Technical Report

Commercial and Recreational Fisheries Technical Report

Revolution Wind Offshore Wind Farm

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List of Acronyms

ACCSP	Atlantic Coastal Cooperative Statistics Program
BMP	Best Management Practice
COP	Construction and Operations Plan
CT DEEP	Connecticut Department of Energy and Environmental Protection
EEZ	exclusive economic zone
EFH	essential fish habitat
GARFO	Greater Atlantic Regional Fisheries Office
GIS	geographic information system
IPF	impact-producing factor
Lease	Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf OCS-A 0486
Lease Area	BOEM-designated Renewable Energy Lease Area OCS-A 0486
MADMF	Massachusetts Division of Marine Fisheries
MEC	munitions and explosives of concern
MRIP	Marine Recreational Information Program
NOAA Fisheries	National Marine Fisheries Service
NROC	Northeast Regional Ocean Council
NYSDEC	New York State Department of Environmental Conservation
O&M	operations and maintenance
OCS	Outer Continental Shelf
OnSS	onshore substation
OSS	offshore substation
Project	Revolution Wind Offshore Wind Farm Project
Project Area	Proposed Wind Farm Area, Export Cable Corridor, and all onshore Project facility locations including the Onshore Transmission Cable Corridor, and Onshore Substation
RIDEM	Rhode Island Department of Environmental Management
RI-MA WEA	Rhode Island-Massachusetts Wind Energy Area
RWEC	Revolution Wind Farm Export Cable
RWEC-RI	Revolution Wind Farm Export Cable-Rhode Island State Waters
RWEC-OCS	Revolution Wind Farm Export Cable-Outer Continental Shelf

RWF	Revolution Wind Farm
SPCC	Spill Prevention, Control, and Countermeasure
TJB	transition joint bay
TSS	total suspended solids
UXO	unexploded explosive ordnance
VTR	Vessel Trip Report
VMS	Federal Vessel Monitoring System
WTG	wind turbine generator

1.0 INTRODUCTION

1.1 Description of the Proposed Action

Revolution Wind, LLC (Revolution Wind), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC (Eversource), proposes to construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The wind farm portion of the Project will be located in federal waters on the Outer Continental Shelf (OCS) in the designated Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486 (Lease Area). The Lease Area is approximately 20 statute miles (mi) (17.4 nautical miles [nm], 30 kilometers [km]) south of the coast of Rhode Island (Figure 1.1-1). The Project consists of the Revolution Wind Farm (RWF), located within the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf -A 0486 Lease Area (Lease Area) and the Revolution Wind Farm Export Cable (RWEC), traversing federal (RWEC-OCS) and Rhode Island state waters (RWEC-RI) to potential landfall options at Quonset Point in North Kingstown, Rhode Island.

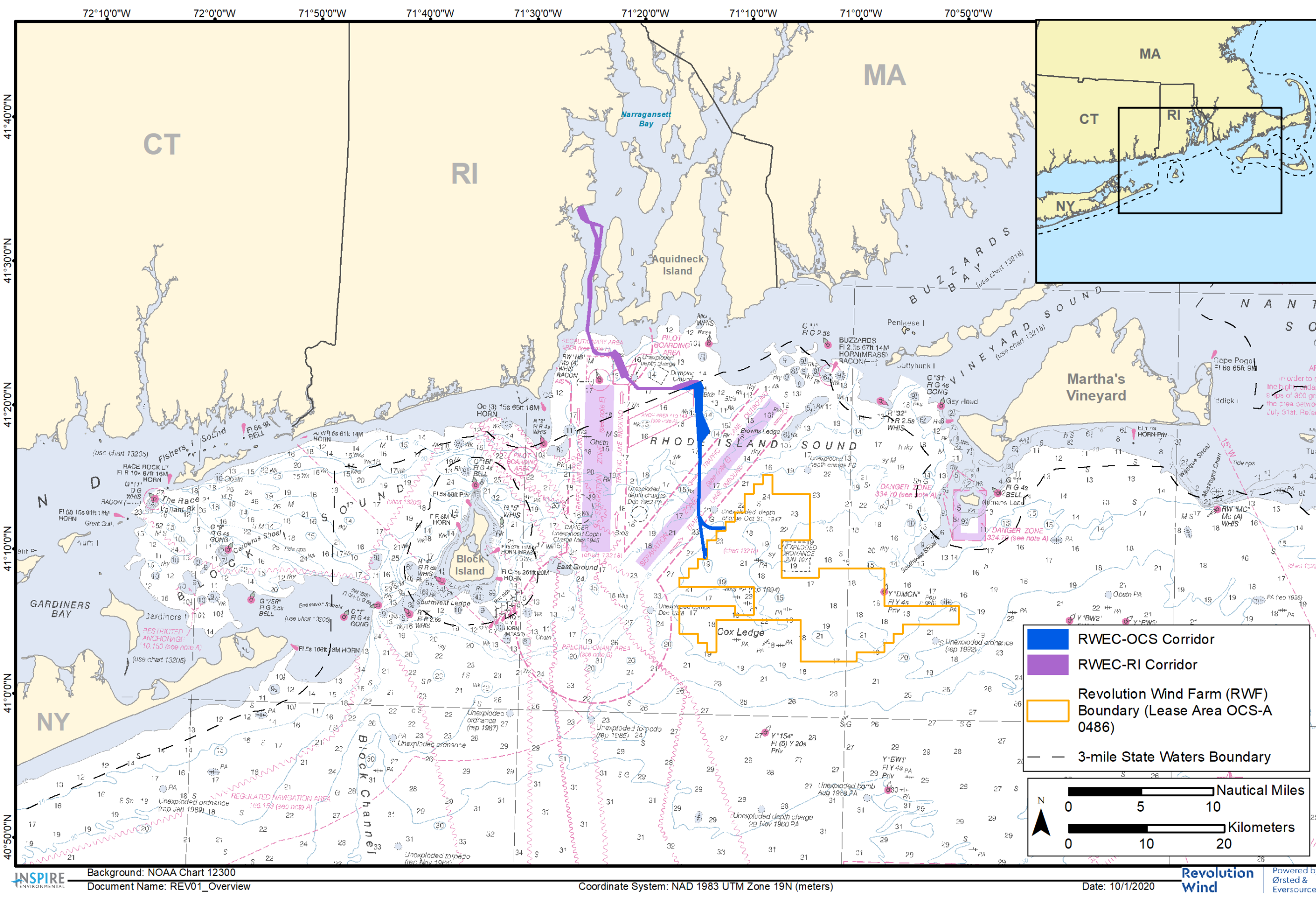

Figure 1.1-1 Map of the Project Area, including the Potential Export Cable Route and Revolution Wind Farm.

The Project will be comprised of both offshore and onshore components, which are described in detail in Section 3 of the Construction and Operations Plan (COP). This Technical Report focuses on evaluation of the Project's offshore components, which include the following:

- up to 100 Wind Turbine Generators (WTGs) connected by a network of Inter-Array Cables (IAC);
- up to two Offshore Substations (OSSs) connected by an OSS-Link Cable; and
- up to two submarine export cables (referred to as the RWEC), generally co-located within a single corridor.

1.2 Regulatory Context and Resource Definition

The National Oceanic Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) requires all federally permitted commercial fishing vessels (with the exception of those vessels that only have a lobster permit) to submit vessel trip reports (VTRs) for every fishing trip (50 Code of Federal Regulations [CFR] 648.7). The VTR data provide a broad census of fishing activity that encompasses the majority of commercial fisheries active near the RWF and RWEC fisheries study corridor (see Section 2.1.1.1). VTRs include a single fishing location (reported in latitude and longitude coordinates) for where "the majority of fishing effort occurred" on each trip, gear type, and species targeted (NOAA Fisheries, 2018).

NOAA Fisheries also monitors the location and movement of commercial fishing vessels for certain fisheries via a vessel monitoring system (VMS). VMS data are maintained by the Northeast Regional Ocean Council (NROC) and the Mid-Atlantic Regional Council on the Ocean for fishing vessel activity of select fisheries (see Section 2.1.1.2) in the northeast and mid-Atlantic regions of the US, which encompasses the RWF and RWEC locations,

The lobster and Jonah crab fisheries do not have VTR or VMS requirements. VMS data for lobster and Jonah crab likely come from fishermen with lobster permits that also participate in other fisheries that require VTRs or VMS (RIDEM, 2017). The American lobster fishery is active in the marine portions of the Project Area and is managed cooperatively by the states and NOAA Fisheries under the framework of the Atlantic States Marine Fisheries Commission. Jonah crab was once considered bycatch of the lobster fishery, but since 2011 (Truesdale et al., 2019) has increasingly been targeted as a commercial fishery. Landings in the fishery come predominantly from Massachusetts (70%) and Rhode Island (24%) and the fishery has only recently (2015) been managed through an interstate Fishery Management Plan (FMP; ASMFC, 2015).

1.3 Contents of This Technical Report

This technical report provides a detailed explanation of the data and analyses used to assess commercial and recreational fisheries resources in the RWF and RWEC fisheries study corridor. The information presented herein supports the summary-level data and analysis presented in Section 4.6.5 of the COP. Section 2 of this technical report describes the data sources and analysis used to characterize commercial and recreational fishing activity in the RWF and RWEC areas. Data analyzed in this technical report were requested from NOAA Fisheries and obtained from publicly available data sources. All data requested were subject to strict confidentiality requirements set forth by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006. These requirements prevent the government from making any data public that can be linked to individual people or businesses. This is achieved by applying the "Rule of Three," where any data presented to the public must have been reported by at least three fishermen, vessels, dealers, etc. Any data that can only be attributed to two or fewer entities must be aggregated to a higher level. Section 2.2 of this report provides detailed summaries of the data requested from state and federal agencies, as well as supplementary maps for data sets referenced in Section 4.6.5 of the COP. Potential impacts and mitigation are discussed in Section 3.0.

2.0 AFFECTED ENVIRONMENT

2.1 Methodology

2.1.1 Federal Data

2.1.1.1 Federal Vessel Trip Report (VTR) Data

The RWF and RWEC fisheries study corridor occur within the larger Rhode Island-Massachusetts Wind Energy Area (RI-MA WEA). The VTR data used for characterizing commercial fisheries in the RWF and RWEC fisheries study corridor as summarized in this report were requested from and processed by NOAA Fisheries following the methods described by Kirkpatrick et al. (2017). Also, included was the application of the statistical model as described by DePiper (2014) that assesses the VTR self-reported fishing locations compared to observed haul locations. NOAA Fisheries also provided nonconfidential data on commercial fishing activity (2008 to 2017) in terms of revenue and landings, for fishing activity reported to occur within the RWF, as well as within a 46-mi (74-km)-long, 6.2-mi (10-km)-wide RWEC fisheries study corridor (Figure 2.1-1) that was established as an approximate buffer around a preliminary RWEC corridor. The RWEC fisheries study corridor was not established for the cable corridor that occurs within the RWF, therefore VTR data collected near the RWEC within the RWF are attributed to the RWF in tables below. The RWEC fisheries study corridor was defined to provide a reasonable geographic extent for fisheries activity that may occur near the RWEC fisheries study corridor, and may, therefore, be affected in some way by the installation and operations of the RWEC. The RWEC fisheries study corridor was created based on a preliminary RWEC corridor and was defined to be wide enough to accommodate changes over time to the RWEC centerline. To add context, the data were provided alongside the overall VTR data available for commercial fishing activity in the Greater Atlantic Region, which extends from Maine to North Carolina.

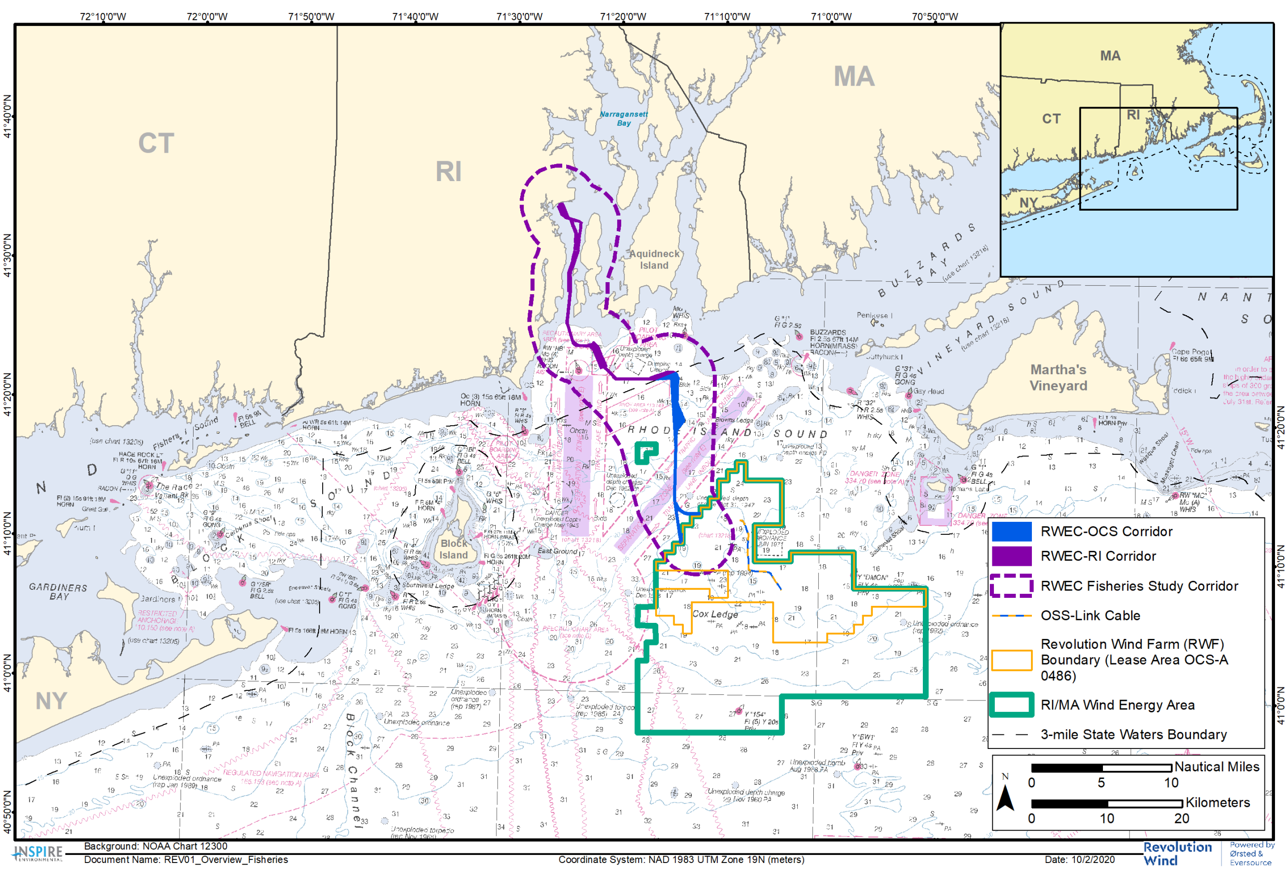

Figure 2.1-1 Map of the Revolution Wind Farm, the RI-MA WEA, and the RWEC Fisheries Study Corridor

The data provided by NOAA Fisheries represent fishing activity for federally permitted vessels that fish in either federal (defined as: 3 nm to 200 nm [3.5 to 345 mi; 5.6 to 556 km]) or state (within 3 nm) waters. Fishermen with federal and state permits (including those who also hold state permits) are required to submit VTRs to NOAA Fisheries. VTR data for fishermen who fish only in state waters were requested and obtained from the Atlantic Coastal Cooperative Statistics Program (ACCSP, 2020). To avoid duplicate records of fishing activity in state waters, fishermen who hold federal permits, but fished in state waters, were excluded from the ACCSP Fisheries VTR data set.

The VTR data provided by NOAA Fisheries provide a context for characterizing both revenue and biomass (pounds landed) from high-volume and high-value fisheries. A limitation of the data set is that it is most accurate when used to describe the general geographical characteristics of the commercial fishing industry in aggregate and does not provide information on precise fishing locations.

2.1.1.2 Federal Vessel Monitoring System (VMS)

VMS data are collected through a satellite surveillance system that primarily is the primary means used by NOAA Fisheries for monitoring the location of certain commercial fishing vessels working in federal waters. Vessels holding the following permits are required to have an operational VMS unit installed:

- Full-time or part-time limited access Atlantic sea scallop (*Placopecten magellanicus*), or limited access general category scallop permit;
- Occasional limited access scallop permit when fishing under the Scallop Area Access Program;
- Limited access monkfish (*Lophius americanus*), occasional scallop, or combination permit electing to provide VMS notifications;
- Limited access multispecies permit when fishing on a category A or B day at sea (DAS);
- Atlantic surfclam (*Spisula solidissima*) or ocean quahog (*Arctica islandica*) open access permit;
- Limited access monkfish vessel electing to fish in the Offshore Fishery Program;
- Limited access Atlantic herring (*Clupea harengus*) permit;
- Open access Atlantic herring Areas 2 and 3 permit;
- Limited access Atlantic mackerel (*Scomber scombrus*) permit; and
- Longfin squid (*Doryteuthis pealeii*) / butterfish (*Peprilus triacanthus*) moratorium permit.

The VMS location data are sent at least once an hour to NOAA Fisheries Office of Law Enforcement via transceiver units on the fishing vessels. The data include vessel identification, time, date, and the location at sea (NOAA Fisheries, 2019a). This information makes it possible for NOAA Fisheries to calculate the approximate speed that the vessel is travelling between vessel transmissions. The data are then filtered by estimated vessel-speed, depending on the gear and fishery, to indicate areas where it is likely that fishing is occurring (and not vessel transit locations). The benefit of VMS data is the geographical specificity of the fishing locations; one limitation of the data is that the “speed rule” used to filter the fishing locations from the vessel’s path of transit does not perfectly isolate fishing locations. In addition, VMS data do not provide complete coverage for all FMPs, i.e., there is not 100% reporting for some FMPs for some years. For instance, from 2017 to 2019, the percentage of FMPs using VMS ranged from 24 percent (American lobster) to 95 percent (Mackerel/Squid/Butterfish) (Douglas Christel, NOAA Fisheries, pers. comm. 5/18/2020).

To characterize fisheries active in the RWF and RWEC fisheries study corridor, spatial VMS data from the years 2011 through 2016 (where available) were overlaid with the RWF and RWEC fisheries study corridor to assess the relative intensity of fishing activity for multiple fisheries within and surrounding the Project Area. General fisheries categories with available data included in this analysis were:

- Large-mesh multispecies (groundfish);
- Monkfish;
- Pelagics (herring, mackerel, and squid);
- Atlantic herring;

- Atlantic surfclam/ocean quahog;
- Atlantic sea scallop; and
- Squid

Squid are listed twice above because this fishery was designated a specific fisheries code by NOAA Fisheries in 2014. Metadata about the VMS data are available at the Mid-Atlantic Ocean Data Portal (http://portal.midatlanticocean.org/), the Northeast Ocean Data portal (www.northeastoceandata.org), and in a report by Fontenault (2018) detailing how VMS data were prepared for the NROC. The VMS maps were qualitatively assessed for intensity of fishing activity in the RWF and RWEC fisheries study corridor. As there is no catch or revenue information attached to VMS locations, the intensity of fishing location should be considered in conjunction with other available data and stakeholder input. The VMS data overlaid with the RWF and RWEC fisheries study corridor are illustrated in Section 2.2.2.

This Technical Report also includes a review of the results of the 2017 report published by Rhode Island Department of Environmental Management (RIDEM) that linked together fishing location from VMS data, trip identification information from VTR data, and additional information from dealer landings data (RIDEM, 2017). This analysis worked with multiple sources of data on federal fishing activity to attach revenue and landings data to VMS point locations from within each of the WEAs, and created fishing-intensity maps based on those data sets for the southern New England region. The results of this analysis describe the fisheries active in the RI-MA WEA and take advantage of the VMS data spatial resolution for describing fishing locations. RIDEM also produced smoothed (i.e., outliers were removed) relative vessel density maps for the fisheries reporting with VMS between 2011 and 2016; which are similar to the maps produced from the data obtained from the data from the Northeast Ocean Data Portal, and therefore, are not included here to avoid repetition.

2.1.2 VTR Data as Rasters

Observed fishing locations may occur far from the VTR reported coordinates, with departures that vary based on gear type and other trip characteristics (DePiper, 2014). NOAA Fisheries, therefore, developed a fishing-intensity raster dataset to improve the spatial representation of self-reported VTR fishing locations (Benjamin et al., 2018). This raster dataset includes the VTR data, the statistical model estimated by DePiper 2014, and spatial data describing closures gathered from GARFO's GIS portal, the Federal Register, and the Code of Federal Regulations (Benjamin et al., 2018). As described in Benjamin et al. (2018), the model developed by DePiper (2014) constructs the great circle distance between the VTR coordinate and all observed hauls on that trip. A duration model is then estimated to explain distance from the self-reported VTR to observed fishing locations as a function of VTR characteristics, finding that gear, trip length, and broad ocean area are the variables that best explain this distance. Confidence intervals are then generated that estimate the smallest distances in which to expect a percent of observed hauls around a VTR point.

This modeling approach can be applied to historical fishery data and aggregated as a metric of fishing effort by target fishery (e.g., herring) and time period (e.g., fishing year 2010). After constructing these raster datasets, maps of fishing effort for various variables (e.g., revenue) can be produced using a heat map visualization of fishing intensity (Benjamin et al., 2018).

2.1.3 State Vessel Trip Reports

The ACCSP holds records for fishing activity reported to occur in state waters by those fishermen who hold state permits, federal permits, or both state and federal permits. The fishing activity in state waters by those fishermen with both federal and state permits is reported to NOAA Fisheries, and was included in the activity summary of commercial fisheries (Section 2.1). The federal VTR data were used to summarize fishing within the RWF and RWEC fisheries study corridor and include fishing by vessels with federal permits in those areas. Thus, to avoid reporting fishing activity in state waters twice, data on fishing in state waters were filtered to include records for vessels that only fish in each states' waters. Many fishermen fish in both state and federal waters; however, those fishermen were not included in the state-waters-only data. For this reason, the data seem to indicate that certain species were not caught and landed from the statistical areas every year, or at all. Landings of those species were reflected in the federal VTR data summary. These caveats apply to all state VTR data described in this report. The state data should be considered in the broader context of fishing activity reported to the federal VTR database, and in conjunction with stakeholder input provided through the communication and engagement program that Revolution Wind has developed for this purpose (Section 2.1.5).

State VTR data are assessed for Connecticut, Massachusetts, New York, and Rhode Island. Connecticut, Massachusetts, and New York were included in the state VTR request because Revolution Wind may use New London and multiple RI ports for construction staging and operations and maintenance (O&M) activities. Vessels leaving and returning to these ports to support Project activities will potentially be transiting through state waters of all these states and, therefore, their impacts are considered and included. An expanded port plan (see Section 3) includes New Jersey, Virginia, and Maryland. The state VTR data were obtained for fishing activity within and around the immediate vicinity of the RWF and RWEC fisheries study corridor, where infrastructure will be located and long-term vessel activity will occur. Transit to and from remote ports will be limited to short-term use of these ports during the construction phase only, therefore Project-generated transit will not add significantly more traffic beyond existing levels. State VTR regions are depicted relative to the RWF and RWEC fisheries study corridor in Figure 2.1-2 and relevant federal statistical areas are depicted in Figure 2.1-3.

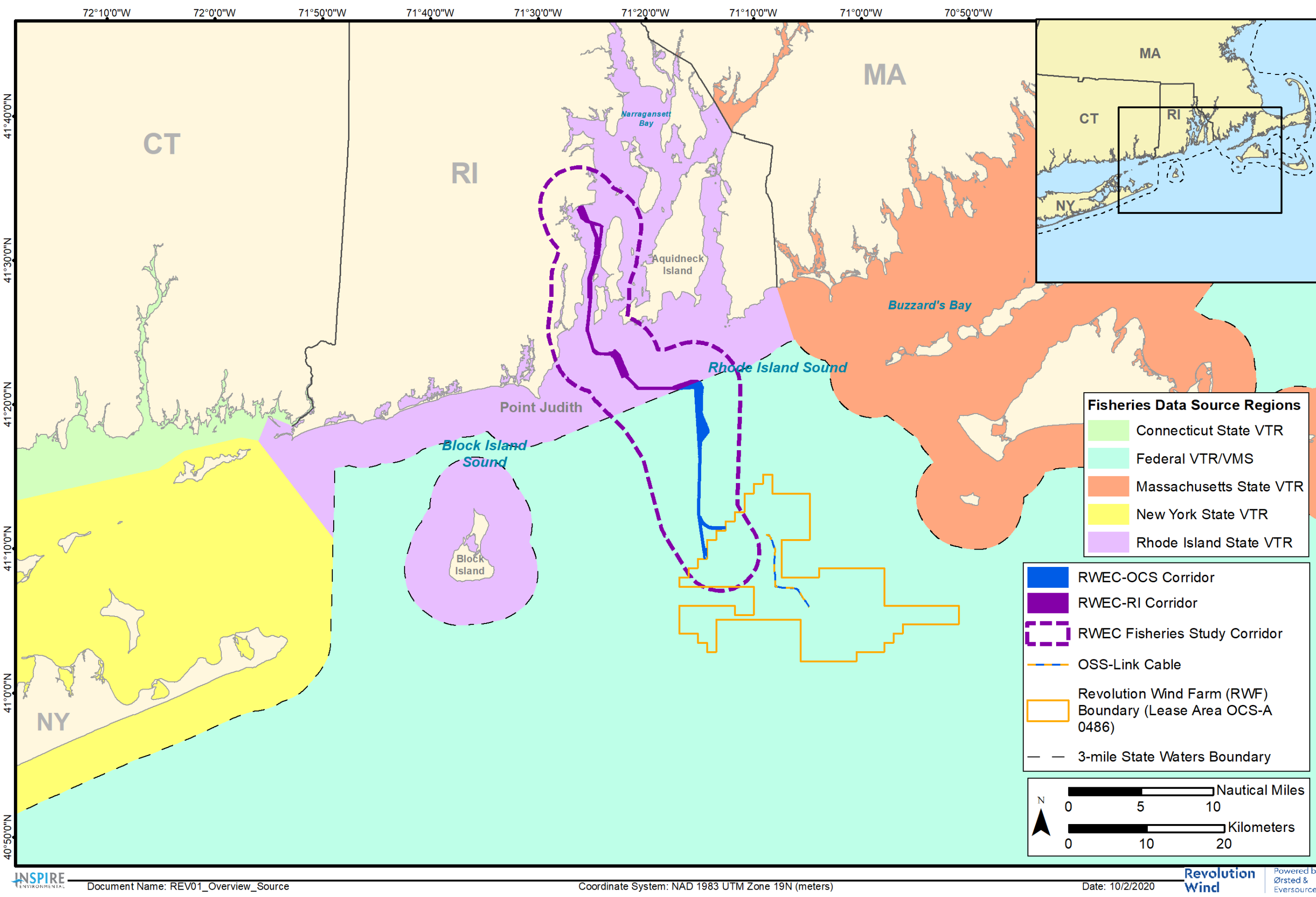

Figure 2.1-2 Map of the Revolution Wind Farm and State VTR Regions

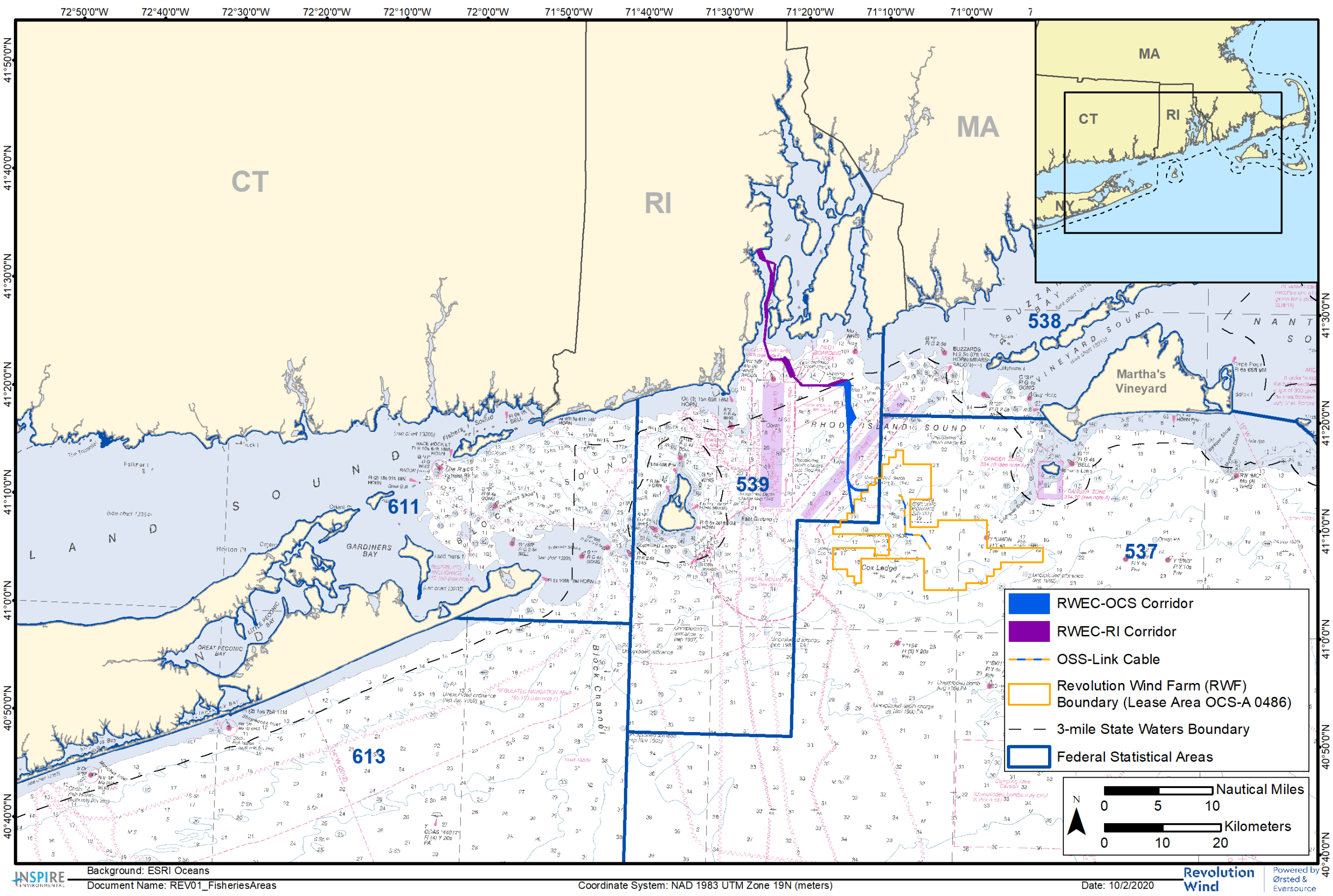

Figure 2.1-3 Map of the Revolution Wind Farm and Federal Statistical Fishing Areas

2.1.3.1 Connecticut State Vessel Trip Reports

Federal VTR data describe most commercial fishing activity in both state and federal waters by vessels that have a federal permit or, both a state and federal fishing permit. However, those vessels that only have state commercial fishing permits are not included in the federal VTR data set. Landing permits allow a vessel to land catch in its home state even though fishing may have occurred outside of the home state's jurisdictional waters. State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the Connecticut Department of Energy and Environmental Protection (CT DEEP). Data on fishing in state waters by state-permitted vessels can be accessed by the public through data requests to the ACCSP.

State commercial fishing data for Connecticut were requested from statistical areas 539 and 611 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3). Fishing activity was characterized in terms of landed pounds of target species, the landing port, and the gear category. The data were presented in the units of landed pounds of catch because the landing price was not readily available. The "average" of pounds landed reflects the sum of pounds landed during the 2009 to 2018 period, divided by the number of years with data available (in this way, 0-value years were excluded).

2.1.3.2 Massachusetts State Vessel Trip Reports

State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the Massachusetts Division of Marine Fisheries (MADMF). Massachusetts State commercial fishing data for this report include statistical areas 537, 538, 539, and 613 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3).

2.1.3.3 New York State Vessel Trip Reports

State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the New York State Department of Environmental Conservation (NYSDEC). New York State commercial fishing data for this report include statistical areas 537, 539, 611, and 613 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3).

2.1.3.4 Rhode Island State Vessel Trip Reports

State-permitted vessels must report their catch, including the statistical area within which fishing occurred (Figure 2.1-3), to the Rhode Island Department of Environmental Management (RIDEM). Rhode Island State commercial fishing data for this report include statistical areas 537, 538, 539, and 611 to characterize those fisheries that could be affected by the RWF and RWEC (Figure 2.1-3).

2.1.4 Marine Recreational Information Program

The NOAA Fisheries Marine Recreational Information Program (MRIP) is a collection of regional surveys organized to produce recreational fisheries statistics. The data are collected through angler-intercept surveys after a fishing trip by boat returns to shore. This integrated series of surveys provides estimates of marine recreational catch, effort, and participation across states, fishing locations, and fishing modes. To describe the affected environment of recreational fisheries in the RWF and RWEC fisheries study corridor, this Technical Report used the NOAA Fisheries MRIP estimates for shoreside and private fishing modes occurring in inland, state territorial sea, and federal exclusive economic zone (EEZ) fishing locations. MRIP data used for this report were provided by NOAA Fisheries, and are available through queries at the Fisheries Statistics Division website (NOAA Fisheries, 2019b).

One of the limitations of the MRIP data set is that it does not include a spatial component; the only location information available is the categorization of fishing location into state or federal waters. An additional limitation of this data set is that the survey program was designed to estimate fishing effort by recreational anglers at the state level. When the data are disaggregated to the county level or lower, the percent standard error increases and the information is less reliable (NOAA Fisheries, 2019b). Given that we cannot assign estimated angler effort to any location in the ocean, it is impossible to estimate recreational effort near the RWF using the MRIP data alone. For this reason, the MRIP data must be considered in conjunction with stakeholder input provided by recreational for-hire boat captains in the Ocean SAMP data set (RICRMC, 2010).

2.1.5 Revolution Wind Stakeholder Communication and Engagement

Revolution Wind has committed to engaging with stakeholders in the commercial and recreational fishing communities that are active in the RWF and RWEC fisheries study corridor. This stakeholder outreach program was formulated by Revolution Wind to gather local knowledge from the region's fishermen and to establish open and reliable communication with the fishing industry. Revolution Wind has established an experienced team of Fisheries Liaisons and Fisheries Representatives to facilitate a two-way process of communication through individual outreach via email, text message, or in person, and that also includes, but is not limited to, public presentations, listening sessions, Notices to Mariners, and updates to websites and social media. Revolution Wind has also extended these outreach efforts to include state and federal fisheries agencies, working groups, and regulatory bodies by soliciting input through joint meetings and webinars. The outreach program will be conducted throughout all phases of the Project and is designed to evolve as needs change and the Project progresses. Detailed information about the communication and outreach plan implemented by Revolution Wind is provided in the Fisheries Communication and Outreach Plan (Orsted, 2020).

2.1.6 Aquaculture

Aquaculture in Rhode Island waters includes the cultivation of oysters, kelp, hard-shell clams, and mussels. Oysters are the main crop, with nearly 296 acres under cultivation worth more than 5.7 million dollars in 2017 (Liberman, 2018).

Locations of Rhode Island aquaculture sites were mapped based on data accessed from the NROC (NROC, 2019) and from the RIDEM Division of Fish and Wildlife, Marine Fisheries Section (RIDEM, 2019). Maps were created based on shapefiles provided by RIDEM with information on site ID, location, and status last updated July 20, 2018.

2.2 Baseline Conditions

Species that are targeted for commercial and recreational fishing in Southern New England are managed through Fishery Management Plans (FMPs) by the New England Fishery Management Council, the Mid-Atlantic Fishery Management Council (50 CFR 600.105), the Atlantic States Marine Fisheries Commission, or some combination of these (NOAA Fisheries, 2017). Some FMPs include multiple species because they share habitat and are often fished or collected as marketable bycatch using the same gear type. Commercial fisheries that target certain species can be grouped into broad categories by the gear used. Mobile-gear is used while the vessel is in motion, and includes gear such as trawls and dredges. Fixed-gear is set and retrieved later, such as lobster pots and gill nets. Recreational fishing activity can be categorized by fishing mode (charter boat, party boat, private boat, or shore) and by fishing location (inland, state territorial sea, and federal EEZ) (NOAA Fisheries, 2019b).

The RWEC-OCS will traverse federal waters located within a study area previously examined for potential wind farm development effects on fish and fisheries by the New York State Energy and Development Authority (NYSERDA, 2017; Scotti et al., 2017). These studies examined fishery dependent data sources, such as federal VTR and VMS data for the most recent years available at the time the studies were conducted. For this technical report, more recent data were obtained from these sources. Other data sources that were reviewed include fishery independent trawl data from the Northeast Fisheries Science Center (NEFSC) and the Northeast Areas Monitoring and Assessment Program (NEAMAP). These sources provide information on a diverse assemblage of fish and invertebrates in the area that can be used for stock assessments for those species targeted in commercial and recreational fisheries. The study area examined by NYSERDA (2017) and Scotti et al. (2017) contains fishing grounds for boats that land their catch in New Jersey, New York, Rhode Island, and Massachusetts.

Vessels originating from New England and Mid-Atlantic states catch a diverse range of pelagic, demersal, and benthic species using various types of gear. Commercially and recreationally valuable saltwater species populations are highly dynamic, both spatially and temporally. Many species undertake seasonal migrations, which are often correlated with seasonal variation in water temperature and prey availability. Interannual fluctuations in population sizes can occur in response to climate change, fishing, and other ecological pressures (Friedland et al., 2018, McManus et al., 2018). Fish and macroinvertebrate populations supporting commercial and recreational fisheries along the Northeast Continental Shelf are diverse (Malek et al., 2014). Some fisheries are experiencing a regional decline and others an increase (Collie et al., 2008), whereas the location of some fisheries has shifted to the northeast in association with climate-related changes (Friedland et al., 2018).

Benthic communities have experienced increased water temperatures in the region in the past several decades, and average pH is expected to continue to decline as seawater becomes more saturated with carbon dioxide (Saba et al., 2016). Acidification of seawater is associated with decreased survival and health of organisms with calcareous shells (such as the Atlantic scallop, blue clam, and hard clam), but less is known about direct effects of acidification on cartilaginous and bony fishes. The ranges of dozens of groundfish species in New England waters have shifted northward and into deeper waters in response to increasing water temperatures (Pinsky et al., 2013; Nye et al., 2009) and more species are predicted to follow (Selden et al., 2018; Kleisner et al., 2017). Predicted range shifts include a northward extension for sea scallops and offshore movement for American lobster (Tanaka et al., 2020). The black sea bass, identified as particularly sensitive to habitat alteration (Guida et al., 2017), has been increasing in abundance over the past several years, and is expected to continue its expansion in southern New England as water temperatures increase (McBride et al., 2018). Several pelagic forage species have been increasing in the region, including butterfish, scup, squid (Collie et al., 2008) and Atlantic mackerel (McManus et al., 2018). Distributions of other species are reported to be shifting southward, including spiny dogfish, little skate, and silver hake (Walsh et al., 2015), or alternatively, shifting offshore (e.g., surfclams; Timbs et al., 2019). It has been suggested that the spiny dogfish may replace the Atlantic cod as a major predator in southern New England as the cod is driven north by warm waters that the spiny dogfish tolerates more readily (Selden et al., 2018). Further temperature increases in southern New England are expected to exceed the global ocean average by at least a factor of two and ocean circulation patterns are projected to change (Saba et al., 2016). Distributional shifts are occurring in both demersal and pelagic species, perhaps mediated by changes in spawning locations and dates (Walsh et al., 2015). Southern species, including some highly migratory species such as mahi that prefer warmer waters, are expected to follow the warming trend and become more abundant in the area (Walsh et al., 2015; South Atlantic Fishery Management Council, 2003). Climate change may also be affecting the migrations of anadromous fish in the region. The herrings, shad, and sturgeon were identified as having high biological sensitivity to adverse effects of climate change (Hare et al., 2016). In addition to physiological effects of temperature and pH, anadromous fishes face a physical risk caused by flooding in their spawning rivers.

The following sections present an assessment of the relative intensity of several fisheries active in the RWF and RWEC, organized based on the data source.

2.2.1 Federal Vessel Trip Report (VTR) Data

VTR data were provided by NOAA Fisheries and the ACCSP for the RWF and for the RWEC fisheries study corridor, and are summarized in the following section. The data are presented based on the subset (defined by the gear used), the targeted species, and the state in which the fisheries' landings occurred. Data for the species and state fishery subsets include estimates for the decade 2009-2018, whereas the gear type fishery subset is based on a nine-year period (2009 to 2017) due to confidentiality rules. Each fishery subset includes estimates for the respective time periods for the:

- Annual average values of revenue and landings sourced from within the RWF or the RWEC fisheries study corridor.
- Annual average revenue and landings for all fishing activity from Maine to North Carolina sourced from NOAA Fisheries' Greater Atlantic Region Fisheries Office (GARFO).
- Percent of revenue and landings sourced from within the RWF or the RWEC fisheries study corridor out of total regional landings reported to GARFO.

Revenue units are United States dollars (USD) deflated to January 2010 for consistency; landings are reported in landed pounds.

2.2.1.1 Revolution Wind Farm

In the RWF, the top fisheries reported on VTRs by federally permitted vessels in terms of average annual revenue were caught using bottom trawl, pot, sink gillnet, and dredge. In terms of average pounds landed from within the RWF, the top gears were the bottom trawl, sink gillnet, and mid-water trawl (Table 2.2-1). The greatest percentage of Greater Atlantic revenue sourced from within the RWF was caught using sink gill net (5.75 percent), followed by bottom trawl (3.20 percent), and midwater trawl (1.08 percent).

Table 2.2-1 Summary of Federal VTR Fishing Data in RWF, by Gear, for 2009 to 2017

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total Gear Values from RWF	
Gear	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Bottom Trawl	330,811	805,298	10,345,534	17,650,034	3.20	4.56
Pot	309,044	97,245	45,170,421	23,622,011	0.68	0.41
Sink Gillnet	263,817	383,264	4,587,604	6,446,946	5.75	5.95
Dredge	174,324	20,636	35,344,833	15,083,131	0.49	0.14
All Others	45,641	380,191	1,630,016,690	1,281,322,761	<0.01	0.03
Midwater Trawl	25,900	259,659	2,388,786	19,750,762	1.08	1.32

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total Gear Values from RWF	
Gear	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
By Hand	5,776	1,652	566,211	236,037	1.02	0.70

Source: NOAA Fisheries, 2019c.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

Federally permitted vessels target many species in the RWF. The top species-groups reported on VTRs in terms of average annual revenue were lobster, flounders, hakes, Atlantic herring, scup, squid, black sea bass, and channeled whelk. In terms of pounds landed, the top species-groups in the RWF were Atlantic herring, Atlantic mackerel, and hakes. Scallops, surf clams, and quahogs are included in the All Others category due to the way data were provided. Table 2.2-2 provides the full species summary. For all of the species-groups listed, the average annual landings and revenue from within the RWF make up a very small percentage of the average annual landings and revenue from the Greater Atlantic region. For instance, the species with the greatest proportion of Greater Atlantic total revenue that was sourced from within the RWF were cunner (0.68 percent), Atlantic mackerel (0.51 percent) and channeled whelk (0.44 percent).

Table 2.2-2 Summary of Federal VTR Fishing Data in RWF, by Species, for 2009 to 2018

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total Species Values in RWF	
Species	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Lobster, America	214,904	50,374	507,710,672	138,232,706	0.04	0.04
Flounders	88,240	33,976	53,080,045	23,015,911	0.17	0.15
Hakes	60,136	141,855	15,760,216	20,652,426	0.38	0.69
Herring, Atlantic	42,852	455,959	26,499,546	166,320,214	0.16	0.27
Scup	36,987	63,108	9,280,444	14,364,599	0.40	0.44
Squids	34,084	30,416	38,571,711	48,152,606	0.09	0.06
Sea Bass, Black	32,211	7,547	8,045,522	2,477,656	0.40	0.31
Whelk, Channeled	31,673	4,512	7,175,012	1,232,408	0.44	0.37
Mackerel, Atlantic	20,008	198,560	3,889,243	16,596,797	0.51	1.20
Dogfish, Spiny	14,296	81,592	3,619,191	18,787,974	0.40	0.43
Crab, Jonah	14,121	23,578	10,983,269	14,424,939	0.13	0.16
All Others	11,886	21,067	946,435,275	407,953,101	0.00	0.01
Butterfish	9,141	16,100	2,180,724	3,340,689	0.42	0.48
Bass, Striped	4,425	1,131	18,797,974	5,984,307	0.02	0.02
Bluefish	2,811	5,382	2,796,095	4,627,112	0.10	0.12
Tautog	381	128	926,176	273,651	0.04	0.05
Weakfish	263	142	319,712	207,805	0.08	0.07
Dogfish, Smooth	231	464	976,231	2,039,068	0.02	0.02
Bonito	191	86	112,986	53,480	0.17	0.16
Cunner	138	97	20,410	6,394	0.68	1.52
Spot	88	175	3,139,254	2,828,116	<0.01	0.01
Eel, Conger	40	61	49,241	68,105	0.08	0.09
Sea Robins	13	33	20,812	124,470	0.06	0.03
Whiting, King	1	1	902,941	810,033	<0.01	<0.01

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

Vessels hailing from Rhode Island, Massachusetts, New York, and Connecticut conducted the most federally permitted fishing activities within the RWF (Table 2.2-3). The greatest average annual revenue generated by federally permitted vessels in the RWF were from landings in Rhode Island ($613,467), followed by Massachusetts ($398,575), and New York ($41,704). These values were put in context by including the total revenue landed in that state from all fishing activity during 2009 to 2018. The greatest percentage of revenue sourced from within the RWF is by Rhode Island (0.73 percent), followed by New York (0.08 percent) and Massachusetts (0.07 percent; Table 2.2-3). Data cannot be reported by port due to confidentiality rules. Further analysis of detailed landings data as reported by individual port is unavailable for all listed states due to confidentiality rules.

Table 2.2-3 Summary of Federal VTR Fishing Data in RWF, by State, for 2009 to 2018

	Annual Average Revenue and Landings from within RWF		Annual Average of Total Revenue and Landings		Percent of Total State Values in RWF	
State	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Rhode Island	613,467	949,843	83,808,376	83,061,985	0.73	1.14
Massachusetts	398,575	811,785	547,819,893	272,427,302	0.07	0.30
New York	41,704	24,420	53,395,207	30,909,690	0.08	0.08
All Others	16,773	9,274	558,828,937	725,429,171	<0.01	<0.01
Connecticut	9,138	7,218	16,183,340	8,793,496	0.06	0.08

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

2.2.1.2 Revolution Wind Export Cable Fisheries Study Corridor

Among the fisheries that are active within the 46-mile (74-km) RWEC fisheries study corridor, the top fisheries reported on VTRs by federally permitted vessels by revenue were caught using bottom trawl, mid-water trawl, pot, sink gillnet, dredge, and by hand (Table 2.2-4). In terms of pounds landed, the top gears in the RWEC fisheries study corridor were the mid-water trawl, bottom trawl, sink gillnet, and pot. The gear categories with the greatest proportion of total revenue that was sourced from within the RWEC fisheries study corridor were mid-water trawl (16.3 percent), bottom trawl (7.6 percent), and sink gillnet (2.2 percent). Table 2.2-4 summarizes the gears used to fish in the RWEC fisheries study corridor, which traverses Federal Statistical Fishing Area 539.

Table 2.2-4 Summary of Federal VTR Fishing Data in RWEC Fisheries Study Corridor, by Gear, for 2009 to 2017

	Annual Average Revenue and Landings from within RWEC Fisheries Study Corridor		Annual Average of Total Revenue and Landings		Percent of Total Gear Values in RWEC Fisheries Study Corridor	
Gear	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Bottom Trawl	781,301	2,186,189	10,345,534	17,650,034	7.55	12.39
Midwater Trawl	389,676	3,969,291	2,388,786	19,750,762	16.31	20.10
Pot	314,797	136,028	45,170,421	23,622,011	0.70	0.58
All Others	110,642	464,104	1,630,016,690	1,281,322,761	0.01	0.04
Sink Gillnet	99,834	213,070	4,587,604	6,446,946	2.18	3.31
Dredge	27,746	9,072	35,344,833	15,083,131	0.08	0.06
By Hand	3,293	1,356	566,211	236,037	0.58	0.57

Source: NOAA Fisheries, 2019c.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.

% = percent

In the RWEC fisheries study corridor, the top individual species reported on VTRs by federally permitted vessels in terms of revenue were Atlantic herring, lobster, squid, flounders, scup, butterfish, hakes, black sea bass, and spiny dogfish (Table 2.2-5). In terms of pounds landed, the top species in the RWEC fisheries study corridor included Atlantic herring, scup, squid, spiny dogfish, hakes and Atlantic mackerel. The species with the greatest proportion of Greater Atlantic total revenue that was sourced from within the RWEC fisheries study corridor were eel (40.00 percent), bonito (4.30 percent), sea robins (2.39 percent), Atlantic herring (1.95 percent), and butterfish (1.93 percent). Table 2.2-5 provides a full summary of the species caught in the RWEC fisheries study corridor.

Table 2.2-5 Summary of Federal VTR Fishing Data in RWEC Fisheries Study Corridor, by Species, for 2009 to 2018

	Annual Average Revenue and Landings from within RWEC Fisheries Study Corridor		Annual Average of Total Revenue and Landings		Percent of Total Species Values in RWEC Fisheries Study Corridor	
Species	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Herring, Atlantic	516,170	4,870,454	26,499,546	166,320,214	1.95	2.93
Lobster, America	253,817	63,112	507,710,672	138,232,706	0.05	0.05
Squids	168,823	157,838	38,571,711	48,152,606	0.44	0.33
Flounders	157,876	49,611	53,080,045	23,015,911	0.30	0.22
Scup	144,737	280,427	9,280,444	14,364,599	1.56	1.95
All Others	46,271	30,389	946,435,275	407,953,101	0.01	0.01
Butterfish	42,181	62,394	2,180,724	3,340,689	1.93	1.87
Hakes	37,112	86,198	15,760,216	20,652,426	0.24	0.42
Sea Bass, Black	27,692	7,820	8,045,522	2,477,656	0.34	0.32
Dogfish, Spiny	24,007	116,148	3,619,191	18,787,974	0.66	0.62
Bluefish	19,697	41,793	2,796,095	4,627,112	0.70	0.90
Mackerel, Atlantic	18,040	70,893	3,889,243	16,596,797	0.46	0.43
Whelk, Channeled	15,139	2,050	7,175,012	1,232,408	0.21	0.17
Crab, Jonah	14,732	28,633	10,983,269	14,424,939	0.13	0.20
Bass, Striped	12,950	3,528	18,797,974	5,984,307	0.07	0.06
Bonito	4,859	2,128	112,986	53,480	4.30	3.98
Tautog	3,728	1,495	926,176	273,651	0.40	0.55
Dogfish, Smooth	1,947	4,051	976,231	2,039,068	0.20	0.20
Weakfish	1,291	735	319,712	207,805	0.40	0.35
Whiting, King	986	1,132	902,941	810,033	0.11	0.14
Sea Robins	498	1,724	20,812	124,470	2.39	1.39
Tuna, Little	425	944	131,168	233,801	0.32	0.40
Eel, Conger	220	421	49,241	68,105	0.45	0.62
Cunner	106	49	20,410	6,394	0.52	0.77
Mackerel, Spanish	103	200	1,192,684	816,845	0.01	0.02
Whelk, Knobbed	101	64	1,041,479	647,789	0.01	0.01
Menhaden	51	309	35,974,035	410,014,306	<0.01	<.01
Sea Raven	45	37	2,734	2,213	1.65	1.67
Triggerfish	41	41	376,831	184,225	0.01	0.02
Eel, Species Not Specified	10	12	25	32	40.00	37.50
Sea Trout, Species Not Specified	0	141	592,033	273,277	0.00	0.05

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
“Total” revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

The data indicate that the top states reported by federally permitted vessels for revenue sourced from within the RWEC fisheries study corridor were Rhode Island ($1.22 million), Massachusetts ($329,573), and Maine ($22,593). Top states for pounds landed from within the RWEC fisheries study corridor were Massachusetts ($3.20 million) and Rhode Island ($2.93 million). The greatest percentage of Greater Atlantic revenue sourced from within the

RWEC fisheries study corridor is by Rhode Island (1.45 percent), followed by Massachusetts (0.06 percent). Table 2.2-6 provides a full summary of states used by federally permitted vessels in the RWEC fisheries study corridor.

Table 2.2-6 Summary of Federal VTR Fishing Data in RWEC Fisheries Study Corridor, by State, for 2009 to 2018

	Annual Average Revenue and Landings from within RWEC Fisheries Study Corridor		Annual Average of Total Revenue and Landings		Percent of Total State Values in RWEC Fisheries Study Corridor	
State	Revenue	Landings	Revenue	Landings	% of Revenue	% of Landings
Rhode Island	1,216,027	2,928,234	83,808,376	83,061,985	1.45	3.53
Massachusetts	329,573	3,203,699	547,819,893	272,427,302	0.06	1.18
All Others	55,981	74,826	558,828,937	725,429,171	0.01	0.01
Maine	22,593	141,941	540,523,922	252,863,406	<0.01	0.06
New York	357	137	53,395,207	30,909,690	<0.01	<0.01

Source: NOAA Fisheries, 2019c. ACCSP, 2019.
Notes:
Values are sorted from largest to smallest revenue values for landings data.
Landings are reported in landed pounds.
Revenue is in USD deflated to 2010 for consistency.
"Total" revenue and landings values refer to all fishing activity as reported by VTRs for fisheries active in state and federal waters from Maine to North Carolina.
% = percent

2.2.2 Federal Vessel Monitoring System (VMS)

Federal VMS data can be used to provide additional qualitative information on fishing location for a particular gear type or target species, by filtering data by estimated vessel speed to eliminate those vessels in transit and not fishing. The methods used by NOAA Fisheries to rank vessel density into relatively "low" to "very high" fishing intensity categories are described in detail in the spatial metadata (NOAA Fisheries, 2019a). In addition to discussing VMS intensity as presented on Figures 2.2-1 through 2.2-14, this section also incorporates information about some fisheries as described in RIDEM (2017), which were highlighted as the fisheries that had the most activity in the RI-MA WEA (i.e., fisheries in the Atlantic herring, sea scallop, squid/mackerel/butterfish, monkfish, and northeast multispecies Fishery Management Plans [FMPs]).

The VMS data map of vessel intensity for the groundfish (large-mesh multispecies or northeast multispecies) fleet for the years 2011 to 2014 indicates there was high density of fishing vessels along portions of the RWEC fisheries study corridor, and medium-high, medium-low, and low density in the RWF, as indicated in Figure 2.2-1. In 2015-2016, the vessel activity for the groundfish fishery was high along portions of the RWEC fisheries study corridor (Figure 2.2-2). On the northeastern portion of the RWF, high, medium-high and medium-low fishing vessel intensity was reported. In addition, RIDEM (2017) indicated that there was medium-low and low relative density of fishing activity near the RWEC fisheries study corridor (Figure 88 in RIDEM, 2017). Over the years 2011 to 2016, the total non-confidential landings revenue for groundfish activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was over $1 million (Section 10.1.4, Table 23 in RIDEM, 2017).

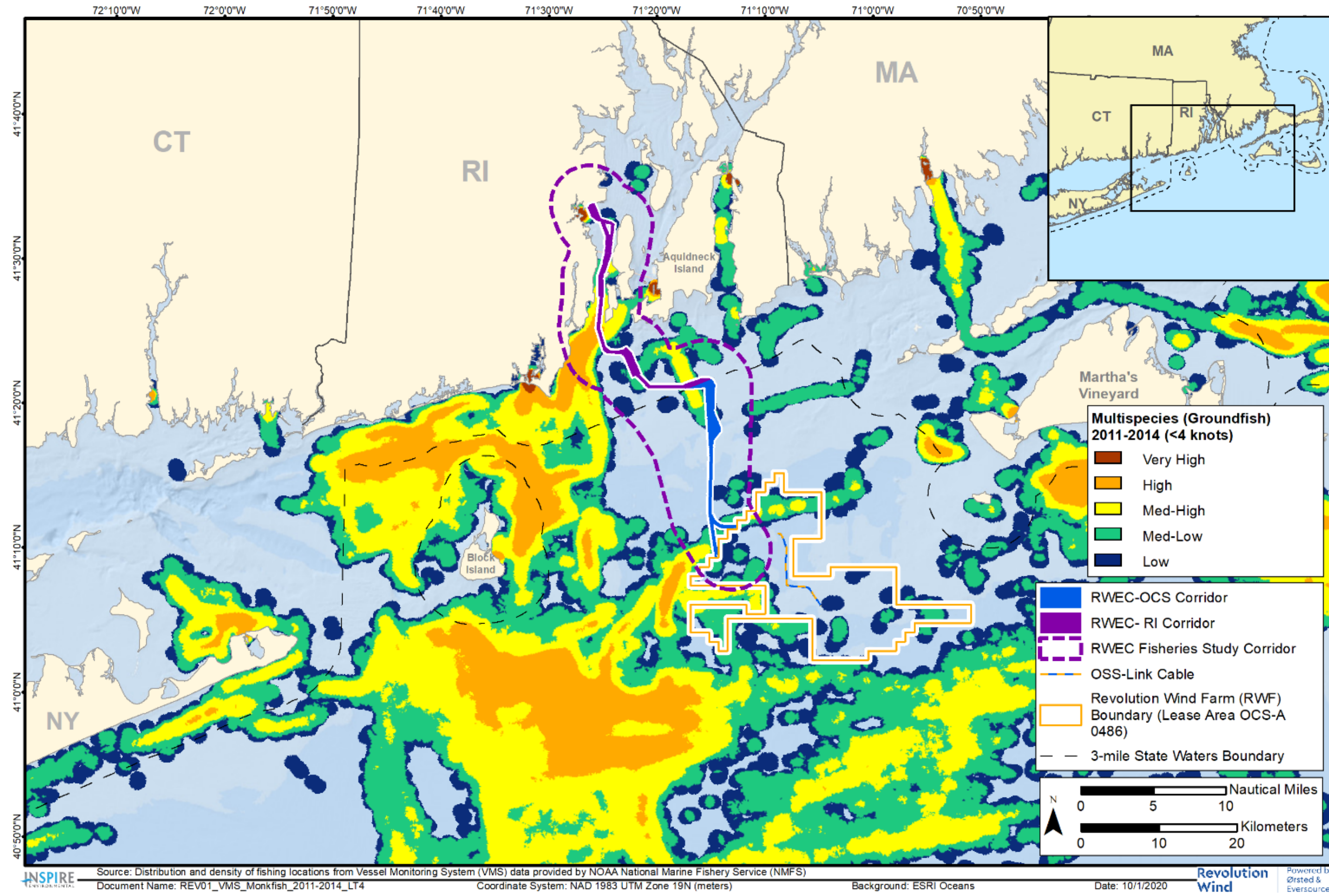

Figure 2.2-1 VMS Map of Vessel Intensity for Large-mesh Multispecies Fishing, 2011 to 2014

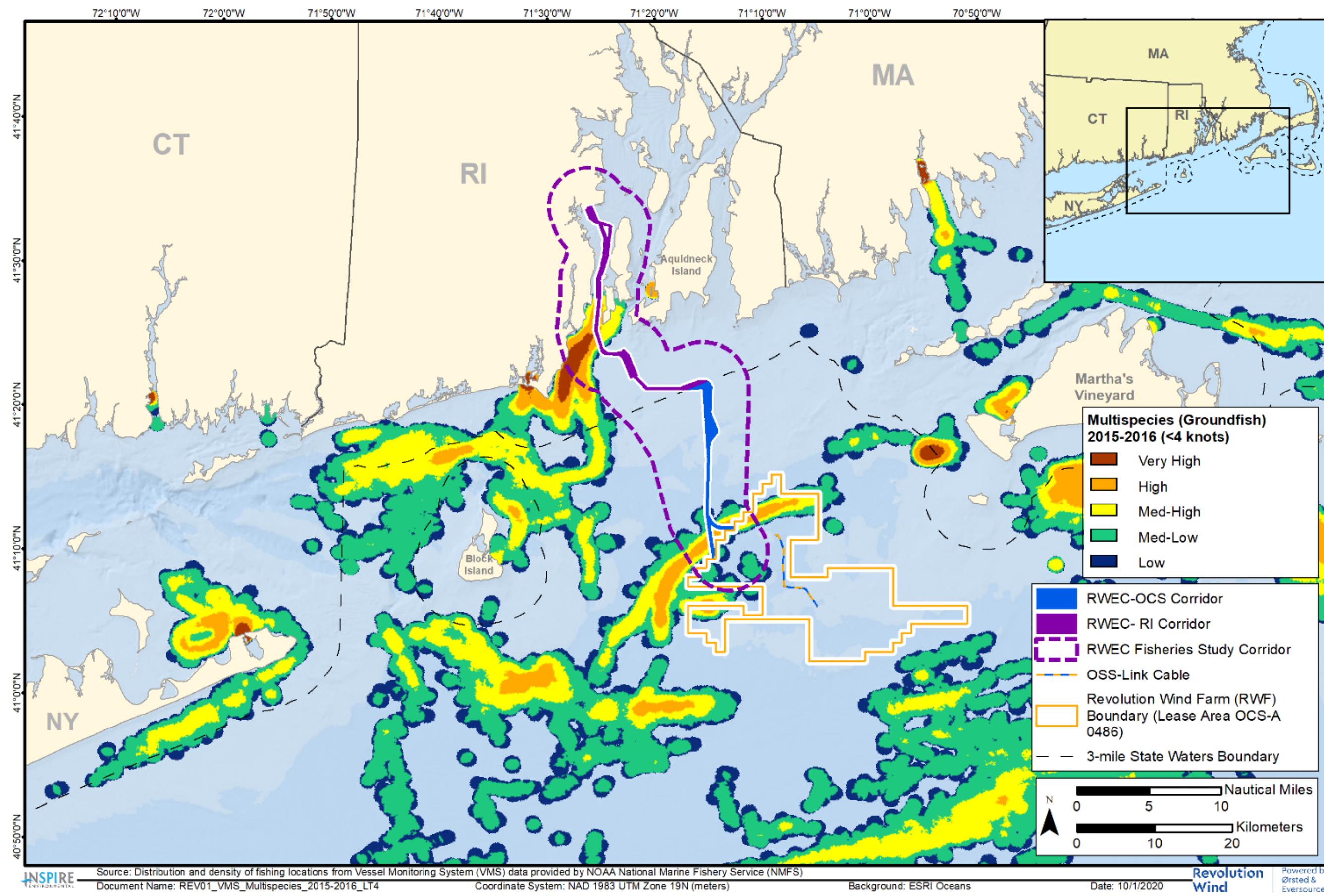

Figure 2.2-2 VMS Map of Vessel Intensity for Large-mesh Multispecies Fishing, 2015 to 2016

The map of vessel intensity for the Atlantic herring fleet for the years 2011-2014 indicates very high, high, medium-high, medium-low and low intensity in areas along the RWEC fisheries study corridor. Vessel activity within the RWF was restricted to the northern portion of the area at medium-high and medium-low intensities (Figure 2.2-3). For the years 2015-2016, the map of vessel intensity indicates medium-high, medium-low, and low intensity on the northern to northwestern portion of the RWF. The RWEC fisheries study corridor borders an area of very-high intensity and traverses high, medium-high, and medium low intensity areas (Figure 2.2-4). There is no map available of smoothed federal fishing activity for Atlantic herring from RIDEM (2017).

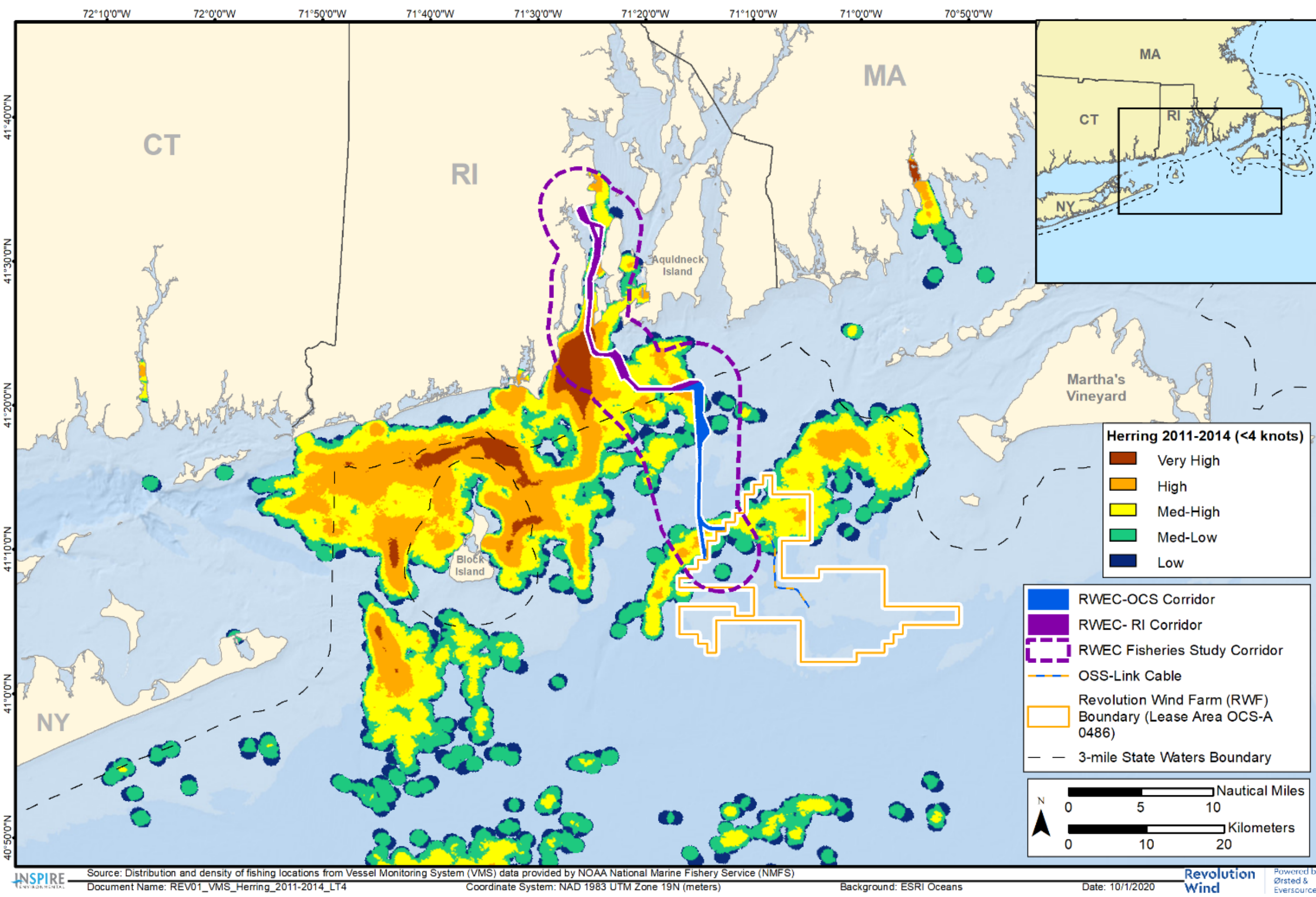

Figure 2.2-3 VMS Map of Vessel Intensity for Atlantic Herring Fishing, 2011 to 2014

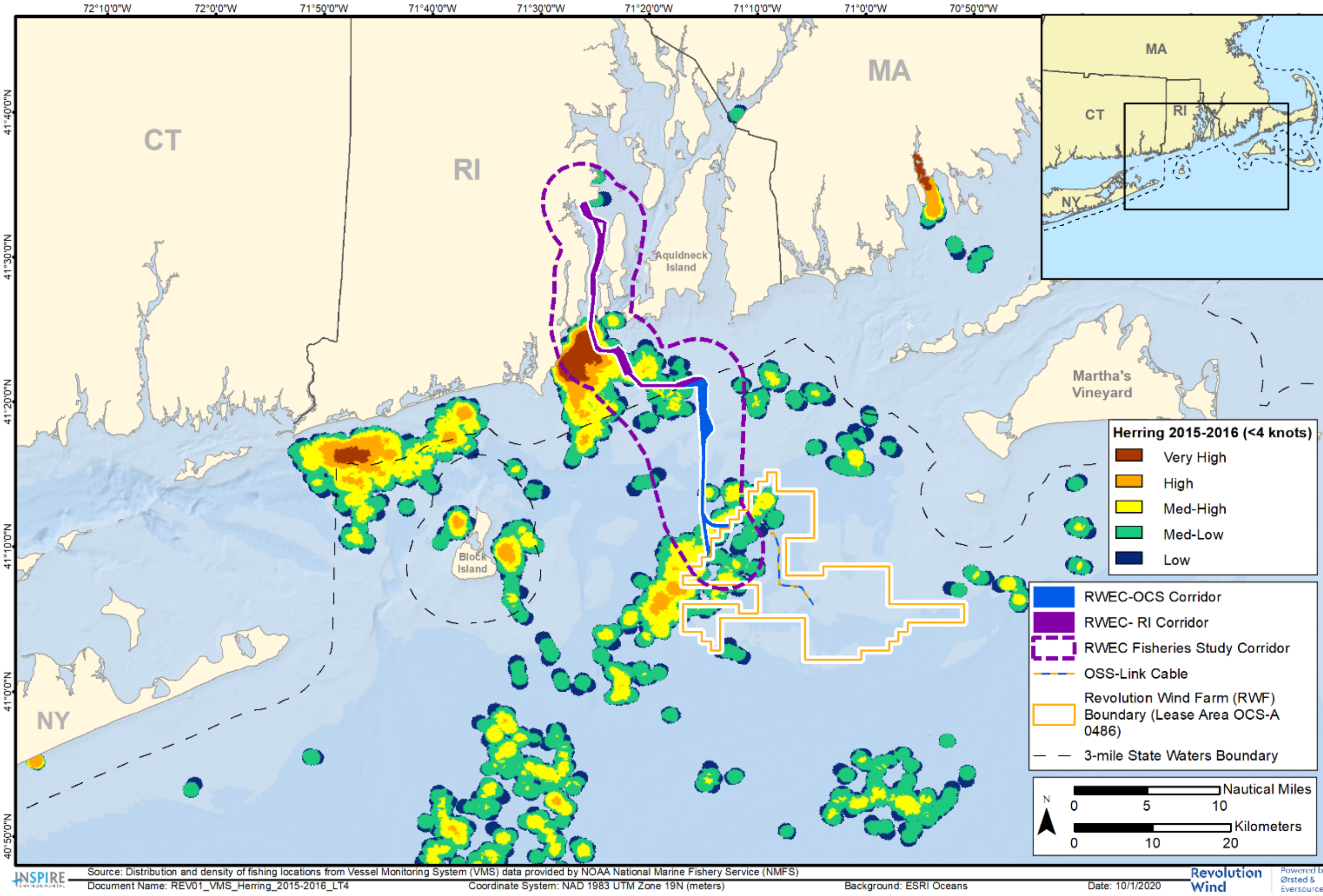

Figure 2.2-4 VMS Map of Vessel Intensity for Atlantic Herring Fishing, 2015 to 2016

The VMS data for vessels targeting pelagic species (herring/mackerel/squid) for 2014 include areas of very-high, high, medium-high, medium-low, and low intensity in the northern portion of the RWF. Along the RWEC fisheries study corridor, all levels of intensity also were encountered (Figure 2.2-5). During 2015 to 2016, vessel intensity targeting these species was concentrated in the northwestern portion of the RWF, ranging from high to low intensity levels (Figure 2.2-6). The RWEC fisheries study corridor traverses the edge of an area of very-high vessel intensity and crosses areas of high, medium-high, medium-low, and low intensity. These data are for several target species combined for a 2-year period, so it is not possible to separate which species is targeted in a specific location from this map. In addition, RIDEM (2017) indicated that there was low relative density of fishing activity for the RWF and the RWEC fisheries study corridor for the squid/mackerel/butterfish FMP (Figure 142 in RIDEM, 2017) over the years 2011-2016. The total non-confidential landings revenue for fishing under the squid/mackerel/butterfish FMP in the RI-MA WEA (depicted in Figure 2.1-1) overall was over $397,000 (Section 10.1.4; Table 23 in RIDEM, 2017).

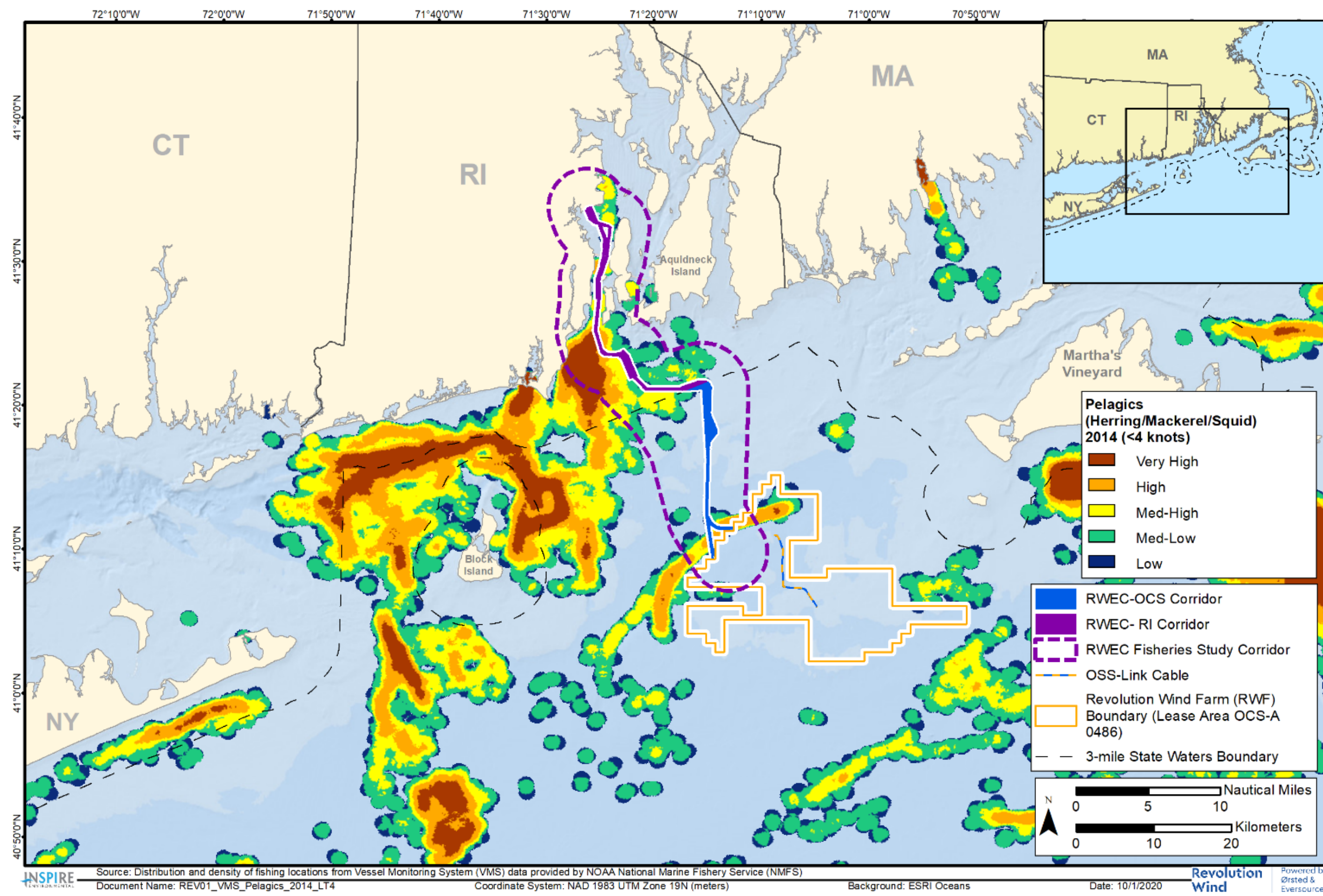

Figure 2.2-5 VMS Map of Vessel Intensity for Pelagic Species (Herring/Mackerel/Squid) Fishing, 2014

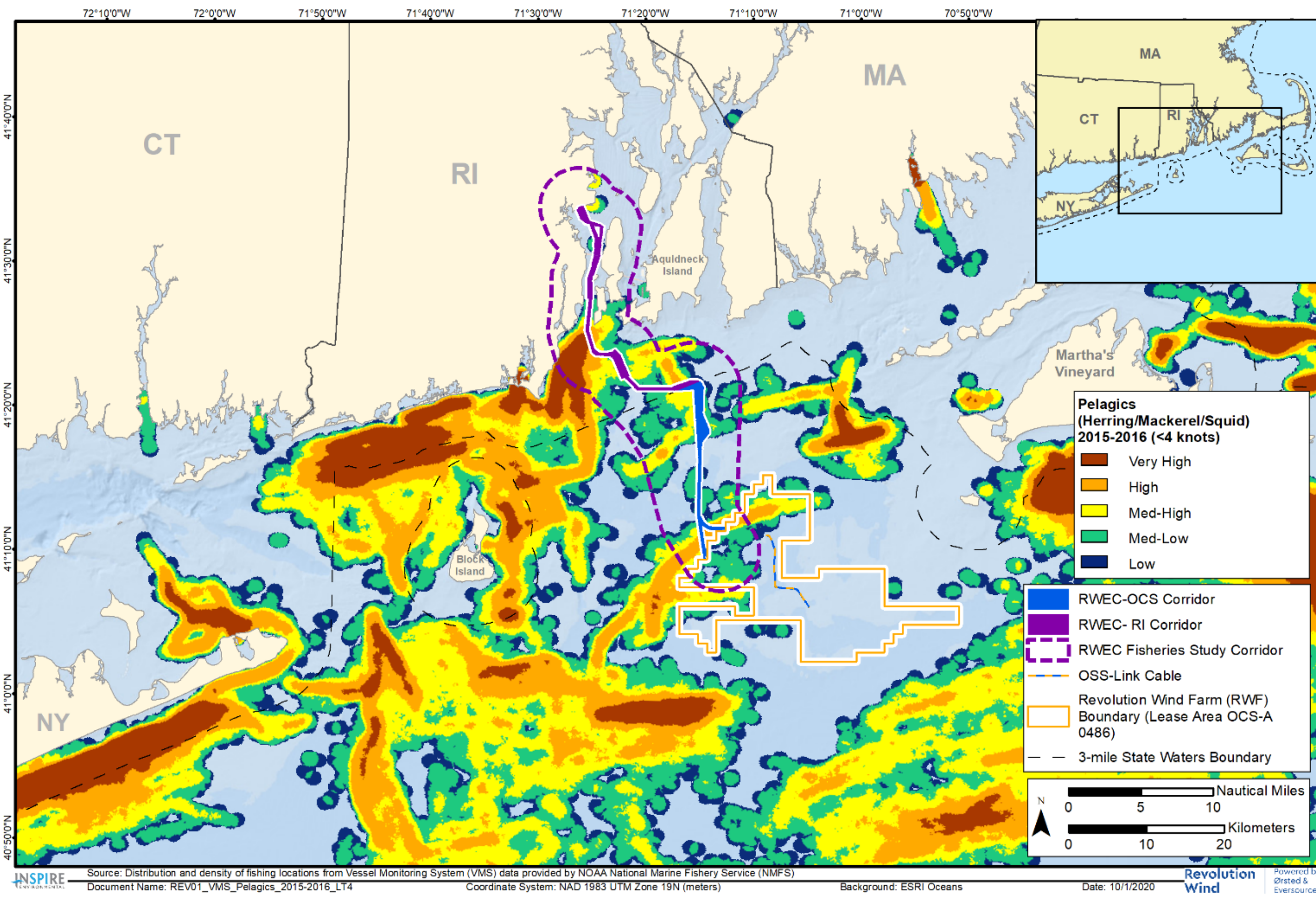

Figure 2.2-6 VMS Map of Vessel Intensity for Pelagic Species (Herring/Mackerel/Squid) Fishing, 2015 to 2016

The map of vessel intensity for the monkfish fleet for the years 2011 to 2014 indicates medium-high, and medium-low intensity activity in areas along the RWEC fisheries study corridor (Figure 2.2-7). It also indicates high, medium-high, and medium-low activity within the RWF. The vessel intensity map for monkfish for 2015 to 2016 indicates high, medium-high, and medium-low activity along the RWEC fisheries study corridor and within the RWF (Figure 2.2-8). Additionally, RIDEM (2017) indicated there was low relative density of fishing activity in the RWF, with medium to very high densities to the southwest of the RWF. Low density fishing activity was indicated for the RWEC fisheries study corridor (Figure 87 in RIDEM, 2017). Over the years 2011 to 2016, the total non-confidential landings revenue for monkfish activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was more than $1.27 million (Section 10.1.4; Table 23 in RIDEM, 2017).

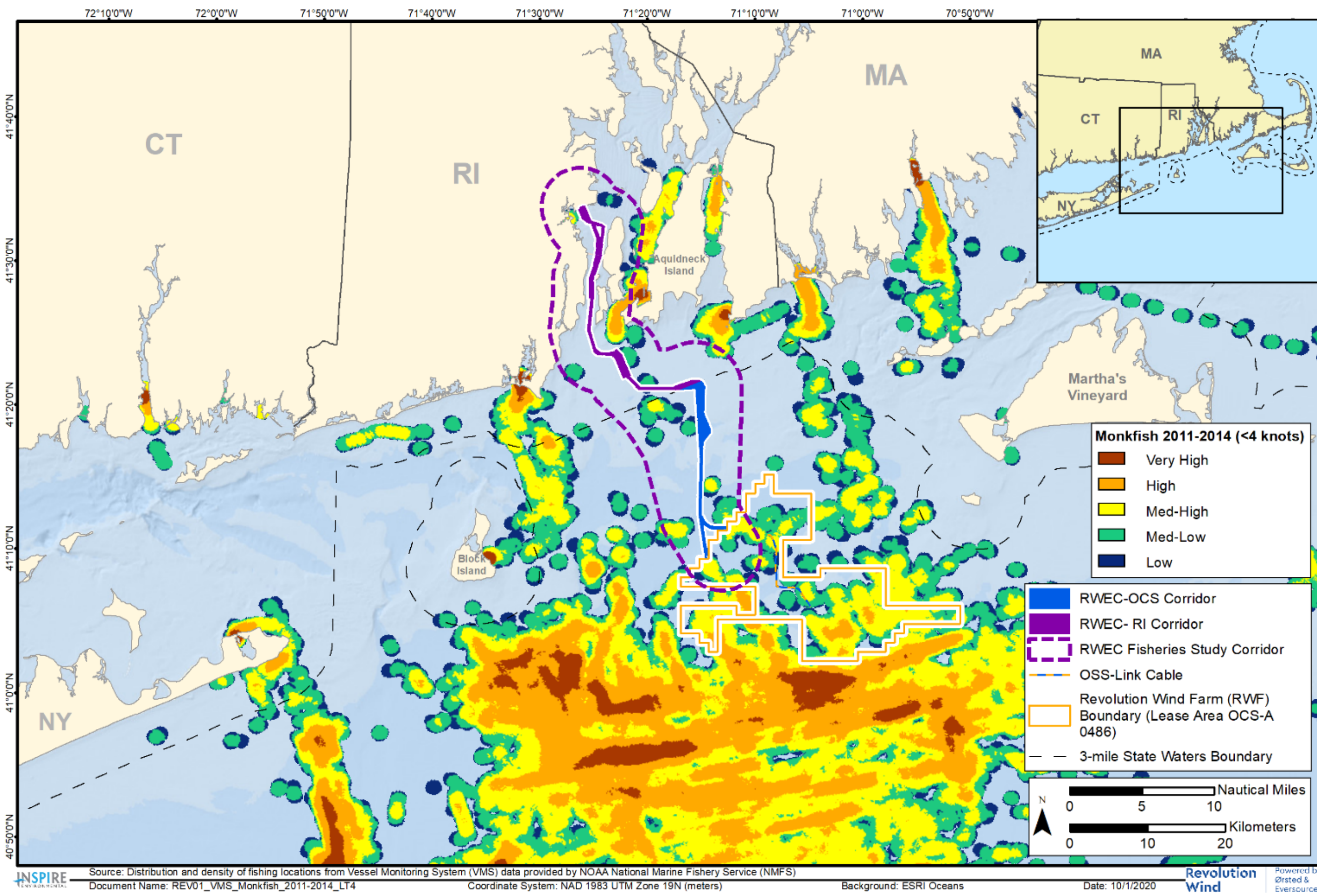

Figure 2.2-7 VMS Map of Vessel Intensity for Monkfish Fishing, 2011 to 2014

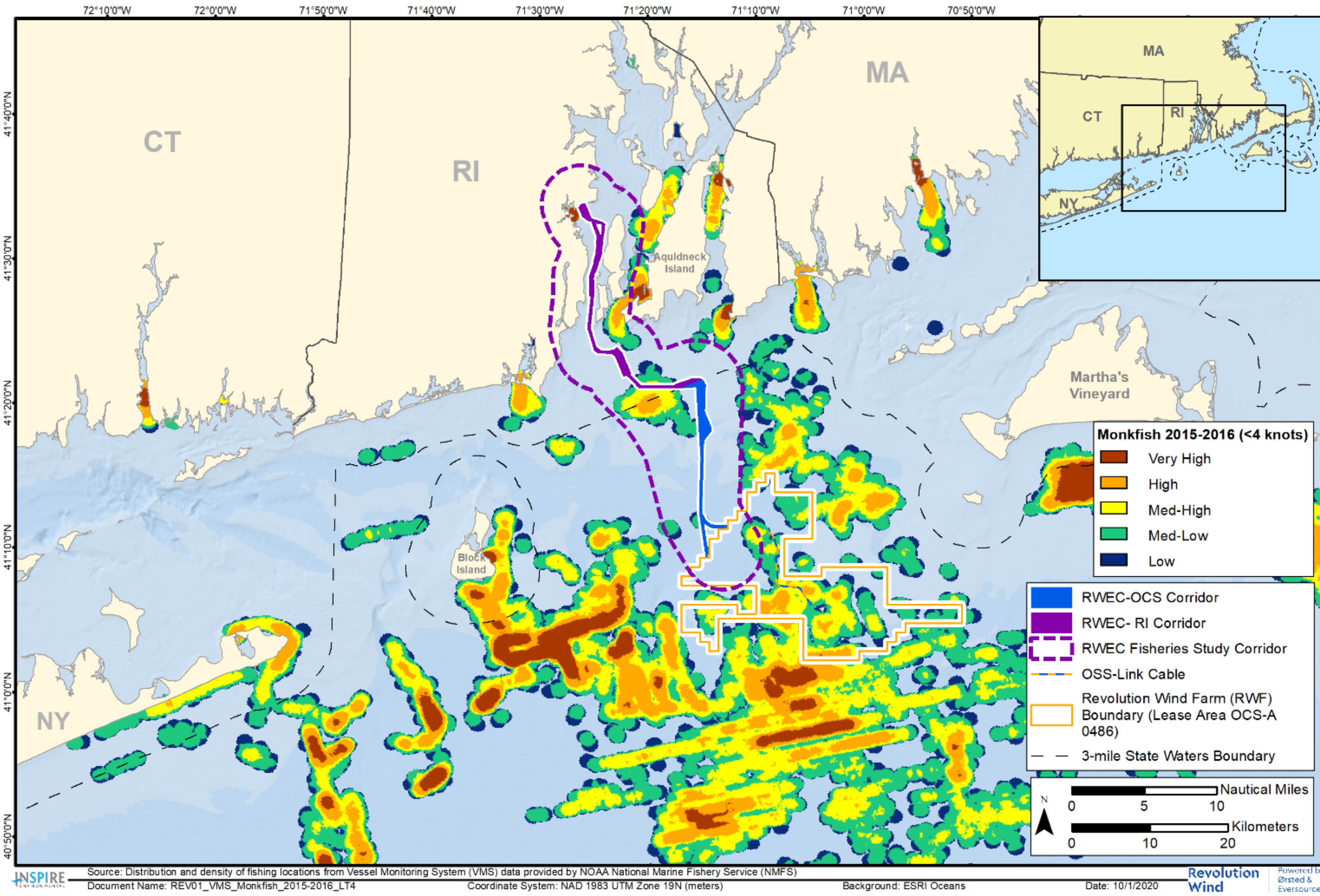

Figure 2.2-8 VMS Map of Vessel Intensity for Monkfish Fishing, 2015 to 2016

The map of vessel intensity for vessels fishing under a surfclam/ocean quahog permit, for the years 2012 to 2014, shows low intensity vessel activity at one location along the RWEC fisheries study corridor and within the northern portion of the RWF, high, medium-high, medium-low, and low fishing vessel intensity is depicted (Figure 2.2-9). The vessel intensity map for surfclam/ocean quahog for 2015 to 2016 indicates very high, high, medium-high, medium-low, and low vessel activity on the northwestern portion of the RWF. The RWEC fisheries study corridor does not overlap surfclam/ocean quahog vessel activity upon exiting the RWF (Figure 2.2-10). RIDEM (2017) indicated that for surfclam/ocean quahog fishing with dredge gear (Figure 59 in RIDEM, 2017), there was some scattered medium and medium-low smoothed relative density of fishing activity in the RWF and RWEC fisheries study corridor over the years 2011 to 2016. Landings revenue for surfclam/ocean quahog dredge activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was confidential for the years 2011-2016 (Section 10.1.3; Table 16 in RIDEM, 2017).

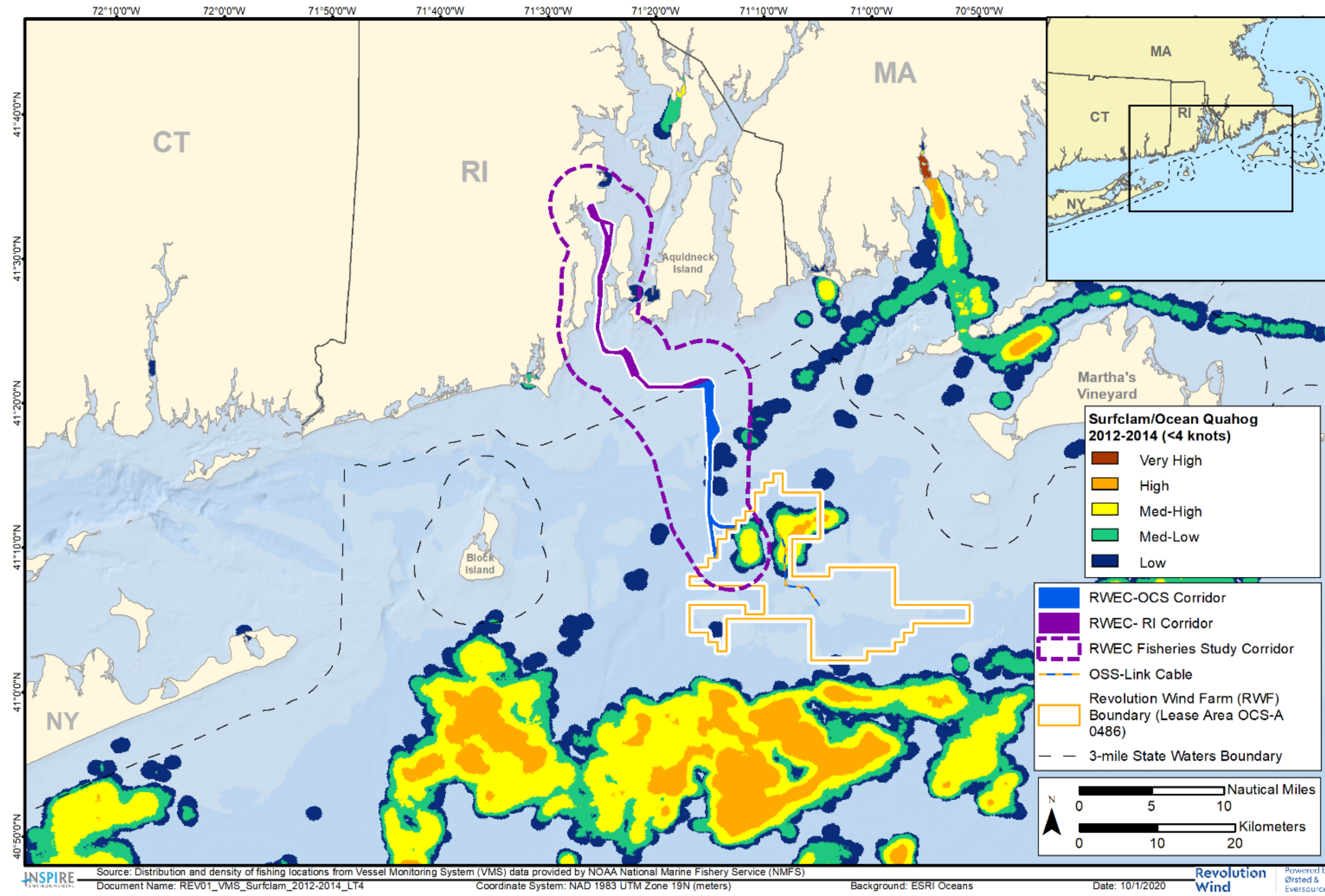

Figure 2.2-9 VMS Map of Vessel Intensity for Surfclam/Ocean Quahog Fishing, 2012 to 2014

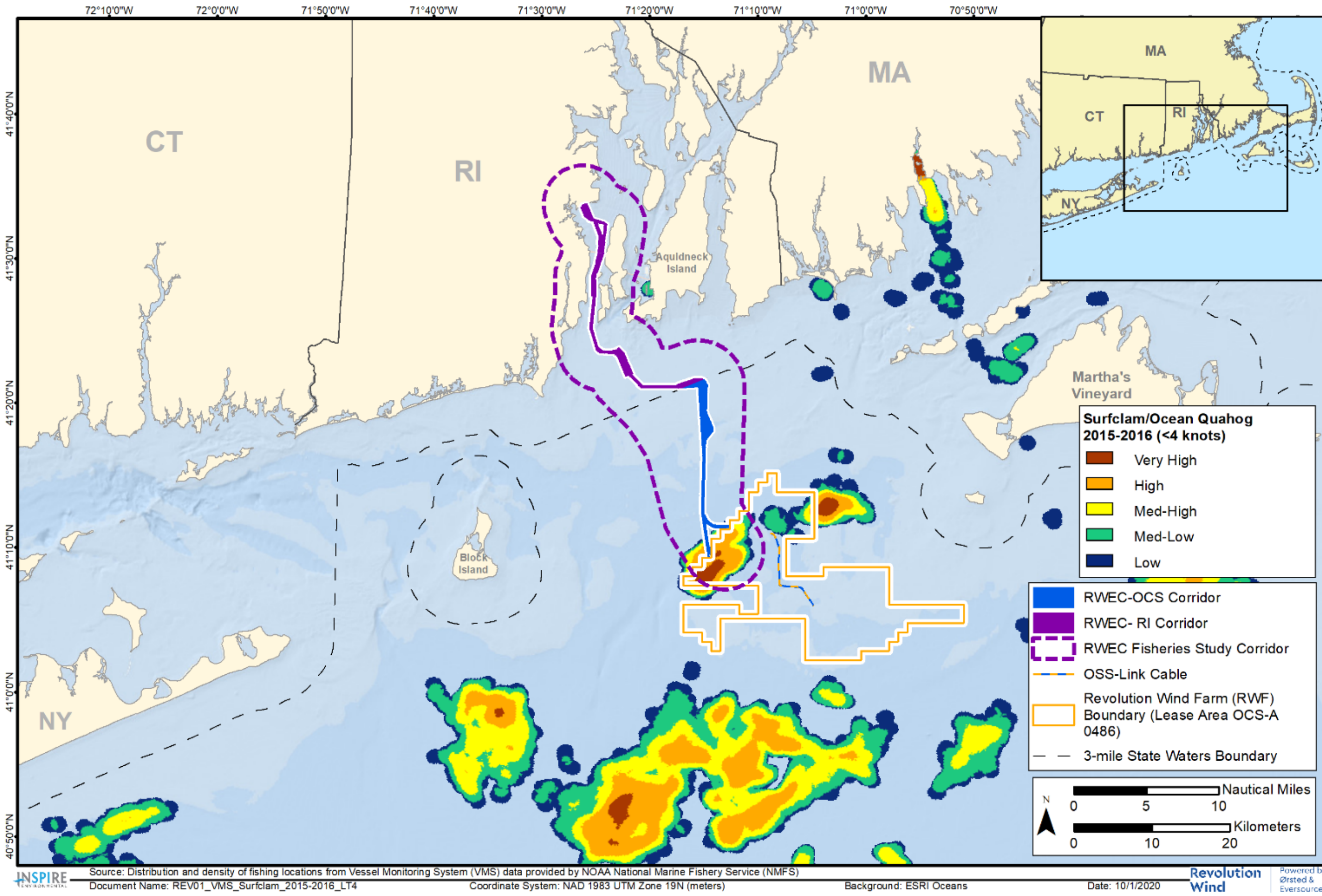

Figure 2.2-10 VMS Map of Vessel Intensity for Surfclam/Ocean Quahog Fishing, 2015 to 2016

The intensity map for vessels fishing for sea scallops for the years 2011 to 2014 indicates a medium-low and low intensity for vessels targeting scallops within the RWF, with the exception of high vessel activity in a small portion of the western RWF (Figure 2.2-11). The RWEC fisheries study corridor traverses areas of medium-low and low vessel activity. The 2015-2016 intensity map for scallop fishery vessels indicates high, medium-high, and low vessel activity in southern portions of the RWF and medium-low to low vessel intensity along the RWEC fisheries study corridor (Figure 2.2-12). In addition, RIDEM (2017) indicated low relative density of fishing activity near the RWF and the RWEC fisheries study corridor (Figure 95 in RIDEM, 2017). Over the years 2011 to 2016, the total nonconfidential landings revenue for sea scallop FMP activity in the RI-MA WEA (depicted in Figure 2.1-1) overall was more than $2.9 million (Section 10.4.1; Table 23 in RIDEM, 2017).

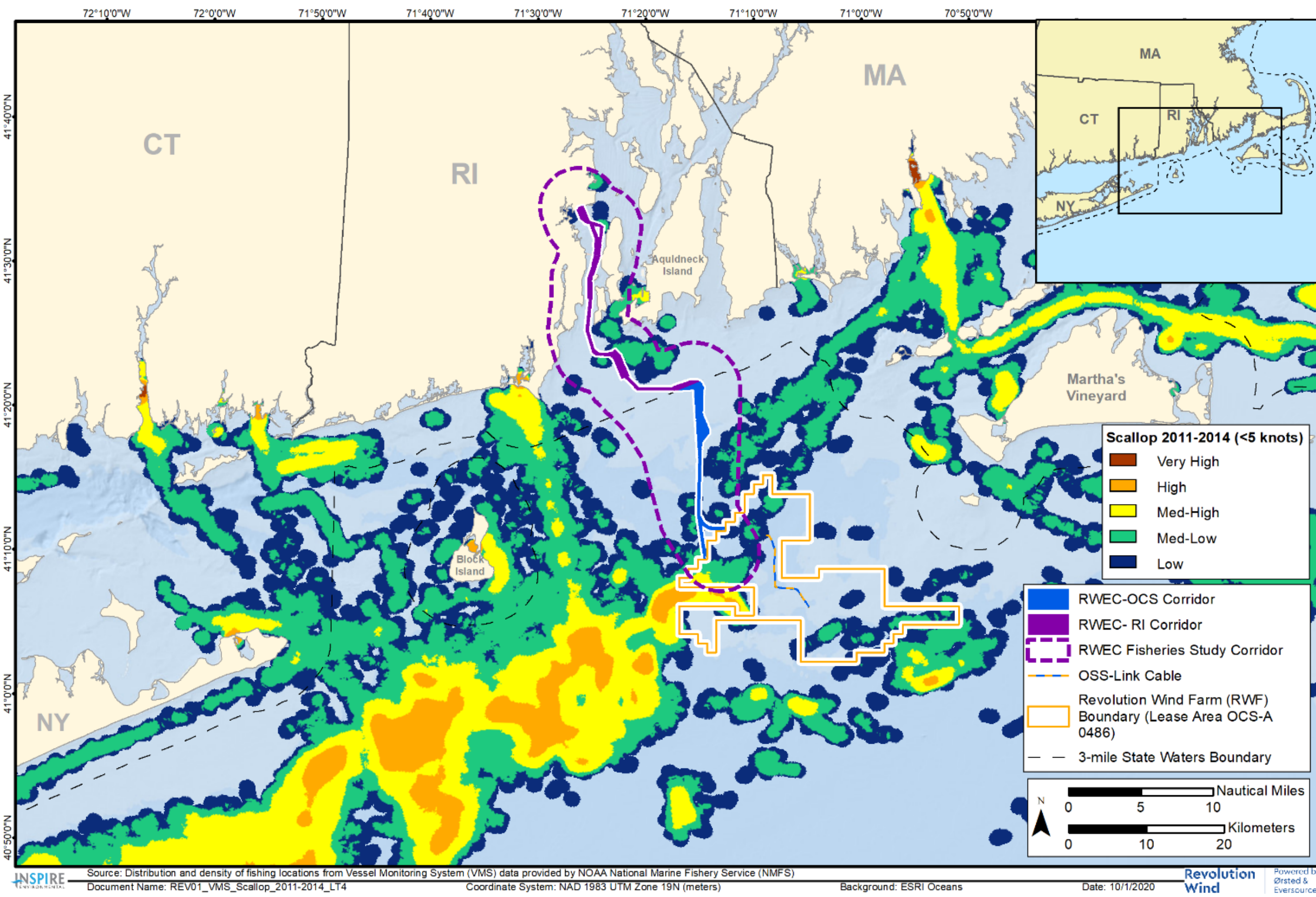

Figure 2.2-11 VMS Map of Vessel Intensity for Sea Scallop Fishing, 2011 to 2014

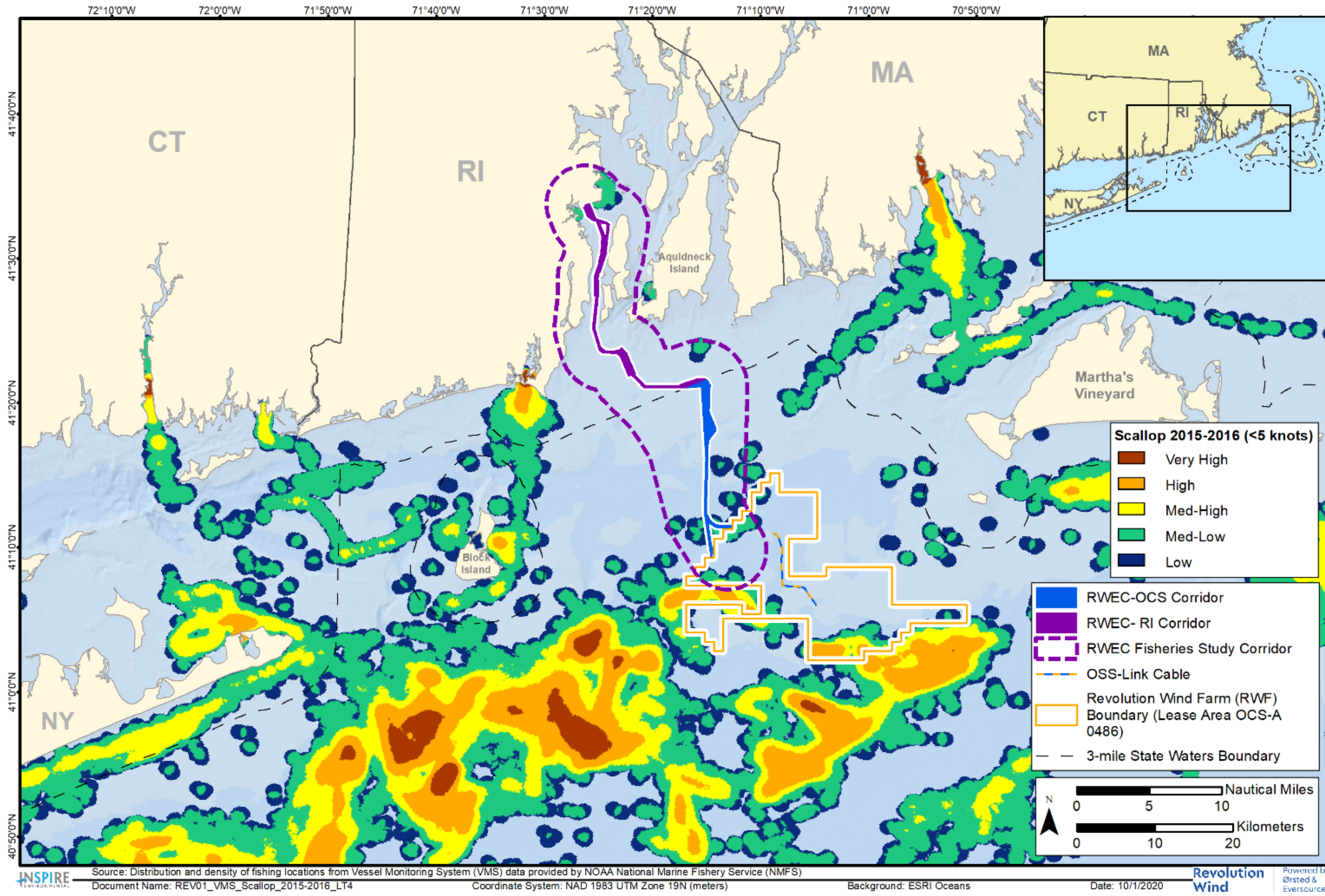

Figure 2.2-12 VMS Map of Vessel Intensity for Sea Scallop Fishing, 2015 to 2016

The intensity map for vessels fishing for squid in the year 2014 indicates medium-low and low vessel intensity occurred on the western edge of the RWF and the RWEC fisheries study corridor traverses areas of high, medium-high, and medium-low intensity (Figure 2.2-13). The 2015-2016 intensity map indicates high, medium-high, and low intensity vessel activity within the RWF, with most activity located in the northern portion of the RWF (Figure 2.2-14). The RWEC fisheries study corridor traverses areas of high, medium-high, medium-low, and low intensity vessel activity along the RWEC fisheries study corridor for 2015-2016. As noted previously, RIDEM (2017) indicated that there was low relative density of fishing activity for the RWF and RWEC fisheries study corridor for the squid/mackerel/butterfish FMP (Figure 142 in RIDEM, 2017) over the years 2011-2016. The total non-confidential landings revenue for fishing under the squid/mackerel/butterfish FMP in the RI-MA WEA (depicted in Figure 2.1-1) overall was over $397,000 (Table 23 in RIDEM, 2017).

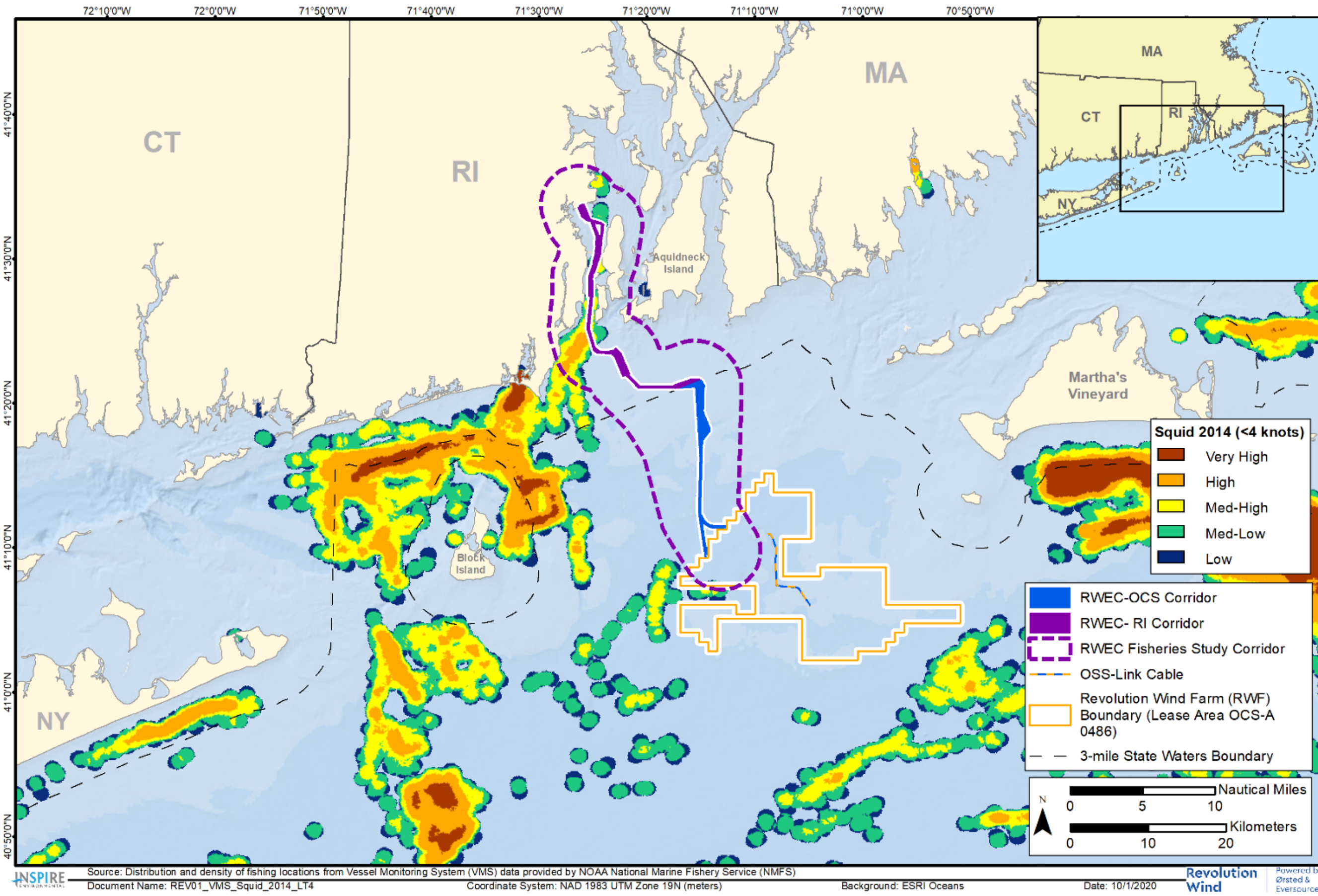

Figure 2.2-13 VMS Map of Vessel Intensity for Squid Fishing, 2014

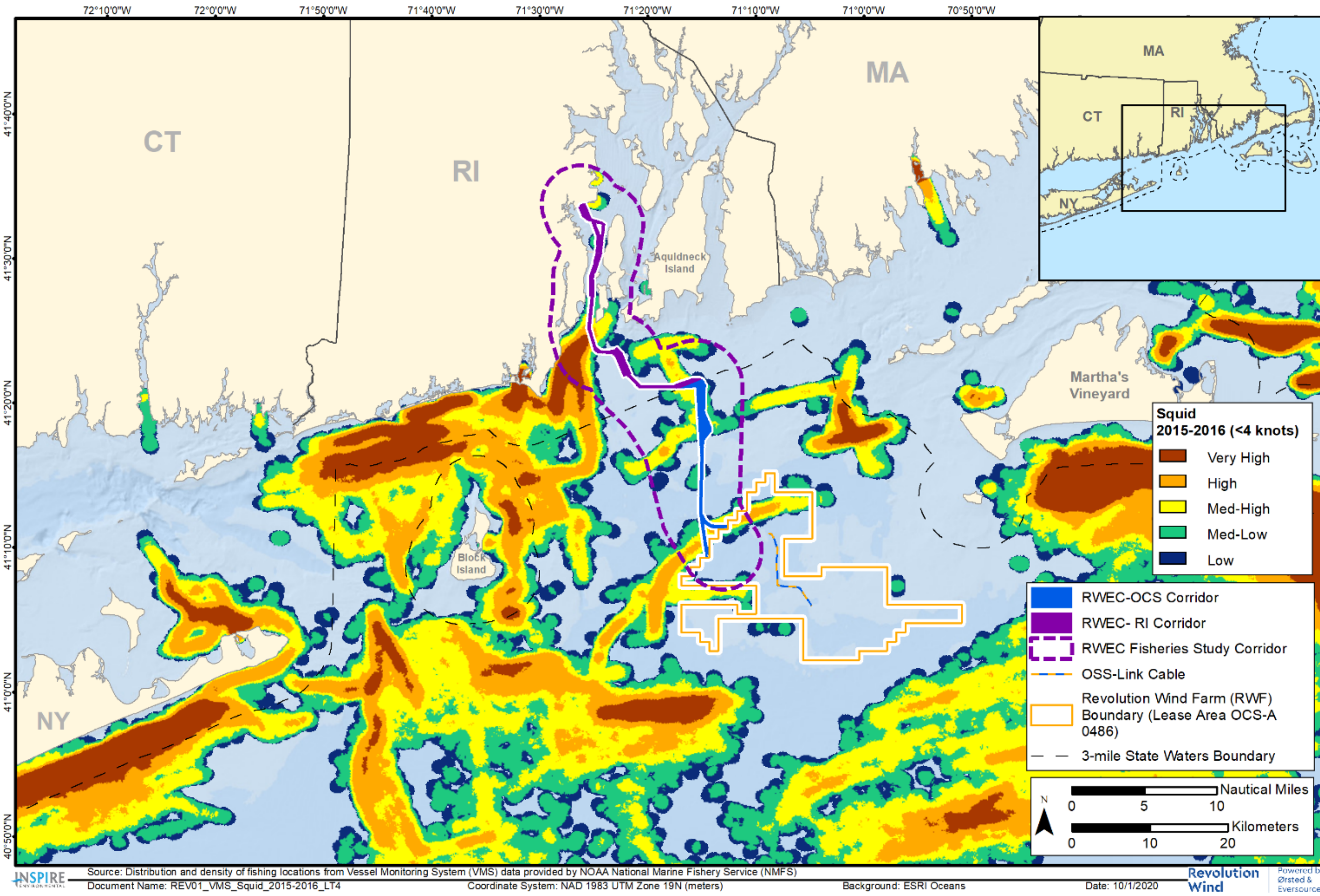

Figure 2.2-14 VMS Map of Vessel Intensity for Squid Fishing, 2015 to 2016

2.2.3 VTR Data as Rasters

Fishing-intensity rasters aggregated by port group were summed to indicate the revenue-intensity of fishing activity in offshore areas being considered as locations for wind turbine facilities (Benjamin et al., 2018). Revenue intensity of fishing activity for 2013 to 2017 is presented on Figures 2.2-15 through 2.2-21 for the fisheries with revenue recorded in the RI-MA WEA (i.e., large-mesh multispecies or northeast multispecies, Atlantic herring, pelagic species by midwater trawl, monkfish, surfclam/ocean quahog, sea scallops, and lobsters).

The revenue-intensity raster map for groundfish (large-mesh multispecies or northeast multispecies) indicates an area of relatively high-revenue fishing activity south of the RWF and an area of moderate-revenue fishing activity southwest of the RWF. Low-revenue fishing activity is depicted in the western portion of the RWF, with no revenue generated by groundfish fishing depicted for the rest of the RWF or adjacent to the RWEC fisheries study corridor (Figure 2.2-15). Maximum groundfish (large-mesh multispecies or northeast multispecies) mean annual revenue per 0.25 km^2 was $4,609 (Figure 2.2-15).

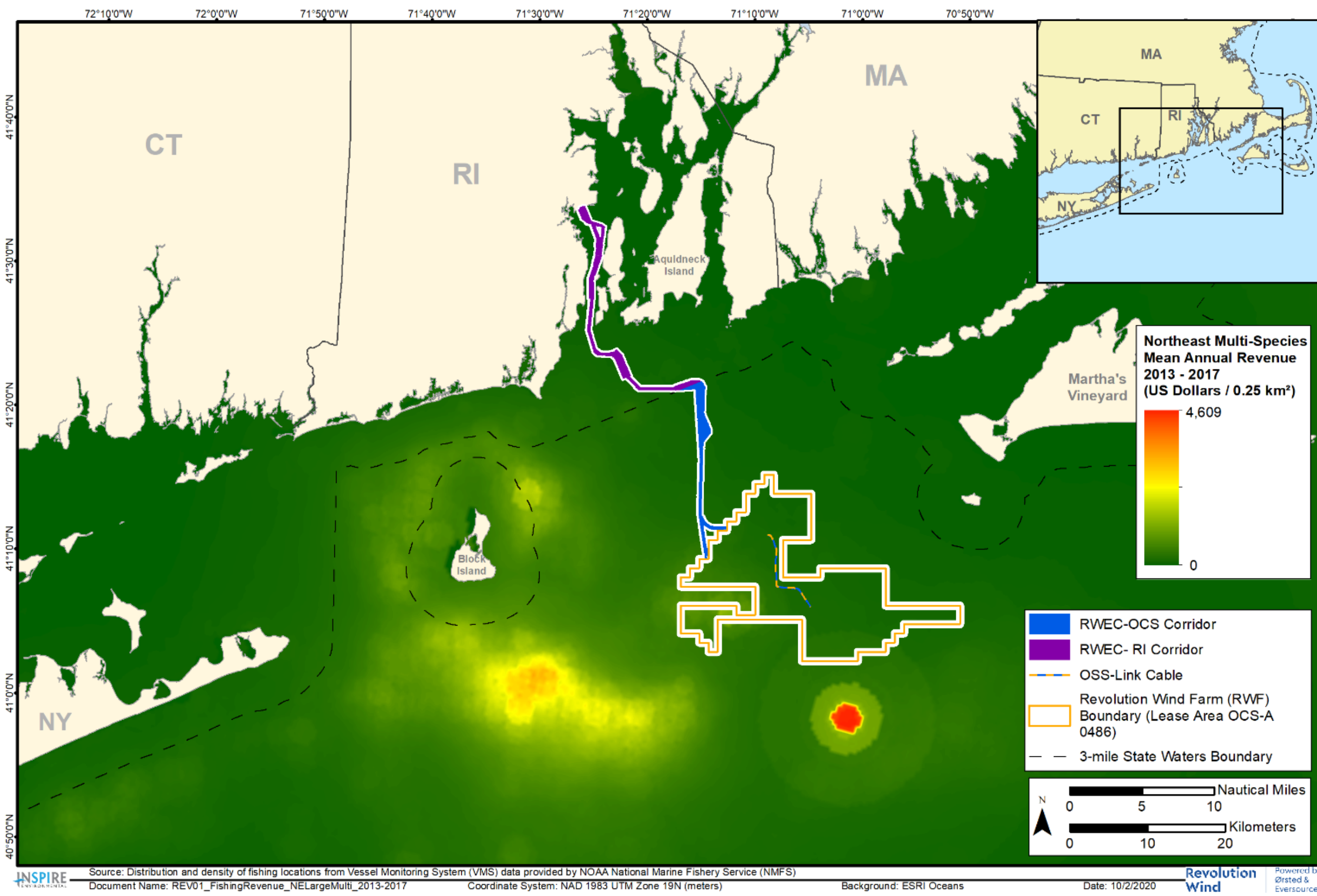

Figure 2.2-15 Revenue-intensity raster map for Large-mesh Multispecies Fishing, 2013-2017

The revenue-intensity raster map for Atlantic herring indicates an area of relatively high-revenue fishing activity southwest of the RWEC fisheries study corridor within RI state waters (Figure 2.2-16). Low-revenue fishing activity is depicted in the northern portion of the RWF, with most of the RWF showing no revenue generated by Atlantic herring fishing activity (Figure 2.2-16). Maximum Atlantic herring mean annual revenue per 0.25 km^2 was $11,482 (Figure 2.2-16).

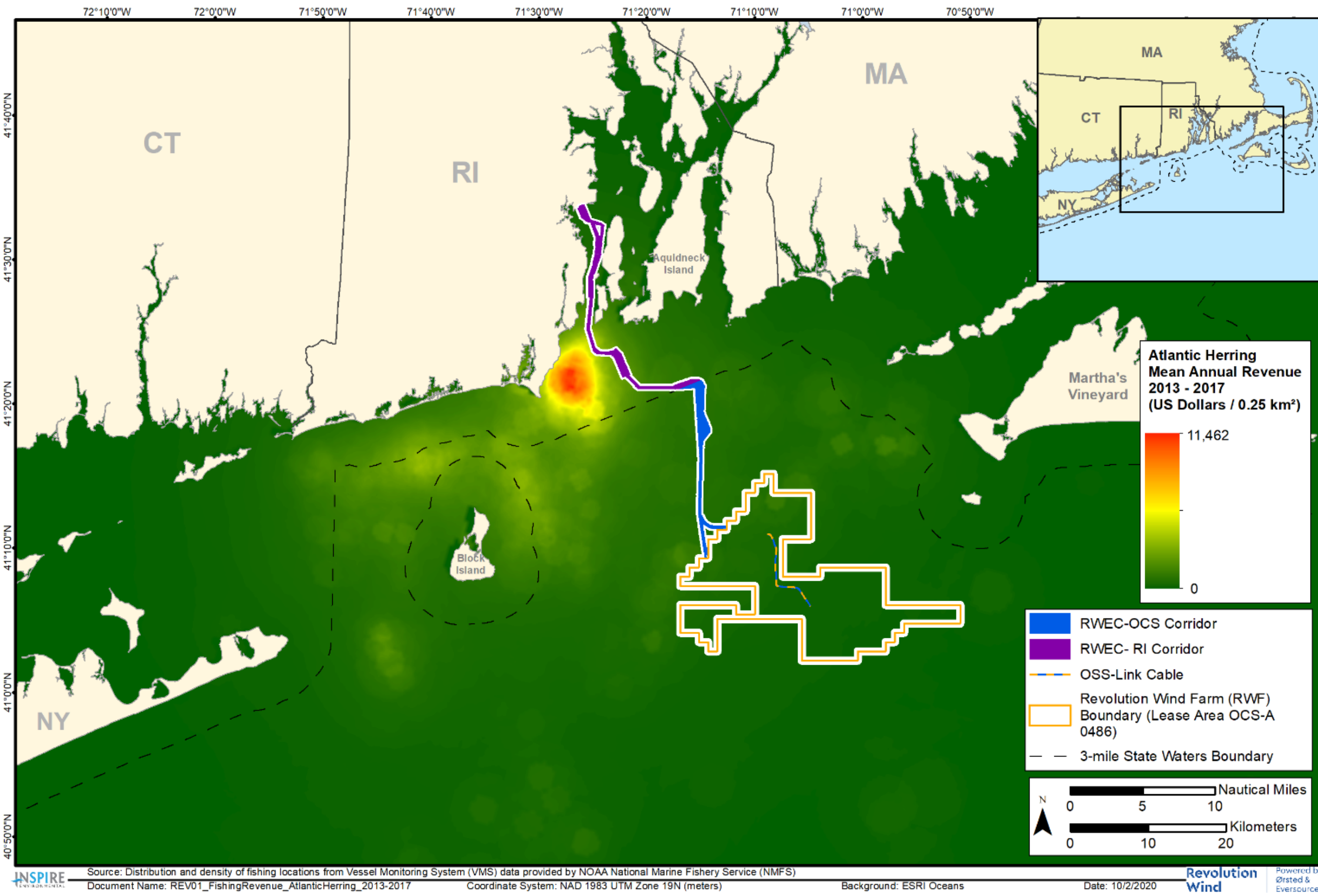

Figure 2.2-16 Revenue-intensity raster map for Atlantic Herring Fishing, 2013-2017

The revenue-intensity raster map for pelagic species (midwater trawl) indicates an area of relatively high-revenue fishing activity southwest of the RWEC fisheries study corridor within RI state waters (Figure 2.2-17). Low-revenue fishing activity is depicted in the northern portion of the RWF, with most of the RWF showing no revenue generated by midwater trawl fishing activity (Figure 2.2-17). Maximum pelagic species mean annual revenue per 0.25 km^2 was $1,634 (Figure 2.2-17).

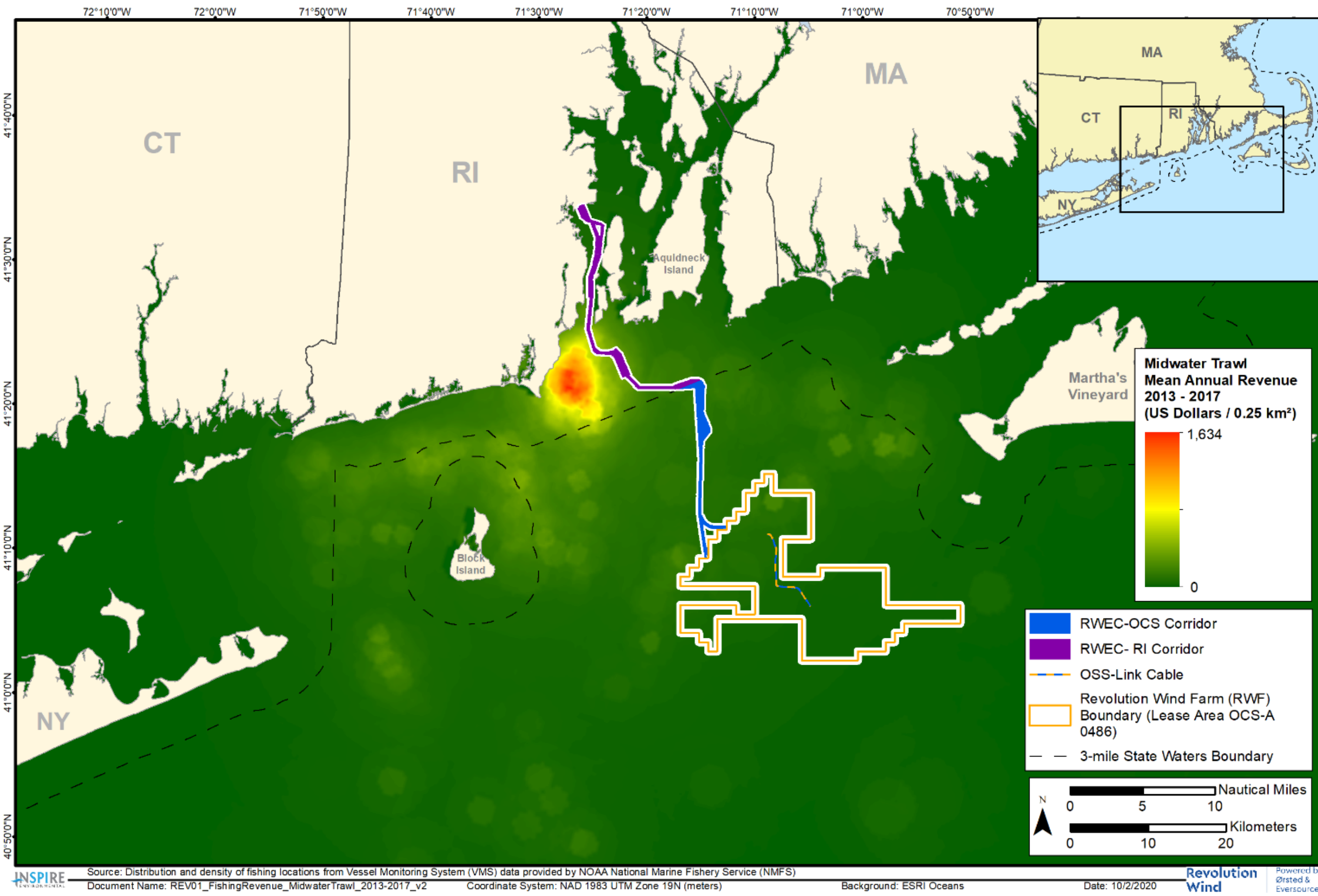

Figure 2.2-17 Revenue-intensity raster map for Pelagic Species (midwater trawl) Fishing, 2013-2017

The revenue-intensity raster map for monkfish indicates an area of relatively high-revenue fishing activity south of the RWF and an area of moderate-revenue fishing activity within the RWF (Figure 2.2-18). There is no indication of revenue-producing fishing activity adjacent to the RWEC fisheries study corridor (Figure 2.2-18). Maximum monkfish mean annual revenue per 0.25 km^2 was $10,729 (Figure 2.2-18).

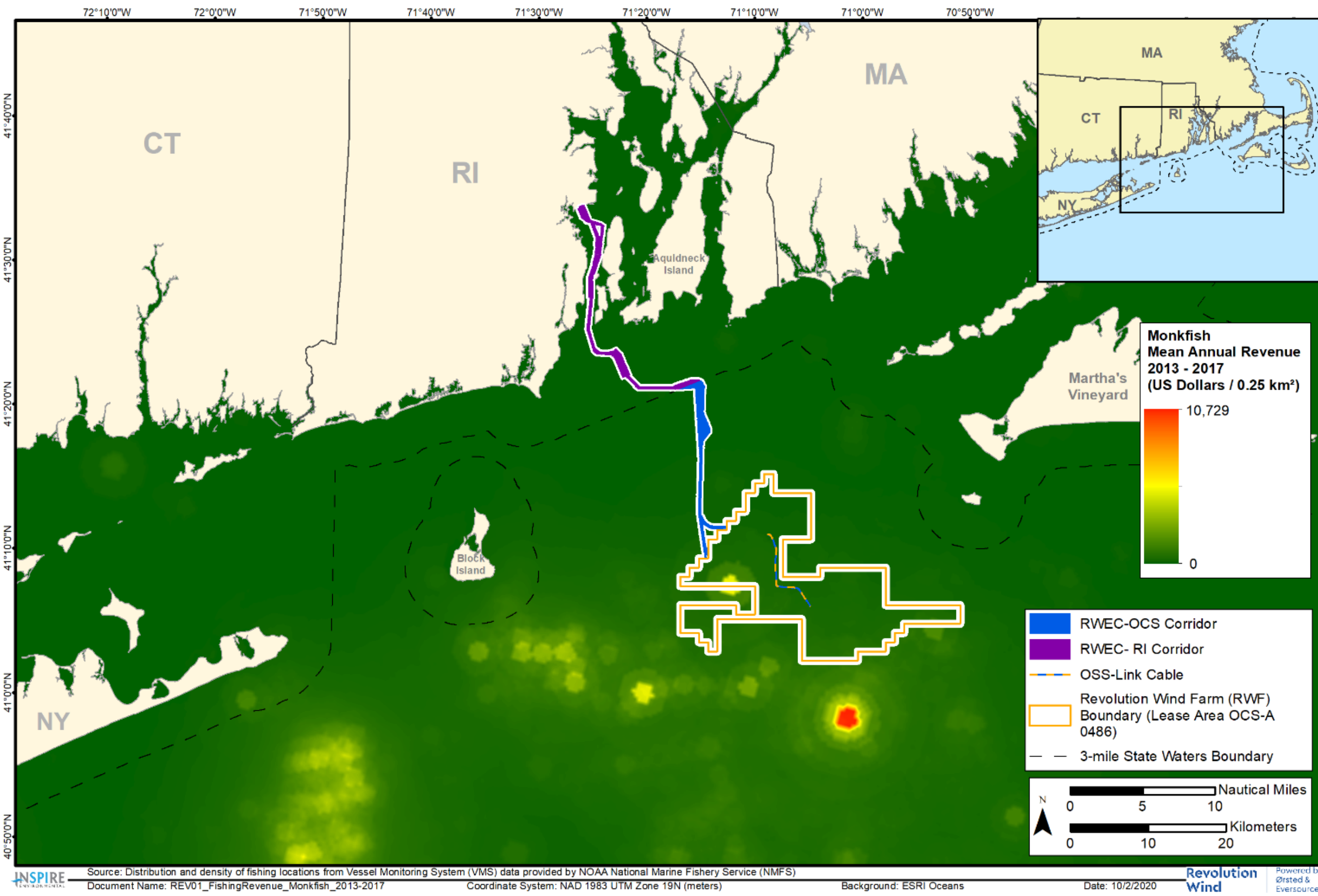

Figure 2.2-18 Revenue-intensity raster map for Monkfish Fishing, 2013-2017

The revenue-intensity raster map for surfclam/ocean quahog indicates areas of relatively moderate to low-revenue fishing activity within the RWF and no revenue-producing fishing activity adjacent to the RWEC fisheries study corridor (Figure 2.2-19). Maximum surfclam/ocean quahog mean annual revenue per 0.25 km^2 was \$12,358 (Figure 2.2-19).

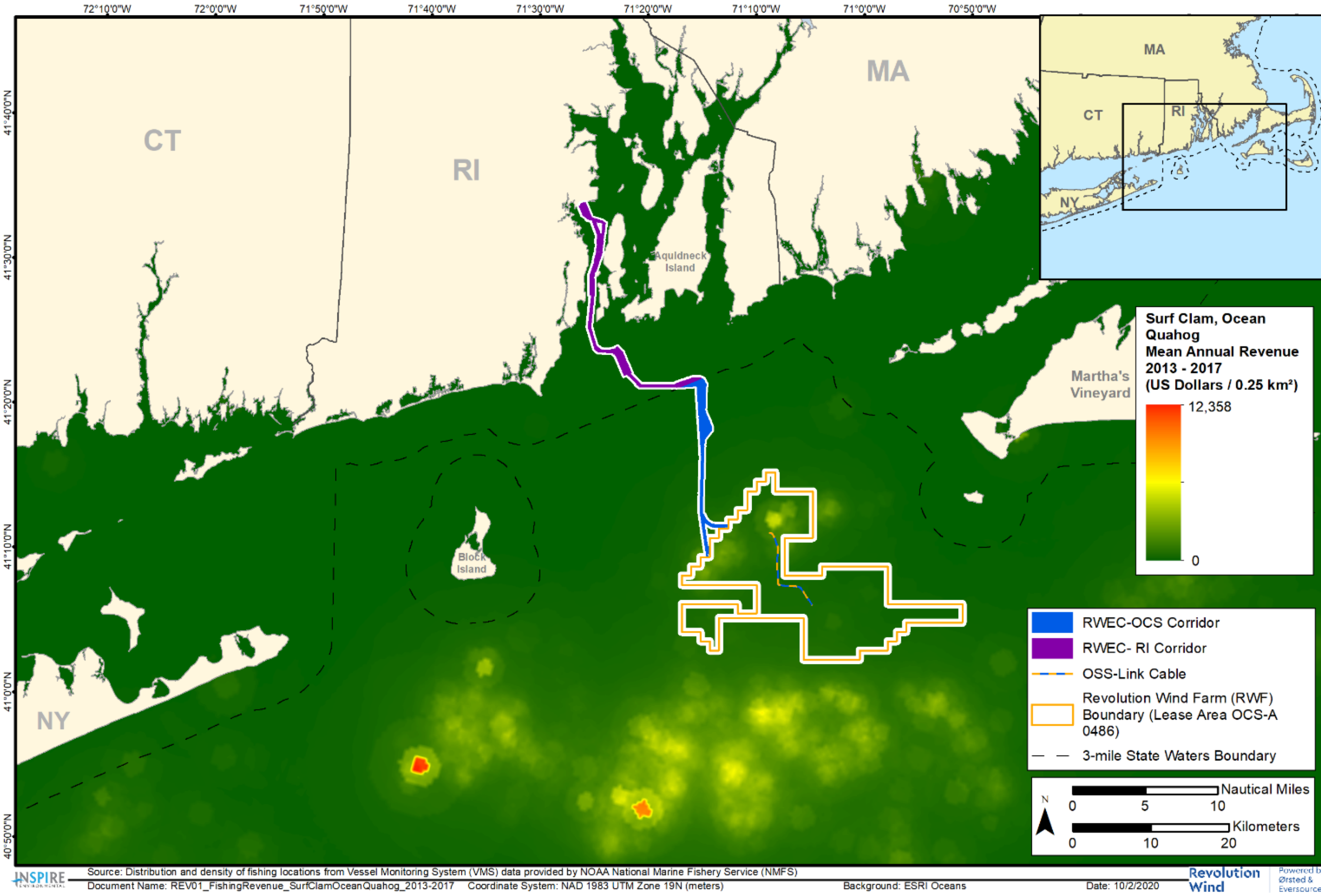

Figure 2.2-19 Revenue-intensity raster map for Surfclam/Ocean Quahog Fishing, 2013-2017

The revenue-intensity raster map for sea scallops indicates an area in the southern RWF of relatively low-revenue fishing activity and no revenue-producing fishing activity adjacent to the RWEC fisheries study corridor (Figure 2.2-20). Maximum sea scallops mean annual revenue per 0.25 km^2 was $19,780 (Figure 2.2-20).

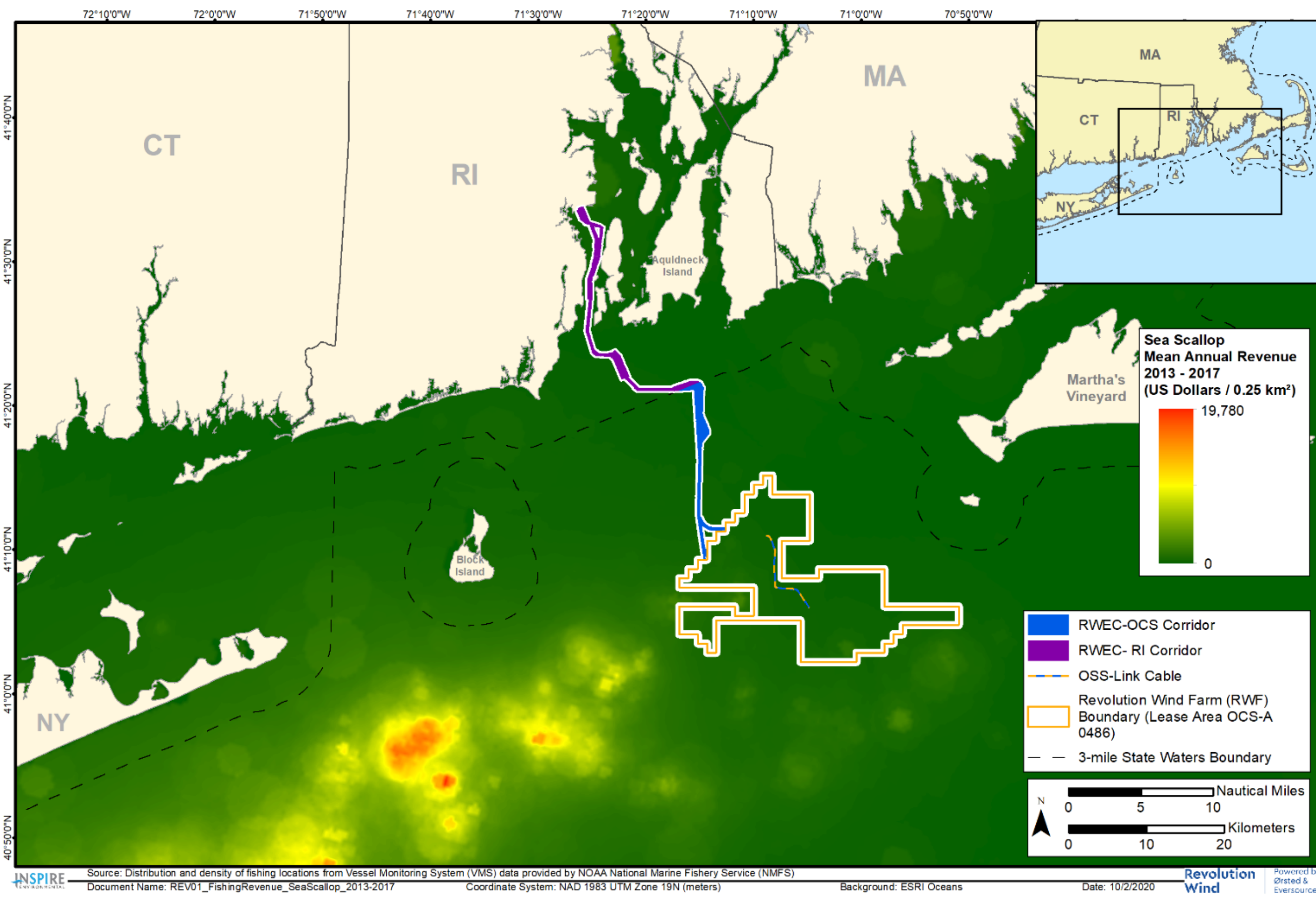

Figure 2.2-20 Revenue-intensity raster map for Sea Scallops, 2013-2017

The revenue-intensity raster map for lobsters indicates relatively low-revenue fishing activity in RWF and adjacent to the RWEC fisheries study corridor (Figure 2.2-21). An area of moderate-revenue fishing activity occurs west of RWF (Figure 2.2-21). Maximum lobster mean annual revenue per 0.25 km^2 was $1,044 (Figure 2.2-21).

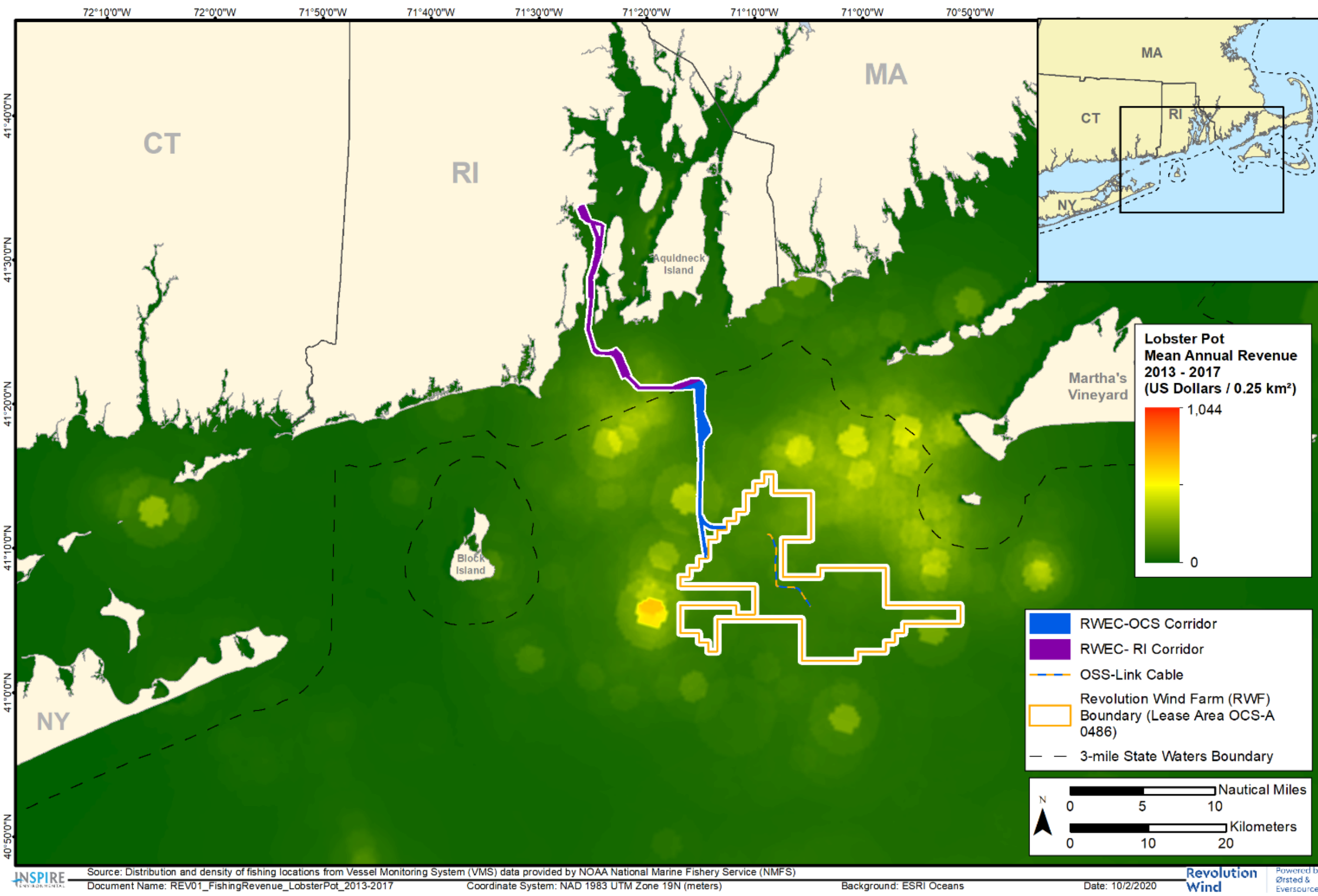

Figure 2.2-21 Revenue-intensity raster map for Lobsters, 2013-2017

2.2.4 Connecticut State Vessel Trip Reports

Commercial fisheries in Connecticut state waters may be categorized similarly to those in federal waters. The largest fishery by gear category in statistical area 611 for the years 2009 to 2018 used pots and traps, where an average of 144,296 pounds were landed per year, representing 100 percent of all landings caught by pots and traps in all Connecticut state waters. The next largest fishery in statistical area 611 used otter trawls, which averaged 106,572 pounds each year, representing all of the state catch. The third largest fishery by gear type was lobster pots and traps, averaging 89,877 pounds per year and also representing all of the lobster pot activity in Connecticut state waters. Table 2.2-7 provides an overview of the gears used in Connecticut state waters (ACCSP, 2019).

From 2009 to 2018, commercial fishermen permitted to fish in Connecticut state waters landed a diverse array of species, including conch, menhaden, lobster, scup, horseshoe crabs, summer flounder, American shad, bluefish, green crabs, and white perch. A complete summary of all species landed in these statistical areas is provided in Table 2.2-8. Statistical area 611 was an important fishing area for conch and menhaden. The greatest average pounds landed for the years 2009 to 2018 include conch (120,204 pounds), menhaden (100,026 pounds), lobster (84,601 pounds), scup (78,320 pounds), horseshoe crabs (58,108 pounds), and summer flounder (47,779 pounds).

The top ports where fishermen landed their catch from fishing in Connecticut state waters were Stonington, Old Saybrook, New London, Guilford, and Clinton. Stonington was the port with the highest average annual landings (82,034 pounds) and the largest number of active fishing permits (58 permits; Table 2.2-9).

Table 2.2-7 Categories of Gear Used by Connecticut State-only Permitted Vessels during 2009-2018 in Statistical Area 611

Gear Category	Average Pounds Landed per Year (2009-2018)	Total Pounds Landed (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% Pounds Landed out of Total Connecticut State Waters, by Gear
	Statistical Areas	Statistical Areas		Statistical Areas
	611	611		611
By Hand, No Diving Gear	57,939	579,389	579,389	100.0
Dip Nets	2,924	29,241	29,241	100.0
Gill Nets	85,978	859,780	859,920	100.0
Hand Line	52	209	209	100.0
Haul Seines	2,227	22,272	22,272	100.0
Hook and Line	56,702	567,023	577,950	98.1
Otter Trawls	106,572	1,065,717	1,065,632	100.0
Pots and Traps, Lobster	89,877	898,767	898,767	100.0
Pots and Traps, Other	12,427	124,269	124,269	100.0
Pots and Traps	144,296	1,442,964	1,443,053	100.0

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and the RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-8 Species Landed by Connecticut State-only Permitted Vessels during 2009-2018 in Statistical Area 611

	Average Pounds Landed per Year (2009-2018)	Total Pounds Landed (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% Pounds Landed out of Total Connecticut State Waters, by Species
	Statistical Areas	Statistical Areas		Statistical Areas
Species	611	611		611
Conch - Family	120,204	1,202,040	1,202,040	100.0
Menhadens	100,026	1,000,262	1,000,322	100.0
Lobster, American	84,601	846,013	846,008	100.0
Scup	78,320	783,205	785,525	99.7
Crab, Horseshoe	58,108	581,081	581,081	100.0
Flounder, Summer	47,779	477,792	482,543	99.0
Shad, American	43,513	435,132	435,132	100.0
Bluefish	20,461	204,605	204,784	99.9
Crab, Green	12,559	125,586	125,586	100.0
Perch, White	10,308	103,084	103,084	100.0
Bass, Black Sea	8,210	82,100	83,013	98.9
Tautog	7,838	78,382	78,467	99.9
Whelk, Channeled	7,182	28,728	28,728	100.0
Bass, Striped	2,918	29,179	29,179	100.0
Eel, American	2,251	22,510	22,510	100.0
Skates, Rajidae (Family)	2,012	20,124	20,059	100.3
Dogfish, Smooth	1,942	19,418	19,418	100.0
Flounder, Winter	1,719	17,190	17,190	100.0
Windowpane	1,662	16,622	16,622	100.0
Sea robins	1,436	14,359	14,359	100.0
Crab, Blue	882	8,815	8,815	100.0
Squid, Longfin Loligo	827	8,269	8,268	100.0
Butterfish	821	8,211	8,211	100.0
Silverside, Atlantic	458	4,580	4,580	100.0
Crabs, Hermit, Pagurus (Genus)	444	2,219	2,219	100.0
Hake, Red	412	2,470	2,475	99.8
Mummichog	370	3,330	3,330	100.0
Mullets	353	1,764	1,764	100.0
Shad, Gizzard	295	1,178	1,178	100.0
Shad, Hickory	293	2,346	2,346	100.0
Crab, Atlantic Rock	206	1,238	1,238	100.0
Weakfish	206	2,055	2,055	100.0
Shiner, Golden	138	415	415	100.0
Triggerfishes	50	502	502	100.0
Cod, Atlantic	26	181	225	80.4
Dogfish, Spiny	22	217	356	61.0
Sculpins	15	61	61	100.0
Tuna, Little Tunny	13	39	39	100.0
Hake, Silver	12	99	98	101.0
Bonito, Atlantic	12	60	60	100.0
Puffers, Tetraodontidae (Family)	8	24	24	100.0

Species	Average Pounds Landed per Year (2009-2018)	Total Pounds Landed (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% Pounds Landed out of Total Connecticut State Waters, by Species
	Statistical Areas	Statistical Areas		Statistical Areas
	611	611		611
Cunner	3	16	16	100.0
Mackerel, Atlantic	2	5	4	125.0

Source: ACCSP, 2019.
Notes:
Values reflect average pounds landed by species and by statistical subarea.
Confidential information was redacted from the requested data set.
Species are sorted by average pounds caught each year in statistical subarea 611.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.

Table 2.2-9 Landing Ports Used by Connecticut State-only Permitted Vessels during 2009-2018 in Statistical Area 611

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)	Total number of Active Fishing Permits	Total Pounds Landed by Subarea (2009-2018)	Total Pounds Landed in Connecticut State Waters (2009-2018)	% of Total Catch from Connecticut State Waters, by Port
	Statistical Areas	Statistical Areas	Statistical Areas		Statistical Areas
	611	611	611		611
Branford	12,771	18	127,709	127,849	99.9
Bridgeport	13,775	17	137,755	137,755	100.0
Chester (Town of)	3,642	4	25,493	25,493	100.0
Clinton	56,789	22	567,888	567,888	100.0
Darien	10,158	3	71,106	71,106	100.0
East Lyme (Flanders)	1,665	3	6,660	6,660	100.0
Greenwich	1,617	8	16,175	16,175	100.0
Groton	52,746	24	527,465	527,465	100.0
Guilford	67,723	21	677,231	677,231	100.0
Haddam	660	6	4,623	4,623	100.0
Middletown	3,757	3	11,272	11,272	100.0
Milford	31,474	12	314,740	314,740	100.0
Mystic	1,267	9	12,671	12,671	100.0
New Haven	36,729	10	367,288	367,288	100.0
New London	70,880	22	708,800	708,733	100.0
Niantic (East Lyme (sta.))	21,415	31	214,149	215,879	99.2
Noank	8,389	9	83,893	83,893	100.0
Norwalk	10,832	8	108,318	108,318	100.0
Old Lyme	6,340	10	57,057	57,057	100.0
Old Saybrook (Town of)	80,805	52	808,047	808,047	100.0
Pawcatuck	243	4	973	1,057	92.1
Stamford	2,778	8	22,221	22,221	100.0
Stonington	82,034	58	820,341	828,711	99.0
Stratford	2,250	8	20,251	20,251	100.0
Waterford	14,223	14	142,234	142,370	99.9
West Haven	3,685	4	11,055	11,055	100.0
Westbrook (Town of)	14,007	15	140,071	140,071	100.0

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.5 Massachusetts State Vessel Trip Reports

The largest fishery by gear category in Massachusetts state waters in statistical areas 537 and 538 for the years 2009 to 2018 used pots and traps, yielding average annual landings of 740,978 pounds, accounting for 49 percent of the statewide landings for this gear type. Total annual landings from hook and line averaged 608,431 pounds, accounting for approximately 45 percent of landings from hook and line within state waters. Landings using lobster pots and traps averaged 522,764 pounds landed per year in both statistical areas combined, representing 12 percent of all lobster trap landings in all Massachusetts state waters. Table 2.2-10 provides an overview of the gears used in Massachusetts state waters (ACCSP, 2019).

From 2009 to 2018, commercial fishermen permitted to fish in Massachusetts state waters landed a diverse array of species, including brachyuran crabs, menhaden, ocean quahog, channeled whelk, northern quahog clam, scup, striped bass, bay scallop, black sea bass, horseshoe crabs, eastern oysters, and soft clams. A complete summary of all species landed in these statistical areas is provided in Table 2.2-11. The majority of species came from area 538, with the exception of brachyuran crabs, which had high landings in area 537. Brachyuran crab landings averaged over 3.0 million pounds per year for all statistical areas combined and accounted for 62 percent of statewide crab landings. Channeled whelk landings averaged 563,513 pounds annually in statistical areas 537 and 538 combined and accounted for 95 percent of channeled whelk landings statewide. Species with high landings in area 538 for the years 2009 to 2018 include channeled whelk (551,351 pounds), northern quahog (415,349 pounds), and scup (290,480 pounds).

The top ports where fishermen landed their catch from fishing in all Massachusetts state waters were New Bedford, Chatham, Edgartown, Falmouth, and Westport. New Bedford was the port with the highest average annual landings in statistical areas 537 and 538 combined (701,301 pounds) and the largest number of active fishing permits (626 permits; Table 2.2-12).

Table 2.2-10 Categories of Gear Used by Massachusetts State-only Permitted Vessels during 2009-2018 in Statistical Areas 537 and 538

	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% Pounds Landed out of Total Massachusetts State Waters, by Gear	
	Statistical Areas		Statistical Areas			Statistical Areas	
Gear Category	537	538	537	538		537	538
By Hand, Diving Gear	210	25,662	839	230,956	527,341	0.2	43.8
By Hand, No Diving Gear	736	74,480	2,207	670,319	1,991,792	0.1	33.7
Dip Nets		16,679		150,107	215,101		69.8
Dredge	60,667	178,442	606,669	1,784,420	22,268,013	2.7	8.0
Gill Nets		7,411		51,879	5,524,403		0.9
Hand Line	68,050	69,044	612,454	690,442	1,740,763	35.2	39.7
Harpoons		780		6,241	71,863		8.7
Hook and Line	111,829	496,602	1,006,460	4,966,017	13,228,436	7.6	37.5
Long Lines		1,352		6,761	3,908,859		0.2
Not Coded	11,511	10,003	11,511	80,023	2,871,527	0.4	2.8
Other Fixed Nets		35,700		285,603	574,627		49.7
Other Gears	112	143,874	335	1,294,864	5,786,102	<0.1	22.4
Otter Trawls	9,807	124,842	49,034	1,123,580	1,716,517	2.9	65.5
Pots and Traps, Lobster	482,902	39,862	3,863,217	358,762	33,966,462	11.4	1.1
Pots and Traps, Other	83,124	62,518	166,247	375,109	1,339,713	12.4	28.0
Pots and Traps	21,237	719,741	148,658	7,197,414	15,063,126	1.0	47.8
Purse Seine					13,880,167		
Rakes	695	488,807	4,170	4,888,075	31,134,543	<0.1	15.7
Suction Pumps		748		4,490	4,494		99.9

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-11 Species Landed by Massachusetts State-only Permitted Vessels during 2009-2018 in Statistical Areas 537 and 538

Species	Average Pounds Landed per Year (2009-2018) Statistical Areas 537	Average Pounds Landed per Year (2009-2018) Statistical Areas 538	Total Pounds Landed (2009-2018) Statistical Areas 537	Total Pounds Landed (2009-2018) Statistical Areas 538	Total Pounds Landed in Massachusetts State Waters (2009-2018)	% Pounds Landed out of Total Massachusetts State Waters, by Species Statistical Areas 537	% Pounds Landed out of Total Massachusetts State Waters, by Species Statistical Areas 538
Whelk, Channeled	12,162	551,351	72,973	5,513,507	5,846,715	1.2	94.3
Clam, Northern Quahog		415,349		4,153,491	6,682,378		62.2
Scup	117,953	290,480	1,061,578	2,904,798	4,106,087	25.9	70.7
Bass, Striped	19,160	151,721	172,440	1,517,212	6,271,230	2.7	24.2
Scallop, Bay	2,644	122,538	23,794	1,225,379	1,275,687	1.9	96.1
Bass, Black Sea	24,744	122,256	222,698	1,222,563	1,543,660	14.4	79.2
Crab, Horseshoe	397	120,109	1,191	1,080,983	2,655,523	<0.1	40.7
Oyster, Eastern	115	118,652	345	1,186,521	4,457,611	<0.1	26.6
Clam, Soft	454	111,632	2,272	1,004,692	22,334,558	<0.1	4.5
Menhadens		104,916		944,245	14,455,094		6.5
Flounder, Summer	15,615	96,401	140,535	964,005	1,138,208	12.3	84.7
Bluefish	4,663	68,860	41,966	688,603	1,412,892	3.0	48.7
Lobster, American	80,755	45,910	807,547	459,102	39,211,503	2.1	1.2
Whelk, Knobbed	675	42,517	2,025	382,649	440,597	0.5	86.8
Crab, Green		41,999		419,994	1,238,936		33.9
Squid, Longfin Loligo	241	36,232	964	326,087	374,995	0.3	87.0
Tautog	2,008	35,090	18,068	350,897	389,325	4.6	90.1
Mussel, Sea		26,987		134,936	11,656,534		1.2
Surfclam, Atlantic		11,013		99,115	6,604,278		1.5
Crabs, Brachyura	3,073,922	5,398	3,073,922	5,398	4,936,562	62.3	0.1
Snail, Moon		5,287		15,860	17,238		92.0
Mackerel, Atlantic	3,560	4,650	17,801	41,853	496,128	3.6	8.4
Quahog, Ocean	281,280	4,462	562,560	40,162	1,833,700	30.7	2.2
Clam Atlantic Razor		4,050		32,403	3,345,259		1.0
Butterfish		3,427		30,846	32,312		95.5
Tuna, Bluefin	1,240	1,839	9,918	14,713	766,324	1.3	1.9
Skates, Rajidae (Family)		1,524		6,095	1,552,660		0.4
Triggerfishes	417	1,458	2,500	13,125	15,634	16.0	84.0
Ark, Blood		1,402		9,816	187,497		5.2
Crab, Jonah		1,217		7,300	448,928		1.6
Eel, American		1,163		10,468	12,061		86.8
Quahog, False		1,124		4,497	4,957		90.7
Flounder, Winter	435	1,076	2,610	9,680	234,000	1.1	4.1
Tuna, Yellowfin	2,188	855	17,501	4,276	51,015	34.3	8.4
Cusk		768		1,535	2,823		54.4
Clam, Stout Tagelus (Stubby Razor/Bamboo)		705		2,818	2,818		100.0
Scallop, Sea		635		3,807	575,015		0.7
Dogfish, Spiny		347		1,735	7,306,603		<0.1

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% Pounds Landed out of Total Massachusetts State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	537	538	537	538		537	538
Bonito, Atlantic	130	344	1,042	3,097	4,201	24.8	73.7
Goosefish	2,299	257	13,796	2,054	165,789	8.3	1.2
Flounder, American Plaice		218		655	61,911		1.1
Cod, Atlantic	419	194	1,258	968	585,844	0.2	0.2
Snail, Slipper Limpet		187		373	373		100.0
Basses, Mixed Sea		140		279	565		49.4
Squid, Shortfin Illex		126		753	1,028		73.3
Hake, Silver		89		356	188,840		0.2
Tuna, Albacore	314	32	1,257	97	4,691	26.8	2.1
Searobins		29		116	154		75.3
Sharks, Chondrichthyes (Class)		10		10			
Dolphinfish	352		2,465		5,797	42.5	
Sharks, Mako	421		2,528		4,029	62.7	
Tuna, Bigeye	864		6,050		20,315	29.8	
Wahoo	55		166		312	53.2	

Source: ACCSP, 2019.
Notes:
Values reflect average pounds landed by species and by statistical subarea.
Confidential information was redacted from the requested data set.
Species are sorted by average pounds caught each year in statistical subarea 538.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-12 Landing Ports Used by Massachusetts State-only Permitted Vessels during 2009-2018 in Statistical Areas 537 and 538

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% of Total Catch from Massachusetts State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	537	538	537	538	537	538		537	538
Barnstable	1,940	137,841	3	127	3,879	1,378,409	4,893,066	0.1	28.2
Barnstable (County)		2,290		26		18,319	1,555,775		1.2
Bass River		53,229		80		479,064	579,929		82.6
Boston		200		5		601	2,404,824		<0.1
Bourne	572	48,501	10	304	5,150	485,006	620,206	0.8	78.2
Chatham (census name for Chatham Center)	1,192	256,396	9	387	9,536	2,563,959	14,079,050	0.1	18.2
Chilmark	17,687	3,982	26	48	123,807	39,823	163,782	75.6	24.3
Cotuit		16,157		31		145,414	1,425,767		10.2
Cuttyhunk		841		7		7,565	7,565		100.0
Dartmouth	15,141	85,977	47	180	136,270	859,767	1,033,194	13.2	83.2
Dennis	388	51,917	4	103	1,163	519,169	6,696,570	<0.1	7.8
Dukes (County)		51		3		102	100		102.0
Eastham		679		8		4,074	625,189		0.7
Edgartown	4,334	215,384	23	113	39,006	2,153,842	2,257,956	1.7	95.4
Fairhaven	50,689	100,555	41	196	506,893	1,005,551	3,725,925	13.6	27.0
Fall River	1,262	61,590	6	46	6,309	554,306	12,279,208	0.1	4.5
Falmouth (census name for Falmouth Center)	6,422	192,888	47	282	64,221	1,928,881	2,118,923	3.0	91.0
Gay Head	432	3,161	6	17	2,162	22,130	25,049	8.6	88.3
Gloucester	432		4		2,592		9,822,240	<0.1	
Harwich Port	351	20,465	8	115	2,108	204,649	591,445	0.4	34.6
Hyannis	1,201	120,164	9	93	7,204	1,081,480	1,257,080	0.6	86.0
Hyannis Port (Hyannisport)		850		8		5,948	7,350		80.9
Lynn		472		4		1,886	109,551		1.7
Marion	588	54,691	3	49	2,351	546,907	558,563	0.4	97.9
Marshfield (census name for Marshfield Compact)		2,489		17		22,402	3,247,865		0.7
Mashpee	688	24,094	6	57	4,131	216,842	256,370	1.6	84.6
Mattapoisett	8,707	60,733	12	102	87,073	607,328	697,571	12.5	87.1
Menemsha	17,450	50,493	50	96	157,051	454,433	620,787	25.3	73.2
Nantucket (census name for Nantucket Center)	8,863	125,468	34	157	79,766	1,254,679	1,495,430	5.3	83.9
New Bedford	481,370	219,931	170	456	4,813,697	2,199,312	11,992,064	40.1	18.3
Oak Bluffs	705	61,221	10	43	5,637	550,990	569,643	1.0	96.7

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in Massachusetts State Waters (2009-2018)	% of Total Catch from Massachusetts State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	537	538	537	538	537	538		537	538
Onset		16,699		28		166,986	173,572		96.2
Orleans		6,263		19		56,367	4,085,400		1.4
Osterville		888		9		5,330	18,818		28.3
Plymouth (census name for Plymouth Center)		5,926		25		53,332	8,237,380		0.6
Provincetown Wharf		510		7		3,572	6,146,964		0.1
Sandwich (census name for Sandwich Center)	36,918	19,569	14	235	369,183	195,689	5,163,988	7.1	3.8
Somerset		1,913		3		9,565	11,173		85.6
Swansea (Swansea Village)		1,313		10		9,190	564,218		1.6
Tisbury (Town of)	1,914	36,173	9	56	17,223	361,731	379,742	4.5	95.3
Truro		400		4		1,200	364,797		0.3
Unknown		39,970		21		113,956	2,131,392		5.3
Vineyard Haven (Town name Tisbury)	665	57,868	12	64	5,989	578,676	587,324	1.0	98.5
Wareham	907	134,526	7	140	4,535	1,345,262	1,361,384	0.3	98.8
Wellfleet		63		6		444	2,121,695		<0.1
West Tisbury		6,142		22		49,133	49,239		99.8
Westport	26,159	163,416	39	314	261,593	1,634,162	1,929,828	13.6	84.7
Woods Hole	1,727	25,804	9	27	13,815	232,237	262,334	5.3	88.5
Yarmouth	339	70,366	4	112	1,697	703,657	917,816	0.2	76.7

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.6 New York State Vessel Trip Reports

The largest fishery by gear category in New York state waters for the years 2009 to 2018 in statistical areas 611 and 613 used otter trawls, yielding average annual landings of 576,114 pounds and accounting for 98 percent of the statewide landings for this gear type. The second largest fishery by gear type used other fixed nets, followed by gill nets, and pots and traps. Table 2.2-13 provides an overview of the gears used in New York state waters (ACCSP, 2019).

Commercial fishermen permitted to fish in New York state waters landed many species from 2009 to 2018. Species with the highest average annual landings by weight in statistical areas 611 and 613 combined included striped bass (540,306 pounds), menhaden (439,932 pounds), and scup (429,999 pounds). A complete summary of all species landed in each statistical area is provided in Table 2.2-14. For several species, landings from the two statistical areas account for over 90 percent of statewide landings; these species include scup, bluefish, whelk, conch, butterfish, black sea bass, bay scallop, smooth dogfish, squid, Atlantic herring, northern sea robins, weakfish, and windowpane.

For the state of New York, the category “unknown” for a port designation claimed the highest landings and total number of active fishing permits, accounting for 45 percent of total statewide landings from statistical areas 611 and 613. Among known ports, Oceanside (620,485 pounds) had the highest average annual landings followed by Shinnecock Indian Reservation (474,331 pounds), Mattituck (290,548 pounds), East Hampton (251,866 pounds) and Greenport (192,106 pounds). The top ports based on the number of active fishing permits were Montauk (145 permits), Shinnecock Indian Reservation (135 permits), Moriches (93 permits), and Hampton Bays (82 permits; Table 2.2-15).

Table 2.2-13 Categories of Gear Used by New York State-only Permitted Vessels during 2009-2018 in Statistical 611 and 613

Gear Category	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Gear	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Beam Trawls	6,787		13,574		13,574	100.0	
By Hand, Diving Gear	876	1,618	5,257	14,565	25,316	20.8	57.5
By Hand, No Diving Gear	91,314	70,700	913,140	707,002	3,479,728	26.2	20.3
Dip Nets	82,635	886	743,711	7,971	2,023,753	36.7	0.4
Dredge	10,053	357,574	100,533	3,218,166	5,469,876	1.8	58.8
Fyke Nets	879	6,281	3,515	56,532	74,223	4.7	76.2
Gill Nets	117,432	408,656	1,174,322	4,086,556	6,637,888	17.7	61.6
Hand Line	325	701	2,276	2,802	7,229	31.5	38.8
Hook and Line	237,069	69,499	2,370,687	694,994	3,881,334	61.1	17.9
Not Coded		321,497		2,250,477	35,378,232		6.4
Other Fixed Nets	482,500	51,744	4,342,501	413,955	4,778,619	90.9	8.7
Other Gears	27,100	8,632	81,300	17,264	150,444	54.0	11.5
Other Seines	148,133	28,469	1,333,197	256,217	1,767,286	75.4	14.5
Other Trawls	12,873	27,159	90,109	81,478	179,240	50.3	45.5
Otter Trawls	407,198	168,916	4,071,983	1,689,163	5,858,347	69.5	28.8
Pots and Traps, Lobster	62,870		628,697		641,516	98.0	
Pots and Traps	344,556	92,863	3,445,564	928,627	9,832,402	35.0	9.4
Pound Nets	145,258	17,837	1,452,583	142,693	1,595,876	91.0	8.9
Rakes		7,817		31,267	75,343		41.5

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-14 Species Landed by New York State-only Permitted Vessels during 2009-2018 in Statistical Areas 611 and 613

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Scup	403,200	26,799	4,032,000	267,988	4,343,179	92.8	6.2
Menhadens	390,071	49,861	3,510,635	498,614	5,727,713	61.3	8.7
Bluefish	276,531	89,047	2,765,306	890,466	3,847,249	71.9	23.1
Bass, Striped	216,413	323,893	2,164,129	3,238,933	5,959,928	36.3	54.3
Lobster, American	202,433	34,636	2,024,332	242,449	2,589,209	78.2	9.4
Flounder, Summer	127,173	24,549	1,271,728	245,492	1,703,933	74.6	14.4
Whelk - Family	123,769	3,562	1,237,685	28,493	1,344,794	92.0	2.1
Crab, Horseshoe	114,738	97,782	1,147,379	977,816	4,063,670	28.2	24.1
Clam, Soft	101,912	15,194	713,387	106,355			
Conch - Family	79,180	320	79,180	320	79,500	99.6	0.4
Whelk, Channeled	66,219	13,546	662,186	108,367	1,021,185	64.8	10.6
Butterfish	56,686	4,402	566,862	44,022	621,550	91.2	7.1
Bass, Black Sea	51,225	11,779	512,250	117,788	671,627	76.3	17.5
Tautog	46,869	1,761	468,685	17,607	680,481	68.9	2.6
Scallop, Bay	30,858	4,927	308,578	44,344	352,981	87.4	12.6
Dogfish, Smooth	22,680	5,648	226,803	56,484	293,642	77.2	19.2
Squid, Longfin Loligo	20,892	105,061	208,918	945,545	1,156,323	18.1	81.8
Herring, Atlantic	11,874	7,152	118,736	35,761	158,697	74.8	22.5
Searobins, North American	10,538	2,832	73,769	19,824	94,961	77.7	20.9
Crabs, Hermit, Pagurus (Genus)	8,995	1,980	35,981	5,941	59,821	60.1	9.9
Crabs, Spider	8,224	3,471	57,567	20,824	176,411	32.6	11.8
Weakfish	7,991	6,678	79,906	66,778	157,927	50.6	42.3
Windowpane	6,895	2,475	68,950	24,747	94,562	72.9	26.2
Crab, Atlantic Rock	6,329	1,601	56,960	8,006	291,367	19.5	2.7
Surfclam, Atlantic	6,282	768,913	12,563	4,613,477	22,139,355	0.1	20.8
Searobins	6,089	187	54,803	1,123	56,563	96.9	2.0
Silversides, Atherinidae (Family)	5,995	4,638	35,968	41,741	185,827	19.4	22.5
Crab, Blue	5,931	17,595	59,306	175,953	4,065,251	1.5	4.3
Skates, Raja (Genus)	5,516	23,667	55,156	213,006	268,170	20.6	79.4
Crab, Green	5,319	6,368	31,913	50,942	510,966	6.2	10.0
Whelk, Knobbed	4,864	1,498	48,640	7,491	59,150	82.2	12.7
Perch, White	4,003	432	36,024	4,324	40,377	89.2	10.7
Skates, Rajidae (Family)	3,848	33,125	38,475	298,127	336,795	11.4	88.5
Spot	3,816	931	34,345	8,375	43,716	78.6	19.2
Eel, American	3,549	4,208	35,490	42,078	212,649	16.7	19.8
Crab, Jonah	2,775	24,882	16,647	223,937	1,086,936	1.5	20.6
Mussel, Sea	2,038	3,051	14,267	21,356	38,373	37.2	55.7
Flounder, Winter	1,821	2,374	18,212	23,740	44,782	40.7	53.0
Flounder, American Plaice	1,079	405	10,790	2,832	13,622	79.2	20.8
Puffer, Northern	995	266	7,962	2,663	15,780	50.5	16.9
Clam Atlantic Razor	989	17,646	4,946	123,523	3,525,195	0.1	3.5

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Mackerel, Atlantic	871	768	6,965	5,373	13,707	50.8	39.2
Goosefish	864	8,257	7,780	82,568	90,452	8.6	91.3
Silverside, Atlantic	698	1,448	4,883	8,690	20,963	23.3	41.5
Jack, Crevalle	619	91	5,570	548	6,118	91.0	9.0
Crab, Lady	607		1,821		10,073	18.1	
Tuna, Little Tunny	570	971	4,560	8,739	13,847	32.9	63.1
Tuna, Albacore	557	1,173	3,897	5,867	10,496	37.1	55.9
Bonito, Atlantic	402	1,155	4,021	9,243	13,365	30.1	69.2
Shad, Hickory	400	642	3,196	6,421	9,618	33.2	66.8
Kingfish, Northern	387	400	3,485	3,196	7,301	47.7	43.8
Whelk, Waved	357		2,497		46,447	5.4	
Mackerel, Spanish	354	251	3,536	2,515	7,065	50.0	35.6
Hake, Red	292	833	2,920	8,326	17,764	16.4	46.9
Tuna, Skipjack	240		2,163		2,175	99.4	
Dogfish, Spiny	218	1,877	1,306	16,892	30,474	4.3	55.4
Toadfish, Oyster	206		1,850		1,968	94.0	
Herring, Blueback	195		780		5,460	14.3	
Squid, Shortfin Illex	190		1,141		1,205	94.7	
Triggerfishes	190	172	1,901	1,550	4,155	45.7	37.3
Shad, Gizzard	139		1,253		1,545	81.1	
Amberjacks	122		854		855	99.9	
Shrimps, Mantis	121		1,088		1,088	100.0	
Shad, American	120	474	838	3,791	10,355	8.1	36.6
Four spot Flounder, American	118		705		1,663	42.4	
Cod, Atlantic	114	558	916	5,581	8,172	11.2	68.3
Cunner	97	20	778	121	913	85.2	13.3
Mackerel, Atlantic Chub	96	4	288	11	299	96.3	3.7
Drum, Black	96	42	862	250	1,112	77.5	22.5
Cobia	94	28	658	85	767	85.8	11.1
Mackerel, King	70	8	417	34	456	91.5	7.4
Searobin, Northern	63	473	125	473	598	20.9	79.1
Herrings	53	111	106	221	327	32.4	67.6
Garfishes	53	5	423	18	441	95.9	4.1
Snappers, Lutjanidae (Family)	51		204		205	99.5	
Sculpins	44		131		131	100.0	
Hake, White	42		250		388	64.4	
Hake, Silver	35	613	242	5,516	8,135	3.0	67.8
Runner, Blue	25		101		101	100.0	
Croaker, Atlantic	23	27	181	165	655	27.7	25.1
Raven, Sea	22		110		110	100.0	
Pompano, Florida	18		53		56	94.6	
Eel, Conger	13		94		276	34.0	
Pollock	12		24		323	7.4	

Species	Average Pounds Landed per Year (2009-2018)		Total Pounds Landed (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% Pounds Landed out of Total New York State Waters, by Species	
	Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613		611	613
Ladyfish	10		41		46	89.1	
Mullets	6		31		55	56.4	
Toadfishes, Batrachoididae (Family)	6		18		18	100.0	
Spadefish, Atlantic	5		21		23	91.3	
Kingfishes	2		6		159	3.8	
Ark, Blood		870		2,610	6,395		40.8
Clam, Northern Quahog		53,201		425,608	10,696,504		4.0
Flounder, Yellowtail		208		831	831		100.0
Oyster, Eastern		7,446		52,125			
Pitar		2,791		13,953	13,953		100.0
Puffers, Tetraodontidae (Family)		30		61	401		15.1
Shark, Thresher		203		1,014	5,693		17.8

Source: ACCSP, 2019.
Notes:
Values reflect average pounds landed by species and by statistical subarea.
Confidential information was redacted from the requested data set.
Species are sorted by average pounds caught each year in statistical subarea 611.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-15 Landing Ports Used by New York State-only Permitted Vessels during 2009-2018 in Statistical Areas 611 and 613

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% of Total Catch from New York State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613	611	613		611	613
Amagansett	98,953	12,561	35	24	989,528	125,612	1,115,432	88.7	11.3
Babylon		4,090		5		20,450	678,556		3.0
Bronx (Borough of New York)	17,748		2		53,244		53,813	98.9	
Bronx (County)	10,338		6		72,363		72,363	100.0	
Brooklyn (Borough of New York)	210		4		631		693,732	0.1	
Center Moriches		9,209		18		82,883	154,246		53.7
City Island	7,273		7		72,729		74,549	97.6	
East Hampton	242,505	9,361	49	27	2,425,047	93,607	2,518,784	96.3	3.7
East Moriches	390	26,458	3	28	1,171	264,577	334,774	0.3	79.0
Freeport	635	60,272	3	6	3,173	482,173	2,477,408	0.1	19.5
Glen Cove	3,477		9		34,770		37,440	92.9	
Greenport	192,106		47		1,921,063		1,923,573	99.9	
Hampton Bays	16,239	100,958	18	64	162,391	1,009,584	1,196,841	13.6	84.4
Huntington	10,456		13		94,101		94,186	99.9	
Islip		2,959		5		8,876	547,025		1.6
Mastic		523		4		1,047	1,068		98.0
Mattituck	271,813	18,735	53	10	2,718,130	187,349	2,942,341	92.4	6.4
Montauk	172,390	57,132	145	128	1,723,900	571,320	2,311,777	74.6	24.7
Moriches	3,060	82,883	16	77	21,422	828,826	1,066,133	2.0	77.7
Mount Sinai	131,071	1,341	45	6	1,310,709	10,724	1,328,395	98.7	0.8
Nassau (County)		12,604		2		63,021	687,651		9.2
New Suffolk	3,856	614	11	5	34,705	3,070	37,775	91.9	8.1
Northport	48,621		18		486,211		486,969	99.8	
Oceanside		620,485		8		2,481,939	2,992,157		82.9
Orient	22,633	473	41	3	226,328	1,419	228,303	99.1	0.6
Oyster Bay	4,523		7		45,232		45,232	100.0	
Patchogue	4,216	8,159	5	9	16,865	65,274	780,273	2.2	8.4
Port Jefferson	6,377		17		63,768		63,841	99.9	
Port Washington	23,214		8		185,714		186,224	99.7	
Queens (County)	22,231		11		222,311		1,049,840	21.2	
Riverhead	100,390	3,533	20	7	1,003,903	31,797	1,036,000	96.9	3.1
Sag Harbor	34,298		10		342,976		344,185	99.6	
Setauket	1,359		3		6,796		6,796	100.0	
Shelter Island	101,235	849	12	3	708,647	1,698	710,445	99.7	0.2
Shinnecock Indian Reservation	101,556	372,775	29	106	1,015,557	3,727,751	4,816,517	21.1	77.4
Smithtown	959		4		6,713		7,484	89.7	
South Jamesport	4,200		7		25,200		25,200	100.0	
Southampton	18,168	31,667	9	6	54,503	63,335	120,094	45.4	52.7
Southold	22,343	5,251	28	4	223,426	21,006	276,423	80.8	7.6
Springs	25,956		3		51,912		54,055	96.0	
Stony Brook	9,143		19		91,425		92,458	98.9	

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)		Total number of Active Fishing Permits		Total Pounds Landed by Subarea (2009-2018)		Total Pounds Landed in New York State Waters (2009-2018)	% of Total Catch from New York State Waters, by Port	
	Statistical Areas		Statistical Areas		Statistical Areas			Statistical Areas	
	611	613	611	613	611	613		611	613
Suffolk (County)	38,018	4,757	7	11	380,181	23,784	496,486	76.6	4.8
Unknown	1,579,150	631,070	477	413	15,791,503	4,417,490	45,281,089	34.9	9.8
Wainscott	57,218		5		572,182		576,454	99.3	

Source: ACCSP, 2019.

Notes:

Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.

Confidential information was redacted from the ACCSP data set.

Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.

Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.7 Rhode Island State Vessel Trip Reports

The largest fishery by landings in Rhode Island state waters in statistical areas 538, 539, and 611 combined for the years 2009 to 2018 used pots and traps (792,343 pounds) and was concentrated in statistical area 539. Other top gear type categories by landings included other fixed nets (540,644 pounds), hook and line (401,508 pounds) and otter trawls (324,192 pounds). Landings for each gear type fished within statistical areas 538, 539, and 611 accounted for over 90% of the statewide landings for that gear type. Table 2.2-16 provides an overview of the gears used in Rhode Island state waters (ACCSP, 2019).

From 2009 to 2018, commercial fishermen permitted to fish in Rhode Island state waters landed many different species, including in order of highest landings from statistical areas 538, 539, and 611 combined by weight, scup (816,584 pounds), channeled whelk, (358,510), summer flounder (255,120 pounds), menhaden (250,306 pounds), and striped bass (135,556 pounds). A complete summary of all species landed in these statistical areas is provided in Table 2.2-17. The majority of species came from area 539, and the landings from the three statistical areas accounted for over 90 percent of the statewide landings for most species.

The top ports where fishermen landed their catch from fishing in all Rhode Island state waters were Point Judith, Little Compton, Newport, Bristol, and North Kingstown. Point Judith was the port with the highest average annual landings (680,126 pounds) and the largest number of active fishing permits (469 permits; Table 2.2-18).

Table 2.2-16 Categories of Gear Used by Rhode Island State-only Permitted Vessels during 2009-2018 in Statistical Areas 538, 539, and 611

Gear Category	Average Pounds Landed per Year (2009-2018) Statistical Areas 538	539	611	Total Pounds Landed (2009-2018) Statistical Areas 538	539	611	Total Pounds Landed in Rhode Island State Waters (2009-2018)	% Pounds Landed out of Total Rhode Island State Waters, by Gear Statistical Areas 538	539	611
By Hand, Diving Gear		5,345			42,759		44,209		96.7	
By Hand, No Diving Gear		45,760			366,078		366,559		99.9	
Dip Nets		7,866			62,925		64,272		97.9	
Dredge		130			520		520		100.0	
Gill Nets		202,887			1,623,097		1,635,066		99.3	
Hand Line		2,242			17,939		18,297		98.0	
Hook and Line	359	388,116	13,033	1,795	3,881,157	117,301	4,013,013	<0.1	96.7	2.9
Long Lines		1,880			13,158		13,177		99.9	
Other Fixed Nets		540,644			4,325,156		4,325,177		100.0	
Other Trawls		32,655			195,930		195,930		100.0	
Otter Trawls		324,192			2,593,534		2,600,214		99.7	
Pots and Traps, Lobster		58,494	2,413		526,445	19,302	546,357		96.4	3.5
Pots and Traps, Other		14,249			128,238		128,274		100.0	
Pots and Traps		757,048	35,295		6,813,434	317,659	7,138,933		95.4	4.4
Rakes		4,629			32,405		32,428		99.9	
Spears		3,217			25,735		26,095		98.6	

Source: ACCSP, 2019.

Notes:

Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.

Confidential information was redacted from the ACCSP data set.

Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.

Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-17 Species Landed by Rhode Island State-only Permitted Vessels during 2009-2018 in Statistical Areas 538, 539, and 611

Species	Average Pounds Landed per Year (2009-2018) Statistical Areas			Total Pounds Landed (2009-2018) Statistical Areas			Total Pounds Landed in Rhode Island State Waters (2009-2018)	% Pounds Landed out of Total Rhode Island State Waters, by Species Statistical Areas		
	538	539	611	538	539	611		538	539	611
Scup		781,887	34,697		7,818,873	312,277	8,135,213		96.1	3.8
Whelk, Channeled		354,286	4,224		3,188,578	16,895	3,209,786		99.3	0.5
Menhadens		250,306			2,002,448		2,219,066		90.2	
Flounder, Summer		248,476	6,644		2,236,288	59,793	2,298,164		97.3	2.6
Skates, Rajidae (Family)		134,682			1,077,456		1,077,613		100.0	
Bass, Striped	448	132,481	2,627	1,790	1,192,327	21,018	1,218,776	0.1	97.8	1.7
Bass, Black Sea		97,625	2,360		781,003	21,242	803,422		97.2	2.6
Searobins		57,726	6		461,807	23	461,843		100.0	<0.1
Bluefish	38	47,408	218	115	379,263	1,523	388,506	<0.1	97.6	0.4
Conch - Family		45,035			225,176		225,199		100.0	
Crab, Horseshoe		40,325			322,601		815,188		39.6	
Lobster, American		37,259	2,238		335,327	17,904	353,841		94.8	5.1
Butterfish		34,970			279,760		279,966		99.9	
Squid, Longfin Loligo		33,490			267,923		268,256		99.9	
Tautog		32,624	569		260,990	4,552	266,886		97.8	1.7
Crab, Atlantic Rock		23,549			211,937		211,973		100.0	
Whelk, Knobbed		20,613			144,292		144,702		99.7	
Skate, Little		16,229			113,600		113,600		100.0	
Tuna, Little Tunny		13,353			93,473		94,710		98.7	
Crab, Green		12,834			102,668		102,668		100.0	
Herring, Atlantic		12,628			88,394		88,394		100.0	
Eel, Conger		7,823			62,583		62,710		99.8	
Crab, Jonah		7,590			60,716		60,716		100.0	
Shrimps, Mantis		6,798			27,190		30,827		88.2	
Flounder, Winter		6,692			53,535		53,556		100.0	
Bonito, Atlantic		6,303			50,422		50,634		99.6	
Quahog, Ocean		5,708			17,124		17,124		100.0	
Dogfish, Spiny		5,179			41,435		41,435		100.0	
Cod, Atlantic		4,864			38,916		38,977		99.8	
Dogfish, Smooth		4,529			36,232		37,040		97.8	
Shad, Hickory		4,298			12,893		12,893		100.0	
Eel, American		3,708			29,666		30,000		98.9	
Hake, Silver		2,973			23,784		23,784		100.0	
Triggerfish, Gray		2,613			20,904		20,910		100.0	
Crustaceans		2,163			4,325		4,325		100.0	
Clam, Northern Quahog		2,140			10,698		10,698		100.0	
Goosefish		2,090			16,722		16,722		100.0	
Hake, Red		1,701			13,610		13,610		100.0	
Skate, Winter		1,691			13,526		13,526		100.0	
Triggerfishes		1,663			13,301		13,307		100.0	
Mackerel, Atlantic		1,568			12,545		12,545		100.0	

Species	Average Pounds Landed per Year (2009-2018)			Total Pounds Landed (2009-2018)			Total Pounds Landed in Rhode Island State Waters (2009-2018)	% Pounds Landed out of Total Rhode Island State Waters, by Species		
	Statistical Areas			Statistical Areas				Statistical Areas		
	538	539	611	538	539	611		538	539	611
Searobin, Striped		1,415			7,077		7,077		100.0	
Crabs, Spider		1,393			5,573		5,573		100.0	
Mollusks		1,378			2,756		2,755		100.0	
Tuna, Yellowfin		1,318			10,543		14,358		73.4	
Spot		904			2,711		2,711		100.0	
Weakfish		757			6,055		6,135		98.7	
Crabs, Brachyura		710			2,841		2,841		100.0	
Searobin, Northern		578			2,888		2,888		100.0	
Hake, White		514			3,084		3,084		100.0	
Cunner		449	6		3,590	18	3,710		96.8	0.5
Tuna, Bigeye		441			2,646		4,480		59.1	
Squid, Shortfin Illex		338			2,367		2,367		100.0	
Clam, Soft		326			1,631		1,631		100.0	
Oyster, Eastern		274			547		547		100.0	
Cobia		206			1,651		1,651		100.0	
Windowpane		205			1,638		1,638		100.0	
Kingfish, Northern		198			1,587		1,587		100.0	
Skate, Big		187			1,124		1,124		100.0	
Shark, Sandbar		180			541		541		100.0	
Dolphinfish		178			1,066		1,377		77.4	
Raven, Sea		166			1,330		1,401		94.9	
Crab, Blue		148			738		738		100.0	
Tuna, Bluefin		144			866		2,066		41.9	
Tuna, Albacore		139			836		943		88.7	
Mullet, Striped		119			119		119		100.0	
Grouper, Yellowedge		83			83		83		100.0	
Snapper, Gray		77			153		153		100.0	
Amberjacks		73			219		219		100.0	
Flounder, Southern		55			111		111		100.0	
Flounder, American Plaice		43			85		85		100.0	
Shad, American		37			223		223		100.0	
Kingfishes		33			132		132		100.0	
Hakes, Red and White		25			126		126		100.0	
Flounder, Yellowtail		23			163		163		100.0	
Pollock		13			26		26		100.0	
Runner, Blue		5			16		16		100.0	

Source: ACCSP, 2019.

Notes:

Values reflect average pounds landed by species and by statistical subarea.

Confidential information was redacted from the requested data set.

Species are sorted by average pounds caught each year in statistical subarea 539.

Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.

Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

Table 2.2-18 Landing Ports Used by Rhode Island State-only Permitted Vessels during 2009-2018 in Statistical Areas 538, 539, and 611

Landing Port	Average Pounds Landed per Year by Subarea (2009-2018)			Total number of Active Fishing Permits			Total Pounds Landed by Subarea (2009-2018)			Total Pounds Landed in Rhode Island State Waters (2009-2018)	% of Total Catch from Rhode Island State Waters, by Port		
	Statistical Areas			Statistical Areas			Statistical Areas				Statistical Areas		
	538	539	611	538	539	611	538	539	611		538	539	611
Barrington		5,251			12			42,005		42,005		100.0	
Bristol		196,716			61			1,573,730		1,576,268		99.8	
Bristol (County)		329			5			987		987		100.0	
Charlestown		26,190	806		38	3		209,519	6,450	216,077		97.0	3.0
Davisville		248			6			1,240		1,240		100.0	
East Greenwich		7,056			35			56,447		56,470		100.0	
Jamestown		24,367			32			194,932		194,932		100.0	
Little Compton		605,416			51			4,843,330		4,854,883		99.8	
Middletown		2,183			3			10,914		10,914		100.0	
Narragansett (census name Narragansett Pier)		381			6			1,144		1,392		82.2	
New Shoreham		2,170			9			17,362		17,362		100.0	
Newport		426,256			80			3,836,305		4,017,574		95.5	
Newport (County) (in PMSA 2480,6480)		11,869			4			59,347		59,445		99.8	
North Kingstown (local name Wickford)		145,080			97			1,160,644		1,167,684		99.4	
Point Judith	128	672,982	7,016	3	459	7	128	6,056,834	42,098	6,103,311	<0.1	99.2	0.7
Portsmouth		82,392			37			659,140		668,046		98.7	
Providence		27,182			13			244,640		244,818		99.9	
Providence (County) (in PMSA 6060,6480)		2,289			10			13,735		13,735		100.0	
South Kingstown (Town of)		19,535			69			156,279		156,422		99.9	
Tiverton		106,842			49			854,738		854,770		100.0	
Unknown		35,798	1,884		64	4		322,183	5,652	327,847		98.3	1.7
Wakefield		3,306			21			26,446		26,446		100.0	
Warren		26,374			38			210,993		211,061		100.0	
Warwick (RR name Apponaug)		144,786			97			1,158,290		1,158,563		100.0	
Westerly (census name Westerly Center)		57,985	55,330		78	29		463,884	442,639	906,523		51.2	48.8

Source: ACCSP, 2019.
Notes:
Values reflect pounds landed caught in statistical subareas relevant to RWF and RWEC.
Confidential information was redacted from the ACCSP data set.
Blank cells indicate those years when the fishing area had no reported landings or redacted confidential landings.
Average pounds landed were calculated as an arithmetic mean, using the sum of pounds landed and the count of distinct years, ignoring zero years.

2.2.8 Marine Recreational Information Program (MRIP)

The MRIP integrates a coast-wide intercept survey throughout the year to estimate recreational fishing effort. The following section presents data provided by NOAA Fisheries through a custom data request and data accessed from the MRIP online data portal (NOAA Fisheries, 2019b). The effort and catch data from Connecticut, Massachusetts, New York, and Rhode Island comprise all of the states of origin identified for recreational anglers, accessed from a custom request and the online MRIP data portal. MRIP data indicated that recreational fishing effort seasonally increased in frequency from March through August, reaching its peak intensity by shore (e.g., surfcasting) and in both federal and state waters by private or for-hire/charter vessel in July and August (Figure 2.2-22).

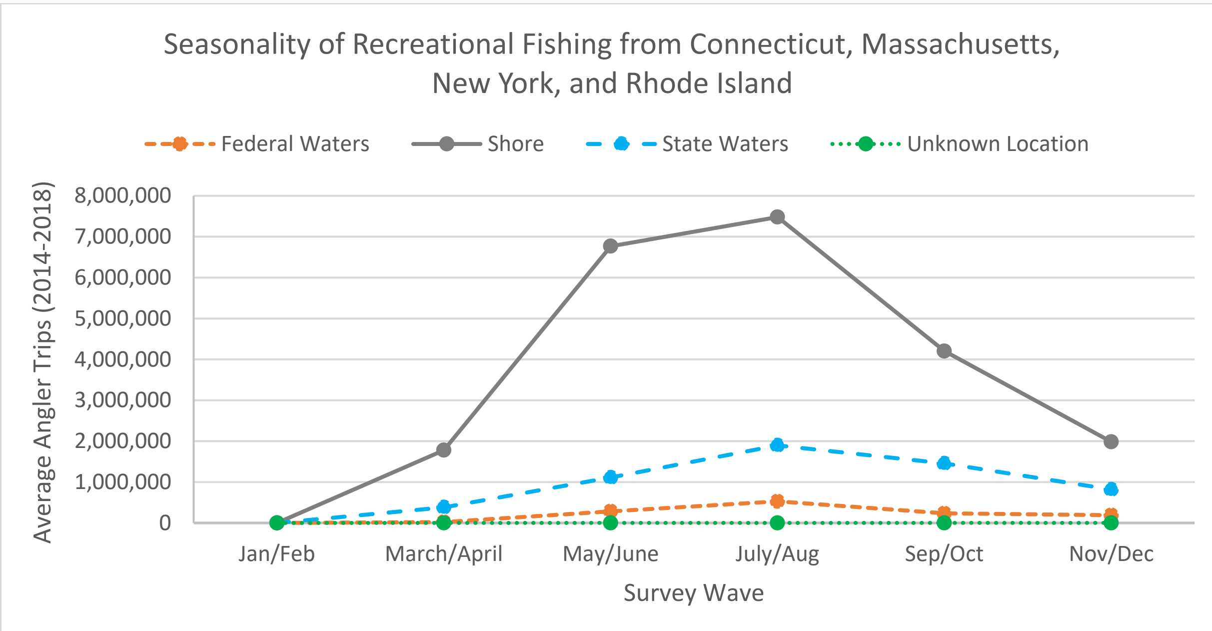

Figure 2.2-22 Average of Estimated Fishing Effort by Recreational Anglers for the Years 2014 to 2018 in Connecticut, Massachusetts, New York, and Rhode Island

Notes: Angler-trip survey data includes trips where fishing location is not recorded, noted as "unknown location" in the figure.
State waters includes water from shore to 3 miles (4.8 kilometers, 2.6 nautical miles); federal waters include waters greater than 3 miles (4.8 kilometers, 2.6 nautical miles) from shore.
Source: NOAA Fisheries, 2019b.

MRIP data were used to estimate relative angler effort for those states with coastlines relatively close to the RWF. Angler effort was categorized by mode (for-hire or charter, private, shore) and by location (federal waters, state waters, and shoreside). There was no spatial information associated with MRIP data; thus, there was no way to determine where fishing trips took place in state or federal waters. These values, therefore, were meant to provide a qualitative overview of angler effort and seasonal changes in activity.

The MRIP survey methods were designed to estimate recreational fishing effort aggregated at the state and regional level. For this reason, the standard error for estimates disaggregated to smaller units than the state level (i.e., county) was very high and indicates weak estimates for fishing activity.

Based on estimates of recreational angler effort disaggregated to the state level, New York state had the greatest average estimated number of angler trips each year (about 14.9 million) for the years 2014 to 2018, most of which visited New York state waters (Table 2.2-19). Of the recreational trips out of New York state that visited New York state waters, 41 percent used private fishing vessels, and 57 percent were shoreside fishing trips (Table 2.2-20).

Of the approximately 7.6 million recreational fishing trips leaving from Massachusetts for the years 2014-2018 (Table 2.2-19), most trips were to fish in Massachusetts state waters. Of the trips to Massachusetts state waters leaving from Massachusetts, 39 percent were on a private fishing vessel, and 59 percent were shoreside fishing trips (Table 2.2-20). Out of approximately 3.8 million recreational fishing trips leaving from Connecticut during this period, the vast majority of trips were to fish in Connecticut state waters (Table 2.2-19). Of the trips to Connecticut state waters leaving from Connecticut, 39 percent were on a private fishing vessel, and 59 percent were shoreside fishing trips (Table 2.2-20). Connecticut recreational fishermen mostly remained in Connecticut state waters for recreational fishing trips.

Out of the nearly 2.9 million recreational fishing trips leaving from Rhode Island, most of the trips were to fish in Rhode Island state waters (Table 2.2-19), with 32 percent of these trips on a private fishing vessel and 67 percent as shoreside fishing trips. For Massachusetts, New York, Connecticut, and Rhode Island, the majority of trips to federal waters were on private vessels, as opposed to charter vessels.

Table 2.2-19 Average Annual Fishing Effort for Recreational Fishing by Mode (Charter Vessel, Private, and Shore Fishing) and by Fishing Area based on MRIP Data (2014-2018)

State	Fishing Area	Average Fishing Effort (Value/5 years)			
		Charter	Private	Shore	Total
Connecticut					
	Federal	4,670	28,693	-	33,364
	State	45,389	1,502,689	2,257,479	3,805,557
	Unknown	-	-	-	-
Connecticut Totals		50,059	1,531,382	2,257,479	3,838,920
Massachusetts					
	Federal	48,612	387,804	-	436,416
	State	111,956	2,790,270	4,224,112	7,126,337
	Unknown	125	-	-	125
Massachusetts Totals		160,693	3,178,074	4,224,112	7,562,879
New York					
	Federal	71,834	609,818	-	681,652
	State	295,414	5,749,305	8,136,501	14,181,220
	Unknown	26	-	-	26
New York Totals		367,274	6,359,123	8,136,501	14,862,898
Rhode Island					
	Federal	12,561	96,011	-	108,572
	State	32,786	892,361	1,836,805	2,761,952
	Unknown	327	-	-	327
Rhode Island Totals		45,674	988,372	1,836,805	2,870,851

Source: NOAA Fisheries, 2019b

Notes:

Unknown location indicates missing data in trip report.

Trips to federal waters cannot take place onshore; therefore, the table cells are marked with “-" because there is no number of trips available.

Trips to state waters include trips that take place onshore, and in charter or private fishing vessels.

Charter boats include party boat and charter boat trips.

Federal waters include waters greater than 3 miles [4.8 kilometers, 2.6 nautical miles]) from shore, state waters include trips that take place inland (onshore and inshore bodies of saltwater or brackish water) and in water less than 3 miles [4.8 kilometers, 2.6 nautical miles] from shore.

Table 2.2-20 Percent of Average Annual Fishing Effort by Mode and Fishing Area, Out of State Totals based on MRIP Data (2014-2018)

State	Fishing Area	% of Total State Angler Trips (based on average values)		
		Charter	Private	Shore
Connecticut				
	Federal	14	86	0
	State	1	39	59
	Unknown	0	0	0
Connecticut Totals		1	40	59
Massachusetts				
	Federal	11	89	0
	State	2	39	59
	Unknown	100	0	0
Massachusetts Totals		2	42	56
New York				
	Federal	11	89	0
	State	2	41	57
	Unknown	100	0	0
New York Totals		2	43	55
Rhode Island				
	Federal	12	88	0
	State	1	32	67
	Unknown	100	0	0
Rhode Island Totals		2	34	64

Source: NOAA Fisheries, 2019b
Notes:
Unknown location indicates missing data in trip report.
Trips to federal waters cannot take place onshore; therefore, shore trips comprise 0% of all trips to federal waters.
Trips to state waters include trips that take place onshore, and in charter or private fishing vessels.
Charter boats include party boat and charter boat trips.
Federal waters include waters greater than 3 miles [4.8 kilometers, 2.6 nautical miles]) from shore, state waters include trips that take place inland (onshore and inshore bodies of saltwater or brackish water) and in water less than 3 miles [4.8 kilometers, 2.6 nautical miles] from shore.

2.2.9 Aquaculture

Aquaculture sites in the area of interest occur along the Rhode Island shoreline, Block Island, and throughout Narragansett Bay (Figure 2.2-23). The proposed RWEC cable corridor is within the geographic range of aquaculture sites depicted in Figure 2.2-24. The RWEC fisheries study corridor to Quonset Point in North Kingstown, Rhode Island overlaps several aquaculture sites in Narragansett Bay; however, the RWEC centerline does not intersect any of these sites (Figure 2.2-24). The closest aquaculture site to the RWEC centerline is located on Conanicut Island, approximately 425 m from the centerline (Figure 2.2-24).

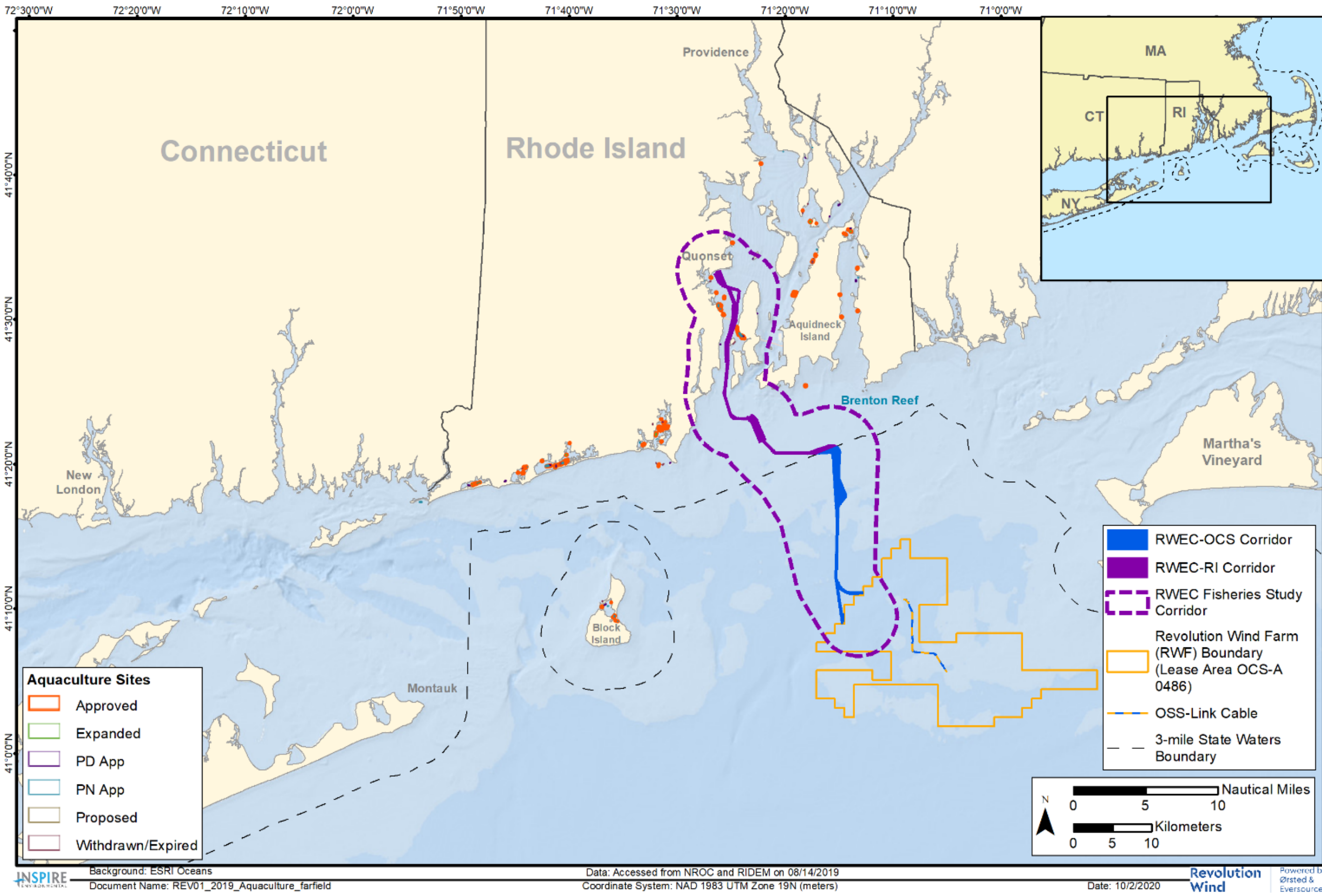

Figure 2.2-23 Map of the OCS-A-0486 Lease Area, Proposed RWEC Corridor, Fisheries Study Corridor, and Aquaculture Sites

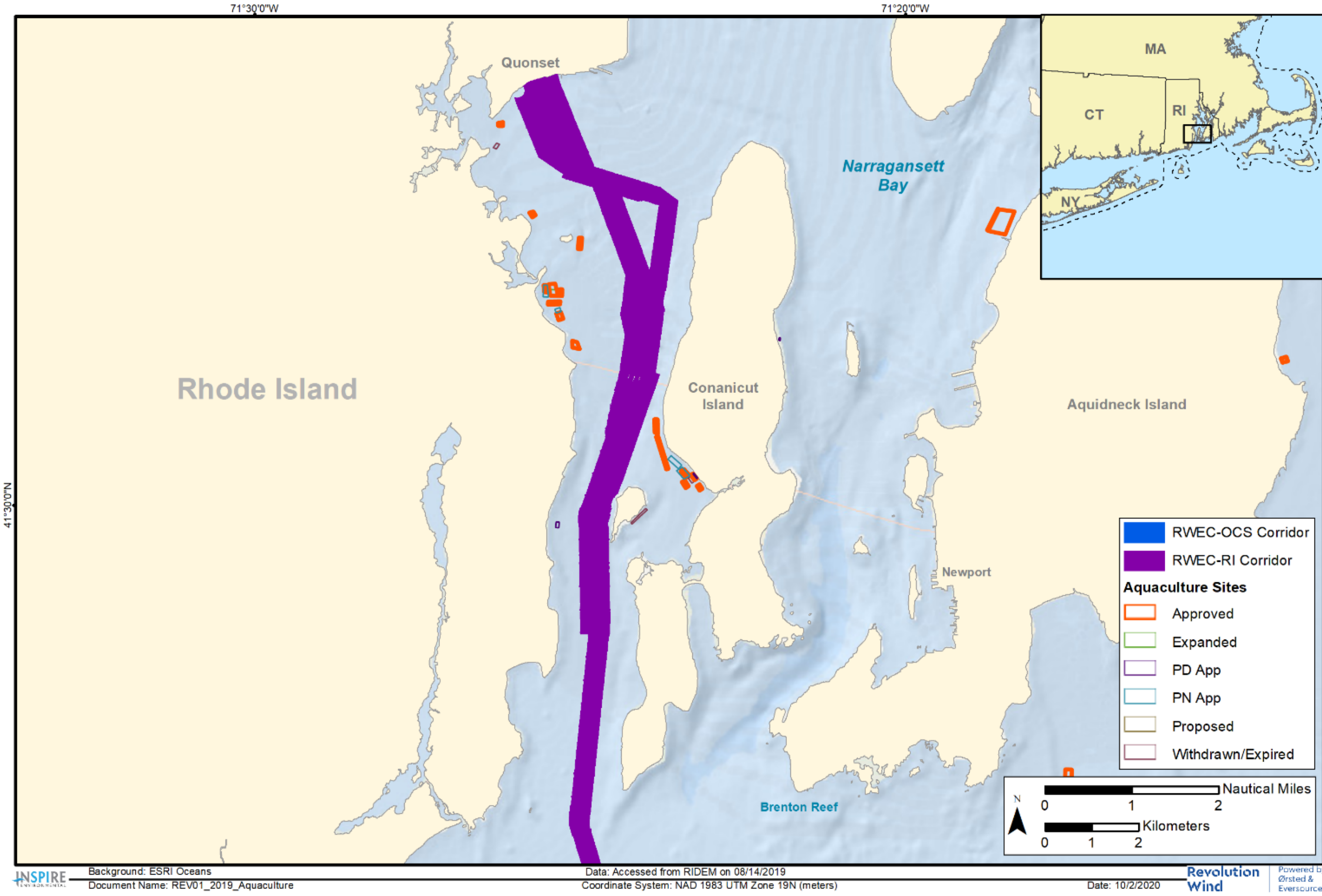

Figure 2.2-24 Map of Proposed RWEC Corridor and the Location of Aquaculture Sites in Narragansett Bay

2.3 Summary

Multiple data sources were used to assess commercial and recreational fisheries activity in the RWF and RWEC fisheries study corridor. Federal (VTR and VMS), state VTR, MRIP, and aquaculture data sources allowed an evaluation of the relative intensity of these fisheries, along with their economic value in the area. Fisheries activities are summarized separately below for the RWF and RWEC fisheries study corridor and by data source. For the VMS data, the highest fishing density category reported for any year analyzed is used in this summary and it should be noted that only the intensity level is summarized, not spatial coverage.

Federal VTR - RWF

- The top fisheries in terms of revenue used bottom trawl, pot, sink gillnet, and dredge.
- In terms of pounds landed, the top gears by revenue were the bottom trawl, sink gillnet, and mid-water trawl.
- The top species in terms of revenue were lobster, flounders, hakes, Atlantic herring, scup, squid, black sea bass, and channeled whelk.
- The top species in terms of pounds landed were Atlantic herring, Atlantic mackerel, and hakes.
- In order of descending percent of total state landings from the RWF, Rhode Island (1.14%), Massachusetts (0.30%), New York (0.08%), and Connecticut (0.08%) had vessels with fishing activity in the RWF.

Federal VTR - RWEC Fisheries Study Corridor

- The top fisheries in terms of revenue used bottom trawl, mid-water trawl, pot, and sink gillnet.
- In terms of pounds landed, the top gears by revenue were the mid-water trawl, bottom trawl, sink gillnet, and pot.
- The top species in terms of revenue were Atlantic herring, lobster, squid, flounders, scup, butterfish, hakes, black sea bass, and spiny dogfish.
- The top species in terms of pounds landed were Atlantic herring, scup, squid, spiny dogfish, hakes, and Atlantic mackerel.
- In order of descending percent of total state landings from the RWEC, Rhode Island (3.53%), Massachusetts (1.18%), and Maine (0.06%) had vessels with fishing activity in the RWF fisheries study corridor.

Federal VMS - RWF

- Fisheries that had the most activity in the RWF were Atlantic herring, surfclam/ocean quahog, sea scallop, squid/mackerel/butterfish, monkfish, and groundfish (large-mesh multispecies or northeast multispecies FMPs).
- Very-high or high-density fishing activity was reported for groundfish, pelagic species (herring/mackerel/squid), monkfish, surfclam/ocean quahog, sea scallops, and squid.
- Medium-high density fishing activity was reported for Atlantic herring.

Federal VMS - RWEC Fisheries Study Corridor

- Fisheries that had the most activity in the RWEC fisheries study corridor were Atlantic herring, surfclam/ocean quahog, sea scallop, squid/mackerel/butterfish, monkfish, and groundfish (large-mesh multispecies or northeast multispecies FMPs).
- Very-high or high-density fishing activity occurred within the RWEC fisheries study corridor for groundfish, Atlantic herring, pelagic species (herring/mackerel/squid), monkfish, squid.
- Medium-low to low density fishing activity was reported for surfclam/ocean quahog, sea scallops.

VTR Data as Rasters - RWF

- Relatively moderate-revenue fish activity occurred in the RWF for monkfish and surfclam/quahog.
- Relatively low-revenue fishing activity occurred in the RWF for groundfish, Atlantic herring, pelagics (midwater trawl), sea scallops, and lobsters.

VTR Data as Rasters - RWEC Fisheries Study Corridor

- Relatively high-revenue fishing activity within the RWEC fisheries study corridor occurred for Atlantic herring and pelagic species (midwater trawl),
- Relatively moderate- to low-revenue fishing activity occurred for lobsters along the RWEC fisheries study corridor.
- No revenue generating fishing activity within the RWEC fisheries study corridor was recorded for groundfish, monkfish, surfclam/quahog, or sea scallops.

State VTRs

Connecticut

- The top gear types by pounds landed were pots and traps, otter trawls, and lobster pots and traps.

- The top species by average annual pounds landed were conch, menhaden, lobster, scup, horseshoe crabs, summer flounder, and American shad.
- The top ports by pounds landed were Stonington, Old Saybrook, New London, Guilford, and Clinton.

Massachusetts

- The top gear types by pounds landed were pots and traps, hook and line, and lobster pots and traps.
- The top gear species by average annual pounds landed were brachyuran crabs, channeled whelk, northern quahog clam, scup, striped bass, bay scallop, black sea bass, whelk, horseshoe crab, eastern oysters, and soft clams.
- The top ports by landed by state-only, permitted vessels were New Bedford, Chatham, Edgartown, Falmouth, and Westport.

New York

- The top gear types by pounds landed were otter trawls, other fixed nets, gill nets, and pots and traps.
- The top species by average annual pounds landed were striped bass, menhaden, scup, bluefish, lobster, horseshoe crab, and summer flounder.
- The top ports by pounds landed were Oceanside, Shinnecock Indian Reservation, Mattituck, East Hampton, and Greenport.

Rhode Island

- The top gear types by pounds landed were pots and traps, fixed nets, hook and line, and otter trawls.
- The top gear species by average annual pounds landed were scup, channeled whelk, summer flounder, menhaden, and striped bass.
- The top ports by pounds landed were Point Judith, Little Compton, Newport, Bristol, and North Kingstown.

MRIP

- Recreational fishing effort seasonally increased in frequency from March through August, reaching its peak intensity by shore (i.e., fishing from shore such as surfcasting) and in both federal and state waters by private and for-hire/charter vessels in July and August.
- For all states surveyed (Connecticut, Massachusetts, New York, Rhode Island), most recreational fishing occurred within the respective state waters.

Aquaculture

- Aquaculture sites occur along the Rhode Island shoreline, Block Island, and throughout Narragansett Bay. No known aquaculture sites are intersected by the proposed RWEC corridor. The closest aquaculture site to the RWEC centerline is located on Conanicut Island, approximately 425 m from the centerline.
- Oysters are the main species cultivated by the aquaculture industry.

3.0 ENVIRONMENTAL CONSEQUENCES AND PROTECTION MEASURES

Potential impacts are characterized as direct or indirect and whether they result from construction, operations and maintenance (O&M), and/or decommissioning of the Project. Anticipated impacts also are characterized as direct or indirect; or as short-term or long-term. Consistent with NEPA (40 C.F.R. § 1508.8.), evaluations in this COP consider both detrimental (or negative) and beneficial impacts of the Project.

- *Direct or Indirect*: Direct effects are those occurring at the same place and time as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity.
- *Short-term or Long-term Impacts:* Short- or long-term impacts do not refer to any defined period. In general, short-term impacts are those that occur only for a limited period or only during the time required for construction activities. Impacts that are short-lived, such as noise from routine maintenance work during operations, may also be short-term if the activity is short in duration and the impact is restricted to a short, defined period. Long-term impacts are those that are likely to occur on a recurring or permanent basis or impacts from which a resource does not recover quickly. In general, direct impacts associated with construction and decommissioning are considered short-term because they will occur within the approximate 1-year construction phase. Indirect impacts are determined to be either short-term or long-term depending on if resource recovery may take several years. Impacts associated with O&M are considered long-term because they occur over the life of the Project (i.e., 25 years per the Lease but could be extended up to 35 years [see Section 3.5 of the COP]).
- *Proposed Environmental Protection Measures*: If measures are proposed to avoid or minimize potential impacts, the impact evaluation included consideration of these environmental protection measures.

Different impact-producing factors (IPFs) may result in varying levels of impact on commercial and recreational fisheries. IPFs that could commercial and recreational fisheries include seafloor disturbance, sediment suspension and deposition, habitat alteration, noise, traffic, visible structures, EMF, discharges and releases, and trash and debris.

3.1 Impact Assessment

Potential impacts are characterized as direct or indirect and as short-term or long-term. Different impact-producing factors (IPFs) may result in varying levels of impact on commercial and recreational fisheries. IPFs that could impact commercial and recreational fisheries include seafloor disturbance, habitat alteration, sediment suspension and deposition, noise, traffic, EMF, visible structures, discharges and releases, and trash and debris. Impacts that affect fishing activity are considered to be direct impacts and impacts on commercial and recreational fisheries that are mediated by impacts on fishery resources (i.e., targeted finfish and invertebrate species) are considered indirect.

The analysis of impacts on commercial and recreational fisheries are discussed separately for the RWF and RWEC in the following sections. The IPFs are further subdivided into IPFs during the construction and decommissioning phases of the Project and the O&M phase of the Project. Potential impacts on fishery resources are discussed in more detail in the Finfish and Essential Fish Habitat (EFH) Assessment (INSPIRE Environmental, 2021). Potential impacts to navigation are discussed in the Navigation Safety Risk Assessment (NSRA) (DNV GL, 2020).

3.1.1 Revolution Wind Farm

IPFs resulting in potential impacts on commercial and recreational fisheries in the RWF area are described in Table 3.1-1 for the construction and decommissioning phases and in Table 3.1-2 for the O&M phase.

Table 3.1-1 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries within the RWF during Construction and Decommissioning

Table 3.1-1			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
Seafloor Disturbance	Seafloor preparation	Direct, short-term Indirect, short-term	Direct Impacts: Seafloor preparation during construction is expected to result in short-term disruption of access to fishing areas for commercial and recreational fisheries. Fishing activity will be temporarily restricted in the immediate area of seafloor preparation operations due to a short-term 500-yard-radius safety zone established around construction operations, based on engagement with the USCG, USCG regulations (33 CFR § 147), as well as recent precedent set by an offshore renewable energy project constructed in the United States. It is expected that the USCG will also provide moving safety zones centered on cable laying vessels. Indirect Impacts: Indirect impacts on fisheries may occur as a result of the impacts of seafloor preparation on fishery resources. Impacts on fishery resources associated with seafloor preparation will primarily be associated with species that have benthic/demersal life stages and prefer the types of habitats that will be disturbed by seafloor preparation. These activities could cause injury or mortality to benthic/demersal species. Negative effects are expected to be short-term as the effects will cease after seafloor preparation are completed in a given area. Impacts on fishery resources that have pelagic early and/or later life stages are not expected, as pelagic habitats will not be directly affected by seafloor preparation. However, these species may temporarily vacate the area of disturbance. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration.
	In-situ MEC/UXO disposal Impact pile driving and/or vibratory pile driving/foundation installation	Direct, short-term Indirect, short-term	Direct Impacts: In-situ MEC/UXO disposal and impact pile driving and/or vibratory pile driving/foundation installation and/or associated scour protections (if necessary) will temporarily disrupt access to some fishing areas. Fishing activity will be temporarily restricted in the immediate area of seafloor preparation operations due to a short-term 500-yard safety zone established around construction operations. Indirect Impacts: Indirect impacts on commercial and recreational fisheries from impact pile driving and/or vibratory pile driving and foundation installation are similar to those discussed for seafloor preparation.
	RWF IAC and OSS-Link Cable installation	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with the IAC and OSS-Link Cable installation are expected to result in similar negative impacts as those discussed for seafloor preparation, as the IAC will be installed in the same area that was disturbed during seafloor preparation. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with the IAC and OSS-Link Cable installation are expected to result in similar impacts as those discussed for seafloor preparation.
	Vessel anchoring (including spuds)	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation, though lesser in spatial extent.

Table 3.1-1			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
Habitat Alteration	Seafloor preparation In-situ MEC/UXO disposal Impact pile driving and/or vibratory pile driving/foundation installation RWF IAC and OSS-Link Cable installation Vessel anchoring (including spuds)	**Indirect, long-term**	Indirect Impacts: In areas of sediment disturbance and/or increased sedimentation, benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels, based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994). Recolonization rates of benthic habitats are driven by the benthic communities inhabiting the area surrounding the impacted region. Communities well adapted to disturbance within their habitats (e.g., sand sheets) are expected to quickly recolonize a disturbed area, while communities not well adapted to frequent disturbance (e.g., cobble and boulder habitats) may take upwards of a year to begin recolonization and several years to become substantially re-established to pre-disturbance levels. This recovery time would result in a long-term loss of productivity in the disturbed area and a subsequent indirect, long-term impact on commercial and recreational fisheries. During decommissioning, foundations and other facilities will be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a). Recovery from decommissioning activities is expected to be similar that experienced during seafloor preparation, resulting in an indirect, long-term impact on commercial and recreational fisheries.
Sediment Suspension and Deposition	Seafloor preparation In-situ MEC/UXO disposal Impact pile driving and/or vibratory pile driving/foundation installation RWF IAC and OSS-Link Cable installation Vessel anchoring (including spuds)	**Indirect, short-term**	Indirect Impacts: Seafloor-disturbing activities will result in temporary increases in sediment suspension and deposition and may result in indirect, short-term, limited impacts on fisheries due to impacts on fishery species that have preferred habitat in the RWF. As discussed in Section 4.3.3.2 of the COP, sediment transport modeling was conducted to evaluate the concentrations of suspended sediments, spatial extent and duration of sediment plumes, and the seafloor deposition resulting from cable burial activities. The models, inputs, and results are described in detail in the Hydrodynamic and Sediment Transport Modeling Report (RPS, 2021). For the RWF IAC, a representative segment of 7,392 ft (2,253 m) of installation was simulated and the modeling results indicate that sediment plumes with total suspended solids (TSS) concentrations exceeding the ambient conditions by 100 mg/L could extend up to 1,273 feet (388 m) from the cable centerline. The plume is expected to be mostly contained within the bottom of the water column. The model estimated that the elevated TSS concentrations would be of short duration and expected to return to ambient conditions in less than 6.7 hours following the cessation of cable burial activities. The modeling results indicate that sedimentation from IAC burial may exceed 0.4 inch (10 mm) of deposition up to 89 feet (27 m) from the cable centerline and could cover up to 2.6 acres (1.1 ha). Sediment suspension and deposition associated with decommissioning activities are expected to be similar, but slightly lower in magnitude. Increases in sediment suspension and deposition associated with construction/decommissioning may cause short-term, limited impacts on benthic species and species with limited mobility, and short-term impacts on pelagic species. Commercial fisheries that target species affected by sediment suspension and deposition may experience indirect, short-term impacts due to losses in productivity.
Noise	In-situ MEC/UXO disposal	**Indirect, short-term**	Indirect Impacts: Impacts on fishery resources associated with potential in-situ MEC/UXO disposal will primarily be associated with species that have benthic/demersal life stages. MEC/UXO disposal could cause injury or mortality, TTS, or behavioral reactions to benthic/demersal species. Impacts are expected to be short-term as the effects will cease after disposal is completed in a given area and limited as they will disturb a small portion of the available habitat in the area. See Section 4.3.3.2 of the COP for a detailed discussion of potential noise impacts on fishery resources.
	Impact pile driving	**Indirect, short-term**	Indirect Impacts: Potential impacts on benthic and demersal species

Table 3.1-1

IPF	Project Activity	Impact Characterization for Commercial and Recreational Fisheries	Discussion
	and/or vibratory pile driving		that are targeted by commercial and recreational fisheries may cause indirect, short-term impacts on the fisheries. Underwater noise can elicit avoidance behavior; therefore, fisheries targeting more mobile species may be affected. See Section 4.3.3.2 of the COP for a detailed discussion of potential noise impacts on fishery resources.
	Vessel noise, construction equipment noise, aircraft noise	**Indirect, short-term**	Indirect Impacts: Indirect, short-term impacts on commercial and recreational fisheries could occur due to avoidance behavior of fishery resources caused by vessel noise, construction and decommissioning equipment noise, and/or aircraft noise. Sounds created by mechanical/hydro-jet plows, vessels, or aircraft during construction and decommissioning are continuous or non-impulsive sounds, which have different characteristics underwater and impacts on marine life. The noise from mechanical/hydro-jet plows is expected to be masked by louder sounds from vessels. The duration of construction equipment and vessel noise at a given location will be short, as the installation vessel will only be present for a short period at any given location along the cable corridor. Underwater noise associated with helicopters is generally brief as compared with the duration of audibility in the air (Richardson et al., 1995). Because of this, impacts on fishery resources from aircraft noise are expected to be short-term. Impacts on fishery resources may result from a temporary degradation of habitat quality due to elevated noise levels. However, the noise generated by vessel and aircrafts will be similar to the range of noise from existing vessel and aircraft traffic in the region, and are not expected to substantially affect the existing underwater noise environment.
Discharges and Releases	Hazardous materials spills Wastewater discharge	**Direct, short-term** **Indirect, short-term**	Direct and Indirect Impacts: Routine discharges of wastewater (e.g., gray water or black water) or liquids (e.g., ballast, bilge, deck drainage, stormwater) may occur from vessels, WTGs, or the OSS during construction and decommissioning; however, those discharges and releases are not anticipated to have impacts because all vessel waste will be offloaded, stored, and disposed of in accordance with all applicable local, state and federal regulations. In addition, compliance with applicable Project-specific management practices and requirements will minimize the potential for negatively impacting water quality and marine life. The construction/decommissioning of the RWF is not anticipated to lead to any spills of hazardous materials into the marine environment. All vessels participating in the construction and decommissioning of the RWF will comply with USCG requirements for management of onboard fluids and fuels, including maintaining and implementing spill prevention, control, and countermeasure (SPCC) plans. Vessels will be navigated by trained, licensed vessel operators who will adhere to navigational rules and regulations and vessels will be equipped with spill handling materials adequate to control or clean up an accidental spill. Best management practices (BMPs) for fueling and power equipment servicing will be incorporated into the Project's Emergency Response Plan and Oil Spill Response Plan (ERP/OSRP). Accidental releases are minimized by containment and clean-up measures detailed in the OSRP. Given these measures and the very low likelihood of an inadvertent release, potential impacts of a hazardous material spill on commercial and recreational fisheries and fishery resources are not anticipated.
Marine Trash and Debris		**Direct, short-term**	Direct Impacts: Vessels will adhere to USCG and EPA regulations that require operators to develop waste management plans, to post informational placards, to manifest trash sent to shore, and to use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Also, BOEM lease stipulations require adherence to Notice to Lessee (NTL) 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, which requires the posting of placards at prominent locations on offshore vessels and structures,

Table 3.1-1			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			and which mandates a yearly marine trash and debris awareness training and certification process. As such, measures will be implemented prior to and during construction and decommissioning to avoid, minimize, and mitigate impacts related to trash and debris disposal. Given these measures, impacts from trash and debris on commercial and recreational fisheries and fishery resources are not expected.
Traffic		**Direct, short-term**	Direct Impacts: Commercial and recreational fisheries may experience short-term impacts due to increased vessel traffic during the construction and decommissioning phases of the RWF, as fisherman may avoid areas of increased vessel activity. Potential impacts on navigation are discussed in the Navigational Safety Risk Assessment (NSRA) (DNV GL, 2020). Primary conclusions of the NSRA included that vessel traffic near the project area is light, recreational/pleasure vessels represent the greatest proportion of vessel tracks in the study area, and deep draft vessel traffic in the wind farm area is expected to be limited to emergency circumstances.
Visible Structures		**Direct, short-term**	Direct Impacts: The physical presence of installation and decommissioning vessels and RWF components may affect fishing activity because there will be a minimum safety perimeter around installation and decommissioning vessels and locations where the RWF components will be installed and removed. This temporarily restricted area will consist of a 500-yard radius safety zone.

Table 3.1-2 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries within the RWF during Operations and Maintenance

Table 3.1-2			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
Seafloor Disturbance	Foundations (WTG and OSS) RWF IAC and OSS-Link Cable non-routine O&M	Direct, short-term Indirect, short-term	Direct Impacts: Seafloor disturbance during O&M of the RWF will be limited to non-routine maintenance of bottom-founded infrastructure (e.g., foundations, scour protection, cable protection). These maintenance activities may result in direct, short-term impacts on fishing activity, as fishing access would be temporarily disrupted. However, the extent of the disturbance would be limited to specific areas. Indirect Impacts: Seafloor-disturbing maintenance activities are expected to result in similar indirect impacts on fisheries as those discussed for construction/decommissioning (Table 3.1-1), as fishery resources would be temporarily affected. However, the extent of disturbance would be limited to specific areas.
	Vessel anchoring (including spuds)	Direct, short-term Indirect, short-term	Direct Impacts: During O&M, anchoring will be limited to vessels required to be onsite for an extended duration. Impacts on commercial and recreational fisheries resulting from potential vessel anchoring during O&M activities are expected to be similar to those discussed in Table 3.1-1. Indirect Impacts: Indirect impacts on commercial and recreational fisheries due to impacts on fishery resources associated with vessel anchoring (including spuds) are expected to be short-term impacts.
Habitat Alteration	Foundations (WTG and OSS) RWF IAC and OSS-Link Cable	Direct, long-term Indirect, long-term	Direct Impacts: Minimal impacts on commercial and recreational fisheries are expected from operation of the IAC and OSS-Link Cable themselves, as they will be buried beneath the seabed. The USCG's stated policy is that "in the United States vessels will have the freedom to navigate through [wind farms], including export cable routes." (See Coast Guard Navigation and Vessel Inspection Circular 01-19 dated 1 August 2019.) Therefore, commercial fishermen will have the freedom to continue to fish within the Lease Area and near cable corridors. Further, the NSRA prepared for the Project, which is based on a very conservative potential layout (i.e., up to 144 WTGs), did not identify major areas of concern regarding safe marine navigation through the RWF. The Project's 1.15 mi (1 nm) by 1.15 mi (1 nm) layout allows for safe navigation by fishing vessels, and, therefore potential impacts on fishing grounds are considered direct and long-term. Indirect Impacts: Presence of the foundations, associated scour protection, and cable protection may result in both negative and beneficial indirect impacts on commercial and recreational fisheries due to conversion of primarily soft-bottom habitat to hard-bottom habitat and the subsequent effects on fishery resources. Fishery resources associated with soft-bottom habitats may experience long-term impacts, as available habitat will be slightly reduced. Fishery resources that inhabit hard bottom habitats may experience a beneficial effect, depending on the quality and type of habitat created by the foundations, scour protection, and cable protection, and the quality and type of the benthic community that colonizes that habitat. Commercial fisheries that target species with limited mobility may have indirect, long-term impacts from the presence of the WTG foundations (due to the impact on benthic and demersal species such as ocean quahog clam, Atlantic surfclam, and Atlantic sea scallop). An indirect, long-term benefit of the WTGs' physical presence is that the new structures may attract recreationally important species. The physical presence of these structures may result in direct benefits to recreational fisheries due to the WTG marking the location with a hardened structure and attracting fishermen. While this is a potentially beneficial impact of the physical presence of the WTGs, it also may be considered a negative impact for recreational fishermen who previously utilized the location as a secluded fishing location because, during operation, the RWF WTGs could potentially become a recreational fishing destination. In addition, increased fishing pressure on fish aggregations at the WTGs may result

Table 3.1-2			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			in increased recreational fishing mortality rates. If these circumstances arise, then indirect, long-term impacts are expected.
Sediment Suspension and Deposition	RWF IAC and OSS-Link Cable non-routine O&M Vessel anchoring (including spuds)	Indirect, short-term	Indirect Impacts: Increases in sediment suspension and deposition during the O&M phase will result from vessel anchoring and non-routine maintenance activities that require exposing the IAC and/or OSS-Link Cable. Negative indirect impacts on commercial and recreational fisheries resulting from sediment suspension and deposition during the O&M phase are expected to be similar to those discussed for the construction and decommissioning phase (Table 3.1-1), but on a more limited spatial scale.
Noise	Vessel and aircraft noise	Indirect, short-term	Indirect Impacts: Negative impacts on commercial and recreational fisheries due to the impacts of ship and aircraft noise on fishery resources are expected to be similar to those discussed for the construction/decommissioning phase (Table 3.1-1), though lesser in extent. The noise generated by vessel and aircrafts will be similar to the range of noise from existing vessel and aircraft traffic in the region, and is not expected to substantially affect the existing underwater noise environment.
	WTG operational noise	Indirect, long-term	Indirect Impacts: The underwater noise levels produced by WTGs are expected to be within the hearing ranges of fish. Depending on the noise intensity, these noises could cause avoidance of the RWF area for some fishery species or their prey, resulting in indirect impacts on commercial and recreational fisheries. However, noise levels from operation of the RWF WTGs are not expected to result in injury or mortality, and finfish may become habituated to the operational noise (Thomsen et al., 2006; Bergström et al., 2014). Lindeboom et al. (2011) found no difference in the residency times of juvenile cod around monopiles between periods of WTG operation or when WTGs were out-of-order. This study also found that sand eels did not avoid the wind farm. In a similar study, the abundance of cod, eel, shorthorn sculpin, and goldsinny wrasse, were found to be higher near WTGs, suggesting that potential noise impacts from operation did not override the attraction of these species to the artificial reef habitat (Bergström et al., 2013). Based on the available literature, operational noise from the WTGs is expected to have an indirect, long-term impact on commercial and recreational fisheries.
Electric and Magnetic Fields	RWF IAC and OSS-Link Cable	Indirect, long-term	Indirect Impacts: A modeling analysis of the magnetic fields and induced electric fields anticipated to be produced during operation of the RWF IAC, OSS-Link Cable, and RWEC was performed and results are included in the Offshore Electric- and Magnetic-Field Assessment (Exponent, 2020). These modeling results were compared to existing scientific literature on the sensitivity of marine species to EMF. Based on the modeling results and existing evidence, behavioral effects and/or changes in species abundance and distributions are not expected (see section 4.3.3.2 of the COP for additional discussion). These conclusions are consistent with the findings of a previous comprehensive review of the ecological impacts of marine renewable energy projects, where it was determined that there has been no evidence demonstrating that EMF at the levels expected from marine renewable energy projects will cause an effect (negative or positive) on any species (Copping et al., 2016). Moreover, a 2019 BOEM report that assessed the potential for AC EMF from offshore wind facilities to affect marine populations concluded that, for the southern New England area, no negative effects are expected for populations of key commercial and recreational fish species (Snyder et al., 2019). Based on this information, it is not expected that fishery resources will be measurably affected by EMF from the cables, and thus indirect impacts on commercial and recreational fisheries are not expected.
Discharges and Releases	Hazardous materials spills Wastewater discharges	Direct, short-term Indirect, short-term	Direct and Indirect Impacts: As discussed for the construction/decommissioning phase, routine discharges of wastewater or liquids (e.g., ballast, bilge, deck drainage, stormwater) are not anticipated to have impacts because all vessel waste will be offloaded, stored, and disposed of in accordance with all applicable local, state and federal regulations. In addition, compliance with applicable Project-

Table 3.1-2			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			specific management practices and requirements will minimize the potential for negatively impacting water quality and marine life. The operation of the RWF is not anticipated to introduce spills of hazardous material into the marine environment. Per the information requirements outlined in 30 CFR 585.626, a list of solid and liquid wastes generated, including disposal methods and locations, as well as federally regulated chemical products, is found in the Project's ERP/OSRP. The WTGs and OSSs will be designed for secondary levels of containment to prevent accidental discharges of hazardous materials to the marine environment. Most maintenance will occur inside the WTGs, thereby reducing the risk of a spill, and no oils or other wastes are expected to be discharged during maintenance activities. All vessels participating in O&M of the RWF will comply with USCG requirements for management of onboard fluids and fuels, including maintaining and implementing SPCC plans. Vessels will be navigated by trained, licensed vessel operators who will adhere to navigational rules and regulations and vessels will be equipped with spill handling materials adequate to control or clean up an accidental spill. Best management practices (BMPs) for fueling and power equipment servicing will be incorporated into the Project's ERP/OSRP. Accidental releases are minimized by containment and clean-up measures detailed in the OSRP. Given these measures and the very low likelihood of an inadvertent release, potential impacts of a hazardous material spill on commercial and recreational fisheries and fishery resources are not anticipated.
Marine Trash and Debris		**Direct, short-term** **Indirect, short-term**	Direct and Indirect Impacts: As discussed in Table 3.1-1, vessels will adhere to the USCG and EPA marine trash regulations, as well as BOEM guidance, and trash and debris generated during O&M of the RWF will be contained on vessels or at staging areas until disposal at an approved facility. Measures will be implemented prior to and during construction to avoid, minimize, and mitigate impacts related to trash and debris disposal. Given these measures, impacts from trash and debris on commercial and recreational fisheries and fishery resources are not expected.
Traffic		**Direct, long-term**	Direct Impacts: Impacts associated with traffic during O&M are expected to be similar to, but less frequent than, those discussed in the construction phase and may result in direct, long-term impacts.

3.1.2 Revolution Wind Export Cable Corridor

IPFs resulting in potential impacts on commercial and recreational fisheries associated with the RWEC Corridor are described in Table 3.1-3 for the construction and decommissioning phases and in Table 3.1-4 for the O&M phase. At the end of the Project's operational life, the Project will be decommissioned in accordance with a detailed decommissioning plan to be developed in compliance with applicable laws, regulations, and best management practices at that time. All of these activities are anticipated to be similar to or less than those described for construction, unless otherwise noted. The impacts discussed in this section apply to both the RWEC-OCS and RWEC-RI, though the impacts would vary based on fishing activity. In RI state waters fishing activity primarily used pots and traps, followed by fixed nets and the top species landed were scup, channeled whelk and summer flounder. In federal waters, the top fisheries use bottom trawls, mid-water trawls, and pots, with Atlantic herring, lobster, and squid the highest landed species by pound.

Table 3.1-3 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries for the RWEC Corridor during Construction and Decommissioning

Table 3.1-3			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
Seafloor Disturbance	Seafloor preparation In-situ MEC/UXO disposal	Direct, short-term Indirect, short-term	Direct Impacts: As discussed in Table 3.1-1, the potential impacts on commercial and recreational fisheries from seafloor preparation are primarily associated with short-term disruption of access to fishing areas for commercial and recreational fisheries. Decommissioning activities are expected to cause similar impacts as construction, but these impacts would be shorter in duration Indirect Impacts: Indirect negative impacts on commercial and recreational fisheries associated with seafloor preparation for the RWEC are expected to be similar to those discussed in Table 3.1-1.
	RWEC installation	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with the RWEC installation/decommissioning are expected to result in similar negative impacts as those for seafloor preparation. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with RWEC installation/decommissioning are expected to result in similar negative impacts as those discussed in Table 3.1-1 for the IAC and OSS-Link Cable.
	Vessel anchoring (including spuds)	Direct, short-term Indirect, short-term	Direct Impacts: Direct impacts on commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation. Indirect Impacts: Indirect impacts to commercial and recreational fisheries associated with vessel anchoring (including spuds) are similar to those discussed in seafloor preparation
Habitat Alteration	Seafloor Preparation In-situ MEC/UXO disposal RWEC installation Vessel anchoring (including spuds)	Indirect, long-term	Indirect Impacts: In areas of sediment disturbance and/or increased sedimentation, benthic habitat recovery and benthic infaunal and epifaunal species abundances may take up to 1 to 3 years to recover to pre-impact levels, based on the results of a number of studies on benthic recovery (e.g., AKRF, Inc. et al., 2012; Germano et al., 1994; Hirsch et al., 1978; Kenny and Rees, 1994). Recolonization rates of benthic habitats are driven by the benthic communities inhabiting the area surrounding the impacted region. Communities well adapted to disturbance within their habitats (e.g., sand sheets) are expected to quickly recolonize a disturbed area, while communities not well adapted to frequent disturbance (e.g., cobble and boulder habitats) may take upwards of a year to begin recolonization and several years to become substantially re-established to pre-disturbance levels. This recovery time would result in a small, long-term loss of productivity in the disturbed area and a subsequent indirect, long-term impact on commercial and recreational fisheries. During decommissioning, foundations and other facilities will be removed to a depth of 15 ft (4.6 m) below the mudline, unless otherwise authorized by BOEM (30 CFR § 585.910(a). Recovery from

Table 3.1-3			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			decommissioning activities is expected to be similar that experienced during seafloor preparation, resulting in an indirect, long-term impact on commercial and recreational fisheries.
Sediment Suspension and Deposition	Seafloor Preparation In-situ MEC/UXO disposal RWEC installation Vessel anchoring (including spuds)	**Indirect, short-term**	Indirect Impacts: As discussed in Table 3.1-1, seafloor-disturbing activities will result in temporary increases in sediment suspension and deposition. Sediment transport modeling results associated with seafloor preparation for RWEC cable installation indicate that sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 5,838 feet (1,780 m) from the RWEC-RI centerline in state waters, and up to 3,067 feet (1,780 m) from RWEC-OCS centerline in federal waters. The plume is expected to be mostly contained within the bottom of the water column, though in shallower waters it may occupy most of the water column due to the water depth. For the RWEC-OCS, predicted TSS concentrations above ambient associated with seafloor preparation for any single circuit installation do not persist in any given location for greater than 85 hours, though in most locations (>75 % of the affected area) concentrations return to ambient within 37 hours. The modeling results indicate that sedimentation from seafloor preparation for RWEC installation may exceed 0.4 inch (10 mm) of deposition up to 1,033 feet (315 m) from the cable centerline in state waters and up to 846 feet (258 m) in federal waters. This thickness of sedimentation could cover up to 4,841.9 acres (195 ha) in state waters, and 808 acres (4,127,794 m^2) in federal waters. The modeling results associated with RWEC cable burial indicate that sediment plumes with TSS concentrations exceeding the ambient conditions by 100 mg/L could extend up to 2,345 feet (715 m) from the RWEC-RI centerline in state waters, and up to 1,755 feet (535 m) from RWEC-OCS centerline in federal waters. The plume is expected to be mostly contained within the bottom of the water column, though in shallower waters it may occupy most of the water column due to the water depth. For the RWEC-OCS, predicted TSS concentrations above ambient for any single circuit installation do not persist in any given location for greater than 69.7 hours, though in most locations (>75 % of the affected area) concentrations return to ambient within 24.5 hours. The modeling results indicate that sedimentation from RWEC burial does not exceed 0.4 inch (10 mm) of deposition in state waters and will exceed 0.4 inch (10 mm) of deposition up to 312 feet (95 m) from the cable centerline in federal waters. This thickness of sedimentation could cover up to 25.9 acres (10.5 ha) in federal waters. For the cable landfall, TSS concentrations exceeding ambient conditions by 100 mg/L could extend up 1,312 feet (400 m) from the centerline and plume concentrations above ambient could persist for 70.3 hours for the HDD. Sedimentation greater than 0.4 in (10 mm) may extend up to 738 feet (225 m) from the centerline and could cover up to 7.4 acres (3 ha). Sediment suspension and deposition associated with decommissioning activities are expected to be similar, but slightly lower in magnitude. Increases in sediment suspension and deposition associated with construction/decommissioning may cause short-term impacts on benthic species and species with limited mobility, and short-term impacts on pelagic species. Commercial fisheries that target species affected by sediment suspension and deposition may experience indirect, short-term impacts due to losses in productivity.
Noise	Vessel noise, equipment noise, aircraft noise, in-situ MEC/UXO disposal	**Indirect, short-term**	Indirect Impacts: Negative indirect impacts on commercial and recreational fisheries resulting from vessel, construction/decommissioning equipment, in-situ MEC/UXO disposal, and aircraft noise are expected to be similar to those discussed in Table 3.1-1.
	Vibratory pile driving (cofferdam) *RWEC-RI only	**Indirect, short-term**	Indirect Impacts: The cofferdam at the RWEC landfall, if required, may be installed as either a sheet piled structure into the sea floor or a gravity cell structure placed on the sea floor using ballast weight.

Table 3.1-3			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	**Discussion**
			Sheet pile installation would require the use of a vibratory hammer to drive the sidewalls and endwalls into the seabed, which may take approximately up to 3 days. For fishery resources exposed, noise from vibratory pile driving may temporarily reduce habitat quality, result in behavioral changes, or cause mobile species to temporarily vacate the area. As a result, noise impacts may result in indirect, short-term impacts on fisheries. However, habitat suitability is expected to return to pre-pile driving conditions shortly after cessation of the pile driving activity.
Discharges and Releases	Hazardous materials spills Wastewater discharge	Direct, short-term Indirect, short-term	Direct and Indirect Impacts: Impacts associated with wastewater discharge or an inadvertent release of hazardous material during construction or decommissioning of the RWEC are expected to be similar to those discussed in Table 3.1-1.
Marine Trash and Debris		Direct, short-term Indirect, short-term	Direct and Indirect Impacts: Impacts associated with marine trash and debris are expected to be similar to those discussed in Table 3.1-1.
Traffic		Direct, short-term	Direct Impacts: Negative impacts on commercial and recreational fisheries resulting from sediment suspension and deposition are expected to be similar to those discussed in Table 3.1-1.

Table 3.1-4 IPFs and Characterizations of Potential Impacts on Commercial and Recreational Fisheries for the RWEC Corridor during Operations and Maintenance

Table 3.1-4			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	Discussion
Seafloor Disturbance	RWEC non-routine O&M	Direct, short-term Indirect, short-term	Direct Impacts: Seafloor disturbance during O&M of the RWEC will be limited to non-routine maintenance that may require uncovering and reburial of the cables, as well as maintenance of cable protection. These maintenance activities may result in direct, short-term impacts on fishing activity, as fishing access would be temporarily disrupted. However, the extent of the disturbance would be limited to specific areas along the cable corridor. Indirect Impacts: Indirect impacts on commercial and recreational fisheries associated with O&M activities for the RWEC are expected to result in similar negative impacts as those discussed for the IAC in Table 3.1-1, as fishery resources would be temporarily affected. However, the extent of disturbance would be limited to specific areas.
	Vessel anchoring (including spuds)	Direct, short-term Indirect, short-term	Direct Impacts: During O&M, anchoring will be limited to vessels required to be onsite for an extended duration. Negative impacts on commercial and recreational fisheries resulting from potential vessel anchoring during O&M activities are expected to be similar to those discussed in Table 3.1-1. Indirect Impacts: Indirect impacts on commercial and recreational fisheries due to impacts on fishery resources associated with vessel anchoring (including spuds) are expected to be short-term impacts.

Table 3.1-4			
IPF	**Project Activity**	**Impact Characterization for Commercial and Recreational Fisheries**	Discussion
Habitat Alteration	RWEC O&M	Direct, short-term Indirect, long-term	Direct Impacts: Commercial and recreational fisheries are not expected to experience impacts from the presence of the RWEC-OCS because it will be buried beneath the seabed. The USCG's stated policy is that "in the United States vessels will have the freedom to navigate through [wind farms], including export cable routes." (See Coast Guard Navigation and Vessel Inspection Circular 01-19 dated 1 August 2019.) Therefore, commercial fishermen will have the freedom to continue to fish within the Lease Area and near cable corridors. Therefore, potential impacts on fishing grounds are not anticipated. Indirect Impacts: Cable protection (e.g., concrete mattresses) may be placed in select areas along the RWEC. As discussed in Table 3.1-2 for the RWF IAC and OSS-Link Cable, the presence of the cable protection may result in both negative and beneficial indirect impacts on commercial and recreational fisheries due to conversion of primarily soft-bottom habitat to hard-bottom habitat and the subsequent effects on fishery resources. The cable protection may have a long-term impact on fishery resources associated with soft-bottom habitats and a long-term beneficial impact on species associated with hard-bottom habitats, depending on the quality of the habitat created by the cable protection, and the quality of the benthic community that colonizes that habitat. Commercial dredgers and trawlers (e.g., surfclam/ocean quahog and scallop fisheries) potentially may lose fishing ground if additional cable protection is needed in areas that are fished. In fished areas where the substrate type necessitates additional cable protection, it is possible that commercial dredgers and trawlers (e.g., surfclam/ocean quahog and scallop fisheries) potentially may lose a small amount of fishing ground in association with the altered seabed structure. After recolonization, the cable protection locations may provide indirect, long-term benefits to recreational fisheries if they choose to target recreational species that may favor these hard-bottom habitats, depending on the quality and type of habitat created by the cable protection, and the quality and type of benthic community that colonizes that habitat.
Sediment Suspension and Deposition	RWEC non-routine O&M Vessel anchoring (including spuds)	Indirect, short-term	Indirect Impacts: Increases in sediment suspension and deposition during the O&M phase will result from vessel anchoring and non-routine maintenance activities that require exposing portions of the RWEC. Negative direct and indirect impacts on commercial and recreational fisheries resulting from sediment suspension and deposition during the O&M phase are expected to be similar to the limited impacts discussed for the O&M of the RWF IAC and OSS-Link Cable (Table 3.1-2).
Noise	Vessel and aircraft noise	Indirect, short-term	Indirect Impacts: Commercial and recreational fishery resources are not expected to experience impacts from vessel or aircraft noise during the RWEC O&M phase. Impacts from vessel and aircraft noise during O&M of the RWEC are expected to be similar to, but less frequent than those described for the construction phase.
Electric and Magnetic Fields	RWEC operations	Indirect, long-term	Indirect Impacts: EMF impacts on commercial and recreational fisheries from the RWEC during O&M are not expected.
Discharges and Releases	Hazardous materials spills Wastewater discharge	Direct, short-term Indirect, short-term	Direct and Indirect Impacts: Impacts associated with wastewater discharge or an inadvertent release of hazardous material during O&M of the RWEC are expected to be similar to those discussed in Table 3.1-1.
Marine Trash and Debris		Direct, short-term	Direct Impacts: Impacts associated with marine trash and debris are expected to be similar to those discussed in Table 3.1-1.
Traffic		Direct, long-term	Direct Impacts: Traffic during the O&M of the RWEC is expected to have similar direct, long-term impacts on commercial and recreational fisheries as those described for the RWF in Table 3.1-2.

3.2 Proposed Environmental Protection Measures

To minimize impacts associated with the RWF and RWEC, Revolution Wind is proposing the following measures to avoid, minimize, or mitigate potential impacts on commercial and recreational species.

- Revolution Wind is committed to an indicative layout scenario with WTGs sited in a grid with approximately 1.15 mi (1 nm) by 1.15 mi (1 nm) spacing that aligns with other proposed adjacent offshore wind projects in the RI-MA WEA. This layout has been confirmed through expert analysis to allow for safe navigation without the need for additional designated transit lanes. This layout will also provide a uniform, wide spacing among structures to facilitate search and rescue operations.
- To the extent feasible, installation of the Inter-Array Cable, OSS Interconnector Cable, and RWEC will occur using equipment such as mechanical cutter, mechanical plow, or jet plow.
- To the extent feasible, the RWEC, IAC, and OSS-Link Cable will typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m) below seabed. The target burial depth will be determined based on an assessment of seabed conditions, seabed mobility, the risk of interaction with external hazards such as fishing gear and vessel anchors, and a site-specific Cable Burial Risk Assessment.
- As appropriate and feasible, BMPs will be implemented to minimize impacts on fisheries, as described in the Guidelines for Providing Information on Fisheries Social and Economic Conditions for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 (BOEM, 2015).
- Revolution Wind is committed to collaborative science with the commercial and recreational fishing industries pre-, during, and post-construction. Fisheries monitoring studies are being planned to assess the impacts associated with the Project on economically and ecologically important fisheries resources. These studies will be conducted in collaboration with the local fishing industry and will build upon monitoring efforts being conducted by affiliates of Revolution Wind at other wind farms in the region.
- Each WTG will be marked and lit with both USCG and approved aviation lighting. AIS will be installed at the RWF marking the corners of the wind farm to assist in safe navigation.
- Revolution Wind will require all construction and operations vessels to comply with regulatory requirements related to the prevention and control of spills and discharges.
- Accidental spill or release of oils or other hazardous materials offshore will be managed through the Project's ERP/OSRP.
- All vessels will comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels will also comply with BOEM lease stipulations that require adherence to NTL 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.
- Communications and outreach with the commercial and recreational fishing industries will be guided by the Project-specific Fisheries Communication and Outreach Plan (Orsted, 2020).
- Project construction, O&M, and decommissioning activities will be coordinated with appropriate contacts at USCG and United States Department of Defense command headquarters.
- RWEC was sited to avoid conflicts with DoD use areas and navigational areas identified by the USCG, as applicable.
- Revolution Wind is committed to a Gear Loss Prevention and Claim Procedure.
- Revolution Wind is committed to a Navigational Safety Fund in the states of Rhode Island and Massachusetts for the commercial fishing industry.
- A comprehensive communication plan will be implemented during offshore construction to inform all mariners, including commercial and recreational fishermen, and recreational boaters of construction activities and vessel movements. Communication will be facilitated through a Fisheries Liaison, Project website, and public notices to mariners and vessel float plans (in coordination with USCG).

- Revolution Wind intends to conduct an as-built survey/bathymetry survey along the entirety of the cable routes following installation. Bathymetry surveys will be performed one year after commissioning, two years after commissioning, and every five years thereafter or in accordance with permits and authorizations received for the Project.

3.3 Summary of Characterizations of Impacts on Commercial Recreational Fisheries

3.3.1 RWF

Overall, construction and decommissioning activities of the RWF are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during construction and decommissioning of the RWF is expected to have direct, short-term, impacts on fishing areas for commercial and recreational fisheries due to an expected 1,640 ft (500 yd) radius temporary safety zone established around RWF components and indirect, short-term impacts because of seafloor disturbance and indirect, long-term impacts because of habitat alteration that would affect some commercially and recreationally targeted species. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat in the RWF. Noise during construction and decommissioning is expected to have indirect, short-term impacts primarily from behavioral responses of targeted fisheries species, such as avoidance behavior for mobile species, though MEC/UXO disposal could cause injury or mortality, TTS, or behavioral reactions to benthic/demersal species. Traffic is expected to have direct, short-term impacts, as fisherman may avoid areas of increased vessel activity. Visible structures are expected to have direct, short-term impacts because installation vessels and RWF components will affect fishing activity via the safety zone. Impacts from discharges and releases and marine trash and debris are not expected because vessels will comply with state and federal regulations and implement BMPs.

Operations and Maintenance activities within the RWF are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during operation and maintenance of the RWF is expected to have direct and indirect, short-term impacts on commercial and recreational fisheries. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat in the RWF. Habitat alteration due to the presence of WTG foundations, scour protection, and cable protection of the IAC and OSS-Link Cable may result in direct, long-term impacts due to the presence of the wind farm structures and related impacts on the use of fishing grounds. Habitat alteration is also expected to result in indirect, long-term benefits that include potential increases in abundances of fishery species that utilize hard-bottom habitats, as well as the WTG marking the location of the fishery resource that was previously a secluded fishing location. Noise and EMF during operation and maintenance is expected to have indirect, long-term impacts. Traffic is expected to have direct, long-term impacts on commercial and recreational fisheries with less frequent disturbances than those discussed in the construction phase. Discharges and releases and marine trash and debris are not expected because the RWF is not anticipated to introduce spills or hazardous material or trash/debris into the marine environment.

3.3.2 RWEC Corridor

In general, RWEC installation and decommissioning activities along the RWEC-OCS and RWEC-RI corridors are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during construction and decommissioning of the RWEC-OCS and RWEC-RI is expected to have direct, short-term impacts on commercial and recreational fisheries because of temporarily restricted access to fishing grounds due to safety restrictions on entering the area, indirect, short-term impacts because of seafloor disturbance, and indirect, long-term impacts because of habitat alteration that would affect some commercially and recreationally targeted species. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat along the cable corridor. Noise during construction and decommissioning is expected to have indirect, short-term impacts primarily from behavioral responses of targeted fisheries species, such as avoidance behavior for mobile species, though MEC/UXO disposal could cause injury or mortality, TTS, or behavioral reactions to benthic/demersal species. Traffic is expected to have direct, short-term impacts, as fisherman may avoid areas of increased vessel activity. Impacts from discharges and releases and marine trash and debris are not expected because vessels will comply with state and federal regulations and implement BMPs.

Operations and Maintenance activities of the RWEC are expected to have limited impacts on commercial and recreational fisheries. Seafloor disturbance during operation and maintenance of the RWEC is expected to have direct and indirect, short-term impacts on commercial and recreational fisheries. Sediment suspension and deposition are expected to have indirect, short-term impacts due to effects on targeted species with preferred habitat in the RWF. Habitat alteration due to the presence of cable protection of RWEC may result in limited impacts due to the presence of the cable protection and related impacts on the use of fishing grounds. Noise and EMF during operation and maintenance are expected to have indirect, long-term impacts. Traffic is expected to have direct, long-term impacts on commercial and recreational fisheries with less frequent disturbances than those discussed in the construction phase. Impacts of discharges and releases and marine trash and debris are not expected.

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