from approximately 790 breeding pairs to a preliminary estimate of 1,898 pairs in 2012 (USDOI, FWS 2013b). Although increased abundance has reduced near-term vulnerability to extinction, piping plovers remain sparsely distributed across their Atlantic Coast breeding range, and populations are highly vulnerable to even small declines in survival rates of adults and fledged juveniles (USDOI, FWS 2009). As of 2012, 70 pairs were nesting on the North Carolina coast (USDOI, FWS 2013) up from 30 in 1986 (USDOI, FWS 2011). The breeding population of piping plovers does not extend further south; the last record of piping plovers nesting in South Carolina was in 1993 (USDOI, FWS 2011).

In general, Atlantic Coast piping plovers are found in sandy coastal habitats for nesting, although they may use coastal sand flats, mud flats, ephemeral pools, as well as the wrack line on sandy beaches for foraging. Piping plovers arrive at breeding locations beginning mid-March and extending into April. The piping plover breeding season extends from April through August. Post-breeding staging in preparation for migration and southward migration extends from late July through September. The breeding season and spring and fall migration overlap; therefore, at either end of the breeding season, there may be plover movement through the BA area.

The Atlantic Coast population of piping plovers winters along the southern Atlantic Coast from North Carolina to Florida and in the Bahamas and West Indies (Elliott-Smith and Haig 2004). The migratory pathways along the coast and to the Bahamas are not well known (USFWS 2009; Normandeau Associates 2011), and there are no definitive observations of this species in offshore environments greater than three miles from the Atlantic Coast (Normandeau Associates 2011). However, it may be difficult to detect piping plovers in the offshore environment during migration because of nocturnal and/or high elevation migratory flights (Normandeau Associates 2011).

3.4.4.1 *Presence within the North Carolina Action Area*

Outside of the breeding season, piping plovers winter on beaches and flats near the described North Carolina Action Area. Critical habitat for the wintering population of piping plovers was designated in 2001 and includes 18 units of North Carolina coastline (66 FR 36038). The designation of four of these units within the Cape Hatteras National Seashore was revised in 2008 (73 FR 62816). None of the designated critical habitat areas are within the described North Carolina Action Area. Piping plovers may migrate over offshore areas in the North Carolina Action Area, although their presence in this area is probably rare (Burger et al. 2011; Normandeau Associates 2011).

Presence within the South Carolina Action Area

Outside of the breeding season, piping plovers winter on beaches and flats near the described South Carolina Action Area, primarily in the winter. Critical habitat for the wintering population of piping plovers was designated in 2001 (66 FR 36038). None of the designated critical habitat areas are within the described South Carolina Action Area. Piping plovers may migrate over offshore areas in the South Carolina Action Area, although their presence in this area is probably rare (Burger et al. 2011; Normandeau Associates 2011).

3.4.4.2 *Presence within the Georgia Action Area*

Outside of the breeding season, piping plovers winter on beaches and flats near the described South Carolina Action Area, primarily in the winter. Critical habitat for the wintering population of piping plovers was designated in 2001 (66 FR 36038). None of the designated critical habitat areas are within the described Georgia Action Area. Piping plovers may also migrate over offshore areas in the Georgia Action Area, although their presence in this area is probably rare (Burger et al. 2011; Normandeau Associates 2011). The critical wintering habitat closest to the Georgia Action Area is located on Little Tybee Island and Tybee Island (USDOI, FWS 2013c).

3.4.5 Roseate Tern (*Sterna dougallii dougallii*)

The roseate tern is a small tern that breeds in colonies. Terns in the Northwestern Atlantic population are likely to occur within the BA Area. Terns from the Caribbean population may also occur within the BA Area. However, neither population has a breeding colony in Georgia, South Carolina, or North Carolina (USDOI, FWS 2010a). Roseate terns in the Northwestern Atlantic population are listed under the ESA as endangered, while terns in the Caribbean population are listed as threatened (USFWS 2010a). No critical habitat has been designated for this species (52 FR 42064-42068). The USFWS published a five-year status review of the roseate tern and provides detailed information about the species (USFWS 2010a).

Birds from both populations winter along the northeastern coast of South America (USFWS 2010a). The migration routes of roseate terns are poorly known but are believed to be largely or exclusively pelagic in both spring and fall (Nisbet 1984; Gochfeld, Burger, and Nisbet 1998; USDOI, FWS 2010a). Hence it is likely that roseate terns will traverse the BA Area during this period (Burger et al. 2011). Only a few offshore roseate tern observations have been recorded, including five recoveries of banded individuals at sea on ships (Nisbet 1984) as well as a small number of additional boat-based observations (Normandeau Associates 2011).

3.4.5.1 *Presence within the North Carolina Action Area*

The roseate tern is rarely seen in North Carolina, although they pass through coastal North Carolina during migration from March–May and August–October. This species has been sighted along the length of the North Carolina coastline and offshore along the barrier islands in spring (eBird 2013c).

Although roseate terns are predicted near shore and west of the Kitty Hawk Call Area, very little roseate tern activity is expected to occur within the Kitty Hawk Call Area (Figure x) (Kinlan et al., 2013 [Appendix L]). The model was built using 124 roseate tern sightings throughout the Mid-Atlantic during the summer and fall months. The modeled results from Kinlan and others (2013) are based on the relationship between roseate terns and distance from shore, sea surface temperature, turbidity, surface chlorophyll-a including others (Kinlan et al., 2013 [Appendix H]). The model predicts (in blue) that terns are virtually absent from the Kitty Hawk Call Area with high certainty (Figure x).

3.4.5.2 *Presence within the South Carolina Action Area*

The roseate tern could pass through South Carolina Action Area during spring and fall migration, although their presence in this area is probably rare. There was a single record during spring migration on the coast of South Carolina (eBird 2013c).

3.4.5.3 *Presence within the Georgia Action Area*

The roseate tern could potentially occur within the Georgia Action Area, although their presence in this area is probably rare. There was a single record during spring migration on the coast of Georgia (eBird 2013c).

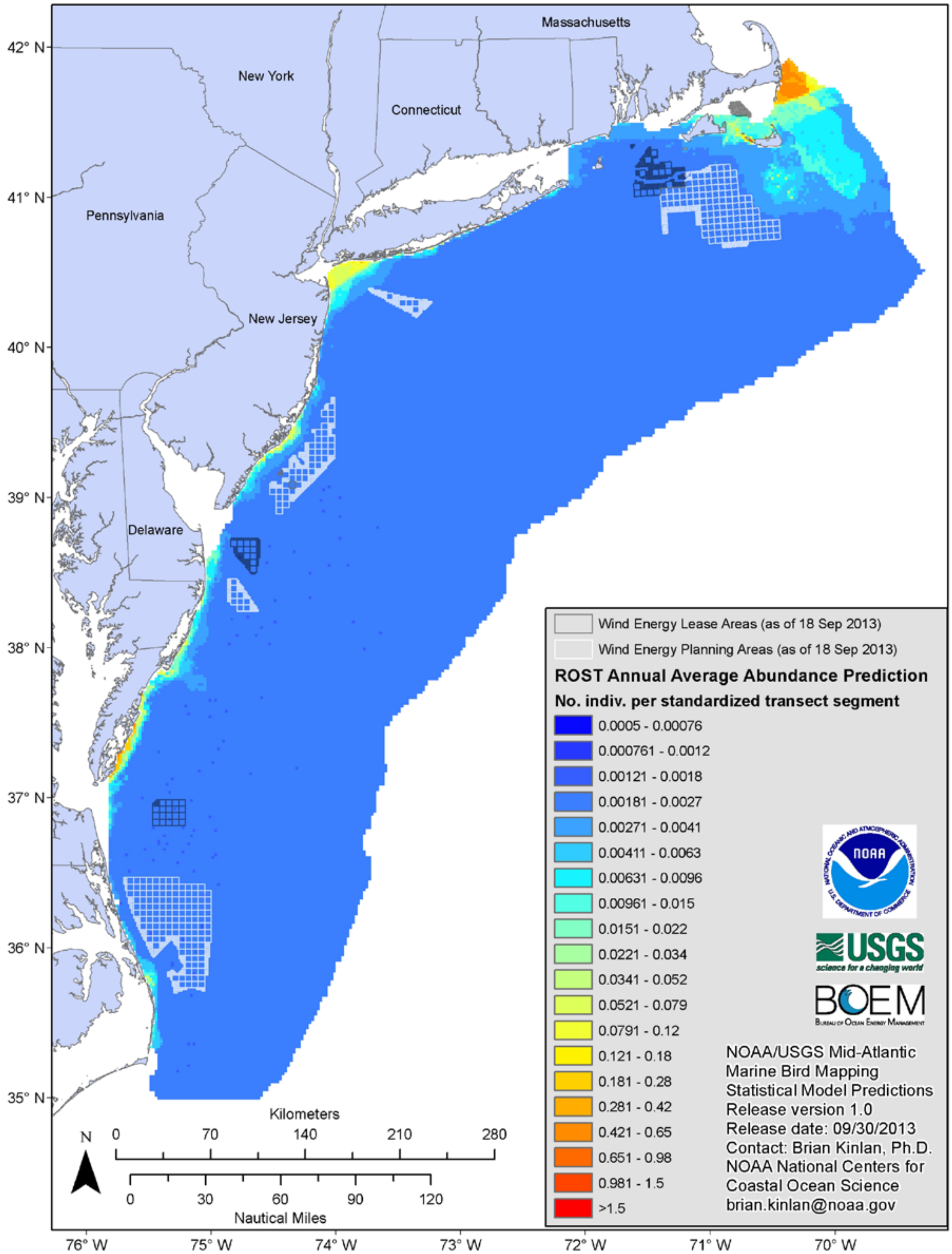

Figure 3-17. Predicted annual distribution and relative abundance of roseate terns (ROST) in the Mid-Atlantic.

3.4.6 Red Knot (*Calidris canutus rufa*)

The red knot is a medium-sized shorebird that migrates in large flocks over long distances between breeding grounds in the mid- and high-Arctic and wintering grounds in southern South America (USDOI, FWS 2010b). The primary threat to the red knot is a decrease in the availability of horseshoe crab eggs as horseshoe crabs are increasingly harvested for bait and to support the biomedical industry (USDOI, FWS 2010b, c). Other threat factors include habitat destruction due to beach erosion and shoreline stabilization projects, human disturbance, and competition with other species for limited food resources.

The red knot is a candidate species that is currently proposed as threatened under the ESA. On September 30, 2013, the USFWS issued a proposed rule to list the red knot as a threatened species under the ESA. Comments on the proposed rule were due to the agency by November 29, 2013 (78 FR 60024).

Along the Mid-Atlantic and southeastern coasts, red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks (USDOI, FWS 2010a). Flocks of up to 6,000 red knots have been observed from Georgia to Virginia in recent years (USDOI, FWS 2010b).

Migratory routes of this species are not well characterized, but recent studies using birds tracked with light-sensitive geo-locators as well as analysis of large geospatial datasets of coastal observations have revealed some migratory patterns of red knots in the US Atlantic OCS (Niles et al. 2010; Normandeau Associates 2011; Burger et al. 2012a, 2012b). Some individuals traverse the northern sections of the US Atlantic OCS as they travel directly between northeastern US migratory stopover sites and wintering areas or stopover sites in South America and the Caribbean, while others follow the US Atlantic coast or traverse the US Atlantic OCS further to the south as they move between US Atlantic coastal stopover sites and wintering areas (Niles et al. 2010; Normandeau Associates 2011; Burger et al. 2012a).

3.4.6.1 *Presence within the North Carolina Action Area*

Red knots use beaches and flats along the coast as stopovers during spring and fall migrations. There are documented sightings of red knots along the entire length of North Carolina's coastal beaches as well as a few documented sightings of migrants in the offshore waters of the North Carolina Action Area (eBird 2013d). No nesting or breeding occurs in the North Carolina Action Area, as red knots breed in the central Canadian Arctic (USDOI, FWS 2010b).

3.4.6.2 *Presence within the South Carolina Action Area*

Red knots use beaches and flats along the coast as stopovers during spring and fall migrations. There are documented sightings of red knots along the length of South Carolina's coastal beaches (eBird 2013d). No nesting or breeding occurs in the South Carolina Action Area (USDOI, FWS 2010b).

3.4.6.3 *Presence within the Georgia Action Area*

Red knots use beaches and flats along the coast as stopovers during spring and fall migrations. There are documented sightings of red knots along the length of Georgia's coastal beaches (eBird 2013d). No nesting or breeding occurs in the Georgia Action Area (USDOI, FWS 2010b).

4. EFFECTS OF THE PROPOSED ACTION

Section 7(a)(2) of the ESA requires each federal agency, in consultation with and with the assistance of the NMFS and USFWS as appropriate, to ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat.

Under the ESA, federal agencies must evaluate the effects of the action on listed species, including whether and what types of "take" is anticipated to occur. *Take* is defined under the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." *Harass* is defined as "…an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly impair normal behavioral patterns including breeding, feeding, or sheltering" (50 CFR § 17.3) and *harm* as "… significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR § 17.3).

Negative effects on listed species may result from the proposed action. These impacts may be direct or indirect. Direct effects are defined as effects that are caused by or will result from, and occur contemporaneous with, the proposed action (e.g. construction-related impacts such as noise disturbance) and those disturbances that are directly related to the project elements that occur very close to the time of the action itself. Indirect effects include those effects that are caused by or will result from the proposed action and are manifested later in time, but are still reasonably certain to occur. The impact determination considers context (the geographic, biophysical, and social context in which the effects will occur), intensity (the severity of the impact, in whatever context[s] it occurs), and duration (short- versus long-term) of potential impacts. The section to follow analyzes the potential range of effects from the proposed action on federally listed species and designated critical habitat.

4.1 Scenario Summary and Impact-Producing Factors

4.1.1 Relevant Impact-Producing Factors

For this BA, BOEM is tiering and incorporating by reference the previous programmatic Section 7(a)(2) consultation documents associated with BOEM's Programmatic Environmental Impact Statement (PEIS) for the *Draft Atlantic OCS Proposed Geological and Geophysical Activities in the Mid-Atlantic and South Atlantic Planning Area*, where applicable. Consultation documents associated with the PEIS include a programmatic BA (2012) and an associated NMFS Biological Opinion (BO) (2013) and USFWS concurrence letter (2012) (collectively called "previous consultation documents" in the rest of this BA). In the 2012 programmatic BA, BOEM identified multiple Impact-Producing Factors (IPF) relevant to the proposed activities that were presented in the PEIS; the IPFs formed the basis of the 2012 BA impact analysis for federally listed species. The following IPFs were identified as relevant to the species addressed in the 2012 BA for Renewable Energy development, which is the BOEM program that the proposed action in this BA falls under:

• Active acoustic sound sources;
• Vessel and equipment noise;
• Vessel traffic;
• Trash and debris;
• Seafloor disturbance associated with bottom-founded monitoring buoys and bottom sampling; and
• Accidental fuel spills.

The one proposed activity considered in this BA that has not been considered in the previous consultation documents is the construction and operation of met towers. Up to 16 meteorological towers are proposed offshore North Carolina, South Carolina, and Georgia in total between 2013 and 2020. North Carolina has five offshore planning areas with up to two towers in each of the planning areas (10 met towers). It is assumed that there will be up to three met towers in the non-delineated areas (see areas offshore South Carolina and Georgia) and a single met tower associated with the Georgia IP Lease application (see Table 1). This scenario assumes that the construction of a met tower would take up to three days per foundation with up to eight hours of pile driving activity per day. Thus, the total exposure to pile driving noise in the Southeast Action Area would be 360 to 408 hours.

Even though met towers were not covered under the previous consultation documents, the same IPFs listed above would apply, and the types of impacts those IPFs could cause to federally listed species have already been assessed. However, there would be additional types of potential impacts to federally listed species from met towers that were not covered in the previous consultation documents. These potential impacts would be substantially different than the IPFs already covered and would include noise associated with pile driving during construction, potential collisions with the tower structure, tower lighting impacts, loss of habitat, and prey abundance and distribution effects. These new and different types of potential impacts will be the focus of the impact assessment in this BA.

It should be noted that 16 met buoys are also being proposed as part of the proposed action. The previous ESA consultation with the NMFS covered up to 20 met buoys for the North Carolina renewable energy area (see NMFS 2013 BO). However, the previous consultation with the USFWS covered only up to six met buoys for the North Carolina renewable energy area. In addition, the Georgia Data Collection Configuration is considered additional to the non-delineated 30 lease blocks and their associated met buoys. The proposed action, therefore, would add an additional 16 buoys that were not considered in their entirety in the previous consultation documents. However, met buoys and their associated IPFs and impact analyses have already been thoroughly covered in the previous consultation documents for the South Atlantic Action Area, and the impact types and IPFs described in the previous consultation documents for met buoys are sufficient and incorporated by reference into this BA. The addition of 16 buoys for the Southeast Action Area would not change the impact analysis for buoys or the effects determinations that BOEM stated in the 2012 BA for federally listed species under USFWS jurisdiction. Therefore, met buoys will not be further addressed in this BA.

4.1.2 Species Not Covered under Previous Consultation Documents

Consultation with the USFWS for this BA resulted in the addition of two bird species that were not assessed in the previous consultation documents: black-capped petrel (candidate) and Kirtland's warbler (endangered). The black-capped petrel is currently under review by the USFWS to determine if it should be proposed as threatened or endangered under the ESA (77 FR 37367). Even though these species were not considered in the previous consultation documents, the applicable IPFs and impact analysis for the four bird species addressed in the previous consultation documents would be the same for these two added species. The species' general migratory use of the BA is similar to what was described for the bird species in the 2012 programmatic BA, and the applicable IPFs and potential impacts BOEM presented in the 2012 BA would be the same. BOEM has described the species and their use of the BA area in this BA (Section 4) but is incorporating by reference from the 2012 BA the entire bird impact analysis for the black-capped petrel and Kirtland's warbler. Therefore, BOEM believes that if the black-capped petrel and Kirtland's warbler were part of the 2012 BA, the effects determination would be **May Affect, Not Likely to Adversely Affect**. It should be noted that there is no requirement to give an effects determination for candidate species based on ESA regulations, but should the black-capped petrel be listed in the future, this would be BOEM's effects determination for the species for activities covered in previous consultation documents.

On July 18, 2013, NMFS proposed critical habitat for the loggerhead sea turtle along areas of the East Coast of the United States (78 FR 43005). In waters off North Carolina, South Carolina, and Georgia in the South Atlantic Action Area, the proposed critical habitat includes loggerhead sea turtle nearshore reproductive habitat, winter habitat, constricted migratory habitat, and *Sargassum* habitat. However, the nearshore reproductive habitat includes only waters less than one mile from shore, which is outside of BOEM leasing authority. Thus only winter habitat, constricted migratory habitat, and *Sargassum* habitat will be further considered. Because the critical habitat is proposed at this time, it will need to be determined if the proposed action would adversely modify proposed critical habitat, and the consultation required is referred to as a "conference" under ESA regulations. In addition, consultation with NMFS for this BA resulted in the removal of the endangered shortnose sturgeon from the list of species to be assessed; this species was assessed in the previous consultation documents. It is believed that the species would not occur in the open water areas where met towers would be proposed; therefore, this species will not be addressed in this BA.

4.2 Potential Impacts to Species under USFWS Jurisdiction

Federally listed species under the jurisdiction of the USFWS that the proposed actions could affect are all bird species—piping plover, Bermuda petrel, Kirtland's warbler, and roseate tern. Two candidate species could also be affected by the proposed action—black-capped petrel and red knot (recently proposed as threatened). The IPFs applicable to these birds in the previous consultation documents for

Renewable Energy development included active acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris, and accidental fuel spills. Seafloor disturbance is not an IPF for birds because they do not use offshore benthic habitats. The potential impacts to federally listed and candidate bird species from proposed actions not covered under previous consultation documents are described below. Potential impacts to the manatee and sea turtles are discussed in Section 4.3.

4.2.1 Direct Effects

Pile Driving and Construction

The construction of met towers would result in increased airborne noise, primarily from pile driving activities. As with any sound in the atmospheric environment, the type and intensity of the sound, and the distance it travels, are greatly dependent on multiple factors and can vary greatly. These factors include atmospheric conditions, the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact hammer (Madsen et al. 2006). Because piping plovers and red knots primarily use beaches and flats for nesting and are not chiefly pelagic birds, it is not anticipated that pile driving activities occurring offshore and far from these habitats would affect these species or their habitats. However, it is possible that the piping plover, red knot, and Kirtland's warbler may be exposed to pile driving noise during migration. The Bermuda petrel, black-capped petrel, and roseate tern could potentially be found foraging or migrating through offshore areas and could be exposed to pile driving noise. The reaction of these species (if present in the area) during pile driving activities could range from mild annoyance to escape behavior. However, the potential noise impacts would be short-term, lasting only for the duration of the pile driving activity (four to eight hours per day over three days for each tower). In addition, these species are highly mobile and would be able to avoid the construction area; the noise from pile driving is not anticipated to impact the migratory movement or migratory behavior of these species through the area. Therefore, pile driving-related construction noise may affect these bird species, but the effect would be negligible.

Collision Effects

This section discusses the potential for impacts to protected species resulting from collisions with vessels and structures associated with the proposed action. BOEM anticipates that marine animals will avoid fixed structures, such as meteorological towers, reducing the risk of collisions with these structures. To minimize the potential for collisions, guide wires will not be used to support the tower mast of an offshore met tower. Collisions with vessels and/or structures associated with the proposed action could result in injury to the animal and/or damage to the vessel or structure. A bird that collides into meteorological tower may be injured or killed. However, the area over which up to 16 meteorological towers may be placed is over 960,288 ha, thus making it unlikely that foraging black-capped and Bermuda petrel will routinely encounter these structures. Towers will not be permanent and would be removed no later than two years after the cancellation, expiration, relinquishment, or other termination of the lease. As a result, these impacts would be short-term and would not likely result in population-level effects. The distance from shore will exclude nesting or foraging Kirtland's warblers, roseate terns, and piping plovers. Only migrating roseate terns, piping plovers, and red knots are anticipated to cross the Southeast Action Area for a short period of time during migration, and the number of passages would be extremely low (i.e., one bird = one pass per migration). Therefore, the likelihood of a Kirtland's warbler, roseate tern, piping plover, or red knot encountering a meteorological tower under climatological conditions that would force a migrating bird low enough to actually collide with a tower is so small that the impact of such collisions on federally listed or ESA candidate bird species is discountable.

Lighting Effects

Under poor visibility conditions (fog and rain), migrating birds become disoriented and circle lighted communication towers instead of continuing on their migratory path, greatly increasing their risk of collision (Huppop et al. 2006). Meteorological tower lighting would have the greatest impact on bird species during evening hours when nocturnal migration occurs. However, red flashing lights are commonly used at land-based wind facilities without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger et al. 2010). Thus, red flashing lights would be used at the meteorological towers to reduce the risk of bird collisions. Though there is the potential for the lighting of the meteorological towers to affect the collision probability of the piping plover, roseate tern, and red knot during migration, the anticipated small number of meteorological towers that will be present will greatly decrease the likelihood of these species being in proximity of a tower. Finally, it is anticipated that any additional lights (e.g., work lights) on towers and support vessels will be used only when necessary and be hooded downward and directed when possible to reduce upward illumination and illumination of adjacent waters. Therefore, the potential impacts from the artificial lighting of the meteorological towers on federally listed or ESA candidate bird species would be negligible.

Micro Wind Turbines

Small turbines might be mounted near the platform of meteorological towers and buoys to charge batteries to power electrical equipment. These micro turbines are commonly used to charge batteries in the marine environment and are anticipated to have a rotor swept diameter of two meters or less. It is possible that a bird flying near the deck of a tower or buoy could collide with a rotor and get injured or killed. However, the likelihood that a bird would collide with a meteorological tower is already discountable; the addition of micro turbines does not expand the footprint of the meteorological tower or buoy, and the rotor swept zone of micro turbines is quite small. Therefore, the likelihood of a collision with a micro turbine is also minuscule, and the potential impacts from micro turbines on federally listed or ESA candidate bird species would be negligible.

Meteorological Tower Decommissioning

Meteorological tower decommissioning activities that could affect birds would consist of any atmospheric noise related to tower removal. This noise is not anticipated to be any louder than the impacts already assessed under the Pile Driving and Construction section above. The potential noise impacts from decommissioning would be short-term, lasting only for the duration of the tower removal (one week or less per tower). The bird species are highly mobile and would be able to avoid the tower area during removal, and the noise generated is not anticipated to impact the migratory movement or migratory behavior of these species through the area. Therefore, noise related to tower removal may affect these bird species, but the effect would be negligible.

Discharge of Waste Materials and Accidental Fuel Leaks

Operational waste generated from all vessels associated with the proposed action includes bilge and ballast waters, trash and debris, and sanitary and domestic wastes. A vessel collision with a meteorological tower or other vessel has the potential to result in the spillage of diesel fuel into the marine environment. Vessels associated with the proposed action are expected to comply with the USCG requirements for the prevention and control of oil and fuel spills. Approximately 10 percent of vessel collisions with fixed structures on the OCS caused diesel spills.

Most equipment on the meteorological towers and buoys would be powered by batteries charged by micro wind turbines or solar panels. However, there is a possibility that diesel generators may be used on some of the meteorological towers and buoys, which may cause minor diesel fuel spills during refueling of generators. If a diesel fuel spill was to occur, it would be expected to be small and dissipate quickly, then evaporate and biodegrade within a few days (USDOI, MMS 2007).

Marine and coastal birds could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. Many species of marine birds (such as gulls) often follow ships to forage on fish and other prey injured or disoriented by the passing vessel. In doing so, these birds may be affected by discharges of waste fluids (such as bilge water) generated by the vessels. Operational discharges from construction vessels would be released into the open ocean, where they would be rapidly diluted and dispersed, or collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through on-site waste treatment facilities before being discharged overboard. Deck drainage would also be processed prior to discharge. Thus, impacts to marine and coastal birds from waste discharges from construction vessels are expected to be negligible.

Coastal and pelagic birds may become entangled in or ingest floating, submerged, and beached debris. Entanglement may result in strangulation, injury to or loss of limbs, entrapment, or the prevention or hindrance of the ability to fly or swim, and all of these effects may be considered lethal (Ryan 1990). However, the discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the BOEM (30 CFR 250.300) and the USCG (MARPOL, Annex V, Public Law 100-220 [101 Statute 1458]). Thus, entanglement in or ingestion of OCS-related trash and debris by marine and coastal birds is not expected, and impacts to marine and coastal birds would be negligible.

Because of the extremely limited amount of vessel traffic and construction activity that might occur with construction and operation of a meteorological tower, the release of wastes, debris, hazardous materials, or fuels would occur infrequently and would cease following completion of the geological and geophysical surveys, meteorological tower construction, and meteorological tower decommissioning.

The likelihood of an accidental fuel release would also be limited to the active construction and decommissioning periods of the site characterization. Kirkland's warblers, piping plovers, and red knots are strictly terrestrial foragers, and roseate terns typically feed only in shallow waters, so these species are not expected to follow vessels to forage. In addition, the areas where these impacts could occur do not strictly overlap with the foraging range of breeding piping plovers and roseate terns and only encompass a tiny proportion of the migratory range of the Kirkland's warbler, piping plover, roseate tern, red knot, black-capped petrel, and Bermuda petrel. As such, impacts to ESA-listed and candidate bird species from the discharge of waste materials or the accidental release of fuels are expected to be negligible.

4.2.2 Indirect Effects

Indirect effects to bird species would include effects that could occur as a result of met towers but at a later time. Alteration of flight paths due to tower presence could disrupt feeding and other behaviors or cause the expenditure of additional energy in individual birds that would have otherwise not occurred. However, there would not be a dense concentration of met towers, with up to 16 met towers placed over 960,288 ha, and towers will not be permanent and would be removed no later than two years after the cancellation, expiration, relinquishment, or other termination of the lease. As a result, these impacts would be temporary and would not result in population-level effects.

4.3 Potential Impacts to Species under NMFS Jurisdiction

Federally listed species under the jurisdiction of the NMFS that could be affected by the proposed action include marine mammals, sea turtles, and fish (see Table 2). The IPFs applicable to listed marine mammals and sea turtles in the previous consultation documents for Renewable Energy development included active acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris, and accidental fuel spills. Seafloor disturbance is not an IPF for the listed whales and sea turtles because the degree of seafloor disturbance is expected to have no effect to benthic forage available and thus consumed by marine mammals and sea turtles. The IPFs applicable to listed fish species in the previous consultation documents for Renewable Energy development included active sound sources, trash and debris, seafloor disturbance, and accidental fuel spills. The potential impacts to federally listed marine species from proposed actions not covered under previous consultation would include noise from pile driving construction, loss of water column and benthic habitat, and prey abundance and distribution effects during met tower construction, operation, and decommissioning.

4.3.1 Direct Effects

4.3.1.1 *Pile Driving and Construction*

As with any sound in the marine environment, the type and intensity of the sound is greatly dependent on multiple factors and can vary greatly. These factors include the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact/vibratory hammer (Madsen et al. 2006). Despite the potential for variance between areas and equipment, this section attempts to capture the range of acoustic impacts that could potentially arise from pile driving meteorological tower foundations.

4.3.1.1.1 Impact Pile Driving

Studies have reported that pile driving can generate sound pressure levels (SPLs) greater than 200 dB re 1 µPa with a relatively broad bandwidth of 20 Hz to >20kHz (Madsen et al. 2006; Thomsen et al. 2006; Nedwell and Howell 2004; Tougaard, Madsen, and Wahlberg 2008). In the Cape Wind Draft EIS, modeling for construction of a commercial wind turbine foundation was presented in Appendix 5-11A (Noise Report) indicating that the underwater noise levels from pile driving may be greater than the NMFS MMPA threshold for behavioral disturbance/harassment (160 dB re 1 µPa) from a non-continuous source (i.e., pulsed) within approximately 3.4 km (2.1 mi) from the source. Actual measures of underwater sound levels during the construction of the Cape Wind met tower in 2003 were reported between 145–167 dB re 1 µPa at 500 m (1,640 ft)(See Table 3). Peak energy was reported around 500 Hz (USDOI, BOEM, OREP 2012a).

Modeling was also conducted for proposed met tower sites located offshore New Jersey and Delaware under Interim Policy (IP) leases by Bluewater Wind, LLC. The 160 dB re 1µPa isopleth was modeled at 7,230 m (23,721 ft) for Delaware and 6,600 m (21,654 ft) for New Jersey (USDOI, BOEM, OREP 2012a). The information from Cape Wind Associates and the Bluewater Wind are a good representation of the potential range of ensonified area with both the 180 dB re 1 µPa and 160 dB re 1 µPa SPLs (Table 3). However, it should be noted that the sources are different sizes, the monopile diameters differ, and the environmental characteristics are likely different, causing the isopleths to vary.

Table 3. Modeled Range at Three Sound Pressure Levels (SPLs) within the Ensonification Area Produced by Pile-Driving

Project (modeled)	Additional Info	180 dB re 1µPa (rms)	160 dB re 1µPa (rms)	120 dB re 1µPa (rms)
Bluewater Wind (Interim Policy Lease offshore Delaware)	3.0-meter (10 ft) diameter monopile; 900 kJ hammer	760 meters (2,493 ft)	7,230 meters (23,721 ft)	N/A
Bluewater Wind (Interim Policy Lease offshore New Jersey)	3.0-meter (10 ft) diameter monopole; 900 kJ hammer	1,000 meters (3,281 ft)	6,600 meters (21,654 ft)	N/A
Cape Wind Energy Project (Lease in Nantucket Sound)	5.05-meter (16.57 ft) diameter monopole; 1,200 kJ hammer	500 meters (1,640 ft)	3,400 meters (11,155 ft)	N/A
Naval Facilities Engineering Command (2013) page 40; California Dept. of Transportation	0.6–1.8-meter (2-6 ft) diameter monopoles; vibratory hammer	≤10 meters (33 ft)	N/A	>7,000 meters (22,966 ft)

(2009) (Appendix 1)				
Source: USDOI, BOEM, OREP 2012a. Key: kJ = kilojoule; rms = root mean squared				

To minimize the effects of pile driving on listed species, BOEM will require lessees to follow several mitigating standard operating conditions as part of their lease or as terms and conditions on a site assessment plan (SAP). These measures are detailed in Section 6.

4.3.1.1.2 Vibratory Pile Driving

Pile driving can also be completed with a vibratory rather than an impact hammer. Vibratory hammers use oscillatory hammers that vibrate the pile, causing the sediment surrounding the pile to liquefy and allow pile penetration. Peak sound pressure levels for vibratory hammers can exceed 180 dB; however, the sound from these hammers rises relatively slowly, and the sound energy is spread out over time. As a result, sound levels are generally 10 to 20 dB lower than impact pile driving (Caltrans 2009).

Almost all available literature on sound levels produced by vibratory hammers are modeled or measured in shallow water (2–15 m or 6.6–49 ft), usually in harbors and bays, using smaller diameter monopiles (DoN 2013; Caltrans 2009), compared to offshore installation sites in the South Atlantic BA Action Areas (approx. 14–100 m or 46–328 ft).

The noise levels produced by vibratory pile driving were modeled by the navy in its request for incidental harassment authorization for the Wharf C-2 recapitalization project at Naval Station Mayport in Florida (DoN 2013). The 180 dB re 1µPa isopleth was modeled at less than 1 m (3.3 ft) and the 120 dB re 1µPa isopleth was modeled at 7, 356 m (22, 966 ft) (Table 3).

As with impact pile driving, it should be noted that differences in monopile diameters, pile types, and environmental characteristics can lead to different isopleths under different project conditions. While modeling done by the navy indicates that the potential range of the ensonified area within the 120 dB re 1µPa SPL would be expected to be larger for vibratory pile driving than for impact pile driving (DoN 2013), due to the lower source level of vibratory pile driving noise compared to impact pile driving noise, the potential range of the ensonified area within the 180 dB re 1 µPa SPL would be expected to be much smaller for vibratory pile driving than for impact pile driving (Table 3). Results from vibratory pile driving projects in the South China Sea indicate that "in appropriate soils, using vibratory hammers can not only reduce the installation time and the costs, but moreover minimizes the environmental impact during installation" (Middendorp and Verbeek 2012).

4.3.1.1.3 Marine Mammals

Currently, impacts to marine mammals from in-water acoustic sources are based on levels that can cause behavioral harassment and/or physiological damage or injury. Under the MMPA, NMFS has established thresholds that determine these impacts that are based on the root-mean-squared (RMS) metric of SPL. The SPL RMS for threshold criteria as established by NMFS are:

- 180 dB re 1 µPa or greater for potential injury to cetaceans (Level A);

- 190 dB re 1µPa for pinnipeds in water for potential injury to pinnipeds (Level A);
- 160 dB re 1 µPa for behavioral disturbance/harassment for non-continuous/impulsive noise to pinnipeds (in water) and cetaceans (Level B); and
- 120 dB re 1 µPa for behavioral disturbance/harassment from continuous noise to pinnipeds (in water) and cetaceans (Level B).

These thresholds have been developed based on limited experimental studies on captive odontocetes, controlled field experiments on wild animals, behavioral observations of wild animals exposed to anthropogenic sounds, and inferences from marine mammal vocalizations as well as inferences on hearing studies in terrestrial animals. Despite the current threshold criteria, individual marine mammal reactions to sound can vary depending on a variety of factors such as age and sex of the animal, prior noise exposure history of the animals that may have caused habituation or sensitization, the behavioral and motivational state of the animal at the time of exposure (i.e., if the animal is feeding and does not find it advantageous to leave its location), habitat characteristics, environmental factors that affect sound transmission, and location of the animal (i.e., distance from the shoreline) (NRC 2003). Generally, pinniped underwater thresholds are applied to manatees given similar hearing ranges. Nonetheless, the threshold levels referred to above are considered conservative based on the best available scientific information.

During met tower construction, noise generated by pile driving may be audible to marine mammals. Unmitigated acoustic interference and disturbance could cause behavioral changes and masking of inter- and intra-specifics calls and disrupt echolocation capabilities. The potential for behavioral reactions may extend out many miles (Madsen et al. 2006; Tougaard, Madsen, and Wahlberg 2008). Near-field behavioral reactions without BOEM's standard operating conditions could result in avoidance of or flight from the sound source, avoidance of feeding habitat, changes in breathing patterns, or changes in response to predators (Watkins and Schevill 1975; Malme et al. 1984; Richardson et al. 1995; Mate, Nieukirk, and Kraus 1997; Nowacek et al. 2007; Tyack 2009). Depending on the frequency and source level of the noise generated during pile driving, physiological effects such as temporary threshold shift (TTS) and permanent threshold shift (PTS) could occur at close range to the source (Richardson et al. 1995; Madsen et al. 2006). Currently, the biological consequences of hearing loss or behavioral responses to construction noise are not fully known (Tougaard, Madsen, and Wahlberg 2008), and little information regarding short-term and long-term impacts to marine mammal populations from such activity is available. A recent study in a large embayment (Moray Firth) in Northeast Scotland suggested that mid- and low-frequency cetaceans, such as minke whales and bottlenose dolphins, could experience behavioral disturbance (at 160 dB re 1 µPa or greater according to NMFS MMPA criteria) up to approximately 50 km (30 nmi) away from the source and potential injury such as permanent threshold shift (PTS) or temporary threshold shift (TTS) (at 180 dB re 1 µPa or greater according to NMFS MMPA criteria) within 100 m (328 ft) of the source (Bailey et al. 2010). It is important to note that the results of this study, due to the geology of Moray Firth and size of the piles (five MW wind turbine foundations), are not directly transferable to met tower construction in the US Southeast Atlantic OCS. While the potential for individual animals to perceive the pile driving activity at great distances exists, it is not expected to affect entire populations of marine mammals. It is expected that some species of marine mammals will leave the area when construction vessels arrive and begin their activities (Dähne et al. 2013). This would greatly reduce their exposure to the noise source. It is expected that marine mammals that left the area during construction would be able to return to the area following the completion of the work (i.e., three days).

Large whales present within the Southeast Action Area are expected to be transiting between summer feeding grounds in the north and winter calving grounds in the south. While large whales may be present within the Southeast Action Area throughout the year, the location of these whales can be monitored, and pile driving can be delayed (outside of the pile driving prohibition period of November–April) until all whales leave the potential area of influence. Based on the best available information and the standard operating conditions listed in Section 7, no North Atlantic right, humpback, fin, sei, blue, or sperm whales are expected to be exposed to noise levels greater than 180 dB re 1µPa. Therefore, North Atlantic right, humpback, fin, sei, blue, and sperm whales may experience temporary adverse impacts equivalent to Level B harassment during met tower pile driving.

Impact Pile Driving

It is expected that potentially injurious noise levels to marine mammals would occur only within the immediate vicinity of the impact pile driving activity (i.e., within 100 m [328 ft]) (USDOI, BOEM 2012a). Construction of a met tower would take place over a relatively short duration and would be limited to a maximum of 10 locations placed over 8,163 square km (2,377 square nmi) of the five offshore areas. All impact pile driving would also be prohibited during the Mid-Atlantic and Southeastern US Seasonal Management Areas November 1 through April 30 and November 15 through April 15 management periods, respectively (see Section 6), for the protection of North Atlantic right whales, which would also benefit other marine mammals in the Southeast Action Area. There are two SMAs in effect over a portion of the North Carolina Action Area (see Mid-Atlantic SMA map in Section 2.2).

It is expected that Level B disturbance/harassment levels of sound (160 dB re 1 µPa) due to impact pile driving would occur within 7 km (4 mi), and Level A disturbance/harassment (180 dB re 1 µPa) would occur within 1,000 m (3,281 ft) of the activity (USDOI, BOEM 2012a). BOEM will require a default exclusion zone of 1,000 m (3,281 ft) to be monitored from the sound source and an additional observation vessel circling the sound source at 500 m (1,641 ft) from the source. Therefore, BOEM anticipates that no whales will be exposed to sound levels greater than 180dB as impact pile driving would not occur should a whale enter within 1,000 m (3,281 ft) of the active source. As such, no whales are expected to be exposed to sound levels that would cause injury (above 180 dB re 1µPA). It is anticipated that NOAA will be revising their acoustic threshold criteria, and should these, as well as updated, field-verified or modeled acoustic data, indicate that current mitigation measures require modification, BOEM reserves the right to modify the mitigation measures to reflect the new data.

Vibratory Pile Driving

As with impact pile driving, it is expected that potentially injurious noise levels to marine mammals would only occur within the immediate vicinity of the vibratory pile driving activity; this range is expected to be smaller for vibratory pile driving than for impact pile driving (Table 3). Vibratory pile-driving would also be prohibited during the Mid-Atlantic and Southeastern US Seasonal Management Areas November 1 through April 30 and November 15 through April 15 management periods, respectively (see Section 6). In addition, construction of met towers would take place over a relatively short duration and would be limited to a maximum of 17 locations placed over 9,603 square km (2,800 square nmi) of the Southeast Action Area. As a result, any noise-related disturbances are anticipated to be discreet and brief. As mentioned above, Level B disturbance/harassment levels of sound (120 dB re 1 µPa) due to vibratory pile driving could occur within approximately 7 km (4 mi) and Level A harassment (180 dB re 1 µPa) within 10 m (33 ft) of the activity. For impact pile driving, BOEM will require a default exclusion zone of 1,000 m (3,281 ft) to be monitored from the sound source and an additional observation vessel circling the sound source at 500 m (1,641 ft) from the source. This exclusion zone is designed to ensure that no whales will be exposed to sound levels greater than 180dB. Since the Level A sound threshold is anticipated to be restricted to a smaller area for vibratory pile driving, the exclusion zone for vibratory pile driving could potentially be smaller than the 1,000 m zone established for impact pile driving. Thus marine mammals may temporarily adversely affected by Level B harassment.

4.3.1.1.4 Sea Turtles

The hearing capabilities of sea turtles are not as well studied or as well-known as those of marine mammals. Limited experimental studies explore the hearing ranges of sea turtles. It is not possible to infer potential hearing ranges based on frequencies of vocalizations, as sea turtles do not vocalize. Therefore, the information that does exist is based on studies that explored the physiological and behavioral reactions of sea turtles exposed to various sounds as well as direct hearing measurements. Ridgeway et al. (1969) reported that Pacific green sea turtles displayed hearing sensitivity in air from 30–500 Hz with an effective hearing range of 60–1,000 Hz. Lenhardt (1994) expanded on this in-air sensitivity by suggesting that in-water sensitivity for sea turtles was 10 dB less than air. Using auditory-evoked potentials, Bartol, Musick, and Lenhardt (1999) found that juvenile loggerheads exhibit an effective hearing range of 250–750 Hz with peak sensitivity at 250 Hz. Lendhardt (1994) found that low frequencies sources (20–80 Hz) invoked a startle response from loggerhead sea turtles and that sea turtles have an effective hearing range of 100–800 Hz with an upper limit of 2,000 Hz. More recently, Bartol and Ketten (2006) reported that sub-adult Pacific green turtles responded to stimuli between 100 and 500 Hz, with maximum sensitivity between 200 and 400 Hz, while juvenile Atlantic greens responded to stimuli between 100 and 800 Hz, with maximum sensitivity between 600 and 700 Hz. Kemp's ridleys responded stimuli between 100 and 500 Hz with maximum sensitivity between 100 and 200 Hz. More recently, Dow Piniak et al. (2012a) developed a new technique to gauge the sensitivity of juvenile green sea turtles to noise underwater and in air. They found that juvenile green sea turtles responded to stimuli between 50 and 1600 Hz in water and 50 and 800 Hz in air, with ranges of maximum sensitivity between 50 and 400 Hz in water and 300 and 400 Hz in air. Martin et al. (2012)

used similar underwater methodologies with a loggerheads and recorded responses to frequencies between 100 and 1131 Hz with greatest sensitivity between 200 and 400 Hz. Both studies using this newly developed methodology found that green and loggerhead sea turtles responded to a broader and higher range of frequency sensitivity than reported by previous studies in air and at the water's surface. Dow Piniak et al. (2012b) have also examined the noise sensitivity of leatherback sea turtle hatchlings and found that leatherback sea turtle hatchlings respond to stimuli between 500 and 1200 Hz in water and 50 and 1600 Hz in air, with the greatest sensitivity between 100 and 400 Hz in water and 50 and 400 Hz in air. This research indicates that sea turtles are capable of hearing low frequency sounds, with some variation in size, age, and species of turtle.

As the hearing frequencies of sea turtles fall within the frequencies produced by construction and survey activities, these animals may be affected by exposure. In regard to source levels required by sea turtles to perceive sounds, Ridgeway et al. (1969) reported that 110–126 dB re 1 µPa were required for animals to hear sounds. Further, McCauley et al. (2000) reported that source levels of 166 dB re 1 µPa were required to evoke behavioral reactions from captive sea turtles.

During met tower construction, noise generated by pile driving may be audible to sea turtles. Loggerhead, leatherback, green, and Kemp's ridley sea turtles are known to occur within the Southeast Action Area. Similar to marine mammals, noise from pile driving could cause some sea turtles to move away from or avoid the construction area. Currently, the biological consequences of hearing loss or behavioral responses to construction noise are not known, and little information exists regarding short-term and long-term impacts to sea turtle populations from pile driving noise exposure. Avoidance of ensonified areas could disrupt foraging and migration or result in the expenditure of additional energy that would have otherwise not occurred; however, these impacts would be temporary and would not result in population-level effects. Large numbers of individuals are not expected to be exposed to pile driving noise due to the short-term duration of the activity and the limited spatial scale of construction within the Southeast Action Area. Also, mitigation measures (as detailed in Section 7) are expected to further reduce any impacts from construction-related acoustics by requiring a 60-minute observation period before pile driving begins, a 1,000 m (3,281 ft) exclusion zone during pile driving, and a soft start procedure to allow animals to leave the area prior to harassing levels of sound.

Little information is available addressing sea turtle behavioral reactions to levels of sound below the estimated TTS and injury levels. The existing studies related to sea turtle hearing have found that sea turtles may have a limited capacity to detect sound; however, this is based on a limited number of individuals and should be interpreted with caution. As previously described, Ridgeway et al. (1969) reported that Pacific green sea turtles displayed hearing sensitivity in air from30-50 Hz with an effective hearing range of 60–1,000 Hz. Whereas, Bartol, Musick, and Lenhardt (1999) found that juvenile loggerheads exhibit an effective hearing range of 250–750 Hz with peak sensitivity at 250 Hz, and Dow Piniak et. al. (2012b) found that leatherback sea turtle hatchlings showed greatest sensitivity between 100 and 400 Hz in water and 50 and 400 Hz in air. Ridgeway et al. (1969) reported that 110–126 dB re 1 µPa were required for sea turtles to hear sounds. However, McCauley et al. (2000) reported that source levels of 166 dB re 1 µPa were required to evoke behavioral reactions from captive sea turtles.

According to available information on sea turtle behavioral response to intense pulsed sounds (i.e., impact pile driving), sea turtles are likely to actively avoid disturbing levels of sound (O'Hara and Wilcox 1990; McCauley et al. 2000). While avoidance may aid in reducing exposure to disturbing sounds, it may also result in the alteration of normal behaviors such as migration and foraging. However, these alterations are expected to be localized and temporary, lasting only the duration of pile installation (impact or vibratory for a maximum of four to eight hours per day over three days for each tower).

Sea turtles would be expected to return to areas previously avoided due to sound levels following the cessation of pile driving activities. As pile driving would occur for approximately four to eight hours a day, it is likely that sea turtles would be excluded from the area with disturbing levels of sound for only this period each day. Should sea turtles be present and feeding or resting in an area where pile-driving occurred, it is expected that they could find alternative forage and resting locations elsewhere within the Southeast Action Area. Additionally, should sea turtles be migrating through the Southeast Action Area, it is expected that they would avoid disturbing noises, thereby decreasing the potential for impacts from the pile driving noise. The avoidance of the area due to sound would therefore affect individuals; however, it is expected that these effects would be temporary and localized. It is expected that foraging, migrating, or resting sea turtles would be only minimally impacted, and no injury or impairment of an individual's ability to complete essential behavioral functions is expected.

As explained in the marine mammal discussion above, a 1,000 m (3,281 ft) exclusion zone will be monitored by trained protected species observers from two distances (0 and 500 m from the sound source) for at least 60 minutes prior to the start of any pile driving. It is expected that the observers will be able to detect the presence of sea turtles within the 1,000 m (3,281 ft) exclusion zone. This exclusion zone is based on the sound levels produced by impact pile driving; the sounds levels produced by vibratory pile driving are anticipated to affect a smaller area (Table 3). However, as it is unknown at this time which method of pile driving will be used, this analysis will use the 1,000 m exclusion zone as a worst-case scenario. Sea turtle dive durations range from 5–40 minutes, depending on the species, with a maximum duration of 45–66 minutes, depending on the species (Spotila 2004). Based on this information, it is reasonable to expect that monitoring the exclusion zone for at least 60 minutes will allow protected species observers to detect any sea turtle within the exclusion zone prior to the start of construction activities. Sound levels during pile driving are expected to dissipate below 180 dB re 1µPa within 1,000 m (3,281 ft) of the source. It is expected that the pile driving activity, while following the standard operating conditions, would result in short-term avoidance of some ensonified areas. Thus, sea turtles may be temporarily adversely affected by pile driving sounds outside of the 1,000 m (3,281 ft) exclusion zone.

4.3.1.1.5 Marine Fish

In estimating the potential effects of noise to fishes, it is important to understand that any sound source produces both pressure waves and actual motion of the medium particles. All fishes, including elasmobranchs such as the listed smalltooth sawfish, detect particle motion since it directly stimulates the inner ear (Popper et al. 2003). Bony fishes with an air bubble (most often the swim bladder) are also likely to detect pressure signals that are re-radiated to the inner ear as particle motion. Species detecting pressure hear a wider range of frequencies and sounds of lower intensity than fishes without an air bubble (such as the listed shortnose sturgeon and Atlantic sturgeon) since the bubble re-radiates the received signal, which is then detectable by the ear as a secondary sound source (Popper et al. 2003; Popper and Fay 2010).

Hearing thresholds have been determined for perhaps 100 fish species; data on hearing thresholds can be found in Fay (1988), Popper et al. (2003), Ladich and Popper (2004), Nedwell et al. (2004); Ramcharitar, Gannon, and Popper (2006), and Popper and Schilt (2008). These data demonstrate that, with few exceptions, fishes cannot hear sounds above about 3–4 kHz, and the majority of species are able to detect sounds only to 1 kHz or below. Studies of the family Aceripensidae (sturgeons) suggested that the highest frequency they can detect is 800 Hz and that they have relatively poor sensitivity (Lovell et al. 2005; Meyer, Fey, and Popper 2010). Studies on a few species of cartilaginous fishes such as the smalltooth sawfish suggest that they detect sounds to no more than 1,000 Hz and are not very sensitive to sound (Casper, Lobel, and Yan 2003).

Literature relating to the impacts of sound on marine fish species can be conveniently divided into the following categories: (1) pathological effects, (2) physiological effects, and (3) behavioral effects. Pathological effects include lethal and sublethal physical damage to fish; physiological effects include primary and secondary stress responses, and behavioral effects include changes in exhibited behaviors of fish. Behavioral changes might be a direct reaction to a detected sound or a result of the anthropogenic sound masking natural sounds that the fish normally detect and to which they respond. The three types of effects are often interrelated in complex ways. For example, some physiological and behavioral effects could potentially lead to the ultimate pathological effect of mortality. Popper and Hastings (2009) reviewed what is known about the effects of sound on fishes and identified areas of uncertainty relative to measurement of sound and the responses of fishes.

Hastings et al. (1996) suggested that sounds 90 to 140 dB above a fish’s hearing threshold may potentially injure the inner ear of a fish. Hastings et al. (1996) exposed oscar fish (*Astronotus ocellatus*) to synthesized sounds with characteristics similar to those of commonly encountered man-made sources. The only damage observed was in fish exposed for one hour to 300 Hz continuous tones at 180 dB re 1 µPa at 1 m and sacrificed four days post-exposure. Enger (1981) provided the earliest evidence of the potential of loud sounds to pathologically affect fishes’ hearing. He demonstrated that the sensory cells of the ears of Atlantic cod (*Gadus morhua*) were damaged after one to five hours of exposure to continuous synthesized sounds with a source sound pressure level of 180 dB re 1 µPa at 1 m (UMT). The frequencies tested included 50, 100, 200, and various frequencies between 300 and 400 Hz. The cod were exposed at less than 1 m (3.3 ft) from the sound source. Chapman and Hawkins (1973) found that ambient noise at higher sea states in the ocean have masking effects in cod, haddock, and pollock. Additionally, sound could also produce generalized stress (Wysocki, Dittami, and Ladich 2006). Thus, based on limited data, it appears that for fish in general, communication masking and stress may occur depending on the species, sound pressure level, frequency, and duration of exposure. Specific acoustic thresholds for behavioral impacts to Atlantic sturgeon have not been established but only sounds from pile driving at close range would be expected to be perceived by Atlantic sturgeon. The only data on mortality associated with sound sources other than explosives comes from studies of driving large piles. For example, the California Department of Transportation (Caltrans 2001) showed some mortality for several different species of wild fishes exposed to driving of steel pipe piles 2.4 m (8 ft) in diameter. However, mortality did not seem to occur at distances of more than approximately 10 m (33 ft) from the source.

For purposes of assessing behavioral effects of pile driving at several West Coast projects, NMFS has employed a 150dB re 1 µPa RMS SPL criterion at several sites including the San Francisco-Oakland Bay Bridge and the Columbia River Crossings. In previous consultations with BOEM, NMFS has used 150 dB re 1 µPa RMS as a conservative indicator of the noise level at which there is the potential for behavioral effects on fish. NMFS has been clear that exposure to noise levels of 150 dB re 1 µPa RMS will not always result in behavioral modifications nor that any behavioral modifications will rise to the level of take (i.e., harm or harassment). However, the potential exists, upon exposure to noise at this level, for fish to experience some behavioral response. Behavioral responses could range from a temporary startle to avoidance of an ensonified area. For assessing injury NMFS has a cumulative sound exposure level of 187 dB 1µPa^{2}s; however, recent studies by Popper et al. (2013) suggest that a cumulative sound exposure level of 207 dB re 1µPa^{2}s is more appropriate.

Noise generated from pile driving could have pathological, physiological, or behavioral effects on marine fish. Unmitigated construction noise could disturb normal behaviors (e.g., feeding) of ESA-listed fish if they were present within the construction area during pile driving activities. However, the soft start procedure for pile driving (see Section 6) is expected to allow fish that may be impacted to leave the area. In addition, the Atlantic sturgeon occur in shelf waters during fall and winter months, which would be the time period when pile driving will be prohibited due to the seasonal pile driving prohibition in the Mid-Atlantic (November 1–April 30) and Southeast (November 15–April 15) for the protection of migrating right whales (see Section 6). Furthermore, when present offshore, Atlantic sturgeon are not anticipated to occur in large densities, greatly reducing the likelihood of their exposure to pile driving noise. Smalltooth sawfish could potentially be in the vicinity of pile driving activities, but this species is unlikely be found in the Southeast Action Area. The smalltooth sawfish historically occurred along the East Coast north to Long Island Sound. However, this range has been greatly reduced over the past 200 years, leaving a single DPS in southwest Florida. A search of the National Sawfish Encounter Database (Simpfendorfer and Wiley 2006), managed by the Florida Museum of Natural History Sawfish Implementation Team, revealed only two recent sightings of smalltooth sawfish: one off Florida and another from Georgia reported by a bottom longline fishery observer who documented the capture of an estimated 4.0 m (13 ft) adult from depths of 45.6–72.6 m (152–242 ft).

Sturgeon and smalltooth sawfish that are exposed to noise levels greater than 150 dB re 1uPa RMS may respond behaviorally. In the worst case, it could be expected that behavioral responses would result in sturgeon and sawfish avoiding the ensonified area for the three to eight hours that pile driving will occur. Sturgeon and sawfish are expected to return to the area once pile driving ceases. Because avoidance would be limited to the period when piles are being driven, no fish will be displaced due to acoustic impacts from a particular area for more than eight hours on no more than three consecutive days. While the movements of individual fish may be affected by the sound associated with pile installation, and normal behaviors such as foraging, resting, or migrating may be disrupted, these effects will be temporary. Major shifts in habitat use or distribution or foraging success are not expected. Injury or mortality to any Atlantic sturgeon or smalltooth sawfish from exposure to pile driving noise is not expected.

The standard operating conditions required by BOEM, primarily the pile driving soft start provision, will reduce impacts to ESA-listed marine fish. This measure will be included as a condition on any leases and/or terms and conditions of SAPs approved under this proposed action. Due to the soft start procedure, it is anticipated that the majority of fish would flee the area during the period of disturbance and return to normal activity in the area post-construction. Due to the offshore location of the activity and the soft start provision, the potential exposure of ESA-listed marine fish to potentially injurious levels of noise (approximately SEL_{cum} 207 dB re μPa^2s) is negligible. Exposure to pile driving noise between SEL_{cum} 207 dB re 1μPa^2s and 150 dB re μPa RMS, although still unlikely, may occur.

4.3.1.2 *Loss of Habitat*

The presence of met towers below the water surface would displace benthic and water column habitat for marine species. A loss of this habitat could affect marine species that may be moving through the area by forcing them to change direction to avoid the structure, resulting in a disruption in their behavior. However, the aquatic habitat displaced by a tower would be extremely small compared to available aquatic habitat surrounding the tower area. ESA-listed whales, sea turtles, and fish are highly mobile and would be expected to avoid tower areas and use the vast areas of aquatic habitat around met towers during construction. After construction, sea turtles and Atlantic sturgeon may utilize the artificial habitat. In addition, there would be a low density of towers with a maximum of 116 towers placed over 960,288 ha off North Carolina, South Carolina, and Georgia.

Loggerhead sea turtle critical habitat has been proposed throughout the Southeast Action Area. However, the planning areas offshore North Carolina (78 FR 43005 Figure 4-1) contains the most in the way of proposed designations. The proposed *Sargassum* habitat covers the entire Southeast Action Area. The proposed winter habitat overlaps with North Carolina Planning Areas 3 and 4, and the proposed migratory habitat would overlap the Kitty Hawk Call Area and Planning Area 4 (Figure 4-1). As a result, it is possible that a met tower could be placed within these proposed critical habitat areas. As described in the proposed rule for designation of critical habitat (78 FR 138; July 18, 2013), the primary constituent elements (PCEs) for winter habitat are: (1) water temperatures above 10°C from November through April; (2) continental shelf waters in proximity to the western boundary of the Gulf Stream; and (3) water depths between 20 and 100 m. The PCEs for migratory habitat are: (1) constricted continental shelf area relative to nearby continental shelf waters that concentrate migratory pathways and (2) passage conditions to allow for migration to and from nesting, breeding, and/or foraging areas.

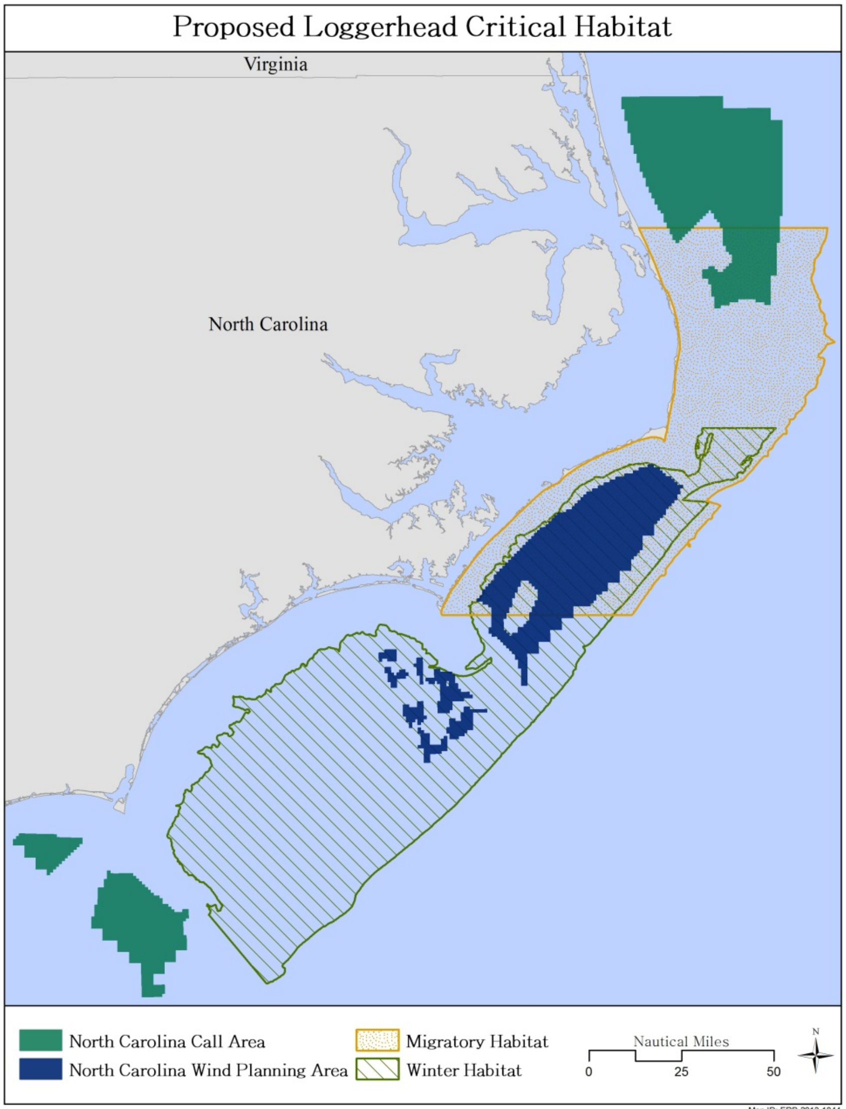

Figure 4-1. Proposed loggerhead critical habitat offshore North Carolina.

Construction of met towers is not anticipated to impact any PCEs for *Sargassum* or winter habitat as they will not result in the physical harvest or pollution of *Sargassum* nor changes in water temperature, respectively. The PCEs for migratory habitat could be impacted if construction of the towers results in altered habitat conditions needed for efficient passage. However, noise associated with construction of a met tower would be temporary (not more than three days), and the area that would be displaced by towers would be a small fraction of the entire proposed critical habitat area, containing no significant physical barriers to migration. Lastly, the towers would be removed no later than two years after the cancellation, expiration, relinquishment, or other termination of the lease. Therefore, it is highly unlikely that this PCE would be significantly impacted, and this habitat would experience no adverse modification.

Although many marine fish are likely to occupy complex structure habitats created by meteorological tower foundations and buoy moorings, the Atlantic sturgeon and smalltooth sawfish are not species known to occupy such habitats. Due to colonization of the foundation structure by mussels and other mollusks, however, the base of the foundation could provide additional forage for Atlantic sturgeon. Overall it is expected that the moorings and foundations would likely result in a negligible loss of habitat within their footprint.

4.3.1.3 *Meteorological Tower Decommissioning*

Meteorological tower decommissioning activities that could affect federally listed marine species would consist of any in-water noise related to removal of the tower. This noise is not anticipated to be any louder than the impacts already assessed under the Pile Driving and Construction section above. The potential noise impacts from decommissioning would be temporary, lasting only for the duration of the tower removal. The marine species are highly mobile and would be able to avoid the tower area during removal; the noise generated is not anticipated to impact the migratory movement or migratory behavior of these species through the area. Therefore, noise related to tower removal may affect marine species, but the effect would be negligible.

4.3.2 Indirect Effects

4.3.2.1 *Prey Abundance and Distribution*

The presence of the tower structure underwater could potentially affect changes in prey abundance within the immediate area (<20 m) of the foundation (Andersson and Öhman, 2010). The underwater portions of the tower could lead to schooling of fish around the structures and would provide a new surface for benthic organisms to colonize in areas where this type of habitat did not previously exist. Sea turtles could be attracted to this habitat and the benthic organisms as an additional food source. Similarly, individual whales and Atlantic sturgeon could be attracted to tower foundations to feed on schooling fish or benthic invertebrates, respectively, that may be present. However, despite the possible localized changes in prey abundance and distribution, any potential changes would be unlikely to affect the overall distribution of any of these species. Therefore, any effects to whales, sea turtles, and marine fish distribution and foraging would be negligible.

4.4 Cumulative Effects

Cumulative effects, as defined in 50 CFR 402.02, are those effects of future state or private activities, not involving Federal activities, which are reasonably certain to occur within the Southeast Action Area. Cumulative effects consider past and current activities (the baseline) as well as future private commercial activities. Section 2.1 of this BA provides a discussion of the impact-producing factors of the environmental baseline in the area of BA coverage. Sections 4.1 through 4.3 discuss the reasonably foreseeable impact-producing factors from the proposed action and present an evaluation of potential impacts of the proposed action on the listed species. Cumulative effects along the Atlantic OCS;

including the effects shipping and marine transportation, commercial and recreational fishing, dredging, coastal development, climate change, and changes in ambient noise levels; are discussed in detail in the programmatic biological assessment and draft environmental impact statement (USDOI, BOEM, 2012b) and will not be repeated here. Future federal actions are not considered because they require separate consultation under Section 7(a)(2) of the ESA. Generally, the incremental impact of the proposed action within the context of the cumulative activities and processes listed above are not expected to be detectable in the long term.

5. DETERMINATION OF EFFECT

5.1 Birds

Federally listed birds could occur in the North Carolina Action Area, and given the geographic scope of the proposed action, some birds could reasonably be expected to come into contact with met tower activities. There would be **No Effect** to piping plover critical habitat.

Based on the analysis in Section 5, the proposed action **May Affect** migrating Bermuda petrels, black-capped petrels, Kirtland's warblers, roseate terns, piping plovers, and red knots due to pile driving noise, tower collisions, tower lighting, and tower decommissioning. Impacts could include escape responses, alteration of migration paths, and injury or death from tower collisions. However, the pile driving noise impacts would be short-term (four to eight hours per day over three days for each tower). Due to the small number of structures over a vast area, the anticipated use of flashing red tower lights, and the restricted time period of exposure during migration; BOEM concludes that the effects of the proposed action are insignificant and discountable. Therefore, the proposed action would **Not Likely Adversely Affect** Bermuda petrels, black-capped petrels, Kirtland's warblers, roseate terns, piping plovers, and red knots.

5.2 Whales

Federally listed whales could occur in the Southeast Action Area, and given the geographic scope of the proposed action, whales could reasonably be expected to come into contact with met tower activities. Therefore, met towers **May Affect** the federally listed whale species.

Based on the analysis in Section 4, whales could experience potential effects from pile-driving, loss of water column habitat, prey abundance and distribution effects, and tower decommissioning. It is anticipated that effects from loss of water column habitat, prey abundance and distribution effects, and tower decommissioning would result in short-term behavioral changes, but these effects are anticipated to be insignificant and discountable. However, it is anticipated that in-water noise generated from pile-driving of met tower foundations (both impact and vibratory) would expose whales to noise up to levels equivalent to Level B harassment. For impact pile-driving, the exclusion zone at 180 dB re 1 µPa would be 1,000 m (3,281 ft); for vibratory pile driving, the exclusion zone would likely be smaller. Pile driving would be short-term (four to eight hours per day over 3 days for each tower), and mitigation measures to reduce noise impacts would include seasonal prohibition on pile driving, exclusion zones, and soft start pile driving. However, despite these measures, it is anticipated that whales could still be exposed to noise levels where whales may experience temporary adverse impacts equivalent to Level B harassment. According to ESA regulations, if the effects of the proposed action cannot be shown to be insignificant or discountable, and if any incidental take is anticipated to occur, the appropriate determination is **Likely to Adversely Affect**.

5.3 Sea Turtles

Federally listed sea turtles could occur in the Southeast Action Area, and given the geographic scope of the proposed action, sea turtles could reasonably be expected to come into contact with met tower activities. Therefore, met towers **May Affect** the federally listed sea turtles.

Based on the analysis in Section 5, sea turtles could experience potential effects from pile driving, loss of water column habitat, prey abundance and distribution effects, and tower decommissioning. It is anticipated that effects from loss of water column habitat, prey abundance and distribution effects, and tower decommissioning would result in temporary behavioral changes, but these effects are anticipated to be insignificant and discountable. However, pile driving noise could be detectable by sea turtles at low frequencies; if sea turtles were to be in close enough proximity to the sound source, the potential for injury could exist. It is highly unlikely that this would happen due to the required standard operating conditions (see Section 6) for a 1,000 m (3,281 ft) exclusion zone and 60-minute all clear period for pile driving, and the short-term nature of the pile driving activities (four to eight hours per day over three days for each tower). However, given the larger area of ensonification that results from pile driving and the known occurrences of sea turtles throughout the Southeast Action Area, it can be reasonably assumed that some sea turtles may be exposed to disturbing/harassing levels of noise beyond the 1,000 m (3,281 ft) exclusion zone. As a result, BOEM concludes that the proposed activity could result in temporary adverse effects to sea turtles during pile driving. According to ESA regulations, if the effects of the proposed action cannot be shown to be insignificant or discountable, and if any incidental take is anticipated to occur, the appropriate determination is Likely to Adversely Affect. Thus BOEM concludes that the proposed action is **Likely to Adversely Affect** listed sea turtles. In addition, based upon BOEM's assessment in Section 4, BOEM concludes that potential impacts **Would Not Adversely Modify** proposed loggerhead sea turtle critical habitat.

5.4 West Indian Manatee

Manatees may occur in the Southeast Action Area. However, given the primary impact-producing factor considered under this BA is noise associated with piling of a met tower foundation, and given the coastal affinity of manatees, the noise from piling is not expected to result in the harassment of manatees. Therefore, the BOEM has concluded that the proposed action will have **No Affect** to federally listed manatees.

5.5 Marine Fish

ESA-listed marine fish could occur in the Southeast Action Area, and given the geographic scope of the proposed action, ESA-listed marine fish could reasonably be expected to be affected by activities done in support of the construction and installation of meteorological towers. Therefore, the proposed action **May Affect** the Federal ESA-listed marine fish.

Based on the analysis in Section 4, marine fish could experience potential effects from met tower/buoy construction and decommissioning, resulting in loss of water column and benthic habitat and prey abundance and distribution effects. It is anticipated that effects from loss of water column and benthic habitat and prey abundance and distribution effects would result in short-term behavioral changes, but these effects are anticipated to be negligible. Met tower piling could disturb normal behavior including avoidance and flight from the sound source if they are in the immediate vicinity of pile driving activities. If fish are within one meter of the sound source during pile driving activity, it is expected that injurious physiological impacts would occur. However, pile driving would be temporary and is anticipated to be limited to the time necessary to drive the piles (four to eight hours per day over three days for each tower). Mitigation measures will also be employed (see Section 6), including the implementation of a soft start procedure, which will minimize the possibility of exposure to injurious sound levels by prompting any fish to leave the area prior to exposure to disturbing levels of sound. In addition, because of their current distribution, smalltooth sawfish are unlikely to be exposed to pile driving because the Southeast Action Area is north of the species' primary distribution (around southern Florida). For Atlantic sturgeon, the seasonal prohibition on pile driving (November 1–April 30 in North Carolina, South Carolina, and northern Georgia and November 15–April 15 in southern Georgia) could limit some potential impacts when they would be moving to offshore habitats after spawning, but Atlantic sturgeon could utilize offshore waters where towers would be constructed outside of the seasonal prohibition. Because BOEM will require a soft start, it would be unlikely that marine fish would be close enough to pile driving activities that would result in physiological impacts. And due to the temporary nature of pile driving activities (four to eight hours per day for a three-day period), marine fish would be expected to be able to return to the pile driving area once pile driving stops. In total, effects to ESA-listed fish are expected to be minor and temporary behavioral disturbances with no injury or mortality. Therefore, BOEM concludes that the proposed action would be **Not Likely to Adversely Affect** the ESA-listed Atlantic sturgeon and smalltooth sawfish.

6. AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

This section outlines the standard operating conditions that BOEM will require to minimize or eliminate potential impacts to protected species including federally listed species of marine mammals, sea turtles, and marine fish. For the purposes of consultation with NMFS under the ESA, these standard operating conditions are being submitted for review only as they apply to their protections for endangered species and are binding only under that consultation insofar as they apply to endangered species. Additional conditions, including mitigation, monitoring, or reporting measures, may be included in any BOEM-issued lease or other authorization, including those that may be developed during Federal ESA Section 7 consultations.

6.1 Requirements for Pile Driving of a Meteorological Tower Foundation

- Visibility - The lessee must not conduct pile driving for a met tower foundation at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the exclusion zones for meteorological tower foundation pile driving as specified below. This requirement may be modified as specified below.
- Modification of Visibility Requirement - If the lessee intends to conduct pile driving for a meteorological tower foundation at night or when visual observation is otherwise impaired, an alternative monitoring plan detailing the alternative monitoring technologies (e.g., active or passive acoustic monitoring technologies) must be submitted to the Lessor for consideration. The Lessor may, after consultation with NMFS, decide to allow the lessee to conduct pile driving for a meteorological tower foundation at night or when visual observation is otherwise impaired.
- Protected-Species Observer - The lessee must ensure that the exclusion zone for all pile driving for a meteorological tower foundation is monitored by a NMFS-approved protected-species observer. The lessee must provide to the Lessor a list of observers and their résumés no later than forty-five (45) calendar days prior to the scheduled start of meteorological tower construction activity. The résumés of any additional observers must be provided fifteen (15) calendar days prior to each observer's start date. The Lessor will send the observer information to NMFS for approval.
- Optical Device Availability - The lessee must ensure that reticle binoculars and other suitable equipment are available to each observer to adequately perceive and monitor protected marine species within the exclusion zone during meteorological tower construction activities.
- Pre-Construction Briefing - Prior to the start of construction, the lessee must hold a briefing to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures. This briefing must include construction supervisors and crews and the

protected species observer(s). The Resident Engineer (or other authorized individual) will have the authority to stop or delay any construction activity if deemed necessary. New personnel must be briefed as they join the work in progress.

6.2 Requirements for Pneumatic, Hydraulic, and Vibratory Pile Driving

- Prohibition on Pile Driving - The lessee must ensure that no pile driving activities (e.g., pneumatic, hydraulic, or vibratory installation of foundation piles) occur from November 1–April 30 (or November 15 – April 15 south of 31°27'N Latitude) nor during an active Dynamic Management Area (DMA) if the pile driving location is within the boundaries of the DMA as established by the NMFS or within 7 km (4.3 mi) of the boundaries of the DMA**.**
- Establishment of Exclusion Zone - The lessee must ensure the establishment of a default 1,000 m (3281 ft) radius exclusion zone for cetaceans, sea turtles, and pinnipeds around each pile driving site. The 1,000 m (3,281 ft) exclusion zone must be monitored from two locations. One observer must be based at or near the sound source and will be responsible for monitoring out to 500 m (1,640 ft) from the sound source. An additional observer must be located on a separate vessel navigating approximately 1,000 m (3,281 ft) from the sound source and will be responsible for monitoring the area between 500 m (1,640 ft) to 1,000 m (3,281 ft) from the sound source.
- Modification of Exclusion Zone - If multiple piles are being driven, the lessee may use the field verification method described below to modify the default exclusion zone provided above for pile driving activities. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the Level A harassment (i.e., 180 dB) zone.
- Field Verification of Exclusion Zone - If the lessee wishes to modify the exclusion zone, the lessee must conduct a field verification of the exclusion zone during pile driving of the first pile if the meteorological tower foundation design includes multiple piles. The results of the measurements from the first pile must be used to establish a new exclusion zone that may be greater than or less than the 1,000 m (3,281 ft) default exclusion zone, depending on the results of the field tests. Acoustic measurements must take place during the driving of the last half (deepest pile segment) for any given open-water pile. A minimum of two reference locations must be established at a distance of 500 m (1,640 ft) and 1,000 m (3,281 ft) from the pile driving. Sound measurements must be taken at the reference locations at two depths (a depth at mid-water and a depth at approximately 1 m [3.3 ft] above the seafloor). Sound pressure levels must be measured and reported in the field in dB re 1 µPa rms for impact (impulse) and vibratory pile driving. An infrared range finder may be used to determine distance from the pile to the reference location.
- Clearance of Exclusion Zone - The lessee must ensure that visual monitoring of the 1,000 m (3,281 ft) exclusion zone must begin no less than 60 minutes prior to the beginning of soft start and continue until pile driving operations cease or sighting conditions do not allow observation

of the sea surface (e.g., fog, rain, darkness). If a cetacean, pinniped, or sea turtle is observed, the observer must note and monitor the position, relative bearing, and estimated distance to the animal until the animal dives or moves out of visual range of the observer. The observer must continue to observe for additional animals that may surface in the area, as often numerous animals may surface at varying time intervals.

- Implementation of Soft Start - The lessee must ensure that a soft start be implemented at the beginning of each pile installation to provide additional protection to cetaceans, pinnipeds, sea turtles, and marine fish near the project area by allowing them to vacate the area prior to the commencement of pile driving activities. For impact hammers, the soft start requires an initial set of three strikes from the impact hammer at 40 percent energy followed by a one-minute rest period before resuming pile driving according to the lessee's approved facility installation report (see 30 CFR Part 585 Subpart G). For vibratory hammers, the soft start requires initiation of noise from the hammers for 15 seconds at reduced energy, with a one-minute waiting period between the two subsequent additional sets.
- Shut Down for Cetaceans, Pinnipeds, and Sea Turtles - The lessee must ensure that any time a cetacean, pinniped, and/or sea turtle is observed within the 1,000 m (3,281 ft) exclusion zone, the observer must notify the Resident Engineer (or other authorized individual) and call for a shutdown of pile driving activity. The pile driving activity must cease as soon as it is safe to do so. Any disagreement or discussion should occur only after shutdown, unless such discussion relates to the safety of the timing of the cessation of the pile driving activity. Subsequent restart of the pile driving equipment may only occur following clearance of the 1,000 m (3,281 ft) exclusion zone of any cetacean, pinniped, and/or sea turtle for 60 minutes.
- Pauses in Pile Driving Activity - The lessee must ensure that if pile driving ceases for 30 minutes or more and a cetacean, pinniped, and/or sea turtle is sighted within the exclusion zone prior to re-start of pile driving, the observer(s) must notify the Resident Engineer (or other authorized individual) that an additional 60 minute visual and acoustic observation period must be completed, as described above, before restarting pile driving activities. A pause in pile driving for less than 30 minutes must still begin with a soft start but will not require the 60-minute clearance period as long as visual surveys are continued diligently throughout the silent period and the exclusion zone remains clear of cetaceans, pinnipeds, and/or sea turtles. If visual surveys are not continued diligently during the pause of 30 minutes or less, the lessee must ensure the exclusion zone is clear of all cetaceans, pinnipeds, and sea turtles for 60 minutes.

6.3 Rationale for Meteorological Tower Construction Measures

The 1,000 m (3,281 ft) exclusion zone is based upon the field of ensonification at the marine mammal Level A harassment threshold (i.e., 180 dB) and based upon publicly available information and previous reports to BOEM on modeled areas of ensonification from pile driving activities. Because of the greater risk of injury to cetaceans, pinnipeds, and sea turtles from pile driving, BOEM has adopted an extremely conservative shutdown requirement that would apply to all incursions into the exclusion zone during pile driving.

6.4 Requirements for Meteorological Tower Decommissioning

Foundation structures must be removed by cutting at least 4.6 m (15 ft) below mudline (see 30 CFR 585.910(a)). BOEM assumes the meteorological towers to be constructed can be removed using non-explosive severing methods. As detailed in 30 CFR Part 585.902, before the lessee decommissions the facilities under the SAP, the lessee must submit a decommissioning application and receive approval from BOEM. Furthermore, the approval of the decommissioning concept/methodology in the SAP is not an approval of a decommissioning application.

6.5 Measures for ESA-listed birds

This sub-section outlines the standard operating conditions that are part of the proposed action which would minimize or eliminate potential impacts to ESA-listed species of birds. BOEM anticipates that only red flashing strobe-like lights that meet FAA requirements for aviation will be installed and used on metrological towers. In addition, BOEM anticipates that only navigation lights that meet USCG requirements for shipping vessels will be installed for meteorological towers and buoys. BOEM will require in all leases that additional lights (e.g., work lights) on meteorological towers and support vessels must be used only when necessary, hooded downward, and directed when possible to reduce upward illumination and illumination of adjacent waters. Based on the information regarding the proposed activities (*see* Section 1) within the Southeast Action Area (*see* Figure 1.1), no additional mitigations for ESA-listed and ESA candidate species are necessary.

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