# APPLICATION FOR AN INDIVIDUAL INCIDENTAL TAKE PERMIT UNDER THE ENDANGERED SPECIES ACT OF 1973


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# 1 Introduction

To satisfy the regulatory requirements imposed by the Bureau of Ocean Energy Management (BOEM), offshore wind developers are required to evaluate the impact the proposed activities may have on fisheries resources (BOEM, 2019). The University of Massachusetts Dartmouth's School for Marine Science and Technology (SMAST), in collaboration with four offshore wind development companies (i.e., Orsted, SouthCoast Wind, Avangrid and Vineyard Wind), have developed monitoring plans to assess the potential environmental impacts of the proposed wind energy development projects on marine fish and invertebrate communities.

BOEM fisheries guidelines recommend two years of data collection before construction to serve as a system baseline. Offshore construction of several of these wind farms slated to begin in 2025. As such, an urgent need to begin monitoring the fisheries resources has arisen. To allow for adequate baseline fisheries monitoring, SMAST is submitting an individual incidental take permit (ITP) to NOAA Fisheries to seek incidental take allocation for these proposed monitoring activities. The proposed action will include five separate trawl surveys with identical methods between the surveys in the Massachusetts/Rhode Island Wind Energy Area (MA/RI WEA; Figure 1). Each survey will cover an offshore wind development area and an associated control, or non-impact, area. The proposed action will utilize a demersal trawl to provide data related to seasonal fish abundance, distribution, population structure and community composition in and around the wind development projects.

# 2 Description of the Endangered Species

The NOAA Fisheries Endangered Species Act Mapper (NOAA Fisheries, 2020a) was consulted to determine what federally threatened or endangered species may be present in the Massachusetts/Rhode Island Wind Energy Area (MA/RI WEA; Figure 1). The map indicated two protected fish species, Atlantic sturgeon (*Acipenser oxyrinchus*) and shortnose sturgeon (*A. brevirostrum*), may be present. Additionally, four protected sea turtle species may be present in the study area, including green sea turtle (*Chelonia mydas*; North Atlantic Distinct Population Segment [DPS]), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*; North Atlantic Ocean DPS). Federally endangered hawksbill sea turtles (*Eretmochelys imbricata*) generally prefer tropical and subtropical waters and are very rarely seen in Massachusetts and Rhode Island waters (observations are typically of strandings), and therefore, will not be evaluated further in this assessment (Lutz & Musick, 1997; NMFS & USFWS, 1993; Lazell, 1980). Additional information regarding each of these species is provided in the sections below.

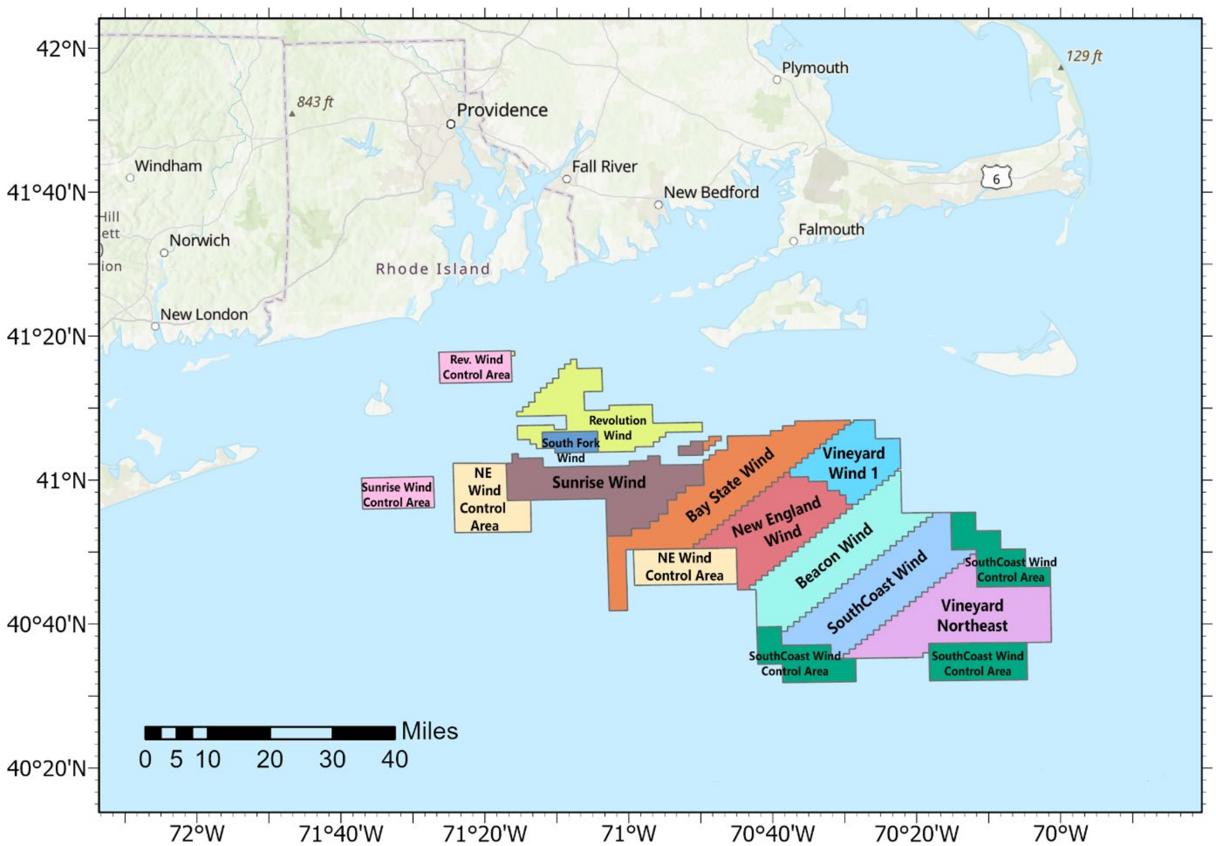


**Figure 1: Current proposed offshore wind development projects and associated study control regions in the Massachusetts/Rhode Island Wind Energy Area (MA/RI WEA).**

## 2.1 Protected Fish Species

### 2.1.1 Atlantic Sturgeon

The Atlantic sturgeon is a state and federally listed endangered species (NOAA, 2020b; Massachusetts Division of Fish and Wildlife [MA DFW], 2015a). The Atlantic sturgeon is a large sturgeon that spends most of its life in salt and brackish waters and returns to freshwater periodically to spawn (Atlantic States Marine Fisheries Commission [ASMFC], 2017). Atlantic sturgeon ranges from Newfoundland to the Gulf of Mexico and are highly migratory. The species is slow-growing and late-maturing and has been recorded to reach up to 14 ft (4.3 m) in length, weigh up to 800 pounds (363 kg.), and live up to 60 years of age (NOAA, 2020b; Sulak et al., 2002). Atlantic sturgeon are bottom feeders, with a diet often consisting of invertebrates (e.g., crustaceans, worms), mollusks, and bottom-dwelling fish (NOAA, 2020b). This anadromous species spends much of its life in estuarine and marine waters throughout the Atlantic Coast. Adults spawn in fresh water in the spring and early summer and migrate into estuarine and marine waters. Eggs are deposited on hard-bottom substrate (e.g., cobble, coarse sand, and bedrock) (Greene et al., 2009). After hatching, the developing larvae move downstream to the estuarine portion of the spawning river, where they reside as juveniles for years. Sub-adults and adults travel within the marine environment, typically in waters less than 164 ft (50 m) in depth, using coastal bays, sounds, and ocean waters.

Coastwide declines in the stock began with intensive fisheries for caviar in the late 1800s, and further declines are attributed to damming of spawning rivers and degradation of water quality (see review in Hilton et al., 2016). Atlantic sturgeon are currently managed as five Distinct Population Segments (DPSs), which include the South Atlantic, Carolina, Chesapeake Bay, New York Bight and Gulf of Maine populations. The Atlantic Sturgeon stock assessment (ASMFC, 2017) indicates that all DPS stocks are depleted with some evidence of recovery at both the coastwide and DPS scale. Adult Atlantic sturgeon in the New York Bight DPS travel upstream and spawn in rivers along southern New England (e.g., Connecticut River), New York (e.g., Hudson River), and Delaware (e.g., Delaware River) in the spring and early summer (ASMFC, 1998, 2017). Historically, Atlantic sturgeon also spawned in the Taunton River (Massachusetts), however, their current status in this river is unknown (ASMFC, 2017). During the spawning period, most adults will be found in natal rivers. Adult Atlantic sturgeon live in coastal and offshore waters during the remainder of the year. Juvenile and sub-adult Atlantic sturgeon undergo yearly coastal foraging migrations after leaving their natal estuaries (Hilton et al., 2016).

Atlantic sturgeon could be present in the MA/RI WEA throughout the year because both the depths and substrates are within their preferred habitats (Stein et al., 2004). This species would likely be most prevalent in the Project Area during the warmer months of the year as the fish would potentially swim through the Project Area to enter various coastal rivers and streams for spawning. The MA/RI WEA is closest in proximity to rivers associated with the New York Bight DPS, however potential interactions with sturgeon may encompass fish from additional DPS stocks. A recent genetic analysis documented significant mixing between DPS populations, especially those in the Mid-Atlantic (i.e., New York Bight, Chesapeake Bay and Carolina; Kazyak et al. 2021). Atlantic sturgeon for all DPS populations may occur within the proposed action area.

As a result, incidental take will be partitioned into respective DPS populations in proportion to the expected regional and local occurrence (Kazyak et al., 2021).

#### 2.1.2 Shortnose Sturgeon

The shortnose sturgeon is state listed as endangered and federally listed as endangered (New York Bight Distinct Population Segment) and threatened (Gulf of Maine Distinct Population Segment; NOAA, 2020c; MADFW, 2015b). Shortnose sturgeon are an anadromous species found mainly in large freshwater rivers and coastal estuaries on the east coast of North America from New Brunswick to Florida. Shortnose sturgeon require freshwater for spawning (salinity limit of about 0.5 parts per thousand [ppt]). They spawn at or above the head-of-tide (the farthest point upstream affected by tidal fluctuations) in most rivers to which mature adults migrate in spring. After hatching, the young-of-year (YOY) remain in freshwater for about one year before moving downstream to the freshwater/saltwater interface. Juveniles (3 to 10 years of age) occur at the fresh-saline water interface in most rivers, where they shift slightly upstream in spring and summer and downstream in fall and winter. Adults are generally found upstream while spawning in the spring and spend the remainder of the year at the fresh and saltwater interface. In estuarine systems, juveniles and adults occupy areas with little or no current over a bottom composed primarily of mud and sand (Shortnose Sturgeon Status Review Team, 2010). Individual shortnose sturgeon do not disperse far along the coastline beyond their home river estuaries (NMFS, 1998). Because of its preference for mainland rivers and estuarine waters, shortnose sturgeon are unlikely to be found in the vicinity of the Offshore Project Area, therefore no take is requested.

### 2.2 Protected Sea Turtles

Data on sea turtle abundance and distribution in Massachusetts and Rhode Island waters are limited. However, available studies suggest that four species are generally found in the MA/RI WEA during the summer and fall (Kraus et al., 2016; Lazell, 1980; Schwartz, 2021). Loggerhead, leatherback, green, and Kemp’s ridley sea turtles are highly migratory and are known to forage in nearby Cape Cod Bay during the summer months when sea surface temperatures range from 61 to 79 degrees Fahrenheit (16 to 26 degrees Celsius; Cetacean and Turtle Assessment Program, 1982).

### 2.2.1 Green Sea Turtle

Green sea turtles occur globally and typically forage in nearshore coastal waters or in bays and lagoons. The species was listed under the ESA in 1978 and was subsequently separated into two ESA-listing designations: endangered for breeding populations in Florida and the Pacific coast of Mexico and threatened in all other areas throughout its range (81 Fed. Reg. 20058, 2016). On April 6, 2016, NMFS listed eleven DPSs of green sea turtles; the DPS known to occur in the Project Area, the North Atlantic DPS, is listed as a threatened population. Additionally, green sea turtles are listed as threatened under the Massachusetts Endangered Species Act (MESA).

Green sea turtles migrate long distances to forage but return to subtropical or tropical waters between 30° N and 30° S to nest (NMFS, 2020). On the east coast of the US, green sea turtles nest between Florida and North Carolina. Sea turtle population estimates are often assessed using nesting beach data because of their low survey detectability and elusive nature in water. However, there can be inconsistencies in population estimates due to fluctuations and variability in clutch frequency and fidelity to nesting sites (Turtle Expert Working Group, 2007). Florida nesting data estimated 8,426 nesting green turtle females in 2011-2012 (Seminoff et al. 2015). The abundance of nesting turtles has shown substantial increases in the past 20 years with population models indicating a high probability of continued growth (Seminoff et al. 2015). Currently, there are no population estimates for green turtle occurrence in northeastern U.S. Atlantic waters due to too few recorded observations (Kenney & Vigness-Raposa, 2010; Shoop & Kenney, 1992).

In pelagic habitats, juvenile green sea turtles typically feed on invertebrates associated with pelagic Sargassum macroalgae and other small animals. As they grow larger, juvenile green turtles transition to a strictly herbivorous diet of seagrass and algae, which is unique among sea turtles (NMFS, 2020; Kenney & Vigness-Raposa, 2010; Bjorndal, 1997). There are recorded observations of green sea turtles foraging in Cape Cod Bay, which is near the MA/RI WEA. Green sea turtles are vulnerable to a variety of anthropogenic impacts, including bycatch from fisheries (Murray & Orphanides, 2013; Wallace et al., 2013; Haas, 2010; Brazner and McMillan, 2008), wildlife trafficking trade, vessel strikes, loss or degradation of critical habitat (Fuentes et al., 2016), ingestion of marine debris (Bolten et al., 2011) and climate change (Von Holle et al., 2019; Rees et al., 2016).

In the MA/RI WEA, no green turtles were identified during the Northeast Large Pelagic Survey Collaborative Surveys (NLPS) conducted from 2011-2015 (Kraus et al., 2016). There were also no recorded observations of green turtles in northeastern U.S. waters during Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys or AMAPPS II surveys conducted from 2010-2016 and 2017-2018, respectively (NEFSC & SEFSC, 2018; Palka et al., 2017). Seventeen green sea turtle observations were recorded by the Sea Turtle Stranding and Salvage Network (STSSN) in Rhode Island and Massachusetts waters south of Cape Cod from 2012-2022 (SEFSC, 2022). Observations included two stranding events and fifteen cold stunning events. Historical green sea turtle observations in the MA/RI WEA are depicted in Figure 2; the data were collected from OBIS-SEAMAP data portal (Halpin et al. 2009). All sightings were provided from the NEFSC Right Whale Aerial Survey datasets (1998-2019; Cole and Khan, 2022).

Due to a lack of historic and recent records of green sea turtle occurrence in the MA/RI WEA and their preference for warmer waters, the co-occurrence of green sea turtles with activities in the Project Area is expected to be uncommon.

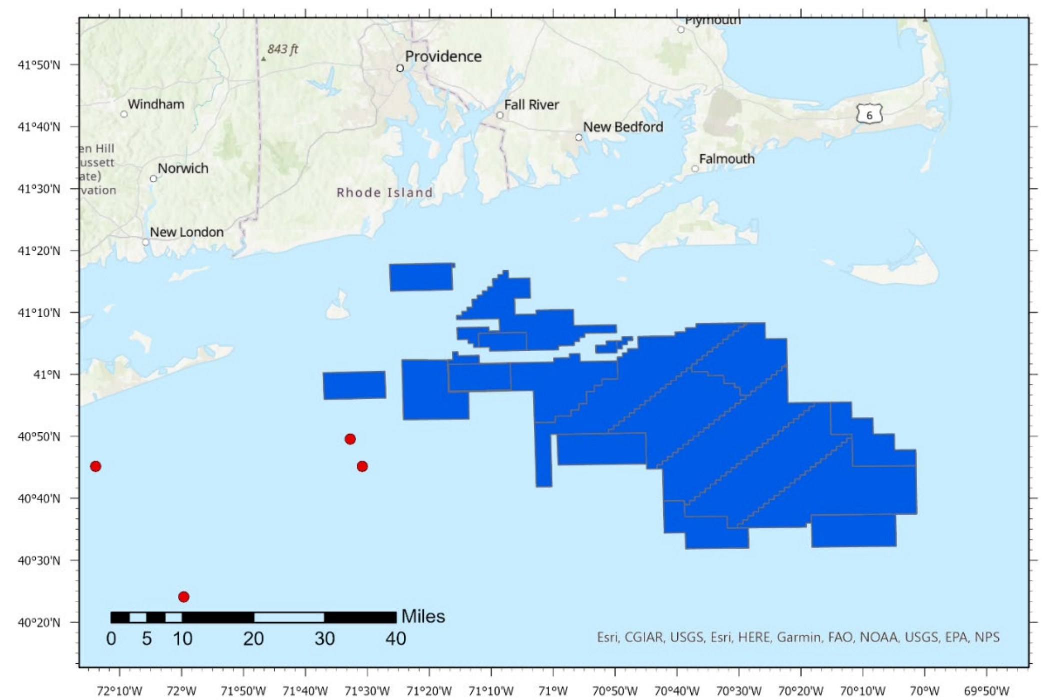


**Figure 2: Historical observations of green sea turtle observations (red dots) in southern New England. Blue shaded areas are wind energy areas in Southern New England, including those areas for which Take Permit is sought.**

### 2.2.2 Kemp's Ridley Sea Turtle

Kemp's ridley sea turtles are the smallest and most endangered sea turtle in the world (Bevan et al., 2016). The Kemp's ridley sea turtle species is listed as endangered under the ESA and MESA (NMFS, 2020b). They are also considered a "Species of Greatest Conservation Need" (SGCN) in the Rhode Island Wildlife Action Plan. There are no definitive population estimates for the Kemp's ridley sea turtle, especially for northeastern U.S. waters. Using historical and recent nesting data, the global population of nesting female Kemp's ridley sea turtles is estimated at 7,000-8,000 individuals (NMFS & USFWS, 2007; TEWG, 2000). According to the International Union for Conservation of Nature, the global Kemp's ridley sea turtle population is estimated to be 22,341 individuals (Wibbels & Bevan, 2019).

The species is most common in coastal waters of the Gulf of Mexico, but juveniles are known to migrate far north for foraging opportunities that are often considered essential for their development. Juvenile Kemp's ridley sea turtles can travel as far as Nova Scotia to forage and then make their way south to warmer waters when winter approaches (Hart et al., 2006; Bleakney, 1955). In pelagic waters, juvenile Kemp's ridley sea turtles feed on small invertebrates associated with pelagic Sargassum (Bjorndal, 1997); in nearshore habitats, their diet is primarily composed of crabs. Historical records and confirmed sightings of Kemp's ridley sea turtles suggest that this species has the potential to occur in the MA/RI WEA, primarily in the summer and early fall (Kraus et al., 2016).

The primary nesting site for Kemp's ridley sea turtles occurs in Rancho Nuevo, Mexico; 95 percent of the species' population originates from this site along with two other sites in Tamaulipas, Mexico. Other Kemp's ridley sea turtle nesting sites occur in other parts of Mexico, and on a much smaller scale in Texas, Florida and the Carolinas (NMFS, 2020b; Bevan et al., 2016; Hildebrand, 1963). The major nesting site in the U.S. occurs on the Padre Island National Seashore in Texas. Once widely abundant, nesting sites in Rancho Nuevo and other areas in the Gulf of Mexico declined sharply from the 1940s to 1980s due to anthropogenic impacts that nearly caused extinction of the species (Bevan et al., 2016; Heppell et al., 2007). Nesting site abundance increased in the 1990s due to strong conservation efforts, but nesting site numbers are still relatively low and are being closely monitored by researchers.

Kemp's ridley sea turtles are vulnerable to anthropogenic impacts that commonly affect other sea turtle species, in addition to cold-stunning caused by drastic changes in water temperatures during the transition from summer to fall (Lutz and Musick, 1997; Burke et al., 1991). Kemp's ridley sea turtles become physically inactive from hypothermia once water temperatures drop below 50 degrees Fahrenheit (10 degrees Celsius). It has recently been suggested that ocean temperature changes and rates of cold-stunning may be related to anthropogenic climate change (Griffin et al., 2019; Liu et al., 2019).

A study by Kenney & Vigness-Raposa (2010) concluded that Kemp's ridley sea turtle numbers are much lower than loggerhead or leatherback turtle numbers in northeastern U.S. waters, but that juvenile Kemp's ridley sea turtles likely move through Massachusetts waters to get to Cape Cod Bay for foraging during growth and development. The study also noted that estimates for the species may be biased low because the relatively small juvenile turtles are more difficult to detect during surveys. Because juvenile Kemp's ridley sea turtles are susceptible to cold-stunning if waters become uncharacteristically cold in early fall as they are migrating south, a STSSN in the state of Massachusetts has implemented extensive monitoring and conservation efforts for cold-stunned sea turtles since 1979 (Liu et al., 2019). Although observed strandings are generally limited to Cape Cod Bay, the STSSN data provide an index of sea turtle cold-stunning events in the region. Data from the STSSN documented 30 observations of Kemp's ridley turtles in Massachusetts waters south of Cape Cod and 8 observations in Rhode Island waters between 2012 and 2022 (SEFSC, 2022). Kemp's ridley sea turtles are considered regular summer visitors in the nearshore waters of Rhode Island, and some have been observed in Narragansett Bay (Schwartz, 2021). The observations in Rhode Island were predominately associated with traditional strandings (7 of 8 observations) occurring between June and October. Conversely, the observations in Massachusetts waters were primarily cold-stunned turtles (27 of 30 observations) occurring between November and January. Observations of Kemp's ridley sea turtle fatality events due to cold-stunning have increased in the past decade.

Kemp's ridley sea turtles were rarely observed in the MA/RI WEA during the NLPS (Kraus et al., 2016). Six Kemp's ridley sea turtle observations were recorded; one in August 2012 and five in September 2012. No Kemp's ridley sea turtles were observed in the MA/RI WEA during the 2009-2015 AMAPPS or 2017-2018 AMAPPS II northeast aerial surveys (NEFSC & SEFSC, 2018; Palka et al., 2017). Historical Kemp's ridley sea turtle observations in the MA/RI WEA are depicted in Figure 3; the data were collected from OBIS-SEAMAP data portal (Halpin et al. 2009) using the

AMAPPS I and II (2011-2019; NEFSC & SEFSC, 2018; Palka et al., 2017) and the NEFSC Right Whale Aerial Survey datasets (1998-2019; Cole and Khan, 2022).

Based on the available data in the SNE Wind Development Area, Kemp's ridley sea turtle co-occurrence with activities in the Project Area is expected to be uncommon but may be present in the area during the summer and fall.

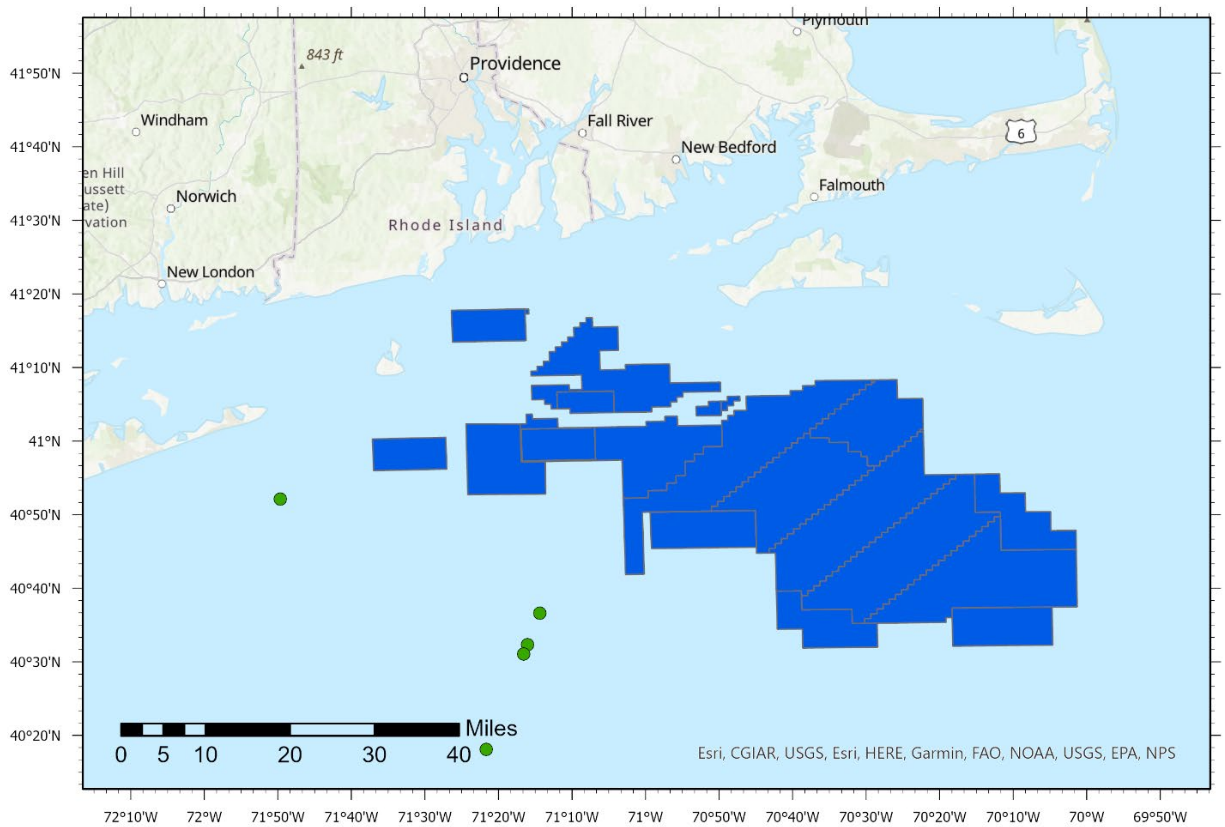


**Figure 3: Historical observations of Kemp's ridley sea turtles (green dots) in the southern New England.**

### 2.2.3 Leatherback Sea Turtle

The leatherback sea turtle is a highly migratory pelagic species that can be found in boreal and tropical waters (Dodge et al., 2014; Plotkin, 2002). The species is listed as endangered under the ESA and MESA. They are also considered SGCN in the Rhode Island Wildlife Action Plan. Leatherback sea turtles that occur off the coast of the U.S. are divided into two populations, Pacific and Atlantic. Of the Atlantic leatherback sea turtle population, the Northwest Atlantic subpopulation occurs in the MA/RI WEA (NMFS & USFW, 2020). There are no definitive population estimates for the Northwest Atlantic leatherback sea turtle population, especially for northeastern U.S. waters; female leatherback turtles are known to have varying clutch sizes and fluctuate in fidelity to nesting sites (TEWG, 2007). Using nest count data from 2004-2005, NOAA's Turtle Expert Working Group (TWEG, 2007) estimated a population of 34,000-94,000 adult leatherback turtles in the entire North Atlantic Ocean and 4,800 to 11,000 female leatherback sea turtles in the Northwest Atlantic. Available nest data for the Northwest Atlantic population show that it has experienced decreasing trends in the last decade with current estimates of nesting females at 20,659 individuals (NMFS & USFW, 2020). In addition to reduced productivity, threats from habitat destruction, overutilization, predation, disease, and fisheries bycatch place this population at a high risk for extinction (NMFS & USFW, 2020).

Like other sea turtle species, leatherback sea turtles are expected to occur in the MA/RI WEA primarily during the summer and fall months. The species travels further between foraging and nesting areas than other sea turtles and their range spans the globe (NMFS, 2020c). Primary nesting sites in the U.S. include the southeast Florida coastline, the U.S. Virgin Islands, and Puerto Rico, and the species is regularly recorded foraging as far north as Newfoundland. In pelagic waters, leatherback turtles are the deepest diving sea turtles, reaching a maximum depth of almost 4,000 ft while foraging for jellyfish, salps, and other gelatinous prey species (NMFS, 2020c; Bjorndal, 1997; Eckert et al.,1989). However, the species is also known to take advantage of highly productive, nutrient-rich coastal and shallow waters, especially in the spring (Dodge et al., 2014; Bjorndal, 1997).

Research involving the aggregation and analysis of sighting, stranding and bycatch data in Massachusetts and Rhode Island waters from 1974-2008 documented 82 leatherback sea turtle observations in the summer, 59 observations in the fall, and one observation in the winter (Kenney & Vigness-Raposa, 2010).

Data from recent leatherback sea turtle survey efforts coincide with historical data analyzed by Kenney and Vingess-Raposa (2010). Leatherback turtles were seen more frequently than other sea turtle species in the MA/RI WEA during the NLPS (Kraus et al., 2016). Leatherback sea turtles were also the primary sea turtle species identified during follow-up surveys conducted in 2018-2019, though these sightings mainly occurred south of Nantucket Island (O'Brien et al., 2021). The majority of observations occurred in the summer and fall, followed by two sightings in spring and none in the winter; 71 observations were recorded in August alone. Observations were recorded across the MA/RI WEA in the summer with a particularly heavy leatherback sea turtle presence just south of Nantucket and in the Muskeget Channel outside of the MA/RI WEA. Leatherback sea turtles are considered regular summer visitors in the nearshore waters of Rhode Island (Schwartz, 2021).

No leatherback sea turtles were observed in the MA/RI WEA during the AMAPPS surveys between 2009-2015 (Palka et al., 2017). Leatherback sea turtle data collected as part of the 2017-2018 AMAPPS II aerial surveys recorded one leatherback turtle observation outside of the MA/RI WEA, just north of Georges Bank (NEFSC & SEFSC, 2018). The NEFSC Right Whale Aerial Survey (1998 – 2019; Cole and Khan, 2022) observed ten leatherback sea turtles in the MA/RI WEA. Two hundred and forty-nine leatherback sea turtle observations were recorded in STSSN reports of Massachusetts waters from 2012-2021 (SEFSC, 2021). Observations included 164 stranding observations and 85 incidental captures. Additionally, fifty observations were recorded in Rhode Island water including 40 stranding observations and 10 incidental captures. The majority of leatherback observations occurred between June and November. Historical leatherback sea turtle observations in the MA/RI WEA are depicted in Figure 4; the data were collected from OBIS-SEAMAP data portal (Halpin et al. 2009) using the AMAPPS I and II (2011-2019; NEFSC & SEFSC, 2018; Palka et al., 2017) and the NEFSC Right Whale Aerial Survey datasets (1998-2019; Cole and Khan, 2022).

Based on the information above, it is expected for leatherback sea turtles to be common in the SNE Wind Development Area and may co-occur with activities in the Project Area, particularly during the summer and fall.

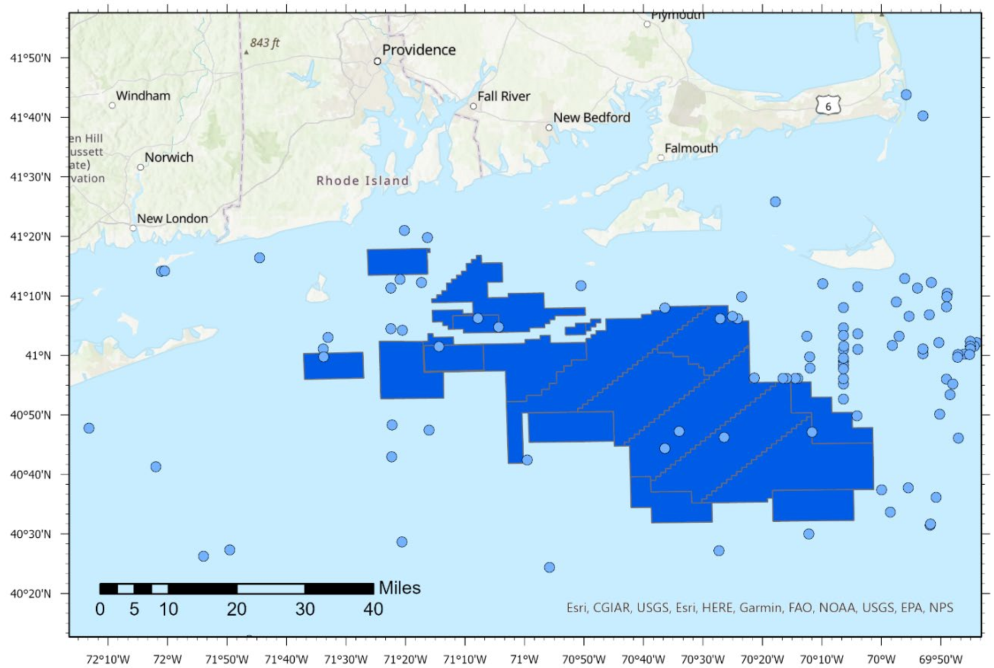


**Figure 4: Historical observations of leatherback sea turtles (light blue dots) in southern New England.**

### 2.2.4 Loggerhead Sea Turtle

Loggerhead turtles are the most abundant sea turtle species found in the U.S. Atlantic, primarily in subtropical and tropical coastal and continental shelf waters (NMFS, 2020d). Loggerhead turtles are listed as Threatened under MESA. They are also considered SGCN in the Rhode Island Wildlife Action Plan. Nine DPSs for loggerhead sea turtles have been designated under the ESA; the Northwest Atlantic Ocean DPS occurs in the MA/RI WEA and is listed as threatened under the ESA. Like other sea turtle species along the U.S. Atlantic Coast, loggerhead turtles are vulnerable to a series of anthropogenic impacts, including habitat loss, pollutant ingestion, climate change and bycatch.

Due to their highly migratory nature and the challenges in tracking and monitoring sea turtles during their first years of life, there are no definitive loggerhead turtle population estimates (Ceriani et al., 2019). One study from 2011, using nest count data from 2001-2010, estimated a population of 38,334 Northwest Atlantic Ocean DPS female loggerhead sea turtles (Richards et al., 2011). Juvenile loggerhead sea turtles can migrate south to foraging areas in the waters of Central and South America, or northwards to foraging areas near the northeastern U.S., further complicating population estimates. Using aerial survey data collected in 2010, the NEFSC estimated a population of approximately 801,000 adult loggerhead turtles in the northwest

Atlantic continental shelf area (NEFSC, 2011). Using aggregated historical records of sighting, stranding and bycatch data, a comparative study of sea turtle presence in Massachusetts and Rhode Island waters documented 171 loggerhead sea turtle observations in the summer, 61 sightings in the fall, and one sighting in the spring between 1963-2006 (Kenney & Vigness-Raposa, 2010). An analysis of the movement behavior of 271 juvenile and adult loggerhead sea turtles using satellite tags documented 2 individuals transiting through the MA/RI WEA during the summer months (Winton et al., 2018).

The species typically nests in the southeastern U.S. Atlantic, but nesting females travel as far as the Mid-Atlantic for foraging (Bjorndal et al., 2013). Immature loggerhead sea turtles migrate as far north as Massachusetts for foraging and are likely to occur in the MA/RI WEA (Bjorndal et al., 2013; Arendt et al., 2012; Mansfield et al., 2009; Bowen et al., 2004; Hopkins-Murphy et al., 2003). In pelagic areas, juvenile loggerhead turtles commonly feed on invertebrates associated with pelagic Sargassum and jellyfish (Bjorndal, 1997). In coastal and continental shelf waters larger juveniles typically feed on a variety of animals including crabs, mollusks and jellyfish, and vegetation near the surface (NMFS, 2020d).

The NLPS recorded 78 loggerhead sea turtle individuals in the MA/RI WEA (Kraus et al., 2016); two observations were recorded in the spring, 31 in the summer and 45 in the fall (which all occurred in the month of September). There were no loggerhead sea turtles observed in the winter. Two loggerheads were observed in the MA/RI WEA during follow-up surveys conducted in 2018-2019 (O'Brien et al., 2021). Recorded observations were spread evenly across the MA/RI WEA in the summer; there was a higher concentration of individuals in the project area in September likely due to turtles migrating south through the project area. The AMAPPS I and II surveys (2011 – 2019; NEFSC & SEFSC, 2018; Palka et al., 2017) observed eleven loggerhead sea turtles in the MA/RI WEA. One hundred and twenty-two loggerhead sea turtle stranding observations were recorded in STSSN reports of Massachusetts waters from 2012- 2022 (SEFSC, 2022). One hundred and eight stranding incidents occurred with four incidental captures. These events primarily were observed between June and November. An additional ten cold-stunned turtles were observed between November and January. Eight-five loggerhead sea turtle stranding observations were recorded in Rhode Island waters from 2012 – 2022 (SEFC, 2022). All observations were stranding events except for one incidental capture. All observations in Rhode Island waters occurred between June and November. Historical loggerhead sea turtle observations in the MA/RI WEA are depicted in Figure 5; the data were collected from OBIS-

SEAMAP data portal (Halpin et al. 2009) using the AMAPPS I and II (2011-2019; NEFSC & SEFSC, 2018; Palka et al., 2017) and the NEFSC Right Whale Aerial Survey datasets (1998-2019; Cole and Khan, 2022).

Based on the information above, loggerhead sea turtles are expected to be a common occurrence in the Lease Area, particularly during the summer and early fall; the sea turtles may co-occur with activities in the Project Area.

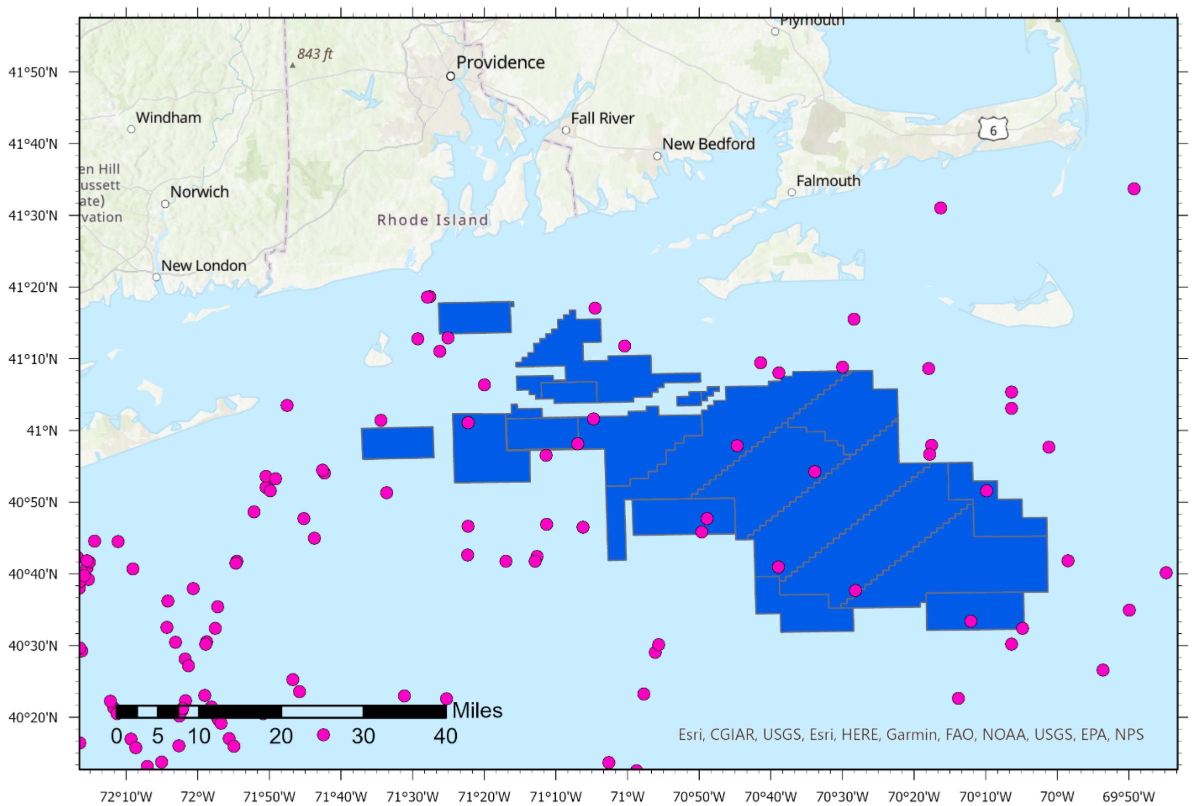


**Figure 5: Historical observations of loggerhead sea turtles (pink dots) in southern New England.**

# 3 Description of Proposed Activities

## 3.1 Overview

The University of Massachusetts Dartmouth's School for Marine Science and Technology (SMAST), in collaboration with four offshore wind development companies (i.e., Orsted, SouthCoast Wind, Avangrid and Vineyard Northeast), has developed a monitoring plan to assess the potential environmental impacts of proposed wind energy development projects on marine fish and invertebrate communities. The current monitoring plan utilizes a demersal trawl to provide data related to seasonal fish abundance, distribution, population structure and community composition in and around the wind development projects. A demersal otter trawl, further referred to as a trawl, is a net that is towed behind a vessel along the seafloor expanded horizontally by a pair of otter boards or trawl doors (Figure 6). Trawls tend to be relatively indiscriminate in the fish and invertebrates they collect; hence trawls are a general tool for assessing the biological communities along the seafloor and are widely used by institutions worldwide for ecological monitoring. Since they are actively towed behind a vessel, they are less biased by fish activity and behavior than passive fishing gear (e.g., gillnets, longlines, traps, etc.), which rely on animals moving to the gear. As such, state and federal fisheries management agencies heavily rely on trawl surveys to evaluate ecosystem changes and to assess fishery resources. The current trawl survey utilizes the same equipment, operating protocols and performance criteria as the Northeast Area Monitoring and Assessment Program (NEAMAP) survey protocol. Exceptions to the NEAMAP protocols include survey area, survey timing (see Section 3.2), survey vessel (see Section 3.2), and specific biological sampling (see Section 3.5). In doing so, the goal is to ensure compatibility with other regional surveys, including the National Marine Fisheries Service annual spring and fall trawl surveys, the annual NEAMAP spring and fall trawl surveys, and state trawl surveys including the Massachusetts Division of Marine Fisheries trawl survey.

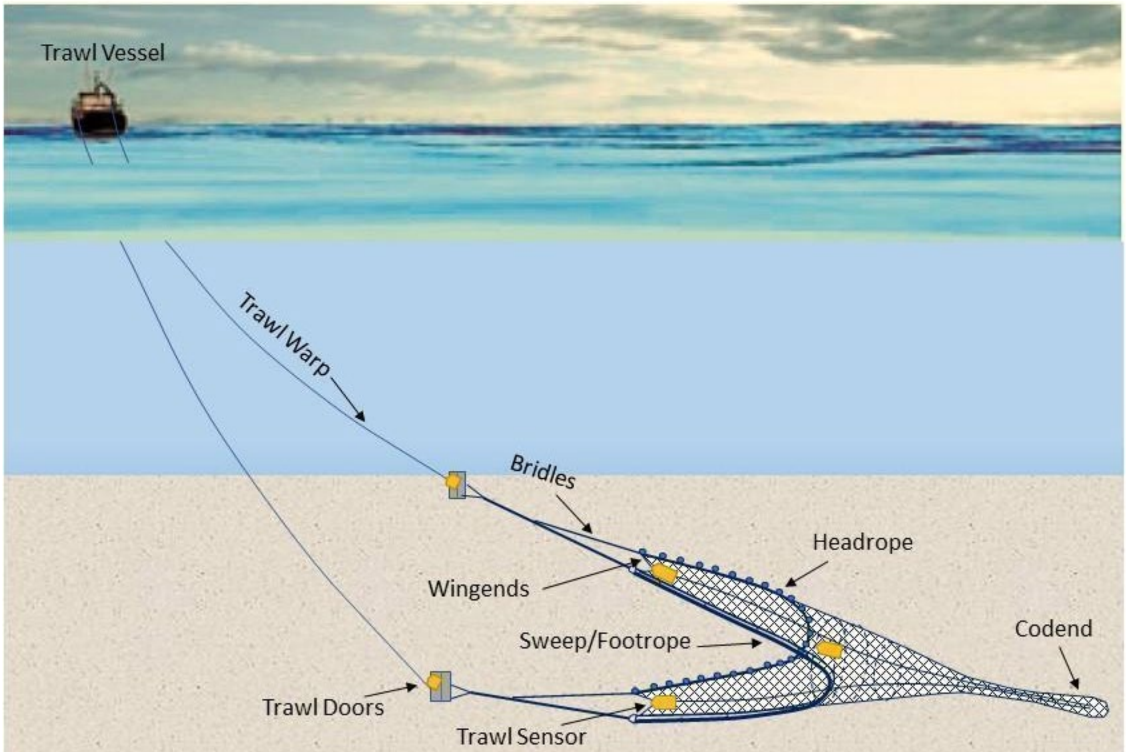


**Figure 6: General schematic (not to scale) of a demersal otter trawl. Yellow rectangles indicate geometry sensors.**

Initiated in 2006, NEAMAP conducts annual spring and fall trawl surveys from Cape Hatteras to Cape Cod. The NEAMAP survey protocol has gone through extensive peer review and is currently implemented near the MA/RI WEA using a commercial fishing vessel (Bonzek et al., 2008). The current NEAMAP survey protocol provides data at a rate of one tow every ~100 $km^2$ (30 $nm^2$), which is inadequate to provide scientific information related to potential changes on a smaller scale. Adapting existing methods with increased resolution will enable surveys to fulfill the primary goal of evaluating the impact of wind farm development while improving the consistency between survey platforms. This should facilitate easier sharing and integration of the data with state and federal agencies and allow the data from this survey to be incorporated into existing datasets to enhance our understanding of the region’s ecosystem dynamics. Additionally, the methodology is consistent with other ongoing surveys of nearby study areas (i.e., Vineyard Wind 1).

### 3.2 General Survey Design

The general survey methodology is designed to provide a consistent framework between projects. The current surveys proposed in this application are designed to provide baseline data (i.e., 1 – 5 year) on species abundance, population structure, and community composition for a future environmental assessment using the BACI framework as recommended by BOEM (BOEM, 2019). Each survey will sample a development area as well as associated control areas. The control areas have been selected to have similar depth and habitat characteristics. The trawl survey will be conducted four times per year - during Spring (April - June), Summer (July - September), Fall (October - December) and Winter (January - March) to adequately capture the seasonal variation within the region, as recommended by BOEM (2019). Incorporating multiple seasonal surveys and multiple control locations is recommended under the “beyond-BACI” methodology to adequately account for temporal and spatial variability (Underwood, 1994). The timing and number of surveys differ from the NEAMAP program which conducts biannual surveys in the spring and fall.

Tow locations within each wind development project will be selected using a spatially balanced sampling design. While depth is an important factor in fish distribution, these surveys are constrained to a narrow depth range (30 – 60 meters). There is not sufficient data or evidence to guide a stratified experimental design based on depth, however post-stratification of the data will be feasible with the current sampling design if it is proven to be beneficial. All project and control areas will be divided into grid cells, and one randomly chosen location will be sampled within each grid cell during each seasonal trawl survey. The spatially balanced design will ensure that sampling effort is distributed throughout the project and control areas. Seasonal sampling will occur in short discrete events as quickly and continuously as weather allows, as opposed to spread out over the season. Sampling intensity will vary between surveys based on area. A detailed description of each individual survey and survey effort is described in Section 3.7.

Surveys will be conducted on a commercial trawl vessel currently operating in the region. Consistent with NEAMAP surveys, all tows will be completed during daylight hours, and the target tow duration will be 20 minutes. Tow time starts when all the trawl wire has been set out and ends at the beginning of haulback (i.e., the initiation of retrieving the gear). A target tow speed range of 2.8 to 3.2 knots will be used. The amount of wire set with each trawl to achieve the target net geometry will be left to the professional judgment of the captain, dependent upon the depth and the *in-situ* conditions. The following data will be collected during each sampling effort:

- Station number
- Latitude and longitude at the start and end of the tow
- Time at the start and end of the tow
- Vessel speed and heading
- Water depth at the start and end of the tow

- Wind speed
- Wave height
- Weather conditions (e.g., cloud cover, precipitation)
- Tow speed
- Gear condition/performance code at the end of the tow

A Conductivity Temperature Depth (CTD) sensor (or similar) will be used to sample a vertical profile of the water column at each trawl station. The CTD profile may be obtained at the start or end of the tow, at the discretion of the chief scientist.

### 3.3 Trawl Design

To ensure standardization and compatibility between this project and ongoing regional surveys the bottom trawl has an identical design to the trawl used by NEAMAP. This trawl was originally designed by the Mid-Atlantic and New England Fisheries Management Council's Trawl Survey Advisory Panel (TSAP, superseded by Northeast Trawl Advisory Panel, NTAP) for NOAA's Biglow. As a result, the net design has been accepted by both the scientific community and commercial fishing industry.

The survey trawl will be a 400 x 12 cm, three-bridle four-seam bottom trawl. This net style allows for a high vertical opening, relative to the size of the net, with consistent trawl geometry. These features make it a suitable net to sample a wide diversity of species with varying life history characteristics (i.e., demersal, pelagic, benthic, etc.). To effectively capture benthic organisms a "flat sweep" will be used. This is allowed due to the soft bottom (i.e., sand, mud) in the survey area. To ensure the retention of small individuals, the net will have a 12 cm diamond mesh codend with a 1" knotless liner. Thyboron Type IV 66" trawl doors will be used to horizontally open the net. The trawl doors are connected to the trawl by a series of steel wire bridles. For a detailed description of the trawl design see Appendix 1 or Bonsek et al. (2008).

The trawls will be fabricated by Reidars Trawl Gear and Marine Supply, a New Bedford-based, reputable trawl manufacturer that has great experience building trawls for other offshore wind area surveys. Prior to the survey, the net will be inspected to ensure the construction is within the acceptable tolerance range based on the net certification criteria highlighted in the NEAMAP protocol. Before and after each survey, the mesh size of different trawl sections will be measured based on the ICES mesh measurement protocol (Fonteyne, 2005). For the subsequent surveys, the trawl will be inspected, and maintenance will be performed by the same gear manufacturer to ensure that the trawl meets specifications before a survey is started.

### 3.4 Trawl monitoring

A Simrad PX trawl monitoring system will be used to measure and monitor trawl geometry in real time. Door spread, wing spread, headline height, and bottom contact will be measured for every tow. These data will be used to validate trawl tows against established permissible deviations from targeted geometry. Tows with geometry outside of allowed deviations may be considered invalid, with the collected data omitted from subsequent analysis. Acceptable trawl parameters are adopted from the NEAMAP protocol. These values are ±5% of the optimal trawl parameters for wingspread and headline height (as defined by the Trawl Survey Advisory Panel). Additionally, the trawl monitoring system will also log depth and bottom water temperature.

### 3.5 Catch sampling

At the conclusion of each tow, the catch will be released from the tail end of the net onto the deck. Animals collected in each trawl sample will be sorted, identified to the species level, weighed, and enumerated consistent with the sampling approach of NEAMAP. Species will be identified consistently with the Integrated Taxonomy Information System (ITIS). The following information will be collected for each trawl that is sampled; catch per unit effort (CPUE), species diversity, and size structure of the catch. All species captured will be documented for each valid trawl sample. When large catches occur, sub-sampling may be used to process the catch, at the discretion of the lead scientist. The three sub-sampling strategies adopted are identical to the NEAMAP survey protocols and include straight subsampling by weight, mixed subsampling by weight, and discard by count sampling (Bonzek et al. 2008). The type of sub-sampling strategy that is employed will be dependent upon the volume and species diversity of the catch. If any protected species are captured during trawling, the sampling and release of those animals will take priority over sampling the rest of the catch. A detailed description of the handling and care of protected species can be found in Section 3.6. Deviations from the current NEAMAP data collection protocol will be the omission of the collection of stomach contents, sex and maturity data and otolith samples.

The biomass (weight, kg) of each species will be recorded on a motion-compensated marine scale that has been calibrated according to the manufacturer's specifications and used to calculate CPUE. Length will be recorded for the dominant species (i.e., most commonly encountered species), and priority species, in the catch. To assess the condition of individual organisms, up to 100 individuals of each species (and size class) will be measured (to the nearest cm) and weighed on a motion-compensated balance. Length (e.g., total length, fork length) will be recorded for each species consistent with the measurement type specified in the Northeast Observer Program Biological Sampling Guide. After sampling, all catch will be returned to the water as quickly as possible to minimize incidental mortality.

### 3.6 Handling and Care of Protected Species

In the event of the capture of a protected species, the following protocols will be adhered to. At least one of the survey staff onboard the trawl survey will have completed NEFOP-observer training (within the last 5 years) or other equivalent training in protected species identification and safe handling (inclusive of taking genetic samples from Atlantic sturgeon). Reference materials for identification, disentanglement, safe handling, and genetic sampling procedures will be available on board each survey vessel. All training will be documented to ensure compliance and provided to federal agencies upon request.

Any sea turtles or Atlantic sturgeon caught and/or retrieved in any fisheries survey gear will first be identified to species or species group. Each ESA-listed species caught and/or retrieved will then be properly documented using appropriate equipment and data collection forms. Biological data, samples, and tagging will occur as outlined below. Live, uninjured animals will be returned to the water as quickly as possible after completing the required handling and documentation.

1) The Sturgeon and Sea Turtle Take Standard Operating Procedures will be followed (https://media.fisheries.noaa.gov/dam-migration/sturgeon_%26_sea_turtle_take_sops_external.pdf).
2) Fisheries survey vessels will have a passive integrated transponder (PIT) tag reader onboard capable of reading 134.2 kHz and 125 kHz encrypted tags (e.g., Biomark GPR Plus Handheld PIT Tag Reader) and this reader will be used to scan any captured sea turtles and sturgeon for tags. Any recorded tags will be recorded on the take reporting form.
3) Genetic samples will be taken from all captured Atlantic sturgeon (alive or dead) to allow for identification of the DPS of origin of captured individuals and tracking of the amount of incidental take. This will be done in accordance with the Procedures for Obtaining Sturgeon Fin Clips. (https://media.fisheries.noaa.gov/dam-migration/sturgeon_genetics_sampling_revised_june_2019.pdf).
4) Fin clips will be sent to a NMFS approved laboratory capable of performing genetic analysis and assignment to DPS of origin. Arrangements will be made for shipping and analysis in advance of submission of any samples; these arrangements will be confirmed in writing to NMFS within 60 days of issuance of an ITP. Results of genetic analysis, including assigned DPS of origin will be submitted to NMFS within 6 months of the sample

collection. SMAST will ensure the availability of funding to process all genetic samples acquired.

5) Subsamples of all fin clips and accompanying metadata form will be held and submitted to the Atlantic Coast Sturgeon Tissue Research Repository on a quarterly basis. The Sturgeon Genetic Sample Submission Form is available for download at: https://media.fisheries.noaa.gov/2021-02/NOAA%20Sturgeon%20Template_USGS.xlsx?null .
6) All captured sea turtles and Atlantic sturgeon will be documented with required measurements and photographs. The animal's condition and any marks or injuries will be described. This information must be entered as part of the record for each incidental take. A NMFS Take Report Form will be filled out for each individual sturgeon and sea turtle and submitted to NMFS as described below.

Any sea turtles or Atlantic sturgeon caught and retrieved in gear used in fisheries surveys will be handled and resuscitated (if unresponsive) according to established protocols and whenever at-sea conditions are safe for those handling and resuscitating the animal(s) to do so. Specifically:

1) Priority will be given to the handling and resuscitation of any sea turtles or sturgeon that are captured in the gear being used, if conditions at sea are safe to do so. Handling times for these species will be minimized to limit the amount of stress placed on the animals.
2) All survey vessels must have copies of the sea turtle handling and resuscitation requirements found at 50 CFR 223.206(d)(1) prior to the commencement of any on-water activity. These handling and resuscitation procedures must be carried out any time a sea turtle is incidentally captured and brought onboard the vessel during the proposed actions.
3) If any sea turtles that appear injured, sick, or distressed are caught and retrieved in fisheries survey gear, survey staff will immediately contact the Greater Atlantic Region Marine Animal Hotline at 866-755-6622 for further instructions and guidance on handling the animal, and potential coordination of transfer to a rehabilitation facility. If unable to contact the hotline (e.g., due to distance from shore or lack of ability to communicate via phone), the USCG must be contacted via VHF marine radio on Channel 16. If requested, hard-shelled sea turtles (i.e., non-leatherbacks) may be held on board for up to 24 hours following handling instructions provided by the Hotline, prior to possible transfer to a rehabilitation facility.
4) Any live uninjured sea turtles or Atlantic sturgeon caught and retrieved in gear used in any fisheries survey will be immediately released according to established protocols (https://www.fisheries.noaa.gov/resource/outreach-materials/atlantic-sturgeon-safe-handling-and-release-guidelines).
5) Attempts will be made to resuscitate any Atlantic sturgeon that are unresponsive or comatose by providing a running source of water over the gills as described in the

Sturgeon Resuscitation Guidelines (https://media.fisheries.noaa.gov/dam-migration-miss/Resuscitation-Cards-120513. pdf).

6) Provided that appropriate cold storage facilities are available on the survey vessel, following the report of a dead sea turtle or sturgeon to NMFS, and if NMFS requests, any dead sea turtle or Atlantic sturgeon will be retained on board the survey vessel for transfer to an appropriately permitted partner or facility on shore as safe to do so.

NMFS Office of Protected Resources (OPR) will be notified as soon as possible of all observed takes of sea turtles and Atlantic sturgeon occurring as a result of any fisheries survey. Specifically:

1) NMFS OPR will be notified within 24 hours of any interaction with a sea turtle or sturgeon (*pr.esa.incidentaltakepermit@noaa.gov*). The report must include at a minimum: (1) survey name and applicable information (e.g., vessel name, station number); (2) GPS coordinates describing the location of the interaction (in decimal degrees); (3) gear type involved (e.g., bottom trawl, trap); (4) soak time, gear configuration and any other pertinent gear information; (5) time and date of the interaction; and (6) identification of the animal to the species level. Additionally, the e-mail must transmit a copy of the NMFS Take Report Form (download at: https://media.fisheries.noaa.gov/2021-07/Take%20Report%20Form%2007162021.pdf) and a link to or acknowledgement that a clear photograph or video of the animal was taken (multiple photographs are suggested, including at least one photograph of the head scutes). If reporting within 24 hours is not possible due to distance from shore or lack of ability to communicate via phone, fax, or email, reports must be submitted as soon as possible; late reports must be submitted with an explanation for the delay.
2) At the end of each survey season, a report will be sent to NMFS OPR that compiles all information on any observations and interactions with ESA-listed species. This report will also contain information on all survey activities that took place during the season including location of gear set, duration of soak/trawl, total effort and minimization/mitigation measures employed. The report on survey activities will be comprehensive of all activities, regardless of whether ESA-listed species were observed.

In the event of a suspected or confirmed vessel strike of a sea turtle, SMAST will immediately call the NMFS New England/Mid-Atlantic Regional Stranding Hotline (866-755-6622) and report the incident to NMFS (NMFS Protected Resources Division, nmfs.gar.incidental-take@noaa.gov and OPR, *pr.esa.incidentaltakepermit@noaa.gov*) as soon as feasible. The report will include the following information: (A) Time, date, and location (latitude/longitude) of the incident; (B) Species identification (if known) or description of the animal(s) involved; (C) Vessel's speed during and leading up to the incident; (D) Vessel's course/heading and what operations were being conducted (if applicable); (E) Status of all sound sources in use; (F) Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike; (G) Environmental conditions (e.g., wind speed and direction, Beaufort scale, cloud cover, visibility) immediately preceding the strike; (H) Estimated size and length of animal that was struck; (I) Description of the behavior of the animal immediately preceding and following the strike; (J) Estimated fate of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and (K) To the extent practicable, photographs or video footage of the animal(s).

In the event that an injured or dead marine mammal or sea turtle is sighted, SMAST will immediately call the NMFS New England/Mid-Atlantic Regional Stranding Hotline (866-755-6622) and report the incident to NMFS (Protected Resources Division, incidental.take@noaa.gov and OPR, *pr.esa.incidentaltakepermit@noaa.gov)* as soon as feasible, but no later than 24 hours from the sighting. The report will include the following information: (A) Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable); (B) Species identification (if known) or description of the animal(s) involved; (C) Condition of the animal(s) (including carcass condition if the animal is dead); (D) Observed behaviors of the animal(s), if alive; (E) If available, photographs or video footage of the animal(s); and (F) General circumstances under which the animal was discovered. Staff responding to the hotline call will provide any instructions for handling or disposing of any injured or dead animals, which may include coordination of transport to shore, particularly for injured sea turtles.

## 3.7 Project Specific Surveys

Five independent trawl surveys will be conducted for each development project (Figure 7, Table 1). All projects will begin immediately upon receipt of this ITP.

### 3.7.1 Revolution Wind

The Revolution Wind (OCS-A 0487) project encompasses a 335 km$^2$ area and is anticipated to produce 704 MW of power. Construction is slated to start in 2025, as such pre-construction baseline monitoring is expected to start in 2023. An examination of benthic habitat data, VMS data, and input from local fishermen indicated that a limited portion of the Revolution Wind lease area can be sampled safely and effectively using the NEAMAP trawl survey net. Therefore, the project area for the trawl survey was limited to the northern portion of the lease area, which encompasses an area of approximately 125 km2. As a result, the trawl survey area will consist of a 125 km$^2$ sampling area located in the northern section of the lease area (Figure 7). Two control areas (125 km$^2$) with similar depth and habitat characteristics have been identified to the west of the development area. The two control areas will be shared with the Revolution Wind survey specified in Section 3.7.2. The benthic habitat in the study areas are primarily sand and gravel with isolated boulder fields. The selection of the study area and control areas were determined by Orsted based on their analysis of the data. However, the sampling methodologies developed by SMAST have been maintained to ensure regional consistency.

Depth ranges from 33 to 48 m (mean depth = 39 m) in the project area and 21 to 41 m (mean depth = 36 m) in the control area. Fifteen tows (2-3 days at sea) will be conducted in each season in each of the development and control areas for a total of 120 tows per year (16-24 days at sea). The sampling rate will be one tow every 8.3 $km^2$. Sampling intensity was based on a power analysis which indicate a high probability of detecting moderate changes in species abundances (i.e., 80% probability of detecting a 33-40% temporal decrease in species with a Coefficient of Variation less than 1.2 and 2.0, respectively; Revolution Wind LLC, 2021). Power analysis represents the relationships among the five variables involved in statistical inference: sample size (N), effect size, variability, type I ($\alpha$) and type II ($\beta$) error rates (Cohen 1992). Scientific trawl data from the nearby Block Island Wind Farm, as well as the Northeast Fisheries Science Center bi-annual trawl survey was used to assess local variability in fish populations. Power curves were constructed to demonstrate how statistical power varies as a function of the variance in the catch data, the effect size (i.e., the percent change at the RWF Project site relative to the reference sites), sample size (i.e., number of trawl tows per area in each season), and the number of reference sites that are sampled. More details and power curves can be found within the Revolution Wind Fisheries Research and Monitoring Plan (Revolution Wind LLC, 2021).

### 3.7.2 Sunrise Wind

The Sunrise Wind project (OCS-A 0486) encompasses a 445 $km^2$ area and is anticipated to produce 924 MW of power. Construction is slated to start in 2025, as such pre-construction baseline monitoring is expected to start in 2023. Trawl surveys for the Sunrise Wind and Revolution Wind Projects are intended to be executed simultaneously using the same vessel, sampling gear, and scientific crew. Catch rates at both the Sunrise Wind and Revolution Wind impact areas will be compared to the same two control areas listed in the previous section. In order to sample an equivalent area (125 km2) within the Sunrise Wind impact site, it was proposed that the trawl survey impact area be limited to the western portion of the lease site. This area reflects the greatest concentration of effort by the commercial large mesh otter trawl fleet occurred in the lease site from 2011 through 2016, there most likely to assess the impact to the commercial fisheries. As a result the trawl survey area will consist of a 125 $km^2$ sampling area located in the western section of the lease area (Figure 7). The benthic habitat in the study areas is primarily sand and gravel with isolated boulder fields. Depth ranges from 41 to 54 m (mean depth = 49 m) in the project area and 41 to 55 m (mean depth = 50 m) in the control area. Fifteen tows (2-3 days of effort) will be conducted in each season in each of the development and control area for a total of 120 tows per year (16-24 days of total effort). The sampling rate will be one tow every 8.3 $km^2$. The sampling intensity is based on a same power analysis conducted in the previous section which indicates a high probability of detecting moderate changes in species abundances (i.e., 80% probability of detecting a 33-40% temporal decrease in species with a Coefficient of Variation less than 1.2 and 2.0, respectively; Sunrise Wind, 2022).

### 3.7.3 SouthCoast Wind

The SouthCoast Wind project (OCS-A 0521), previously Mayflower Wind, encompasses a 515 $km^2$ area and is anticipated to produce 2400 MW of power. Construction is slated to start in 2026, as such pre-construction baseline monitoring is expected to start in 2023. Geophysical surveys conducted in the SouthCoast Wind lease site in 2020 characterized the benthic substrate as predominately sand and muddy sand. As a result, the trawl survey will be conducted throughout the entirety of the lease area. Three areas located to the northeast, southwest and southeast of the development area will be established as control regions (Figure 7, total area: 535 km2). The selected regions have similar depth contours, bottom types, and benthic habitats to the development area, and are not currently leased for future development. Depth ranges from approximately 40 to 60 m in the project area and 30 to 70 m in the control area. Thirty tows (4 -5 days of effort) will be conducted in each season in the development and control areas, respectively, for a total of 240 tows per year (32 - 40 days of total effort). The sampling rate will be one tow every 17.2 and 17.8 $km^2$ in the development and control areas, respectively. The selection of 30 tows is based on recommendations from BOEM (BOEM, 2019) in addition to a power analysis conducted using catch data from an ongoing trawl survey in the region (Rillahan and He, 2021). Data from 320 tows in a neighboring development were used to conduct this power analysis. The data was collected between 2019 and 2021 using identical survey methodology proposed in this action. The variability observed in the catch data was used to assess the relationship between sampling effort and statistical power using the equations presented in Van Bell (2011). A detailed description of the analysis and results are provided by Rillahan and He (2021).

The results indicated that several species, including little skate, *Leucoraja erinacea*, Atlantic longfin squid, *Dorytheuthis pealei*, silver hake, *Merluccius bilinearis*, and fourspot flounder, *Paralichthys oblongus*, had relatively low variability and therefore a high probability of detecting small to moderate effects (~25% change) under the current monitoring effort. Many of the common species observed, including winter skate, *Leucoraja ocellata*, red hake, *Urophycis chuss*, windowpane flounder, *Scophtalmus aquosus*, monkfish, *Lophius americanus*, summer flounder, *Paralichthys dentatus*, scup, *Stenotomus chrysops*, yellowtail flounder, *Pleuronectes ferrugineus*, winter flounder, *Pleuronectes americanus*, and butterfish, *Peprilus triacanthus*, had higher variability (CV: 1.5 – 2.3). For these species, the current monitoring would have a high probability of detecting moderate effects (i.e., 30 – 50% change). For species exhibiting strong seasonality and high variability (CV: 2.5 – 4), large effects (i.e., 50 - 75% change) can be detected with a high probability under the current monitoring plan.

### 3.7.4 New England Wind

The New England Wind project (OCS-A 0534) encompasses a 411 km$^2$ area and is proposed to deliver up to 2600 MW of power. Construction is slated to start in 2026, as such pre-construction baseline monitoring is expected to start in early 2024. Benthic imaging of the substrate between 2019 and 2020 characterized the benthic substrate as predominately sand and muddy sand (Bethoney et al. 2020a). As a result, the trawl survey will be conducted throughout the entirety of the lease area. Two areas located to the west and southwest of the development area will be established as control regions (Figure 7, total area: ~406 km2). The selected regions have similar depth contours, bottom types and benthic habitats to the development area, and are not currently leased for future development. Depth ranges from approximately 45 to 60 m in the project area and 45 to 65 m in the control area. Twenty-five tows (4 -5 days of effort) will be conducted in each season in the development and control areas, respectively, for a total of 200 tows per year (32 – 40 days of total effort). The sampling rate will be one tow every 16.2 and 16.4 km$^2$ in the control areas and development area, respectively. The selection of 25 tows was based on a power analysis previously as mentioned in Section 3.7.3 (Rillahan and He, 2021).

### 3.7.5 Vineyard Northeast

Vineyard Northeast (OCS-A 0522) is seeking incidental take allowance to continue long-term baseline monitoring of the fisheries resource in the development area. Trawl monitoring has been conducted in the area since 2019. This baseline monitoring is being used to assess the long-term population dynamics in the region prior to full pre-construction monitoring. Data collected will be used to provide insight into the general dynamics of species in the region as well as provide a more accurate power analysis based on the regional species dynamics. Reports can be found www.vineyardwind.com/fisheries-science. Vineyard Northeast is an exemption to the general survey methodology in that sampling is conducted on a lower resolution without a control area. Ten tows per season (2 days of effort) will be collected in the Vineyard Northeast project for a total of forty tows per year (8 days of total effort).

The current survey started in concert with the pre-construction monitoring of the Vineyard Wind 1 project. The selection of the survey effort in 2019 was determined by the developer based on a reduced sampling design to that collected for Vineyard Wind 1, which used 20 tows per season. Benthic imaging of the substrate between 2019 and 2021 characterized the benthic substrate as predominately sand and muddy sand (Bethoney et al. 2020b). As a result, the trawl survey will be conducted throughout the entirety of the lease area. Depth ranges from approximately 40 to 60 m in the project area. The survey equipment and protocols are identical to those listed in the proposed action.

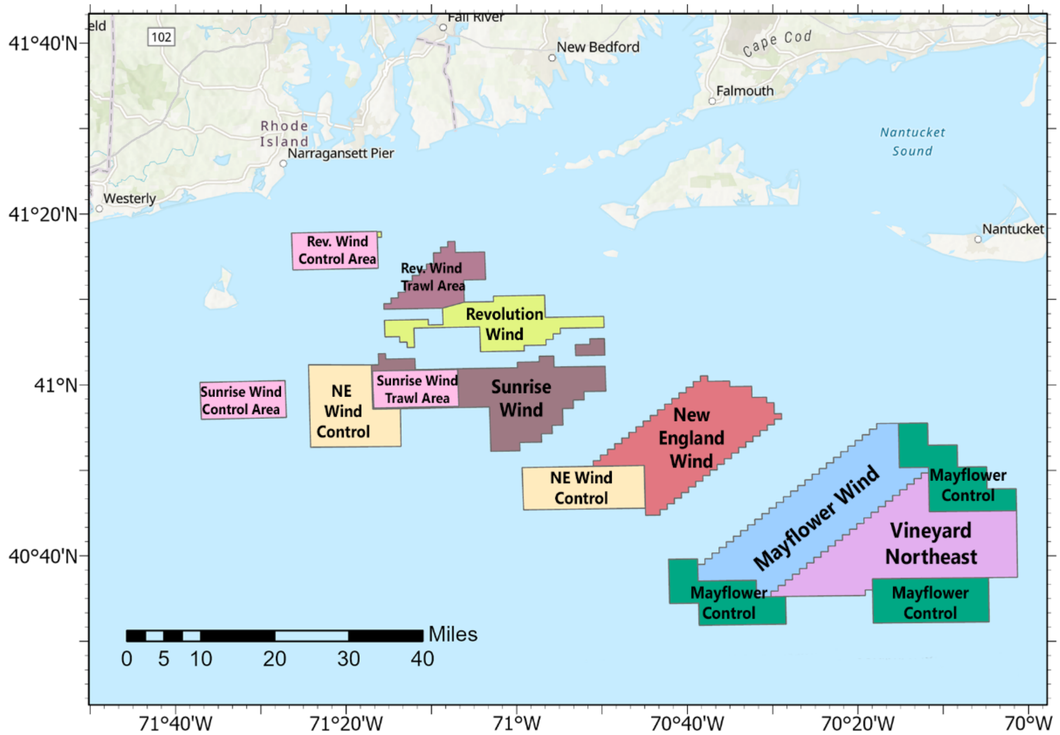


**Figure 7: Proposed trawl survey areas including the development and control areas.**

**Table 1: Project and trawl survey information.**

| Project | Developer | Project Size | Project Area | Trawl Survey Area | Control Area | Total Number of Tows per Year |
|---|---|---|---|---|---|---|
| Revolution Wind | Orsted LLC/ Eversource | 704 MW | 335 $km^2$ | 125 $km^2$ | 112 $km^2$ | 120 |
| Sunrise Wind | Orsted LLC/ Eversource | 924 MW | 445 $km^2$ | 112 $km^2$ | 112 $km^2$ | 120 |
| SouthCoast Wind | SouthCoast Wind LLC | 2400 MW | 515 $km^2$ | 515 $km^2$ | 535 $km^2$ | 240 |
| New England Wind | Avangrid LLC | 2036 MW | 411 $km^2$ | 411 $km^2$ | 406 $km^2$ | 200 |
| Vineyard Northeast | Vineyard Offshore LLC | TBD | 516 $km^2$ | 516 $km^2$ | NA | 40 |

**Table 2: Project and trawl survey timelines, upon issuance of an ITP.**

| Project | Developer | Anticipated Survey Start | Anticipated Construction Start |
|---|---|---|---|
| Revolution Wind | Orsted LLC/ Eversource | Upon issuance of the ITP | 2025 |
| Sunrise Wind | Orsted LLC/ Eversource | Upon issuance of the ITP | 2025 |
| SouthCoast Wind | SouthCoast Wind LLC | Upon issuance of the ITP | 2026 |
| New England Wind | Avangrid LLC | Upon issuance of the ITP | 2026 |
| Vineyard Northeast | Vineyard Offshore LLC | Upon issuance of the ITP | Undetermined |

# 4 Conservation Plan

## 4.1 Anticipated Impact of the Proposed Activity on the Listed Species

### 4.1.1 Atlantic Sturgeon

#### 4.1.1.1 Anticipated Interactions

Atlantic sturgeon may be present in the marine environment, and therefore susceptible to interactions with trawl gear while migrating, however Atlantic sturgeon are most frequently captured in depths less than 50 meters. Additional information suggests that captures in otter trawl gear are most likely to occur in waters less than 30 meters (ASMFC, 2007). The mortality of Atlantic sturgeon in commercial otter trawls has been estimated at approximately 5% (NEFSC, 2011). However, scientific research surveys, such as the proposed activities, have been documented to have reduced mortality due to short tow duration and careful handling of captured sturgeon (NMFS, 2021a). It has been documented that hundreds of Atlantic sturgeon have been captured in state and federal surveys, including the NEAMAP and NEFSC surveys, with no recorded serious injuries of mortalities (NMFS, 2021a).

Estimating the interaction rate with Atlantic sturgeon by the proposed action was derived from the observed interaction rates in the NMFS Northeast Fisheries Science Center (NEFSC) trawl surveys. Similar to the NEAMAP survey, the NEFSC trawl survey is twice a year (spring and fall) covering from Cape Hatteras, NC to the Canadian Border. The NEFSC trawl survey uses a similar protocol and net design. While the NEAMAP survey extent is near shore, the NEFSC ranges from coastal waters to the continental shelf break. The NEFSC trawl survey currently operates in the proposed action area. NMFS provided an interaction rate of 0.00167 for the NEFSC spring trawl surveys from 2012-2022 for trawls above 39°N (excluding the Gulf of Maine) to be used to calculate estimated take. A total of 3 sturgeon interactions were documented over 1796 tows giving an interaction rate of 0.00167 sturgeon per tow. The spring interaction rate (0.00167) is higher than the fall interaction rate (0.00058), which may be because fall NEFSC surveys do not overlap temporally with sturgeon presence in the survey area. Therefore, we are using the spring interaction rate and the estimated interaction rate should be considered conservative for the proposed action. No sturgeon were observed in or around the study area.

Incidental take of Atlantic sturgeon has to be allocated based on their respective DPS. Kazyak et al. 2021 compared the capture location of Atlantic sturgeon to their DPS using genetic analysis. This study found significant movement of sturgeon between regions irrespective of their natal grounds. As a result, all five DPSs could be present in the action area. The MA/RI WEA is defined as “MID Offshore” within the genetic mixed stock analysis presented by Kazyak et al. 2021. While this analysis presented the genetic composition of the sturgeon in the Mid-Atlantic, the majority of the data used in the analysis was collected near the Chesapeake Bay, Delaware Bay and Hudson River. Limited observations were collected from Southern New England. Of the five sturgeon collected from the region, two belonged to the South Atlantic DPS, two belonged to the Gulf of Maine DPS and one individual belonged to the Canadian DPS. To account for the disparity between the regional and local observations, the relative expected proportions were combined (i.e., regional plus local) then normalized (Table 3).

**Table 3: Expected DPS of observed Atlantic sturgeon based on local and regional data presented by Kazyak et al. (2021).**

| Distinct Population Segment (DPS) | Regional Observations (%) | Local Observations (%) | Combined (%) | Normalized Allocations (%) |
|---|---|---|---|---|
| New York Bight | 55.3 | 0 | 55.3 | 27.7 |
| Chesapeake Bay | 22.9 | 0 | 22.9 | 11.5 |
| South Atlantic | 13.6 | 40 | 53.6 | 26.8 |
| Carolina | 5.8 | 0 | 5.8 | 2.9 |
| Gulf of Maine | 2.4 | 60 | 62.4 | 31.2 |
| Total | 100.0 | 100.0 | 200.0 | 100.0 |

Based on the presented analysis, the estimated annual incidental take of Atlantic sturgeon is derived from the number of tows in the action area and the interaction rate. The take is then allocated to each DPS based on Table 3. Each incidental take estimate is rounded up to the nearest whole number. Incidental take estimates are presented in Table 4. To help account for the interannual variability in estimated takes due to annual variability in sturgeon abundance and distribution in the survey area, we request take for two-year rolling intervals (e.g., any two consecutive years). The total two-year rolling interval take request is 10 Atlantic sturgeon, based on 5 estimated takes (1 per DPS) per year.

**Table 4: Estimated annual incidental take of Atlantic sturgeon with respect to DPS within each project area. Whole numbers in parentheses represent the estimated take after rounding up to the nearest whole animal.**

| Project | Tows per Year | Interaction Rate (#/Tow) | Est. Annual Take | Estimated Incidental Take by DPS | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | New York Bight | Chesapeake | South Atlantic | Carolina | Gulf of Maine |
| Revolution Wind | 120 | 0.00167 | 0.20 | 0.06 | 0.02 | 0.05 | 0.01 | 0.06 |
| Sunrise Wind | 120 | 0.00167 | 0.20 | 0.06 | 0.02 | 0.05 | 0.01 | 0.06 |
| SouthCoast Wind | 240 | 0.00167 | 0.40 | 0.11 | 0.05 | 0.11 | 0.01 | |
| New England Wind | 200 | 0.00167 | 0.33 | 0.09 | 0.04 | 0.09 | 0.01 | 0.10 |
| Vineyard Northeast | 40 | 0.00167 | 0.07 | 0.02 | 0.01 | 0.02 | 0.002 | 0.02 |
| Total | 720 | | 1.2 | 0.33 (1) | 0.14 (1) | 0.32 (1) | 0.03 (1) | 0.37 (1) |

#### 4.1.1.2 Indirect Impacts

Bottom trawling has been documented to impact the seafloor (He and Winger, 2010). The impact to the benthic community is dependent on the trawl gear, bottom substrate, biological communities, depth, and hydrological conditions (i.e., current and tides). Due to the short tow duration, limited footprint of the survey gear, and infrequent survey effort, the minor effects to the benthic habitat are anticipated to be negligible to Atlantic sturgeon (NMFS, 2021a, NMFS, 2021b). Additionally, while there may be some changes to the benthic community on which sturgeon feed, there is no evidence that the bottom trawling activities will have a negative impact on prey availability, thus any potential effects are extremely unlikely.

### 4.1.2 Sea Turtles

#### 4.1.2.1 Anticipated Interactions

Underwater video observations have documented the herding of sea turtles toward the mouth of a trawl. The behavior of sea turtles in front of, and around, trawl gear is inconclusive, however studies have documented evidence of trawl herding in which sea turtles will swim in front of the trawl until they become fatigued and caught, however (NMFS, 2002; DeAlteris, 2010). Capture within the trawl can lead to forced submergence, which can result in prolonged anoxia and seawater infiltration of the lungs, potentially resulting in death (Lutcavage and Lutz, 2017). The probability of mortality has been documented to be related to trawl duration with increased tow duration leading to an increased probability of mortality (Henwood and Stuntz, 1987, Sasso and Epperly, 2006). Short tow durations (<30 min.) have been documented to have a negligible likelihood of mortality (Sasso and Epperly, 2006). Based on the analysis by Sasso and Epperly (2006), as well as additional information from state and federal bottom trawl surveys (NMFS and NEAMAP), NMFS has previously concluded that "tow times less than 30 minutes are expected to eliminate the risk of death from forced submergence for sea turtles caught in the beam and bottom otter trawl survey gear" (NMFS, 2021a, NMFS, 2021b). Based on this assessment, we conclude that the proposed activity, including tows of 20-minute duration, would not result in sea turtle mortality. As we anticipate all sea turtles will be captured and released alive we are only requesting take of live take of sea turtles. To help account for the interannual variability in estimated takes due to annual variability in sea turtle abundance and distribution in the survey area, we request take for two-year rolling intervals (e.g., any two consecutive years).

Estimates of interaction rate for sea turtles were based on data from NEFSC surveys (Northwest Atlantic Ocean DPS of loggerhead sea turtles) and Murray's (2020) analysis on interaction rates in the US commercial bottom trawl fisheries along the Atlantic (Kemp's ridley, leatherback, and the North Atlantic DPS of green sea turtles). The NEFSC surveys overlap spatially and temporally (in spring and fall) with the survey area and use the same survey methodology and gear. NMFS provided an interaction rate of 0.00175 for the NEFSC fall trawl surveys from 2012-2022 for trawls above 39° (excluding the Gulf of Maine) to be used to calculate estimated take. A total of 3 sea turtle interactions were documented over 1716 tows giving an interaction rate of 0.00175 sea turtles per tow. The NEFSC surveys did not interact with sea turtles during spring surveys, however the surveys are conducted in early spring, likely before sea turtles arrive in the area. The fall interaction rate was used for all survey tows with the exception of winter tows as no turtles are anticipated to be present in the survey area during winter months. Each incidental take estimate is rounded up to the nearest whole number. Incidental take estimates for loggerhead sea turtles are presented in Table 5. The total two-year rolling interval take request is 2 loggerhead sea turtles, based on 1 estimated take per year.

**Table 5: Estimated annual incidental take for each project for loggerhead sea turtles. Total estimated annual incidental take is rounded up to the nearest whole number, displayed in parenthesis.**

| Project | Number of tows (Spring, Summer, Fall only) | Interaction rate (#/tow) | Estimated incidental take per year |
|---|---|---|---|
| | | | Loggerhead sea turtle |
| Revolution Wind | 90 | 0.00175 | 0.16 |
| Sunrise Wind | 90 | 0.00175 | 0.16 |
| Mayflower Wind | 180 | 0.00175 | 0.32 |
| New England Wind | 150 | 0.00175 | 0.26 |
| Vineyard Wind | 30 | 0.00175 | 0.05 |
| **Total** | | | **0.95 (1)** |

Murray estimated the interaction rates of sea turtles in the US commercial bottom trawl fisheries along the Atlantic coast between 2014-2018 using fisheries observer data (Figure 8). Data from the Northeast Fisheries Observer Program and at-sea monitors documented the capture of loggerhead, Kemp's ridley, leatherback and green turtles aboard commercial fishing vessels over 5,227 days fished. The analysis examined the interaction rate with respect to region, season, and depth. The results of the analysis can be found in Table 6. Interaction rates from this analysis were used due to similar fishing gear characteristics. These data overlap temporally and spatially with the survey area, however, as trawl gear used in these fisheries varies, they may differ from those used in the proposed survey. This dataset includes trawl activities during the summer months, when Kemp's ridley, green, and leatherback sea turtles are most likely to be present in the action area. While these fisheries may use a variety of trawl types, the Murray (2020) analysis shows that, even with low interaction rates, there is potential for trawls operating in the survey area to interact with Kemp's ridley, green, and leatherback sea turtles. Due to this potential for interaction, we request take of 1 Kemp's ridley, 1 green, and 1 leatherback sea turtle annually, for a total of 2 of each species in any two-year rolling interval.

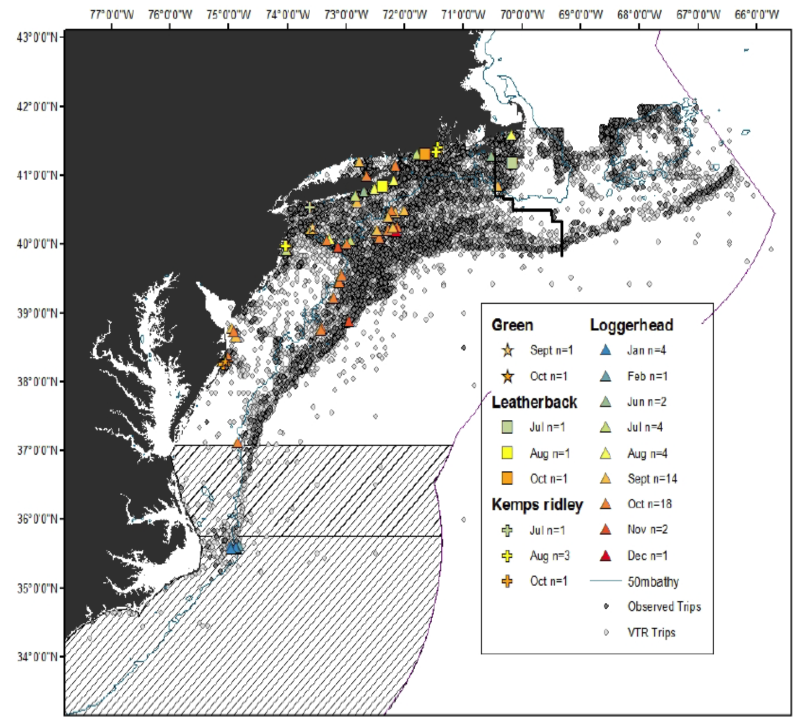


**Figure 8: Observed loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*) and green (*Chelonia mydas*) turtle interactions, observed trips and commercial trips in US bottom trawl gear from 2014 to 2018 throughout Georges Bank and the Mid-Atlantic. From Murray (2020).**

**Table 6: Stratified interaction rates and coefficient of variation (CV) for each turtle species in bottom trawl gear 2014-2018. MA = Mid-Atlantic; GB = Georges Bank. Cc = loggerhead (*Caretta caretta*); Lk = Kemp's ridley (*Lepidochelys kempii*); Dc = leatherback (*Dermochelys coriacea*); Cm = green (*Chelonia mydas*). From Murray (2020).**

| Region | Latitude Zone | Season | Depth | Cc rate (CV) | Lk rate (CV) | Dc rate (CV) | Cm rate (CV) |
|---|---|---|---|---|---|---|---|
| GB | N/A | July – Oct | <= 50m | 0.004 (0.70) | 0 | 0.002 (1.0) | 0 |
| MA North | >=39ºN | July – Oct | <= 50m | 0.025 (0.24) | 0.006 (0.49) | 0.003 (0.72) | 0.002 (1.0) |
| | >=39ºN | July – Oct | > 50m | 0.050 (0.33) | 0 | 0 | 0 |
| | >=39ºN | Nov-Jun | <= 50m | 0.003 (0.71) | 0 | 0 | 0 |
| | >=39ºN | Nov-Jun | > 50m | 0.001 (0.68) | 0 | 0 | 0 |
| MA Mid | >37ºN & <39ºN | July – Oct | <= 50m | 0.259 (0.52) | 0.052 (1.02) | 0 | 0.052 (1.0) |
| | >37ºN & <39ºN | July – Oct | > 50m | 0.022 (0.55) | 0 | 0 | 0 |
| | >37ºN & <39ºN | Nov – Jun | > 50m | 0.003 (0.99) | 0 | 0 | 0 |
| MA South | <=39ºN | Nov – Jun | <= 50m | 0.231 (1.01) | 0 | 0 | 0 |
| | <=39ºN | Nov – Jun | > 50m | 0.428 (0.68) | 0 | 0 | 0 |

#### 4.1.2.2 Indirect Impacts

Bottom trawling has been documented to impact the seafloor (Jones, 1992). The impact to the benthic community is dependent on the trawl gear, bottom substrate, biological communities, depth, and hydrological conditions (i.e., current and tides). Due to the short tow duration, limited footprint of the survey gear, and infrequent survey effort, the minor effects to the benthic habitat are anticipated to be negligible to sea turtles (NMFS, 2021a, NMFS, 2021b).

Green and leatherback sea turtles primarily feed on sea grass/algae and jellyfish/tunicates, respectively. As such the trawl survey is not expected to impact prey availability. Kemp's ridley and loggerhead sea turtles are known to feed on various crustaceans, fish and mollusks. The trawl survey will capture these organisms; however, the majority of the catch will be returned to the sea. While some of the discarded catch will be dead or injured, sea turtles have been known to scavenge on dead organisms. Given the limited scope of the proposed action it is unlikely that it will have a measurable impact on sea turtle prey availability.

## 4.2 Measures to minimize, mitigate and monitor protected species

### 4.2.1 Minimization of potential interactions and impacts of interactions

At least one of the survey staff onboard the trawl survey will have completed NEFOP-observer training within the last 5 years, or other equivalent training in protected species identification and safe handling (inclusive of taking genetic samples from Atlantic sturgeon). Reference materials for identification, disentanglement, safe handling, and genetic sampling procedures will be available on board each survey vessel. All training will be documented to ensure compliance and provided to federal agencies upon request.

Between June 1 and November 30, SMAST will have a trained lookout posted on all vessel transits during all phases of the project to observe for protected species and communicate with the captain to take avoidance measures as soon as possible if one is sighted as detailed below. The trained lookout will maintain a vigilant watch and monitor a Vessel Strike Avoidance Zone (500 m) at all times to maintain minimum separation distances from ESA-listed species. If the trained lookout is a vessel crew member, this will be their designated role and primary responsibility while the vessel is transiting. Any designated crew lookouts will receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements. The following avoidance measures will be implemented between June 1 and November 30:

1) The trained lookout will monitor seaturtlesightings.org prior to each trip and report any observations of sea turtles in the vicinity of the planned transit to all vessel operators/captains and lookouts on duty that day.
2) If a sea turtle is sighted within 100 m of the operating vessel's forward path, the vessel operator must slow down to 4 knots (unless unsafe to do so) and may resume normal vessel operations once the vessel has passed the sea turtle. If a sea turtle is sighted within 50 m of the forward path of the operating vessel, the vessel operator must shift to neutral when safe to do so and then proceed away from the turtle at a speed of 4 knots or less until there is a separation distance of at least 100 m at which time normal vessel operations may be resumed.
3) The vessel will spend 15 minutes prior to each tow at the sampling station looking out for sea turtles. If a sea turtle is sighted during transit to a sampling station, during scouting, or while the gear is being prepared and deployed, the vessel will immediately proceed to an alternative tow station away from where the animal was observed.
4) Between June 1 and November 30, vessels will avoid transiting through areas of visible jellyfish aggregations or floating sargassum lines or mats. In the event that operational safety prevents avoidance of such areas, vessels will slow to 4 knots while transiting through such areas.
5) All vessel crew members will be briefed in the identification of sea turtles and in regulations and best practices for avoiding vessel collisions. Reference materials will be available aboard all project vessels for identification of sea turtles. The expectation and process for reporting of sea turtles (including live, entangled, and dead individuals) will be clearly communicated and posted in highly visible locations aboard all project vessels, so that there is an expectation for reporting to the designated vessel contact (such as the lookout or the vessel captain), as well as a communication channel and process for crew members to do so.

For any survey gear lost, all reasonable efforts that do not compromise human safety will be undertaken to recover the gear. All lost gear will be reported to NMFS (nmfs.gar.incidental-take@noaa.gov) within 24 hours of the documented time of missing or lost gear. This report will include information on any markings on the gear and any efforts undertaken or planned to recover the gear.

Tow time for the survey is limited to 20 minutes. The brief tow duration has been documented to reduce potential mortality in both Atlantic sturgeon and sea turtles. A tow speed of 2.8 – 3.2 knots reduces the potential for vessel strikes.

#### 4.2.2 Mitigation of potential interactions to the general population

The goal of the proposed action is to provide an improved understanding of the impacts of offshore wind development on wild fish populations. The data collected will improve the state of science in relation to this topic. While the proposed action is anticipated to have minimal interactions with the Atlantic sturgeon or sea turtles, any interaction will provide valuable data related to the use of this area by the species. Additionally, data collected from individuals (i.e., size, weight, tag ID, genetics) will provide scientists with valuable information which may be used to improve the management of the species. The genetic samples collected from Atlantic sturgeon will provide scientists and regulators data to improve our understanding of the species distribution and use of the proposed area.

Any observations of sea turtles will be reported to seaturtlesightings.org as well as other working vessels in the area. Reporting observations will increase awareness and vigilance with the goal of reducing potential interactions. Additionally, reports of sea turtles will provide data on the spatial and seasonal distribution and occupancy within the MA/RI WEA.

Trawl survey vessels will have a knife and boathook onboard and disentangle any sea turtles consistent with the Northeast Atlantic Coast STDN Disentanglement Guidelines at https://www.reginfo.gov/public/do/DownloadDocument?objectID=102486501 and the procedures described in "Careful Release Protocols for Sea Turtle Release with Minimal Injury" (NOAA Technical Memorandum 580; https://repository.library.noaa.gov/view/noaa/3773 ). Any animal in distress will immediately be reported to NMFS New England/Mid-Atlantic Regional Stranding Hotline (866-755-6622).

#### 4.2.3 Assessment of alternatives to the proposed action

Three alternatives were assessed to the proposed action. The first alternative was a reduction in survey effort. Reducing the survey effort would result in a significant reduction in the statistical power to detect changes in fish populations with a minimal impact on protected species. For example, the SouthCoast Wind survey is anticipated to have a 71.8% chance of detecting a 30%

change in Atlantic longfin squid (*Dorytheuthis pealei*) abundance at the current survey effort, based on previous data collected in the survey areas and an associated power analysis conducted by Rillahan and He (2021). Reducing the survey effort by 50% would result in a 43.4% chance of detecting the same effect, significantly undermining the ability of the survey to detect effects. The reduced sampling intensity would require a larger effect (39.6% change in abundance) to yield the same statistical power. The reduction in statistical power would not come at commensurate reductions in impacts to protected species. As previously mentioned, the impacts to habitat and prey are deemed to be negligible at the proposed level. Additionally, estimates of take are conservative. Each take estimate has been rounded up to the nearest integer. While a reduction in effort is expected to reduce the risk of an interaction, due to the low interaction rates, estimates of take were under a single take at the current effort. Reducing the proposed action would result in the same request for take. As previously mentioned, the capture of Atlantic sturgeon in survey tows has not documented any mortality from the interaction, as a result we believe the proposed action would not result in impacts to the general population of the species.

Additional modifications to this alternative would be to combine control areas. As previously mentioned, any reduction in effort would result in reduced statistical power with negligible reductions in take. Data collected from these projects is considered the property of the developer. Sharing control sites, with reduced effort, would require data sharing agreements between parties. All of these surveys, with the exception of Vineyard Northeast, have been reviewed or are currently being reviewed as fisheries monitoring plans (FMPs) by state and federal agencies, including the NOAA, NMFS, Rhode Island Coastal Resource Management Council (RI CRMC), and the Massachusetts Office of Coastal Zone Management (MA CZM). Any changes to the survey design would require consultation with the associated developers which would result in significant delays in monitoring. The associated delays would result in a lack of data collection of pre-construction baseline data, as the construction schedules would not change. Additionally, multiple control areas have been found to improve data interpretation toward the true impacts of the proposed action. For example, Wilber et al. (2022) found that species dynamics different among the control sites near the Block Island Wind Farm. Furthermore, the study found that a single control area would lead to incorrect inference of the data for several species. Multiple control sites allowed this study to provide an interpretation of the data in a regional context further advancing the understanding of the complicated nature of these systems.

A second alternative to the proposed action is to change the survey design from a BACI to a Before – After Gradient (BAG) survey design. It should be noted that both the BACI and BAG experimental designs are recommended methodologies by BOEM and ROSA (Responsible Offshore Science Alliance). A BAG study design is a distance-based study design which differs from the BACI in that it samples at radiating distances from the proposed impact area. The different study design reflects different thinking about the nature of the proposed impact (Methratta, 2021). A BACI design implicitly tests for the presence or absence of an impact while the BAG design assumes an impact radiating from the proposed action. The goal of a BAG study is to understand the magnitude of the proposed action along the gradient. While there is a logical theoretical underpinning to this study design, applications of this design are sparse, therefore performance is uncertain. Additionally, this study design would ideally operate under stable spatial and temporal gradients. Due to the staggered construction and operation schedules in this area, these conditions would invalidate the study design or potentially requiring additional effort to tease out these effects. This could result in increased survey effort and increased interactions with protected species. To date the BAG design has not been applied to a large-scale survey of this nature. As a result, this method has not been statistically validated, nor is there any data which would suggest that the BAG design would result in reduced effort, and therefore reduced interactions with protected species. Our selection of the study design for this project was due to the uncertainty in the BAG study design and the proven effectiveness of the BACI study design (Christie et al., 2020). Furthermore, data collected from the BACI design does contain spatial information and can therefore be used to answer the same questions addressed in the BAG design. While it is unproven whether the alternative design using BAG method would result in less survey effort than the BACI method, it is prudent to keep the existing BACI method for consistency across surveys in different development areas, some of which already have (or soon have) BiOp in place that specifies the BACI method for fisheries surveys related to offshore wind energy development. In addition, with low rate of interactions of survey trawl with protected species in the area, any slight change in survey effort would not likely change overall take requests of the protected species in question.

A third alternative to the proposed action is to utilize a non-extractive sampling technology. Optical, acoustic, and environmental DNA technologies have been used to study fish populations in the wild (Engas et al. 1996, Stoeckle et al. 2021, Whitmarsh et al. 2017,). While these novel technologies are promising, they are understudied and have yet to be evaluated for efficacy and statistical power to detect trends. Environmental DNA has yet to be applied to regional assessments of fish ecology. Similarly, optical and acoustic technologies are commonly more species and size selective than trawls. As a result, demersal trawls are still the most effective method for sampling fish populations on a regional scale. This is also why NOAA Fisheries still uses bottom trawl survey as the main survey for stock assessment and ecological monitoring.

### 4.3 Funding assurance

SMAST assures that funds will be available to conduct the proposed work and associated monitoring, mitigation and minimization strategies. Funding for the surveys as well as the implementation of the conservation plan are provided by the associated project developer. The estimated cost of implementing the conservation plan is $100,000.

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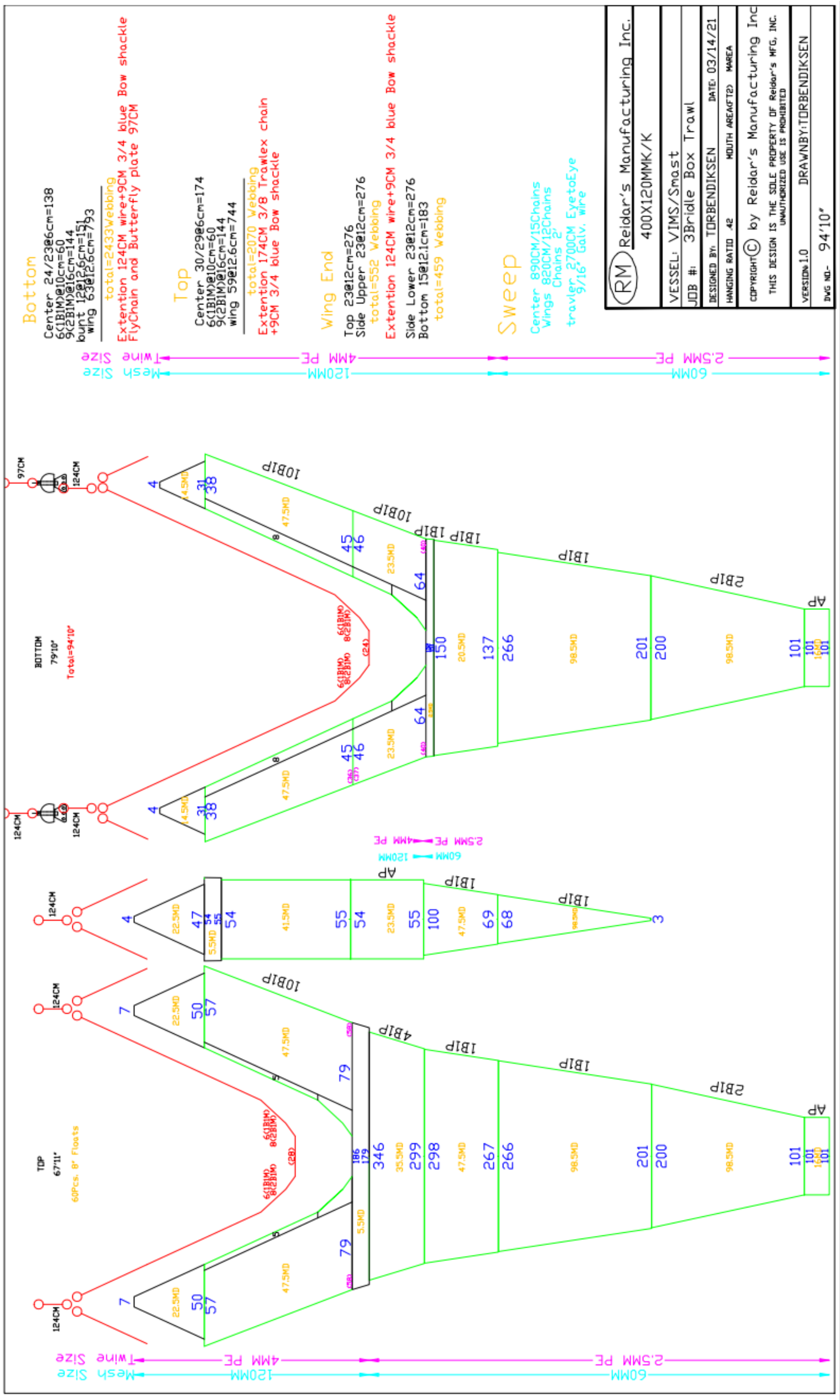
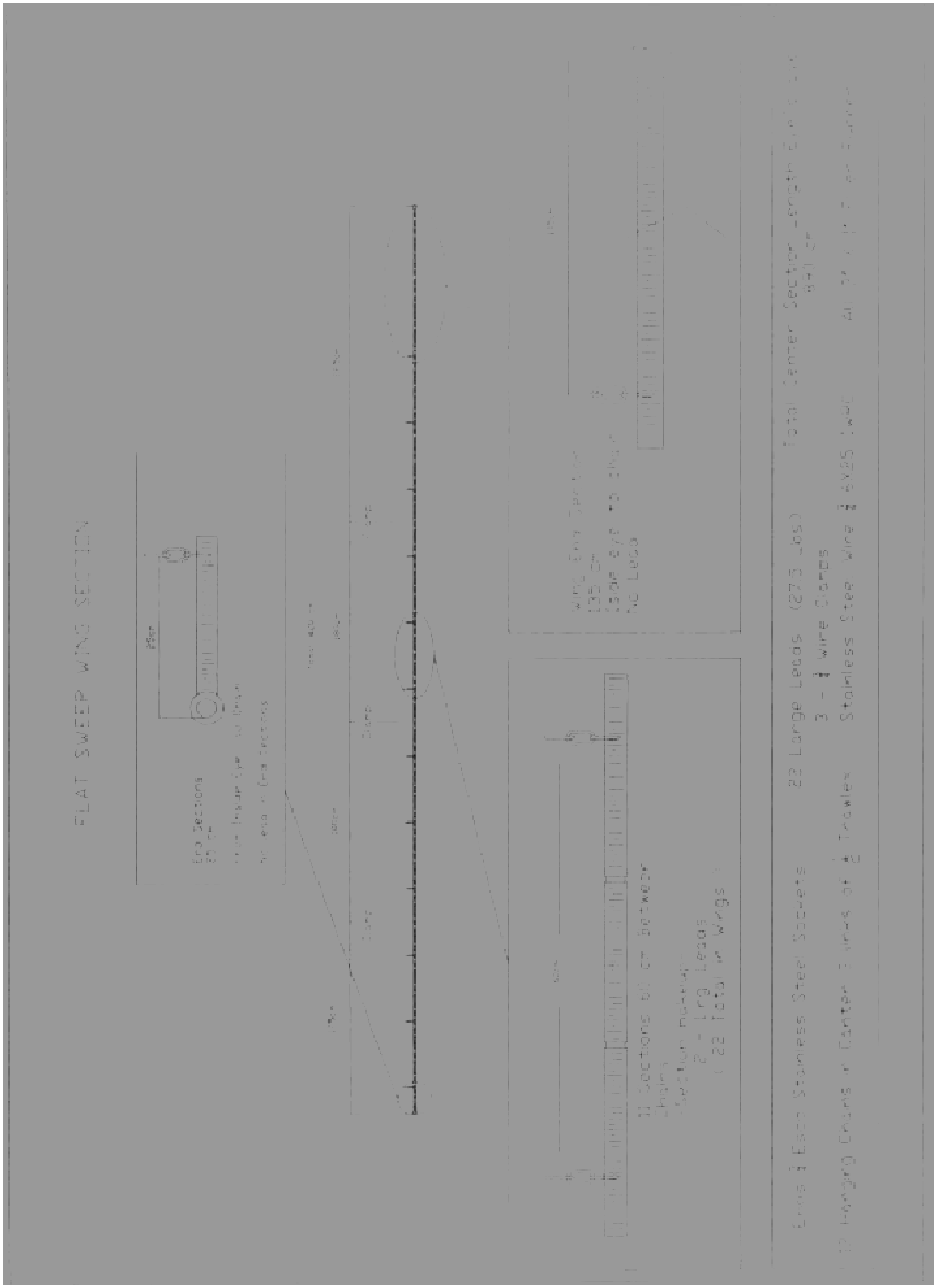
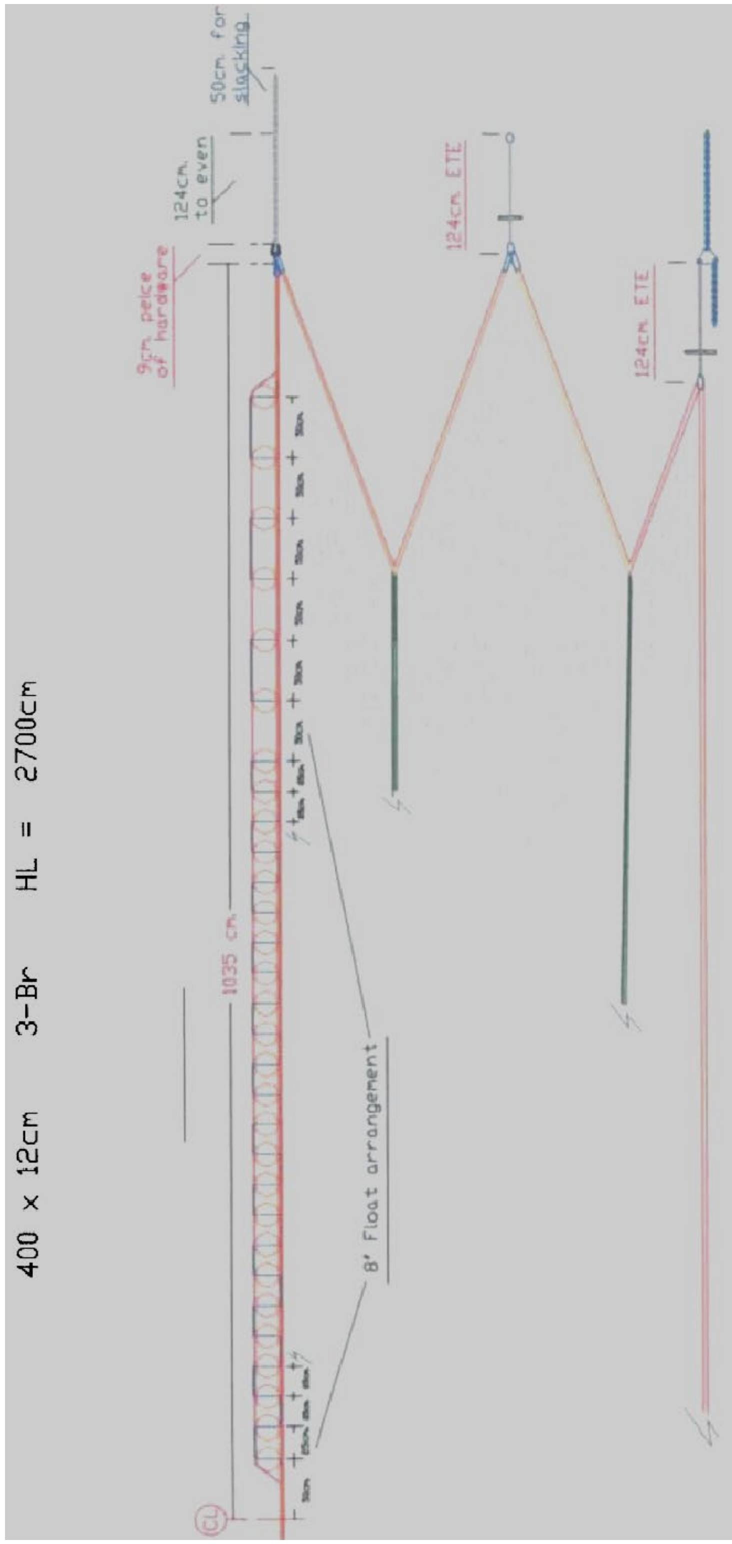
# 6 Appendix




Appendix 1: Schematic net plan for the NEAMAP trawl (Courtesy of Reidar’s Manufacturing Inc.).




**Appendix 2: Sweep diagram for the survey trawl (Bonzek et al., 2008).**




**Appendix 3: Headrope and rigging plan for the survey trawl (Bonzek et al., 2008).**

**Appendix 4: Bridle and door rigging schematic for the survey trawl (Courtesy of Reidar's Manufacturing Inc.).**